

Type of the Paper (Article)

# Ancient bacterial class *Alphaproteobacteria* cytochrome P450 monooxygenases can be found in other bacterial species

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**Supplementary Dataset 1: P450 sequences identified in Alphaproteobacterial species.**

**Full-length P450s:**

>CYP101B1 (Saro\_3533) *Novosphingobium aromaticivorans*

MEAPAHVPADRVVDIDIMPPGLAEHGFHKAWSDSL SAGNPAVVWTPRNEGHWIALGGEALQEVQSDPERFSSR  
IIVLPKSVGEMHGLIPTTIDPPEHRPYRQLLNAHLNPGAIRGLSESI RQTAVDLIEGFAAQGHCNFTAQYAEQ  
FPIRVFMALVGIEASEAPRI RHWAECMTRPGMDMTFDEAKAVFFDYVGPLVDARRETPGEDMISAMINADLGD  
GRRLTRDEALSVVTQVLIAGLDTVNVNLGFMIMRELAGNPALRADLRQRGADILPVVHELFRRFGLVSIAREVR  
RDIEFHGVHLKAGDMIAIPTQVHGLDPRVNPDLAIDPSRKRARHSTFGSGPHMCPGQELARKEVAITILEEWL  
RRIPDFALGPNSDLSPPVPGIVGALRRVELVWNT

>CYP101C1 (Saro\_2249) *Novosphingobium aromaticivorans*

MIPAHVPADRVVDFDIFNPPGVEQDYFAAWKTLLDGPGLVWSTANGGHWIAARGDVVRELWGDAERLSSQCLA  
VTPGLGKVMQFIPLQQDGAEHKAFRTPVMKGLASRFVVALEPKVQAVARKLMESLRPRGSCDFVSDFAEILPL  
NIFLTLIDVPLEDRPRLRQLGVQLTRPDGSMTVEQLKQAADDYLWPFIEKRMAQPGDDLFSRILSEPVGGRPW  
TVDEARRMCRNLLFGGLDTVAAMIGMVALHLARHPEDQRLLRERPDLPAAADELMRRYPTVAVSRNAVADVD  
ADGVTIRKGD LVYLPSVLHNLDPASFEAPEEVRFRDGLAPIRHTTMGVGAHRCVGAGLARMEVIVFLREWLGG  
MPEFALAPDKAVTMKGGNVGACTALPLVWRA

>CYP101C5 (PP1Y\_AT30146) *Novosphingobium* sp. PP1Y

MATVAANRPDHPADRVVDFDIFAPPGSEEDYFAAWASVRGDHALVWTTANGGHWIAADGETTRKLWDAENL  
SNEALAVTPGLGEAMNFIPLQQDAPEHKPFMRMAVMKGFANNHV VAMEPLIREVARELTAQITPHGECEFMEEY  
AEVLPIHIFLTLIDVPTQDRRLRLPLGQQLTRPDGSMTVEQLRDAADDYLRPYIEERLRKPGQDLFSRILSIP  
IEGREWTFDEAQRMCNLLFGGLDTVVS MFGNIALHLARYPEDQNL LRNP ELIPQAADELMRRYPMVSVTRN  
LVRDVEIDGITLRSGDLVYLNSSIHNLDTACFDNPHKVD FERNLSPVRHTTMGVGPHRCVGAGLARLEAILFI  
EEWLKGI PSFRVKPGSPPRYRAGNVGALTELRL EWD

>CYP101C6 (WG74\_05650) *Citromicrobium* sp. JL477

MSAQPIPDHVPADRVVDFNVFAPPGGEQDFFAAWKSLLGGPGLVWTTENGHWIGACGEVVRSLWGDAERFSN  
EALAVTPGLGEVMEFIPLQQDPPEHKPFMRMAVMKGFANNHV VAMEPLVREQARLLIEGLMGKGGCEFM SQFAE  
ILPIHIFLTLIGVPPEDRAKLRPLGQQLTRPDGSMTVVELRDAADAYLEPYIRERLANPGSDLFSRILSVPIE  
GRAWTFDEAQRMCNLLFGGLDTV VAMGMNIMHLARHPDDQDYLRDALRIPAAVDELMRRYPTVSVTRNCV  
ETTEVDGVEVREGDLIYLPSVLHNLD PACFDDPEKVD FDRGLSPVRHTTMGVGPHRCVGAGLARLEAIVVLEE  
WLARVPHFSLAEDVQPTFRGGNVGSLLQLQLELRWAE

>CYP101D1 (Saro\_0514) *Novosphingobium aromaticivorans*

MNAQTSTATQKHRVAPPPHVPGH LIREIDAYDLGLEQGFHEAWKRVQQPDTPPLVWTPFTGGHWIATRGTLI  
DEIYRSPERFSSRVIWVPREAGEAYDMVPTKLDPPEHTPYRK AIDKGLNLAEIRKLEDQIRTI AVEIIEGFAD  
RGHCEFGSEFSTVFPVRVFLALAGLPVEDATKLG LLANEMTRPSGNTPEEQGRSLEAANKGFFEYVAPIAAR  
RGGSGTDLITRILNVEIDGKMPDDRALGLVSLLLGGGLDTV NFLGFMMIYLSRHPETVAEMRREPLKLQRG  
VEELFRRFVAVSDARYVVS DMEFHGTM LKEGDLILLPTALHGLDDRHHDDPMTVDLSRRDVTHTSTFAQGP HRC  
AGMHLARLEVTVMLQEWLARIPEFR LKDRAPPIYHSGIVA AVENI PLEWEPQRVSA

>CYP101D2 (Saro\_1478) *Novosphingobium aromaticivorans*

MATNFDEAVRAKVERPANVPEDRVYEIDMYALNGIEDGYHEAWKKVQHPGIPDLIWTPFTGGHWIATNGDTV K  
EVYSDPTRFSSEVIFLPKEAGEKYQMVPTKMDPPEHTPYRKALDKGLNLAKIRKVEDKVREVASSLIDSFAAR  
GECDFAAEYAE LFPVHVFMALADLPLEDIPVLSEYARQMTRPEGNTPEEMATDLEAGNNGFYAYVDPIIRARV  
GGDGDDLITLMVNSEINGERIAHDKAQGLIS LLLGGGLDTV NFLSFFMIHLARHP ELVAELRSDPLKLMRGA

EEMFRFRFPVSEARMVAKDQEYKGVFLKRGDMILLPTALHGLDDAANPEPWKLDFSRRSISHSTFGGGPHRCA  
GMHLARMEVIVTLEEWLKRIPEFSFKEGETPIYHSGIVA AVENVPLVWPIAR

>CYP101E1 (Swit\_0361) *Sphingomonas wittichii*

MQDVMERALAPRPDHVPADLVRDFDLYDIPGAAEDIQAAYRAIQQASPDIFWTFPHNGGHWVATRGEDI IEMQR  
DYSRFSHRRIVLPPMPDAPRQI PLEMDPPEHARYRRPLMQALMP SIVAELEAKVRQVAID AVERLLPRGECEF  
VEDFAKVLPIHVFLALVELPLDDKAYLLTLAEDSVRGRDAETRGRSQQLMGAYLLPWIRARRETPGNDLLSKL  
VNVDIGGERISEAEATSYATLVLFGGGLDTVAGMIAFIARFLAQNPQGRRQLVERLDDDAFVRNAIEEMVRRHG  
LANTARVIASDFDYKGVSFragDRILPANLFGVDDRLNPDLVVD FSREKPVHAAFGNGAHACPGAVLARRE  
IRIFLQEWLSRIPDFRIRPGTSPVLATGMVNGVLRLELVWP

>CYP101E2 (TZ53\_05350) *Sphingobium* sp. YBL2

MTSVAEGELAPRPDHVPAALVRDFNIYDIPGSAEDVQAAYAAIQQANPDIFWTFPHNGGHWVATRSDDIIAMQR  
DYHHFESHKHIVLPPMPEGTPRQI PLEMDPPEHARYRRPLMQSLMPAVVSELESKVRDVAVEAIERVLPRGECE  
FIEDFAKILPIHVFLLELVDLPI SDKHRLLP IAERSVRGH TAEIRLQAQQEMGGYLI DEIRARRDNPGEDLLSK  
LVNVNVGEGRISEMEAVSYATLVLFGGGLDTVAGMIGFIARFLALNPGHRRQLVERLDDDEFIKHAI EEMIRRH  
GLANTSRVITENLEYKGVYFQAGDRILPANLWVGTD DRVNADPLVVD FSREKPVHAAFGNGAHACPGAVLARR  
EIRIFLQEWLSRIPDFRIKPGTKPVLATGMVNGVLSLDLCWP

>CYP101Q1 (K663\_16320) *Sphingobium* sp. MI1205

MFSLASEVPHHPPECVVDFDYRLTDDGTDFFEAWKKLQRSVNTDMVWTPRNGGHWIAVRGKLIQALFTDNV  
NLSSAVTGVPRETSIANFIPLQSDPPMHAIYRAPVVRGLGAKYILGLQGTIRSLTRELINAFKHRGGCE FVDD  
FAEQMPFGVFLTLIGLPLSDREMLRQVGTQLSRPVDKTAEEVVALVSDYLRPYVIERLEQPGDDLISRI LATP  
IDGRAWTLDEAMRLSLNMLIGGLDTVAA MIGFV TYFLACSPDHQTA IREDREI IPRAADEFIRRFGMVTNARV  
AVRDIQVGELTLRTDDIVLLPTMLHNLDD EAFPNAMKVDFNRGLCRHSTMGGGAHRCV GAGLAREELIAFLEE  
WFDAPVEFELDPARSVRMSSGPVASMTCLPLRWA

>CYP101R1 (AZL\_b01800) *Azospirillum* sp. B510

MSGCPFAKLAHAADYPDHVPADRVFDVEVYAI PGADRDFHLALKAMHDHGLPDVFWTPRQGGHVVTRYEDMM  
GVLADPVNFSNGAIVVPKSRNPTRENGSLPLYPLTADLPEHTAYRALLSPTFS PRGVQQLS ELARAVAIRLVE  
ELKPRGSCEFITDFAQHLP IEIFMS IVDVPAEDREWLLALTDRMVRPAEPEDMHKTMGT LFGYVRDLVAKRKA  
KPGNDLISSIIAGKVFG RPMDDDEL TGM CALILIGMDTVVSAMGFAAWFLARHPDHRQLLENPELIPNAVD  
EMLRRHSIVNIGRLVKNDVT VGGVAMKAGDMLVMP SPLGSM DERKFDPDPLTVDFTRS NSGEYSTFGKGPHRCP  
GANLGRAELRIFVEEWLRRI PDFHVRDEAAVGMSCGINGTIYSLPLEWTPQEWSCPGKVAARNVSTTVRQP EL

>CYP102A6 (blr\_2882) *Bradyrhizobium diazoefficiens* USDA 110

MSSKNRLDPIQPPTKPVVGNMLSLDSAAPVQHLTRLAKELGPIFWLDMMGSPIVVSGHDLVDELSDEKRFD  
KTVRGALRRVRVGGDGLFTADTREPNWSKAHNILLQPFGNRAMQSYHPSMVDIAEQLVQKWERLNADDEIDV  
VHDMTALTLDITGLCGFDYRFNSFYRRDYHPFVESLVRSL ETIMMTRGLPFEQIWMQKRKTLAEDVAFMNKM  
VDEIIAERRKSAEGIDDKKDM LAAMMTGVDRSTGEQLDDVNIRYQINTFLIAGHETTSGLLSYTLYALLKHPD  
ILKKAYDEVDRVFGPDVNAKPTYQQVTQLTYITQILKEALRLWPPAPAYGISPLADETIGGGKYKLRKGTFIT  
ILVTALHRDPSVWGPNPD AFDPENFSREAEAKRPINAWKPFGNGQRACIGRGFAMHEAALALGMILQRFKLID  
HQRYQMHLKETLTMKPEGFKIKVRPRADRER GAYGGPVAAVSSAPRAPRQPTARPGHNT PMLVLYGSNLGTAE  
ELATRMADLAEINGFAVHLGALDEYVGKLPQEGGVLI ICASYN GAPPDNATQFVKWLGS DLPKDAFANVRYAV  
FGCGNSDWAATYQSVPRFIDEQLSGHGARAVYPRGEGDARS DLDGQFQKWFPAAAQVATKEFGIDWNFTRTAE  
DDPLYAIEPVAVTAVNTIVAQQGAVAMKVLVNDELQNKSGSNP SERSTRHIEVQLPSNITYRVGDHLSVVPRN  
DPTLVDSVARRFGFLPADQIRLQVAEGRRALPVG EAVSVGRLLSEFVELQQVATRKQIQIMAEHTRCPVTKP  
KLLAFVGEEAEP AERYRTEILAMRKSVYDLLLEY PACELPFHVYLEMLSLLAPRYYSISSSPSVD PARCSITV  
GVVEGPAASGRGVYKGICSNYLANRRASDAIYATVRETKAGFRLPDDSSVPIIMIGPGTGLAPFRGFLQERAA  
RKAKGASLGPAMLFFGCRHPDQDFLYADEL KALAASGVTELF TAFSRADGPKTYVQHVLAAQDKVWPLIEQG  
AIIYVCGDGGQMEPDVKAALVAIRHEKSGSDTATAARWIEEMGATNRYVLDVWAGG

>CYP102A10 (ELI\_00100) *Erythrobacter litoralis* HTCC2594

MDAPTALAPIPQPPGKPIVGNFTVDSSRLIQSLMELAEYGPFIQLEVMGTPLVVFVSGADMVAEICDESFRD  
KTVRGPLKRLRLIAGDGLFTGDTDDPNWAKAHILLPSFSQKAMGSYLPMMTDIASQLMLKWERLNSDDVIDV  
PMDMVRLTLDITIGVCGFGYRFNSFYREDFHFFIEALNRTLDTTQKMRGLPGEKLLKRQQIEQLNEDAAYMNNL  
VDEIIRERRQTGESGQGDLLDFMLSGRDPVTGERLSDENIRYQINTFLIAGHETTSGLLSFTLYLLKNRDVL  
QRAYADEVDELGRNIDQTPTLSQIGRLPYIRAILSEALRLWPTAPAMGLAPFEDEVLGKGYAIAKGTFTTVLI  
PSLHRDKLVWGENPEAFNPDNFSPKAEAAARPPHAYKPFNGQQRACIGRQFAIQESILVLGMLLQRFELFDHAD  
YQLRIKETLSIKPDGFTIKARLRHDVERGGVATVEPESKTPDQAAAVPSHGTPLLVLVYGSNLGSSEGFARELA  
QRGEFSGFDVTMAPLDAHVAKLPTDGAVAIACASYNGMPPDNAAKFVDWLEQADAADAPLSNVSYLVLCGNS  
DWAATFQVVRKIDALMEQHGAERLVPAEELDARGDLDTQFHDWLDGLIPQLGDAFDIDLESGFDVAFPEPLYT  
VEITDSITGNTVADRVGAREVEVVANRELKDTSKDEGRSTRHLEVRLEPMEYEPGDHLCVVPVNDPAVVDRL  
LKRFGDLDRDTFVRIESRSDMRGPFPSGSTFSVLNLAETAGELQAVATRCDIATLARYSECPSNSRAALEALAAP  
PSADGTDRYTSEVLEKRRSVLDMLEEFACDVPLAVFLELIPFLSPRYYSISSAPEANQGLCSITVGVVKGPA  
LAGTGEFKGTCSAYLADLPPGDRFRAVVRKPTAQFRLPDNPETPVIMIGPGTGVAFPFRAFLQRRDHLQEDGAV  
LGEAMLFFGCRHPDIDYLYREELDDYDQRGVATVHAAFSRHDGSRTYVQDLIAREADRVWELIEQDARIYVCG  
DGARMEPDVRKALMAIYAEKKSSDEASAKAWIDDLVAQDRYLLDVWVG

>CYP102A12 (RPB\_3645) *Rhodopseudomonas palustris* HaA2

MSSSNKLAPIPHPPKQPVVGNMLSIDTKAPVQHLVRLAEELGPIFWLDMMGAPIVIVSGYDLVDEISDEKRFD  
KAVRGALRRVRTVGGDGLFTADTSEPWNWSKAHNILLTPFGGRAMQSYHPSMVDIAEQLVKKWERLNADDEIDV  
VHDMTALTLDITIGLCGFDYRFNSFYRRDYHPPVESLVRSLLETIMMTRGLPLENLWMKKRRDTLAEDVAFMNAM  
VDEIIAERRKAAAVADKMDMLGAMMTGVDKVTGEPLDDVNIRYQINTFLIAGHETTSGLLSCAIYALLKHPEV  
LQKAYDEVDRVLGADTSVEPSYQQVNQLGYITQILKETLRLWPPAPAYGVAPIQDETIGGQYHLKRGFTFTTVL  
VLALHRDPSIWGNPDADFDPENFSREAESKR PANAWKPFNGQQRACIGRGFAMHEAALALGMILQRFKLIDHT  
RYRMVLKETLTIKPEGFKIKVRPRSDKDRATRIASGVSHSVAPAPAAPRARPGHNTPLLVLVYGSNLGTAEELA  
HRVADLADLNGFATRLGALDQYVGQLPEEGGVLIFAASYNGAPPDNATQFVRWLSGDLPPDAFAKLRYAVFGC  
GNRDWTATYQAIPLRIDERLAAHGGRNIFVRGEGDARDLLEGQFEAWFATLGPLAVKEFGIDAAFDRGADDT  
LYGIEPLAPAASQPLAATGVAVAMRVLENRELQDRAASGRSTRHIEIALPQGMYSYRVGDHLSVIPRNDPALVA  
AVAQRFGFAPDDQIRLSAAPGRRAQLPVGEAVSIGLLGDHVELQQVATRKQIVALAAHTRCPQTRPKLQALA  
GGDGAADDAYRAEVLGKRRSVFDLLQEHAPACELPFAAYLEMLTPLQPRYYSISSSPARDPARASVTAVVEGP  
ALSGRGIYRGACSSWLAGRSGSDTVQATVRATKACFRLPDDDRVPLIMIGPGTGVAFPFRGFLQERSARKVGG  
TLGPALLFFGCRHPAQDYLYADELQGFADGIVELHAAFSRGDGPKTYVQHLLIAAQKDRVFALIEQGAIVYVC  
GDGGRMEPDVKAALCAIHRERSGADATAAAWIADLGARDRYVLDVWASV

>CYP102A12 (RPD\_1820) *Rhodopseudomonas palustris* BisB5

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KAVRGALRRARAVGGDGLFTADTKEPNWSKAHNILLTPFGGRAMQSYHPSMVDIAEQLVKKWERLNADDEIDV  
VHDMTALTLDITIGLCGFDYRFNSFYRRDYHPPVESLVRSLLETIMMTRGLPLENLWMKKRRETLADDVFMNAM  
VDEIIAERRKASESAADKKDMLGAMLAGVDRATGEPLDDVNIRYQINTFLIAGHETTSGLLSCAIYALLKHDP  
VLQKAYDEVDRVLGSDTAVRPSYQQVNQLSYITQILKETLRMWPPAPAYGVAPIKDEVIGGKYHLKRGTFVTV  
LVLALHRDPAIWGNPDADFDPENFSREAESKR PANAWKPFNGQQRACIGRGFAMHEAALALGMILQRFQLIDH  
QRYRMVLKETLTIKPEGFKIKVRPRSDKDRGDFVAAGASQVSTPALAQAAAPRAPDHNTPLLVLVYGSNLGTAE  
ELATRVADLAELNGFSTRLGALDQYVGHLPEEGGVLI FTASYNGAPPDNATQFVQWLSGDLPKDAFAKLRYAV  
FGCGNRDWTATYQAIPLRVDERLAAHGGRNIFLRGEGDARDLLEGQFESWFAKLGPLAVKEFGIDAKFARAVD  
DAPLYRIEPVAPAAGNAVAAGGAVPMKVLANRELQDCAASGRSTRHIEIALPEGISYRVGDHLSVMPRNDPA  
LVAAVAQRLGFAPDDQIKLQVAPGRRAQLPIGEAISVGRLLGDFVELQQVATRKQIAVMAEHTRCPQTRPKLQ  
ALAGGDGADEAYRAGVLAKRKSVDLQEHAPACELPLHAYLEMLSPLAPRYYSISSSPLRDP SRAAITVAVV  
DGPALSGRGHYRGVCSTWLAGRSVGDTHATVRATKAGFRLPDDDRVPLIMIGPGTG LAPFRGFLQERAARQQ  
NGATLGPALLFFGCRHPAQDYLYADELQGFAAEGVVELHTAFSRGEGPKTYVQHLLIAAQKDRVFTLIEQGAII  
YVCGDGGKMEPDVRAALMAIHRERSGADAAAASTWIDDLGACNRYVLDVWASA

>CYP102A6 (BJ6T\_68860) *Bradyrhizobium japonicum* USDA 6

MSSKNRLDPIQPPTKPVVGNMLSLDSAAPVQHLLRLAKELGPIFWLDMMGSPIVVVS GHDLVDELSDEKRF  
KTVRGALRRVRVAVGGDGLFTADTREPNWSKAHNILLQPFGNRAMQSYHPSMVDIAEQLVNKWERLNADDEIDV  
VHDMTALTLDITGLCGFEYRFNSFYRRDYHPFVESLVRSLLETIMMTRGLPFEQLWMQKRRKTLAEDVAFMNKM  
VDEIIAERRKSAEGVDDKKDMLAAMMTGVDRSTGEQLDDINIRYQINTFLIAGHETTSGLLSYTYALLKHPD  
ILKKAYDEVDRVFGPDVNAKPTYQQVTQLTYITQILKEALRLWPPAPAYGISPLNDETIGGGNYRLRKGTFTIT  
ILVTALHRDPSVWGNPDFAFNPFNSREAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALALGMVLQRFKLID  
HQRYQMHLKETLTMTKPEGFKIKVRPRADRERGERAYGGPVAVASSGPRAPRKPTTRPGHNTPMLVLYGSNLGTAE  
ELATRMADLAEINGFAVHLGFLDDYVGKLPHEGGVLIICASYNGAPPDNATQFVKWLGDLDLPEDAFANVRYAV  
FGCGNSDWAATYQSVPRFIDEQLSKHGARAVYPRGEGDARSDDLGGQFQKWFPAQAQVATKEFGIDWNFTRTAE  
DDPLYAIEPVAVTAVNTIVAQGGAVAMKVLVNDELQNKFGANPSESTRHIEVQLPSNITYRVGDHLSVVPRN  
DPTLVDSVARRFGFLPADQIRLQVAEGRRALPVGDAVSVGRLLSEFVELQQVATRKQIQIMAEHTRCPVTKP  
KLLAFVGEAEPLERYRTEILARRKSVFDMLEYPACELPFHVYLEMLSLLAPRYYSISSSPSVDPARCSVTV  
GVVEGPAASGRGTYKGICSNYLSNRRAGDAIYATVRETKAGFRLPDESSVPIIMIGPGTGLAPFRGFLQERAA  
RKAKGAALGPAMLFFGCRHPDQDFLYAEELKGLAASGITELFTAFSRADGPKTYVQHMLAAQKDRVWPLIEQG  
AIIYVCGDGGKMEPDVKAALVAIHREKSGSDAAAAARWIEEMGAKNRYVLDVWAGG

>CYP102A6 (RN69\_33415) *Bradyrhizobium japonicum* E109

MSSKNRLDPIQPPTKPVVGNMLSLDSAAPVQHLLRLAKELGPIFWLDMMGSPIVVVS GHDLVDELSDEKRF  
KTVRGALRRVRVAVGGDGLFTADTREPNWSKAHNILLQPFGNRAMQSYHPSMVDIAEQLVNKWERLNADDEIDV  
VHDMTALTLDITGLCGFEYRFNSFYRRDYHPFVESLVRSLLETIMMTRGLPFEQLWMQKRRKTLAEDVAFMNKM  
VDEIIAERRKSAEGVDDKKDMLAAMMTGVDRSTGEQLDDINIRYQINTFLIAGHETTSGLLSYTYALLKHPD  
ILKKAYDEVDRVFGPDVNAKPTYQQVTQLTYITQILKEALRLWPPAPAYGISPLNDETIGGGNYRLRKGTFTIT  
ILVTALHRDPSVWGNPDFAFNPFNSREAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALALGMVLQRFKLID  
HQRYQMHLKETLTMTKPEGFKIKVRPRADRERGERAYGGPVAVASSGPRAPRKPTTRPGHNTPMLVLYGSNLGTAE  
ELATRMADLAEINGFAVHLGFLDDYVGKLPHEGGVLIICASYNGAPPDNATQFVKWLGDLDLPEDAFANVRYAV  
FGCGNSDWAATYQSVPRFIDEQLSKHGARAVYPRGEGDARSDDLGGQFQKWFPAQAQVATKEFGIDWNFTRTAE  
DDPLYAIEPVAVTAVNTIVAQGGAVAMKVLVNDELQNKFGANPSESTRHIEVQLPSNITYRVGDHLSVVPRN  
DPTLVDSVARRFGFLPADQIRLQVAEGRRALPVGDAVSVGRLLSEFVELQQVATRKQIQIMAEHTRCPVTKP  
KLLAFVGEAEPLERYRTEILARRKSVFDMLEYPACELPFHVYLEMLSLLAPRYYSISSSPSVDPARCSVTV  
GVVEGPAASGRGTYKGICSNYLSNRRAGDAIYATVRETKAGFRLPDESSVPIIMIGPGTGLAPFRGFLQERAA  
RKAKGAALGPAMLFFGCRHPDQDFLYAEELKGLAASGITELFTAFSRADGPKTYVQHMLAAQKDRVWPLIEQG  
AIIYVCGDGGKMEPDVKAALVAIHREKSGSDAAAAARWIEEMGAKNRYVLDVWAGG

>CYP102A6 (S23\_51340) *Bradyrhizobium* sp. S23321

MSSKNRLDPIQPPTKPVVGNMLSLDSAAPVQHLLRLAKELGPIFWLDMMGSPIVVVS GHDLVDELSDEKRF  
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VHDMTALTLDITGLCGFDYRFNSFYRRDYHPFVESLVRSLLETIMMTRGLPFEQLWMQKRRKTLGEDVAFMNKM  
VDEIIAERRKSAEGIDDKDMLAAMMTGVDRATGEQLDDVNIRYQINTFLIAGHETTSGLLSCTIYALLKHPD  
ILKKAYDEVDRVFGPDVNAKPTYQQVTQLTYITQILKEALRLWPPAPAYGISPLKDEVIGGGKYRLRKGTFTT  
ILVTALHRDPSVWGNPDFAFDPENFSREAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALALGMILQRFKLID  
HQRYQMHLKETLTMTKPEGFKIKVRPRADRERGERAYGGPVAAAPKAPRQPTARPGHNTPMLVLYGSNLGTAE  
LATRMADLAEINGFAVHLGFLDDYVGKLPQEGGVLIICASYNGAPPDNATQFVKWLGDLDLPKDAFANVRYAVF  
GCGNSDWAATYQSVPRFIDEQLSKHGGRVYPRGEGDARSDDLGGQFQKWFPAQAQVATKEFGIDWNFTRTAE  
DPLYAIEPVAVTAVNTIVAQGGAVAMKVLVNDELQNKTSNPSESTRHIEVQLPANISYRVGDHLSVVPRND  
PTLVDSVARRFGFLPADQIRLQVAEGRRALPVGDAVSVGRLLSEFVELQQVATRKQIQIMAEHTRCPVTKPK  
LLAFVGEETLERYRTEILARRKSVFDLLLEYPACELPFHVYLEMLSLLAPRYYSISSSPSVDPARCSITVG  
VVEGPAASGRGTYKGVCSNYLANRRAGDAIYATVRETKAGFRLPDDPSVPVIMIGPGTGLAPFRGFLQERAAR  
KAKGAALGPAMLFFGCRHPDQDFLYKDELTAALASGITELFTAFSRADGPKTYVQHVLAQKDKVWPLIEQGA  
IVYVCGDGGKMEPDVKAALVAIHREKSGSDAVASARWIEEMGAKNRYVLDVWAGG

>CYP102A6 (BCCGELA001\_12905) *Bradyrhizobium* sp. CCGE-LA001

MSSKNRLDPIPHPPTKPVVGNMLSLDAAPVQHLLRLAKELGPIFWLDMMGSPIVVVS GHDLVDELSDEKRF  
KTVRGALRRVRVAVGGDGLFTADTREPNWSKAHNILLQPFGNRAMQSYHPSMVDIAEQLVQKWERLNADDEIDV  
VHDMTALTLDITGLCGFEYRFNSFYRRDYHPFVESLVRSLLETIMMTRGLPFEQIWMQKRRKTLAEDVAFMNRM  
VDEIIAERRKSSEGIDDKDMLAAMMTGVDRATGEQLDDINIRYQINTFLIAGHETTSGLLSYTYALLKHPD

ILKKAYDEVDRVFGPDVNAKPTYQQVTQLAYITQILKEALRLWPPAPAYGISPLNDETIGGGKYRLRKGFTTT  
ILVTALHRDPSVWGNPDADFDPENFSKEAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALALGMILQRFKLID  
HQRYQMHLKETLTMTKPEGFKIKVRPRADRDGRGAYGGPVAAVASAPKAQRQPTTRPGHNTPMLVLYGSNLGTAE  
ELATRMADLAEINGFAVHLGPLDDYVGKLPQEGGVLIICASYNGAPPDNATQFVKWLGSDDLNDAFANVRYAV  
FGCGNSDWAATYQSVPRFIDEQLAKRGARAVYPRGEGDARSDDLGGQFQKWFPAQAQVATKEFGIDWNFTRTAE  
DDPLYAIEPVAVTAVNTIVAQQGAVAMKVLVNDELQNRSGANRSESTRHIEVQLPSNLTYRVGDHLSVVPRN  
DPTLVDSVARRFGFLPADQIRLQVAEGRRALPVGAASVGRLLSEFVELQQVATRKQIQTMAEHTRCPVTKP  
KLLAFVGEDEPLEYRSEILAKRKSIFDLLLEYPACELPFHVYLEMLSLLAPRYYSISSSPSVDPARCSVTV  
GVVEGPAASGRGVYKGICSNYLANRRAGDAIYATVRETKAGFRLPDDPSVPIIMIGPGTGLAPFRGFLQERAA  
RKAKGATLGPALLFFGCRHPDQDFLYADELKALAAGGITELFTAFSRADGPKTYVQHVLAAQKDKVWPLIEQG  
AIIYVCGDGSKMEPDVKVALVAIHGEKSGSDAAASARWIDEMGATNRYVLDVWAGG

>CYP102A6 (BF49\_1812) *Bradyrhizobium* sp. BF49

MSSKNRLDPIQPPTKPVVGNMLSLDSAAPVQHLTRLAKELGPIFWLDMMGSPIVVSGHDLVDELSDEKRF  
KTVRGALRRVRVAVGGDGLFTADTREPWNKAHNILLQPFGNRAMQSYHPSMVDIAEQLVGKWERLNADDEIDV  
VHDMTALTLDITGLCGFDYRFNSFYRRDYHPFVESLVSLETIMMTRGLPLEQLWMQKRRTMAEDVDPMNKM  
VDEIIAERRKGGDATDDKKDMLAAMMTGVDRSTGEQLDDVNIRYQINTFLIAGHETTSGLLSCTLYALLKHPD  
ILKKAYDEVLDVLGPNVDVRPTYQQVTQLTYITQILKEALRLWPPAPAYGISPLNDETIGGGKYRLRKGFTTT  
ILVTALHRDPSVWGNPDADFDPENFSREAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALALGMILQRFRLID  
HQRYQMHLKETLTMTKPEGFKIKVRPRADRERGAYGGPVAVSSAPKAPRQPTARPGHNTPMLVLYGSNLGTAE  
LATRMADLAEINGFAVHLGPLDDYVGKLPQEGGVLIICASYNGAPPDNATQFVKWLGSDDLNDAFANVRYAVF  
GCGNSDWAATYQSVPRFIDEQLSAHGARAVYPRGEGDARSDDLGGQFQKWFPAQAQVATKEFGIDWNFTRTAE  
DPLYAIEPVAVTAVNTIVAQQGAVAMKVLVNDELQNKAGSNPSESTRHIEVQLPSNINIRVGDHLSVVPRND  
PTLVDSVARRFGFLPADQIRLQVAEGRRALPVGDAVSVGRLLSEFVELQQVATRKQIQIMAETHTRCPVTQPK  
LLAFVGEETPLERYRSEILAKRKSIFDLLLEYPACELPFHVYLEMLSLLAPRYYSISSSPSVDPVRCSTIG  
VVEGPAASGRGTYKGICSNYLANRRAGDVIHATVRETKAGFRLPDDPSVPIVMIGPGTGLAPFRGFLQERAAR  
KAKGAALGPAMLFFGCRHPDQDFLYADELKALAASGITELFTAFSRAEGPKTYVQHVLAAQKDKVWPLIEQGA  
IVYVCGDGSKMEPDVKAALVAIHREKSGGDAATAARWIEEMGARNRYVLDVWAGG

>CYP102A28 (LMTR13\_28840) *Bradyrhizobium* *icense*

MASSNKLSPIPHPPKPVVGNMLSLDPNAPVQHLVKLSKELGPIFWLDMMGAPIVIVAGHDLIDELSDEKRF  
KTVRGSRLRRVRVAVGGDGLFTADTTEPNWNKAHNILLQPFGNRAMQSYHPSMVDIAEQLVKKWERLNADDEIDV  
VHDMTALTLDITGLCGFDYRFNSFYRRDYHPFVESLVSLETIMMTRGLPLENLWMQKRRTLAQDVVFMNKM  
VDEIIAERRGSAEATEAKKDMLGAMMTGIDRSTGEQLDDINIRYQINTFLIAGHETTSGLLSCTIYALLKHPE  
VLKKAYEEVDRVLGPDINARPTYQQVTQLTYITQILKEALRLWPPAPAYGITPLQDEAIGGGKYKLKKNFTIT  
VLVMALHRDPSVWGNPDVDFDPENFSREAEAKRPINAWKPFNGNGQRACIGRGFAMHEAALAIGMILQRFKLVD  
VHRYQMHLKETLTVKPDGFKIKVRPRGDKDRGVFAGRTAVAAAASSAAAPQARTRPGHNTPLLVLVLYGSNLGTA  
EELATRVADLAEVNGFATKLGLALDDYVGKLPQEGALMIFCASYNGAAPDNATQFVKWLDSGLPKDAFAKVRYA  
VFGCGNSDWAATYQSVPRLIDEGLAHVHGARSYARGEEDARSDDLGGQFEKWFAAAPAAMKELGVDSGFARSA  
DDAPLYSIEPVAPSAVHTIVAQQGVAPMKVLVNSELQNKTGASRSRSTRHIEVELPPGIAYRVGDHLSVVPR  
NDPALVDSVARRFGFLPADQIRLHVAEGRRALPVGDAVSVGRLLTEFVELQQIATRKQIQIMSEHTRCPVTK  
PKLLAYVGDDGASTELYRSDVLAKRKSIFDLLLEHPACELPFHAYLEMLSLLAPRYYSISSSPSSDPARCSVT  
VGVVEAPASSGRGVYKGVCSNYLAGRRVGDVTHATIRETKAGFRLPDDAAQPVIMIGPGTGLAPFRGFLQERA  
HRKAQGAKLGPAMLFFGCRHPEQDFLYADELKAFANDGIAALHTAFSRAEGPKTYVQHVTQAQKDRVWSLIEQ  
GAIVYVCGDGGKMEPDVKAALVAIYREKSGADAEAGLHWIDDLGTKNRYVLDVWAGG

>CYP102K1 (AZC\_3520) *Azorhizobium* *caulinodans*

MSETSTPPALKSVLDGLAAGTVRVGWFPASREAVLAAVRGAAGLSGETAFHVETADGVTIALDDSVPACTRL  
RLVVQGEVPSSAAPALHRPVPGPKPYPVVGNLPELHNAEGLVAAVDALHAKHGEFFAFQVGKRAYFCSDADI  
ISEMCAAPDVFAKLVEGRGGLGNLAEKSVGSALFTASDNDPLWHQAHRI LAPAFGATALKNYYGRIVEVADDL  
LDHLDRLAPGESFLATDLMTRMTFEAISYA AFNRRYGAIDSPALPAFVEAMNVVLT DAMAEPRLLPEV FYHE  
ARKTRAAADKIMLEEVETIIAERRFAMAAGAPVPTDLLQVMLTTPDRVTGQKLPDDNIRGQLIVLLIAGHETT  
SGMLAYALYHLWKYPETMEKLIAEVDEVLRDYSYKPTYEDVGRLAYTQRVLKEALRLCPPVPMFPRYVTRDA  
TVGNGRYDLKAGERIFVLSLSAMQKNPRFWGADALVFRPERFGPEEEKHHHPHAYHPFGMGARSCIGFQFALVE  
AKMVLARFIQRFTARPDPHYVLCHKQALTVKPDHLDMLLERRPEVKGRFPVRTEAPKTQGA PLAVAQAGGRP

MRVLYGSNMGGCRDIALSLAQQAGARGFAATVAELDEQVGQPWLTDGPVVIVTSTYNGTPPDNAARFAKWLET  
APAGVCAGVRHAVLGCNTQWHQTFQKFKPTIASGLAALGGTALLDEGTADAAGDYEAAVEGWTAALWPALEA  
AFGGAAGAAVIGSAEAAAEAPAVKVEVVNFAGAATGAAPRTGTRLDQGAQLSRIRVNRELLSPGAQGSTRHIE  
IPLPAGTSYAAGDHLAVFPVNPPALVAAAAARCLAPETQVLLTALHPDAASEAGLPFGVPVSVGELLAEHVD  
LAGPVTRRDLRAWAQAAQCPPDRARIAGWLSDFPSAVAEAKPRMEDLLAQVPSVQLDLAALLTVRPALKPRYY  
SISSSPLMSPDACALTGVGVHQTADGVRHDGLCSSYLVSCEGADAPVRVLVKDTGSTFHLPPADPAVPLILVGP  
GTGLAPLRGFIQERHALRAQGRATGPVLLFFGCRDDGDYLYREELEAYRDEGTLSLLAVGFSRRPGTPTTYVQ  
DLLRTHGDAVREQVAAGASILICGNARTMAPDVHAAFLLELLGAGAVAELEAGGRYLQDVWASS

>CYP102AC1 (SAMCFNEI73\_pB0314) *Sinorhizobium americanum*

MSKLEEIPQPKGLPVLGHITSINPHAPVQSLIRLSKELGPIFRLQTFGRNVIIVGNQELTAELCDETRFCKAL  
HPPLAELRTIGNDGLFTADNNESNWGKAHRLLTAPAGPLGLKSMFSKMVDVVDQMLVRWERFGSDAEIDVADN  
MTRVALDTIALCAFDHRFNSFYRNERHSFVTAMEGALKEVSRRALFPPGASKLMFLNRNRFFKAHTRTLRALAD  
DLIDKRRLDARLGRSDLLDIMLTTKDQETGEMLSRENIGYQMITFLIAGHETTSGLLSFATWLLLKNPEELS  
RLQAHVDDALGGEPPTAQDLGKLDCVEQALMETLRLWPTAPGFAVHPIENTTLAGSYRLTPDDILLILLPVLH  
RDPKVWDEPDVFRPARFNFDHAKALQHAWKPFNGQRAQLGRGFAMQEAVLVMAMMLQRFYISLVDDSYELV  
VGETLTMKPIGLRIRAKRRHWSAGMPRRSAPAASKEQVLRVPRSIADRGPVLIYGSNTGMSESFAKRIGSE  
AATRGYAPVVAPADDYSFGLPVDIPFVVVTASYEGLPPNNARRFLAWAESLPPDTLAGLPFAVFGCGNRHWVQ  
TWQAVPKRLEAALARAGAVPVAKRGEADAGGDVLASLDAWSAELWEALAAEV

>CYP103A1 (Ach5\_52420) *Agrobacterium tumefaciens* Ach5

MIANSSTDVSVADQKFLNVAKSNQIDPDAPVISRLDSEGHSIFAEMRPKRPFLLRREDGIFLVLRADHIFLLGT  
DPRTRQIETELMLNRGVKAGAVFDFIDHSMFLFSNGETHGKRRSGLSKAFSFRMVEALRPEIAKITECLWDDLQ  
KVDDFNFTEMYASQLPALTIASVLGLPSEDTPFFTRLVYKVSRLCLSPSWRDEEFEEIEASAIELQDYVRSVIA  
DSGRRMRDDFLSRYLKAVREAGTLSPIEEIMQLMLIIILAGSDTTRTAMVMVTALALQNPALWSSLRGNQSYVA  
AAVEEGLRFEPVPGSFPRALAKDIDLDGYVLPKGSLLALSVMGLRDEKHYEHPQLFDVGRQQMRWHLGFGAG  
VHRCLGETLARIELQEGLRTLRLRAPNLAVVGDWPRMMGHGGIRRATDMMVKLSFDL

>CYP103A2 (Atu\_6150) *Agrobacterium fabrum*

MITSSISGTDQQFQONATQPKELDPDAVPVSRLDSEGHEIFAEMRPKRPFLLRREDGVFLVLRADDIFLLGTDPR  
TRQIETELMLNRGVTRGAVFDLIRYSMLFSNGEVHVKKRSFAKTFAFRMIDALRPEITKLTEHLWDDVPRVD  
DFDFAEMYASKLPALTIASVLGLPFGDAPFFTRLVYNVSRCLSPSWGEDDFPEIEASAVELQDYVRAVVADRS  
RRISDDFLSCYLKAVREEGTLSPIEEIMQLVFLILAGSDATRNAMVMLPTLLLQNPVWSSLCHDQSGVAAAV  
EEGLRFEPVSGSFPRALAEIDIDLDGYVLPKGSFLALSIMGLRDERHYEHPQLFDIKRKQMRHRLGFGAGVHR  
CLGEALARIELQEGLRTLRLRAPSLRVTGDWPRMIGHGGARRATGMTVNLGVDR

>CYP103A4 (Avi\_8251) *Agrobacterium vitis*

MISELNPENVSVAAALDRFGHEIFKEWRPKRPFLHRQDGVYVVLRADDVLGLSSDPTRQIETELMLNRGVNEG  
AVFDFVRYSMFLFSNKETHRRRRSPFTRTFAFRMIENLRPQIRQLTEMLFRDLKELGSFNFVAEYSSKLPAVTI  
ASLLGLPSSDIPYFTQLVYRVARCLSPSWRADFPDIEKSAVEFKNYVQAVINDRRTDPRDNFLSSYINATRE  
AEDLSPVEGLTQLMLIIILAGTDTTKTGLTALTGQLLQHRQAWDALLKDVTLPAAVEEGLRFEPVPGSYPRSA  
RVDIDLDGFILPKGSLLALCTMSALRDEKHYAHPQLFDIHRKQMRWHMVFGAGEHRCLGEALARLEMQEGLAT  
VLRHAPNLSIEGEWQGIQGHGGVRRIAEMRVGFMREN

>CYP104A1 (Ach5\_52430) *Agrobacterium tumefaciens* Ach5

MLFAPVDDVTTIDDLTLDPYPIYRRMRVQNPVVHVASVRRTFLTAKAFDTKMVKDDPSRFSSDDPSTPMKPAFQ  
AHTLMRKDGTETEHARERMAMARAFAPKAIADHWAPIYRDIVNEYLDRLPRGDTVLDLFAEICGPVAARILAHILG  
ICEASDVEIIRWSQRLIDGAGNFGWRSELFERSDEANAEMNCLFNDLVKKHRSAPNPSAFATMLNAPDPIPLS  
QIYANIKIAIGGGVNEPRDALGTILYGLLTNPEQLEEVKRQQCWGQAFEEGLRWVAPIQASSRLVREDTEIRG  
FIVPKGDIVMTIQASANRDEDVFEDGESEFNVFRPKSAHQSGSGPHHCPGAQISRQTVGAIMLPILFDRFPDM  
ILPHELVQWRGFGFRGPINLPVTLR

>CYP104A2 (Atu\_6151) *Agrobacterium fabrum*

MQ LAPVDRVTTIDDLTLDPYPIYRRMRAQTPVVRVASVMRTFLTKASDTKMVKDQPRRFSSDDPNTPMKPAFQ  
AHTLMRKDGAEHARERMAMAKAFAPKTTAEHWAAIYRDIVNEYLDRLSRGSTVDLFAEICGPVAARILAHILG  
ISEASDAEMIRWSQRLIEGAGNFGWRPEPPERANEANAEMNRLFDNLVEKHRAEPNPSAFAIMVTASDPIPM  
SIYANIKIAVGGGINEPRDALGTIIYGLLTNPEQFEEVKRQQCWGQVFEEGVRWVAPIQASSRLVLEDTEIRG  
FLVPKGDVTMTIQASANRDEEDVFDDGERFNVFRQNNAHQSFSGSPHHCAGAQISRQTVGAIMLPTLFFERFPM  
TLTNPDAVQWRGFGFRGPISLPVTLI

>CYP104A5 (A6B35\_33065) *Mesorhizobium amorphae*

MRLVPVDRVSTIDELTFDPYPIYRRMRAQTPVVHVASVQRTFLTKASDTKMVKDQPERFSSDDPNTPMKPAFQ  
AHTLMRKDGAEHARERMAMAKAFAPKTIAEHWAPIYRDIVNEYLDRLPRGGTVDLFAEICGPVAARILAHILG  
ICGASDAEMIRWSQRLIDGAGNFGWQPEPFERSDEANAEMNRLFDNLIEKHRAEPNPSAFAIMVNAPDPIPM  
SIYANIKIAIGGGINEPRDALGTIVYGLLTNPEQFEEVKRQQCWGQAFEEGVRWVAPIQASSRLVREDTEIRG  
FLIPKGDVTMTIQASANRDEEVFEDGERFNVFRQKIPHQSFSGSPHHCAGAQISRQTVGAIMLPMLFFERFPM  
TLDPDQVVQWRGFGFRGPINLPVKLS

>CYP104A6 (APZ00\_12855) *Pannonibacter phragmitetus*

MPLAPLDETTTIAQLTDDPYPVYRRMRAETPVIRVASVKRTFLTKAVHTKAVKDNPELFSSDDPNTPMKPAFQ  
AHTLMRKDGEEHRRERMAMQPAFTPKAIRCNWAELYQSI AEDYVSRLPRGQTVDLFTDLCGPVAARILAHILG  
VEEATDEEMQRWSQLLIDGAGNFGWRPEPFESDKANAEMNALFDRLQARHKAEPNASAYSIMLNADPIPLS  
SIYANIKIAIGGGINEPRDALATIIYGLLSNPDQLAEVRRQEAWQAFEEGVRWVAPIQASSRRVLEDTEIGG  
FEIPKGDVTMTIQASANRDEDIYQNGEEFFVFRDKNPHQAFSGSPHHCAGAHIAARRTVGQIMLPPLFFDRFPDM  
ELPDPSAVKWKGFGRGPINLPVKLN

>CYP104A7 (ACP90\_00230) *Labrenzia* sp. CP4

MAVAPVDETLTLADLTRDPYPIYKRMRAETPIVQVPAANRIFLTAKHTKMVKDDPELYSSDDPVTMPMRAFL  
AHTLMRKDGEEHRRERMAMQPAFSPKVIKTDWADLYRKIAAEYLDRLPRGETVDLFTDLCGPVAARILAHILG  
LDEVGADMQRWSQVLIDGAGNFGFADEPFARSDAANAEMDAVFDLSLIARHLAEPNNSAFSVMLNARDPIPRS  
SIYANIKIAIGGGINEPRDALATIIYGLLTNPDQLEEVKRQNAWADAFEEGVRWVAPIQASSRRATRDLEIDG  
IDIPEGVTLMTIQASANRDEEDLYEDGESFNVFRKKAPHQAFGNGPHHCAGAHISRRTVGEIMLPMLFFERFPGM  
TLDKPEDVVWSGFGFRGPLNLPVKLN

>CYP104A7 (B0E33\_11740) *Labrenzia aggregate*

MAVAPVDETLTLADLTRDPYPIYKRMRAETPIVQVPAANRIFLTAKHTKMVKDDPELYSSDDPVTMPMRAFL  
AHTLMRKDGEEHRRERMAMQPAFSPKVIKTDWADLYRKIAAEYLDRLPRGETVDLFTDLCGPVAARILAHILG  
LDEVGADMQRWSQVLIDGAGNFGFADEPFARSDAANAEMDAVFDLSLIARHLAEPNNSAFSVMLNARDPIPRS  
SIYANIKIAIGGGINEPRDALATIIYGLLTNPDQLEEVKRQDTWADAFEEGVRWVAPIQASSRRATRDLEIDG  
IDIPEGVTLMTIQASANRDEEDLYEDGESFNVFRKKAPHQAFGNGPHHCAGAHISRRTVGEIMLPMLFFERFSGM  
TLDKPEDVVWSGFGFRGPLNLPVKLS

>CYP104A8 (S58\_14830) *Bradyrhizobium oligotrophicum*

MLTASLAPLDETITIAADLTRDPYPIYQRLRREAPVLRVKS VGRFTFLTKAADTKYVKDNAALFSSDDPNTPMKR  
AFLAHTLMRKDHDEHRAERMAMMPALMPKTIEAAWEPLYRQFATDYLDRLPRGEVVDLFPALAGPLAARILAH  
VMGVDPDASDADMQRWSQTLIDGAGNFGWTPGPFDDASDVANAEMDRCIRANMARVRAMPDSSALSFMVNAKNPI  
PESQIIANIKIAIGGGINEPRDALLTILYGLLTNPEQLEAVRAQDKWRS AFEEGVRWVAPIQASSRLVMEDTE  
IRGCLIPKGDVTMTIQASANRDEELFTDGESYNALRDPNPHQAFGNGPHHCAGAHLSRRTVGAILLPMLFFERF  
PRMELPEPAGVRWHGFGFRGPLNLPVRLQ

>CYP104A9 (BBta\_6721) *Bradyrhizobium* sp. BTAi1

MPIASLAPLDETITIAELTRDPYPIYQRLRRDAPVLRVKS VGRFTFLTKAADTKYVKDNAALFSSDDPNTPMKR  
AFLAHTLMRKDHDEHRAERMAMMPALMPKTIEQEWGLYTTFAADYLDRLPRGEVVDLFPALAGPLAARILAH



VMGIPDASDADMQRWSQTLIDGAGNFGWTPGPFDATDIANAEMDR CIRANMARVRNEPDSSALSFMVNAKKPI  
PESQIIANIKIAIGGGINEPRDALLTILYGLLTNPEQLEAVRAQDKWRS AFEEGVRWVAPIQASSRLVMEDTE  
IRGCLIPKGD TMMTIQASANRDEDLFEDGETYNALRDPNPHQSFGNGPHHCAGAHLSRRTVGAILLPMLFERF  
PKMTLPDPASVRWHGFGFRGPLNLPVRLQ

>CYP104A10 (BRADO\_1377) *Bradyrhizobium* sp. ORS 278

MLTASLAPLDETITIAELTRDPYPIYQRLRREAPVLRVKS VGRFTLTKAADTKYVKDNAALFSSDDPNTPMKR  
AFLAHTLMRKDHDEHRAERMAMMPALMPKTIEAVWEPLYTKFANEYLDRLPRGETVDLFPALAGPLAARILAE  
VMGVDPASDEEMQRWSQTLIDGAGNFGWTPGPF DASDRANAEMDR CIRANMERVRAEPDSSALSFMVNAKNPI  
PESQIIANIKIAIGGGINEPRDALLTILYGLLTNPEQLEAVRADNTWRAAFEEGVRWVAPIQASSRLVMEDTE  
IRGCLIPKGD TVMTIQASANRDEELFTDGEHYNALRDPNPHQAFNGNGPHHCAGAHLSRRTVGAILLP LLLFERF  
PKMELVDAASVRWHGFGFRGPLGLAVRMA

>CYP104A11 (BMG03\_04545) *Thioclava nitratreducens*

MALAPLDEEITLAQLTTDPYPIYRRLRAESPVL RVASAGRTFLT TTAELTKKVKDNPELFSSDDPNTPMKPAFR  
AHTLMRKDGEEHLRERMAMAPALTPKRIQTDWGP LYEKFAEEYVGR LPRGETVDL FSEL CGPLAARILAHVLG  
IPEASDAQMQRWSQHLIDGAGNFGWQPEPFAISDKANDEMDALFTELREKRIAE PDGSAYSVM LNAENPI PMS  
QIWANIKIAIGGGINEPRDALATIIYGLLTNPDQLEQVRAEGAWSKA FEEGVRWVAPIQVSSRLVTEDELGG  
FEIPKGD TVMTIQASANRDESIYENGEEYFVFRDKNPHQAFNGNGPHHCAGAH IARRTVGKIILPLL FDRFPDM  
RLPDPDAVIWRGFGFRGPINLPVELN

>CYP104A12 (BF49\_3851) *Bradyrhizobium* sp. BF49

MTYVTD RSSPLDETIT IADLVRDPYPIYKRLRRQAPVLRVKS VGRFTLTKAADTKYVKDN PALFSSNDPNTPM  
KRAFLAHTLMRKDH EHRSERMAMMPALMPKTIESVWAALYADLAEAYLDRLPRGEVVDLFPALAGPLAARIL  
AHAMGVDPASDEDMQRWSQMLIDGAGNFGWTPGPFQATDIANAEMDR CIRANAERVRAEPDSSALSFMVNAKN  
PIPESQMIANVKIAIGGGINEPRDALLTVLYGLLTNPDQLEAVRAGGKWRAAFEEGIRWVAPIQASSRLVVED  
TEIRGCFIPKGD TVMTIQASANRDEDVFDGENYNALREPNPHQAFNGNGPHHCAGAHLSRRTVGDILLPLLFE  
RFPKMTLPDPVSVRWHGFGFRGPLNLPILLQ

>CYP104A13 (BO069\_11765) *Sulfitobacter* sp. AM1-D1

MADLAPLDEKITLQELDRDPYPIYRRLRREAPVLRVKSAGRTLLTKAEDTRYVKDTPEIFSSDDPNTPMKRAF  
WAHTLMRKDGEDHKRERMAMAPAFAPRVIKEDWMPQYMR IAEQYVSRLPRGEIVDLFSILSGAYAARGLA ILL  
GMPEASDEEMMEWSQALIEGAGNFGWADAPFERADRANTQIHALLDHIQERHRAEPDNSAFSVMLNADDP IEE  
KQIYSNIKIAIGGGINEPRDSLNTVIYGLLTHPDQLAEVRRHDHWEQAFEEAVRWVAPIQVSSRLVTQDTEL R  
GFLIPKGD TVMTVQASANRDEDIYHDGESFNVYRDKAPHQAFNGNGPHFCQGTHVARRAVGQIMLPMLFDRFPK  
MSIPDRDDVIWKGFGRGPIQIPVLLK

>CYP104A14 (SAR116\_2093) *Candidatus Puniceispirillum marinum*

MPLAPCDDTVTIADLTYPYFYKTARHHHPVVNVSSVKRTMLTKAEDTKFVKDNWQIFSSDDPSTPMKRAFQ  
AHTLMRKDGAEHMRERTAMTAAFSQRNIRDVWVPLYEKIVDDYIGRLPRGETVDL FHALAAPVSARCLSHLIG  
LEHASD TDLCRWSQTLIDGAGNFGWADAPFAATDRANDEINQSIQKTVDGHDANETPHAIAAMLNLEVPM DID  
VIRSNIKIVIGGGINEPRDAMLTAIYGVLTNPDQLADAKSDNSLWHHAFEE SVRWVAPIQVSSRRTLEDVEIR  
GYLIPKGDVMTVQASANHDEDMYEDGHLFNLHRPKQPHQAFNGNGPHFCLGTHIARRTVADIVLPRLFDRFPN  
LALDLGAPVLFQGFGRGPINLPVKLH

>CYP105BF3 (G432\_19820) *Sphingomonas* sp. MM-1

MTTETQIQEKVPETTFPWERGTYP PPAYAWLREHEPVRRVVLHDGTPAWLVTRYNDVRSILADPRVSSNQ N  
LPGFPQIELLP RSEESTFLNMDAPRHTLFRRLISKHFIVKKLEVMPRIQALVDEHIDHIIDRSEPFDFVE  
EIALPVPSTVIAWLLGVPPSDHPFFNRETEALLAASLGTEEAIERATEAYANINDYVDR LIAEREKLDDPGDD  
ILGDLVRASREGQIERRDVLNTAWLLLVAGHDTTANMIGLGMLT LLEHPDQLAQLQAE PALIPDAIEELLRYL  
TVVHLIILRIATEDIEIGGV TIPAGEGIIPLNFAANRDDGHFPDAAKFDIRRRPRDHVAFGYGVHQCIGQALA  
RIELQIVFETLLRRIPNVRLATDPADIQFKSHASINGIARLPVAL

>CYP105BF3 (K663\_19828) *Sphingobium* sp. MI1205

MTTETQIQEKVPETTFPWERGTYPDPAYAWLREHEPVRRVVLHDGTPAWLVTRYNDVRSILADPRVSSNQNLPGFPQIELLPRPSEEEESTFLNMDAPRHTLFRRLISKHFIVKKLEVMPRIQALVDEHIDHIIDRSEPFDFVEEIALPVPSTVIAWLLGVPPSDHPFFNRETEALLAASLGTEEAIERATEAYANINDYVDRLIAEREKLDDPGDDILGDLVRASREGQIERRDVLNTAWLLLAVAGHDTTANMIGLGMLTLLLEHPDQLAQLQAEPALIPDAIEELLRYLTVVHLIILRIATEDIEIGGV TIPAGEGI IPLNFAANRDDGHFPDAAKFDIRRRPRDHVAFGYGVHQCIGQALARIELQIVFETLLRRIPNVRLATDPADIQFKSHASINGIARLPVAL

>CYP105BF3 (SJA\_C2-04970) *Sphingobium japonicum*

MTTETQIQEKVPETTFPWERGTYPDPAYAWLREHEPVRRVVLHDGTPAWLVTRYNDVRSILADPRVSSNQNLPGFPQIELVPRPSEEEESTFLNMDAPRHTLFRRLISKHFIVKKLEVMPRIQALVDEHIDHIIDRSEPFDFVEEIALPVPSTVIAWLLGVPPSDHPFFNRETEALLAASLGTEEAIERATEAYANINDYVDRLIAEREKLDDPGDDILGDLVRASREGQIERRDVLNTAWLLLAVAGHDTTANMIGLGMLTLLLEHPDQLAQLQAEPALIPDAIEELLRYLTVVHLIILRIATEDIEIGGV TIPAGEGI IPLNFAANRDDGHFPDAAKFDIRRRPRDHVAFGYGVHQCIGQALARIELQIVFETLLRRIPNVRLATDPADIQFKSHASINGIARLPVAL

>CYP105CX1 (LH19\_26270) *Sphingopyxis macrogotabida* 203

MSNTATELPYFPMPRDSKCFSPPELKRIQQETPVSKVRIWDGREAWLVTRYDDVRFVLRDQRFVSNPHHPGWPFMSAGQGATRRDLKPNIFALDNPVHNELRRMQSADFRIAQIEGWRPRVQQLVDEAIDAMLEMPKPVDLWEAFALKIPSIVICELLGVAYEDSEFFQHHSDDLVTGTSTSEEIGESMDALRGFLRDLVEKKVVTPTEDILSRMATQQVKEGLLTASEVADLCVMLLIAGHDTTNTICLATILLQHPDQLEKFRNGDDEVVAKGVEEILRFLDVPHLGRRRVALEDVEVGGQLIRAGEGVIAAQMIADRDETA FEDPDKFDIDRDARHHLGFGFGTHQCLGQPLVRVEVQIALATLFRRIPTLQLAVPMEEIRFDYDALVYGVHELPMTW

>CYP107AN1 (b11\_6537) *Bradyrhizobium diazoefficiens* USDA 110

MVTPGSGAAIGVFVSCGNRFEVTMNEQAQPAGGDPLFNPLSPDFIRNPYPHYDRLRAIDPIHVT PFGQFVASRHADVSLVMRDKRFGKDFVERS KRRYSEKIMDEPVFRSMHWM LQADPPDHTRLRGLVVKAFTARRVEDMRPRIQEIVDEAIDAVIDRGHMDLIEDFAFRLPV TIIICDMLGIPEDHREVFYKSSRDGGRLDPVPLTP EEIAKGNAGNMMAQMYFQQLFELRRRNPADDLTTQLVQAEEDGNKLTNEELTANIILLFGAGHETT VNLI GNGLLALHRNPDQLALLKARPELMVNAIEEFLRYDSSVQMTGRVTLEDIDDLGGRKIPKGETVLC LLGSANRDP AVYPDRPDRLDVTRPNVKPLSFGGGIHFCLGAQLARIEAEIAIATLLRRLPDLRIDDDVENPEWRPTFVLRGLKSLPASW

>CYP107AN1 (BJ6T\_28960) *Bradyrhizobium japonicum* USDA 6

MNEQVQPAGGPLFNPLSPDFIRDPYPHYDRLRTIEPIHVT PFGQFVTSRHADVSLVMRDKRFGKDFVERS KRRYSPAIMDEPVFRSMHWM LQSDPPDHTRLRGLVVKAFTARRVEDMRPRIQAIVDQAIDAVIERGHMDLIEDFAFRLPV TIIICDMLGIPEDHRETFYNSSRDGGRLDPVPLTP EEIAKGNAGNMMAQMYFQQLFELRRRNPGDDLTTQLVQAEEDGNKLTNEELTANIILLFGAGHETT VNLI GNGLLALHRNPDQLALLKARPELMVNAIEEFLRYDSVQMTGRVALEDIADLGGSIPKGETVLC LLGSANRDP AVYPDRPDRLDVTRPNVKPLSFGGGIHFCLGAQLARIEAEIAIATLLRRLPDLRIDDDVENPEWRPTFVLRGLKRLPASW

>CYP107AN1 (RN69\_14145) *Bradyrhizobium japonicum* E109

MNEQVQPAGGPLFNPLSPDFIRDPYPHYDRLRTIEPIHVT PFGQFVTSRHADVSLVMRDKRFGKDFVERS KRRYSPAIMDEPVFRSMHWM LQSDPPDHTRLRGLVVKAFTARRVEDMRPRIQAIVDQAIDAVIERGHMDLIEDFAFRLPV TIIICDMLGIPEDHRETFYNSSRDGGRLDPVPLTP EEIAKGNAGNMMAQMYFQQLFELRRRNPGDDLTTQLVQAEEDGNKLTNEELTANIILLFGAGHETT VNLI GNGLLALHRNPDQLALLKARPELMVNAIEEFLRYDSVQMTGRVALEDIADLGGSIPKGETVLC LLGSANRDP AVYPDRPDRLDVTRPNVKPLSFGGGIHFCLGAQLARIEAEIAIATLLRRLPDLRIDDDVENPEWRPTFVLRGLKRLPASW

>CYP107AN1 (BF49\_5136) *Bradyrhizobium* sp. BF49

MNEHVQGTGGPLFNPLSPDFIRDPYPHYERLRAIFPIHVTPFGQFVTSRHADVSLVMRDKRFGKDFVERSKRR  
YSEKIMEEPVFRSMHWMQLQADPPDHTRLRGLVVKAFTARRVEDMRPRIQEIVDQTIDAVVDRGHMDLIEDFA  
FRLPVTIICDMLGIPEDHRETFYNSSRDGGRLDPVPLSPEEIAKGNAGNMMAQMYFQQLFELRRKNPGDDLI  
TQLVQAEEDGNKLTNEELTANIILLFGAGHETTVNLIGNGLLALHRNPDQLALLKARPELMVGAIEEFLRYDS  
SVQMTGRVALEDIDDLGGAKIPKGETVLCLLGSANRDPVYPDRPDRLDVTRQNVRLPSFGGGIHFCLGAQLA  
RLEAEIAIATLLRRLPDLRIDDDVENPEWRPTFVLRGLKRLPASW

>CYP107AN1 (S23\_17940) *Bradyrhizobium* sp. S23321

MNEQAQPAGGDPLFNPLAPDFIRDPYPHYDRLRTLDPPIHVTPFGQFVASRHADVSLVMRDKRFGKDFVERSKR  
RYS PAIMDEPVFRSMHWMQLQADPPDHTRLRGLVVKAFTARRAEDMRPRIQEIVDQIDA VINRGHMDLIEDF  
AFRLPVTIICDMLGIPEDHREVFYKSSRDGGRLDPVPLSKEEIAKGNAGNMMAQMYFQQLFELRRKTPGDDL  
ITQLVQAEEDGNKLSNEELTANIILLFGAGHETTVNLIGNGLLALHRNPDQLALLKARPELMVNAIEEFLRYD  
SSVQMTGRVALEDIDDLGGKKIPKGETVLCLLGSANRDPVYPDHPDRLDVLRQNVRLPSFGGGIHFCLGAQL  
ARIEAEIAIATLLRRLPDLHIDDVENPKWRSTFVLRGLTELPAW

>CYP107AN2 (BRADO\_5601) *Bradyrhizobium* sp. ORS 278

MSELWERDHMNEHVQAAKAAPLFNPLSPEFIRNPYPFYQQLRDNDPVHVTPFGSFLASRHAESSVLVRDKRFG  
KDFVARSIRRYGPEIMNEPIFRSMHWMQLQDPPDHTRLRGLVVKAFTARRVEDMRPRIQAIVDSTLDEIIPR  
GRMDLIEDFAFKLPVTVICDMLGIPEEHREAFYKSSREGGRLLPEVPLSKAEIEEGNAGNAVSRAYFQHLFEL  
RRKQPGDDLTTQLLQAEEDGAKLSHEELTANIILLFGAGHETTVNLIGNGLLALYRNPDLALLKARPELMTN  
AIEEFLRYDSSVQLTGRVALEDIEDLGRRIPAGETVLCLLGSANRDPVYPDNPEQLDITRANVKPLSFGGG  
IHHCLGAQLARIEAEVAIGTLLRRLPELKLDDPDNPEWRPTFVLRGLKRLPAHW

>CYP107AN2 (S58\_20060) *Bradyrhizobium oligotrophicum*

MNEHVQANKAAPLFNPLSPEFIRDPYPFYAQLRDNDPMHVTPFGAFLASRHAESSVLVRDKRFGKDFVARSIR  
RYGPDIMNEPVFQSMHWMQLQDPPDHTRLRGLVVKAFTARRVEDMRPRIQEIVDRTLDEVI PQGRMDLIEDF  
AFKLPVTVICDMLGIPEEHREAFYKSSREGGRLLPEVPLSKAEIAEGNAGNAVSKAYFQHLFELRRKQPGDDL  
TTQLLQAEEDGAKLSHDELTANIILLFGAGHETTVNLIGNGLLALHRNPDQLALLKARPELITNAIEEFLRYD  
SSVQLTGRVALEDIEDLGRRIPKGETVLCLLGSANRDPVYPDDPEKLDIVRANVKPLSFGGGIHHCLGAQL  
ARIEAEVAIGTLLRRLPELKLDDPDNPEWRPTFVLRGLKRLPAHW

>CYP107AN2 (BBta\_6122) *Bradyrhizobium* sp. BTAi1

MNELVQAAKAAPLFNPLSPEFIRDPYPFYQQLRDNDPMHVTPFGSVLASRHAESLVLVRDKRFGKDFVDRSIR  
RYGPEIMQEPVFRSMHWMQLQDPPDHTRLRGLVVKAFTARRVEDMRPRIQQIVDRTLDEVI PHGRMDLIEDF  
AFKLPVTVICDMLGIPEEHREAFYRSSREGGRLLDPVPLSKAEIAEGNAGNAVSTAYFQHLFELRRKHGPGDDL  
TTQLLQAEEDGAKLSHEELTANIILLFGAGHETTVNLIGNGLLALHRNPDQLALLKARPELITNAIEEFLRYD  
SSVQLTGRVALEDIEDLGRRIPKGEAVLCLLGSANRDPVYPDAPEQLDITRANVKPLSFGGGIHHCLGAQL  
ARIEAEVAIGTLLRRLPELKLDDPDNPEWRPTFVLRGLKRLPAHW

>CYP107JE1 (NT26\_0569) *Rhizobium* sp. NT-26

MRGRSEADALPLEAPLDLLDPSFVCDPYTIYRRLRTHDPVHRSRNGGWILTRHRDIVSALGDP SLGNAPSRY S  
VVAPRNRGRYVCANVAQNILPFLDKPEHVRPRRILSRVLSTHMKDNPLDIAQIARQLLDPQLARRQMDAIADF  
GTPLSAEVMCRMLGIPAPDRDRMLEYSHYFFFLFAPIPSDQIRQKADEALTAFRGYFADLVQERRRKQPADLI  
SLLLSAEDEGERLSDCQLVDNCMLLFSDGVENV DAGIANILLALGRHPAEMKRLRDAPELIANAVAEGFLRYDS  
PAQLIARVARDDVEIGGQTIKR DSTVFLALGSANRDPAVFADPDRFNISRNTSPLLSFGKG GHS CIGASLVRS  
QSVEAVRSL LQT TTVVEVDQDGLEWLPRVGHRLKTLPIRLFPS

>CYP107-fragment (TMO\_3392) *Tistrella mobilis* KA081020-065

MGIAGERFEDLHPLLAAITRGHDMAPTEADMRMRGRFAQQTMGRWLAPRVLAAPEGSLAAAVRDIAAGRND DGR  
MVVGWAAMLVYSGSTTIRDFLVNVVALLVDRPDVAARLAAEPAILGTMVEECLRLEGPVRGTRVAAADVIG  
ETGIPAGSVLHLMFDHANRDPERFSDPDVFDPVRSNP HLSFGHGNTFCLGAHLARLETRALILRILPHLHRL  
RRTHPPIWTSVRLRLREQARLTLSCH

>CYP108A3 (BSY17\_2029) *Sphingobium* sp. RAC03

MATSLDADVRPIIPDDIARIVIAPKSYTDDATIYGAFRWLREHMPLGIAQVPGYDPVWVVTKHADIKEVERNG  
RLFHNADHNPIILVDQASDAFTTRDINGGSIRILSSLTYMDPPEHASRYTLTSNWFLPGKISKLEDKIRVLARQS  
VDNLLSFDGECDFVRDFALHYPLRVIMTLFGVPPPEDEPRMLKLTQEFGVHDPPEEQRPEMAADPVVAAKQWAA  
SIEDFYTYFDKLSADRRERPTDDLTLIANSRINGAPIPRDEANGYYVAIATAGHDTTSSSTAGGLHGMMVYP  
ENWAKVKADPSLIPGLVDEAIRWTSPVKHFMRNATADTQVRGMDIRAMERLMICYPSGNRDEAVFDDADRFDI  
TRSPNPHIAFGFGPHMCLGQHLAKLEMRIILFEELLPHLSSVEMAGDPRMVETNFVGGYKALPIRFTKN

>CYP108A4 (WYH\_03331) *Altererythrobacter atlanticus*

MASATQTASGPLIPQHIAETVFSKSYTDDAVIYDAFKWLRENMPLGIAEVEGFDPVWVVTRHADIRQVEKDA  
KLFHNADFNPIILNDRASDAFTREMTGGSVSGLASLTYMDPPVHQYRMLTANWFLPGKISKLEDQIRVLARQS  
VEHFLSFDGECDFVRDFALHYPLRVIMTLFGVPPPEDEPKMLKLTQEFGGHDPPEEQRAELREDPIVAAKMWAA  
TLEDFFQYFDALAEKRAEPQDDLTLIANSRINGSPIGRDEANGYFVAIATAGHDTTSSSVAGGMHGMIAFP  
ENFAKVKADPALIPGLVDEAIRWTSPVKHFMRNATQDTEVGGQLIRSMDRLMICYPSGNRDEAVFEHPDRFDI  
TRSPNRHVAFGFGPHMCLGQHLAKLEMRIILFEELLPHLAAVELAGSPKLVETNFVGGYKSLPIRFRKA

>CYP108D1 (Saro\_3162) *Novosphingobium aromaticivorans*

MDSIPMVPAEVGRAVIDPKSYGTWEPLLDLRFDAALRAEAPVAKVVAPDDEHEPFWLVSFSGVMKASKDNATFL  
NNPKSTVFTLRVGEMMAKAITGGSPHLVESLQMDAPKHPKLRRLTQDWFMPKNLARLDGEIRKIANEAIDRM  
LGAGEEGDFMALVAAPYPLHVVMQILGVPPPEDEPKMLFLTQQMFQGGQDEDMNKSGLKDLPEQISQIVAGAVA  
EFERYFAGLAAERRRNPTDDVATVIANAVVDGEPMSDRDTAGYIIITASAGHDTTSSASSAGAALALARDPDLF  
ARVKADRNLPLGIVEEAIWTTTPVQHFMRTAATDTTELQCGQKIAAGDWLMLNYVAANHDPAQFPEPRKFDPTRP  
ANRHLAGFAGSHQCLGLHLARLEMRLLDVLLDRVDSLELAGEPKRVNSTFVGGFKSLPMRWKAA

>CYP108D4 (Ga0102493\_11805) *Erythrobacter litoralis* DSM 8509

MASAGDTKQPAALPPETAREVIDPKAYAEDWGLLDTFDRLREEAPVAKVMPETEGLFEPFWLVTRYDDVMRIS  
KDNAAFNNPRPVVFSFNQAIIEFSRAATGSDMLVDSLVSFVDAPIHPKYRRLTQDWFMPRNLGRIEEEIRALAH  
RTVDAMIEKGGIDFVKEVSGPYPLRVVMQILGVPPPEDEPRMQMLTQQLFQGGQDADLSGTGMENMTPEQVVQL  
VAGAVKSFEDYFAKLAEDRRRAHPTEDVASVIANATVDGEPLPPRDMAGYIIIVATAGHDTTSSASTAGAMQALA  
NDPEQWERVKADRSLPLGIVEEAIWTTTPVQHFMRTAAEDCEVGGQQVKKGDWLMINYYVAANHDPAQFDNPRK  
FDAARSPNRHLAFGAGAHQCLGLHLARLEMRLLEALLDKVASVAPAGEAKRASSTFVGGGLKTLPLRITPE

>CYP108D5 (BG023\_11389) *Porphyrobacter* sp. LM 6

MSGEAVLPGLDARRVIDPHAYAQWDGLLDTFDHIRAETPVVKVQPDTPGLFDPFWLVTRYDDVMRISKDNATF  
LNNPRPVVFSFNQAIIEFSRAATGSNMLVDSLVSFVDAPIHPKYRRLTQDWFMPRNLARLEDELRLAARTVDRM  
LEQAKTSGDEVDFVKEVSGPYPLRVVMQILGVPPPEDEFRMQMLTQQLFQGGQDKDLSGSGMDQMTPEQVVQIVA  
GAVKTFEDYFAGIAEDRRKNPTEDVASVIANALVDGQFLPRATWRDITSSLPPPGMTPPRQAPQARCRSPAT  
PNNTPASAPIARCFPALSRRRSAGPAPCSTSCAPRPRTSNWAGSR

>CYP108D7 (AMC99\_02398) *Altererythrobacter epoxidivorans*

MSGEAILPPDVAREVIDPHAYAENGLLDTFDRLRQESPVALVKPEDGELFDPFWLVTRYDDVMRLSKDNKTF  
LNNPRPVVFSFRQAIIEFSRQATGSDMLVDSLVSFVDAPIHPKYRRLTQDWFMPRNLAKMEAEIRNIAEATVDRL  
VAAGSEADFVKLVSGPYPLHVVMQILGVPEEDEPRMQMLTQQLFQGGQDADLSGTGMENMSPEQVVQLVAGAVK  
TFEGYFAELAAQRRANPTDDVASVIANATVDGEPLPERDMAGYIIIVATAGHDTTSSASTAGAMMALAQDPEQW  
ARVRADRSLPLGIVEEAIWTTTPVQHFMRTAAEDVEVGGQQVKKGDWLMINYSANHDPSQFDDPRRFDAARS  
PNRHLAGFAGAHQCLGLHLARMEMKILFETLLDRIETIELAGEPKRATSTFVGGGLKTLPLVRFKAA

>CYP108D8 (ELI\_12320) *Erythrobacter litoralis* HTCC2594

MMASGTPILPPDTAREVIDPHSYAEWGSLLDTFDRLRAESPVAKIVPDEEGLFEPFWLVTRYEDVMRMSKDNR  
TFLNNPRPVVFSLSNAIEFSRAATGSDMLVDSLVSFVDAPVHPKYRRLTQDWFMPRNLAKIEGEIIRIIANRVVD

KLLEAGPELDFCKLVSAFYPLHVVMQILGVPEEDEPRMLMLTQQMFGGQDADLSGTGMENMTPEQVLQVLVSGA  
VKSFEDYFAEIANQRRENPTDDVASVIANATVDGEPLPDRDMAGYYIIIVATAGHDTTSASTAGAMQALAQDPE  
QWAKVKADRSLPLGIVEEAIWTPVQHFMRTAAEDTELGNQAIKKGDWLMMSYVAANHDPAQFENPRKFDAA  
RSPNRHLAFGAGAHQCLGLHLARLEMRLFEALLDRVETVELAGEPKRSTSTFVGGKLTPLRITPA

>CYP108D9(BSY18\_1523) *Blastomonas* sp. RAC04

MATIAPATLPSEIASAIVNPVAYGQWDDLKTKFRWARDNMPVGLVQAEGYMPFWAITRHEDIMTVSKDNARFL  
NAPKSVVLGPVAVQMLTHMITGGSPHLVRSVLTMDAPEHMDYRKLTQSWFMPKNLAGSEARIREIARASIDAM  
VATGGACDFVHQVSALYPLHVVMQILGVPHDEDEPLMLKLTQEMFGGEDPDLNRARSVDLTPEQVMQFVVDAVR  
DFEGYFMKLAADRRASPRDDVASVIANATIDGEPISDRNAAGYYIIIVAAAGHDTTSASTAGAMWALANDPEQF  
ARIKADRSLPLGLIEEAIWTPVQHFMRTAAEDCEIGGQAIKDDWLMLCYVSGNHDERVDDPDRFDAARG  
PNRHVAFGAGVHQCLGLHLARMEMRLFEELLDRVESVELAGTPQRASSTFVGGPKLTPIRFVAS

>CYP108G1(CC\_2494) *Caulobacter vibrioides* CB15

MTISTDIANTIIDPKAYADGDRIDQAFAPHLRREAPLAVAQPDGDFPFWVTRHADILEVERQNELFHNGDRAT  
VVTTEIPDKKVREMMGGSPHLVRSVQMDNPDHFAYRKITQGALLPQNLRALEARIREIARGFVDRMAEHGDR  
CDFARDVAFLYPLHVIMEVLGVPESEDEPRMLKLTQELFGNADPDLNRTGKSVTDVGEVDSIQSVVMDFMMYF  
NAITEDRRANPRDDLATLIANGKINGEPMGHLEAMSYYIIAATAGHDTTSSTTAGALWALAENPDQFAKVKAD  
PSLIPGLIEESIRWVTPVKHFMRTATADAELGGQKIAKGDWIMLSYPSGNRDEAVFEDPFTFRVDRTPNKHVA  
FGYGHAHICLGQHLARMEMRVLWEELFARLDHVELDGAPTRMVANFVCGPKSVPIRFKMH

>CYP108G1(CCNA\_02579) *Caulobacter vibrioides* NA1000

MTISTDIANTIIDPKAYADGDRIDQAFAPHLRREAPLAVAQPDGDFPFWVTRHADILEVERQNELFHNGDRAT  
VVTTEIADKKVREMMGGSPHLVRSVQMDNPDHFAYRKITQGALLPQNLRALEARIREIARGFVDRMAEHGDR  
CDFARDVAFLYPLHVIMEVLGVPESEDEPRMLKLTQELFGNADPDLNRTGKSVTDVGEVDSIQSVVMDFMMYF  
NAITEDRRANPRDDLATLIANGKINGEPMGHLEAMSYYIIAATAGHDTTSSTTAGALWALAENPDQFAKVKAD  
PSLIPGLIEESIRWVTPVKHFMRTATADAELGGQKIAKGDWIMLSYPSGNRDEAVFEDPFTFRVDRTPNKHVA  
FGYGHAHICLGQHLARMEMRVLWEELFARLDHVELDGAPTRMVANFVCGPKSVPIRFKMH

>CYP108G3(Plav\_1544) *Parvibaculum lavamentivorans*

MTDKTIDNAIVNPKTYAHVDEFHRLFTQLRKEEPVRWTEPDGFRPFWTVSKHADIMEVERQNDKFLNDPRLTL  
QTIEVEEEVKKFTGGNSKLIRSLVMDNPDHNRNYRGLTQAWFMPPNLKAI SARVEALAEKYIDRLEAKGGECD  
FVSDVAVWYPLRVIMTVLGVPAEDEPIMLKLTQELFGSTDPDMKRDPATETVNTVTTEFFNYFTAMTEDRRKNP  
KDDVASVIANATIDGEPIGHLEAISYYIIIVATAGHDTTSSTAAGLLALMQNPPEEFAKLANPEGLLGGAIDE  
MIRWTPVKKHFFRTAAVDYELRGQKIKAGDNLLMCYWSANRDEEAFDDPFSFKIERSPNKHLAFGYGAHLCLG  
QHLAKMEIRALYKELLARLDHIELAGDPAWVEASFVSGLKRLPIRYSMKRKA

>CYP108G6(Cseg\_1214) *Caulobacter segnis*

MTIPADIAKDIDVPTAYADGDRVDQAFAPHLRREAPLDIAQPEGDFPFWVTRHADILEVERQNELFHNGDRAT  
VLTTEIADRKVREMMGGSPHLVRSVQMDNPDHFAYRKVTQGALLPQNLRALEARIREIARGFVDRMAEHGDR  
CDFARDVAFLYPLHVIMEVLGVPESEDEPRMLKLTQELFGNADPDLNRSGKTITDAGEVDSIQSVVMDFMMYF  
NAITEDRRAPRDDLASLIANGKINGEPMGHLEAMSYYIIAATAGHDTTSSTTAGALWALAENPEQFAKVKAD  
PSLISGLIEESIRWVTPVKHFMRTATADAELAGKKIAKGDWFLSYPSGNRDETVEFDPFSFKVDRAPNKHLA  
FGYGHAHICLGQHLARMEMRVLWEELLSRLDSVELDGTPTMTANFVCGPKAVPIRFKMH

>CYP108G7(Caul\_3446) *Caulobacter* sp. K31

MTIPMDIANTIVDPTAYADGDRIDKAFAPHLRRESPLEVAQPEGDFPFWVTRHADILEVERQNELFHNGDRAT  
IVTNIEADKKVREMMGGSPHLVRSVQMDNPDHFAYRRVTQGSLLPQNLRTLEARIREIARGFVDRMAEQGDR  
CDFARDVAFLYPLHVIMEVLGVPEADEPRMLKLTQELFGNADPDLNRAGKTFDTISEGLDSLQSVVMDFMMYF  
NAMEDRRANPREDLASIIANGKIDGQPMGHLEAMGYIIAATAGHDTTSSTTAGALWALAESPQDFARLKAD  
PGLIPGLVEESIRWVTPVKHFMRTATADAELAGRKIAKGDWMLSYPSGNRDEAVFEDPFSFRIDRTPNKHVA  
FGYGAVCLGQHLARMEMRVLWEELFARLDSVELDGTPTMTANFVCGPKSVPIRFKMH

>CYP108G8 (PHZ\_c0168) *Phenylobacterium zucineum*

MIPQDVANTIVDPKAYAAWTPIEEAFGYLRREAPLEQAQPEGFDPPFWVVTQDDIRAVELQNELFHNGDRSTV  
VTTIEADKKVRALMGGSPLVRSVLVQMDNPDHGNRYRRLTQGWFPQNLRALEERIRVIARGFVDRMAAHGGRC  
DFAKDVAFLYPLHVIMEVLGVPEIDEPRMLKLTQELFGNADPELNRSAGQLQDQDQALLALQGTIADFIAYFN  
EMTEDRRAKPRQDVASIIANGMIEGKPLGHLEAMSYYIIIVATAGHDTTSSTTASALWALAENPAQFRAVKDDL  
SLVKGLIEESIRWETPVKHFMRATDDAELAGKKIAKGDWLFSLYPSGNRDEAVFDNPFYAFDVTRSPNKHVAF  
GYGAHVCLGQHLARMEMRILWEELLPRLESVELDGQPRRMEASFVCGPKSVPVRFKMN

>CYP108G9 (HNE\_0569) *Hyphomonas neptunium* ATCC 15444

MAIPEHIAREVIDPKAYADGKRVDDAFTWLRANAPLDVATVEGFDPFWVVTNRHADILNIERQNDLFHNEEDRSA  
TLTTIESDKRVREMMGGSPNILRSLVQMDNPDHMQYRRLTQAWFMPQNLRLKLEDVREIARGFIDQMAAKGTE  
CDFARDVAFLYPLHVIMEVLGVPPIDEPRMLKLTQELFGTQDPDVNRAGKEVGTDDALKMINETIFDFMTYF  
NAMTEDRRQNPREDLASVIANGAVYGQPLGHLEAMSYYIIAATAGHDTTSNTTAGAMWALAENPDQFRVKKDD  
LSLIPSMVEESIRWETPVKHFMRATDDTEVAGQKIAKNDWLFSLAYPSGNRDEAVFDDPFTFKVDRSPNKHVA  
FGYGAHVCIQHLARMEMRVLWEELLPRLSIEMAGKPQRTQANFVSGPKSVPIRFKMS

>CYP108G10 (BBta\_7865) *Bradyrhizobium* sp. BTAi1

MGAAAASADEAIPQDIAAALVDPACYADHRIHDAYRWLRANNPLGRAQLDAFDPFWVVTNRHADILAI SRQNDLF  
HNADRATTLTNKAVLERVHKITGQPNLVRSLVQMDAPDHPKYRALTQGWFM PANIAKFEPRIREIARATVDRM  
AAAAAANGGVCFVADVALGYPLHVIMEILGVPEADEPRMLKLTQELFGPQDPD TARVREALSAEVFAAMLQA  
VVADFAAYFQRITEDRR AHPRDDLATVIANAKINGEDMPLHDRTSYYMIVATAGHDTTSSTAGAIWALAEDP  
AQFARVKADPELIPGLVDEAIRWMTPVKHFMR SATADTELGGRRIAKGDWLM L CYASGNRDEAVFEEADRFR C  
DRRPNRHVAFGYGAHLCLGQYLAKLEMRI LFEELLPRLSALS LAGPVKMTQATFVNGPKTLPIRV TMA

>CYP108G11 (S58\_72760) *Bradyrhizobium oligotrophicum*

MGAAAQAEETIPAHVATALVDAACYADHRIHDAYRWLRANNPLGRVRLEAFDPFWVVTNRHADILSISRQNDLF  
HNADRATTLTNKAVLERVHKITGQPNLVRSLVQMDAPDHPKYRALTQGWFM PANIARFEPRIREIARATVDRM  
AAAAAANGGVCFVDE VALGYPLHVIMEILGVPEEDEPRMLKLTQELFGPQDPD TARVREALSAELFAAMLQA  
VVADFAAYFQRITEDR KANPREDLATVIANAKINGEDMPLHDRTSYYMIVATAGHDTTSSTAGAIWALAEDP  
EQFARVKAEPGLIPGLVDEAIRWMTPVKHFMR SATADTELGGRH IARGDWLM L CYASGNRDEAVFDEPD AFR C  
DRKPNRHVAFGYGAHLCLGQHLARLEMRI LFEELLQRLSSLAPVGPVKMTQATFVNGPKKLPIRV EMS

>CYP108G12 (AEM38\_10480) *Hyphomonadaceae bacterium* UKL13-1

MSADPTLPEELSRAVVSPKTYADQAVMDATFAKIRTDYPLAKTQMSDFEPFWFVSKHADILEISRQNDLFLSG  
ELPTTLTTKSVDEKVRKQTGGSPHLIRTLVQMDAPDHPKFRVMTQAWFMPQNLRLKLEDQIRKIARMYVDKMAG  
MDGQCDFLNDIALFFPLRVIMEILGVPEVDEPRMLKLTQELFGAQDPEMNRSGGELQDEQKALADIQAVLMDF  
FMYFNQITEARRANPTEDVATVIANAKMDGAPIGAFAEAVSYTIIATAGHDTTSSTAGLFGLIQNP DQLKA  
VQQDPNLIHGLVDESIRWATPVRHFMR SATADYALRGQTIKKGDWLM L SYPSGNRDEEVFDDPYAFRIDRTPN  
KHLAFGYGAHLCLGQHLAKLEMRI FWEELLPR LKSVEFAGEPKLSEANFVGGLKNLP IRYVMD

>CYP108G13 (BRADO\_7134) *Bradyrhizobium* sp. ORS 278

MSAALADEVIPADIAVTLVDPACYADHRIHDAYRWLRANNPLGRAELETDFPFWVVTNRHADILAI SRQNELFH  
NADRATTLTNKAVLERVHKITGQPNLVRSLVQMDAPDHPKYRALTQGWFM PANIAKFEPRIREIARATVDRMA  
AKAAAHHGGACDFVADVALGYPLHVIMEILGVPEEDEPRMLKLTQELFGPQDPD TARVREGLSAEVFAAMLQAV  
VADFAAYFERITADRRARPRDDLATVIANARINGEEMPLHDRTSYYMIVATAGHDTTSSTAGRDLGAGAGSR  
AVRAREGR CRTDSGTGRRGDFLDDAGQAFHAQRDRRHRARRPADREGRLADAVLRLGKSRRGV

>CYP108G14 (HNE\_2207) *Hyphomonas neptunium* ATCC 15444

MDHSHEASGPDLPDWVSQRLVSPKAYATDQIDEAYRWARTNNPLGVARAEGYDPFWVLTKHDDILTVSRNNSL  
FHSADRATTLNQA AIERTTRITGGSPN LVRSLVQMDAPDHMKYRTLTQGWFM PANLRKREEEVGQIADA AAVA

SFLKQNGRCDFVRDVALNYPLHVVMNILGVPPEDFPRMLRLTQELFGSQDPDTARQLDALSAEQFGAMIQAVV  
QDFAVYFNAISEDRRRDPKDDLATIIANATIDGRPIGMEATSYIIIVATAGHDTTSSATSMAMWALATQAGL  
LQRLQAQPEPIPGFVEEAIRWATPVKTFMRSATKDTELRGRIAKGDWMLLCYASGNRDEEVFSDPYTFDIDR  
KPNRQLAFNGAHVCIGQHLARLEMRVLF EKLI PALKSVSLDGDIFVESYFVSGPKTLPIRFEVM

>CYP108G15 (S58\_21260) *Bradyrhizobium oligotrophicum*

MVGRIDDQVVDPATYGTTPHKYDEIFAELRRSDPVRWTEPAGYRPFWTIAKHS DILEIERQNDKFINDPRTSLV  
PIEEEEERRVRAGNAKLVRTLITMDEPDHRA YRGITQAWFMPVNL RKIEGEIKNLAGEFVALMDERGGRCDFVN  
DVALWYPLRIIMTILGVPREDDAKMLKFTQALLASSDKDLSGGSNNFQSRQVAAQEFFAYFGAIAEDRRRNPK  
DDLASIIANASVGGNPAGVFESLSYLVIIATAGHDTTSSAMAGGLHALIEHPAEFRRLRESPPELLNSAVEEML  
RWTSPVKHFFRTATQDYQLRGKQIRAGDSLMMCFPSGNRDEEVFVDPFAFRVDRTPNRHIAFGHGVHQCLGLN  
LARMEMKALFTEIVARVDSIELAGEPAWIEANLVSGPKRLPITYRMKSCP VQ

>CYP108G16 (LH19\_04405) *Sphingopyxis macrogoltabida* 203

MSDTLSGNIDEIIVDPKTYGDEHSYHRAFDRLRRDDPVHWTEPKDYRPFWAVTRHADIMAVELNAKNFLNDPR  
QFLVTRADEDLLEQTGSHKFAHNLVAMDDPEHRAFRSLTSAWFGAKSIRGLEEEIIAALARETVDRMVEMGGS  
CDFAAEIAAWFPLRTIMIVLGVPREDEPLMLHLSQKLFSGVGGVDGMAGMVDAFNAFNDYFGKVTEDRRRNPR  
GDVATILATATIDGEPIGEAEARNAYYLIVAAAGHDTTSSSISGGLLALI QNP DQMAKL RADPALIGTAVDEFI  
RWTSPVKHFFRTAVADCEVGGKQIRAGDNLMMCYPSGNRDASVFDDPYAFRVDRPDARKHLSFGYGPHLCLGN  
ALAKLEIRILFTEMLRRIDDFELAGDPAWVEASFSVGLKHLPIRYKVRETGA

>CYP108G17 (LH19\_15640) *Sphingopyxis macrogoltabida* 203

MANMLADNIDEIITDPATYADEALYHQTFAELRRTDPVHWCNPAQYHPFWAVTRHADIMRVELDAANFLNEPR  
QFLVTIDDQKMMEEQTGESNFARNLVAMDNPDHKA YRALTADWFGAKSVRALEEKITELARETVDRMVAKGGT  
CDFAKEIAAWYPLRTIMIVLGVPREDEPLMLELSQKVFGGSDADTGGGEGMTSMLEAFAAFNDYFGRVVADRL  
VNPQDDVATLLSTATIDGAPIGEAERNAYFLIIAAAGHDTTSSAISGGLLALIRNP DQMAKL RANPDLM PQAV  
DEFIRWTTPVKHFFRTAVADCEVGGQAVKAGDSLMMCYPSANRDEAAFD DPM EFRIDRKPNRQLAFGYGPHVC  
LGQFLAKMEIRILFTELLARIEEIELAGEPAWVKANFVSGLKRLP IRYRCEGAASVTGG

>CYP108G18 (JI59\_08785) *Novosphingobium pentaromativorans*

MTVLSEIGPMLVDPKAYADGSIYEAYRWLRRNDPLASIEVEGYQPFRVVTLYSDVQYVSRHNALFHSSPNPTL  
SPISRMKLVREL TGSTSPIKSLVMDPPEHGKYRALTSPWFQPGNLKSLEGRIRDIAREMVERMV DARQCDF  
ARLVAHEFP LQVILEILGLPREDHPVMLRLTQEMFGATDPDVLGNRSATNDSASASDLGAVREMMAYFDKLTE  
DRRAHPTSDLASVIANARIDGEPMGHLETMGYYVITATAGHDTTSSSIGGAMWALAEHPDQFARLKADMSLLP  
TMIDEAIRWTTPVKHFMRTATADTEIGGRP VREGERLMLCYGSANRDES VFDDPD TFR LDRKPNRH LAFGYGG  
HLCLGQYLARIEMRILFEELLPR LSS LALDGE PAMTEAIFVSGPKRLPIRYEIA PPVGAPRVADAEPNCPA

>CYP108G19 (S58\_21370) *Bradyrhizobium oligotrophicum*

MKEGPGLSAANFPIPDNIVAVLTDPAAYGTQRIFDAYRWLRVNQPLGKASPRGFNPFWVVRHADIQTISQQS  
QLFRSSDRPVALLSSKAEAKIEAATGGNGLLRTL VQMDAPDHPKFRALTQKWFTPGNLRAIEGRIRDIARSYA  
DRLTASGQHCDVFSEIALGFFPLRVVMTILGVDPDHEPKMLRLTQEFFGT KDLDNARKGRNDGATALS DVVLEF  
GEFFSSVADRRANPSDDLASVIANAQIDGESISDL DALSYFVTIATAGHDTTSSSSAGGMWALCEHPQQFER  
LKANPGLIPGFVDEAIRWTTPVKHFMRTAAEDTELDGRSIRRGDWMLLCYASANRDEAVFQDPDTFRIDRSPN  
RH LAFGYGAHLCLGQYLAKLEMRI LFEELLQRISCVELDGE GATTVSWFVNGPKRLPIRFQLR

>CYP108G20 (HNE\_0939) *Hyphomonas neptunium* ATCC 15444

MSDSAVLAVPPDTKKDPARRMSEAAAATCDQIVTPAVYADPPTLDAAFKRLRAEDPLAWCEPEGFRPFWAVTK  
HADIMDVSRQNQLFTNGQREMLSYHEAEKGVYAKFGQPHLLKTLVQLDDPSHYKLRHLTQEWFM PQNVKKRDD  
AVRSIAKQYVDRMEDLGGECD FQRDIALYYPLRVIMQILGVPESEDEPMMLKLTQEI FGAQDEDLMRDKSLAEE  
RDVEKGLASIQATLAEFFMYFTNITADRRANPKDDVSTVIANGMIDGEP I GQLEAMSYIIITAAAGHDTTSSAS  
TGGGV LAMLQSPSELKKMMDDPKGMSRTAVDEAIRWTTPVKHFMRTAQDDYTLRGKNILKGESLLL CYPSGNR

DEEVFDDPYSFKADRSFNKLISFGYGGHMCGLGMHLARLEMQAIYEELFSRVKSIELAGEPSFIKANFVGGPKS  
IPVRYRF

>CYP108L2 (S58\_21390) *Bradyrhizobium oligotrophicum*

MQDTSLDQAIVDHETYGALDRQHILFSTLRKEDPVHWTEPPGFRPFWTISKHQDVIEIERQNEKFINAPRTKL  
LSIDFETKVRDAMAGRPMLVRAINQMDNPDHAKYKKITHAWFQPREVRHLEDRIAVIARTSVDQMLEKGTECD  
FYKDVAGWYPLRVIMLILGIPDEHGPRLLDITRAYFGGGDAEVQRGNDLIDATFAYVNFKEVARERRRNPTD  
DLASIIATAEVDGEPIDGEFETSSYYVALASAGHDTISATLSGGLLALIENPGEMRKLKQNPDLIPAAVEEMVR  
WVSPVKHFFRTATETYTTLRGKTIKQGDHLLLAYPSANRDEDAFESPFADFVADRTPNRHVGFVGFGIHACLGGLYL  
AKVEMIAFMRELLSRVDGIELAGEPAWTETSFVGGGLKRLPIRFSRLH

>CYP108P1 (BRADO\_6084) *Bradyrhizobium* sp.ORS 278

MSAGWSRIDRSGAVARAVIDVLISARGHASPAREHACALLRERAPLLWVERPGVRPFVAVTRYADIVSMETRS  
GQFAAGPRTYLASETSEAVLQRTVGKQPLVRSLSLTEMPPDHGVYRAILQNAFAPPALREMEAWLARWAAEIID  
RVAARGSVCFACDVAVPFTFRVIGHMLGTPEADDAQLARLAQAFVGAEDPQRRLAEPGDTMRMAMLALRDY  
FEAVVADRRAPRADLATLIARAEPHGRAMPHYELISFFILLVTAGHDTTAFALSGGLEALLAAPDQFERLRT  
APDLLDSAIEEMLRWTTTPVRHFMRALTCDTEVGRRIREGEALALFFHSANRDEAVFADAGEFRIDRSPNPHI  
AFGRGPHICMGLQLARMQMRAMFAELLRRTERIERAGRVRVQSQFMSGVGALPVIRISLCAARRSTVA

>CYP108P2 (S58\_62710) *Bradyrhizobium oligotrophicum*

MEVLISSRGHASPRLERACALLRREAPLHWVERPDVRPFVAVTRYADIVSIETRSGQFAAGPRTYLASETSE  
AVLQRTVGKQPLVRSLSLTEMPPDHAVYRAIIQGAFAAPPALRELETWLARWAAEIIDRIAACSGPIDFAADVAL  
PFTFRVIGRMLGTPEADDARLARLAQAFVGAEDPQRRLAESPGDTMRMAMLALRDYFEAVVADRLAYPRDDL  
SLIARAEPHGAAMPHYELISYFILLVTAGHDTTALALGGGLEALLAAPDQFARLRAEPDLLDSAIEEMLRWTT  
PVRHFMRALTGDTEVAGQPIREGDALALFFHSANRDESVFESAGAFIDRSPNPHIAFGRGPHVCMGLQLARM  
QMRAMFAELLRRTERIERAGRVRVQSPFMSGVSRLPVRIAIFRASFDAAAE

>CYP108U1 (SGRAN\_1188) *Sphingopyxis granuli*

MSAQNLVTQPQEQGNAPQLPADMASRLTDPVWAEAGLHELLATIRAQYPLAIADVPGFRPFVWVSKYQDIM  
EISRQNSLFHSGDLSAVLMPPEEYQKLAGGGEDAIEKVHRSIVYMDPPEHGRYRMLTQAWFQPGSVRKREEEIR  
AIAKKTVERMRAAGGTCDVSDIAVHYPLEVIMNIGIPDEHYSRVLRLTQEVFVSVADEELGREGDDTFSLSGS  
DNVFRDFNAFLRPFHEDRKVNPRDDVLSIIANAQIDGQVPPEIEALSYYVTVATAGHDTTSSTSATALWALS  
RSPLEFRELKEDPSRIPALIDEALRWTTTPVRHFMRSAITEDYELRGQLIRKGDWMLCYPSGNRDEEIEFENPQQF  
QPDRSPNKHVAFGYGAHVCLGQHLAKLEIRILLEELLANLDAIEPAGPPKYTKAIFVGGGLKSLPIRYQTA

>CYP108V1 (P73\_0333) *Celeribacter indicus*

MDQQTTSNAIADPKTYGDPSKMYALFERLRREEPVWCEPEGYRPFWAIARHAEIMEIERQPDLFISAPRTAL  
RTFAQEENIRKMTGSYQMVRTLLQMDPPDHRKYRALSQAWFMGKLSLEPAMKRLAGEFIDRMESLDGNCDF  
AKDIASLYPLRAILQILGVPPPEDEPMVLKLTQOFFAGTDPSTFDEDNEETDITSAAAQLFPYFNEKVAERRKE  
PKNDLFTLLADAEDVGQPIISDFERNYSFFIVAVAGHDTTSLTMASFMHALVEHPDQLRRLQENPALLED  
AINEAVRWASPVFHFMRATADYEIGGKTIRKDDSIMLLYPSANRDESVFEAPEEFIDRQPNRHVGFVGFY  
GPHLCLGQHFALKELRMFFGQLLRLREVSLDGEPQWLETNFVGGGLKTLPISYRLNTPELV

>CYP108W1 (Swit\_3069) *Sphingomonas wittichii*

MNGATRTIDKPDVERAIVDPATYMDRAAYDAIFTGLRRDDPIRWIEPEGFRPFVWLVTRSADIVDIERRATIFL  
NGPRAVLKPLAFEERLARQQRGHSEIIKSMNNMDGEAHRANRAVTSRDFLRPNIERMAAQLEPVAADFVQRLV  
DKAPTCDFAADVMTWYPLRVILTLLGVAPEHDARILALTQRIFLDPGDGADPAAAQADKMAAVEGFFDFFRPI  
VADRRANPRDDIASKVANARIDGPEMDEFETLSYFLTLATAGHDTTAAIAGGLLALIRNPGEKLEKRGDPGL  
LETAADEMIRWNAPVKHFFRTAAEDFEIGGKAIRAGDSVMLAFASACRDEDLFEDPFAFRVDRTPNRHLALGS  
GPHACLGQHLAKLEIRLFFRHLLDRIDHIELVGEPRSNPSSFISGIVSLPIRYRVRR

>CYP108X1 (LH20\_00540) *Sphingopyxis* sp. 113P3



MTKPILPGEVAAAVIDPTAYAAWEPLHEQLAWARANAPLAVAENPTHDPFWLVTRHADIMAI SRDPQRFANGI  
RPTVLTDRDGEALARAATPGGDGHLIRSLVQMDAPDHMKYRLLTQGWFMKPNLRIVEERIREIARETVDHMLS  
LGDTCDFFARDVAAHYPLRVIMDILGVPPPEDEPRMLMLTQQLFGSTDPPELNREGREAVKSTEQVIAMLHYVIADF  
ENYFRNL TADRRANPREDIATVIANATIDGGQIPDRELAGYYMIVATAGHDTTSASTAGAMMELAKCPALFAR  
FRDAASDKGGLIEEAIRWSTPVQHFMRS AKEDVEIGGQTI RQGDWLMLNYSANRDEAVFADPFTFD PDARN  
QQIAFGFGAHVCLGQHLARMEMRI LMEELL PRLKSVELAGEPARVESVFVGGLKRLPIRFEAA

>CYP108X2 (SGRAN\_3743) *Sphingopyxis granuli*

MTKPILPGEVAAAVVDPVAYGEWDGLHQQLAWARAHAPLAVAENPDHDPFWLVTRHADIMAI SRDPQRFANGV  
RQTVLTNREGEALARAATPGNDGHLIRSLVQMDAPDHMKYRLLTQAWFAPKNLRIVEDRVKRLAREAVDHMLS  
FDGECDFARDVAAHYPLRVIMDILGVPPPEDEPRMLMLTQQLFGSTDPDLNRSREAITSAEQAIAMLHYVIADF  
ETYFRELTADRRAS PREDIATVIANATIDGGPIPDRELAGYYMIVATAGHDTTSASTAGAMMELAKNPALFER  
FRDAETEKAGLIEEAIRWSTPVQHFMRS AKADVEVGGQTI REGDWLMLNYSANRDEAVFDDPFTFD PDRRKN  
QQIAFGFGAHVCLGQYLARMEMRI LMEELL PRLKKIELAGEPARVESVFVGGLKRLPIRFEAA

>CYP108X3 (Sala\_2021) *Sphingopyxis alaskensis*

MTKPILPGEVAAAVVNPAAYGAWKPLHEQLAWARANMPLAVAENPNHDPFWLVTRHADVMAI SRDPQRFANGI  
RPTVLTDRAGEALARAATPGGDGHLVRSLSVQMDAPDHMKYRLLTQSWFMPRNLKTIEDRIRQIARDTVEHMLE  
AGGSCDFARDVAAHYPLRVIMDILGVPPPEDEPRMLMLTQQLFGSTDPPELNRSREAITSSSEQAIAMLHYVIADF  
EAYFGALTADRRANPREDIATVIANAMVDGEQIPDRELAGYYMI IATAGHDTTSASTAGAIMELARNPTLFQR  
FRDAESDKAGLIEEAIRWTTTPVQHFMRSARQDVEMGGQTI REGDWLMLNYSANRDEGVFVDFPMFDPDRKN  
PQIAFGFGAHVCLGQHLARLEMRI LMEELL PRLTSLELAGEPARVESVFVGGLKRLPIRFEAA

>CYP108X4 (LH19\_00225) *Sphingopyxis macrogoltabida* 203

MFTRSTNAPNRGSFGCMTKPILPGEVAAAVINPVAYGQWEPLHEQLAWARANAPLAVAENPNHDPFWLVTRHA  
DIMAI SRDPQRFANGIRPTVLTDRDGEALARAATPNNDGHLIRSLVQMDAPDHMKYRLLTQSWFMKPNLKIVE  
ERIREIARDTVDHMLEAGGECDFARDVAAHYPLRVIMDILGVPPPEDEPRMLMLTQQLFGSTDPPELNRSREAIT  
SAEQAIAMLNYSVIADFFENYFGALTADRRANPREDIATVIANAMVGGEQIPDRELAGYYMI IATAGHDTTSAST  
AGAMMELAKNPALFERFRSAESDKAGLIEEAIRWTTTPVQHFMRS AKEDVEIGGQTI HAGDWLMLNYSVSGNRDE  
EVFTDPPFAFDPDRVKNQQAIFGFGAHVCLGQHLARMEMRI LMEELL PRLKSLELAGEPARVESVFVGGLKRLP  
LHFRTH

>CYP108X5 (SKP52\_00530) *Sphingopyxis fribergensi*

MTKPILPGEVAAAVVDPVAYGNWDPLHEQLTWARANMPLGVAENHDHDPFWLVTRHADIMAI SRDPQRFANGI  
RPTVLTNRDGEALARAATPNNDGHLIRSLVQMDAPDHMKYRLLTQSWFMKPNLKIVEERIRQIARETVDHMLE  
QGGTCDFFARDVAAHYPLRVIMDILGVPPPEDEPRMLMLTQQLFGSTDPPELNRSREAITSAEQAIAMLDYVIADF  
TQYFGALTADRRANPREDIATVIANATINGEQIPDREMSGYYMIVATAGHDTTSASTAGAMMELAKNPALFER  
FRSADSDKAGLIEEAIRWTTTPVQHFMRS AKEDVEIGGQTI REGDWLMLNYSANRDEGVFGPEFAFNPDRKN  
QQIAFGFGAHVCLGQHLARMEMRI LMEELL PKLKSVELAGEPARVESVFVGGLKRLPVRFEAA

>CYP111A2 (Saro\_0759) *Novosphingobium aromaticivorans*

MLDLKNPDYQGGVPYAAALQDLRAEGPVHWNPESDGAGFWAVLGHDEIVAVSRQPDFSSAFENGGHRIFNEN  
QVGLTGAGESAIGIPFISRDPPSHTQYRKFMVPALSPARLQGI EERIAKRVERLFAQVPLGETVNILPLLTP  
LPLLTLAELLGVPADLWPD LHRWTD AFGVEDDPDFRQSPEAMQAVLAEFMGFATALFEDRRANPGPDIA SLLA  
NTEIRGEPAPLRDFIANLILALVGGNETTRNS INHTMIALAENPGQWDILRADPSLMTAAVKEMVRFASPV I H  
MRRTAMRDTQLGQQAICKGDKVVI FYPAGNRDPAVFENPDRFEITR PVRQHLAFGSGAHVCVGSRLAEMQLRL  
AFAEMARHVRAFEVVGEPSRVRSNFINGFKRLEVRLLV

>CYP111B1 (Plav\_0029) *Parvibaculum lavamentivorans*

MLRPQAKAIDLNGKPDLPDLYLHEQHHEAFRRLRAEEP VYWNPEADGPGFWAVTRYDDIEAVSKNP KLFSS  
AKHNGGHRIFNENEIGGNDTDASMI SMDPPAHAGYRRMVT PGFVPKRISNMEERIRARVTRLLDAMPKTGEAE

FISAVAAALPIEVLAEELFGVPESDGPGLFEWSNATVGEDDPELRSVDEYMQKCIMEMAGYAAGLWQQRLTPG  
DDLISMLAHSKIGGEAMNFTYIGTFILLVVAGNETTRNSISGGLLALSENPGERQKLLDDPSLIPSAVQEI  
RWVSPVLHMRRTATEDTELRGQKIRKGDVVMWYASGNRDEAQWADPYRFDVARYAAPGVPAQIGFGVQGHFC  
LGSRLAELQLTILFEELLRRFPDINVS GPIRRLRSNFIYGIKEMPVSYPTEG

>CYP112A2 (NGR\_a02700) *Sinorhizobium fredii* NGR234

MPEQPLPTLPMWRVDHIEPSPTMLALRANGPIHNVRFPFRGHEGWVVTGYDEAKAVLSDAAFRPAAGMPPAAFT  
DCVILGSPGWLVSHEGGEHARLRTIVAPAFSDRRVKLLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTQHESGPRASRLAWEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDRG  
EATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMLRHPQQRERLVGNPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPHFEDPEIFDIGRDAKPHLAFSYGPHYCIGMALARLELKVVFGS  
IFQRFPALRLAVALPEELKLRKEIITGGFEFPVLW

>CYP112A3v1 (mlr\_6364) *Mesorhizobium loti* MAFF 303099

MSEQPLPTLPMWRVDHIEPSPEMLALRANGPIHHVRFPSPGHEGWVVTGYDEAKAALSDAAFRPAAGMPPAAFT  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNNRVKLLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTQHESGPRASRLAWEELRAYIRGKMWDKRQDPGDNLLTDLLAAVEQG  
NATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPHFDDPEIFDIGRDENPHLTFSHGPHYCIGMALARLELKVVVGS  
IFQRFPALRLAVALPEELKLRKEIITGGFEFPVLW

>CYP112A4 (RHE\_PD00252) *Rhizobium etli* CFN 42

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFPLAGMPPADFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNSRVKLLTQQVEAIVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAGLSDEVMTQHESGPRASGLAWEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPCHFKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAIIFS  
IFQRFPALRLAVALPEELKLRKEIITGGFEEMPVLWCGRPPASQSSHLAAPGAHRSDQPLDR

>CYP112A4 (AMC79\_PC00281) *Rhizobium phaseoli*

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFPLAGMPPADFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNSRVKLLTQQVEAIVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAGLSDEVMTQHESGPRASGLAWEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPCHFKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAIIFS  
IFQRFPALRLAVALPEELKLRKEIITGGFEEMPVLWCGRPPASQSSHLAAPGAHRSDQPLDR

>CYP112A4 (AMK02\_PC00299) *Rhizobium* sp. N731

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFPLAGMPPADFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNSRVKLLTQQVEAIVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAGLSDEVMTQHESGPRASGLAWEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPCHFKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAIIFS  
IFQRFPALRLAVALPEELKLRKEIITGGFEEMPVLWCGRPPASQSSHLAAPGAHRSDQPLDR

>CYP112A1 (blr\_2144) *Bradyrhizobium diazoefficiens* USDA 110

MSEQQPLPTLPMWRVDHIEPSPEMLALRANGPIHRVRFPSPGHEGWVVTGYDEAKAVLSDAAFRPAAGMPPAAFT  
PDSVILGSPGWLVSHEGREHARLRAIVAPAFSDRRVKLLVQQVEAIAAHLFETLAAQPQPADLRRHLSFPLPA  
MVISALMGVLYEDHAFFAGLSDEVMTQHESGPRASRLAWEELRAYIRGKMRDKRQDPDDNLLTDLLAAVDQ  
GKASEEEAVGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMR  
YPRTDVTIAGEHIPAESKVLVGLPATSFDPHFDDPEIFDIERQEKPHLAFSYGPHACIGVALARLELKVVFG  
SIFQRLPALRLAVALPEELKLRKEIITGGFEFPVLW

>CYP112A1 (BJ6T\_77060) *Bradyrhizobium japonicum* USDA 6

MSEQQPLPTLPMWRVDHIEPSPEMLALRANGPIHRVRFPSGHEGWWVTGYDEAKAVLSDAAFRPA GMPPAAFT  
PDSVILGSPGWLVSHEGREHARLRAIVAPAFSDRRVKLLVQQVEAIAAHLFETLAAQPQPADLRRHLSFPLPA  
MVISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWEELRAYIRGKMRDKRQDPDDNLLTDLLAAVDQ  
GKASEEEAVGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMR  
YPRTDVTIAGEHIPAESKVLVGLPATSFDPHFDDPEIFDIERQEKPHLAFSYGPHACIGVALARLELKVVFG  
SIFQRLPALRLAVAPEQLKLRKEIITGGFEQFPVLW

>CYP112A1 (RN69\_37420) *Bradyrhizobium japonicum* E109

MSEQQPLPTLPMWRVDHIEPSPEMLALRANGPIHRVRFPSGHEGWWVTGYDEAKAVLSDAAFRPA GMPPAAFT  
PDSVILGSPGWLVSHEGREHARLRAIVAPAFSDRRVKLLVQQVEAIAAHLFETLAAQPQPADLRRHLSFPLPA  
MVISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWEELRAYIRGKMRDKRQDPDDNLLTDLLAAVDQ  
GKASEEEAVGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMR  
YPRTDVTIAGEHIPAESKVLVGLPATSFDPHFDDPEIFDIERQEKPHLAFSYGPHACIGVALARLELKVVFG  
SIFQRLPALRLAVAPEQLKLRKEIITGGFEQFPVLW

>CYP112A1 (RGR602\_PB00446) *Rhizobium gallicum*

MSEQPLPTLPMWRVDHIEPSPEMLALLANGPIHRVRFPSGHEGWWVTGYDEAKAVLSDAAFRPA GMPPAAFTP  
DSVILGSPGWLVSHEGEEHARLRTIVAPAFSNRRVELLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWEELRAYIRGKMRDKRQDPGANLLTDLLAAVDQG  
EATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPHFDDPEIFDIGRDKPHLAFSYGPHNCIGVALARLELKAVFGS  
IFQRFPGRLRLAVAPEELKLRKEIITGGFEEMPVLW

>CYP112A3 (LMTR13\_26575) *Bradyrhizobium icense*

MSEQSLPTLPMWRVDHIEPSPEMLALRANGPIHRVRFPSGHEGWWVTGYDEAKAALS DTAFRPA GMPPAAFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNRRVKLLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPHFDDPEIFDIGRQEKPHLAFSYGPHSCIGAALARLELKAVFGS  
IFQRFPALRLAVAPEELKLRKEIITGGFEEFPVLW

>CYP112A3 (SAMCFNEI73\_pB0340) *Sinorhizobium americanum*

MSEQPVPTLPMWRVDHIEPSPEMLALRANGPIHRVRFPSGHEGWWVTGYDEAKAALS DTAFRPA GMPPAAFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSDRRVKLLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWQELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRIDVTIAGVHIPAESKVLVGLPATSFDPHFHFAHPEIFDIGRDEQPHLAFSHGPHYCIGAALARLELKVVFGS  
IFQRFPALRLAVAPEELKLRKEIITGGFEEFPVLW

>CYP112A3 (A6B35\_33010) *Mesorhizobium amorphae*

MSEQPLPTLPMWRVDHIEPSPEMLALSANGPIHRVRFPSGHEGWWVTGYDEAKAVLSNAAFRPA GMPPAAFTP  
DSVILGSPGWLVSHEGGEHARLRTIVAPAFSNGRVKQLAQQVEAIAAQLFETLAAQPQPADLRCHLSFPLPAM  
VISALMGVLYEDHAFFAGLSDEVMTHQHESGPRSASRLAWEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDEG  
KATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLLDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPHFENPEIFDIGRDEKPHLAFSYGPHYCIGMALARLELKVVFGS  
IFQRFPELRLAVAPEELKLRKEIITGGFEEFPVLW

>CYP112A4 (RHECIAT\_PB0000291) *Rhizobium etli* CIAT 652

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFRPA GMPPADFTP  
DSVILGSPGWLVSHEGDEHARLRTIVAPAFSNSRVKLLTQQVEAITVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAGLSDEVMT HQHESGPRSASGLAWHEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYS PGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDP RHFKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAI FGS  
IFQRF PALRLAVAPEELKLRKEIITGGFEEMPVLWCGRPPASQSSHLAAPGAHRSDQPLDR

>CYP112A4 (IE4803\_PB00399) *Rhizobium etli* bv. Phaseoli IE4803

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFRPA GMPPADFTP  
DSVILGSPGWLVSHEGDEHARLRTIVAPAFSNSRVKLLTQQVEAITVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAELSDEVMT HQHESGPRSASGLAWHEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
EATEEEAVGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYS PGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDP RHLKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAVFGS  
IFQRF PALRLAVAPEELKLRKEIITGGFEEMPVLWCGRPPASQSSHLTAPGAGRS DQPPDR

>CYP112A4 (AMJ98\_PC00304) *Rhizobium* sp. N1341

MSEQSLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRLPSGHECWVVTGYDEAKAVLSDAAFRPA GMPPADFTP  
DSVILGSPGWLVSHEGDEHARLRTIVAPAFSNSRVKLLTQQVEAITVQLFDTLAVQPQPADLRRHLSFPLPAK  
VISALMGVPFEEHAFFAELSDEVMT HQHESGPRSASGLAWHEELRAYIHGKIRGKRQDPGDNLLTDLLAAVDQG  
EATEEEAVGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPSLVDKAVEEILRMYS PGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDP RHLKDPEVFDIGRDANPHLAFSYGQHNCIGAALARLELKAVFGS  
IFQRF PALRLAVAPEELKSRKEIITGGFEEMPVLWCGRPPASQSSHLTAPGAGRS DQPPDR

>CYP112A7 (RTCIAT899\_PB00455) *Rhizobium tropici*

MSEQPLPTLPMWRNLNHI EPSPEMLT L SANGPIHRVRFP SGHEGWVVTGYDEAKAVLSDTAFRPA GMPPAAFTP  
DSVILGSPGWLVSHEGDEHARLRTIVGRAFS DRNMELLAQKVEAIAAQLFETLAAQPQPADLRLHLSFPLPAI  
VISALMGVLYEDHAFFAGLSDEVMT HQHESGPRSASRLAWHEELRAYIRGKMRDKREDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHESTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKTVEEILRMYP PGAGWDGVMRY  
PRTDVTIAGVRIPAESKVLVGLPATAFDPRHFEDPEIFDIGREGKPHLAFSYGPHYCIGVALARLELKAVFGS  
IFQRF PALRLAVAPEELKLRKEIITGGFE EFPVFW

>CYP112A8 (IE4771\_PB00363) *Rhizobium etli* bv. Mimosa IE4771

MFEQPLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRFP SGHEGWVVTGYDEAQAVLSDAAFRPA GMPPETFTP  
DSVILGSPGWLVSHEGGKHAWLRMIVAPAFSNRRVKLLAQQVEAIAAQLFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHIF FAGLSDEVMT HQHESGPRSASRVAWHEELRTYICRKM RGKREEPGDNLLTDLLAAVDHG  
KATEEEAVGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRERLVRDPFLADKAVEEILRMYS PGAGWDGIMRY  
PRTDVTIAGMDIPAESKVLVGLPATSFDP RHFDPEVFDIGRDPNPHLAFSYGPHNCIGAALARLELKVVFGS  
IFQRF PALRLAVAPEELKLRKEIITGGFE EFPVLW

>CYP112A8 (REMIM1\_PE00083) *Rhizobium etli*

MFEQPLPTLPMWRVDHIEPSPEMLALRAKGPIHRVRFP SGHEGWVVTGYDEAQAVLSNAAFRPA GMPPETFTP  
DSVILGSPGWLVSHEGGKHAWLR TIVAPAFSNRRVKLLAQQVEMVAAQLFDTLAAQPQPADLRCHLSFPLPAM  
VISALMGVLYEDHTFFAGLSDEVMT HQHESGPRSASSVAWHEELRTYICRKM RGKREEPGD LLLTDLLAAVDRG  
KATEEEAVGLAAGVLVAGHESTVAQIEFGLLAMFRHPQQRKRLTRDPSLADRAVEEILRMYS PGAGWDGIMRY  
PRIDVTIAGVDIPAESKVLVGLPATSFDP RHFDPEVFDIGRDPNPHLAFSYGPHNCIGAALARLELKVVFGS  
IFQRF PALRLAVAPEELKLRKEIITGGFE EFPVLW

>CYP112A9 (Sinme\_5616) *Sinorhizobium meliloti* AK83

MSEQPLPMLPMWRVDHIEPSPEMLALRVKGPIHRVRFP SGDEGWVVTGYDEAKAVLSDAAFRPSGMPPAEFTP  
ATVILGSPGWLGSHEGSEHARLRTIVAPAFSSGRVKLLAQQVEAIAAELFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLS DKVMTHQHESGPRSAA RLAWHEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHETTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYP PGAGWDGIMRY

PRTDVTIAGVHIPAESKVLVGLPATSFDPRHFDDPEIFDVGREEKPHLAFSYGPHYCIGVELARLELRVVFGS  
IFQRFPALRLAVALPEELKLRKAIITGGFEAFPVLW

>CYP112A9(SM11\_pC0151) *Sinorhizobium meliloti* SM11

MSEQPLPMLPMWRVDHIEPSPEMLALRVKGPIHRVRFPSPGDEGWVVTGYDEAKAVLSDAAFRPSGMPPAAVTS  
ATVILGSPGWLGSHEGSEHARLRTIVAPAFSSGRVKLLAQQVEAIAAELFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSKVMTHQHESGPRSAARLAWHEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHETTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPRHFDDPEIFDVGREEKPHLAFSYGPHYCIGVELARLELRVVFGS  
IFQRFPALRLAVALPEELKLRKAIITGGFEAFPVLW

>CYP112A9(SinmeB\_5267) *Sinorhizobium meliloti* BL225C

MSEQPLPMLPMWRVDHIEPSPEMLALRAKGPIHRVRFPSPGDEGWVVTGYDEAKAVLSDAAFRPSGMPPAAVTS  
ATVILGSPGWLGSHEGSEHARLRTIVAPAFSSGRVKLLAQQVEAIAAELFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSKVMTHQYESGPRSAARLAWHEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHETTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PKTDVTIAGVHIPAESKVLVGLPATSFDPRHFDDPEIFDVGREEKPHLAFSYGPHYCIGVELARLELRVVFGS  
IFQRFPALRLAVALPEELKLRKAIITGGFEAFPVLW

>CYP112A9(C770\_GR4pB020) *Sinorhizobium meliloti* GR4

MSEQPLPMLPMWRVDHIEPSPEMLALRAKGPIHRVRFPSPGDEGWVVTGYDEAKAVLSDAAFRPSGMPPAAVTS  
ATVILGSPGWLGSHEGSEHARLRTIVAPAFSSGRVKLLAQQVEAIAAELFETLAAQPQPADLRRHLSFPLPAM  
VISALMGVLYEDHAFFAGLSKVMTHQYESGPRSVARLAWHEELRAYIRGKMRDKRQDPGDNLLTDLLAAVDQG  
KATEEEAIGLAAGMLVAGHETTVAQIEFGLLAMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
PRTDVTIAGVHIPAESKVLVGLPATSFDPRHFDDPEIFDVGREEKPHLAFSYGPHYCIGVELARLELRVVFGS  
IFQRFPALRLAVALPEELKLRKAIITGGFEAFPVLW

>CYP112A-fragment(C770\_GR4pB120) *Sinorhizobium meliloti* GR4

MTEEEAIGLAAGMLVAGHETTQIEFGLLSMFRHPQQRERLVGDPSLVDKAVEEILRMYPGAGWDGIMRY  
KTDVTIAGMHIPAESKVLVDCRRRRSIRAIISTTRKSSTSDARKSRTWRSPTARTIASAWSRPGWNSRWCSVRF  
SSAFPRCAWPWRQKCLLALDGLAKSNRLDAVVIARYIADLPTLEMRIDPLREKPIRQHRKICSSGGTPTAVA

>CYP114A2(NGR\_a02710) *Sinorhizobium fredii* NGR234

MDMQETTTACADAFELASPACIDDPYPFMRWLREHDPVHRAASGLFLLSRHADICWALKATGDAFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKEPPTHRLRLISRDFTMREIDNLRPSIARFVAARLDGMAPALERGEAV  
DLHRQFALALPMLVFAELFGMPQDDMFGLAAGIGAILEGLSPHASDPQLAAADAASARMKAYFGDLIQRKCID  
PRHDIVATLVGAHDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPDQRHWLQGDAGVEAFVE  
EVLRCDAFAMFSSIPIRIAQSDIELSGVVIKPNADVRLIAAGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFHGHGIFCLGAQLARVQLAESLPRIQARFPTLTVAEQPTREPSAFLRTFRALPVRHLHAQGDSPRLTSAFL  
NQQRGVEGGASFEHGDGERRSATDRRAQP

>CYP114A3v1(mlr\_6365) *Mesorhizobium loti* MAFF 303099

MDVQETTAACRDAFELASPACIQDPYTFMRWLREHDPVHRAASGLFLLSRHADIYWALKATGDVFRGPAPGE  
LARYFPRAETSLSLNLLASTLAMKEPPTHRLRLISRDFTIHQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHWEFALAVPILVFAELFGMPQDDMFGLAAGIGAILEGLSPHASDPQLAEADAASARVQAYFGDLIQRKRTD  
PRNDIVSMVVGADHDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEQRHWLQGDAGVVKAFVE  
EVLRCDAFAMFSSIPIRIAQRDIELGGVVIKPNADVRLIAAGNRDPDAFSDPDRFDPARFYGTTPGMSTDGKI  
MLSFHGHGIFCLGAQLARVQLAESLPRIEARFPTLALAEQPTREPSAFLRTFRALPVRHLHAQGG

>CYP114A3(A6B35\_33015) *Mesorhizobium amorphae*

MDVQEATAACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALKATGDAFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKEPPTHRLRRLISRDFTMQCIDNLRPSIALIVAARLDGIAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFGLAAGIGAILEGLSPHASDPQLAAADAASARVQAYFGDLIQRKRTD  
PRHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFATTAASIDHAVLAMLAYPEQRHWLQGDAVGVKAFVE  
EVLRCDAFAMFSSIPRIAQRDIELDGVVPIKADVRVLLAAGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPRIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQGG

>CYP114A4 (RHE\_PD00251) *Rhizobium etli* CFN 42

MDVQDTTAACHDAFAELASPACIQDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDVFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHTDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAGVEAFVE  
EVLRCFAPAMFSSIPRIAQRDIELHGVVPIKDADVRVLLAAGNRDPDAFADPDRFDPVRFYGTSPGMSSDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPQIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQAAAQEVVVVDQ  
DLCGTTGQCVLTLPGTFRQREPDGVAEVCMTVPQALHAAVRLAASQCPVAAIRVIESEAGDDHCTNPGPTPS  
PADAERHAAKDLRNPGEHDGTI

>CYP114A4 (AMK02\_PC00298) *Rhizobium* sp. N731

MDVQDTTAACHDAFAELASPACIQDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDVFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHTDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAGVEAFVE  
EVLRCFAPAMFSSIPRIAQRDIELHGVVPIKDADVRVLLAAGNRDPDAFADPDRFDPVRFYGTSPGMSSDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPQIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQAAAQEVVVVDQ  
DLCGTTGQCVLTLPGTFRQREPDGVAEVCMTVPQALHAAVRLAASQCPVAAIRVIESEAGDDHCTNPGPTPS  
PADAERHAAKDLRNPGEHDGTI

>CYP114A4 (AMC79\_PC00280) *Rhizobium phaseoli*

MDVQDTTAACHDAFAELASPACIQDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDVFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHTDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAGVEAFVE  
EVLRCFAPAMFSSIPRIAQRDIELHGVVPIKDADVRVLLAAGNRDPDAFADPDRFDPVRFYGTSPGMSSDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPQIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQAAAQEVRAVVDQ  
DLCGTTGQCVLTLPGTFRQREPDGVAEVCMTVPQALHAAVRLAASQCPVAAIRVIESEAGDDHCTNPGPTPS  
PADAERHAAKDLRNPGEHDGTI

>CYP114A4 (RHECIAT\_PB0000290) *Rhizobium etli* CIAT 652

MDVQDTTAACHDAFAELASPACIQDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDVFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHTDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAGVEAFVE  
EVLRCFAPAMFSSIPRIAQRDIELHGVVPIKDADVRVLLAAGNRDPNADFADPDRFDPVRFYGTSPGTSSDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPQIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQAAAQEVVVVDQ  
DLCGTTGQCVLTLPGTFRQREPDGVAEVCMTVPQALHAAVRLAASQCPVAAIRVIESEAGDDHCTNPGPTPS  
PADAERHAAKDLRNPGEHDGTI

>CYP114A4 (IE4803\_PB00398) *Rhizobium etli* bv. Phaseoli IE4803

MDVQETKAACHDAFAELASPACIQDPYPFMRWLQEHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHSDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAGVEAFVE  
EVLRCFAPAMFSSIPRIAQRDIELHGVVPIKDADVRVLLAAGNRDPDAFADPDRFDPVRFYGTSPGMSSDGKI

MLSFGHGIHFCLGAQLARVQLTESLPQIQARFPTLALAEQPTRERSAFLRTFRALPVRLRAQAAA EVRVVVDQ  
DLCGTTGQCVLTLQGAFRQREPDGVAEVC MATV P QALHAAVRLAASQCPVAAIG

>CYP114A4 (AMJ98\_PC00303) *Rhizobium* sp. N1341

MDVQETKAACHDAFAELASPACIQDPYPFMRWLQEHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPSE  
LARYFPRAASSLSLNLLASTLAMKEPPTHRLRRLISRDFTVGQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFELSAIVSAILEGLSPHASDPQLAAADVASARVKAYFGDLILRKRAD  
PRRDIVSTLVGAHSDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEERHWLQGDAAAGVEAFVE  
EVLRC EAPAMFSSI PRIAQRDIELHGVV I PKDADVRLIAAGNRDPDAFADPDRFDPVRFYGT R PGMSSDGKI  
MLSFGHGIHFCLGAQLARVQLTESLPQIQARFPTLALAEQPTRERSAFLRTFRALPVRLRAQAAA EVRVVVDQ  
DLCGTTGQCVLTLQGAFRQREPDGVAEVC MATV P QALHAAVRLAASQCPVAAIG

>CYP114A7 (SAMCFNEI73\_pB0339) *Sinorhizobium americanum*

MRWLREHDPVHRAASGLFLLSRHADIYWALKATGDALRG PAPGELARYFPRAATSLSLNLLASTLAMKDPPTH  
TRLRRLISRDFTMGQIDNLRPSIARNVAARLDGMAPALERGEAVDLHREFALALPMLVFAELFGMAQDDMFGL  
AAGIGAILEGLSPHASDPQLAAADAASARVQAYFGDLIQRKRTDPLHDIVSMLVGAHDDADTLSDAELISML  
WGMLLGGFATTAATIDHAVLALLAYPEQRHWLQGD AVGIEAFVEEVLRC DAPAMFSSI PRIAQRDIELNGVVI  
PKNADVRLIAAGNRDPDAFADPDRFDPARFYGTSPGMSTDGKIMLSFGHGIHFCLGAQLARVQLAESLPRIE  
ARFPTLVLAGKPTREPSAFLRTFRSLPVRLHAQAGG

>CYP114A8 (BJ6T\_77050) *Bradyrhizobium japonicum* USDA 6

MDVQETTAACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPGE  
LARYFSRAATSPSLNLLASTLAMKDPPTHTRLRRLISRDFTMGQIDNLRPSIARIVAARLDGITPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFELAAGIGTILEGLGPHASDPQLAAADAASARVQAYFGDLIQRKRTD  
PRRDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFVTTAASIDHAVLAMLAYPEQRHWLQADAARVRAFVE  
EVLRC DAPAMFSSI PRIAQRDIELGGVVI PKNADVRLIASGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFGHGIHFCLGAQLARVQLAESLPRIQARFPTLAFAGQPTREPSAFLRTFRTL PVRLHAQGS

>CYP114A8 (RN69\_37415) *Bradyrhizobium japonicum* E109

MDVQETTAACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWAFKATGDAFRGPAPGE  
LARYFSRAATSPSLNLLASTLAMKDPPTHTRLRRLISRDFTMGQIDNLRPSIARIVAARLDGITPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFELAAGIGTILEGLGPHASDPQLAAADAASARVQAYFGDLIQRKRTD  
PRRDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFVTTAASIDHAVLAMLAYPEQRHWLQADAARVRAFVE  
EVLRC DAPAMFSSI PRIAQRDIELGGVVI PKNADVRLIASGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFGHGIHFCLGAQLARVQLAESLPRIQARFPTLAFAGQPTREPSAFLRTFRTL PVRLHAQGS

>CYP114A8 (blr\_2145) *Bradyrhizobium diazoefficiens* USDA 110

MDVQETTAACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIWF AFKATGDAFRGPAPGE  
LARYFSRAATSPSLNLLASTLAMKDPPTHTRLRRLISRDFTMGQIDNLRPSIARIVAARLDGITPALERGEAV  
DLHREFALALPMLVFAELFGMPQDDMFELAAGIGTILEGLGPHASDPQLAAADAASARVQAYFGDLIQRKRTD  
PRRDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFVTTAASIDHAVLAMLAYPEQRHWLQADAARVRAFVE  
EVLRC DAPAMFSSI PRIAQRDIELGGVVI PKNADVRLIASGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFGHGIHFCLGAQLARVQLAESLPRIQARFPTLAFAGQPTREPSAFLRTFRTL PVRLHAQGS

>CYP114A9 (Mesau\_05697) *Mesorhizobium australicum*

MDVQETKTACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALTATGDAFRGPAPGE  
LARYFPRAATSLSLNLMAS TIAMKDPPTHTRLRRLISRDFTM RQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGLPQDDMFGLAAGIGAIVEGLSPHASDPQLAAADAGSARVQAYFGDLIQRKRTD  
PRHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFTTTAAAI DHAVLAMLAYPEQRHWLQGD AVEVKAFVE  
EVLRRDAPVLF SATPRIAQRDIELGGVVI PKNADVRLIAAGNRDPDGFADPDRFDPARFYGTNPGMSTDGKI  
MLSFGHGIHF CPGAQLARMQLAESLPRIQARFPTLALAEQPTREPSAFLRTFLALPVRLNAQAGG

>CYP114A9 (Mesop\_6228) *Mesorhizobium opportunistum*

MDVQETKTACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALTATGDAFRGPAPGE  
LARYFPRAATSLSLNLMASTIAMKDPPTHRLRRLISRDFTMQRIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGLPQDDMFGLAAGIGAIVEGLSPHASDPQLAAADAGSARVQAYFGDLIQRKRTD  
PRHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFTTTAAIDHAVLAMLAYPEQRHWLQGDAVEVKAFVE  
EVLRRDAPVLFSAIPRIAQRDIELGGVVI PKNADVRLIAAGNRDPDGFADPDRFDPARFYGTNPGMSTDGKI  
MLSFHGHGIFHFCPGAQLARMQLAESLPRIQARFPTLALAEQPTREPSAFLRTFLALPVRLNAQAGG

>CYP114A9 (Mesci\_5645) *Mesorhizobium cicero*

MDVQETKTACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALTATGDAFRGPAPGE  
LARYFPRAATSLSLNLMASTIAMKDPPTHRLRRLISRDFTMQRIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGLPQDDMFGLAAGIGAIVEGLSPHASDPQLAAADAGSARVQAYFGDLIQRKRTD  
PRHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFTTTAAIDHAVLAMLAYPEQRHWLQGDAVEVKAFVE  
EVLRRDAPVLFSAIPRIAQRDIELGGVVI PKNADVRLIAAGNRDPDGFADPDRFDPARFYGTNPGMSTDGKI  
MLSFHGHGIFHFCPGAQLARMQLAESLPRIQARFPTLALAEQPTREPSAFLRTFLALPVRLNAQAGG

>CYP114A9 (LMTR13\_26570) *Bradyrhizobium icense*

MDVQETTAACRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALKATGDAFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKDPPTHRLRRLISRDFTMQRIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALVLPMLVFAELFGMPQDDMFGLAAGIDAILEGLSPHASDPQLAAADAASARVQAYFGDLIQRKRTG  
PRHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEQRHWLQGDAGVVKAFVE  
EVLRCDA PAMFSSI PRIAQRDIELGGVVI PKNADVRLIAAGNRDPHAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFHGHGIFHCLGAQLARVQLAECLPRIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAQGAEMRVVVDQD  
LCGTTGQCVLTLPGTFRQREP DGVAEVC GATVPQALHAAVRLAASQCPVAAIRVIESDAGDDGRASADPAPSP  
AEAERHAAKDQRNPGGHDGTV

>CYP114A10 (RGR602\_PB00447) *Rhizobium gallicum*

MDVKETTAVCRDAFAELASPACIHDPYPFMRWLREHDPVHRATSGLFLLSRHADIYWAFTATGDAFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKEPPTHRLRRLISRDFTMREIDNLRPSIARIVAARLDGIAPALERGEAV  
DLHREFALALPMLVFAELFGMPQEDMFGLAAIIGAILEGLSPHASDSQLAAADAASAKVKAYFGDLIQRKRTD  
PRQDIVSMLVGAHGDDADMLSDAELISMLWGMLLGGFTTTAATIDHAVLAMLAYPEQRHWLQGDAMGIEAFVE  
EVLRCDA PAMFSSI PRIAQRDIELCGVVI PKDADVRLIAAGNRDPDAFADPDRFDPARFYGTSPGMSTDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPRIEARFPTLVLAKEPTREPSAFLRTFRALPVRLNALGEA

>CYP114A11 (RTCIAT899\_PB00450) *Rhizobium tropici*

MDVKETTAVCRDAFAELASPACIHDPYPFMRWLREHDPVHRAASGLFLLSRHADIYWALKATGDAFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKDPPTHRLRRLISRDFTMREIDNLRPSIVHIVAARLDGMAHALERGEAV  
DLHREFALALPMLVFAELFGIPQEDMFGLAANIGAILEGLSPHASDPQLAEADAASAKVKAYFGDLIQRRTD  
PRQDVVSMLVGAHGDDADMLSDVELISMLWGMLLGGFATTAATIDHAVLAMLAHPEQRHWLQGDAKGVEAFVE  
EVLRCNAPAMFSSI PRIAQRDIELGGVVI PKNADVRLIAAGNRDPDAFADPDRFDPVRFYGTSPGMSIDGKI  
MLSFHGHGIFHCLGAQLARVQLAESLPRIEARFPTLVLADQPTLEPSAFLRTFRALPVRLHAQAGR

>CYP114A12 (REMIM1\_PE00082) *Rhizobium etli*

MDVQETTAVCKDAFAELASPACIQNPYPFMRWLREHDPVHRSASGLFLLSRHADIYWALKATGDEFRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKEPPTHRLRRLISRDFTMQRIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQEDIFELSAVISTILEGLSPHASDLQLAAADAASARVQAYFGDLILRKRRTD  
PHQDIVSTLVSAHSDSDTLSDAELISMLWGMLLGGFATTAATVDHAVLAMLAYPEQRHWLQGDAAGVEAFVE  
EVLRC EAPAMFSSI PRIAQRDIELRGVVI PKGADVRLMAAGNRDPDAFADPDRFDPARFHGTRPGMSNDGQI  
MLSFHGHGIFHCLGAQLARVQLAESLPQIQARFPTLALAEQPTREPSAFLRTFRALPVRLHAHGAAEVHVVDQ  
DLCGTTGQCVLTLPGA FRQRES DGVAEVS VATVPQALHAAVRLAASQCPVAAIRVIESDAGNDHRTISDSAPS  
PEEAARHVAKDLRNPGGHDGTI



>CYP114A12 (IE4771\_PB00364) *Rhizobium etli* bv. mimosae IE4771

MDVQETTAVCKDAFAELASPACIQNPYPFMRWLREHDPVHRSASGLFLLSRHADIYWALKATGDEFGRGPAPGE  
LARYFPRAATSLSLNLLASTLAMKEPPTHRLRLISRDFTMRQIDNLRPSIARIVAARLDGMAPALERGEAV  
DLHREFALALPMLVFAELFGMPQEDIFELSAVISTILEGLGPHASDLQLAAADVASARVQAYFGDLILSKRTD  
PHQDIVSTLVGAHSDDSDTLSDAELISMLWGMLLGGFATTAATVDHAVLAMLAYPEQRHWLQGHAAAGVEAFVE  
EVLRCAPAMFSSIPRIAQRDIELRGVVI PKGADVRLMAAGNRDPDAFADPDRFDPARFHGTSPGMSSDGQI  
MLSFGHGIHFCLGAQLARVQLAESLPQIQARFPTLALAERPRTREPSAFLRTFRALPVRLLHSQGAAEVHVVDDE  
DLCGTTGQCVLTLPGAFRQRES DGVAEVS VATVPQALHAAVRLAANQCPVAAIRVIESNAGDDNRNNDPAPSP  
AEVERHAAKDLRNPGGHDGTI

>CYP114A13 (C770\_GR4pB021) *Sinorhizobium meliloti* GR4

MDVPETTAACRDAFAEMASPTCIHDPYPFMRWLREHDPVHRAESGLFLLSRHADIHWALKATGDAFRGPTPGE  
LARYFPRAATSLSLNLLASTLAMKDPPTHRLRLISRDFTRRQIDNLRPSIARIVAARLDGMASTLERGEVV  
DLHREFALALPMLVFAELFGLPQDDMFGLAAGIGAILEGLSPHASDPQLAAADAASARVQAYFGDLIQRKRTD  
PCHDIVSMLVGAHDDADTLSDAELISMLWGMLLGGFATTAATIDHAVLAMLAYPEQRRWLQGDVAVGASERAR  
NNSGQSYWLRGLHGPPFAVVRVYLYK

>CYP115A2v1 (m11\_6125) *Mesorhizobium loti* MAFF 303099

MPAAPTQLDRLSSAILRQGGMARVSLPGDVVTWAAARHQTLRQMLSDQRFNKDWRQWRALQDGEIPEDHPLIG  
ICKVDNMTTAHGADHRRRLRGLLSSSFAPSRIALLAPRVEQCVDRLLAEMAQRGGSADLMSEFAAPLPTNVIAE  
LFLGLPDEQREEIVALTYSLASTSATAEEVRQTRQRIPEFFRRLIALKRGQLGDDLASALIVARDKGELVSDTE  
LIDMLFMVLSAGFVTTAGVINGV LALLTHPQQLHLVRSQVWPWSQAIEEILRWGTSANLPFRYATQDVEID  
GCLVRRGDAVLMAFHAANRDEKAFGPGANRFDVTRRHNP HLSFGEGPHSCLGAALARLELRCAFPPFLFRLED  
LALTIAAEDVVYMPYSYVIRCPQRLPVSFRPSVA

>CYP116B183 (IMCC20628\_00551) *Hoeflea* sp. IMCC20628 *Hoeflea* sp. IMCC20628

MTDDKAAVCPAHGRADGCPVSPQAAAFDPFAPAYLANPAEALRWSREQEPVFYSPQLGYWVVSRYDDVKAVFR  
DNDTFSPSIALERVVPPSQEAVETLKRYNYAMNRTL VNEDEPAHMERRLLMDHFLPANLAEHEAMIRRLTRE  
KVDAFVEKGRVDLVEAMLWEIPLTVLHFLGVPKEDMDSLKEFVSVAHTVNTWGKPTPEQQVAVADTVGRFWQF  
AGKVLDKMRKEPDGTGWMHDAIRKNADYPDIVTDSYLHSMMAIIVAGHETTSLASTNALKLLLSNRLVWERI  
CKDPALIPNAVEECLRLLEGSVVAWRRKATRETEISGV TIPKDAKLLIVSGSANHRRHFENGDFLDIYRDSAV  
EHLTFGYGSHQCMGKNFARLEMRI FIEELTRRLPHMQLVADQQFTYLP SLSFRGPDRLLEWDPANNPEHADP  
SLAASSISFPVGAPSAKEIARSVRVAETKLI AEGVKLVRLLED PDGLPLPPWTPGAHIDVVFDEF SRKYS LCGD  
PSDPLYSIAVLRENEGRGGS RFVHDQLVPGMTLHMRGPKNYFRLEEDADRHIL IAGGIGITPIVAMADRLKAS  
GCDYEVHYAGRSRDRMAFLDRMVADHGANVVLHVS GEGTRAQMNSIVDGWSVGTRI HACGPRGLLGELESLCT  
HLPEGAFKCEAFSTDAGSGAHADDTAFVVELKDSDLTLTVPTGSTLLETVRAAGIDVPSDCEEGLCGSCEVRV  
LEGAIDHRDKVLSSAERAVSDRMMACCSRAAGGKLKLAL

>CYP117A2 (NGR\_a02740) *Sinorhizobium fredii* NGR234

MNVLLNPLNRRHRLRYDIPVMPGAFPLVGHLPAIVCDLPRLRRRAERTLGSHFWLDFGPAGHLMTCVDPHAF  
LLRHKDVSSALIEEIAPELLGGTLVAQDGG AHRQARDAIKAAFLPEGLTQAGIGDLFAPVIRARVQAWDRGD  
VTILPETGDLMLKLIFTLMGVPAQDLP GWHRKYRQLLQLIVAPSVDL PGLPLRRGRAARDWIDAQLRQFVRDA  
RAHAARTGLINDMVSAFDRSDDALSDDL LVANIRLLLLAGHDTTASTMAWMVIELARQPMLWDALVEEAQRVG  
AVPTRHADLEQCPVAEALFRET LRVHPATTLPRRALQELQLGQRRIPAGTHLCIPLLFST SALLHEAPDQF  
RLARWLQRTEPIRPVMDMLQFGTGPHVCIGYHLVWLELVQFSIALALTMHKAGVRPLLLSGVEKGRRYYPTAHP  
SMTIRIGFS

>CYP117A2 (A6B35\_33030) *Mesorhizobium amorphae*

MDMLLNPLNRRHRLRYDIPVVP GAFPLVGHLPAIVGDLPRLLRRRAERTLGSHFWLDFGPAGQLMTCVDPAAFA  
LLRHKDVSSALIEEIAPELLGGTLVAQDGG AHRQARDAIKAAFLPKGLTQAGIGDLFAPVIRARVQAWDRGD  
VTILRETGDLMLKLIFSLMGI PAQDLP GWHRKYRQLLQLIVAPPIDLPGLPLRRGRAARDWIDAQLRQFVRDA  
RAHAARTGLINDMVSAFDRSDDALSDDVL VANIRLLLLGGHETTASTMAWMVIELARQPVLWDALVEEAQRVG

AVPTRHADLAQCPVAEALFRETTLRLHPAVTLLPRRALQELQLGQRRIPAGTHLCIPLLFSTSAALLHEAPDQF  
RLARWLQRTEPIRPVDMLQFGTGPHVCIGYHLVWLELVQFCIALALTMHKAGVRPRLLSGVEKGRRYYPTAQF  
SMTIRIGFS

>CYP117A3(mlr\_6367)*Mesorhizobium loti* MAFF 303099

MDMLLNPLDRRHRLRDDIPVMPGAFPLVGHLPAIVCDLPRLLRRAERTLGSHFWLDFGPAGHLMTCDPDAFA  
LLRHKDVSSALIEEIAPELLGGTLVAQDGGGAHRQARDAIKAAFLPKGLTQAGIGNLFAPVIQARVQAWRDRGD  
VTILRETGDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDAQLRQFVRDA  
RAHAARTGLINDMVSSFDRGDDALSDDVLVANIRLLLLLAGHDTTASTMAWMVIELARQPGLWDALVEEAQRVG  
AVPTRHADLAQCPVAEALFRETTLRVHPATTLLPRRALQELQLGQRRIPAGTPLCIPLLFSTSAALLHEAPDQF  
RLARWLQRTEPIRPVDMLQFGTGPHVCIGYHLVWLEMVQFCIALALTMHKAGVRPRLLSAVEKGRRYFPTAHP  
SMKIRIGFS

>CYP117A3(A9174\_30935)*Mesorhizobium loti* NZP2037

MDMLLNPLDRRHRLRDDIPVMPGAFPLVGHLPAIVCDLPRLLRRAEWTLGSHFWLDFGPAGHLMTCDPDAFA  
LLRHKDVSSALIEEIAPELLGGTLVAQDGGGAHRQARDAIKAAFLPKGLTQAGIGNLFAPVIQARVQAWRDRGD  
VTILRETGDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDAQLRQFVRDA  
RAHAARTGLINDMVSAFDRGDDALSDDVLVANIRLLLLLAGHDTTASTMAWMVIELARQPGLWDALVEEAQRVG  
AVPTRHDPDLAQCPVAEALFRETTLRVHPATTLLPRRALQELQLGQRRIPAGTPLCIPLHLSTSAALLHEAPDQF  
RLARWLQRTEPIRPVDMLQFGTGPHVCIGYHLVWLEMVQFCIALALTMHKAGVRPRLLSAAEKGRYFPTAHP  
SMKIRIGFS

>CYP117A3(LMTR13\_26560)*Bradyrhizobium icense*

MDMLLNPLDRRHRLRHDIPVMPGAFPLVGHLPAIVCDLPRLLRRAERTLGSHFWLDFGPAGHLMTCLDPDAFA  
LLRHKDVSSALIEEIVPELFGGTLVAQDGGGAHRQARDAIQAAFLPKGLTQAGIGDLFAPVIRARVQAWRDRGD  
VTILRETDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDAQLRQFVRDA  
REHAARTGLINDMVSAFDRSDDALSDDVLVANIRLLLLGGHDTTASTMAWMVIELARQPGLWDALVEEAQRVG  
AVPTRHADLAQCPVAEALFRETTLRVHPATTLLPRRALQELQLGQRRIPAGTHLCIPLLFSTSAALLHEAPDQF  
RLARWLQRTEPIRPVDMLQFGTGPHVCIGYHLVWLELVQFCIALALTMHKAGVRPRLASGVEKGRRYYPTAHP  
SMTIRIGFS

>CYP117A4(RHE\_PD00249)*Rhizobium etli* CFN 42

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLLRRAERTLGSHFWLDFGPAGHLMTCLDPDALA  
LLRHKEVSSALIEEMAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLTEAGIGELFEPPIIRAQVKAWRDRGE  
VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVAPPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RARAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTIAWMVIELAQHPPELWDALVEEAQRVG  
AVPTGHEDLAQCPVAEALFRETTLRMHPASSLVPRRAMQELQLGQRRIPSGTHLCIPLLFSTSPLLHEAPDQF  
RLGRWLQRTEPIRPVDMLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGVRPRLMSGVEKGRRYYPTAHP  
SMTVRIGFS

>CYP117A4(AMK02\_PC00296)*Rhizobium* sp. N731

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLLRRAERTLGSHFWLDFGPAGHLMTCLDPDALA  
LLRHKEVSSALIEEMAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLTEAGIGELFEPPIIRAQVKAWRDRGE  
VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVAPPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RARAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTIAWMVIELAQHPPELWDALVEEAQRVG  
AVPTGHEDLAQCPVAEALFRETTLRMHPASSLVPRRAMQELQLGQRRIPSGTHLCIPLLFSTSPLLHEAPDQF  
RLGRWLQRTEPIRPVDMLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGVRPRLMSGVEKGRRYYPTAHP  
SMTVRIGFS

>CYP117A4(AMC79\_PC00278)*Rhizobium phaseoli*

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLLRRAERTLGSHFWLDFGPAGHLMTCLDPDALA  
LLRHKEVSSALIEEIAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLTEAGIGELFEPPIIRAQVKAWRDRGE

VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVAPPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RARAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTIAWMVIELAQHPPELWDALVEEAQVRG  
AVPTGHEDLAQCPVAEALFRETLMHPASSLVPRRAMQELQLGQRRIPSGTHLCIPLLHFSTSPLLHEAPDQF  
RLGRWLQRTEPIRPVDMQLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGVRPRMLMSGVEKGRRYYPTAHP  
SMTVRIGFS

>CYP117A4 (IE4803\_PB00396) *Rhizobium etli* bv. Phaseoli IE4803

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLRRRAERTLGSHFWLDFGPAGHLITCLDPDALA  
LLRHKEVSSALIEEMAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLSEAGIGELFEPIIRAQVKAWDRDGE  
VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVATPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RAPAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTMAWMVIELAQHPPELWDALVEEAQVRG  
AVPTGHEDLAQCPVAEALFRETLMHPASSLVPRRAMQELQLGPRRIIPAGTHLCIPLLHFSTSPLLHEAPDPF  
RLGRWLQRTEPIRPVDMQLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGVRPRMLMSGVEKGRRYYPTASV  
HDNPHRILMSWDPLPRVKRQRRRR

>CYP117A4 (AMJ98\_PC00301) *Rhizobium* sp. N1341

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLRRRAERTLGSHFWLDFGPAGHLITCLDPDALA  
LLRHKEVSSALIEEMAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLSEAGIGELFEPIIRAQVKAWDRDGE  
VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVATPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RAPAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTMAWMVIELAQHPPELWDALVEEAQVRG  
AVPTGHEDLAQCPVAEALFRETLMHPASSLVPRRAMQELQLGPRRIIPAGTHLCIPLLHFSTSPLLHEAPDPF  
RLGRWLQRTEPIRPVDMQLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGVRPRMLMSGVEKGRRYYPTASV  
HDNPHRILMSWDPLPRVKRQRRRR

>CYP117A4 (RHECIAT\_PB0000288) *Rhizobium etli* CIAT 652

MDMLLNPLNRWRRLRDDIPVMPGAFPLVGHLPAIVCDLPRLRRRAERTLGSHFWLDFGPAGHMTCLDPDALA  
LLRHKEVSSALIEEMAPDILGGTLVTLDGSAHRQARDGIKAAFLPRGLTEAGIGELFEPIIRAQVKAWDRDGE  
VAILPDTRNLMLKLTFSLMGIPAQDLSEWHRKYRQLLQLMVAPPIDLPGMPLRRGRAARDWIDAQSRQFIRDA  
RARAARTGLINDMVSAFDCSDGALSDDVLVANIRLLLLLAGHETSASTIAWMVIELAQHPPELWDALVEEAQVRG  
AVPTGHEDLAQCPVAEALFRETLMHPASSLVPRRAMQELQLGQRRIPSGTHLCIPLLHFSTSPLLHEAPDQF  
RLGRWLQRTEPIRPVDMQLQFGAGPHVCMGYHLVWLELVQFSIALALTMQEAGGAAAIIDERRKRPAALLPDRS  
VHDSPHRILMSWDPLPRVKRQRRRRWAALLHSARARGATPAAPRRLAARRGILCQVEGDEQHAEGFHAKRRPN  
WRFVVRIGRAGVRRIAGARVHRHWRAMRRRGGRALLCTAHWIAIAPVSALYCRWSRMTRQRMTRRWASPRQ  
ACGGEESNRRADHEAACSAFVSAGPMARGRGSHELLAAPACGAVGAGRAAGQKGICSSSTRRAHWRRSARRRRRT  
AAIGRRHR

>CYP117A7 (Mesci\_5648) *Mesorhizobium cicero*

MLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAIICDLPRLLRRRAERTLGSYFWLDFGPAGHMTCMDPDAFALL  
RHKDVSSALIEGIAPELLGGTMVAQDGGAHQRARDAIKPAFLPKGLTQAGIGDLFEFVIRARVQAWDRDGDVA  
ILRETGDLMLKLIFSLMGIPAQDLAGWHRKYRQLVQLIVAPPIDLPGLPLRRGRAARDWIDAQLHQFVRDARA  
HAARTGLIKDMVSAFDRSDDALSDDVLVANIRLLLLGGHETTASTMAWMVIELARQPVWDLTLVEEAQVRGAV  
PTRHADLAQCPVAEALFRETLLRLHPAVTLLPRQALQELQLGQWRIPAGTHLCIPLLHFSTSPALLHEAPDQFRL  
ARWLQRTEPIRPVDMQLQFGTGPHVCIGYHVWLELVQFCIALALTMHKAGVRPRLLSDVEKGRRYYPTANPSM  
KIRIGFS

>CYP117A7 (Mesop\_6231) *Mesorhizobium opportunistum*

MLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAIICDLPRLLRRRAERTLGSYFWLDFGPAGHMTCMDPDAFALL  
RHKDVSSALIEGIAPELLGGTMVAQDGGAHQRARDAIKPAFLPKGLTQAGIGDLFEFVIRARVQAWDRDGDVA  
ILRETGDLMLKLIFSLMGIPAQDLAGWHRKYRQLVQLIVAPPIDLPGLPLRRGRAARDWIDAQLHQFVRDARA  
HAARTGLIKDMVSAFDRSDDALSDDVLVANIRLLLLGGHETTASTMAWMVIELARQPVWDLTLVEEAQVRGAV  
PTRHADLAQCPVAEALFRETLLRLHPAVTLLPRQALQELQLGQWRIPAGTHLCIPLLHFSTSPALLHEAPDQFRL  
ARWLQRTEPIRPVDMQLQFGTGPHVCIGYHVWLELVQFCIALALTMHKAGVRPRLLSDVEKGRRYYPTANPSM  
KIRIGFS

>CYP117A7 (Mesau\_05700) *Mesorhizobium australicum*

MLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAIICDLPRLLRRAERTLGSYFWLDFGPAGHLMTCDPDAFALL  
RHKDVSSALIEGIAPELLGGTMVAQDGGAHQRQARDAIKPAFLPKGLTQAGIGDLFEPVIRARVQAWRDRGDVA  
ILRETGDLMLKLIFSLMGIPAQDLAGWHRKYRQLVQLIVAPPIDLPGLPLRRGRAARDWIDAQLHQFVRDARA  
HAARTGLIKDMVSAFDRSDDALSDDVLVANIRLLLLGGHETTASTMAWMVIELARQPVLDLTLVEEAQVRGAV  
PTRHADLAQCPVAEALFRETLLRLHPAVTLLPRQALQELQLGQWRIPAGTHLCIPLLHFSTSALLHEAPDQFRL  
ARWLQRTEPIRPVMDLQFGTGPHVCIGYHVWLELVQFCIALALTMHKAGVRPRLLSDVEKGRRYYPTANPSM  
KIRIGFS

>CYP117A8 (blr\_2147) *Bradyrhizobium diazoefficiens* USDA 110

MDMLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAVVCDDLPRLLRRAERTLGSHFWLDFGPAGHLMTSLDPDALA  
LLRHKDVSSGLIEDIAPELFGGTLVAQDGLAHQRQARDAIQAALLPKGLTLAGIGELFAPVIRARVQWRERGD  
VTILRETGDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDARLREFVRAA  
REHASRTGLINDMVSAFDRSDDALSDDVLVANIRLLLLGGHDTTASTMAWMVIELARQPGLWDALVEEAQVRG  
AVPTRHADLAQCPVAEALFRETLLRVHPATPLLVRALREL RIGQQRIPTGTDLCIPLLHFSTSALLHEAPDQF  
RLARWLQRTEPIRPVMDLQFGTGPHFCMGYHLVWLELVQFCIALALTMHEAGVRPRLLSGVEKGRRYYPTAHP  
SMTIRIGFS

>CYP117A8 (BJ6T\_77020) *Bradyrhizobium japonicum* USDA 6

MDMLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAVVCDDLPRLLRRAERTLGSHFWLDFGPAGHLMTSLDPDALA  
LLRHKDVSSGLIEDIAPELFGGTLVAQDGLAHQRQARDAIQAALLPKGLTLAGIGELFAPVIRARVQWRERGD  
VTILRETGDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDARLREFVRAA  
REHASRTGLINDMVSAFDRSDDALSDDVLVANIRLLLLGGHDTTASTMAWMVIELARQPGLWDALVEEAQVRG  
AVPTRHADLAQCPVAEALFRETLLRVHPATPLLVRALREL RIGQQRIPTGTDLCIPLLHFSTSALLHEAPDQF  
RLARWLQRTEPIRPVMDLQFGTGPHFCMGYHLVWLELVQFCIALALTMHEAGVRPRLLSGVEKGRRYYPTAHP  
SMTIRIGFS

>CYP117A8 (RN69\_37400) *Bradyrhizobium japonicum* E109

MDMLLNPLNRRHRLRHDI PVVPGAFPLVGHLPAVVCDDLPRLLRRAERTLGSHFWLDFGPAGHLMTSLDPDALA  
LLRHKDVSSGLIEDIAPELFGGTMVAQDGLAHQRQARDAIQAALLPKGLTLAGIGELFAPVIRARVQWRERGD  
VTILRETGDLMLKLIFSLMGIPAQDLPGWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDARLREFVRAA  
REHASRTGLINDMVSAFDRSDDALSDDVLVANIRLLLLGGHDTTASTMAWMVIELARQPGLWDALVEEAQVRG  
AVPTRHADLAQCPVAEALFRETLLRVHPATPLLVRALREL RIGQQRIPTGTDLCIPLLHFSTSALLHEAPDQF  
RLARWLQRTEPIRPVMDLQFGTGPHFCMGYHLVWLELVQFCIALALTMHEAGVRPRLLSGVEKGRRYYPTAHP  
SMTIRIGFS

>CYP117A9 (SAMCFNEI73\_pB0337) *Sinorhizobium americanum*

MLLNPLNRRHRLRYDIPVMPGAFPMVGHLPAIICDLPRLLRRAERTLGSHFWLDFGPAGHLMTCLDPDALALL  
RHKDVSSALIEEIAPEILGRTLVTLNLSAHRQARDGIIKAAFLPRGLTEAGIGELFEPAIWARVQAWRDRGEVT  
ILRETADLMLKLTFSLMGIPAQDLPEWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDAQSREFIRDARA  
HAVRTGLINDMVSAFDRSEDALSDDVLVANIRLLLLAGHETTASTMAWMVIELARRPELWDALVEEAQVRGAV  
PTRHADLAQCPVAEALFRETLLRMHPASSLLPRRATQELQLGERRIPAGTSLCIPLLHFSTSALLHEAPDEFRL  
ARWLQRTGPIGPVMDLQFGSGPHVCIGYHLVWLELVQFSIALALTMHKAGVRPRLLSDAEKGRRYYPTAQPSM  
KIRIEFS

>CYP117A9 (RGR602\_PB00450) *Rhizobium gallicum*

MDMLLNPLNRRHRLRHDI PVMPGAFPMVGHLPAIVTDMPRLLRRAERTLGSHFWLDFGPAGQMTCLDPDALA  
LLRHKDVSSSTLIAEIAPEILGRTLVTLNLSAHRQARDGIIKAAFLPRGLTEAGIGELFAPVIRARVQAWRDRGE  
ITILRETGDLMLKLTFYLMGIPAQDLPEWHRKYRQLLQLIVAPPVDLPGLPLRRGRAARDWIDAQSRQFIRDA  
RAHSARTGLINDMVSAFDRSEDALSDDVLVANVRLLLLLAGHETTASTMAWIVIELARQPELWDALVEEAQVRG  
AVPTRHADLAQCPVAEALFRETLLRMHPASSLVPRRATQELQLGQRRIPAGTSLGIPLLHFSTSALLHEAPDQF

RLARWLQRTGPIGPVDMLQFGSGPHVCIGYHLVWLELVQFSIALALTMHKAGVRPRLLSDAEKGRRYYPTAQPSMKVRIGFS

>CYP117A9 (RTCIAT899\_PB00435) *Rhizobium tropici*

MLLNPLNRRHRLRDDIPVMPGAFLVGHLPALVCDLPRLLRRAERTLGSHFWLDFGPAGQLMTCLDPDAFALL  
RHKDVSSALIEEIAPEILGGTLVTLNGSAHRQARDGIKSAFLPRGLTEAGIGELFEPVIRARVQAWRERGEVT  
ILPETGDLMLKLTFFYLMGIPAQDLPEWHRKYRQLLQMLAPPIDLPGTFFRRGRAARDWIDAQSRQFIRGARA  
HAARTGLINDMVSAFDRSEGALSDDVLVANVRLLLLAGHETTASTMAWMVIELARQPELWDSLVEEAQRVGAV  
PTRHADLSQCPVAEALFRETLMHPASSLLPRRATQELQLGQRRIPAGTSLGIPLLFSTSPLLHEAPDQFRL  
ARWLQRTGPIRPVDMLQFGSGPHVCIGYHLVWLELVQFGIALALTMHKAGVRPRLLSDAEKGRRYYPTAQPSM  
KIRIGFS

>CYP117A10 (IE4771\_PB00366) *Rhizobium etli* bv. mimosae IE4771

MDMLLNPLNRWHRLRDDIPVMGAYPLVGHLPALVCDLPRLLQRAERTLGSHFWLDFGPAGHMTCLDPDAFA  
LLRYKEVSSALIEEMAPDILGGTLVTLNGSAHRQARDGIKAAFLPRGLTEAGIGELFEPVIRARVQAWRDRGE  
VTILPETGDLMLKLTFFSLMGIPARDLPQWHRKYRQLLQMLVAPPIDLPGMPLRRGRAARDWIDVQSRQFIRDA  
RACAARTGLINDMVSAFDRSEDALSDDVLVANIRLLLLLAGHETTASTMAWMVIELARQPELWDALVEEAQCVG  
AVPTRHADLAQCPVAEALFRETLMHPASSLVPRRATQELQLGQRRIPAGTRLGIPLLFSTSPALLHEAPDQF  
RLTRWLERTGPIRPLDMLQFGSGPHVCIGYHLVWLELVQFSTALALTMHKAGVRPRLLSDAAKGRRYFPTAQPS  
MKIRIGFS

>CYP117A10 (REMIM1\_PE00080) *Rhizobium etli*

MDVLLNPLNRWHRLRDDIPVMGAYPLVGHLPALVCDLPRLLRRAERTLGSHFWLDFGPAGHMTCLDPDAFA  
LLWHKEVSSALIEEMAPDILGGTLVTLNGSAHRQARDGIKAAFLPRGLTEAGIGELFEPVIRARVQAWRDRGE  
VTILPETGDLMLKLTFFSLMGIPARDLPQWHRKYRQLLQMLVAPPIDLPGMPLRRGRAARDWIDVQSRQFIRDA  
RACAARTGLIDDMVSAFDRSEDALSDDVLVANIRLLLLLAGHETTASTMAWMVIELARQPELWDALVEEAQCVG  
AVPTRHADLAQCPVAEALFRETLMHPASSLVPRRATQELQLGQRRIPAGTRLGIPLLFSTSPALLHEAPDQF  
RLTRWLERTGPIRPLDMLQFGSGPHVCIGYHLVWLELVQFSTALALTMHKAGLRPRLLSDAEKGRRYFPTAQPS  
MKIRIGFS

>CYP125P1 (PHZ\_c0594) *Phenyllobacterium zucineum*

MEIDLLSPASFAGGQPHAQFAWLREHAPVFRHAEPDGPGEFVAVTRHADVRAVDRDFQTFSSSEPTVMI PDPAAE  
AAAAFGPYKMMLMDPPEHTAFRKLIRSEFTEPQARLRAERIRALARQIVDAVVHKGECDFVAEVAGEMPFSV  
IAELMGLPLDDGRELYKLTETIHTAPEALPPGAGAAVMKMFYGAQVMAQKRARPGGDLASRL LACEVDGRR  
LEDMEFLLFFLLIDAGGDTTRNLLSGGLLALMEHPEQLAWLTADL PARLPAAREELLRYVSPVIYMRRTARR  
DVELGGRRIAAGDKVVMYFGAANRDPAAIERPDALDLSREETAHLAFGNGPHVCLGQH IARVEIDAMLEEVLS  
RMTDFAPAGEVEWLASNFISGPKVMPLRFRAAA

>CYP127A1 (NGR\_a01170) *Sinorhizobium fredii* NGR234

MSDLRRKRKVTNPIDPHVPPALVRHFSLFTSPGMAPTPNGDPHAAVACVHDDGPPIFYSPSNTRDGRGTWVIT  
RARDQRRVLEDTEFSSHSRIFASALGEHWPVIPLELDPPAHGVFRALLNPLFSSRRVLAEPTIHARAGALI  
DCIAKEKTS CDVMKDFALPFTFSVFLSFLGLSQRSEVLVGWVSDLLHGNAEKRRAAARSVVAFIDEMAAMRR  
KSPAVDFMTFVVQAKIEGRSLTEEEVRGIGVFLVAGLDTVAAAIGFDMAYLARNPKHQELLRNEPARLGLAA  
EELLRAYSTVQIIRVATKDIEFEGVPIREGDYVSCPAMIANRDPSEFKCPNTIDLARQDNQHTAFGYGPHLCH  
GAHLARREIVIGLREWLARIPAFRIKEGTAPITHGGHVFGISNIILTWA

>CYP127A3v1 (mlr\_5876) *Mesorhizobium loti* MAFF 303099

MAINPVDPDHVPPEMVRDFSLFTSPGMPPTPNGDPHAAVACAHGDPPIFYSPYNTQDGRGTWVITRAADQRKVL  
QDTETFSHSRIFSSILGETWPTIPLELDPPAHGAFRSLLSPLLSPKRVTALEPAVRERAIALIDRITASATS  
CDVMKDFAFPFTVSIFLRFGLPDQGLDTFVGWAKDLLHGDDVERPVAARKIVAFIDELATNRRKDPVDDLMT  
FIVQAQIEGRRLTDGEIRGIGVLVFGVAGLDTVAAAIGFDELAYLARNLKDQELLRSEPARILLATEELLRAYPP

IQLIRVATKDIDFEGAPIRKGDYVSCATMIANRDPPEEFESPNTVDLARDHNRHAAFGYGPHRCLGSHLARREI  
VIGLEEWLARIPTFRIKEGTAPITCGGHVFGIENLILDWS

>CYP127A4 (RHE\_PD00215) *Rhizobium etli* CFN 42

MHLCSERIYRKRGTRENPMSTGRAGEASKKFRLRPTKQRGFRAARRSDRCIACHWRLALLRLEIWRSTILLAP  
SPRRIRSRRRGFDDRRKAVATIRVPEHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHNGPRIIFYSPCNTR  
DGRGTWVIVRAQDQRKLLQDTGTFSSHRSLSFASALGENWPLIPLLELDPPAHSVFRSLNPLLSPRRIMELEPA  
VRDRAIALISKISASSTSCDILTDFAFPFAVSIFLRLGLSLDERLNTFVGWGKDLLHGDGIRRTAAARTILAF  
IDELAAMRRKEPADDFMTFVVQAKVDGRLLRDQEIHGIGVLLFVAGLDTVATAIGFDLAYLARNPTEQELLRS  
KPDRIVLAAEELLRAYSTVQMIRVATKDINFEGAPIRKGDYISCATMIANRDPVEFENPNTIDLAREDNRHTA  
FAYGPHRCLGSHLARREIIIGLEEWLSRIPDFRIKDGTAPITYGGHVFGMENLILDWS

>CYP127A4 (AMJ98\_PC00266) *Rhizobium* sp. N1341

MATIRVPEHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHNGPRIIFYSPCNTRDGRGTWVIVRAQDQRKLL  
QDTGTFSSHRSLSFASALGENWPLIPLLELDPPAHSVFRSLNPLLSPRRIMELEPAVRDRAIALISKISASSTS  
CDILTDFAFPFAVSIFLRLGLSLDERLNTFVGWGKDLLHGDGIRRTAAARTILAFIDELAAMRRKEPADDFMT  
FVVQAKVDGRLLRDQEIHGIGVLLFVAGLDTVATAIGFDLAYLARNPTEQELLRSKPDRIVLAAEELLRAYST  
VQMIRVATKDINFEGAPIRKGDYISCATMIANRDPVEFENPNTIDLAREDNRHTAFAYGPHRCLGSHLARREI  
VIGLEEWLSRIPDFRIKDGTAPITYGGHVFGMENLILDWS

>CYP127A4 (AMC79\_PC00243) *Rhizobium phaseoli*

MATIRVPEHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHNGPRIIFYSPCNTRDGRGTWVIVRAQDQRKLL  
QDTGTFSSHRSLSFASALGENWPLIPLLELDPPAHSVFRSLNPLLSPRRIMELEPAVRDRAIALISKISASSTS  
CDILTDFAFPFAVSIFLRLGLSLDERLNTFVGWGKDLLHGDGIRRTAAARTILAFIDELAAMRRKEPADDFMT  
FVVQAKVDGRLLRDQEIHGIGVLLFVAGLDTVATAIGFDLAYLARNPTEQELLRSKPDRIVLAAEELLRAYST  
VQMIRVATKDINFEGAPIRKGDYISCATMIANRDPVEFENPNTIDLAREDNRHTAFAYGPHRCLGSHLARREI  
VIGLEEWLSRIPDFRIKDGTAPITYGGHVFGMENLILDWS

>CYP127A4 (AMK02\_PC00261) *Rhizobium* sp. N731

MATIRVPEHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHNGPRIIFYSPCNTRDGRGTWVIVRAQDQRKLL  
QDTGTFSSHRSLSFASALGENWPLIPLLELDPPAHSVFRSLNPLLSPRRIMELEPAVRDRAIALISKISASSTS  
CDILTDFAFPFAVSIFLRLGLSLDERLNTFVGWGKDLLHGDGIRRTAAARTILAFIDELAAMRRKEPADDFMT  
FVVQAKVDGRLLRDQEIHGIGVLLFVAGLDTVATAIGFDLAYLARNPTEQELLRSKPDRIVLAAEELLRAYST  
VQMIRVATKDINFEGAPIRKGDYISCATMIANRDPVEFENPNTIDLAREDNRHTAFAYGPHRCLGSHLARREI  
VIGLEEWLSRIPDFRIKDGTAPITYGGHVFGMENLILDWS

>CYP127A4 (RHECIAT\_PB0000259) *Rhizobium etli* CIAT 652

MHLCSERIYRKRGTRENPMSTGRAGEASKKFRLRPTKQRGFRAARRSDRCIACHWRLALLRLEIWRSTILLAP  
SPRRIRSRRRGFDDRRKAVATIRVPEHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHNGPRIIFYSPCNTR  
DGRGTWVIVRAQDQRKLLQDTGTFSSHRSLSFASALGENWPLIPLLELDPPAHSVFRSLNPLLSPRRIMELEPA  
VRDRAIALISKISASSTSCDILTDFAFPFAVSIFLRLGLSLDERLNTFVGWGKDLLHGDGIRRTAAARTILAF  
IDELAAMRRKEPADDFMTFVVQAKVDGRLLRDQEIHGIGVLLFVAGLDTVATAIGFDLAYLARNPTEQELLRS  
KPDRIVLAAEELLRAYSTVQMIRVATKDINFEGAPIRKGDYISCATMIANRDPVEFENPNTIDLAREDNRHTA  
FAYGPHRCLGSHLARREIVIGLEEWLSRIPDFRIKDGTAPITYGGHVFGMENLILDWS

>CYP127A5 (BN877\_p0289) *Rhizobium* sp. IRBG74

MKSNTIPDHVPRELVRDFSLSFSSPGMAPTPNGDPHAAVACVHDGPPIIFYSPSNTRDGRGTWVITRARDQRRVL  
QDTRTFSSHRRIFASALGEHWPVIPLELDPPTHGVFRALLDPLFSSKRIVALEPTIRERARALIDRIARERTS  
CDVLRDFALPFTASVFLSFLGLSQRRESEVFVGWVSDLLHGNADKRTAAARSIVGFIDEIAARRRRTPAFDFMT  
FVVLAEIDGRSLTEEEVVRGIGVLFVAGLDTVAAAIGFDMAYLARNPKDQELLRNEPDRVMLAVEELLRAYST  
VQMIRVAAKDIVFEGVPIRKGDYVSCATMIANRDPSEFECPETIDLARRGNHHTAFGYGPHLCLGAHLARREI  
VVGLREWLARIPTFRIKEGTAPITHGGHVFGIKDLILTWT

>CYP127A6 (SAMCFNEI73\_pB0103) *Sinorhizobium americanum*

MACKPVPDHVPPPEMVKDFSLFTSPGMERMPNGDPHAAVACLHDAPPIFYSPNNTRDGRGTWVITRAKDQRRVL  
QDTATFSSHSRIFASALGENWPMIPLELDPPAHGVFRSLNPLFSPKRVMLPEPVIRERAITLIDRILAASTS  
CDVMKDFAFPPFAVSIFLGLFLGLSDKERDTFVGWGRDLLHGENVKRTAAALAIVGFIDELAAMRRKEPAGDFMS  
FAVGAQVNGRPLTDEEVRGIGVLLFVAGLDTVATAIGFDLAHLARNLKDQQLLRSEPDRIGLASEELLRAYST  
VQMIRVATKDIDFDGAPIRKGDYISCATMIANRDPEEFDCPNTIDLAREDNRHTAFAHGPHRCLGSHLARREI  
VIGLEEWLSRIPDFRIKGGTAPITFGGHVFGIENLILEWS

>CYP127A7 (RTCIAT899\_PB00985) *Rhizobium tropici*

MGDPIPDHVPREMVSDFSLFTSPGMQRVSNNGDPHGAAARVHAGPPVFYSLHNTRDGRGTWLRTRAKDQQRKVLQ  
DPDTFSSNRSIFASALGDDWPLIPLELDPPAHGIFRSLNPLFSPKRVMALEASIRAQAITIVEKISVSGKSC  
EVMKDFAIPTTVGVFLQFLGLPNERLDVFGWAKALLHGDKVQRSAAARSILEFIDELAALRRKEPAGDFMTF  
VVQAQIDSRLLAENEVRGIGVLLFVAGLDTVAAAIGFDLAHLARNPKDQNLRLSEPERIVLATEELLRAYSTV  
QMIRVATKDIDFEGAPIRKGDYVCCATMIANRDPAEFEDPNVIDLAREDNCHTAFAAGPHRCLGSHLARREI  
IGLEEWLSHIPHFRIKEGTAPITHGGHVFGIENLVLEWS

>CYP127A8 (Mesci\_5828) *Mesorhizobium cicero*

MVANPVPDHVPPPEMVGDFSLFTSPCMSPTPNGDPHAAVACVHAGPPIFYSPWNTRAGQGTWVITRAADQRRVL  
QETEVFSSHSRIFASALGEDWPMIPLELDPPYHGVFRSLNPLLSPQRVAEFEPTIRERAITLIDSIASRGTS  
CDVMKDFAFPPFAVNIFLRFLGLPDHRLDTFVGWAKDLLHGDDLRRPAAARTIVAFIDELAAMRRKEPVDDFMS  
FIVHAQVEGRGLTDQEVGRGIGVLTFFVAGLDTVAAAIGFDLAYLARNLEDQELLRNEPDRIVLAAEELLRAYPS  
VQMIRVARKDIDFKGAPIRKGDFVSCATMIANRDPTEFEAPNTVDLTREGNPHAAFGYGPHRCLGSHLARREI  
VVGLEEWMARIPPFRIKEATAPITHGGHVFGIENLVLDWARPRPRGTGHIRGK

>CYP127A8 (Mesop\_6403) *Mesorhizobium opportunistum*

MVANPVPDHVPPPEMVGDFSLFTSPCMSPTPNGDPHAAVACVHAGPPIFYSPWNTRAGQGTWVITRAADQRRVL  
QETEVFSSHSRIFASALGEDWPMIPLELDPPYHGVFRSLNPLLSPQRVAEFEPTIRERAITLIDSIASRGTS  
CDVMKDFAFPPFAVNIFLRFLGLPDHRLDTFVGWAKDLLHGDDLRRPAAARTIVAFIDELAAMRRKEPVDDFMS  
FIVHAQVEGRGLTDQEVGRGIGVLTFFVAGLDTVAAAIGFDLAYLARNLEDQELLRNEPDRIVLAAEELLRAYPS  
VQMIRVARKDIDFKGAPIRKGDFVSCATMIANRDPTEFEAPNTVDLTREGNPHAAFGYGPHRCLGSHLARREI  
VVGLEEWMARIPPFRIKEATAPITHGGHVFGIENLVLDWARPRPRGTGHIRGK

>CYP127A8 (Mesau\_05876) *Mesorhizobium australicum*

MVANPVPDHVPPPEMVGDFSLFTSPCMSPTPNGDPHAAVACVHAGPPIFYSPWNTRAGQGTWVITRAADQRRVL  
QETEVFSSHSRIFASALGEDWPMIPLELDPPYHGVFRSLNPLLSPQRVAEFEPTIRERAITLIDSIASRGTS  
CDVMKDFAFPPFAVNIFLRFLGLPDHRLDTFVGWAKDLLHGDDLRRPAAARTIVAFIDELAAMRRKEPVDDFMS  
FIVHAQVEGRGLTDQEVGRGIGVLTFFVAGLDTVAAAIGFDLAYLARNLEDQELLRNEPDRIVLAAEELLRAYPS  
VQMIRVARKDIDFKGAPIRKGDFVSCATMIANRDPTEFEAPNTVDLTREGNPHAAFGYGPHRCLGSHLARREI  
VVGLEEWMARIPPFRIKEATAPITHGGHVFGIENLVLDWARPRPRGTGHIRGK

>CYP127A9 (TZ53\_19625) *Sphingobium* sp. YBL2

METFAARPIPAHVPPDMVGDFSLFSSPGMQPTPNGDPQAAAAVVHQGPRIFYSPVNTRDGRGTWVITRAQDQR  
KVLQDPETFSSHSRIFASALGESWPMIPLELDPPDHGKFRSLNPLLSPKRVMALES AVRERAI FLIDRIAAA  
GTSCHVMEDFAFPFAVNI FLRFLGLSDDRLEDFVRWANALLHGDNVQRPAAARTIIGFIDELSAERRRRPVDD  
FMSFLVQSKIDDRPLTDM EIRGTGVLLFIAGLDTVAAAIGFDLNYLARHMDDQQLLRSDPSRIVLAAEELLRA  
YPTVQMIRVATRDIDFEGAPIRRGDYVSCATMIANRDPLEFPHPERIDLAREDNRHTAFAYGPHRCLGSHLAR  
REIVVGLEEWLKRIPPFRIKQGTAPVTFGGHVFGIENLVLDWS

>CYP127A10 (EP837\_00046) *Sphingobium* sp. EP60837

METLATRPIPAHVPPPEMVGDFSLFSSPGMQPTPNGDPQAASAVVHQGPRIFYSPVNTRDGRGTWVVTRAQDQR  
RVLQDPETFSSHSRIFASALGESWPMIPLELDPPDHGKFRSLLNPLLSPRRVMALETAVRERAVSLIDGIAAS  
GTSCDVMQDFAFPFAVNIFLRFLGLSDDRLQEFVRWANDLLHGDNVQRPAARTIIAFIDDLAAERRKRPVDD  
FVSFLVQAKIDDRPLTDAEIRGTGVLLFVAGLDTVAAAIGFDLNYLARHPSDQQWLRRDPSRIVLAAEELLRA  
YPTVQMIRVATKDIDFEGAPIRKGDYVSCATMIANRDPNEFPEPEKIDLTREDNRHTAFAYGPHRCLGSHLAR  
REIVVGLEEWLKRIPTFRIKEGTAPITYGGHVFGIEKLILDWS

>CYP127A11 (RGR602\_PB00271) *Rhizobium gallicum*

MPSNRVPDHVPPPEMVRDFSLFTSAAMQRTKNGDPHAAVACAHAGPPIFFSPYNTRDGRGTWVITRANDQRKLL  
QDTATFSSHSRIFASALGENWPMIPLELDPPAHGVFRSLLNPLLSPKRVMALEPAVRERAIALIDMISASSTS  
CDVMKDFAFPPFAVSIFLRFLGLSDERLDTFVGWAKDLLHGDGIKRTAAARTIVAFIDDLAAMRRKEPADDFMT  
FVVQAKVDGRPLRDEEIRGIGVLLFVAGLDTVATAIGFDLAYLARNPRDQELLRSEPDRIVLAAEELLRAYST  
VQMIRVATKDIDFEGAPIRKGDYISCPTMIANRDPAEFECNPNTIDLAREDNRHTAFAYGPHRCLGSHLARREI  
VIALEEWLSRIPDFRIKKGTAPITYGGHVFGIENLILDWS

>CYP127A12 (IE4771\_PB00206) *Rhizobium etli* bv. *mimosa* IE4771

MTFQPNGDLIAASHIVRSSRDLSLEVSRSTIWSVPSSPGRHFRRRGFDGRRKAVASHRVPEHVPPPEMVKDFSL  
FTSPGMERTPNGDPHAAVACVHDGPPIFYSPCNTRDGRGTWVITRAEDQRRLQDTETFSSHSRSLFASALGEN  
WPLIPLELDPPAHGAFRSLLNPLLSPKRVIELEPAIRDRAIALISKISASSTSCDVMKDFAFPPFAVSIFLRL  
GISDERLDTFVGWGKHLHGDGVKRTAAARTILAFIDELAATRRIKPADDFMTFVVQANVDGRPLRDEEIRGM  
GVLLFVAGLDTVATAIGFDLAHLARNPKEQELLRSEPDRIVLAAEELLRAYSTVQMIRVATKDIFEGAPIRK  
GDYISCATMIANRDPAEFERPNTIDLARKDNRHTAFASGPHRCLGSHLARREIVIGLEEWLSRIPEFRIKEGT  
APITFGGHVFGMENLILDWS

>CYP127A13 (REMIM1\_PE00312) *Rhizobium etli*

MCCSGRILPEGRNPVKLQCGRGDHLQLPQIPITSDDFPAEGRSDRCIAHRPLVARSEVGSVALNDLFIPSSPRR  
HFRRRGFDSRRNAVASHRVDPDHVPPPEMVNDFSLFTSPGMERTPNGDPHAAVACVHDGPPIFYSPCNTRDGRGT  
WVITRAQDQRRLQDTETFSSHSRSLFASALGENWPLIPLELDPPAHGVFRSLLNPLLSPKRVTELEPAIRNRA  
IAVISKISASSTSCDVMKDFAFPPFAVSIFLRLGLISDERLDTFVDWGKHLHGDGIKRTAAARTILAFIDELA  
ALRNEPADDFMTFAVQANVDGRALRDEEIRGMGVLLFVAGLDTVATAIGFDLAYLARNPKEQELLRSEPDR  
VPAVEELLRAYSTVQMIRVATKDVNFEGAPIRKGDYISCATMIANRDPAEFKCPNTIDLAREDNRHTAFAYGP  
HRCCLGSHLARREIVIGLEEWLSRIPDFRIKEGTAPITFGGHVFGMENLILDWS

>CYP127C1 (SGRAN\_1061) *Sphingopyxis granuli*

MSGGCPSRPDIAPDMVRRWDLARETEAVGCPFVAASKLHDGPDIFFNLSDDLRNVDGGSWIVTRADLQREVLQ  
KSELFSSRGISGFSAILGESWPLMPVELDAPDHMYRKLINPLFSPPRMDEIEAGVRESAIELIEAVRHRGGC  
EFMTAYARELPVNVFLRLMGLPLAEVDTFRKWEDEMMHSDDVAVRAGAAHALKAYLLDIIGRRRAEPTDDLIS  
HLVTATLDDRPLDDDAVLGLCFFLYIAGLDTVAATLSFIFATLAEQPDQLQNLRLSTPAEIEPAVEELIRAFGT  
VVTSRYLTEDTVFHGVAMRKGDVRITPLGVASRDPAEYEDANTLNIDRLSTRNISFGAGPHRCIGSHLARREI  
TLTLEEWLARIPEFRLAPNGKPPVNVTVWGHDTLQLEW

>CYP133F1 (B488\_03070) *Liberibacter crescens*

MDLSQFSSPEFIINPYPFYEEVRS LGAVVPISPHIVISARYESVREMLHDSRIGKDHIQSIRIRYGEESQGP  
VFQSF SRMMLMLDPPVHYKVRSLT KAFTAQRVESLRETIQNI SNRLINNLVNQLKKHKEIDLAAEYAFKLPV  
EIICKLLNIPVQDGEKYGEAARKSVQALNFTPLTAQQISEANAAILSLENYFSKVIAERHKKTGDDLISALLT  
TKENDIFLSDDDEIISNVILMF IAGHETTSNMISNALISLYKQPEQLNLLRNDSSLM PKAVTECLRLDSSVQIV  
GRVALNDLEISGFHIKCGTIIFLMIGAANRDP

>CYP147D2 (Mnod\_0160) *Methylobacterium nodulans*

MPDPNLFAAVKDPANRPNPYPLYARLRETPVALQHDSYVVTTHAALRALVFDPRLSSEDLPPISHPRTGNPF  
KDWIVNPIKD YVRTKHRPFI FRDPPDHVLR RHVTRQFTPERLRTMHGRVDALVADLLDRCDARTIDLVDHF  
SYPLPVMVICELLGVPHEDEPRFHGWATQLATALEPDAREDEETKGRNIETFDVIAAYMQDLIREKRRHPQDD



LLTGLATYEDPKVGRMGDYDLIATAILLIAGHETTVNLI TNGMTLLRFPEHLERLRADPEIAPRLIEELLR  
YEPPVHFRTKALADIRMEGV TIPQGAPIVLLFASGSRDPARFPDPDRFDPDREDNQHFGGGSLHFCVGAPL  
ARMEAEALVALAQRLRNPR LIEDPPPYRPGASLRGPQHRLRLAIEGVA

>CYP147D3 (Mex\_1p4388) *Methylobacterium extorquens* AM1

MCRSPSPVSGSTLFDQILDPANRANPYPLYAELRKVPVARQEDGTYVVS GHAE LARLISDPRISSDDL PDPQK  
FRWTGHPVTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQEITDDLIGKMRGKT  
QIDLVD DFSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDAETQAKNEVC FNEIADYLQGLIKE  
KRKDPQQDILSDLATDKEGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHGERLRAEPDLAPRLIE  
ELLRYEPPVHYRTRVALTDIPVAGITIPKDAPVIFLLAAANRDP IRFPDPDRFDPDRPDNRHLGFGGGLHYCV  
GAPLARIEAEVALVSLVRRLKGVSLIEDPPPYRPGASLRGPRHLRLALEGVAEA

>CYP147D3 (METDI\_4994) *Methylobacterium extorquens* DM4

MSGSTLFDQILDPANRANPYPLYAELRKIPVARQEDGTYVVS GHAE LARLISDPRISSDDL PDPQKFRWTGHP  
VTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQEITDDLIGKMRGKTQIDLVD D  
FSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDAETQAKNEVC FNEIADYLQGLIKEKRKDPQE  
DILSDLATDKEGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHGERLRAEPDLAPRLIEELLRYEP  
PVHYRTRVALTDIPVAGITIPKDAPVIFLLAAANRDP IRFPDPDRFDPDRPDNRHLGFGGGLHYCVGAPLARI  
EAEVALISLVRRLKGVSLIEDPPPYRPGASLRGPRHLRLALEGVAEE

>CYP147D3 (Mext\_4000) *Methylobacterium extorquens* PA1

MSGSTLFDQILDPANRANPYPLYAELRKFPVARQEDGTYVVS GHAE LARLISDPRISSDDL PDPQKFRWTGQP  
VTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQEITDDLIGKMRGKTQIDLVD D  
FSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDAETKAKNEVC FNEIADYLQGLIKEKRKDPQQ  
DILSDLATDKEGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHGERLRAEPDLAPRLIEELLRYEP  
PVHYRTRVALTDIPVAGITIPKDAPVIFLLAAANRDP ARFPDPDRFDPDRPDNRHLGFGGGLHYCVGAPLARI  
EAEVALISLVRRLKGVSLIEDPPPYRPGASLRGPRHLRLALEGVAEE

>CYP147D3 (Mchl\_4369) *Methylobacterium extorquens* CM4

MSGSTLFDQILDPANRANPYPLYAELRKIPVARQEDGTYVVS THAE LARLISDPRISSDDL PDPQKFRWTGHP  
VTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQEITDDLIGKMRGKTTRIDLVD D  
FSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDEETQAKNEVC FTEIADYLQGLIKEKRKDPQQ  
DILSDLATDKEGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHGERLRAEPDLAPRLIEELLRYEP  
PVHYRTRVALTDIPVAGITIPKDAPVIFLLAAANRDP IRFPDPDRFDPDRPDNRHLGFGGGLHYCVGAPLARI  
EAEVALVSLVRRLKGVSLIEDPPPYRPGASLRGPRHLRLALEGVAEA

>CYP147D3 (Mpop\_4481) *Methylobacterium populi*

MSGSTLFEQILDPANRANPYPLYAEMRRVPVARQADGTYVVS THAE LARLISDPRISSDDL PDPQKFRWTGHP  
VTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQTITDDLIGKMRGKTTRIDLVD D  
FSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDEETQAKNEVC FNEIADYLQGLIKEKRKDPQQ  
DILSDLANDGDGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHGARLRAEPDLAPRLIEELLRYEP  
PVHYRTRLALADIPVAGITIPKDAPVIFLLAAANRDP TRFPDPDRFDPDRPDNRHLGFGGGLHYCVGAPLARI  
EAEVALVSLVRRLKGVSLIEDPPPYRPGASLRGPRHLRLALEGVAE

>CYP147D3 (Y590\_19915) *Methylobacterium* sp. AMS5

MSGSTLFEQILDPANRANPYPLYAELRKAPVARQADGTYVVS THAE LARLISDPRISSDDL PDPQKFRWTGHP  
VTDLLVRPVRAEIRKRHRPFIFRDPPDHDRLRGQVMRCFTPERVRGMRAKTQAITDDLIGKMQGKSRIDLVD D  
FSYPLPVTVICELLGVPPED EAQFHGWATQLATALEPNQRGDEENQAKNEVC FNEIADYLQGLIKEKRKDRQE  
DILSDLANEKEGMNDFDLIATAVLLL VAGHETTVNLI TNGMTLLRFPEHLERLRAEPETAPRLIEELLRYEP  
PVHYRTRLALTDIPVAGITIPKDAPVIFLLAAANRDP IRFPDPDRFDPDRPDNRHLGFGGGLHYCVGAPLARI  
EAEVALVSLVRRLKGVSLTEDPPPYRPGASLRGPRHLRLALEGVAGE

>CYP147D4 (M446\_4599) *Methylobacterium* sp. 4-46

MPDPTLFAAVKDPANRPNPYPLYARLREAPVALQDDGTYVVTTHAALRALLFDPRISSDLPSTSHPRTGNPF  
KDWIINPFKDHVRTKHRPFI FRDPPDHDLRRHVMREFTPERIRAMHGRVDGLVADLLDRRRDARAIDLVDDE  
SYPLPVTVICELLGVPEDEGRFHGWATQLATALEPDARQDEAALGRNIETFDAIAAYMQDLIKDKRRHPKDD  
LLTGLATREDPQAGRMGDYDLIATSILLIAGHETTVNLITNGMLTLLRFPAQLERLRAEPEIAPRLIEELLR  
YEPPVHFRTKALAEIELAGTTIPAGAPVLLLFASGSRDPARFADPDRFDPDREDNQHFGGSLHFCVGAPL  
ARLEAEAAALVALARRLRNPRLLDDPPPYRPGASLRGPEHLRLAIDGVSPDA

>CYP147D5 (Maq22A\_c00735) *Methylobacterium aquaticum*

MTDTDGTLFAQVRDPENRADPYPLYTRLRAQPVARQDDGTWVASGYAAIRALLHDPVSSDLPPEHPATGN  
PIKDFVNPIKDWITDRHRPFI FRDPPDHGLLRQVMGQFTVARVRGMKRRTEALVDECLRARAGATRFDLVD  
DLAYPLPVTVICEMLGVPREDEARFHWATQLATALEPESRNDEDLRARNTETFDAIAAYMRDLIREKRRAPA  
DDMLSGLATTKDAQAGRMSDPLVATAILLIAGHETTVNLITNGMLTLLRHPDELARLRADPERAPRVIEEL  
LRYEPPVHFRTRLTRAPIVGDVTIPEGVPLVLLFAAGNRDPARFPDPRFDPDREDNQHFGGGALHYCVGA  
PLARIEAEAAALTALVARLREPRLVEDPPPYRAGASLRGPERLLLDIRGIA

>CYP147D6 (MOC\_4430) *Methylobacterium oryzae*

MSDDALFAAVMDPANRADPYPLYARLRQRPVSRQRDGSYVSTHAAIRGLLFDPRLSSEDLPPIRRPRTGNPL  
KDLILNPIKNRISATHRPFI FRDPPDHDLRLSLVMREFSIARVQALRPRIAREVDALIDTCRGRREVCLVSDL  
SYPLPVTVICELLGVPREDEPRFQAWATQLATAVEPDARHDDTTRRKIVGAFDEIAAYMRDLIREKRRRPTDD  
MLSGLAAPGPDGRKQLSDFDLLSTAVLLL VAGHETTVNLITNAMLTLLRHPEQLERLRADPERAPRLIEEVL  
YEPPVHFRTKALGAI TVAGETIPKGAPVILLFAAANRDPARFDAPDRFDPDRSDIEHFGGGGLHYCVGAPL  
ARIEAEIALVALSRRLIAPRLPQDPPPYRPGASLRGPEQLPIGIDGIA

>CYP147D6 (Mrad2831\_3880) *Methylobacterium radiotolerans*

MSDDALFAAVMDPANRADPYPLYRRMRQQPVSRQRDGSYVSTHAAIRSLLFDPRLSSEDLPPIRRPRTGNPL  
KDLILNPIKNRISATHRPFI FRDPPDHDLRLSLVMREFSIARVQALRPRIAREVDGLIDACRERREVCLVSDL  
SYPLPVTVICELLGVPRADEPRFQAWATQLATAVEPDARHDDGTRRQIVGAFDEIAAYMRDLIREKRRRPADD  
MLSGLAAPGPDGRKQMSDFDLLSTAVLLL VAGHETTVNLITNAMLTLLRHPEELERLKADPERAPRLIEEVL  
YEPPVHFRTKALGAI AVAGEMI PKGAPVILMFAAANRDPDRFAAPDRFDPDRGDIEHFGGGGLHYCVGAPL  
ARLEAEIALVALSRRLVAPRLAVDPPPYRPGASLRGPEQLRIGIDGVA

>CYP147D7 (Mpop\_5420) *Methylobacterium populi*

MGDDTLFAQVLDPRNRDPYPLYGRLRET PVSQRQADGSFVSTHAAVRSLIFDPRLSSEDLPSSRRPPTGNPL  
RDWILNPIRNRVNAHRPLIFRDPPDHDLRDFVMKEFTIARVRESHAKVARLVDTLIDACRGRDTVCLVDDL  
SYPLPVAVICELLGVPEADEAQFHAWAIRLATALEPDARHDEAGRREITATFDAISDYMRLIREKRRRPADD  
MLSGLAARGGQGRPAMGDIDL ISTAILLL VAGHETTVNLITNGMLTLLRHPDELERLKVDPARAPRVIEEMLR  
YEPPVHFRTKALGAIDVAGVTIPAGSPVILLFASASRDPARFADADRFDPDRRDNQHFGGGGLHYCAGAPL  
ARIEAEIALVTLCRRLVAPRLLDPPPYRPGASLRGPKNLGTSASGLYLFFYYLGGLAGTAVLGQVFERWGW  
ACVLGVAASLALAAALTLGLREPSSARGVT

>CYP147D8 (MOC\_2231) *Methylobacterium oryzae*

MPDATLLNQKDFANRPNPYPIYARLREN PVSQRQDDGTEEGTWVAATHGTIASLLQDPRVSSETLPPADRPRT  
GNPLTDLIVKPLKDWMMDRHRVFI FRDPPDHDLRSVAMHQFSRERVQAMRARSQQLVADLLDEKCGAREIDA  
VDDLAYPLPVTVICELFGVPREDEPKFHGWATQLATALEPDSLSDPEIRAENSRTFDAIGGYMADLIKDKRKH  
PGDDMLSGLANHATPAGVKMGDYDLIATSILMLVAGHETTVNLITNGMLTLLRHPDELERLRQDPLRAPRLIE  
ELLRYEPPVQFRTRTL SAIDIAGVTIPEGADLVLLLASGNRDGAVFPDPRFDPDRAGLRHLGFGGSLHYCV  
GAPLARFEAEAAALTALARRLKAPRLIEDPPPYRSGAALRGPEHLRVAIDGIA

>CYP147D8 (Mrad2831\_1827) *Methylobacterium radiotolerans*

MPDATLLDQVKDFANRPNPYPVYAKLRENPVSRQDDGTEAGTWVAASHGTIARLLQDPRVSSDTLPPADRPRT  
GNPLTDLIVKPLKDWMMDRHRVFI FRDPPDHDLRSVAMHQFSRERVQAMRARS DRLVADLLDEKCGAREIDA  
VDDLAYPLPVTVICELFGVPREDEPKFHGWATQLATALEPDSLS DPEIRAANSRTFDAIGGYMGDLIKEKRRH  
PQDDMLSGLANHATPAGVKMGDYDLIATSILMLVAGHETTVNLITNGLLTLLRHPDELERLRQDPLRAPRLIE  
ELLRYEPPVQFRTRRTLSPIDIAGVTVPEGADLVLLLASGNRDAAVFPDPDRFDPDRAGTRHLGFGGGLHYCV  
GAPLARFEAEAAALTALARRLKAPRLIEDPPPYRPGAALRGPEHLRVAIDGIA

>CYP147D9 (MOC\_0533) *Methylobacterium oryzae*

MSDETLFAQVLAPKNRADPYPLYARMRETPVSRQADGSYLVSTQAALRSLIFDPRLSSEDLPSSRRPATGNPP  
KDWILNPIRHRVNAHRPLIFRDPPDHDLRGIVMKEFTIARVRDSHAKVATLV DALIDKCRGRDTVCLVDDL  
SCPLPVAVICELLGVPEADERQFHAWATRMATALEPDARHDEAGRREIAATFDAISDYMRLIREKRRHPADD  
MLSGLAARGGRRLAMGDIDLITAILLLVAGDETTVNLI SNGMLTLLRHPDELEK LKADPKRAPCVIEEILR  
HEPPVHFRTRKALGAIEVAGATIPAGSSVVLMLAAGNRDPARFTQPD RFPDRNDNQHF GFGGGLHYCVGAPL  
ARVEAEIALVTL CQRLVAPRLDDPPPYRAGASLRGPKNLGIAIAGIA

>CYP147D10 (Maq22A\_1p34675) *Methylobacterium aquaticum*

MNGTLFQQILD PANRADPYPLYAEMRRTPVSRQDDGSYVSTHAELYRLLHDPRISS EDLDPDPLFRWTGHPL  
SDLFVRPVRSRITARHRPFI FRDPPDHDLRRQVMREFAPARVRAMRRKTEQLTHTLLDGLRDRTNLDLVDDF  
SYPLPVTVICELLGVPREDEPRFQGWATQLATALEPDRRTDRENAGRTEE AFTAISDYLRGLIKGKRRAPQDD  
LLSGLAAEHDGERMNDHDLVATAVLLL VAGHETTVNLITNGILTLLRFPEHLERLRREPEVAPRLIEELLRYE  
PPVHYRTRLARADIAIGGTTIPEGAPVVL LLASGSRDPMRFADPDRFVPDRANNQHFGFGGSLHYCVGAPLAR  
IEAEVALVALAQRLQAPRLLADPPPYRPGASLRGPRHLLLAIDAVAPGASAE LA

>CYP151C1 (Ga0080559\_TMP4891) *Salipiger profundus*

MPAMSLEAQFPDAPFLDVANPAFSLRSEPVREARAQSWYARTPYGLAVLRHKEMGELLTHKS LIQGSHAWPAL  
NGVTSGETFADWWNSSILVTEGDDHWRLRLVNPAFSPKVVKALMPEFERIANDLADGFIESGSCDFMAEFADP  
YAARVLCLLLGLPETEAPFILRTSATMGLALGVNFPDLVDEIEAATVELGDYISEVLKARETDPGDDILSTLV  
QVRAEGDRLSHDELWNIALMLAFAGVDTTRNQLGLGMSMF AAHPEQWETLAADPSLDMAAATEVMRMRPTITW  
VSREATEDFEYGGVTIPQGTVLHLYSESAGTDPQVMGEAPFDITAKRARNYGF GGGIHHCLGNLVARNDMAVA  
YRVLSARMGPPVVGEGATWLADSGNTGPISLPITFAPR

>CYP151C2 (Ga0080574\_TMP4712) *Pelagibaca abyssi*

MSAETLFADAPYLDVADPAFSLRSEPVREARRDSWFARTPYGLAVLRHKEMGELLTHKS LIQGSHAWPALNGI  
TEGSFAEWWNKSILVTEGDDHWRLRKLVNPAFSPKVVKALMPEFERIATDLADGFIAKGACDFMEDFADPYAA  
RVLCLLLGLPESEAPFILRTSATMGLALGVNFKA EAENIEAATEELGAYIAQVLADRQATPGEDILS IMVQAS  
EDGDRLSYDELHNLALMLAFAGVDTTRNQLGLGMSMF AAHPEQWEALAADPSLDMAAATEVMRMRPTITWVSR  
EAIEAFDYGGITIPKGTVLHLYSESAGTDPAVMGEAGFDITQKRARNYGF GGGIHHCLGNLVARNDMAVAYRV  
LSAGMGAPSIAEGATWLADSGNTGPISLPITFLPR

>CYP152B3 (Meso\_4213) *Chelativorans* sp. BNC1

MPRIPRDRSLDSTIALMGDPYRFISNRSRRYRSDLFETRLLLRKTICMTGPEAAQLFYDPSR FVRTGAMPKAI  
QKTLLGVGGVQGLDDDAHRHRKQMFMSLMTPERIEQLVQLTAAEWQIRVLKWGSMDEVVLYPELHLLL TRAVC  
AWAGVPLADSEVDARTKEIAALFDHAGAVGLRHLWSRWARDQADRWIADI IDQIRSGRIRPPEQSAHI IAWH  
RDLNGELLTPQIAAVELINVIRPTVAVSVYMLFVAHALHAHPKIRERLQADEDSYSRRFVQEVRRYYPFFFAV  
AARTRQAFDWNQYQFTAGRRVLLDLYGTNQDPRTWKRP EEFEPERFRHWDESPFNFI PQGGGDHYVNHRCPGE  
WIAIELMKLTADFLSRMSYEVPPQQLRIDWSRLPALPRSRFVIRNVRES

>CYP152B4 (Sala\_2556) *Sphingopyxis alaskensis*

MSRIPRDKSLDSTIALMGDPYRFISNRCRRYRSDLFETRLLLRKTICMTGPEAAARLFYDQSR FARHGAMPKAI  
QKTLLGVGGVQGLDEGAHRHRKQMFMSLMTPEGIEKLVRLTSAEWQIRVRK WASMNNAVLYPELHALLTRAAC  
AWAGVPLADSEVEPRTRQVTALFDHAGSIGLRHLWSRRARKRADSWAADIVEQIRSGRLRAPEHSAAHVVAWH  
RDFSGALLTPQVA AVELINVIRPTVAVSVYMIFVAHALHTHPQVREKLQAGDEDYAECFVQEVRRYYPFFFAV

AAQTRLAFEWNGYQFPAGRRILLDLYGTNQDPRTWERPEDFEPERFGRRDGSPFNFI PQGGGDHYFDHRC PGE  
WIAIELMKLTADFLTRMSYEVPGQDLRIEWSRLPALPRSRFVLSNVRECQELHLQRTWRRR

>CYP152B6 (NT26\_p10171) *Rhizobium* sp. NT-26

MSRIPRDRSFDSTLALLLDPYGFISKRCRRYGADLFQTRLLLRPTICMTGPEAAELFYRQDLFARSGAAPGRV  
QKTLFGQGGVQGLDGEAHRHRKQMFMSLMTPERIEALKELTAEWRTYAQKWTMDRVILYDEVQELLTRAVC  
AWVGVPPLPEAEAGRRAAELTALFDYAGSVGPKHWSRLSRRRCESWIEGIVEQIRAGDLSPPGSAARVIATW  
RDQDGALLSPRIA AVELLNILRPTVAVAVFIVFAAHALHGFPACRPKLQTGDEYPELFVQEIRRLLYPPFFPAVM  
ARTRHNFEWNGYRFPRGRRVMLDLYGTNRDARAWDAPEEFRPDRFRSWDGSFPNFIPQGGGDHMHNRCPGEW  
MTIELMKLSCRFLAASIEYDLDPQDLRIDITRLPAIPKSRFVMSNLRYAIGGAS

>CYP152B7 (MALG\_04698) *Marinovum algicola*

MSSIPSATGFDSTLALLRNYPYGFIRQTCRHLADLFFETRILLHKTICMTGAAAAEAFYREEQLIREGSMPSRI  
QKTLLEGEGGVQGLDGATHQHRKKMFMSMGTEHIAALQGMSLHMLDNFADPWEAKNEVVFYDEVREMLTRAVC  
AWCGVPIPEAEVATRTAQLTSLFQDAGAIGPKHWAARLARHRLEKWAARMIQQVRDGELOPTQESALHFIATW  
RDLDGELLNPRVA AVELLNVL RPTVAVSVFIVQTAHALYRYPEWQEKLNRNDEGLLEPFVQEVRRLLYPPFFPAVA  
ARVKSTFEWQGYRFPKGHRVLLDLYGTNTDRSWDAPVEFRPERFRGRAENPYDFIPQGGGNHYTNHRCPGEW  
IAISQMKAFCRYLVNDIDYDVPDQDLELDPGELPSLPQNRIFIMRNVRRQ

>CYP152C1 (RSP\_2378) *Rhodobacter sphaeroides* 2.4.1

MTTDEGRRPEEPGTPASLREMPRDPRIDASMALMSEGYRFVSNLCDRMDS DAVATRLRLREVVC LRGSA AARL  
LYGA EGLTRVGAMPSTVLHLLQDKGSVQQLLEGPAHRHRKALFLSICMDPARVEALVSEMLAWRERLP AWEAE  
GRIVLQQE AARLLTRAGCRWAGVAHQPEAQLADEIFDMIDKAGSVGPRNWLAQMRRAGTEKRLRTLVEEV RAG  
EVVPEAATALHAI AFHREEDGTLLDPSVA AVELLNLLRPIVAVGRYITFAALALHRETTWRELFRSGNLELAG  
DFAEEVRRASPFFPFTA AAVTTTRPITWEGYDFPEGQWLLLDLYGTTHDPRHFPEPTRFRAERMLS WTGQDEAFI  
PQGAGDVARTHRC PGEMITVELMKEAIRLLCCEMDYE VPAQDLGVRLNRMPAQPRSGMILSAISRAGTEASR  
NG

>CYP152C1 (Rsph17029\_1038) *Rhodobacter sphaeroides* ATCC 17029

MTTDEGRRPEEPGTPASLREMPRDPRIDASMALMSEGYRFVSNLCDRMDS DAVATRLRLREVVC LRGSA AARL  
LYGA EGLTRVGAMPSTVLHLLQDKGSVQQLLEGPAHRHRKALFLSICMDPARVEALVSEMLAWRERLP AWEAE  
GKIVLQQE AARLLTRAACRWAGVAHQPEAQLADEIFDMIDKAGSVGPRNWLAQMRRAGTEKRLRTLVEEV RAG  
EVVPEAATALHAI AFHREEDGALLDPSVA AVELLNLLRPIVAVGRYITFAALALHRETTWRELFRSGNLELAG  
DFAEEVRRASPFFPFTA AAVTTTRPITWEGYDFPEGQWLLLDLYGTTHDPRHFPEPTRFRAERMLS WTGQDEAFI  
PQGAGDVARTHRC PGEMITVELMKEAIRLLCCEMDYE VPAQDLGVRLNRMPAQPRSGMILSAISRAGTEASR  
DG

>CYP152C2 (Rsph17025\_1898) *Rhodobacter sphaeroides* ATCC 17025

MSNSDARHEAGPSDTTCGREIPRDPRLDASMGLLSEGYRFVSNLCDQLDSDIVSTRIRLREVICLRGGTAARL  
LYGA EGLTRVGAMPSSVLHLLQDKGSVQQLLEGPAHRHRKALFLGICMDPARVEALVAEFRAAWRAALDEWEEA  
DSIVLQQE AARVLTRAACRWAGVENQPEARLAEEIFDMIDKAGSIGPRNWLAQMRRSGTERRLRKLIEQVRAG  
EVVPGSATALHAI AFHREADGALLDDTVAAVELLNVL RPIVAVGRYITFTALALHRETNWRDLFRSGTLELAA  
DFAEEVRRISPFFPFTA AAVTTTRPLQWEGYDL PADQWLLLDLYGTLHDARNFPDPAFRAERMLSWSGQDDCFV  
PQGGGEVAVTHRC PGEMITVELLKEAIRLLCLEMDYEIPPQDLGVRLNRLPAQPRTGMVLASIRRRPGTEPCV  
AG

>CYP152E3 (AZOBR\_p440090) *Azospirillum brasilense* Sp245

MHPIPRDASPDSTLALLSEGYRFVMNRCERHGSDFETRMLRKAICVMGEEAAGMFYEPDRFTRKGAMPITTT  
LMLLQDRGAAQTL DGEAHRWRKRLMALMEPENIRRLCGEVAAEWRAALPGWERAERVLLDAVRAILCRAVC  
RWAGVPLAEEEEAGPRTAEFAAMIDGAGAVGLRNWRGLLLRTRTERWARGLIEDVRAGRLVMTEGDAESRAIHA  
IATHRGLDGNRLDTVTASVELINILRPVVAIAQYVVF AAMALHEHPEQRAALQDASPEEVEHFVQEVRRFYFPF

FPLVAGRVRTPFDWRGHRFAEGTWVLLDLYGTCHDPRIWNDPERFRPERFRGREPGAFALIPQGGGGHLRGHR  
CAGEWITIEVVKTALRLLTREMRYSVPAQDLALDLSRMPAVPRSRFVITDVAPRRKADAVLDPPVALSRRAH

>CYP152P2 (M446\_4307) *Methylobacterium* sp. 4-46

MFAIPRDPAPDSTLALLREGYGFI PGRCRNFGSDLFTTRLMLTNVVCMTGADAAAQFYAPDRFTRRGALPRIS  
FTLIQDNGSVMEVMDGEAHRHRKAMFLSLMSPEALQRLADLTQAWRARMRRWAAQETIPLFDEAHVPFCAAV  
CAWAGLPLNEAEAERSREFLAMIEGTGSIGPRNWRGHLLRARAERWMRDAIRQIREGSRVPEGSAAHVIAHH  
RDAEGRLLDVRTSAVELINILRPTVANARYVVFAAHALHCYPESREALQAAEGVEPFVQEVRRFYFPIFIGG  
RALQTVEFHGHRFAVGDWVLMDLYG TNRDPNRWGQPERFI PDRFAQWDHDPNGFI PQGGGAYETGHRCPGEWI  
TIEQMRAVVP LLAREMRYVVPEQDLTIDLGRIPAMPKSRFVITKVAG

>CYP152AA1 (W911\_03615) *Hyphomicrobium nitrativorans*

MKEPPRDPFPDSTVALAWEGYRFASNRLRRFGTD AFSCRLMMKKA VCIGGPAAAALFYDSGSVERKDVAPGRI  
EKTLLGQGGI HGLDGLAHRHRKEMYLELMGPQSLSSFTPI LVRTWREAAASWQPGTRLNLFSEAQT VLFRTMC  
EWAGIPLGPRETQ QRAADAAAMVDAFGGIAWRNWKGRFARRRSERWMHGIVSATRDRTSAPSPTSALARIANF  
RDVDGNLLPAEVTAVELLNVIRPALAI PYFLDLAALKLSEISEMRDQVASNDEM LDCFVQELRRFCPFTPF LG  
ARSRREIAWQGFRI PSDTLVVLDVYGIHRDERVWQNAAAFAPLRFQGVGDYRFSLLQ QGGGDHLSGHR CAGEW  
FTIEALKFFSRELARMPYAVIPASSSFSLTRIPSRLIPPVALRLG

>CYP152AB1 (BN1229\_v1\_0635) *Filomicrobium* sp. W

MRSGLPRLKGF DHTIAFLHDGYEFVSRRCDRLNSDAFLARLMLQKVV CARGEDAAQLFYEGGRFTRRGAMPP  
TTMRLQLD LGSVQQLDGAAHRHRKAMFVRLLMGADAEQQITELFRGEWRNAAKEWSSRPSIVLFDQANVILTK  
TICRWMQIPASKPYAELANEFSSMIENSGSAGFAVILALIRRRSTERYFERLVRSIREGTAIVATDSPLAYVV  
NYRDMDGSLLSERSAAVELINILRATVAIGRFVIFVAMALEQQPKWKEKLHSADDAAYEHFAEEVRRLYPFFP  
VIGGRAIESFEWRGHEFDCGDWFILDLYGTNHFRRLFEPHQFNPARRLAWRTQGYDFIPQGGGDSRTDHRCP  
GEQITVGIMREACRLLVEDMQYELPEQDLTSLSLHEIPARPRSGVVL SNIRLNI

>CYP152AB1 (BN1229\_v1\_0639) *Filomicrobium* sp. Y

MRSGLPRLKGF DHTIAFLHDGYEFVSRRCDRLNSDAFLARLMLQKVV CARGEDAAQLFYEGGRFTRRGAMPP  
TTMRLQLD LGSVQQLDGAAHRHRKAMFVRLLMGADAEQQITELFRGEWRNAAKEWSSRPSIVLFDQANVILTK  
TICRWMQIPASKPYAELANEFSSMIENSGSAGFAVILALIRRRSTERYFERLVRSIREGTAIVATDSPLAYVV  
NYRDMDGSLLSERSAAVELINILRATVAIGRFVIFVAMALEQQPKWKEKLHSADDAAYEHFAEEVRRLYPFFP  
VIGGRAIESFEWRGHEFDCGDWFILDLYGTNHFRRLFEPHQFNPARRLAWRTQGYDFIPQGGGDSRTDHRCP  
GEQITVGIMREACRLLVEDMQYELPEQDLTSLSLHEIPARPRSGVVL SNIRLNI

>CYP153A2 (CC\_0063) *Caulobacter vibrioides* CB15

MMSQNTDPREDLMSDGSIDLKADARARAYSIPLEDYHVADPALFQADAMWPYFERLRKEAPVHYSKGD EEVGP  
YWSVTRYNDIMTVDTTHQVFSSDAHLGGITIRNFDEDFVLPMFIAMDQPKHDIQRKTVSPIVSPANLGRLEGI  
IRERVCGILDALPINEPFDWVDKVSIELTTQMLATLFD FPWEERRKLTRWSDIATASPESGLIESEEARRAEL  
LECLAYFTNLWNERVNLTEPGNDLISMLAHGEATRDMPPMEYLG NVILLIVGGNDTTRNSLTGGLYALSKNPQ  
EEAKLRADPGLIPNMVSEIIRWQTPLAHMRRTALEDYELAGQTIKKGDKVVMWYVSGNRDDTVIENADQFIVD  
RPNARRHLSFGFGIHRCVGNRLAEMQLKIVWEEILKRFPKIEVLEEPKRVYSTFVKGYERMMVRIPERI

>CYP153A2 (CCNA\_00061) *Caulobacter vibrioides* NA1000

MSDGSIDLKADARARAYSIPLEDYHVADPALFQADAMWPYFERLRKEAPVHYSKGD EEVGPYWSVTRYNDIMT  
VDTTHQVFSSDAHLGGITIRNFDEDFVLPMFIAMDQPKHDIQRKTVSPIVSPANLGRLEGIIRERVCGILDAL  
PINEPFDWVDKVSIELTTQMLATLFD FPWEERRKLTRWSDIATASPESGLIESEEARRAELLECLAYFTNLWN  
ERVNLTEPGNDLISMLAHGEATRDMPPMEYLG NVILLIVGGNDTTRNSLTGGLYALSKNPQEEAKLRADPGLI  
PNMVSEIIRWQTPLAHMRRTALEDYELAGQTIKKGDKVVMWYVSGNRDDTVIENADQFIVDRPNARRHLSFGF  
GIHRCVGNRLAEMQLKIVWEEILKRFPKIEVLEEPKRVYSTFVKGYERMMVRIPERI

>CYP153A3 (blr\_7242) *Bradyrhizobium diazoefficiens* USDA 110

MHYCKDSMFGPYWSVTRYNDIMEIETNHSVFSSASALGGITIRDIDPDLRRESFISMDPPRHAAQRKTVA PMF  
TPTHLDNLALNIRARSAECLDNLPRGEVFDWVDRVSIELTTQMLAVLFD FFWEDRRKLTRWSDIATTIPGPDG  
LVATEDERQAELTECAGYFARLWKERIEQPPKSDLLSMMAHGAATRDMDAKNFLGNLVLIVGGNDTTRNTMS  
GSIYALSQHPEQYRKLRENPAL LDSFVPEVIRWQTPLAHMRR TALSDFEFRGKQIKKGDKVVMWYVSGNRDEE  
AIEKPYDFIIDRARPRTHLSFGFGFIHRCVGLRLAELQLKIIWEEILKRFDHIDVVGE PKRVYSSFVKGLETLP  
VKIAA

>CYP153A3(BJ6T\_21500)*Bradyrhizobium japonicum* USDA 6

MHGTIESAAKLDLRRATSLPLEQFDPGDPELFR TDTFWPYFDRLRRDDPVHYCKDSMFGPYWSVTRYNDIM  
EIETNHSVFSSASALGGITIRDIDPDLRRESFISMDPPRHAAQRKTVA PMFTPTHLNLA LSIRERSAECLDN  
LPRGEVFDWVDRVSIELTTQMLAVLFD FFWEDRRKLTRWSDIATTIPGPDGLVATEDERQAELTECAGYFARL  
WKERIEQPPKSDLLSMMAHGAATRDMDAKNFLGNLILLIVGGNDTTRNTMSGSIYALSQHPEQYRKLREN PGL  
LDSFVPEVIRWQTPLAHMRR TALADFEFRGKQIKQGD KVVMMWYVSGNRDEEAIEKPYDFIIDRARPRTHLSFG  
FGIHRCVGLRLAELQLKIIWEEILKRFDHIDVVGE PKRVYSSFVKGLETLPVKISA

>CYP153A3(RN69\_10530)*Bradyrhizobium japonicum* E109

MHGTIESAAKLDLRRATSLPLEQFDPGDPELFR TDTFWPYFDRLRRDDPVHYCKDSMFGPYWSVTRYNDIM  
EIETNHSVFSSASALGGITIRDIDPDLRRESFISMDPPRHAAQRKTVA PMFTPTHLNLA LSIRERSAECLDN  
LPRGEVFDWVDRVSIELTTQMLAVLFD FFWEDRRKLTRWSDIATTIPGPDGLVATEDERQAELTECAGYFARL  
WKERIEQPPKSDLLSMMAHGAATRDMDAKNFLGNLILLIVGGNDTTRNTMSGSIYALSQHPEQYRKLREN PGL  
LDSFVPEVIRWQTPLAHMRR TALADFEFRGKQIKQGD KVVMMWYVSGNRDEEAIEKPYDFIIDRARPRTHLSFG  
FGIHRCVGLRLAELQLKIIWEEILKRFDHIDVVGE PKRVYSSFVKGLETLPVKISA

>CYP153A3(S23\_58660)*Bradyrhizobium* sp. S23321

MHGTIESAAKLDALRERASSLPLEQFDPGDPELFR TDTFWPYFDRLRREDPVHYCKDSMFGPYWSVTRYNDIM  
EIETNHSVFSSASSLGGITIRDIDPDLRRESFISMDPPRHAAQRKTVA PMFTPTHLNLA LNIRKRSAECLDN  
LPRGEVFDWVDRVSIELTTQMLAVLFD FFWEDRRKLTRWSDIATTIPGPDGLVATEDERQAELAE CAGYFARL  
WKERIAQPPKSDLLSMMAHGAATRDMDAKNFLGNLILLIVGGNDTTRNTMSGSLHALSQHPEQYRKLREN PEL  
LDSFVPEVIRWQTPLAHMRR TALADFEFRGKQIRKGD KVVMMWYVSGNRDEEAIERPYDFIIDRARPRTHLSFG  
FGIHRCVGLRLAELQLKIIWEEILKRFDHIDVVGE PKRVYSSFVKGF EALPVKIAA

>CYP153A3(BF49\_2772)*Bradyrhizobium* sp. BF49

MHGTIENAAKLDALRERASSLPLEQFDPGDPELFR TDTFWPYFDRLRREDPVHYCKDSMFGPYWSVTRYNDIM  
EIETNHSVFSSASSLGGITIRDIDPDLRRESFISMDPPRHAAQRKTVA PMFTPTHLNLA LSIRQ RSAECLDN  
LPRGEVFDWVDHVSIELTTQMLAVLFD FFWEDRRKLTRWSDIATTIPGPDGLVATEDERQAELTECAGYFARL  
WKERIAQPPKSDLLSMMAHGAATRDMDAKNFLGNLILLIVGGNDTTRNTMSGSLHALSQHPEQYRKLREN PAL  
LDSFVPEVIRWQTPLAHMRR TALADFEFRGKQIKKGDKVVMWYVSGNRDADAIEKPYEFII DRARPRTHLSFG  
FGIHRCVGLRLAELQLKIIWEEILKRFDHIEVVGE PKRVYSSFVKGLETLPVKIAA

>CYP153A4(bl r\_7243)*Bradyrhizobium diazoefficiens* USDA 110

MDGRRRRPMP LPQAGEVRKTTGATTMNIQTPVKVDKAERMRRARGEAYATPLAQFHGAPRLFQDDTLWPWFE  
RLRKEEPVHYCTNAPIEPYWSVVKYNDIMHVD TNHGIFSSDSTLGGISIRDVPEGYDPSFIAMDQPRHSAQR  
KTVSPMFTPTHLDELAKLIRQRSQTVLDNLPRNETFN FVERVSIELTTQMLATLFD FPWEERRKLTRWSDVST  
ALPKSGIVASAEERRREMD ECYAYMSKLWNERVNSAPRNDLLSLMAHNDATRFMDPDNL MGNIILLIVGGNDT  
TRNTMTG SVLALNENPEQYDKLRANPALIDSMVPEVIRWQTPLAHMRR TALQDTEIGGKQIKKGDRVVMWYVS  
GNRDEEAIDRPN EFII DRPRPRTHLSFGFGFIHRCVGMRLAELQLKIVWEEM LKRFDRIE VVGE PKRIYSSFIK  
GYESLPVRIPG

>CYP153A4(S23\_58670)*Bradyrhizobium* sp. S23321

MNIQTPVKTDKAERMRRAREEAYATPLAQFHGAPRLFQDDTLWPWF ER LRKEEPVHYCTNAPIEPYWSVVKY  
DDIMHVD TNHGIFSSDSTLGGIGIRDVPQGYDWPSFIAMDQPRHSSQRKTVSPMFTPAHLDELAKLIRQRSQT

VLDNLPRNETFNFVERVSIELTTQMLATLFDFFPWDERRKLTRWSDVATALPKSGIVASAEERRREMDECYAYM  
SKLWNERVNSAPRNDLLSLMAHNDATRFMDPDNLMGNIILLIVGGNDTTRNTMTGSVLALNENPEQYDKLRAN  
PELIDSMVPEVIRWQTPLAHMRRTALQDTEIGGKHIKKGDRVVMWYVSGNRDEEMFEKPNEFIIDRPRPRTHL  
SFGFGIHRCSVGMRLAELQLRIVWEEMLKRFDRIEVVGEPEPKRIYSSFIKGYESLPVRIPG

>CYP153A4 (BF49\_2773) *Bradyrhizobium* sp. BF49

MNIQAPVQVDKAERMRRAREEAYATPLAQFHGAPRLFQDDTLWPWFERLRKEEPVHYCTNAPIEPYWSVVKY  
DDIMHVDTNHGLFSSDSTLGGIGIRDVPEGYDWPSFIAMDQPRHSSQKRTVSPMFTPTHLELAKLIRQRSQT  
VLDNLPRNETFNFVERVSIELTTQMLATLFDFFPWEERRKLTRWSDVATALPKSGIVASAEERRREMDECYAYM  
SRLWNERVNSAPRNDLLSLMAHNDATRFMDPDNLMGNIILLIVGGNDTTRNTMTGSVLALNENPEQYDRLAN  
PELIDSMVPEVIRWQTPLAHMRRTALQDTEVGGKHIKKGDRVVMWYVSGNRDEEMFERPNEFVIDRPRPRTHL  
SFGFGIHRCSVGMRLAELQLKIVWEEMLKRFDRIEVVGEPEPKRIYSSFIKGYESLPVRIPG

>CYP153A4 (BJ6T\_21490) *Bradyrhizobium japonicum* USDA 6

MNIQTPVKTDKAERMRRAREEAYATPLAQFHGAPRLFQDDTLWPWFERLRKEEPVHYCTNAPIEPYWSVVKY  
NDIMHVDTSHGIFSSDSTLGGIGIRDVPQGYDWPSFIAMDQPQHSARQKTVSPMFTPTHLELAKLIRQRSQT  
VLDNLPRNETFNFVERVSIELTTQMLATLFDFFPWDERRKLTRWSDVATALPKSGIVASAEERRREMDECYAYM  
SKLWNERVNSAPRNDLLSLMAHNDATRFMDPDNLMGNIILLIVGGNDTTRNTMSGSVLALSENPEQFDKLRAN  
PELIDSMVPEVIRWQTPLAHMRRTALADTEIGGKHIKKGDRVVMWYVSGNRDEEMFEKPNDFIIDRPRPRTHL  
SFGFGIHRCSVGMRLAELQLRIVWEEMLKRFDRIEVVGEPEPKRIYSSFIKGYESLPVRIPG

>CYP153A4 (RN69\_10525) *Bradyrhizobium japonicum* E109

MNIQTPVKTDKAERMRRAREEAYATPLAQFHGAPRLFQDDTLWPWFERLRKEEPVHYCTNAPIEPYWSVVKY  
NDIMHVDTSHGIFSSDSTLGGIGIRDVPQGYDWPSFIAMDQPQHSARQKTVSPMFTPTHLELAKLIRQRSQT  
VLDNLPRNETFNFVERVSIELTTQMLATLFDFFPWDERRKLTRWSDVATALPKSGIVASAEERRREMDECYAYM  
SKLWNERVNSAPRNDLLSLMAHNDATRFMDPDNLMGNIILLIVGGNDTTRNTMSGSVLALSENPEQFDKLRAN  
PELIDSMVPEVIRWQTPLAHMRRTALADTEIGGKHIKKGDRVVMWYVSGNRDEEMFEKPNDFIIDRPRPRTHL  
SFGFGIHRCSVGMRLAELQLRIVWEEMLKRFDRIEVVGEPEPKRIYSSFIKGYESLPVRIPG

>CYP153A5 (Rpa1\_1803) *Rhodopseudomonas palustris* TIE-1

MHGTIETGKAARLRAAREEAYATPLKDFHGPAPRHFRDDTLWPWFERLRAEEPVHYCTNAPIEPYWSVTKYND  
IMHVDTNHQIFSSDSTLGGISIRDAPVGYDWPSFIAMDEPRHSAQKRTVSPMFTPDHLDELAVLIRGRTQKVL  
DGLPRGETFNFVDRVSIELTTQMLATLFDFFPDERRKLTRWSDVATALPKSGVVDSEQQRRDELNECAAYFAR  
MWNERNVNSEPRNDLLSMMAHHDATRTMDRDNIGNILLIVGGNDTTRNTMSGSVLALNENPHEFEKLRANPK  
LIDTMVPEVIRWQTPLAHMRRTALQDTELGGKTIKRGDRVVMWYVSGNRDDEVIERPEEFIIDRARARIHLSF  
GFGIHRCSVGMRLAELQLRIVWEEMLKRFERIEVVGEPEPKRVYSSFVKGYESLPVRVS

>CYP153A5 (Rpx1\_3910) *Rhodopseudomonas palustris* DX-1

MHGTIESGKAARLRAAREEAYATPLKDFHGPAPRHFRDDTLWPWFERLRKEEPVHYCTNAPIEPYWSVTKYND  
IMHVDTSHQIFSSDSTLGGISIRDAPVGYDWPSFIAMDEPRHSAQKRTVSPMFTPDHLDELAVLIRGRTQKVL  
DGLPRGETFNFVDRVSIELTTQMLATLFDFFPDERRKLTRWSDVATALPKSGVVESEQQRRDELNECAAYFAR  
MWNERNVNSEPRNDLLSMMAHHDATREMDRDNIGNILLIVGGNDTTRNTMSGSVLALNENPHEFDKLRANPK  
LIDTMVPEVIRWQTPLAHMRRTALVDTELGGKTIKRGDRVVMWYVSGNRDDEVIERPDEFIIDRPRARIHLSF  
GFGIHRCSVGMRLAELQLRIVWEEMLKRFERIEVVGEPEPKRVYSSFVKGYESLPVQVS

>CYP153A9 (blr\_1853) *Bradyrhizobium diazoefficiens* USDA 110

MNRRLEIHRADDGYIIPSELVDVSEGRFQDDSIWGCFERLRREDPVHYCQNSAHGPYWSITKYRDIVAVDTN  
HHAFSSQQGVTVIVEVPDKHWTPSFIKMGPPQHAEQRNTVSPIVGPESLTRLETIRSRVIRMILDGLPRNEVFN  
WVTKVSIELTTQTLATLFDFFPDERRLLTYWSDAAVTTPKAGYAIDSWDKRSTILSECLDYFTRLWNERINAE  
PRLDLISLMAHSPVTRHMEPTFEFLGNLILLIVGGNDTTRNSITGGLLFMSQYPSELRLKLTDPNKLISAVSEI  
IRYQTPIAHMRRTAAIDSIVGGKPIRTGDKVVMWYISGNRDEEVNIENANSFVIDRKNVRQHLSFGFGIHRCLG  
RHLAELQLRVLWEEILDGGLKIKVVGEPERIASNFVHGYSALPVRIEA

>CYP153A9 (RN69\_38720) *Bradyrhizobium japonicum* E109

MEIHRADDGYIIPLSELVDVSEGKRFQDDSIWGCFERLRREDPVHYCQNSAHGPYWSITKYRDIVAVDTNHHAF  
SSQQGVTVIVEVPDKHWTPSFIFKMGPQHAEQRNTVSPIVGPESLTRLTLIRSRVRMILDGLPRNEVFNWVTK  
VSIELTTQTLATLFDFFEDRRLTTYWSDAAVTPKAGYAIDSWDKRSTILSECLDYFTRLWNERINAEPRLD  
LISLMAHSPVTRHMEPTEFLGNLILLIVGGNDTTRNSITGGLLFMSQYPSELRKLTDPNKLISSAVSEIIRYQ  
TPIAHMRRTAAIDSIVGGKPIRTGDKVVMWYISGNRDEEVIENANSFVIDRKNVRQHLSFGFGIHRCLGRHLA  
ELQLRVLWEEILDGGLKIKVVGEPERIASNFVHGYSALPVRIEA

>CYP153A9 (BJ6T\_79720) *Bradyrhizobium japonicum* USDA 6

MPDKHWTPSFIFKMGPQHAEQRNTVSPIVGPESLTRLTLIRSRVRMILDGLPRNEVFNWVTKVSIELTTQTL  
ATLFDFFEDRRLTTYWSDAAVTPKAGYAIDSWDKRSTILSECLDYFTRLWNERINAEPRLDLISLMAHSPV  
TRHMEPTEFLGNLILLIVGGNDTTRNSITGGLLFMSQYPSELRKLTDPNKLISSAVSEIIRYQTPIAHMRRTA  
AIDSIVGGKPIRTGDKVVMWYISGNRDEEVIENANSFVIDRKNVRQHLSFGFGIHRCLGRHLAELQLRVLWEE  
ILDGGLKIKVVGEPERIASNFVHGYSALPVRIEA

>CYP153A15 (HNE\_2042) *Hyphomonas neptunium* ATCC 15444

MTEREPLHPHNLRFGANIPPAADIDLSTLDLIDGELWRQGYWDRFERLRNEDPLHYCPDSFPGPFWSVTRYE  
DVMAIDTDHKRFSSSWEYGGITLGEPIISDFEMPMFIAMDEPRHSEQRKTVQPAVAPDMLKVYEPLIRSRTQGL  
LDLSLPVNEPFDWVDKVSVELTTMMLATLFDYPFENRRDLTHWSDVATGMHNPDICPGGEEEWKATMMKCLMTF  
MGIYQERQQQPQKPDLMSSLLAHGEKTKNMTPEMELLGNVILLIVGGNDTTRNSMTASVFALNKFPKEYEKLKAD  
PSIIPNMVSETIRWQTPLAYMRRTALEDEVEMHGKTIKKGQVAMWYVSANRDERFWDKPNDFIADRPEARRH  
SFGFGIHRVGNRLAELQLRILWEEIMERFEHIEVLAEPSLNQNAFVKGYNWMPVVLHPK

>CYP153A26 (Plav\_0025) *Parvibaculum lavamentivorans*

MSDAAVKYEADAEARDEAYSIPLAEINVADPSLFRDYKMWPYFERLRRAEAPVHYSQGNEDTGPYWSVTRYNDIM  
SVDTNHQVFSSEGGITLRDQDEDFKLPMFIAMDPPKHDDQRKVVSPIVAPGNLAKLEGTIRERAGKILDELPT  
GEPVDWVDRVSIELTTQMLATLFDFFPEERRKLTRWSDVATATEESGIIIESEEQRRAELLECAEYFMGLWNER  
VNAREPGNDLISMLAHGESTRNMDKMEYLGNLILLIVGGNDTTRNSISGGLYALNKFPDQYKLLANPGIIPN  
MVPEIIRWQTPLAYMRRTALQDAEVGGQTIRKGEKVAMWYVSGNRDESVIQNPNELVIDRERPRQHLSFGFGI  
HRCVGNRLAEMQLRIIWEIILKRWDPQIRVLSEPPQVRVHSSFVKGYEKMVELPKRKH

>CYP153A27 (Plav\_1765) *Parvibaculum lavamentivorans*

MSETLVAARDKSIADAYAIPLEKIDVSNPELFRANAIWPYFERLRREDPVHYCKESEYGSFWSVTKYKDIMHV  
DTNHGIYSSEATLGGVALRNQEEGFFLPMFIMMDPPKHDAQRKVVSPIVAPGNLAKLEGTIRERAGNILD  
VNETFDWVDRVSIELTTQMLATLFDFFPEERRKLTRWSDVAAAGTAFGDEETEKARNELRDCAAYFTELWNQ  
RVNATEPGNDLITMLAQGEATKNMGPMYELGNVLLIVGGNDTTRNSITGGLLALNENPVQYKLLRDNPSLVE  
SMVPEIIRWQTPLSHMRRTALQDTELGGKQIKKGDKVVMWYVSGNRDEEAIENANSFIIDRKHPRQHLSFGFG  
IHRVGNRLAEMQLRVVWEEILKRWDPKPIEVVGEPTRVFSNLIKGYSSMPVRIPG

>CYP153A29 (Plav\_1782) *Parvibaculum lavamentivorans*

MTTDTLVGDTASTVPLSQMDVSDPKLFQSDMIGSYFARLRREDPVHYCPESAYGPYWSVTKFNDIMQVEVNHQ  
TFSSEAKLGGIALQDMQSGEAALELEMFIAMDPPKHDAQRKAVSPAVAPSNLVLLPEIIRERAGIILD  
EIDWVDRVSIELTTMTLATLFDFFPEERRKLTRWSDVATSTPETGVVSSFEQRREELLECAHYFKGLWDQ  
NEPPKPDLSMMVHSPATRDMPYLEFLGNLILLIVGGNDTTRNSISGGVLALNQNPAEYRKLMADPDLPKMI  
PEIIRWQTPLTHMRRTALMDAEIGGKKIRKGDVVMWYLSGNRDEVIDRPNEFIINRPNSRHLSFGFGVHR  
CMGNRVAELQLRIIWEIILKRFKVEVVGAPERTLSNFIRGFTHLPVKLYVH

>CYP153A30 (Plav\_1951) *Parvibaculum lavamentivorans*

MSEQVSVGRDYTRSNADLAAKWKIDVNRDPWSIPLLELDPAHDELFAANTVLPYFERLRKEDPVHLNETGPY  
RYWSVTKYEDIMHVDTNHKIFSSDIRNGGIRLGGQRIEGEPDPLTYLPMFIMEDPPKHDEQRKAVQPMFT  
PQN



LADLEPLIRERAGLILDALPRGETFNWVRQVSVELTGRTLATLFNVPQEDRHKLIHWSDTVERLGDPEYFETP  
EEGFKELWNCWEYFDGVWKDRLANPGSDLISLLAHSPSTKNMPPNEYLGNMLLLIVGGNDTTRNSITGGVLAL  
NQYPDEYAKLIANPDIIPNMVSEIIRWQSPVAHMCRTATEDTELGGKKIRKWDKVAMWYVSGNRDDSKIDRAN  
EFLIDREGARHHLISFGFGIHRICIGNRVGEMQLRILWEEIMKRFKKVEVVGDPKYLRSNFIRGITELPVIVRE

>CYP153A31 (Plav\_2128) *Parvibaculum lavamentivorans*

MTATASAAAPAGIDDPYALSLDQIDVSKPELFERNAEGAYFARLRREDPVHFCADSAYGPYWSITKYKDIMAV  
DTNHQVFSSEAGLGGIIIEDGIQKSSGEGSIDLPNFIAMDPKHDGQRKAVSPIVAPANLANLEGTIRERVGR  
VLDGLPVGEEFDWVPVAVSIELTTQMLATLFDFFPEERSKLTWSDVATAEPGSGIVDSWEQRTSEIMECAECF  
QGLWNERMEKPGMDLVSMMAHSPATHDMTPQNYLGNVLLLIVGGNDTTRNSMTGGVLALHQNPAEFAKLKANH  
GLIDSMVSETIRWQTPLAHMRRTALADAIEVGGKTIRKGDKVVMWYVSGNRDKDVI IQPDDFIIDRERPRQHL  
FGFGVHRCVGNRLAEMQLKILWEEILKRFSRIEVTSEPVTRTSNFVRGYASMPVRLHA

>CYP153A77 (TQ29\_05625) *Confluentimicrobium* sp. EMB200-NS6

MAWLCTCRSNNSDCRVKEKAMTSIKDIPLSDLDPSVQTRFQSGEHFEVFDRLRAEAPVYFHETTQYGPFWIS  
KYKDIEVEANPKVFSSDAAYGGIWIKEQPKDTIRKSEMTADQPEHDQQRKVVNPIVSPSNLNDMEQKVRD  
TLVLDDLPLNEEIDWVERVSVEVTGRVLCELMDFPVEERMDLTWSDIVNTDVDAGTEITDEYVKLEKLKPMI  
IKFKELFAERTGMPPQNDLISMLAHSQETANMEPQQFVGMLVLLMVGGNDTTRNSISGGLDALNKFPEEYKKL  
RENPELVESMVPEIIRWVTPVAHMRRTALEDIEFHGQQIKKGDKVIMWYCSGNRDEPIEDPYTFKIDRKNPR  
QHVSFGFGIHRCLGNRMAELQLRVLWEEILKRGVVIETTGEPERRFSNFVVGIDSLKAIIRKPE

>CYP153A78 (JI59\_24805) *Novosphingobium pentaromativorans*

MSRFVAGIPLAEIDVSRPSLFQSDKIGAFFERLRREDPVHYCAESSYGPYWSITRYDDIMAVDTNHKVYSSEA  
KLGGAIQDMHRDQSNLELEMFIAMDQPKHDAQRKAVTPAVAPSNLLLLLEPVIRERAGAILDALPVGEEIDWV  
KCVSVELTTMTLATLFDFFPDERARLTRWSDVTTAIPGAGIVDSFEQRRAEELIECAMYFKGLWDQRIDQPEGN  
DLISMMANSPATRDMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNRHPDQYDKLRRDPAVISSMVPEIIRW  
QTPLTHMRRTALEDSEIGGKRIAKGDKVVMWYLSGNRDETAIDRPEEFIIDRKNPRQHLISFGYGIHRCMGNRL  
AELQLRIIWEEIQKRFDFFVEVVGEPPERLLSNLVRGITRPLVKLHAH

>CYP153A78 (AB433\_17955) *Croceicoccus naphthovorans*

MTTLTISPDQDSAELSRFVAGIPLAEIDVSRPSLFQSDKIGAFFERLRREDPVHYCAESSYGPYWSITRYDDI  
MAVDTNHKVYSSEAKLGGIAIQDMHRDQSNLELEMFIAMDQPKHDAQRKAVTPAVAPSNLLLLLEPVIRERAGA  
ILDALPVGEEIDWVKCVSVELTTMTLATLFDFFPDERARLTRWSDVTTAIPGAGIVDSFEQRRAEELIECAMYF  
KGLWDQRIDQPEGNDLISMMANSPATRDMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNRHPDQYDKLRRD  
PAVISSMVPEIIRWQTPLTHMRRTALEDSEIGGKRIAKGDKVVMWYLSGNRDETAIDRPEEFIIDRKNPRQHL  
ISFGYGIHRCMGNRLAELQLRIIWEEIQKRFDFFVEVVGEPPERLLSNLVRGITRPLVKLHAH

>CYP153A78 (PP1Y\_AT31178) *Novosphingobium* sp. PP1Y

MAVDTNHKVYSSEAKLGGIAIQDMHSDQSNLELEMFIAMDQPKHDAQRKAVTSAPVAPSNLLLLLEPVIRERAGA  
ILDALPVGEEIDWVKCVSVELTTMTLATLFDFFPDERARLTRWSDVTTAIPGAGIVDSFEQRRAEELIECAMYF  
KGLWDQRIDQPGGNDLISMMANSPATRDMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNKHDPQYDKLRRD  
PALIGSIVPEIIRWQTPLTHMRRTALEDSEIGGKRIAKGDKVVMWYLSGNRDETAIDRPEEFIIDRKNPRQHL  
ISFGYGIHRCMGNRLAELQLRIIWEEIQKRFDFFVEVVGEPPERLLSNLVRGITRPLVKLHAH

>CYP153A79 (BSY18\_3828) *Blastomonas* sp. RAC04

MAAQAIPTDLDEADLARAIAAIPLAEIDVARPSLFQSDKIGAFFERLRREDPVHYCAESAYGPYWSITRYNDI  
MAVDTNHKAFSSEAKLGGIAIQDMHSDQSNLELEMFIAMDQPKHDDQRKAVTPAVAPSNLLLLLEPVIRERAGA  
ILDSLVPGEEIDWVQSVSVELTTMTLATLFDFFPDERARLTRWSDVTTAIPGAGIVGSFEQRRKELIECAMYF  
KGLWDQRIDQPGGNDLISIMANSPATREMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNRHPQYDKLRRD  
PGLIGSMVPEIIRWQTPLTHMRRTALEDSEIGGKRISKGDKVVMWYLSGNRDETVIDRPEEFIIDRKNPRQHL  
ISFGYGIHRCMGNRLAELQLRITWEEIQKRFFHVEVVGEPPERLLSNLVRGITRPLVKLHAH

>CYP153A80 (Hba1\_0836) *Hirschia baltica*

MPDSSCVIGPDIGASRGNEILEAVSRGRFNTGGVVIAGPDQLDMDKVFLHPELWRRGEYFPYFKWLRDNSPV  
HYTAESPEGPFWSITRYEDIVAVDKNHQQFSSDSKYGGITIADLNQGFQLPMFIAMDRPEHTRYRKAVQPVMD  
AASLKNFEHLIRERTIQTLDSLPIHEPFDFVDKVSVELTMMMLATLFDFFPQKDRRKLRSWSDIATNKYNPEIC  
PGGEAQWQKELTECLMYFMTLWQERGQREEPGHDLLSALAHDANTKNMTPQELLGNLILLIVGGNDTTRNSMT  
GSVYAWNLFPEFEKVKADRSLVPNLAAETLRWQTSLAYMRRTAVEDVEMHGKLIKKGDKVLMWYVSGNRDER  
AIERPDEIWIDRPNVRRHLAFGFGIHRVCVGNRLAEMQMSILWEEILKRYSYIEVLQEPERLPNSFVKGYKSMN  
VMLHPA

>CYP153A81 (Cseg\_0011) *Caulobacter segnis*

MSDGSVDLKEAARAQAYATPLEDIHVANPALFQADAMWPYFERLRKEAPVHYSQGDEETGPYWSITRYNDIMT  
VDTTHQVFSSDAHLGGITIRNFDEDFVLPMFIAMDPPKHDIQRKTVSPIVSPQNLRLEGIIRERVQRILDDL  
PVGEPFDWVDKVSIELTTQMLATLFDFFWEERRKLTRWSDVATASPESGIVESEDARRAEELLECLGYFTNLWN  
ERVNQTEPGSDLISMLAHGEATRDMPPEYLGNVILLIVGGNDTTRNSITGGLYALSKNPQEEAKLRADPSLI  
PNMVSEIIRWQTPLAHMRRTALEDYELSGQTIKKGDKVVMWYVSGNRDDTVIEDADKFIIDRPSARRHLSFGF  
GIHRCVGNRLAEMQLRIVWEEILQRFPRIEVLLEPPRRVYSTFVKGYERMMVRIPEPV

>CYP153A82 (Caul\_0020) *Caulobacter* sp. K31

MSDGSIDFGDDARAKAWSIPLEDYHVADPALFQADAMWPYFERLRKEDPVHWSRGIEETGPYWSITKYNDIMA  
VDTNHQVFSSDAHLGGITIRDFDEDFVLPMFIAMDPPKHDIQRKTVSPIVSPQNLRLEGIIRERVCTILDGL  
PIGETFDWVDKVSIELTTQMLATLFDFFWEERRKLTRWSDVATASPESGIEESEEARRAEELLECLAYFTNLWN  
ERVNATEPGDDLISMLAHGEATRDMPPEYLGNIILLIVGGNDTTRNSLTGGLYALSKNPQEAKLRADPELI  
PSMVSEIIRWQTPLAHMRRTALADIELGGKQIRKGDVVMWYVSGNRDDTVIENPDAFIIDRENPRRHLSFGF  
GIHRCVGNRLAEMQLKIVWEEILKRFPKIEVLGEPKRVYSSFVKGYESLPVRIPTRL

>CYP153A83 (AEM38\_08110) *Hyphomonadaceae bacterium* UKL13-1

MADGNFNPAEFKSVQEHAKRAWSIPLEEIDVAMPPELWTHDCHWPYFERLRKEDPIHWCESQEEKVGGYWSVT  
RYKDIMAVDTNHHQFSSDAFLGGITIVGFDEDFILPMFIAMDPPKHDAQRKVVQPIVGPDLNLMESTIRERV  
NLIFDELPIDQEFDWVDKVSVELTTQMLATLFDFFWEDRRKLTRWSDVATAQPIPGGLIETEDQRRAELECL  
AYFTNLWNERVNNSGGNDLISMLAHGEATRNMEPLEYLGNIILLIVGGNDTTRNSLTGGLYALSKNPPEEFKKL  
RADPSVIPNMVSEIIRWQTPLAHMRRTALEDELGGKQIKKGDKVVMWYVSGNRDDEMIERPNDFWIDRPRAR  
NHLISFGFGIHRVCVGNRLAEMQLRIVWEEALKRYSDIQVSEPTRIRSAFVKGYESMRVILRK

>CYP153A84 (Caul\_5296) *Caulobacter* sp. K31

MSDGAIDLRAEARAKAYAMPLEDINLADTELWRTDTVWPYLERLRKEDPVHLHPAHHHPDGAFWSITKYADIM  
AVDINHEVFSSEPSITIFDPKEDFTLPMFIAMDPPKHQVQRKTVSPIVSPANLHLMPELIRSRTIKTLDELPI  
GEPFDWVDRVSIELTTQMLATLFDFFWEDRRKLTRWSDIATAVPESGLFVTDDYETERMELFGCVDYFTRLW  
NERVNAPPKGDLSMLAHGEATRNMDRMEYLGNIILLIIGGNDTTRNTMTGSILAMNQNPQDLRKLRENPSLI  
PSMVSETIRWQTPLSNMRRTATQDFELGGKLIKKGDKVLIWYASGNRDEEAIENPEAYIIDRERPRNHLISFGF  
GIHRCVGNRLAELQLRILWEEILPRFPFPIQVLEDPQVRVSVLIRGYSSMPVMIPARS

>CYP153A85 (PHZ\_c0813) *Phenylobacterium zucineum*

MDDASIDLQRAARDAAYSMPIEEINPADPELFRDTMWPYFERLRKEDPVHWGVSPHEDVGGYWSVTKYNDIM  
AVDTNHEVFSSEPTIVLPDPADDFTLPMFIAMDPPKHQVQRKTVQPIVAPNHLAYLEPIIRERAGKILDDLPI  
GEEINWVDKVSIELTTMTLATLFDFFWEDRRKLTFWSDVATSAPESGILGTTDPEEHNLRRTLFECVDYFM  
RLWNERVNAPPKPDLSMLAHGESTKNMDRMEYLGNIILLIIGGNDTTRNTISGSVLALHQNPDQDRKLREN  
GLIPAMVSETIRWQTPLAYMRRRAKRDFELGGKTIREGDKVAMWYVSGNRDEEVIDRPNDYWIERPRVRQHLS  
FGFGVHRCVGNRLAELQLKIWEEILARFPRLEVVGPPRRVYSSFVKGYEELPVVPIPTRN

>CYP153A86 (SKP52\_24460) *Sphingopyxis fribergensis*

MATSAVHNQTVDSIPLGEINVANPYLFQNDTVGEYFSRLRREDPVHYCAESRFGPYWSVTKFNDIMAVDTNHHK  
VFSSEAKLGGISVQDMHSDESASALELEMFIAMDQPKHDQQRKAVSPVVAPSNLLLLLEPIIRERAGSILDALPVG  
EEIDWVKLVSVELTTMTLATIFNFPWEERAKLTRWSDVTTASPETGIVESFEQRREELIECAMYFKGLWDQRI  
DQPGGNDLISMMAHSPATRDMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNQNPGYQKLRNNPALVSSMI  
PEIIRWQTPLTHMRRTALEDVKIGGKQIRKGDVVMWYLSGNRDDTVIDRAEEFIIDRENPRHHSFGFGIHR  
CMGNRLAELQLRIIWEIEILKRYSFVEVVGEPERLLSNLVRGITRLPVKLHVH

>CYP153A87 (S58\_15730) *Bradyrhizobium oligotrophicum*

MHGSTITAETRRHAATGKPAIDEAASRAASLPLAEFDPGHPELFRDTHTWPHYFDRRLRREEPVHYCKNSMFGPY  
WSITRYDDIMEIETNHAVFSSASALGGITIRDVDPPELRRESFIAMDPPRHAAQRKTVPMTPTHLDELAINI  
RKRSAECLDNLPVGEVFDWVDRVSIELTTQMLAVLFDFFWEDRRKLTRWSDIATTIPGPDGLVATEDERQAE  
MECARYFARLWQERASQPPKSDLISMMAHSEATRNMDPKNFLGNLVLLIVGGNDTTRNTMSGSIYALSQHPEQ  
YRKLKDNPALIDSFVPEVIRWQTPLAHMRRTALEDFFEFRGRQIRKGDVVMWYVSGNRDETSIERPYDFIIDR  
IRPRQHLISFGFGIHRVGLRLAELQLKIIWEIEILRRFDHIDVMDPEKRVYSSFVKGYETLPVRIAV

>CYP153A88 (S58\_15720) *Bradyrhizobium oligotrophicum*

MTVQAALRSDDHADRLRDARLEAYSTPIEDFHPGAPRLFQNDTIWPFERLRKEAPVHYCTKAPIEPYWSVTRY  
HDIMHVDTNHAIFSSDVSHGGITIRDVAPGYEWPSFIAMDEPVHGEQRKTVPMTPTDHLDELAVLIRQSAK  
VLDALPRNETFNVWEKVSIELTTQMLATLFDFFPEERRKLTRWSDVSTALPKSGIVSSEEERRRELAECAET  
GRMWKARQAEPGRDLISMMAHSEATRNMTPDNLGMNLILLIVGGNDTTRNSMTASVLALNENPAEYQKLRDNP  
ALVETMVPEVIRWQTPLAHMRRTALVDTELGGKTIKKGDRVVMWYVSGNRDEEVIENPDFAFIIDRKRPRIHLS  
FGFGIHRVGMRLAELQLRIVWQEILKRFDRIEVVGEPEKRVYSSFVRGYESLPVRIPG

>CYP153A89 (RPB\_3934) *Rhodopseudomonas palustris* HaA2

MHGTIEIDNAARQRAAREEAYATPLSQFHGAPRHRFRDDTLWPWFERLRAEAPVHYCTNAPIEPYWSVTKYND  
IMHVDTSHQIFSSDSTLGGISIRDAPQGYDWPSFIAMDEPRHSAQRKTVPMTPTDHLDELAVLIRGRTEKVL  
DGLPRNETFNFVERVSIELTTQMLATLFDFFPFAQRRLTRWSDVATALPKSMIVASEEERRSELNECAATFAA  
MWNERNVSEPRNDLLSMAHHDATRQMDRDNIGNILLIVGGNDTTRNTMTGSLALNQNPDQFAKLRANPA  
LIDTMVPEVIRWQTPLAHMRRTALQDTELGGKTIKKGDRVVMWYVSGNRDDEVIERPNEFIIDRKRAKIHLSF  
FGFGIHRVGMRLAELQLKIVWEEMLRFRERIEVVGEPEKRVYSSFVKGYESLPVRIS

>CYP153A89 (RPD\_3694) *Rhodopseudomonas palustris* BisB5

MHGTIEIDKAARQRAAREEAYSTPLAQFHGAPRHRFRDDTLWPWFERLRAEAPVHYCTNAPIEPYWSVTKYND  
IMHVDTHHGIFSSDSTLGGIAIRDAPVGYDWPSFIAMDEPRHSAQRKTVPMTPTQHLDELAVLIRGRTEKVL  
DALPRNETFNFVERVSIELTTQMLATLFDFFPEERRKLTRWSDVATALPKSLIVASEEERRTVLNECAATFIK  
LWNERNVSEPRNDLLSMAHHDATRQMDRDNIGNILLIVGGNDTTRNTMTGSLALNENPDQFAKLRANPA  
LIDTMVPEVIRWQTPLAHMRRTALEDTELGGKTIKKGDRVVMWYVSGNRDDEVIERPNEFIIDRKRPKIHLSF  
FGFGIHRVGMRLAELQLKIVWEEMLRFRDRIEVVGEPEKRVYSSFVKGYESLPVRIS

>CYP153A90 (RPE\_4309) *Rhodopseudomonas palustris* BisA53

MHGSIESGKAARLRAAREEAYATPLKDFHGPAPRFRDDTLWPWFERLRNEAPVHYCTNAPIEPYWSVTKYHD  
IMHVDTHHQLFSSDQSLGGISIRDTPAGYDWPSFIAMDEPRHTAQRKTVPMTPTDHLDELAVLIRSRTRTL  
DGLPKNETFDFVERVSIELTTQMLATLFDFFPEQRRLTRWSDVATALPKSGVVESESQRRAMSECATYFTK  
MWNERNVSEPRNDLLSMAHHDATRMDHDNLLGNILLIVGGNDTTRNSMTGSLALNENPEQFAKLRANPA  
LIDTLVPEVIRWQTPLAHMRRTALEDSELGGKTIKGDVVMWYVSGNRDDEVIERPDEFIIDRKRPKIHLSF  
FGFGIHRVGMRLAELQLRIVWEEMLRGFENIDVVGDPKRVYSSFVKGYEALPVRLS

>CYP153A91 (RPC\_4264) *Rhodopseudomonas palustris* BisB18

MHGSDVSEKADRLRAARAEAYATPLKDFHGPAPRFRDDTLWPWFERLRAEAPVHYCTNAPIEPYWSVTKYHD  
IMNVDTHHEIFSSDSTLGGISIRDAPQGYDWPSFIAMDQPRHAEQRKTVPMTPTPEHLDELAVLIRQAGQVL  
DALPKNETFNFVEKVSIELTTQMLATLFDFFPDERRKLTRWSDVATALPKSGVVESETQRRTEMSECASYFTK  
LWNERINAAPRNDLISMMAHHDATRQMDHDNLLIGNILLIVGGNDTTRNTMTGSLALNENPDQFRKLRENPA

LLDSMVPEVIRWQTPLAHMRRTALVDSELGGKLIRKGERVVMWYVSGNRDDEAIEAPNDFIIDRARPRTHLSF  
FGGIHRCVGMRLAELQLRIVWEEMLKRFDDHIQVVGEPRRVYSSFVRGYECLPVRI

>CYP153A92 (SKP52\_13370) *Sphingopyxis fribergensis*

MSIDTMELDTAGKVAaipideIDVARPSLFQQDTIGLYFDRLRKEEPVHYCRESYVGpywsITKFDDIMAVDT  
NHKVSSEAKLGGIAIQDMHSVEGALELEMFIAMDPKHDQQRKAVTPAVAPSNLLLLLEPTIRERACQILDDL  
PIGEEFDWVDKVSVELTTMTLATLFDfPWEERRKLTRWSDVTTAAPETGIVESYEARREELIECAMYFKGLWE  
QRINEEPKNDLISIMAHSPATRDMPFLEFLGNLLLLLIVGGNDTTRNSISGGVLALNQNPDEYRKLNDPSLIA  
SMVPEIIRWQTPLTHMRRTALQDWEIGGKQIKKGDKVVMWYLSGNRDETVIDRADRFIIDRKNPRHLSFGYG  
IHRMGNRLAELQLRIIWEEIHKRFAKVEVTGEPERLFSNLVRGITNLPVRLHAR

>CYP153A93 (SGRAN\_1597) *Sphingopyxis granuli*

MDSQIAEPDAAARIASIPIEEIDVARPSLFQNDTIGLFFDRLRAEEPVHYCRESYVGpywsITKFDDIMAVDT  
NHKVSSEAKLGGIAIQDMHSVEGALELEMFIAMDPKHDQQRKAVTPAVAPSNLQLEPIIRKRAGEILDEL  
PIGEDFDWVDKVAIELTTMTLATLFDfPWEERRKLTRWSDVATAAPETGIVESYEARREELIGCAMYFKTLWD  
ERINEEPKNDLISIMAHSPATRDMPFLEFLGNLMMLLIVGGNDTTRNSISGGVLALNQSPDEYAKLDADPSLIS  
KMVPEIIRWQTPLTHMRRTALEDWEIGGKQIKKGDKVVMWYLSGNRDESAIERADQFIIDRKNPRHLSFGYG  
IHRMGNRLAELQLRIIWEEIHKRFSRVEVTGEPERLFSNLVRGITRLPVRLRAR

>CYP153A93 (ELI\_14945) *Erythrobacter litoralis* HTCC2594

MDSQIAEPDAAARIASIPIEEIDVARPSLFQNDTIGLFFDRLRAEEPVHYCRESYVGpywsITKFDDIMAVDT  
NHKVSSEAKLGGIAIQDMHSVEGALELEMFIAMDPKHDQQRKAVTPAVAPSNLQLEPIIRKRAGEILDEL  
PIGEDFDWVDKVAIELTTMTLATLFDfPWEERRKLTRWSDVATAAPETGIVESYEARREELIGCAMYFKTLWD  
ERINEEPKNDLISIMAHSPATRDMPFLEFLGNLMMLLIVGGNDTTRNSISGGVLALNQSPDEYAKLDADPSLIS  
KMVPEIIRWQTPLTHMRRTALEDWEIGGKQIKKGDKVVMWYLSGNRDESAIERADQFIIDRKNPRHLSFGYG  
IHRMGNRLAELQLRIIWEEIHKRFSRVEVTGEPERLFSNLVRGITRLPVRLRAR

>CYP153C1 (Saro\_1821) *Novosphingobium aromaticivorans*

MAATLAPDRAINPHDVSLNALYTEDRWREPFRWLRENMPVSYRAESPFGAYWSVVTHDLIQQVELDPGTYS  
WQRGNITIADSVNETEFNPIAQDPPIHTAQRKVIAPAFGPSQMVKLERLVRETTQLLDGLPMGEEFDWVER  
VSIPLTLGMLLILFDMFPDEWRDIKRWSDWASGVSEDSLNDAYRAEFVQQMGMMLRFDRLEARRALPPSDD  
LLSRMVHSDAMGHLTPPERIANIALLLIVGGNDTTRNSMSGLEALHRYPAELDKLRADPALSANAAQEIIRWQ  
SPVTHMRRTLTRDAELGGQRLAEGDKIVMWYISGNRDENVFPDAERFDVTRENARRHIGFGHGIHRCVGARLA  
EVQIAAVIEEIIATRRLRITPQGAPTRLASPFLLHGFTAMPVVMsRD

>CYP153C2 (ELI\_09815) *Erythrobacter litoralis* HTCC2594

MATAATDARAIAPVDVSREALYVENRWHEPFAQLRREMPVSWTPESPYPGYWSVVTHELVSKVELDTETFS  
WERGNITIADPAPETNLPNFIAADPPLHTAQRKVIQPAFAPSQMRIREQQVRERCAYLLDKVPVGETFDWVTE  
VSIPTMGMLCIIFGMDPDAESEDLKRWSDFASGVGENSQTEEYRAEWLTQMHAMLARFDQLLDERRQAEFGD  
DLLSRMVHSEAMGNLLPMERLANLALLLVGGNDTTRNSASAIVRGFDMYPEQLDVLYGDASLIPNAAQEVIRW  
QSPVLHMRRTTTRDTLAGQHIPEGEKVVLWYISANRDEAVFEDADRFDVARANARRHLAFGHGIHRCVGARLA  
AEIQIGTLIEEIVGRGWRIVPQGEPTRQASPFLLRGFTSMPVKIERG

>CYP153D1 (Saro\_0220) *Novosphingobium aromaticivorans*

MATQLAPEVPQFTYHSSPTATEAFAAWLKDNPAIPAHSHPWDVSRSDIYVEDRWQPIFAEMRAKAPVNRVPD  
SPYGAYWNVASHKAIMHVESLPELFSSSWQYGGITIGDPEDVDPOKLAERQLPMFIAMDRPDHTGQRRTVAP  
AFTPAKMVEMAEIRRRRTASVLDLSPWGERFDWVDKVSIELTTGMLAILFGFPWADRLLTFWSDWAGDVELT  
LARELADTRFGFLGEMAHYFQRLWGARMQAPPSGDLISMMIHSEAMNHMSPOEFMGNLVLLIVGGNDTTRNTM  
SGIVHALDKFPDQRELLERDASLIPNAVQECIRYVTPLAHMRRTATADTELFGNQIKAGEKVILWYISANRDE  
TVFENPDKLMVDRPNARRHLSFGHGIHRCVGARLAELQLRILLEEMHERRMRVRVAGEVERVRANFVHGFRKL  
EVELEKR

>CYP153D2 (LH19\_23840) *Sphingopyxis macrogoltabida* 203

MATVIRETPADPHPLDLSRADLWREDQWQEPMRQLRAESPIYYCEDSKFGPYWSVTTYKPIQHIEALPKIFSS  
SWEYGGITVAGDGLKEGEIPMPMFIAMDPPQHTAQRRTVAPAFGPSEIERMRADTQARTAALIDTLPVGE  
AFDWVERLSIELTTDMLAILFDFPWENRNLTRWSDALGDIESFNTLEERQQRLLATAFEMGAAPKELWDHKAK  
NPGKHDLSISIMLQSDAMNHMSHEEFMGNLILLIVGGNDTTRNSMSAYAYGLHCFPEERAKLEANHDPDLAVNA  
MHEIIRWQTPLAHMRRTALEDTLFGHQIRARDKIALWYASANRDESVFPDGDRIIVDRENARRHLAFGYGIH  
RCVGARVAELQLTSLISEMQKRRLRVNVLAEPERVNASFVHGHRMQVELERY

>CYP153D20 (BG023\_11368) *Porphyrobacter* sp. LM 6

MATIAPTPASQGIQRPQVRREPSAYDALKAHFAEHPEERLRHSHPWDVSRSEIYAEDKWQPIFAEMRKAGQLH  
WIPESPFPGPYWAVVGHKAIQHIEALPETFSSSWEHGGITILNRLSEEELAASNIERRELPFMFIAMDRPQHTGQ  
RRTVAPKFTPTSIADMEAEIRQRTGELLDSLPRGEVFDWVDTVSIELTTGMLAILFGFPWEDRRLTLFWSWDA  
GDTLGAVALDEVWGILQEMAAYFQTLWIERTMDKEPGNDLISMMIHSPAMNQMSPEEFMGNLVLLIVGGN  
DTTRNTMSGIIHALDKFPDQRKLFEEQPELIPNAVQEILRMQVPLAHMRRTCTEDTEVFGQTIKAGDKVVLWY  
ISANRDDEVFENPDKLDITRENARRHLAFGYGIHRCVGARLAELQLRVLLEELHKRRMRVHVAGDVERVRANF  
VHGFRKLEVEITTF

>CYP153D21 (Ga0102493\_11827) *Erythrobacter litoralis* DSM 8509

MATIAPKRPEVRRSPTAYEALKQHYDKHPDERLNLNHPHKWDVSRSDIYFEDRWQPIFKEMQDAGPLHYIPESPY  
GPYWAVVDHKAIQHIEALPETFSSSWEYGGITILERLTEEEAASNIDTRELPFMFIAMDRPQHTGQRRTVAPK  
FTPTAMADMEGDIRARTGELLDSLPRGETFDWVDKVSIELTTGMLAILFGFPWEDRRLTLFWSWAGDTLATA  
VRDLQDQERWSFLQEMAAYFQSLWVERTQDPSGDDLISMMIRSEAMNQMRPEEFMGNLVLLIVGGNDTTRNTMS  
GIVHALDKFPDQRKAFFENPELIPNAVQECLRYITPLAHMRRTCTEDTDVFGQTVKKGDKVVLWYLGANRDEK  
VFENPHKLDIRRENARRHIAFGYGIHRCVGARLAEMQLRLLEEMHKRRMRVHVAGDVERVRANFVHGFRKLE  
VEITEF

>CYP153D22 (AMC99\_02425) *Altererythrobacter epoxidivorans*

MATVAPERPKCRTEPTAYKALQQHLEHPEDKLDHPHKWDVSRSDIYAENTWHPHIFREMRAAGPLHYIPESPF  
GPYWAVVGHKAIQHIEALPDIFSSSWEHGGITILERLTDEQLAERGLEERRELPFMFIAMDRPQHTGQRRTVAP  
KFTPSGMAEMEGERQRTGELLDTLPRGEVFDWVDKVSIELTTGMLAILFGFPWEDRRLTYWSDWSGDTELA  
TVRELDDMRWGILQEMAAYFQSLWVERTHDKEPGDDLISMMIHSEAMNQMSPOEFMGNLILLIVGGNDTTRNS  
MSGFVYQLDKNPDQRKLFQDPSVIPNAVQEMLRMQTPLAHMRRTCTEDTEVFGQTIKAGDKVVLWYLSANRD  
EEVFENPDKLDLTRENARRHIAFGYGIHRCVGARLAELQLRVLLEEMHKRRMRVHLAGDVERVRANFVHGFRK  
LEVEITSF

>CYP153D23 (ELI\_12445) *Erythrobacter litoralis* HTCC2594

MATIAPQRPECRSEPTAYEALKKHFEHPEERPOHTHKWDVSRSDIYYENTWHPHIFREMREAGPLHYIPESPF  
GPYWAVVGHKAIQHIEALPDVFSSSWEHGGITILNRLSDEEREESGVDRRELPFMFIAMDRPEHTGQRRTVAPK  
FTPSGMAEMEGERQRTGELLDSLPRGEVFDWVDKVSIELTTGMLAILFGFPWEDRRLTLFWSWSDGDTELA  
VRELDEMWRWGLHEMAAYFQSLWVERTHDKEPGDDLISMMIHSPAMNQMRPEEFMGNLVLLIVGGNDTTRNSM  
SGIIYQLDKNPDQRKLFQDPSVIPNAVQEILRMQTPLAHMRRTCTEDTEVFGQIKKGDVVLWYLSANRDE  
EVFENPDKLDLTRENARRHIAFGYGIHRCVGARLAELQLRVLLEELHKRRMRVHLAGDVERVRANFVHGFRKL  
EVEVTEF

>CYP153D24 (WG74\_00870) *Citromicrobium* sp. JL477

MATTAQSPAGTHQWSRSPSAHKALEAHYAANPDTRPDYPHKWDTSRSDIYFENRWEPIFKEMRAAGPVHYIPE  
SPFGPYWSVVGHKAVQHTALPDIFSSSWEYGGITILDDLDPDIPPEERMRLPMFIAMDRPKHTGQRKTAVAPAF  
TPAEMKRLEDDIRQRTGETLDALPRGEVFDWVNTVSIPLTTGMLAILFDFPWEDRDLTHWSDWAGDTLATA  
RALDETRRGMLEHMAAYFQLLWAERAQKGEAPDLISRMHSPAMNQMEPOEFMGNLVLLIVGGNDTTRNTMSG  
IVHAFDRFPDQRKAFFEDASLIPNAVQECIRYQTPLKHMRTATQDTELFQONIAAGDKVVLWYNSANRDESV  
FEDAELKLDITRENARRHLAFGYGIHRCVGARLAELQLRVLLEEMHKRRLRVHVAGDVQVRANFVEGFRKLEV  
EVTEF

>CYP153D25 (TS85\_00425) *Sphingomonas* sp. WHSC-8

MATLAPETAPGSRVDPLDVTRPELYRDDTWHEPFQRRLRAEAPVRYTPDSEAFGPYWSVSSYKGIVAVESLPELY  
SSEAGGITVADLQEGDIKMPMFIAMDRPKHTGQRRTVAPAFPTSEMARMRENIRARSAEILDSPVGETFDWV  
DSVSIELTTQMLAILFDFPWADRRKLTFWSDWAGDIEIAKDPIKKQERLQHLFECAAYFGTLWQSKLGKPPPTP  
DLISMMIHSDAMSHMDQHEFLGNLILLIVGGNDTTRNSMSAFAYGLDLFPDERAKLEADPGLIPNAVQEIIIRW  
QTPLSHMRRTATADTELEGQTIIRAGDKLALWYVSANRDESVFADADRIRLDRENARRHLAFGHGIHRCVGARL  
AELQIGILLEEMARRRLRVNVVGAPERVAACFVHGYSRKLPLVELSRY

>CYP153D26 (BSY18\_3190) *Blastomonas* sp. RAC04

MATVFKDPGAELTYDMSDASWYVEDRWQEPFAQLRAHDPIHWTQGGSFQDFWNVTSHKAIQHVEALPEIFSSS  
YFEGGITLADRIDDGTELIMPMFIAMDRPKHTGQRRTVAPAFPTSEMARMRENIRARSAEILDSPVGETFDWV  
VDTVSIELTTQMLAILFDFPWADRRKLTWSDWAGDIELVHSEELRAERLKHLYEMGAYFKNLWDKINAEPT  
PDLISMMIHSDAMAEMDELEFMGNLILLIVGGNDTTRNSMSGAYCLHQFPEQREKLEQNPSLIPNAVQEIIIR  
WQTPLAHMRRTALADYDLFGKTIKKGDKLALWYISGNRDETVFEDADSIIVDRENARRHLAFGYGIHRCVGAR  
LAELQIAILLEEMAKRRMRVNVLAEPERVRACFVHGYSRSMQVQLSKY

>CYP153D27 (AM2010\_2294) *Altererythrobacter marenensis*

MATQFAEQPRQYRTSPIAVEALREHLALHPPEEKWSHTHPYDVSRSDIYFEDRWQPIFADMRAKGPIHWVDESP  
VGPYWNVVGHKAIGHVEALPELFSSSWEHGGITILNRLDEEQLAAGQGRERFELPMFIAMDRPKHTGQRRTVAP  
AFPTAEMKRLDDDIRHRTGELLDSLPGKEVFDWVDRVSIELTTGMLAILFDFPWEDRLLTFWSDWAGDTEIA  
MVRDLDEMQRQILREMGAYFQQLWADRANKEPGPDLISMMIHSPAMNQMSQPEFMGNLVLLIVGGNDTTRNTM  
SGIVHAFDFTFPDQRKLFEENPDLPNAVQECIRYQTPLAHMRRTCTEDTELFQKKIKAGDKLVWYLSANRDE  
DVFENPDKLDITRENARRHLAFGYGIHRCVGARLAELQLRVLLLEEMHARRMRVHVAGDVERVRANFVHGFRKL  
EVEVTSF

>CYP153D28 (SGRAN\_0250) *Sphingopyxis granuli*

MATVIREAPETVNPLDVSRAELWREDRWQEPMRRLRAESPIHYCEDSKFGPYWSVTYKPIQHVEALPKIFSS  
SWEYGGITVAGDGVEHLQEGEVPMPMFIAMDPPOHTAQRRTVAPAFGPSETERMRADTLKRTSDVLDLSPVGE  
PFDWVEKLSIELTTQMLAILFDFPWEERHKLTAWSDALGDIESFNTAEERQQLAIAYEMGAAFKELWDRKAQ  
NPGQHDLSIMLQSDAMSHMSHEEFMGNLILLIVGGNDTTRNSMSAYAYGLHQFPEERAKLEANHDPDLAVNA  
MHEILRWQTPLAHMRRTATEDTELFQGHQIKRKDKIALWYASANRDESVFPDGDRIIVDRENARRHLAFGYGIH  
RCVGARVAELQTLALISEMQRRRLRVNVLAEPERVNACFVHGYSRHMVQVELERY

>CYP153D29 (LH20\_02570) *Sphingopyxis* sp. 113P3

MATQIRVAPENPDPLDVSRAELWSEDWQEPMARLRAESPIHYCEDSKFGPYWSVTYKPIQHVEALPKIFSS  
SWEYGGITVAGDGIEHLQEGEVPMPMFIAMDPPOHTAQRRTVAPAFGPSEIERMRADTLARTSAVLDTLPIGE  
AFDWVEKLSIELTTQMLAILFDFPWEERHKLTAWSDALGDIESFNTLELRQKRLAIAYEMGAAFKELWDRKAK  
APGPHDLISIMLQSDAMSHMSHEEFMGNLILLIVGGNDTTRNSMSAYAYGLHCFPEERAKLEANHDPDLAVNA  
MHEIIRWQTPLAHMRRTATEDTELFQGHQIKRKDKIALWYASANRDESVFPDGDRIIVDRENARRHLAFGYGIH  
RCVGARVAELQTLALISEMQRRRLRVNVVGEPERVHASFVHGYSRHLPPVLEQY

>CYP153D30 (LH20\_20865) *Sphingopyxis* sp. 113P3

MATQIRVAPENPDPLDVSRAELWSEDWQEPMARLRAESPIHYCEDSKFGPYWSVTYKPIQHVEALPKIFSS  
SWEYGGITVAGDGIEHLQEGEVPMPMFIAMDPPOHTAQRRTVAPAFGPSEIERMRADTLARTSAVLDTLPIGE  
AFDWVEKLSIELTTQMLAILFDFPWEERHKLTAWSDALGDIESFNTLELRQKRLAIAYEMGAAFKELWDRKAK  
APGPHDLISIMLQSDAMSHMSHEEFMGNLILLIVGGNDTTRNSMSAYAYGLHCFPEERAKLEANHDPDLAVNA  
MHEIIRWQTPLAHMRRTATEDTELFQGHQIKRKDKIALWYASANRDESVFPDGDRIIVDRENARRHLAFGYGIH  
RCVGARVAELQTLALISEMQRRRLRVNVVGEPERVHASFVHGYSRHLPPVLEQY

>CYP153D31 (LH19\_27210) *Sphingopyxis macrogoltabida* 203

MATQALTKGDLATLDVSRGELYADDSWRPLFAQLRAEIPHIHYCPDSVFGPYWSVTRYDDIVAVEADPQTFSSS  
FEHGGIVLFDMDQDTNVKLMAMFIAMDDPEHGAQRKTVAPAFGPSEIAGHAVALRERTARLLDSLVPGETFDWVE  
RVSIELTTSMIATLFDWPWDDRHRLPVWSDWTAKIDIGDPVLNAERETHIFEMAAAFKQLFEERKAMPPKGD  
LLSIMAHSEVMADMDEQRFIGAIALLLVGNDTTRNSMSGLEQMNKFPDQWERLKADRSLISTAATETIRLQ  
TPICHMRRTVVQDTELGGQKLKAGDKVALWYNSANRDEAVFPDGDLDWDVGRSNSRRHLSFGYGIHRCLGARLA  
ELQLQVLIIEELLARDMTVEIAGEPERIPSCFTRGFHHLFVRIRKG

>CYP155J1 (S58\_40390) *Bradyrhizobium oligotrophicum*

MRIDSFAGAREVLRCPDVRQAGFNAELVARFIGPAHAPVLYQDGEPHQKQRSATARFFAPRVVATRYRELIER  
TSHELVARFRAAGRRLDDMSLELAVAVAADIVGLTESDRAMAVRLNRFFSAPVSGHGTIATLRQALLGQWR  
MLSFWHFDVRPAIRVRRRTTPREDVISHLIQEGYSREILTECLTYGAAGMATTREFIVMAAWRLLEREDLRAR  
FLQGDEQDRMTILEEVLRLPEVSTLKRRTATDLVVDGAGPMAIAANSLVEIEVGAANRDPASAAGPCPHQLD  
PDRARPAKASASLMSFGDGPGRCPGAVALHEAAIFLDQLLRVPGLHLEQVPAMTINPVSSGYELRGAVIAVA  
PQR

>CYP155J2 (BRADO3466) *Bradyrhizobium* sp. ORS 278

MTAQSSQHASAGAPVGHGDTFVIRIDSFAAARAVLRSGDVRQAGFNAELVHRFIGPRHAPVLYQDGEPHQRQR  
SATARFFTPRVVATRYCRLMETTSRELVAQFVTARRARLDDLSLTLAVAVAADIIGLTDSSRAAMAARLNRRFF  
AAPVGQGAATLRNAVFGQLRSLAFYWFVDVRPAIRARRARPREDVISHLLAEGYSREILTECLTYGAAGMAT  
TREFIVMAGVRLFEDDALRARFLAGNEPQRMALILEEVLRLPEVSTLKRRTACEMTLES DAGATTIPARSLLE  
IDVGAANRDEAAAGACPHRLDPDRTRPAKGSASLMSFGDGPGRCPGAVALHEAAIFLDQLLRVPGLRLERQP  
TKTVNPVSSGYELRDAVIVVG

>CYP155J3 (G432\_18345) *Sphingomonas* sp. MM-1

MLLVNAQAHSEADCPFHSGDDHRKSARASAGGGIIDADIWTDTFDRARAILRSDGAKQAGFLAEQVGKIGRAT  
RQPIFLFLEGEAHRVRRGATARFFTTPRIVATRYRELMIRLSDELVERFRQQKRARLDDLSLELAVAVAGDIVGL  
TASDPNGLARRLDIFFTGNFDPGRGRFRALVKFLRSQYRVLSFHYRDVVPARARKKKRQDDVISHLIDEEYT  
DREILTECLLYGAAGMATTREFIVMAAWHMLERDELRAAFQQADEAGKIAILEEILRLPEVVGYIFRRMRTDL  
PAADVRAAGNAVAVDVRAANTDETAFTGCPREIMAGREVS AKYGNAGMSFGDGEHRCPGAQVALHESCLFLDRL  
LRVPGLKLERAPDLAWNRLVTSYELRNAVIICS

>CYP155K1 (Swit\_3367) *Sphingomonas wittichii*

MDATIEPDERRTAFGRIPSRIAVERDAAGVWHVRGF AAAARALLRGDSTRQAGFKAELIERVPGRGKVPILFLE  
GRPHHEQRRLTAPFFTTPRAVDARYRPLMARLADRVIGDFRRRRRGELSAMGMEMAVGVAAEVVGLTDSRRPGL  
DRRINAFFADGLEQGGRLRRIRQALVAQFRLRLRFYVIDVRPSMAARRAQPREDVISHLLAQGYSGTEVLTEC  
ITYGAAGMVTTFREFITVCAWHLIDDAALCAQYLAADEPARHALLEELLRLPEVVGTLFRRTTCPVTLGGAEIP  
EGAMVAVDVRAVNADPAVSGERPLVRQPGRCPAERAGAPVLSFGDGAHRCPGSFLAIQEADIFLTRLLAIPGL  
RFERE PQVGWNDLVTGYELREAWLACD

>CYP173A1 (mlr5192) *Mesorhizobium loti* MAFF 303099

MDTQPAPFVPPAPKPRTSPPSTLEMIRIVYRNPLELWGEPTYNEPWISANGVGGHLIVANDPGLIRHVLVDNA  
KNYKMATVRQKILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHIFGFAQPMLKRTKEFVTRYEEGGASDIAH  
DMTLLTYDILAETLFSGEIAGEPGSFANEIDRLFETMGRVDPLDLLRAPDWLPRLTRIRGRKTMAYFRKIVTD  
TVKMREEKFRRDPDAVPQDFLTLLKAE GPDGLTRSEVEDNIIITFIGAGHETTARALGWTLYCLAESPWERNR  
VEQEIDEVLAREPDPTKWLDAMPLTRA AFDEALRLYPAPSINREPIEPBMWKDLYIPRHA AVLMPVWVVRH  
RKLWDRPD AFLPERFHGPNREKIDRFQYLPFGAGPRVCIGASFAMQEAI IALAILLSRFRFDTTAE TKPWPVQ  
KLTTQPQGGLPMQVTPR

>CYP173A1 (A9174\_01555) *Mesorhizobium loti* NZP2037

MDIQPAPFVPPAPKPRTPPSTLEMIRIVYRNPLELWGEHTYNEPWISANGVGGHLIVANDPGLIRHVLVDNA  
KNYKMATVRQKILRPILRDGLLTAEGEVWRRSRKAMAPVFTPRHIFGFAQPMLKRTKEFVTRYEAGGTS DIAH  
DMTLLTYDILAETLFSGQIAGEPGSFANEIDRLFETMGRVDPLDLLRAPDWLPRLTRIRGRKTMAYFRKIVTD

TVKMREEKFKRDPDAVPQDFLTLLLKAEGPDGLTRSEVEDNIITFIGAGHETTARALGWTLYCLAESPWERNR  
VEQEIDEVLARESDPTKWLDAMPLTRAADFDEALRLYPPAPSINREPIEPPEMWKDLYIPKHA AVLMPVWVHRH  
RKLWDRPDAFLPERFHGPNREKIDRFQYLPFGAGPRVCIGASFAMQEAIIALAILLSRFRFDTTAETKPWPVQ  
KLTTQPQGGLPMQVTPR

>CYP173A1 (Mesau\_00295) *Mesorhizobium australicum*

MDTQPAPFVPPAPKPRTSPPSTLEMIRIVYRNPLELWGEPTYNEPWISAKGAGGPLVIANDPGLIRHVLVDNA  
KNYKMATVRQKILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHIFGFVQ PMLKRTLEFVTRYEAGGTS DIAH  
DMTLLTYDILAETLFSGEIAGEPGSFANEIDRLFETMGRVDPLDLLRAPDWLPRLTRIRGRKTMAYFRKIVTD  
TVKMREEKVRRDPDAVPQDFLTLLLKAEGPDGLTRPEVEDNIITFIGAGHETTARALGWTLYCLAESPWERNR  
VEQEIDRVLAREPDPKWL DAMPLTRAADFDEALRLYPPAPSINREPIVPEMWKDLYIPKHA AVLMPVWVHRH  
RKLWDRPDAFLPERFHGPNREKIDRFQYLPFGAGPRVCIGASFAMQEAIIALAILLSRFRFDATAETKPWPVQ  
KLTTQPQGGLPMGVTPRPR

>CYP173A1 (Mesop\_0306) *Mesorhizobium opportunistum*

MDTQPAPFVPPAPKPRTSPPSTLEMIRIVYRNPLELWGEPTYNEPWISANGAGGPLVIANDPGLIRHVLVDNA  
KNYKMATVRQKILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHIFGFAQ PMLKRTREFATRYEAGGMS DIAH  
DMTLLTYDILAETLFSGEIAGEQGSFANEIDRLFETMGRVDPLDLLRAPDWLPRLTRIRGRKTMAYFRKIVTD  
TVKMREEKVRRDPDAVPQDFLTLLLKAEGPEGLTRAEVEDNIITFIGAGHETTARALGWTLYCLAESPWERNR  
VEQEIDQVLAREADPTKWLDAMPLTRAAFEALRLYPPAPSINREPIVPEMWKDLYIPKHA AVLMPVWVHRH  
RKLWDRPDAFLPERFHGPNREKIDRFQYLPFGAGPRVCIGASFAMQEAIIALAILLSRFRFDVTAETKPWPVQ  
KLTTQPHGGLPMQVTPR

>CYP173A1 (Mesci\_0325) *Mesorhizobium cicero*

MDIQPAPFIPPAPKPRTPPSTLEMIRIVYRNPLELWGEHTYNEPWISANGVGGHLIVANDPALIRHVLVDNA  
RNYKMATVRQKILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHIFGFAQ PMLRRTQDFVTRYEDGGTS DIAH  
DMTLLTYDILAETLFSGEISGEPGSFANEIDRLFETMGRVDPLDLLRAPDWLPRLTRIRGRKTMAYFRKIVTD  
TVKMREAKFKRDPDAVPQDFLTLLLKAEGPDGLTRAEVEDNIITFIGAGHETTARALGWTLYCLAESPWERNR  
VEQEIDQVLAREPDPPTKWLDAMPFTRAAFDALRLYPPAPSINREPIEPPEMWKDLHIPKHA AVLMPVWVHRH  
RKLWDRPDAFLPERFHGPNREKIDRFQYLPFGAGPRVCIGASFAMQEAIIALAIMLSRFRFDTTAETKPWPVQ  
KLTTQPQGGLPMQVTPR

>CYP173A2 (SMc02579) *Sinorhizobium meliloti* 1021

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRLILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHAQGFAGQMLRVCEAFVDYAGASSEPFVT  
NVAVDMTLTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCVANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A2 (SM11\_chr3525) *Sinorhizobium meliloti* SM11

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRLILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHAQGFAGQMLRVCEAFVDYAGASSEPFVT  
NVAVDMTLTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCVANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A2 (C770\_GR4Chr0060) *Sinorhizobium meliloti* GR4



MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRRLLILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHAQGFAGQMLRVCEAFVDRYAGASSEPFVT  
NVAVDMTELTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCVANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A2 (SM2011\_02579) *Sinorhizobium meliloti* 2011

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRRLLILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHAQGFAGQMLRVCEAFVDRYAGASSEPFVT  
NVAVDMTELTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCVANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A2 (DU99\_00295) *Sinorhizobium meliloti* RMO17

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRRLLILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHAQGFAGQMLRVCEAFVDRYAGASSEPFVT  
NVAVDMTELTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCVANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A2 (BN406\_03194) *Sinorhizobium meliloti* Rm41

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLNRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRRLLILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHAQGFAGQMLRVCEAFVDRYAGASSEPFVT  
NVAVDMTELTFEILAETLFSGEIAVEKQGFAANVEELLHRMGRVDPMDLLVAPSWVPRLTRIGGRKVLDRFRG  
VVSETMSLRRRRRTTEAPGDVPNDFTLLLLQLEGPDGLSTSEIEDNILTFIGAGHETTARALAWCFYCIANTPA  
YRETMEQEIDSVLASGADPVDWLGRMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGERVPIRKGISVL  
VMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DETHPWPVQRLTTQPRGGLPMKVSARVK

>CYP173A4 (A6B35\_06230) *Mesorhizobium amorphae*

MDTQPAPFVPPAPKPRTPPTSTLEMMRIVYRNPLELWGEHTYNEPWISVTGVGGPLVVANDPGLIRHVLVDNA  
RNYKMATVRQMILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHIFGFAQPMLKRTLDFVSRYEAGGTS DIAH  
DMTLLTYDILAETLFSGEISGEPGSFAREIDRLFETMGRVDPLDLLRAPEWLPRLTRIRGRKTMAYFRKIVTD  
TVRMREERLKRDPDAVPQDFLTLLLLKAEEDGLTRAEVEDNIIITFIGAGHETTARALGWTIYCLAEAPWEREK  
VEREIDTVLAREPDPTKWLDAMPLTRA AFEEALRLYPPAPSINREPIEPETWNELYIPRAAVLVMPVWVHRH  
RKLWDRPD AFMPERFHPGNREKIDRFQYLPFGAGPRVICIGASFAMQEAI IALA IMLSRFRFDTTAETKPWPVQ  
KLTTQPQGGPLPMQITPRVPIFK

>CYP173A5 (AA2016\_0104) *Aminobacter aminovorans*

MDTRPEPFVPPAPTPTPTSTLEMMRIVYRNPLELWGEPSYNEPWISVNGVGGPLVIANDPGLIRHVLVDNA  
RNYKMATVRQMILRPILRDGLLTAEGDVWKRSRKAMAPVFTPRHIFGFAQPMLARTLDFVKRYEDASGTV DVA  
HDMTMLTYEILAETLFSGEIAGEAGSFAHEIDRLFETMGRVDPLDLLRAPEWLPRLTRIRGRKTMAYFRKIVT  
DTVAMRS DKLVRDAAGAPEDFTLLLLRAEGPDGLSRQEIEDNIIITFIGAGHETTARALGWTIYCLAEATWERD  
RIEQEIDAVLAREPDVVRWLDAMPLTRA AFEEALRLYPPAPSINREPIAEDEYKGFKI PRKAQVLVMPWTVHR  
HRKLWDKPD AF LPERFHPENRDRIDRYQYLPFGAGPRVICIGMSFAMQEAI IALA ILLSRFRFDTTDETRPWPV  
QKLTTQPQGGPLPMRVTRR

>CYP173A6 (BSQ44\_05960) *Mesorhizobium* sp. B7

MDATPAPFVPPAPKPRTPPSSLQMLRIVYRNPLELWGEPSYNEKWVSISTGVGGPLVIANDPGLIRHVLVDN  
AKNYKMARVRQKILRPILRDGLLTAEGEVWKRSRKAMAPVFTPRHINGFAAPMLRRSEAF AERYEGETGTVDI  
ARDMTLLTYDILAETLFSGEIAGEPGSFAKQVDRLFETMGRVDPLDLLGAPDWLPRFTRIRGARAMAFFRRLV  
ADTARMRKEKLECDPEGAPNDFLTLLLKAEGPQGLSRDEIADNIITFIGAGHETTARALGWTLYCLAEAPWER  
ERVEAEIDAVLAREADPAKWLDAMPVTRA AFEEAMRLYP PAASISREALADEFYEDLHIRKGAQVQVMPWTVH  
RHRKLWDNPEAFMPERFLPHNRNRIDRFQYLPFGAGPRICIGASFAMQEAMIALGVLLSRFRFDTVAETKPWP  
VQKLTTQPEGGLPMRVTRRR

>CYP173A7 (Meso\_4009) *Chelativorans* sp. BNC1

MATPTDLVAASFRPPAPSPRQTPPSTLQMMRIVYRNPLELWGEPSYNEPWVQLTGIGGGPLLIANDPGLIRHV  
LVDNARNYKMARVRQKILRPILRDGLLTAEGEVWRRSRKAMAPVFTPRHISGFAGPMLQKAEAF AERYEQAIG  
GTVDVSRDMTMLTFDILSETLFSGEVAGDPGGFAHQVDRLFETMGRVDPLDLLGAPDWLPRITRILGRNSLAF  
FRNIVARTMEMRKEKLAGGDAEVPEDFLTLLLRAEGPQGLSRGEIEDNIITFIGAGHETTARALGWTLYCLAN  
LPEERERIEAEIDSVLSSSEPDPVKWLDAMPLTRA AFEEAMRLYP PAPSINREAIENDSYSDLKIAAGTQVLVM  
PWTVHRHRKLWDDPDAYRPSRFHPENREKINRFQYLPFGAGPRVCIGATFAMQEAVIALAVLMSRYRFDLLPE  
TKPWPVQKLTTQPGGLPMGVSR

>CYP173A8 (Oant\_0140) *Ochrobactrum anthropic* ATCC 49188

MEIANVMSERPVPFVPPAPRPREKPVGRFEMMRVVYKNPLELWGEPSYNERWISVSWFGMKTIIANDPGLIRH  
VLVDNAANYPMSAIRQVRVLRPLLRDGLLTAEQVWKR SRKAMAPVFTPRHIGGF AEAMRDRSLQFVERYKTPG  
TITDVAHDMTLLTYDILAETLFSGEIAGDPNDFAHQIDKLFETMGRVDPFDLLGLPDWLPRLTRLRGQQSLGF  
FRELVSNTIELRKTRMDRQEDVPSDFLTLLLRAEGPDGLSRSEIEDNIITFIGAGHETTARALGWTLYLLAKA  
PQERELIELEIDGFFAKGGRDLPPQEWLASLPFARAAFE EAMRLYP PAPSINREAA TDDTYDDLKIPKGATVL  
VMPWVIHRHRLYWDQPD AFMPERFWPENRDKLDRFQYLPFGAGPRVCIGASFALQEAVIALAILLDGRRFEVL  
ETTKPWPVQKLTTQPGGLPMKVMKR

>CYP173A8 (DR92\_107) *Ochrobactrum anthropic* OAB

MSERPVPFVPPAPRPREKPVGRFEMMRVVYKNPLELWGEPSYNERWISVSWFGMKTIIANDPGLIRHVLVDNA  
ANYPMSAIRQVRVLRPLLRDGLLTAEQVWKR SRKAMAPVFTPRHIGGF AEAMRDRSLQFVERYKTPGTITDVA  
HDMTLLTYDILAETLFSGEIAGDPNDFAHQIDKLFETMGRVDPFDLLGLPDWLPRLTRLRGQQSLGFFRELVS  
NTIELRKTRMDRQEDVPSDFLTLLLRAEGPDGLSRSEIEDNIITFIGAGHETTARALGWTLYLLAKAPQEREL  
IELEIDGFFAKGGRDLPPQEWLASLPFARAAFE EAMRLYP PAPSINREAA TDDTYDDLKIPKGATVLVMPWVI  
HRHRLYWDQPD AFMPERFWPENRDKLDRFQYLPFGAGPRVCIGASFALQEAVIALAILLDGRRFEVLETTKPW  
PVQKLTTQPGGLPMKVMKR

>CYP173A9 (A8A54\_00395) *Ochrobactrum pseudogrignonense*

METTIAMKDAAQPFVPPAPRPREKPVGRFEMMRVVYKNPLELWGEPSYNERWVSVSWLGIKTIIANDPGLIRH  
VLVDNAANYPMSAIRQVRVLRPLLRDGLLTAEQVWKR SRKAMAPVFTPRHIGGF AEAMRDRSRQFVERYKTSG  
IITDVAHDMTLLTYDILAETLFSGEIAGDPNDFARQIDKLFETMGRVDPFDLLGLPDWLPFRFTRLRGNQSLGF  
FRELVSNTIALRKARMDKGEDVPNDFLTLLLRAEGPDGLSRAEIEDNIITFIGAGHETTARALGWTLYLLAKA  
PQERERVEAEIDAFFADGGNDLPPQEWLAKLPFTRAAFE EAMRLYP PAPSINREAA TDDTYGDLKIAKGTAVL  
VMPWVIHRHRLYWDQPD AFMPERFWPENRDKLDRFQYLPFGAGPRVCIGASFALQEAVIALATLLDGRRFDVL  
ETTKPWPVQKLTTQPGGLPMKVRR

>CYP173A10 (Smed\_3268) *Sinorhizobium medicae*

MDTRPEPFEPAPVPRTGIPSRLEIIRTVLRNPLELWGEPSYTLPIWETKFINQRTLIVNDPGLIRYILVENA  
ANYEMSNVRRILRPILRDGLLTAEGEVWRRSRKAMAPVFTPRHAKGFAGQMLRVSEEFVGRYARAASEPFVT  
NAAVDMTELTFEILAETLFSGEIAVEKHGFAANVEELLHRMGRVDPMDLLVAPGWI PRLTRIGGRKVLDRFRG  
VVSETMALRRRRMSETPGNVNDFLTLLLQLEGPDGLSTSEIEDNITFIGAGHETTARALAWCLYCIANTPT  
YRETMEKEIDKVIAGGADPVDWPGRMPNVLA AFEEALRLYP PAPSINRAAIEE DEWISPQGERVP IRKGISVL

IMPWTLHRHVAYWQKPRAFMPERFLPENRDKIHRFQYLPFGAGPRICIGATFALQEAVIALAVLMHRFRFDVT  
DETHPWPVQRLTTQPRGGLPMRV SARVR

>CYP173A11 (NGR\_c34090) *Sinorhizobium fredii* NGR234

MDTRPEPFEPAPVPRTHIPSRIEII RTVLRNPLELWGEPSYTL PWIETKFINQRTLIVNDPGLIRYILVENA  
SNYEMSNVRRILRPILRDGLLTAEGDVWKR SRKAMAPVFTPRHAKGFAGQMLRVSEHFRERYERAASEPFVS  
NVAVDMTELTTFEILAETLFSGEI AVEKEGF AANVEELLHRMGRVDPMDLLVAPPWPRLTRIGGRKVLDRFRG  
VVSATMAERRRRMADEPKVPNDFTLLLLQLERPEGLSTSEIEDNLTFIGAGHETTARALAWTLYCIANTSA  
YRETMEKEIDSALASGAEPVEWLERMPHVLA AFEEALRLYPPAPSINRAAIEEDAWTSPEGEVVP IRKGISVL  
IMPWTLHRHALYWQKPRAFMPERFLPENRDKINRFQYLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
EATHPWPVQRLTTQPKGGLPMKVS VRAA

>CYP173A12 (FA04\_18030) *Ensifer adhaerens* Casida A

MDMRPEPFEPAPVPRVGIPSYLKI IRTVLRNPLELWGEPSYTL PWIETKFVTQRTLIVNDPGLIRHILVDNV  
ANYEMSKVRRILRPILRDGLLTAEGEVWKR SRKAMAPVFTPRHAKGFAGQMLRSSEQFVERYAGA QEAPFTT  
NVANDMTELTTFDILAETLFSGEV AVEREGFVQSVEELLHRMGRVDPMDILLAPEWI PRPTRIGGRKVMNRFRS  
IVSETMALRRRKMAEDPKGTPQDFLTLLLEIEGSQGLSTAEIEDNLTFIGAGHETTARALAWTLYCVANTPA  
YREIMEAEIDTAMASGAEPVEWLGLMPHVLA AFEEAMRLYPPAPSINRAAIEEDAWTSPTGERVRI PKGI AVL  
IMPWTLHRHVLYWDKPRAFMPERFLPENREKLNRYQYLPFGAGPRVCIGATFALQEAVIALAVMMHRYRFDTT  
AETNPWPVQRLTTQPRGGLPMRV SAR

>CYP173A13 (OV14\_0942) *Ensifer adhaerens* OV14

MDMRPEPFEPAPIPRVGIPSYLKI IKTVLRNPLELWGEPSYTL PWIETKFITQRTLIVNDPGLIRYILVENV  
SNYEMSKVRRILRPILRDGLLTAEGE IWKRSRKAIAPVFTPRHAKGFAGQMLRRSEEFVERYAHAKVKPFTT  
NVASDMTELTTFDILAETLFSGEV AVEREGFVQSVEELLHRMGRVDPMDILLAPEWLPRLTRIGGKKVMNRFRS  
IVSETMAMRRQRMATDPAGTPNDFTLLLLQTEGANGLSTQEIEDNLTFIGAGHETTARALAWTLYCVANTPA  
FRETMEAEIDTVLKSGAEPVEWLNLMPHVLA AFEEAMRLYPPAPSINRAAIEEDEWTSPSGERVRI PKGI AVL  
VMPWTLHRHVLYWDRPRAFMPERFLPENREKLHRFQYLPFGAGPRICIGATFALQEAVIALAVLMHRFRFDVT  
DETRPWPVQRLTTQPRGGLPMRV SAR

>CYP173A14 (RG1141\_CH40350) *Neorhizobium galegae* bv. officinalis bv.  
officinalis HAMBI 1141

MDIRPEPFVPPAPPHRDRLLSPIEVIWTALRNPLELWGKVSYTL PWLETKF FFKERTLIVNHPGLIRHILVDNV  
SNYVMSEIRQLVLRPILRDGLLTAEGEVWKR SRKAMAPVFTPKHSRGFAGQMLNQTEEFSGKYAEAGADGAVR  
DISVDMTELT YAILAETLFSGEVAGNKETVADDVDQLLHRMGRIDPMDMLRAPPWPVRVTRIGGRILDKFRR  
VVAETMLMRQERM RKHPDDVPQDFLTLLLLQLAGPDGLTMDEIEDNLTFIGAGHETTARALAWTLYCVAESPS  
VRQNMEEEIDRVLASGADPVEWLELMPWVRA AFEEALRLYPPAPSINREAI SDDSWTSPEGKTIRIDAGVTVL  
VMPWTLHRHELYWDKPRAFMPERFLPENRGKLNRFQYLPFGAGPRTCIGATFALQEAVIALAVLMGRYRFDVT  
PETKVWPVQKLTTQPRDGLLMRVSPRHQRSPLVN

>CYP173A14 (RG540\_CH40900) *Neorhizobium galegae* bv. orientalis HAMBI 540

MDIRPEPFVPPAPPHRERLLGPIEVIWTALRNPLELWGKVSYTL PWLETKF FFKERTLIVNHPGLIRHILVDNV  
SNYVMSEIRQLVLRPILRDGLLTAEGEVWKR SRKAMAPVFTPKHSRGFAGQMLSQTEEF SRKYAAAGAGGAVR  
DISVDMTELT YAILAETLFSGEVAGNKETVADDVDQLLHRMGRIDPMDMLRAPPWPVRVTRIGGRILDKFRR  
VVAETMLMRQERM RKHPDDVPQDFLTLLLLQLAGPDGLTMDEIEDNLTFIGAGHETTARALAWTLYCVAESPS  
VRQAMEEEIDRVLASGADPVEWLELMPWVRA AFEEALRLYPPAPSINREAI SDDSWTSPEGKTIRIDAGVTVL  
VMPWTLHRHELYWEKPRAFMPERFLPENRGKLNRFQYLPFGAGPAPVSARPLPCRKR

>CYP173A15 (LPU83\_0051) *Rhizobium* sp. LPU83

MDMRPHPFEPAPLPRTPVPPGRLEI IRTILRNPLELWGEPSHTLPWIHTRFFRERTLIVNDPGLIRHVLDNA  
ANYRMSDIRQLILRPILRDGLLTAEGEVWKR SRKAVAPVFTPRHANGFAGQMLRQSEDYARKYQAAGSEGKVF  
EIAADMTELTFFAILADTLFSGEIVTSSDSFADDVNALLHRMGRVDPMDLLRAPSWVPRLTRIGGQKVLDKFRN

IVRQTMNARLARMQANRAATPDDFLTLLLDQAASGGLTNDEIEDNILTFIGAGHETTARALAWTLYCVANTQH  
IREAMEEEIDRVLARDVEPVKWLDMPLYTRAAFEELRLYPPAPSINRAAIAADRWTDAKGETVEIEAGVTVL  
IMPWTLHRHELYWDKPRAYLPERFLPENRGKIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRFRFDLT  
DQTKPWPVQKLTTQPQNGLPMCVTPRSLPKSA

>CYP173A16 (RGR602\_CH00052) *Rhizobium gallicum*

MDMRPEPFVPPAPLPRSVPPSPLEIIRTILRNPLELWGEPSYTLPWIKTRFFHDSTIIVNDPGLIKHVLVDNV  
ANYRMADIRQLVLRPILRDGLLTAEGEVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEVYARKYEAVAGESQVF  
EIASDMTELTFAILADTLFSGEIVTSSDSFAEDVNALLHRMGRVDPMDLLRAPSWVPRVTRIGGQKVLDKFRT  
IVRETMDARLRRMAADRGSAPEDFLTLLLDRAATGGLTNEEIEDNILTFIGAGHETTARALAWTLYCVANS  
IRDAMEEEIGRVLASGAEPVEWLDLMPFTRAAFEELRLYPPAPSIDRAAIADDSWTDKGEKVDIHAGMTVL  
VMPWTLHRHELYWEKPRSYMPEFFPENRGKIGRFQFLPFGAGPRVCIGATFAMQEAVIVLAVLMSRFRFDVT  
EKTNPWPVQKLTTQPQNGLPMRVTERTVLSA

>CYP173A17 (RHECIAT\_CH0000054) *Rhizobium etli* CIAT 652

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
NNYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAQGFAGQMLRQSEYARKYESAGAAGAI  
DISIDMTELTFAILADTLFSGEIVTSSGSFADVDNALLHRMGRIDPMDLMRAPSWVPRVTRIGGQKVLEKFR  
IVRDTMDMRLAKMKADRAAAPDDFLTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVSNS  
IREAMETEIDAVLATGAEPVEWLDLMPQTRAAFEETLRLYPPAPSINRAAISDDSWTNPKGERIEIEAGVT  
IMPWTLHRHEFYWEKPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
DETNPWPVQKLTTQPQNGLPMRVTPRTVSSA

>CYP173A17 (AMC79\_CH00054) *Rhizobium phaseoli*

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
NNYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAQGFAGQMLRQSEYARKYERAEPAGAI  
DISIDMTELTFAILADTLFSGEIVTSSGSFADVDNALLHRMGRIDPMDLMRAPSWVPRVTRIGGQKVLEKFR  
IVRDTMDMRLAKMKADRAAAPDDFLTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVSNS  
IREAMETEIDAVLATGAEPVEWLDLMPQTRAAFEETLRLYPPAPSINRAAISDDSWTNPKGERIEIEAGVT  
IMPWTLHRHEFYWEKPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
DETNPWPVQKLTTQPQNGLPMRVTPRTVSSA

>CYP173A17 (Rleg2\_3985) *Rhizobium leguminosarum* bv. trifolii WSM2304

MDMRPEPFVPPAPLPRTVPPSRLEIIRTILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
GNYRMSDIRQLVLRPILRDGLLTAEGSVWKRSRKAVAPVFTPRHAQGFAGQMLRQSEYAGKYQSEAGPIFDI  
STDMELTFAILADTLFSGEIVTSSGHFADVDNALLHRMGRVDPMDLMRAPSWVPRVTRIGGQKVLEKFR  
IVRDTMDMRTAKMKADRATAPEDFLTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVSNS  
EAMETEIDAVLATGAEAWEWLDMPQTRAAFEETLRLYPPAPSINRAAISDDSWTSPEGERVELEAGVT  
PWTLHRHELYWDRPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
TNPWPVQKLTTQPQNGLPMRVTPRIISR

>CYP173A18 (IE4803\_CH00051) *Rhizobium etli* bv. phaseoli IE4803

MDMRPDPFVPPAPLPRTVPPSRLEIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEYVGKYEGAGPAGQVF  
DIAADMTDLTFAILAETLFSGEIVSSSGHFADVDNQLLHRMGRVDPMDLLRAPSWVPRVTRIGGQKVLEKFR  
IVRDTMDMRLAKMKADRAGAPDDFLTLLLEQAGPDGLTKDEIEDNILTFIGAGHETTARALAWTLYCVANS  
IREAMETEIDAVLATGADSVWLDLMPVTRAAFEELRLYPPAPSINRAAIADDVWINAKGERVEIPADITVL  
IMPWTLHRHELYWDKPRAYMPERFFPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDQT  
EATDPWPVQKLTTQPQNGLPMRVTPRIISQA

>CYP173A18 (IE4771\_CH00052) *Rhizobium etli* bv. mimosa IE4771

MDMRPDPFVPPAPLPRTVPPSRLEIIRIILRNPLELWGEPSYTLPWIRTSFFGQHTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEYVRKYEGAGPAGQVF  
DIAADMTDLTFFAILAETLFTGEIVSSSGHFADDVNELLHRMGRVDPMDLLRAPSWVPRLTRIGGQKVLEKFRA  
IVRDTMDMRLAKMKADRAAAPDDFTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PH IREAME TEIEAVLATGADPVEWLDLMPVTRAAFEELRLYPPAPSINRAAIADDVWTS AKGERVEIPADITVL  
IMPWTLHRHELYWDRPRAYMPERFFPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDQT  
EATNPWPVQKLTTQPQNGLPMRVTRRIISQAA

>CYP173A18 (AMJ98\_CH00052) *Rhizobium* sp. N1341

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEDFVRKYENVDAAGQVF  
DIASDMTDLTFFAILAETLFSGEIVSSSGHFADDVNQLLHRMGRIDPMDLLRAPAWVPRLTRIGGQKVLEKFRA  
IVRDTMDMRLAKMKADRAAAPEDFTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PH IREAME TEIDAVLATGAEPVEWLDLMPVTRAAFEELRLYPPAPSINRAAIADDLWINAKGEKVEIPADITVL  
IMPWTLHRHELYWEKPRAYMPERFLPGNRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDQT  
ATTNPWPVQKLTTQPQNGLPMRVTSRIISRTA

>CYP173A18 (AMK02\_CH00052) *Rhizobium* sp. N731

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEDFVRKYENVDAAGQVF  
DIASDMTDLTFFAILAETLFSGEIVSSSGHFADDVNQLLHRMGRIDPMDLLRAPAWVPRLTRIGGQKVLEKFRA  
IVRDTMDMRLAKMKADRAAAPEDFTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PH IREAME TEIDAVLATGAEPVEWLDLMPVTRAAFEELRLYPPAPSINRAAIADDLWINAKGEKVEIPADITVL  
IMPWTLHRHELYWEKPRAYMPERFLPGNRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDQT  
ATTNPWPVQKLTTQPQNGLPMRVTSRIISRTA

>CYP173A18 (REMIM1\_CH00052) *Rhizobium etli*

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEDFVRKYENGDAAGQIF  
DIATDMTDLTFFAILAETLFSGEIVSSSGHFADDVNQLLHRMGRIDPMDLLRAPSWVPRLTRIGGQKVLETFRA  
IVRDTMDMRLAKMKADRAAAPEDFTLLLEQAGPDGLTEEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PH IREAME TEIDAVLTGAEPVEWLDLMPVTRAAFEELRLYPPAPSINRAAIADDLWINAKGEKIEIPADITVL  
IMPWTLHRHELYWEKPRAYMPERFLPENRGAIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDQT  
ATTNPWPVQKLTTQPQNGLPMRVTSRIFSRTA

>CYP173A18 (RLEG12\_31535) *Rhizobium leguminosarum* bv. trifolii CB782

MDMRPDPFVPPAPLPRTVPPSRLDIIRIILRNPLELWGEPSYTLPWIKTSFFGQHTLIVNDPGLIKHVLVDNA  
NNYRMSDIRQLVLRPILRDGLLTAEGQVWKRSRKAVAPVFTPRHAKGFAGQMLRQSEYIGKYEGSGSAGQVF  
DIASDMTDLTFFAILAETLFSGEIVSSSGHFSDDVNQLLHRMGRVDPMDLLRAPSWVPRLTRIGGQKVLEKFRA  
IVRDTMDLRLAKMKADRAAAPDDFTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PH IREVMETEIDAVLATGAEPVEWLDLMPVTRAAFEELRLYPPAPSINRAAIADDVWTSNAKGEEVEIPADITVL  
IMPWTLHRHELYWDRPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVMMHRYRFDST  
DETNPWPVQKLTTQPQNGLPMRVTPRIISTKA

>CYP173A19 (Arad\_0067) *Agrobacterium radiobacter*

MDMIPEAFSPPAPIPRTVPPSRITIIRITILRNPLELWGEPSYTLPWIMTRFIRERTLIVNDPGLIKHVLVDNA  
ANYRMSDIRQLILRPILRDGLLTAEGPVWKRSRKAVAPVFTPRHAQGAGQMLSQSEDYVRKYEDVGSEGEVF  
DIAVDMTELTFAILAETLFSGEIVTEGASFADDVNQLLHRMGRVDPMDLLRAPSWVPVTRIGGQKVLDFKFRG  
IVRDTMNLRLDKMRKDRASAPDDFTLLLEKTGPDGLTMEEIEDNILTFIGAGHETTARALAWTLYCVANCPH  
IREAME TEIDRVLATGVEPVAWLDLMPNVRASFEEAMRLYPPAPSINRASIADDEWTS PSGERVEIPAGVTVL  
IMPWTLHRHALYWDKPRAFMPERFLPENRGKINRFQYLPFGAGPRVCIGATFALQEAVIALAVMMHRFRFDLT  
DETNPWPVQKLTTQPQGGLPMRVTRR

>CYP173A19(RL0053)*Rhizobium leguminosarum* bv. *viciae* 3841

MDMRPDPFVPPAPLPRTVPPSRLEIIRIILRNPLELWGEPSYTLPWIRTNFFGQRTLIVNDPGLIKHVLVDNA  
NNYRMSDVRQLVLRPILRDGLLTAEGPVWKRSRKAVAPIFTPRHAQGFAGQMLRQSEYARKYEGAGEAGAIIF  
DISTDMTELTFFAILADTLFSGEIVTSSGHFADDVNELLHRMGRVDPMDLMRAPSWVPRVTRIGGQKVLEKFRA  
IVRNTMDMRLAKMKADRSSAPEDFLTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVSNSPH  
IREGMEEEIDAVLATGAKPVEWLDMMMPQTRAAFEELRLYPPAPSINRAAISDDFWTSPKGERVELEAGVTVL  
VMPWTLHRHELHWDPRAYMPERFLPENRASIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
DQTNPWVQKLTTPQKNGLPMRVTPRIISTKA

>CYP173A19(Rleg\_4313)*Rhizobium leguminosarum*\_bv. *trifolii* WSM1325

MDMRPDPFVPPAPLPRTVPPSRLEIIRIILRNPLELWGEPSYTLPWIRTNFFGQRTLIVNDPGLIKHVLVDNA  
NNYRMSDVRQLVLRPILRDGLLTAEGPVWKRSRKAVAPIFTPRHAQGFAGQMLRQSEYARKYEGAGEAGAIIF  
DISTDMTELTFFAILADTLFSGEIVTSSGHFADDVNELLHRMGRVDPMDLMRAPSCVPRVTRIGGQKVLEKFRA  
IVRNTMDMRLAKMKADRSSAPEDFLTLLLEQAGPDGLTKEEIEDNILTFIGAGHETTARALAWTLYCVSNSPH  
IREGMEEEIDAVLATGAKPVEWLDMMMPQTRAAFEETLRLYPPAPSINRAAISDDSWTSPKGERVELEAGVTVL  
VMPWTLHRHELHWDPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
DQTNPWVQKLTTPQNGLPMRVTPRIISTKA

>CYP173A19(RLEG3\_32540)*Rhizobium leguminosarum* bv. *trifolii* WSM1689

MDMRPDPFVPPAPLPRTVPPSRLEIVRIILRNPLELWGEPSYTLPWIRTNFFGQRTLIVNDPGLIKHVLVDNA  
NNYRMSDVRQLVLRPILRDGLLTAEGPVWKRSRKAVAPIFTPRHAQGFAGQMLRQSEYARKYEGAGEAGAIIF  
DISTDMTELTFFAILADTLFSGEIVTSSGHFADDVNELLHRMGRVDPMDLMRAPSWVPRVTRIGGQKVLEKFRA  
IVRNTMDMRLAKMKANRSTAPEDFLTLLLEQAGPDGLTNEEIEDNILTFIGAGHETTARALAWTLYCVSNSPH  
IREAMEEEIDAALATGAEPVEWLDMMMPQTRAAFEELRLYPPAPSINRAAISDDSWSTKGERVVIEAGVTVL  
IMPWTLHRHELHWDPRAYMPERFLPENRGSIGRFQFLPFGAGPRVCIGATFALQEAVIALAVLMHRYRFDST  
DQTNPWVQKLTTPQNGLPMRVTPRIISTKA

>CYP173A20(RTCIAT899\_CH00270)*Rhizobium tropici*

MDMIPEAFSPPAPIPRTVPPSRLEIIRTILRNPLELWGEPSYTLPWIKTKFFNERTLIVNDPGLIKHVLVDNA  
ANYRMADIRQLVLRPILRDGLLTAEGPVWKRSRKAVAPVFTPRHAQGFAGQMLSQSLEYLQKYEDIGAEGAVF  
DIATDMTELTFFAILAETLFSGEILTEGEHFADEVNELLHRMGRVDPMDLLRAPAWVPRITRIGGQVRVLDKFRG  
IVRTTMDQRLDKMRRDRASAPDDFLTLLLEKAGPDGLTMEEIEDNILTFIGAGHETTARALAWTLYCVANS  
PHIRDAMEEIIDRVLATDAKPVAWLDLMPHVRAAFEEAMRLYPPAPSINRAAIADDEWTSKGERVTIEKGITVL  
IMPWTLHRHELYWEKPRAFMPEFLPENRAKINRFQYLPFGAGPRVCIGATFALQEAVIALAVMMRRFRFDST  
DETDPWPVQKLTTPRGGGLPMRVTRR

>CYP173A21(shn\_20235)*Shinella* sp. HZN7

MDVRPEPFEPPIPRSVPPSRLEIIRTVFRNPLELWGEPSYTLPWIMTRFFGEKTLIVNDPGLIKYLLVDNA  
QNYKMAVVRQLVLRPILRDGLLTAEGAVWRRSRKAVAPIFTPRHAKGFASQMLAQSELYAKKYEGSDGTVF  
DI GNDMTELAFAVLSETLFSGEIVTRSESFADDVEDLLHSMGRVDPMDLLRAPSWVPRVTRIGGLKVLK  
KFRGIVRDTMDLRLRMKDSDTAPNDFLTLLLRAGPEGLTMEEEVEDNILTFIGAGHETTARALAWTLYCVANS  
PHVRDAMEEIIDRVLESGADPVDWLDMPWTRAAFEELRLYPPAPSINREAIADDAWISPKGERVEIPKDV  
TILVMPWTLHRHALLWQKPRAYMPERFLPENREAIHRFQYLPFGAGPRVCIGATFAMQEAIIALGVLMRRFR  
FDMTEETRPWPVQRLTTPANGALALRVTTARRPASSIS

>CYP173A22(NT26\_3879)*Rhizobium* sp. NT-26

MDMRPEPFVPPAPIPRTVPPSRLEIIRTVFNNPLELWGEPSYTLPWIEKTKFLKERTIIVNDPGLIRHVLVDNA  
ANYEMSEIRQLILRPILRDGLLTAEGPVWKRSRKAMAPVFTPRHARSFADQMLYKSEYVEKYSVGEGEEV  
FV DISVDMTEITFNILSETLFSGEIVTESNDFSEDVDSLHRMGRVDPMDLLRAPWVPRVTRIGGKRV  
LGKFREIVAKTMAIRQKKMRKNPGHVPQDFLTLLLELAGPDGLTMDEIEDNILTFIGAGHETTARALAWTLYCVANS  
PQIRKRMESEIDEVLASGAEPVEWMDRMPMVRAAFEEALRLYPPAPSLNRAAIADDEWTS PDGKT  
VRI RAGVTVL

IMPWTLHRHQLYWDNPRAFMPERFLPENRGKIGRFQYLPFGAGPRVCIGATFAMQEAVIALAVLMSRYRFDMT  
PGTKPWPVQKLTQTQPRDGLPMRVTRRVQ

>CYP173A23 (BSY16\_3110) *Sinorhizobium* sp. RAC02

MDMRPEPFEPAPIPRTVPPSKLEIIRTVFRNPLELWGEPSYTLPWIMTSFFGEKTLIVNDPGLIKYLLVDNA  
ANYKMAVVRQLVLRPILRDGLLTAEGAVWRRSRKAVAPIFTPRHAKGFASQMLAQSELYAQKYEGADGAAFDI  
GNDMTELAFAILSETLFSGEIVTSSNNFADDVDDLHSMGRVDPMDLLRAPAWVPRVTRIGGLRVLGKFRKIV  
RDTMDLRLKRMNSAAGDAPNDFLTLLLRAAGPEGLTMEEVEDNILTFIGAGHETTARALAWTLYCVANS PHVR  
EAMEDEIDRVLASGADPVEWLELMPWTRA AFEEAMRLYPPAPSINREAIADDVWTS PSGERVEIPKDV TILVM  
PWTLHRHALLWQKPRAYMPERFLPENRDAIHRFQYLPFGAGPRICIGATFAMQEAI IALGVL MHRFRFDMTET  
TRPWPVQRLTTQPANGLALRV TARRPASSIS

>CYP173A24 (BSY240\_2823) *Agrobacterium* sp. RAC06

MDASLRKSTFEPPAPVPRTVPPSRLEIIRTVLNRNP LELWGQPSYTWPIVTRFFGQTTIIANDPGLIRHVLVD  
NASNYEMSEIRQLVLRPILRDGLLTAEGPVWKR SRKAMAPVFTPRHARGFARQMREQSELF LRYEAGTEGVV  
RDIADVDMTELT YAILSETLFSGGIVSEQGDFAKDVDDLHSMGRIDPLDLLKAPRWIPRLTRIRGLGVLRKFR  
ELVRR TMDHRRAI IKTDRENAPDDFLTLLLELEGP DGLTSEEIEDNILTFIGAGHETTARALAWTLYCVAHCP  
DVRDAMEREIDEVIASGADPVDWLEQMPHV RASFEEAMRLYPPAPSINRDAIADDRYTAPSGETVEIAKGATV  
LVMPWTLHRHELYWDKPRIFDPSRFLPGEREKIGRFQYLPFGAGPRVCIGATFALQEAVIALAVLMQRYRFAT  
TPQTKPWPVQKLTQTQAGGLPMRVTPRKP

>CYP173A25 (IMCC20628\_04172) *Hoeflea* sp. IMCC20628

MTKPHTPFVPPAPVPRTTPPSRFQIIRTVMRNP LELWGEPSFRLEWMKTKFFNERTLIVNHPGLVRHVLVDNA  
KNYKMAVIRQLILRPILRDGLLTAEGETWRRSRKAMAPVFTPRHAQGFAEQMLEQSRAFTGRYDIAAEKGEVR  
DIAVDMTELT FDI LSATLFSGQVAGTETEFAGDIERLLSTMGRVDPMDLLKAPS WVPRI RRLFGRRLVAKFRN  
IVKQTMADRQH LIKTDPAAPEDFLTLLIRLHGPDGLTLDEIEDNIITFIGAGHETTARALGWTLYCLANS PS  
DREKVEAEIDEVLAREPDPVKWLDAMPWTRA AFEEAMRLYPPAPSINRAAIADDKWDNGKETVTIEAGTTIL  
VMPWTLHRHTKLWDQPGAYIPSRFLPENRGKIDRYQYLPFGVGPRICIGATFALQEAVIALGVLMSKYRFD CV  
AETKPWPVQKLTQTQPEGGLPMRVSR

>CYP173B2 (Mext\_2663) *Methylobacterium extorquens* PA1

MLDTLPLAPPTTTPLFRPKVPPPLTQPLGLFAFLKKVRENPIATWMDAHFEEFVVAGETAMGRITVVSDPALV  
RYLLVERAAHYRKDDLQKRV LAPGLGNLLTAEGDEWRLQRR TLAPIFSARHVAGFVAQMDAAGARLGRR LAR  
RDGATVDVALEMTRATLDV LERTIFTQGLPGDPDALGRAITRLLESIGPIDPLDVFGFPAFV PRLGRLRARPA  
LRFFAEVVD TLLDERKAALARGEAPHDLMTLLLA AQDPETGRGLSDLEV KANIVTFIAAGHETTANALTWALY  
CLSQDEAARTRVEAEVDAAAGPDGALQLDRLPFTKAVMEETMRLFPVPVFLSRQALREDRIGRVKI PRNSTVI  
IAPWVMHRHRKLWD EPDAFI PERFLGERRESVERFAYLPFGAGPRVCIGQSFSVQEATLVLAHVARAVRLTLP  
ADHPPVTPLHRVTLRPKDGLRMLTQRR

>CYP173B2 (Mex\_1p2856) *Methylobacterium extorquens* AM1

MLDTLPLAPPTTTPLFRPKVPPPLTQPLGLFAFLKKVRENPIATWMDAHFEEFVVAGETAMGRITVVSDPALV  
RYLLVERAAHYRKDDLQKRV LAPGLGDGLLTAEGDEWRLQRR TLAPIFSARHVAGFVAQMDAAGARLGRR LAR  
RDGATVDVALEMTRATLDV LERTIFTQGLPGDPDALGRAITRLLESIGPIDPLDVFGFPAFV PRLGRLRARPA  
LRFFAEVVD TLLDERKAALARGEAPHDLMTLLLA AQDPETGRGLSDLEV KANIVTFIAAGHETTANALTWALY  
CLSQDEAARARMEAEVDAAAGEGGALQLDRLPFTKAVMEETMRLFPVPVFLSRQALREDRIGRVKI PRNSTVI  
IAPWVMHRHRKLWD EPDAFI PERFLGERRESVERFAYLPFGAGPRVCIGQSFSVQEATLVLAHVARAVRFTLP  
ADHPPVTPLHRVTLRPKDGLRMLAQRR

>CYP173B2 (METDI3422) *Methylobacterium extorquens* DM4

MLDTLPLAPPTTTPLFRPKVPPPLTQPLGLFAFLKKVRENPIATWMDAHFEEFVVAGETAMGRITVVSDPALV  
RYLLVERAAHYRKDDLQKRV LAPGLGDGLLTAEGDEWRLQRR TLAPIFSARHVAGFVAQMDAAGARLGRR LAR  
RDGATVDVALEMTRATLDV LERTIFTQGLPGDPDALGRAITRLLESIGPIDPLDVFGFPAFV PRLGRLRARPA

LRFFAEVVDLTLLDERKAALARGEAPHDLMTLLLLAAQDPETGRGLTDLEVKANIVTFIAAGHETTANALTWALY  
CLSQDEAARTRVEAEVDAAAGEGGALQLDRLPFTKAVMEETMRLFPVPFSLRQALREDRIGRVKIPRNSTVI  
IAPWVMHRHRKLWDEPDFAFI PERFLGERRESVERFAYLPFGAGPRVCIGQSFSVQEATLVLAHVARAVRFTLP  
ADHPPVTPLHRVTLRPKDGLRMLAQRRRA

>CYP173B2 (Mpop\_2785) *Methylobacterium populi*

MLDTLPLAAPVTNAPLFRPKVPPPLTRPLGLFAFLKAVRANPIATWMDAHFEEFIVAGETAMGRVTVVSDPAV  
VRYLLVERAANYRKDDLQKRVLAPGLGDGLLTAEGDEWRLQRRTLAPIFSARHVAGFVAQMDAAGARLGRRRLA  
RRDGATVDVALEMTRATLDVLERTIFTQGLPGDPDALGRAITRLLSIGPIDPLDVFGFPAFVPRLGRLRARPA  
ALRFFAEVVDLTLLDQRKAALARGEAPHDLMTLLLLAAQDPETGRGLSDLEVKANIVTFIAAGHETTANALTWAL  
YCLSQDEAARDRVEAEVDAAAGPDGALRLDRLPFTKAVMEETMRLFPVPFSLRQALREDRIGRVKIPRNSTV  
IIAPWVMHRHRKLWDEPDFAFMPEFFGAARDSIERFAYLPFGAGPRICIGQSFSVQEATLVLAHVARAVRFTLP  
PADHPPVTPLHRVTLRPKDGLRMLAQRRV

>CYP173B2 (Mchl\_2890) *Methylobacterium extorquens* CM4

MLDTLPLAPPTTTPLFRPKVPPPLTQPLGLFAFLKKVRENPIATWMDAHFEEFVVAGETAMGRITVVSDPALV  
RYLLVERAAHYRKDDLQKRVLAPGLGDGLLTAEGDEWRLQRRTLAPIFSARHVAGFVAQMDAAGARLGRRRLA  
RDGATVDVALEMTRATLDVLERTIFTQGLPGDPDALGRAITRLLSIGPIDPLDVFGFPAFVPRLGRLRARPA  
LRFFAEVVDLTLLDERKAALARGEAPHDLMTLLLLAAQDPETGRGLSDLEVKANIVTFIAAGHETTANALTWALY  
CLSQDEASRTRVGAEVDTAAGPDGALQLDRLPFTKAVMEETMRLFPVPFSLRQALREDRIGRVKIPRNSTVI  
IAPWVMHRHRKLWDEPDFAFI PERFLGERRDRVERFAYLPFGAGPRVCIGQSFSVQEATLVLAHVARAVRFTLP  
ADHPPVTPLHRVTLRPKDGLRMLAQRRRA

>CYP173B2 (Y590\_12775) *Methylobacterium* sp. AMS5

MHSVTAEVVRLPMLDTLPLAPPTDTPLFRPKVPPPLTRPLGLFAFLKKVRENPIATWMDVHFEEFVVAGETAM  
GRITVVSDPALVRYLLVERAAHYRKDDLQKRVLAPGLGNGLLTAEGDEWRLQRRTLAPIFSARHVAGFVAQME  
AAGARLGRRRLARRDGATVDIALEMTRATLDVLEQTIFTQGLPGDPDALGRAITRLLSIGPIDPLDVFGFPAF  
VPRLGRLRARPALRFFAEVVDLTLLNERKAALARGEAPHDLMTLLLLAAQDPETGRGLSDLEVKANIVTFIAAGH  
ETTANALTWALYCLSQDEAARARVEAEVDAAAGPDGALQLDRLPFTKAVMEETMRLFPVPFSLRQALREDRI  
GRVKIPRNSTVIIAPWVMHRHRKLWEEPDAFI PERFLGERRDRVERFAYLPFGAGPRVCIGQSFSVQEATLV  
AHVARAVRLTLPADHPPVTPLHRVTLRPEGLRMLAQRRRA

>CYP173B3 (Mrad2831\_4522) *Methylobacterium radiotolerans*

MSATIDLPEPATRFRPAVPPPLKEPLGLFEFLRAARKNPITTWMDAHFKLPVVAEAGAMGRITLVSDPALIRH  
LLIENADGYRKDDLQRRVLAPGLGNGLLSAEGDEWRLQRRTLAPIFNARTVQGFSDAMNAAGARLGRRRLVRRD  
GKQVDVALEMTRVTLVDLERTIFTQGLPSDPDALGRAITRFLEAVGPIDPLDVFVGFVDFVPRIGRLRARPA  
FFAEVVDDELIAARRKALMARGEAPRDLTLLLLAAQDPETGNGLTDLAVKANIVTFIAAGHETTANSLTWALYCL  
SQDPAAQARVEAEIDAAGPGDFAVERLPFTRAVIEEAMRLFPVPFSLRQAIRDDRLGRIKVPGRSLVMVAPW  
VLHRHRLWEDPEAFVPERFLPGNRDAIPRFAYLPFGAGPRVCIGQSFSIQEAVILLAHVVRVAVRFRLLPADHP  
PVTPLHRVTLRPEHGLRMEATARR

>CYP173B3 (MOC\_5180) *Methylobacterium oryzae*

MSATIDLSEPAARFRPVPPPLKAPLGLFDFLRAARKNPITTWMDAHFKLPVVAEAGAMGRITLVSDPALIRY  
LLIENADGYRKDDLQRRVLAPGLGNGLLSAEGDEWRLQRRTLAPIFNARTVQGFSEAMNAAGARLGRRRLVRRD  
GKQVDVALEMTRVTLVDLERTIFTQGLPSDPDALGRAITRFLEAVGPIDPLDVFVGFVDFVPRIGRLRARPA  
FFAEVVDDELIAARRKALMARGEAPRDLTLLLEAQDPETGNGLSDLAVKANIVTFIAAGHETTANSLTWTLYCL  
SQDPAAQARIEAEVDAAAGPGDFAERLPFTRAAIEEAMRLFPVPFSLRQAIRDDRLGRIKVPGRSLVMVAPW  
VLHRHLLWEDPEAFVPERFLPENRDTIPRFAYLPFGAGPRICIGQSFSIQEAVIVLAHVVRVAVRFRLLPADHP  
PVTPLHRVTLRPEHGLRMDAVARG

>CYP173C2 (Maq22A\_1p37300) *Methylobacterium aquaticum*



MTSPAAVAAPFRPAVPRPRTEPMGLFSFLRAARANPLTTWYEEHFEEKPIVTGEGALGRVTVVSEPSAIRHVM  
VDNAANYRKDDLQRRVLAPGLGNGLLTAEGDEWRLQRRTLAPIFSRPHVARFEAPMAEAAARLARRLKRRDGQ  
SVDAGLEMTRVTLVDLERTIFTHGLAREPDALGRAITRYFEALGPIDPLDVFGMPDWLPRIGRLKARPALRFF  
AEVVDELIERRRALVASGKEAPHDLLTLLQLAQDPETGRGLSDLEVRANIVTFIGAGHETTANALTWTLYCLS  
QDETAREAVEAEIDAFAAQDPAPGLEALPHTKAALAEAMRLFPPVPMFMSRQALAEADRIGRIKIPRGS�VTVAP  
YVLHRHRRLWEEPDAFIPERFLPENRARIDRYAYLPFGAGPRVCIGASFVMEATLVLAHVLAHVRLDRAPEA  
GPVVPLHRVTLRPQDGLRMRVTARG

>CYP173C3 (Mnod\_0696) *Methylobacterium nodulans*

MSDAAVAARPAQSPFRPAVPRPRTEPMDLFAFLRAARANPLTTWFREHFEHLIVAGDGALGRVTVVSDPAAIR  
HILVDNAANYRKDDLQRRVLAPGLGNGLLTAEGEEWRLQRRTLAPIFSRPHVAGFQAPMSEAADRLAGRLARR  
SGQTVDALEMTRVTLVDLERTIFTHGLPRKPEALGRAMTSYFEALGPIDPLDVFGLPDWVPRIGRIRARPAL  
RFFAEIVDELIARRRALLAGGEAPHDVLTLLLRAQDPETGRGLSDLEVRANIVTFIGAGHETTANALTWTLYC  
LSQDEAARERAEAEIDAFAAGDPAPCSEALPFTRAALEEAIRLFPPVPLMSRQALAEADRLGRIKIPRGS�VTI  
APYVLHRHRRLWQDPDAFVPERFLPENRARIDRFAYLPFGAGPRVCIGMSFSLMEATLVLAHLMRAVRLDRSP  
GAGPVVPLHRVTLRPDGLRMRVTRAAAPPE

>CYP173C4 (M446\_1094) *Methylobacterium* sp. 4-46

MIEARPPQAPFRPAVPRPRTEPMDLFAFLRAARANPLTTWFREHFEHLIVTGEALGRITVVS DPAAIRHILV  
DNAANYRKDDLQRRVLAPGLGNGLLTAEGEEWRLQRRTLAPIFSARHVAGFQAPMSEAAV LARRLARRDGQA  
VDVALEMTRVTLVDLERTIFTHGLPRDPDALGRAITRYFEALGPIDPLDVFGMPDWVPRIGRLRARPALRFFA  
EVVDELIARRRALLAAGEAPHDLMTLLLR AQDPETGQGLSDLEVKANIVTFIGAGHETTANALTWTLYCLSQD  
EASRARAEAEIDAFAAAEAQPRADAFPFTRAALAEAIRLFPPVPMFMSRQAIADDR LGRIKIPRGS�VTVAPYV  
LHRHRRLWDDPDAYRPERFLPEFRGRIDRYAYLPFGAGPRVCIGMSFSLMEATLVLAHLLRAVRLDRSPEAGP  
VVPLHRVTLRPDGMRMVTRRESGR

>CYP173G1 (Mmar10\_0514) *Maricaulis maris*

MPKDVSM TVAFTPPKPPCAQYSGVGKLELSDYWTFYFRAMQRNPLEVWGEQHFSIRMAPFQFLGRSSLLLNDPA  
GIHHCFVTNAANYGMNPVRQAVLKPFLRDGLLTAEGDVWKTARKAVSPVFTPRRVNGFAPQIRTVCDATLSAL  
AERDQGTV D ASDLMVELTLDVLIETLFSGDEALDKARFTRGICDLEISGIPHPFDLIHLPGWIPRIGQGKSR  
RVIKDLREQVGTVASARRAAPSAKEAGRTPDFLDLLL GAGLDDTAVIDNLLTFLAAGHETTARTLAWTLYLLS  
RDEEARTRLEAEVDGADLTGTD PANWSSLLPFTEAVLKESRLYPSAPILARTSKAWDLVAGLPVPAGSDVLV  
STWLLHRQRDIWEHADEF RPD RFLGEAASAI PRDAYLPFGLGPRVCIGARFAMMEMVIVMACLASRLRLDFCG  
DREPVPVMRITLQPD TAMP MRVSRR

>CYP173H1 (Hden\_0697) *Hyphomicrobium denitrificans* ATCC 51888

MSLTLSLSEYVSTGPRPRPAAPRPPEKPQQLSLLWTLNKNPLEAWPQSHYEEPIVTGNTVLGRFAMVSSPDA  
IRHVLVEKTENYRKDDLQNL LRPALGNGLLTSSGNEWRMQRRSFAPVFS PRKVTSYAPAMLNEAAALASRWR  
SLDGKIVDICEEMARSM LDTLATTLF SRGIGRDPAEFRRAATRYFETQGRIDPLDLIGAPAWLPRIGRLSRP  
ALKFFPLVNAILEERRRAADAPTNPEDWDFVDTLLNARDEATGAPISEEEIAANIITFIGAGFETPANALSW  
TLYLLSIDETWRRKVEAESDRLLPDLQTGNVKIDEFIYTRALIEEAMRLYPPVAILSR TALHDHVL SGRKIVA  
GTTVIIAPWILHRHRMLWNDPDCFD PARFLPQNR SNIERLSYIPFGAGPRVCIGATYAMQQIIIT IATLARHY  
RLDLVPGHAVLPVHRVTLRPEHGMKMSIMRRR

>CYP173J1 (Bind\_0833) *Beijerinckia indica*

MRQSINRATHTPSGQASKPLYPPAPRPQKAPLGPFTMLRLLRNPIETWTEAHFQLPILIGPTILGQVAVLND  
PAAIRRVFVDNASNYHKDRLQKRILGPGLGQSVLIAEDADWRLQRRILAPLFTPKTVATFAKATQECASEMVA  
RWQRLPEESPLDIHQEMTKITLEILGRTLFADGLDRRPEEVTAAMTRYFETIGSLDPFDLLDLPNWLPRWNQW  
RAKSALDFLGD TVSALISRKRLLARGV PNLQRDLLTLLLEAEDPETGVGLTETEVQANIVAFI GAGHETTAN  
ALTWSLYLLSLSEEWRRARLAAEADRVLDMPVESQA EHLIETRAVIEEAMRLYPPVASLSREALDYDDLGRRI  
RKGTVMVMSQWVLHRHRLLWEDPD RFDPT RFLPGQREKIDRFAYLPFGAGPRVCIGAGFAMQEATLVLAQILR  
AVRLETKKGFKAEPVQHITLRPRGGMPMILHHR LQRHGKIRH

>CYP173J2 (Msil\_1926) *Methylocella silvestris*

MMDFSPAAVLP RP PAPAPRAGPLGLQTMWVLRKNPIETWTRAHFELPILVGPTILGTIAVLSEPGAIRRF  
VDNAANYRKDALQKRVLGEGLEGLLMAEGDDWRVQRRTLAPLFTPKTIASFAPAMNLAAEKLVARWMNFRD  
RLFDVQPEMARVTLDALGRTLFS DGLGRDPSEFTTALTRYFLTGLTLPFDLLDFPDWAPRFRSGGRAALGF  
FEDVVD TIVARRKRLIAQDAGAAPRDLTLTLLLEAQDPQTGAGLTGAEVRSNIVTFIGAGHETTANALIWSLFL  
LSISPEWRARLAE EADAVLAGPIEQYAERLVETRAVIEEAMRLYPPVASISRE AIDFDTLAGRRIRKRTLVMV  
SQWVLHRHRLWDEPDVFDPRRFLPGAREKIDRFAYLPLGAGPRICIGGAFALQEAAIILAHIMRSFTLETRK  
GYEVKPVQHITLRPEGGLPMILRRRV

>CYP180D1 (OSB\_15900) *Octadecabacter temperatus*

MKPQLAADLSDQGHFDHGIPQDVFKDLRAMDGLAWNPLPSEGPDEGFWSVGRFDDVLAVSRDPETFSSATGHI  
QMYNIDDDALSARAS MIDMDPPDHTRLRLVNP GFIPKVIRTYTDIVRERASALLDDMMSQGGGDWVSKVAKP  
IPIGIICDMLGVPEEDRDLMIEMTDYLVAGTSAEPLDPNAYGNTTPLRLLPFNSPAAHGLREYARKLGEERRA  
NPKDDLISQLVTMEIDGEMLTDEEYTNFFRLLI FAGNETTRTAMSHMALQLSQYPEQFARLKDEPELIDTAVE  
EIVRYSSPIMYFRRTATKDTELSGTKIAAGDRVVMWYASANFDDTRFDDAQTFDIARPKMPIHAGYGGGGVHT  
CLGAGLARIELKVLLEEILARDLKIEIDGEPEYVNTNFVNGVEVLNIRLTQGTGA

>CYP186K1 (AMJ98\_PE00057) *Rhizobium* sp. N1341

MNARSHAIFPRVNRAGWFDTLRVLTAVVAPTVAKGII IRRPTMERLAERQRFDTNAVQMQRLKHKYGPAPLL  
LPIPLRPQLLILDPADVATVLQSSPEPF AAATAEKHAALVHFEPENVLISSGSRRAELRPAHEHALATADRLH  
PFTVHFKNIVDAELLHLLNLPRELDWPAFSQAWFRIVRRVVLGERARNDVTLTETLNELRGRANWFAAPVDQ  
HKLAQFHEQVG RYLRDPEKHS LVNRFPSGDELAPENQVAQWLF AFDAAGIAVMRTLALLACHVSYWGKAVEEA  
MGGNLD RPFTRSCLEVLRLWPTTPAILRQLTKDIQSGDRVIARGTGVIIFVPPFFHRDPALLYANRMEPSIWG  
QNDALPAAGLV PFSAGPVICPAHNLP AIASLAVGTFLSTADIVLLHPSLTVANLP GTLNHFDIRLKL TARRR  
EK

>CYP186K1 (AMK02\_PD00059) *Rhizobium* sp. N731

MNARSHAIFPRVNRAGWFDTLRVLTAVVAPTVAKGII IRRPTMERLAERQRFDTNAVQMQRLKHKYGPAPLL  
LPIPLRPQLLILDPADVATVLQSSPEPF AAATAEKHAALVHFEPENVLISSGSRRAELRPAHEHALATADRLH  
PFTVHFKNIVDAEFLQLLNIPRELDWPAFSQAWFRIVRRVVLGERARNDVTLTETLNELRGRANWFAAPVDQ  
HKLAQFHEQVG RYLRDPEKHS LVNRFPRGDELAPENQVAQWLF AFDAAGIAVMRTLALLACHVSYWGKAVEEA  
MGGNLD RPFTRSCLEVLRLWPTTPAILRQLTKDIQSGDRVIARGTGVIIFVPPFFHRDPALLYANRMEPSIWG  
QNDALPAAGLV PFSAGPVICPAHNLP AIASLAVGSFLSAADIVLLHPSLTVANLP GTLNHFDIRLKL TARRR  
EK

>CYP186K2 (IE4803\_PC00042) *Rhizobium etli* bv. phaseoli IE4803

MNARSHAVFPRVNRAGWTDTLRVIMTIVAPTA AKGII IRRPTIERLAERQDWNAAVKQMQRLKKKYGPAPLL  
LPIPF RPQLLLLD PADVSTVLQSSPEPF AAATPEKHAALAHFEPKNVLVSSASRRRAELRPAHEQALATADRLH  
PNSAHFKGV IDAEFLQLLGDIRSNRSGELDWPAFSQAWFRVVRRLVLGERARNDIKLTETLNDLRERANWASA  
APVDRRELALFHQQVGDYLSEPDKHS LVSRFPKGGEFAPESQVAQWLF AFDAAGITVIRTLAMLACHVSYWGK  
AVEESMSGDLDRPFTRSCLEVLRLWPTTPVILRQLTEDIKCGGRIIPRG TGVIIFAPFFHRDPEFLYANRMD  
PSIWGPNDALPAAGLV PFSAGPVICPAHNLP VPTVASLAVGALLSAADVLLQPSLAVDNLP GTLDHFAIRLRL  
AARRREK

>CYP186K2 (IE4771\_PD00043) *Rhizobium etli* bv. mimosa IE4771

MNARSHAVFPRVNRAGWTDTLRVIMTIVAPTA AKGII IRRPTIEHLAERQDWNAAVKQMQRLKKKYGPAPLL  
LPIPF RPQLLLLD PADVSTVLQSSPEPF AAATPEKHAALAHFEPKNVLVSSASRRRAELRPAHEQALATADRLH  
PYSAHFKGV IDAEFLQLLGDIRSNRSGELDWPAFSQAWFRVVRRLVLGERARNDIKLTETLNDLRGRTNWASA  
APVDRRELALFHQQVGRYLSEPDKHS LVSRFPKGGEFAPESQVAQWLF AFDAAGITVIRTLAMLACHVSYWGK  
AVEEAMSGDLDRPFTRSCLEVLRLWPTTPVILRQLTEDIKCGGRIIPRG TGVIIFAPFFHRDPEFLYANRMD  
PSIWGPNDALPAAGLV PFSAGPVICPAHNLP VPTVASLAVGALLSAADVLLQPSLAVDNLP GTLDHFAIRLRL  
AARRREK

>CYP186K3 (AMC79\_PD00042) *Rhizobium phaseoli*

MNARSHAIFPRVNRAGWIDTLRVMTRVIVPTVAKGTIIRRQTMERLAERQSLHIRAVKEMQRLKDKYGPSPLL  
LPIFPRPQLLILDPADLATVLRSSPEPFAAATAEKHAALAHFEPENVLISSTARRAELRPAHEHALATADRLH  
PYSIHFKRIVDTEFLQLISGIGSNRPNELDWLGFSQAWLRVVRVVLGERARNDVTLTETLNELRERANWPF  
ARVDRRKLALFHQQLAGYLGEPDKHSLVGRLLPTSDQIAPEDQVAQWLFDAAGIAVMRTLALLASHASYWAP  
AVEEAMGGRLDRPFTRSCLEALRLWPATPAILRHLTTEIRSADRIVPSGAGVVIFAPFFHRNPALLYANRME  
PSIWGENDALPDAGLVPPSAGPVICPAHNLPVTIASLAVGTVLSESGLALIDPVLVDNLPGLDHFALRLRL  
SARRREK

>CYP186K4 (RLEG3\_33000) *Rhizobium leguminosarum* bv. *trifolii* WSM1689

MNSRNQAVFSNARATGFVRINRASWIDTLRVVAAMVPTAAKGVIIRRPIMERLAQRQDLDTGAVRQMQRVLK  
KYGRAPLLLPIFPRPQLLVLDPAADVSTVLECSPPQFATATWEKRAALAHFEPKNVLISPASRRAELRPIHEHA  
LASADGLHPSSARFKTIVDSELLEILDGIGSGGNELDWSAFSLAWFRIVRRTVLGDRARNDVTLTKTLNDLR  
SRANWAFSAASIDRHKLRLQFQQQLGQYLRQPEEGSLIGRLPKGSDFDLESQVAQWLFDAAGIAVFTLALLA  
CHPSYWAKAVDEVKDPELERPFTRNCLLEALRLWPPTFVILRELTEDIRSGDRTVARGTGVIIIFAPFFHRDPE  
LAYANRMEPSIWGPNDTLPTVGFVPFSAGAAICPAHNLPVPAIASFAIGALLSQADITLLQPSLTVGDLPGTLN  
HFDIRLRLTRQVRGAGAPHAAGFPFH

>CYP186K5 (REMIM1\_PFO0058) *Rhizobium etli*

MNARSHAIFPRVNRAGWLDTLRVLTAVVAPTVAKGIIIRRPMTMERLAERQGFDTTAVKQMQRLLSKYGPAPLL  
LPIPLRPQLLILDSADVATVLQSSPEPFAAATMEKHAALVHFEPENLLISSNSRRAELRPAHEHALATADRLH  
PYAMHFKKIVDAEFLEVLNLPRELDWPAFSQAWFRIVRRIVLGERARNDVTLTETLDELGRANWAFAPVDQ  
HKLARFHEQVGRYLVDPKHSVLNRFPRGDELAPENQVAQWLFDAAGTAVIRTLALLACHVSYWGKAVEEA  
MGVDLDRPFTRSCLEVLRLWPPTPAILRQLTKDIQTGDRVIARGTGVIIIFVPPFHRDPALVYADRMEPTIWG  
RNDALPAAGLVPPSAGPVICPAHNLPVPAIASLAVGTFLSSADIVLLHPSLTVANLPGTLNHFDIRLKLTAARR  
ENR

>CYP191B1 (JI59\_08790) *Novosphingobium pentaromativorans*

MDVTAIKAQDYDPFSPEVMRNPLPYAELRRSDSIFYSAKYDAFFLSRFSIDLELLGYTDNTFIASEGTLFPV  
AALAVHNAGAPALPPTNPFPLSQRLGMPHIGEVRRAHMKPLLPRSVTELRFVSKRANERLDELIAQRHFDLT  
REFGGIVSGNVIAARLLGMPLELGETVLDLVNAGSLADPVTGGVDTRAAQKVIALILPWVERRFEAGADGSYP  
LIDGMIGYRFENEALTPEQVAQQIACAVIGGVETVPKVVAHGLMELNARPEQMAAVRADLKAAPVKLAEMIR  
FCAPAQWFMRTAHKPVTIAGQRIEPGQRVFYIAASAARDEREFDEPDEFWRDRPIRRTLAFGHGMHFCIGTHL  
ARMEVQVLVETFLSRVHRFHFDLEESVRLPSSFQGWNSLSVSIEEAE

>CYP192A1 (CC\_2997) *Caulobacter vibrioides* CB15

MDADVRSAPLIIPPAKVHPRQLGGSFVGELRIALEMSRNLMGAWCEEDFDNLFTPYVFMGQPGMVVSDPAAAR  
RILSSPNYVRPVKAARSVRPIAGDGLLLSEGETWRQRKSLAPVFTPMAVEGLLPHFVAAGASLAEALSGHAR  
ADLSEAFHHATLDAVLSALFSRRADAQGDQLAYMVRRYMEGPAHFNLMDFVSRGADDLTFLDVERRRQGAAWF  
QAVEHLIAQRQAHPHAEARDLLDRLLAARDEDGAPLSNQEIRDQCGTMLVAGFETTSRLFWATYLLALDPAT  
QDRLRAEVLAAAPAAVRTLDDDLQAWPLMRSVLFETLRLYPTAPLLAREAI GPDTVMGHAVVPGQIITISPWLI  
HRHRKLWDAPTAFFVPDRFIDQPHPWGIEAFLPFGAGPRVCIGASFALAEQIVLASLLERFEIGLVSDRPVIP  
IASITLGPDHAPFTLTPVS

>CYP192A1 (CCNA\_03092) *Caulobacter vibrioides* NA1000

MDADVRSAPLIIPPAKVHPRQLGGSFVGELRIALEMSRNLMGAWCEEDFDNLFTPYVFMGQPGMVVSDPAAAR  
RILSSPNYVRPVKAARSVRPIAGDGLLLSEGETWRQRKSLAPVFTPMAVEGLLPHFVAAGASLAEALSGHAR  
ADLSEAFHHATLDAVLSALFSRRADAQGDQLAYMVRRYMEGPAHFNLMDFVSRGADDLTFLDVERRRQGAAWF  
QAVEHLIAQRQAHPHAEARDLLDRLLAARDEDGAPLSNQEIRDQCGTMLVAGFETTSRLFWATYLLALDPAT  
QDRLRAEVLAAAPAAVRTLDDDLQAWPLMRSVLFETLRLYPTAPLLAREAI GPDTVMGHAVVPGQIITISPWLI

HRHRKLWDAPTA FVPDRFIDQPHPWGIEAFLPFGAGPRVCIGASFALAEAQIVLASLLERFEIGLVSDRPVIP  
IASITLGPDHAPAFTLTPVS

>CYP192A2 (Cseg\_3488) *Caulobacter segnis*

MDAQVRDVKVGPGLVPPVPKVHPRPLGGSPDLLRIAWEMSRNLIGAWCEEDFDNLVTPYHFMGQPGLVVSD  
PAGVRQVLASPNFRRLKLGRPLKPLAGEGLLLSEGETWKRQRKSLAPAFTPAAIGGLLPHFVAAGASLTEGL  
ANQTKANLSEAFHHGTLDAVLRALFSRRADRDGAVLAQIARRYLEGPAHFRLLDFIGRGRDDLTTFADGDRRRL  
GGRWLAEVDALIAQRRAPAAADDRPGDLLDRLLTARDEDGGPLPDQEIRDQCSSMLAAGFETTSRLLFWATYL  
LARDPETQDRVRAEILAFPVVERVNGLDLKA WPLLRSVLFETLRLYPTAPTFRQALADETVLGHKVPAGAMV  
TISPWLIHRHRKLWDAPAVFRPERFLDQPHPWGIEAFLPFGGGPRVCIGAGFALAEAQIILATVLARLEIALA  
DDRPVIPVASITLGPDPDFLLTPIVQARA

>CYP193A1 (b117012) *Bradyrhizobium diazoefficiens* USDA 110

MARGCASRCSRPVSDASAPRAGTSLGARLECRLCRFMALDERCLCVCRCPLLWVMRTRYRARTPCPNRWGQT  
AAPERASLAGHSRETALSTAPRIDIDPAAFWADPYPMLANMRKEAPIAFVPQLGSTLLTSRDDISISEKQIDV  
FSSHQPAGLMNRLMGNMMRKDGEAHQVERRAMFPTVSPKTVKGYWTALFQAHADRIIDAIEPGRIDFMRDFA  
LPFSGECLKSITGLTNIGFAEMDAWSQGMIEGIANVVGDPAVEARCHAATSGIDAAIDDMPLVMRKNPDQSIL  
GVLLASGMPMESVRANVKLAISGGQNEPRKAIAGTVWALMTHPEQLDLVRRGEVTWLQAFEEYARWISPIGMS  
PRRIAKPWSIRDVAFELDERVFLMFGSANRDEKHFERADQFDVRRDTSKSVAFGAGPHFCAGAWASRAMIADV  
ALPTL FARAGRIE IADDEPVRIGGWAFRGLQNLPARWLH

>CYP193A1 (BF49\_4496) *Bradyrhizobium* sp. BF49

MERSLSTAPRIDIDPAAFWADPYPMLAKMRKEAPIAFVPQLGSTLLTSRDDISISEKQIDVFSSHQPAGLMNR  
LMGNMMRKDGEAHQVERRAMFPTVSPKTVKAHWAALFQAHADRIIDAIEPGRIDFMRDFALPFSGECLKSIT  
GLTNIGFAEMDAWSQGMIEGIANVSGDAAVEARCHAATSGIDAAIDDILPVMRKHPDQSILGVLLASGMAMES  
VRANVKLAISGGQNEPRKAIAGTVWALLTHPDQLDLVRQGEVTWLQAFEEYARWISPIGMSPRRIAKPWTIRD  
VAFETDERVFLMFGSANRDEKHFERADQFDVRRDTAKSVAFGAGPHFCAGAWASRAMIADVALPTL FARASRL  
E IADDEPVRVGGWAFRGLQNL PVRWLH

>CYP193A1 (BJ6T\_23930) *Bradyrhizobium japonicum* USDA 6

MSTAPRIDIDPASFWVDPYPMLAKMRKEAPIAFVPQLGSTLLASRDDISISEKQIDVFSSHQPAGLMNRLMGH  
NMMRKDGEAHQVERRAMFPTVSPRTVKAHWTALFQAHADRIIDAIEPGRIDFMRDFALPFSGECLKSITGLTN  
IGFQMDAWSQGMIEGIANVGGDPAVEARCHAATSGIDAAIDDILPVMRKHPDQSILGVLLAAGMPMESVRAN  
VKLAISGGQNEPRKAIAGTVWALLSHPEQLALVRKGEVTWLEAFEEYARWISPIGMSPRRIAKPWSIRDVSFE  
LDERVFLMFGSANRDEKHFERADQFDVRRDTSKSVAFGAGPHFCAGAWASRAMIADVALPTVFARAKQLEIAD  
DEPVRIGGWAFRGLQNL PVRWH

>CYP193A (RN69\_11690) *Bradyrhizobium japonicum* E109

MSTAPRIDIDPASFWVDPYPMLAKMRKEAPIAFVPQLGSTLLASRDDISISEKQIDVFSSHQPAGLMNRLMGH  
NMMRKDGEAHQVERRAMFPTVSPRTVKAHWTALFQAHADRIIDAIEPGRIDFMRDFALPFSGECLKSITGLTN  
IGFQMDAWSQGMIEGIANVGGDPAVEARCHAATSGIDAAIDDILPVMRKHPDQSILGVLLAAGMPMESVRAN  
VKLAISGGQNEPRKAIAGTVWALLSHPEQLALVRKGEVTWLEAFEEYARWISPIGMSPRRIAKPWSIRDVSFE  
LDERVFLMFGSANRDEKHFERADQFDVRRDTSKSVAFGAGPHFCAGAWASRAMIADVALPTVFARAKQLEIAD  
DEPVRIGGWAFRGLQNL PVRWH

>CYP193A1 (BCCGELA001\_31425) *Bradyrhizobium* sp. CCGE-LA001

MSTAPRIDIDPAAFWADPYPMLAKMRKEAPIAFVPQLGSTLLTSRDDISISEKQIDVFSSHQPAGLMNRLMGH  
NMMRKDGEAHQVERRAMFPTVSPRTVKAHWAQFQAHADRILDAIEPGRIDFMRDFALPFSGECLKSITGLTN  
IGFQMDAWSQGMIEGIANVGGDPAVEARCHAATSGIDAAIDDILPVKRKHPDQSILGVLLASGMAMESVRAN  
VKLAISGGQNEPRKAIAGTVWALLTHPDQLDLIRRGESVWLQAFEEYARWISPIGMSPRRIAKPWTIRDVAFE  
LDERVFLMFGSANRDEKHFQRADHFDVRRDTSKSVAFGAGPHFCAGASASRAMIADVALPTVFARAKQLEIAD  
DEEVRIIGGWAFRGLQNL PVRWRH

>CYP193A3 (Jann\_3733) *Jannaschia* sp. CCS1

MNKTYDIDPKAFWRDPYPDLARIQAQAPAVFVPQLGATLLTRRDDIFEQEKRIEVFSSEQPGGLMTMLMGENL  
MRKDGDAHMAERKVIFPALS PRVKATWK RQFEAATNSILDAL EPQGHCDLVTD FAMPVCGEALKVITGLTQM  
PTAEMDRVSQHMLDGCANYVGDNEVEARCHAATAFIDEHIDLMVPELIKTPDASVLSVQLAAGLPMASTRANV  
KLVISGGQNEPRDAIAGTAWALLAHGHALAKIAEGSASF LDAFEEYARLISP IGMSPRQVARSEHVLGHDFEV  
GDRVFLMFGAANRDPRIFEAPDVF DITRNNRKS VTFGAGPHFCAGAAASRALIAEVALPKL FERLPRLR LDGG  
VTFGGWAFRGPLKVPVRWF

>CYP193A4 (S23\_12910) *Bradyrhizobium* sp. S23321

MSTAPRIDIDPAAFWADPYPMLAKLRQEAPIAFVPQLGSTLLTRDDISISEKQIDVFSSHQPAGLMNRLMGH  
NMMRKDGEAHQAERRAMFPTVSPKTVRAHW TALFQAHADRIIDAIAPGSRIDLMRDFALPFSGECLKSITGLT  
NIRYQDMDAWSQGMIEGIANYGGDPAVEARCHAATSGIDAAIDDILPVMRERPDQSILGVLLASGMPMDSVRA  
NVKLAISGGQNEPRKAIAGTVWALLSHPDQLALVRSGEVSWLQAFEEYVRWISPIGMSPRRITKPWSIRDVSF  
ETDERVFLMFGSANRDEQHFERADQFDVRRDTSKSVAFGAGPHFCAGAFASRAMIADVALPTLFASANKLELA  
DDEPVRIGGWAFRGLQNL PVRWLH

>CYP193A5 (S58\_18580) *Bradyrhizobium oligotrophicum*

MSTAPRFDIDTATFWADPYPALARMRKEAPIAFVPQLGSTLLCRRNDIFVSEKQIDVFSSHQPQGLMNRLMGH  
NMMRKDGAHMAERHAIAPAVSPRAVRVH WLAQFQAHADRLIDALDPAAEIDLVRDFALPFSAECLKLITGLT  
NMRFEDMNAWSQAMIDGIANYTGDPAVEARCNAATSGIDAAIDDM LPVLEKHPNQSL LGVMLAGGMPMDSVRA  
NIKLAISGGQNEPRDAIAGTVWALLLHPEQLALAVNGEVRLQVFEEYARWISPIGMSPRRIARPWSIRDVAF  
EPDERVFLMFGSANRDEAYFTDPDRFDIRRDVSKSIAFGAGPHFCAGAWASRAMIADVALPTLFARLQNLRLR  
EAESARIGGWAFRGLLNL PVTWDATRH

>CYP193A6 (BBta\_6269) *Bradyrhizobium* sp. BTAi1

MSTAPHFDIDPAAFWADPYPALARMRREAPIAFVPQLGSTLLCRRDDIFVSEKQIEVFSSHQPQGLMNRLMGH  
NMMRKDGAH LAERQAIAPAVSPRAVRVH WLTQFQAHADRLIDALDPAADV DLVRDFALPFSAECLKLITGLT  
NMRFEDMNAWSQAMIDGIANYTGDPAVEARCNAATAGIDAAIDDM LPVLEKTPNQSL LGVMLAAGMPMDSIRA  
NIKLAISGGQNEPRDAIAGTVWALLTHPEQLALAVHGEVRWLQVFEEYARWISPIGMSPRRIAKPWTIRDVAF  
APEERVFLMFGSANRDEAHFTAPDRFDIRRDVSKSIAFGAGPHFCAGAWASRAMIADVALPTLFRRLNNLRLR  
DDEPVRIGGWAFRGLLNL PVKWEATQD

>CYP193A6 (BRADO5757) *Bradyrhizobium* sp. ORS 278

MSTAPHFDIDPVTFWADPYPALARMRKEAPIAFVPQLGSTLLCRRDDIFVSEKQIEVFSSHQPQGLMNRLMGH  
NMMRKDGEAHLAERQAIAPAVSPRAVRVH WLAQFQAHADRLIDALDPAAEVDLVRDFALPFSAECLKLITGLT  
NMRFQDMNAWSQAMIDGIANYTGDPAVEARCNAATAGIDAAIDDM LPVLETAPNQSL LGVMLAAQMPMESIRA  
NIKLAISGGQNEPRDAIAGTVWALLTHPEQLALANTGAVRWLQVFEEYARWISPIGMSPRRIAKPWTIRDIAF  
APEERVFLMFGSANRDEAHFIDPDRFDIRRDVSKSIAFGAGPHFCAGAWASRAMIADVALPTLFRRLQNLRLR  
DAEPVRIGGWAFRGLLNL PVTWDATRR

>CYP193A7 (RPB\_1938) *Rhodopseudomonas palustris* HaA2

MSNAPHFEINVAFWADPYPALAKMRAQAPIAFVPQLGSTIFTRRDDIFVNEKRIDVFSSHQPAGLMNRLMGH  
NMMRKDGAHLAERTAMFPAVSPRTVKEVWRKQFQAHADRILED LAPRGAADLVKAFALPLSGECLKDVTGLT  
NISYHEMDAWSQAMIDGIANYTGDRAVEDRCHAATAGIDAAIDDMAPVVRKHPDHSM LSVLIAAGMAMDSIRA  
NIKLAISGGQNEPRDAISGCVWALLTHPSEYARVVAGEASWLDVFEEYARWIAP IGMSPRRVAQPFHYRGVDF  
EPEDRVFFMFGSANRDEACFSDPDVFDVGRDHAKSIAFGAGPHYCAGAFASRAMVADVALPGVFARLTDLR LD  
PREPVRIGGWAFRGLLNL PVVWNSAAPN

>CYP193A8 (RPD\_3440) *Rhodopseudomonas palustris* BisB5

MSNAPHFEIDVASFWADPYPALARMRAEAPIAFVFPQLGSTIFTRDDIFVTEKRIDVFSSHQPAGLMNRLMGH  
NMMRKDGAHIAERSALFPAVSPRTVKDVWRAQFQAHADRIDELAPQGHADLVKAFALPLSGECLKHITGLT  
NISYHEMDSWSQAMIDGIANYTGDKAVEDRCHAATAGIDAAIDDMAPVVSXSHNSMLSVLLASGMAMDSIRA  
NIKLAISGGQNEPRDAIAGCIWALLTHPAEYAKVVAGDASWLAVFEEYARWIAPIGMSPRRVAQPFHYRGVDF  
EPEDRVFFMFGSANRDEACFTDPDLFDVSRDHAKSIAFGAGPHYCAGAFASRAMVADVALPSVFARLKALRLD  
EGEPVRIGGWAFRGLLNLPVAWSSAAPN

>CYP193A9 (LMTR13\_07025) *Bradyrhizobium icense*

MSNAPHFDIDVPTFWADPYPALAKMRKETPIAFVFPQLGSTVFTKRDDIFTQEKRIDVFSSHQPNGLMNVLMGH  
NMMRKDGEAHMTERQAMFPAVSPRTVRDVTWRQFQAHADRIDELTPKGEADLCKAFALPLSAECLKDVTGLT  
NMRYQMDMAWSQAMIDGIANYTGNKEVEARCHAATAGIDAAIDDMI PVVKKHPNTSILSVLLASGQNMESIRA  
NIKLAISGGQNEPRDAISGATWALLTHPEQLAVVREEKAKWIDVFEEYARWIAPIQMSPRRVAKPWTYHGVDF  
EPEDRVFFMFGSANRDEACFSDPDRFDITRDTQKSIAFGAGPHYCAGAFASRAMVADVALPSLFARLKRLRLD  
EREPVRIGGWAFRGLLNLPVKWGAG

>CYP193A10 (BSQ44\_19500) *Mesorhizobium* sp. B7

MSDAPRYEIDPAAFWRNPYPDLARMRESAPIAFVFPQLGATLFSRRDDIFVCEKNVAVFSSHQPGGLMNRLMGH  
NMMRKDGAHLSERRAIFPSVSPKTVRDVWKQTFEHAADTVLDELDPAGADLVKDFALRFSAECLKSLTGLV  
NMRSQMDMAWSQAMIDGIANYAGDPAVEARCHSATSGIDSAIDDMVPVVRAPNASLLSVMLDGGMPMESVRA  
NVKLAISGGQNEPRDAIAGAVWALLTHPSERARVEAGEASWMQVFDEYCRWLAPIGMSPRRVAVRHRYGDI TF  
EPEDRVFFMFGSANRDEAHFIDPDRFDVSRATSKSIAFGAGPHFCAGAWASRCMVAEVALPKLFGRLRGLQIE  
EGAQVRIGGWAFRGILNLPVRWKPR

>CYP193A11 (SPO0226) *Ruegeria pomeroyi*

MTTRTPQNTHCVDMTTGSRAMSDAPVYEIDLAAFWADPYPDLKRMRAEAPIAYVPQLGATLITRRDEIFAQEK  
RIEIFSSDQPQGLMTVLMGQNMNRKDGAHMAERKAIFFTVSPKTVKQVWVAQFRAAAQVRLDDLAPRGACDL  
VRDYAMPVSAEALKAITGLTNMTAAEMDRVSQGMIDGCANYAGDPLVEARCHDCTASIDAHIDAMIPVLDA  
DHSLLSVQRRAGLSAQTRANIKLAISGGQNEPRDAIAGTAWAVLSHPDALARLQSGAVPWLRAFEYARWIS  
PIGMSPRRVAQRTATVQGVTTLEPEDRVFLMFGSGNRDES VFANPDRFDLDQDIAPAI SFGAGPHFCAGAWASRA  
LIGEVALPLLFERLPGLALDGEARFGGWAFRGPI TVPVRWEPAPREG

>CYP193A12 (BO069\_09450) *Sulfitobacter* sp. AM1-D1

MTDAPHFSIDPAAFAADPYPALARMRREAPIAFVPELGATLLTRDDIHRQEKRIEVFSSHQPDGLMSVLMGE  
NMMRKDGAHQAERRALFPALSPRTVAQHWSVFEAAANDILDDLAPLGACDLVTDYAMPVSAAALIAITGLS  
GMTRAEMDRVSQH MIDGCANYLGDPEVEARCHAATALIDSHIDRSFDMPPPKSALAVQRAAGLPMQSLRANIK  
LVISGGQNEPRDAIAGIAWALLTHPDQLALIRRGENTWQDAFAEYARWISPIGMSPRIVARADSVGGVRFDPG  
DRVFLMFSSAGRDEAHFDRPDADFVTRDTGAAIPFGAGPHFCAGAAAARCLIAEVALPLLFDRLPGLRLDGPV  
PFKGWAFRGPTSMPPVAW

>CYP193A14 (BWR18\_05930) *Tateyamaria omphalii*

MSSAPT VHIDPAAFHADPYPTLAAMRQNAPVCYVPEMGATLFTTRDDVFREKRVDLFSSHQPNGLLTKVMGS  
NLMRKDGEAHMRERKALFPALSPRTVRDVLGPKFREIVQGHIDGLQPLGACDLVTDYAMPVSADALRLITGLT  
NMEAAEMDAASQAMLDAAANYQRDPEVDRLGYGYADHVLDL IKERLPQLRAAPDMSIISVLDQAGLTLD E IAG  
NVRV IIGGGQNEPRDAIAGTAWALLTHPDQYAMMANGTADWNAAFDEYVRLVAPIGMSPRRVARPDRACDVEF  
NADELIFMFGSACRDADHFTDPNAYDLTRNTGPAIPFGAGPHFCAGAAASRALIAGHALPMLFDQLPNLRLT  
DDVT FAGWAFRGPLSVPVAWDI

>CYP194A1 (b112905) *Bradyrhizobium diazoefficiens* USDA 110

MSDVSEPV AHPPVTDWVNDFDHTDPQWTD DFPPIWDELRAASPVVHTEFLGCYMPTTYEAVREIANDTEHFS  
SRRIIVRDVRPEIARNAAPPITSDPPVHKPAKQLLLPFP TP DAMKKLEPRVRTICNELIDGFISDGKVDAAAR  
YSKYIPVRAIAHMLGIPESDSDLFVNWIHMILELGIKDETMLLQAVQEMSAYFRTHIEERRSRPTDDLISYLM  
NAKDKEGQPLEESHVLGSLRLLLIAGIDTTWSAIGSSLWHLARTPADRERLIAEPGLPIPIAVEELLRAYSPVT

MAREVVKETTISGCPVKAGNMVLLSFPAANRDPKMFPDADKVIDRRENRHAAFGLGIHRCVGSNLARMEMQV  
ALEEWLKRIPDFRLDPAGTVTWSQGTVRGPRQLPFLLGKAM

>CYP194A1 (S23\_51100) *Bradyrhizobium* sp. S23321

MSDVSQPAAHPPVTDWVHDFDHTDPQWTEDPFPIWDELRAASPVVHTEFLGCMPTTYEAVREIANDTEHFS  
SRRIIVRDVRPEVARNAAPPITSDPPVHKPAKQLLLPPFTPDAMKKLEPRMRAICNELIDGFIADGKVDAAAR  
YAKYIPVRAIAHMLGIPESDSDLFIDWIHMILELGIKDESKLLQAVQEMSAYFRTHIEERRSKPTDDLISHLM  
NAKDKEGQPLEESHVLGSLRLLLIAGIDTTWSAIGSSLWHLARTPADRERLIAEPGVIPIAVEELLRAYSPVT  
MAREVVKETTISGCPVKAGNMVLLSFPAANRDPKVFPDADKVIDRRENRHAAFGLGIHRCVGSNLARMEMQV  
ALEEWLKRIPDFRLDPAGTVTWSQGTVRGPRQLPFLLGKAM

>CYP194A2 (RPA1732) *Rhodopseudomonas palustris* CGA009

MSERAPVTDWVNDFDHTDPRWTENPYPIWDELRSAGPLVHTDRFLGCMPTTFAAVKEISYDTHFSSRRVIV  
RNVRSSEPPAPPITSDPPEHKPAKRLLLPPFTPDAAVAKLEPRVRAICNELIDAFIEDEGCDAATAYTKHIPV  
KTICHMLGIPEDDSDFIRWIHEILELGINDDAILMKAVFEMSTYFQGHIAHRKQKPTDDLITLMNARDDKG  
QPLSDAHVLGSLRLLLIAGIDTTWSAIGAALWHLATHPADRERLLAEPELMPTAIEEFLRAYSPVTMAREVMK  
ETSIAGCPVKPGNMVLLSFPAANRDPSVFPEADRVIMDRKENPHVAFGLGIHRCVGSNLARMENTVAIEEWLK  
RIASFRLDPSQKVRWSEGTVRGPRSLPLLFGKPS

>CYP194A2 (Rpa1\_1932) *Rhodopseudomonas palustris* TIE-1

MSERAPVTDWVNDFDHTDPRWTENPYPIWDELRSASPLVHTDRFLGCMPTTFAAVKEISYDTHFSSRRVIV  
RNVRSSEPPAPPITSDPPEHKPAKRLLLPPFTPDAAVAKLEPRVRAICNELIDAFIEDEGCDAATAYTKHIPV  
KTICHMLGIPEDDSDFIRWIHEILELGINDDAILMKAVFEMSTYFQGHIAHRKQKPTDDLITLMNARDDKG  
QPLSDAHVLGSLRLLLIAGIDTTWSAIGAALWHLATHPAERERLLAEPELMPTAIEEFLRAYSPVTMAREVMK  
ETSIAGCPVKPGNMVLLSFPTANRDPSVFPEADKVMIDRKENPHVAFGLGIHRCVGSNLARMENTVAIEEWLK  
RIASFRLDPSQKVRWSEGTVRGPRSLPLLFGKPS

>CYP194A3 (RN69\_33290) *Bradyrhizobium japonicum* E109

MSDVSQPAAHPPVTDWVHDFDHTDPQWTDPPFPIWEELRAASPVVHTEFLGCMPTTYEAVREIANDTEHFS  
SRRIIVRDVRPEISRNAAPPITSDPPVHKPAKQLLLPPFTPDAMKKLEPRMRAICNELIDGFIADGKVDAAAR  
YSKYIPVQAIHMLGIPESDSDLFINWIHMILELGIKDESKLLQAVQEMSAYFSTHIEERKKKPTNDLISYLM  
NARDKEGNPLEDSHVLGSLRLLLIAGIDTTWSAIGSSLWHLAKTPADRERLIAEPGLIPIAVEELLRAYSPVT  
MAREVVKETTISGCPVKAGNMVLLSFPAANRDPKMFPDADKVIDRRENRHAAFGLGIHRCVGSNLARMEMQV  
ALEEWLKRIPDFALDPAGTVTWSQGTVRGPRQLPFLFGKAM

>CYP194A4 (BF49\_1787) *Bradyrhizobium* sp. BF49

MSDISQPAAHPPVTDWVHDFDHTDPQWTEDPFPIWDELRAASPVVHTEFLGCMPTTYEAVREIANDSEHFS  
SRRIIVRDVRPEITSRNSAPPITSDPPVHKPAKQLLLPPFTPDAMKKLEPRVRAICNELIDGFITEDRLDAAE  
RYTKHIPVRAIAHMLGIPETDSDLFIRWIHMILELGIKIDENTLLQAVQEMTVYFSGHIEARKTKPTDDLISYL  
MNARDKDGNPLEDShVLGSLRLLLIAGIDTTWSAIGSSLWHLARTPADRERLVAEPGLIPTAVEELLRAYSPV  
TMAREVVKETTISGCPVKAGNMVLLSFPAANRDPKMFPDADKVIDRRENRHAAFGLGIHRCVGSNLARMEMQ  
VALEEWLKRIPDFALDPAGTVTWSQGTVRGPRQLPFLLGKAM

>CYP194A5 (RPD\_1836) *Rhodopseudomonas palustris* BisB5

MTERTPVTDWVNDFDHTDPRWTDPPFPIWNEMRSAGPVVHTEFLGCMPTTFAAVKEISYDTHFSSRRVIV  
RNSRPEPVQSAPPITSDPPEHKPAKRLLLPPFTPDAAVALEPRVRAICNELIDQFIENGSCDAAADYSKHIPV  
KTICVMLGIPESDSDQFIQWIHEILELGINDDAVMMKAIQEMSVYFLGHIAKRKQHPTDDLITLMNARDASG  
QPLSDVHVLGSLRLLLIAGIDTTWSAIGATLWHLATHPDDRARLVAEPELMPTAIEEFLRAYSPVTMAREVMK  
ETTISGCPVKPGNMVLLSFPSANRDPSVFADQVRIDRKENPHVAFGLGIHRCVGSNLARMENTVAIEEWLK  
RIPEFRLDPSQKVRWSEGTVRGPRKLPLLFGKAM

>CYP194A6 (RPB\_3631) *Rhodopseudomonas palustris* HaA2

MTERAPVTDWASDFDHTDPRWTENPYPIWDELRAASPVVHTDRFLGVYMPPTTFAAVKEISYDTHFSSRRRIIV  
RNSRPEPVQSAPPITSDPPEHKPAKRLLLPPFTPD AVAKLEPRVRSICNELIDDFIADGRCDAAKAYSKHIPV  
KTICAMLGIPETDSDRFIQWIHEILELGIHDDAMLKAIQEMSVYFAGHIAKRKQHPTDDLSTLMNARDADG  
QPLSDVHVLGSLRLLLLIAGIDTTWSAIGAALWHLATHPEDRVRLVAEPDLMSTAIEELLRAYAPVTMAREVMK  
ETTIAGCPVKPGNMVLLSFPAANRDPDVPDADRVKIDRQENPHVAFGLGIHRCVGSNLARMEMTV AIEEWLK  
RIPEFRLDSSQNRWSEGTVRGPRQLPLLLGQPS

>CYP194A7 (Nham\_2693) *Nitrobacter hamburgensis*

MSSPAPVTDWVRDFDHTDPRWTENPYPIWDELRAECPVAHTDRFLGVYLPPTYEAVKEICYDTEHFSSRRVVV  
RNVREPEPPPAPPITSDPPAHKHAKQILLSPFLPD AVRQLEPRVRAICNDLIDGFINDKSCDAAARYTKRIPI  
RAITHMLGVPEKDGDLFIRWIHEMLELGVHDDNMVMKAIHEMVAYFAEQIESRKKHPTDDLSTLMNARGEDG  
QPLTDLHVQGALRLLLLVAGLDTTWSAIGSSLWHLAQTPADRARLVAEPELLPTAIEEFLRAFSPATSGREVMK  
ETTVSGCPMKPGNTVLLSFPAANRDP AVFPDADKVIIDRKENRHVAFGVGIHRCVGAHLARMEMLVAIEEWLK  
RIPDFRLDPSGEITWSEGSVRGPRQLPLLLGTG

>CYP194A8 (Nwi\_2279) *Nitrobacter winogradskyi*

MSSPAPVTDWVHDFDHTDPRWTENPYPIWDDL RARCPIAHTNRFLGVYLPPTYEAVKEISRDEHFSSRRVVV  
RNRREPEPPPAPPITSDPPAHKHAKQILLPPFAPEAVAKLKPRIRAI CNELIDGFINEKGCDAAARYTRYIPT  
RAITIMLGVP EKDGDLFIKWIHEILEVGLNDDAVMQAVREMGVYFAEQIEARKKHPTDDL IATLMNARSEDG  
QPLTDMHVQGALRLLLLVAGIDTAWSAIGSSLWHLAQTPADRERLIAEPELIPTAIEEFLRAFAPATSGREVMK  
ETTVSGCPMKPGNMVLLSFPAANRDP AVFPDADKIIIDRKENRHIAFGVGIHRCVGAHLARMEMLVAIEEWLK  
RIPEFRLDPSGGVKWSEGSVRGPRQLPLLLGKA

>CYP195A1 (b112856) *Bradyrhizobium diazoefficiens* USDA 110

MNADAKELAASFLEKLTPEFYDNPYPTYRALRENEPVKRLPNGTVFLTRYDDLVT TYKNTKSFSSDKKREFA  
PKYGNTPLYEHHTTSLVFNDPPAHTRVRRLIMGALSPRAIAGMEADLIKLV DGLLDAIAAKGSCELIEDFAAS  
IPIEVIGNLLDVPHDERTPLRDWSLAILGALEPVVSPEAAAARGNKAVKD FLSYLETLVARRRGKPGNPERDVL  
TRLIQGEGNGEENGERLTEKELLHNCIFLLNAGHETTTNLIGNGLVALDRHPDQKQRLIDHPDMIKTAVEEML  
RYESSNQLGNRMTTERVELGGVMLDAGTSVTLCIGAANRDP AQFPDPESFDIARTPNRH LAFATGAHQ CAGMA  
LARLEVAIAISRFLARFPNYAVNGRPVRGGRVRFRGFLSVPCAIG

>CYP195A1 (RN69\_33545) *Bradyrhizobium japonicum* E109

MNASAKELAANFDLEKLTPEFYDDPYPTYRALRENEPVKRLPNGTVFLTRYDDLVT TYKNTKSFSSDKKREFA  
PKYGDTPLYEHHTTSLVFNDPPAHTRVRRLIMGALSPRAIAGMEPDIVKLVDGLLDAIAAKGACELIDDF AAS  
IPIEVIGNLLDVPHDEREPLRDWSLAILGALEPVVSPEVAARGNKAVKD FLAYLET LVARRRQKPGNPERDVL  
TRLIQGEGNGEENGERLTEKELLHNCIFLLNAGHETTTNLIGNGLVALHRNPDQKQRLIENS DMIKTAVEEML  
RYESSNQLGNRMTTEKIELGGVMLDAGTSVTLCIGAANRDP AQFPPEPERFDIARTPNRH LAFATGAHQ CAGMA  
LARLEGAIAISRFLARFPNYAVSGHPVRGGRVRFRGFLSVPCSIG

>CYP195A2 (RPA3778) *Rhodopseudomonas palustris* CGA009

METAPAE LAEAFDLARLTPDFYDNPYPTYHALRAHQPVKRLASGGYFLTRYDDL VAVYKNTTLFSSDKKREFT  
PKYGDSLLFEHHTTSLVFNDPPSHTRVRRLIMGALTPRAIAGMEPD LIALVDRLLDAMAAKGRVDLIEDFASA  
IPIEVIGNLLGVPHDERGPLRGWSLAILGALEPVIGPEAFALGNAAVA EFLGYLDTLIARRTAEPGDPERDVL  
TRLIRGEAGGEKLTAKELLHNCIFLLNAGHETTTNLIGNGLVTLAANPDQKRRLIAEPALIKTAVEEILRYES  
SNQLGNRITTAEVEIGGVSMFANTSLTLCIGAANRDP AQFADPDRFDVSRSPNRHLAFASGPHQCAGMALARL  
EGAIALSRFLAHFPDYVLDGPPQRGGRVRFRGYLGVPCLRG

>CYP195A2 (Rpa1\_4299) *Rhodopseudomonas palustris* TIE-1

METAPAE LAEAFDLARLTPDFYDNPYPTYHALRAHQPVKRLASGGYFLTRYDDL VAVYKNTTLFSSDKKREFT  
PKYGDSLLFEHHTTSLVFNDPPSHTRVRRLIMGALTPRAIAGMEPD LIALVDRLLDAMATKGRVDLIEDFASA  
IPIEVIGNLLGVPHDERGPLRGWSLAILGALEPVIGPEAFALGNAAVA EFLGYLDTLIARRTAEPGDPERDVL



TRLIRGEAGGEKLTAKELLHNCIFLLNAGHETTTNLIIGNGLVTLAANPDQKQRLIAEPALIKTAVEEILRYES  
SNQLGNRITTAEVEIGGISMPANTSITLTCIGAANRDPAQFADPDRFDVSRSPNRHLAFASGPHQCAGMALARL  
EGAIALSRFLARFPDYVLDGPPQRGGRVFRFRGYLSIPCRFG

>CYP195A7 (BF49\_1839) *Bradyrhizobium* sp. BF49

MNASANELAASFLEKLTPEFYDNPYPTYRALRENEPVKRLRNGTVFLTRYDDLVTYKNTKSFSSDKKREFAP  
PKYGETPLYEHHTTSLVFNDPPAHTRVRRLLIMGALSPRAIAGMEPDIIKLVDGLLDIAIAVKGNCELIEDFAAS  
PIEVIGNLLDVPHERAPLRDWSLAILGALEPVVSPEVAVRGNKAVTDFLGYLRTLVARRRERPGNPERDVL  
TRLIQGEDNGERLTEKELLHNCIFLLNAGHETTTNLIIGNGLVALERNPDQKQRLIDHPELIKTAVEEMLRYES  
SNQLGNRMTTERVELGGIMLDAGTSITLTCIGAANRDPAQFPDPESFDIARTPNRHLAFATGAHQACAGMALARL  
EGAIAVSRFLARFPNYAVSGQPVRGGRVFRFRGFLSVPCAIG

>CYP195A8 (S23\_51560) *Bradyrhizobium* sp. S23321

MNASAKELAASFDLTRLTAEFYDDPYPTYRALRENEPVKRLPNGTVFLTRYEDLVTYKNTKSFSSDKKREFAP  
PKYGDTPLEHHTTSLVFNDPPSHTRVRRLLIMGALSPRAIAGMEPDIVRLVDGLLDIAIAAKGACELIEDFAAS  
PIEVIGNLLDVPHERGRLRDWSLAILGALEPVVSSEVAARGNKAVTDFLAYLQTLVARRRNPGNPERDVL  
TRLIQGEENGERLTEKELLHNCIFLLNAGHETTTNLIIGNGLVALDRNPDQKQRLIDNPDMIKTAVEEILRYES  
SNQLGNRMTTEAVELGGVMLDAGTSVTLTCIGAANRDPAQFTDPERFDIARTPNRHLAFATGAHQACAGMALARL  
EGAIAISRFLARFPPTYAVSGQPVRGGRVFRFRGFLSVPCAIG

>CYP195A9 (BBta\_2844) *Bradyrhizobium* sp. BTAi1

MNDAAALAADFLESLTPAFYADPYPTYRALRQYAPVKRLRNGSYVLTRYDDLVTAYKATKTFSSDKTREFAP  
KYGASLLYEHHTTSLVFNDPPAHTRVRRLLIMGALSPRAIAEMEPALIALVDGLLDRIA AEDRCELIEDFAAAI  
PIEVIGNLLGVPHEERGRLRDWSLAILGALEPVVSEAQLSRGNRAVKAFLAYLEGLVARRRRAAPGNPERDVL  
RLILGEADGERLSEKELLHNCIFLLNAGHETTTNLIIGNGLVLLCEHPAERQRLIDAPSLIRTAVEEILRYESS  
NQLGNRMTTEPVELGGVKLEAGTSVTLTCIGAANRDPAQFEDPERFDIGRLANRHLAFGTGAHQACAGMALARLE  
GAVAIISRFLARFPNYQLDGAPVRGGRVFRFRGFASVPCRIGVGGG

>CYP195A10 (S58\_51130) *Bradyrhizobium oligotrophicum*

MTDDAALASQFDLERLTPEFYADPYPTYRALRQHAPVKRLRNGSYFLTRYDDLVTAYKATKTFSSDKKREFAP  
KYGASLLYEHHTTSLVFNDPPAHTRVRRLLIMGALSPRAIAEMEPALIALVDGLLDRIA AAKDRFELIDDFASAI  
PIEVIGNLLGVPHEERGRLRDWSLAILGALEPVL SAEQLARGNQAVGDFLTYLRLGLVARRRRTTPGNPERDVL  
RLILGEADGERLSETELLHNCIFLLNAGHETTTNLIIGNGLVLLCQHPAERQRLIEEPGLIRTAVEEILRYESS  
NQLGNRMTTEAVELSGVRLEAGTSITLTCIGAANRDPAQFDDPERFDIARPANRHLAFGTGAHQACAGMALARLE  
GAVAIARFLSRFPNYQLDGSPVRGGRVFRFRGFASVPCVVEG

>CYP195A11 (BRADO2499) *Bradyrhizobium* sp. ORS 278

MTDAAALADDFDLERLTPGFYADPYRTYRALRQYAPVKRMRNGSYFLTRYDDLVTAYKTTKAFSSDKKREFAP  
KYGDSLLYEHHTTSLVFNDPPSHTRVRRLLIMGALSPRAIAEMEPALIALVDGLLDRIA AAKPRFELIEDFAAAI  
PIEVIGNLLGVPHEERGRLRDWSLAILGALEPVL TPEQLARGNQAVADFLDYKTLVARRRARP GHPERDVL  
RLIQGESDDENGGERLSEKELLHNCIFLLNAGHETTTNLIIGNGLVLLCQHPAERKKLIEAPALIRTAVEEILR  
YESSNQLGNRMTTEAVELGGITLAPGTSVTLTCIGAANRDPAQFDDPERFDITRIANRHLAFGTGAHQACAGMAL  
ARLEGAVAIARFVS RFPNYQLAGEPVRGGRVFRFRGFASVPCVVS

>CYP195A12 (Rpxd1\_1566) *Rhodopseudomonas palustris* DX-1

METAPAEALAEAFDLARLTPDFYDNPYPTYQALRTHQPVKRLPGGGYFLTRYDDLISVYKNTTLFSSDKKREFAP  
PKYGESLLFEHHTTSLVFNDPPSHTRVRRLLIMGALT PRAIAGMEPDIALVDRLLDAMASKDKVDLIEDFAAA  
PIEVIGNLLGVPQDERAPLRGWSLAILGALEPVIGPEAFDRGNEAVREFLGYLETLIARRTAEPGDPERDVL  
TRLILGEAGGEKLSAKELLHNCIFLLNAGHETTTNLIIGNGLVTLADNPAQKQRLIAEPGLIRTAVEEILRYES  
SNQLGNRITTAAQVEIGGVTMPANTSITLTCIGAANRDPAQFADPDRFDVARSPNRHLAFASGPHQCAGMALARL  
EGAIALSRFLARFPDYALDGAPQRGGRVFRFRGYLSVPCRLG

>CYP195A13 (RPB\_3652) *Rhodopseudomonas palustris* HaA2

MEMPSRELAAEFELERLTPEFYDNPYPTYRALQTHQPVKRLRNGGYILTRYDDLVTYKNTTLFSSDKKREFAPKYGDSLLFEHHTTSLVFNDPPAHTRVRRLLITGALSPRAIAGMQPDLIALVDRLLDAMAAKAGVDLIEDFAAAIPIEVIGNLLGVPHDERGPLRDWSLAILGALEPVIGPETFSRGNEAVRDFLAYLEILITRRRAEPGDPEDHDLTRLIQGDDGTGEKLSAKELLHNCIFLLNAGHETTTNLIGNGLVALADNPAEKQRLIGQPGLARTAVEEILRYESSNQLGNRITTTTEVEIGGVMTQANTSLTLCIGAANRDPAQFPDPDRFDVGRTPNRHLAFATGPHQCAGMALARLEGVIALTRFLARFPNYTLDGTPSRGGRVFRFRGYLRVPCRL

>CYP195A14 (RPD\_1807) *Rhodopseudomonas palustris* BisB5

METAPIELAAAFDLERLTRDFYDDPYPTYHALRTHAPIKRLRNGGYFLTRYDDLVEVYKNTTLFSSDKKREFAPKYGDSLLFEHHTTSLVFNDPPAHTRVRRLLITGALSPRAIAGMEPDIALVDRLLDRMEAKGTLDLIEDFAAAIPIEVIGNLLGIPHDERGPLRDWSLAILGALEPVIGPDTFARGNDSIRDFIAYLETLIARRRANPGDPERDVLTKLIQGDGGGEQLSARELLHNCIFLLNAGHETTTNLIGNGLVALAVHPAEKQRLIAQPGLVRTAVEEILRYESSNQLGNRITTADVEIGGVAMPANTSLTLCIGAANRDPEHFPDPDRFDVARSPNRHLAFATGPHQCAGMALARLEGAIALRRFLARFPNYALAGAPTRGGRVFRFRGYLQAPCRI

>CYP195A15 (M446\_2531) *Methylobacterium* sp. 4-46

MSAVDAAERARRFDLRLPEGFIEDPYPVYAALRTHAPVHVFAFGQVLLTRYVDLERYKDAATFSSDKVVEFGAKFGPSPLYAHHTTSLVFNDPPRHTRVRRRIAGALAPRAIASMEASIVALVDGLLDAAEERGRIDLIEDFAAAIPVEVIGNLLGVPRAREPLRAWSLAILGALEPVLDAATMEAGNRAVTEFLDYLKRLVAERRRRRLGDPERDILTRLIQGEMEGERLSPEELLQNCIFILNAGHETTTNLIGNGLHLLTQWPEARERLLSEPDLRRRAVEEMLRFESSNQLGNRIAAKPFALGGRDFPAGTQITLGIGAANRDPDQFPDPDRFDVAREPNRHLAFASGIHQCVGMTVARLEGRIAIGRFLARFPSYALDGPPLRSRRVRFRGFSRLPARVEA

>CYP195A16 (SP01622) *Ruegeria pomeroyi*

MILQPPGPGERRGAARQFTGRNVMSETVMQTQIGKLDLTAPPPGFLENPFPPFYDALLAHAPVLAQPDGSVLLSRHADLDRIYRDTTLYSSDKKAAFGPKFGVGSPLFEHHTTSLVFNDPPLHTRVRKIMTSALTPRAIARMEPGLFETVDHLLLEAMAGRDRVDLIADFASTIPIQIIGNLLDVPMDERGPLRDWSLIILGALEPKLSAEQLAQGGQAVTEFKTYLEDLVARRRRARPGDPETDVLTRLIRGEGADQQLSEIELLQNCIFILNAGHETTSNLIGNGLALLHDYPEERARLLADPSLLPSAVEEILRFRSPNQLGNRETTAEIELDGRRLPRGTNLHLCIGAANRDPAVFDDPTRFDIARKPNRHLAFAGGPHVCVGLTLARLEGRIALGRLLERFPDYCLLEGRVPGGRIRFHGYAELPARL

>CYP195A17 (Mnod\_1189) *Methylobacterium nodulans*

MTDAALARSFDLRLPDGFCDDPYPVYAALRQHAPVHVFAEGHLLLSRYADLERYKDAATFSSDKTVEFGAKYGPSPLYDHHTTSLVFNDPPRHTRVRRRIAGALTPRAIASMEAGIVALVDGLLDAAAARGRIDLIEDFAAAIPVEVIGNLLGVPRAREGPLRAWSLAILGALEPVLDEAEAAAGNRAVTEFLAYLDGLVAERRRRPGDPDKDILTRLIRGEPGGERLAPEELLQNCIFILNAGHETTTNLIGNGLHLLTLWPQARERLRAEPDLIRKAVEEMLRFESSNQLGNRIAAKPFMTMGGRAFPAGTRITLCIGAANRDPEQFPDPDRFDIARDPNRHLAFASGIHQCVGMNVARLEGRIAIGRFLARFPAYALDGPPLRSQRVRFRGFLRMPARLA

>CYP195A18 (RHPLAN\_24330) *Rhodoplanes* sp. Z2-YC6860

MAIVADMAADFIDINRLDRAFLDDPYPTYRALRERDPVHRMPDGSYFLTRYDDLVAVYHDTKTWSSDKTVQFKPKFGDSALYEHHTTSLVFNDPPIHTRVRKLLAPAFTPRALKALQPRIELLVDRLLDHAAEHGQIDLIEDFAAAIPVQLIGDMLGIPQDERGPLRDWSLSILGALEPVLSEQQLGGMATAVEEFKAFLRDLVARRQREGAQDPGEILSTLIGATDLGGTEPSGDKLSELELLHNCIFLLNAGHETTTNLIGNGIDLLRRHPDVMRDLAAHPQTIETAIIEEFLRMESSNQLGNRRAAADTRIGETAMPAGTYVHLCIGAANRDPAQFPDPDTLDIRRTPNRHLAFGFGIHTCAGNSLARMEAQVAIGKLVRRFKSIECTSEPDRGGRARFRGFLHYPVSVK

>CYP195A19 (METH\_10630) *Leisingera methylohalidivorans*

MSGGQHGFVNIEEFDLANPPEGFLIEDPFPFYDALLRGAPVLPQPDGSLLVCRHADLDRIYRDTTLFSSDKKKVFAPKFGAGSPLFEHHTTSLVFSPPPLHTRVRRIMTSALTPRALARMEPGLVETVDHLLDRMEGAAKVDLIEDF

AASIPQIIGNLLDVPMAERAPLRDWSLAILGALEPALKADQLAAGHRAVEAFKAYLQDLIARRRRARPGNIET  
DVLTRLINGEGADGTLSEVELIQNCIFILNAGHETTTNLIGNGLALLNDHPDQKQRVLEQPDLIKPAVEEVLR  
FRSPNQLGNETTAEVEIGGMKVPAGTNLHLLIGAANRDPEVFDKPGDFDAGRTPNRHLAFAGGPHVCVGLTL  
ARLEGRIAIERLLHRFPGYRLLTGRVPGGRIRFRGYAALPAEMG

>CYP195A20 (Maq22A\_c22575) *Methylobacterium aquaticum*

MSDPALAEGFDLRLRPDGFIANPYPVYAALREHAPVHRLGEGQILLSRYADLERVYKDAATFSSDKTVEFGAK  
FGAGSGAGEAPSPLYRHHTTSLVFNDPPRHTRVRRRIAGALTTPRAVAAMEAGIVALVDDLLDRAAARGTIDLI  
EDFAAAIPVEVIGNLLGVPRDERGPLRDWSLAILGALEPVLPPPEVEADGNRAVTAFLAYLDRLVDDRRRHDPG  
PDKDILTRLIQGEVGGERLSRSCCRTASS

>CYP195D1 (Jann\_0677) *Jannaschia* sp. CCS1

MLDIAQFDLNQIDAAFIEDPYSTLAALRRTSPVHPNADGSVYLTRHDDCLATYRSRDMLSDKTEAFGQKFGEC  
PLKVHHTTSLIFNDPPYHTVVRKLIAGFTPRKLKEMERAIERIVSRLLDRVEDLGELDVIADFGMMLPTEII  
SIMLGVPEAYRAQLRGYSTAILGALDPVVSSQMEAGNRAVEEFGAVLDDLINHRRANPDAAAEGEVLESILF  
GEHDGRTLTQEELVQNCIFLLNAGHETTTSLVGNAVAVILLANPSEHRLIDDPITLIGTAVEEILRVESPLQIG  
NRLAGEDIALPSGPTIPKGTIHTSIAANRDPEVFADPDRFDVSRKPNPHIAFITGIHVCLGASLARMEGKI  
AIGGFVKRFPKLAATGEGERLGLARFRGWTSLPIRVR

>CYP195E1 (SL003B\_4100) *Polymorphum gilvum*

MTVSTAADDEVLSGQARGFNLFDPEDYFDDPGPYFRLLLRDGDPLHAQEDGSVLLTRYDDVRQVWRDLISGLVYK  
GDQFRQRFEGEPLLEHHTSTMLFRDNPDDHRLRNIVNPFQAQTSIQQLSRFTQDVVDQEIEKVKRMGEFDFVR  
DFAFRIPVTLICKIIGVPVEDADYIQAVGRKVLFLPNPKVPDSIAAEGHDAVAEFKTYLLPFLQEIKSRSID  
RAENILCAMAAQREGVEISDDEILHMCIVTLNGGHETTTNLISQSIHFLMDDPESLKQLRDGEVPIATALEE  
LIRFVTPLQLQGRRTTRDVVLDSGNGTIPAGTEVVLCQASANDERIFDSDPRLNLARRPNNHVGFAGAGIHVC  
LGRSLARLEASIAIPTVLRELPTLARGGDVRFQRNTRFRGLEQFPVRIA

>CYP195E2 (TQ29\_17135) *Confluentimicrobium* sp. EMB200-NS6

MTEAARIDQTDSEKAQAFNLLAPPDDYFDDPSKYFRLLLRDGDVPVHRQADGTVLLTRYDDVRQVWRDLISGLVYK  
GEYFEKKFGKGPLLEHHTSTMLFRDNPDDHRLRDIVNPFQSQTSIKSLTDFTQDVIDREIKVKQMGEFDFVR  
DFAFRIPVALICRVIGIPVEDADYIQGVGRKVLFLPNPQVSAEAIKQGHEAVTEFMGYLLPFLDEIKARTID  
PSESILCAMAAQRNGVEVSDAEILHMCIVTLNGGHETTTNLISQSMHFLMDDPESKRQLVEGEVALPTALEE  
LIRFITPLQLQGRRTTNDVELASNGTIPAGTEVVLAAQASANDERVFEDPDRLNFARRPNNHVAFGAGIHVC  
LGRPLARMEAPIALASVLKELPTLVRNGEARFQHNTFRFRGLEELPVRLA

>CYP196A1 (b110894) *Bradyrhizobium diazoefficiens* USDA 110

MLPRSAGAGRNKVAVARCPFGQPTGALVMSMQNVAAPALQFTAPRRNELTHIPGDEGWVIGKTFQVLADPKG  
HIEANGAKYGPVYRTHVFGETNVVLLGPEANELVMFDQQKLFSSSTHGWNKVLGLLFPRGLMLLDFDEHRLHRK  
ALSVAFKSGPMKSYLSDLDRGISARVAQWKAKPGEMQLYPAMKQLTDLAAASFLGADIGPEVDEINRAFDVM  
VAAAVAPIRRPLPGTQMARGVAGRKRIVAYFRQQIPLRRGNHGGDDLFSQLCRATHEDGALLSEQDII DHMSF  
LMMAAHDTLTSSLTSFVIGELAAANPDWQDRLRAEVLALGLAPGAPSSFDDLEKMPLSEMAFKEALRIKPPVPSM  
PRRAMRDTFRKGFRIPAGTAVGVNPLYTHMKDIWPEPDRFDPLRFTEEAQRNRHRFAWVPFGGGAHMCGLGH  
FAYMQAKCFARHFLQNIIEVSLAPGYKPDWQMWPIPKPRDGLKVRVKAV

>CYP196A1 (S23\_69120) *Bradyrhizobium* sp. S23321

MSLQNVAAAPALQFTAPKRNELTHIPGDEGWVIGKTFQVLADPKGHIENAAKYGPVYRTHVFGETNVVLLGP  
EANELVMFDQQKLFSSSTHGWNKVLGLLFPRGLMLLDFDEHRLHRKALSVAFKSGPMKSYLSDLDSGIAARVAQ  
WKANPGEMQLYPAMKQLTDLAAASFLGADIGPEVDEINRAFDVMVAAAVAPIRRPLPGTQMARGVAGRKRIV  
AYFRQQIPLRRGNHGGDDLFSQLCRATHEDGALLSEQDII DHMSFLMMAAHDTLTSSLTSFVIGELAAANPDWQD  
RLRAEVLALGLAPGAPSSFDDLEKMPLSEMAFKEALRIKPPVPSMPRRAMRDTFRGFTIPAGTAVGVNPLYT  
HHMKEIWPEPDKFDPLRFTEEAQRNRHRFAWVPFGGGAHMCGLGHFAYMQAKCFARHFLQNIIEVSLAPGYKPD  
WQMWPIPKPRDGLRVRMKAV

>CYP196A1 (BCCGELA001\_35185) *Bradyrhizobium* sp. CCGE-LA001

MSMQNVAASALQFTAPKRNELTHIPGDEGWPIIGKTFQVLADPKGHIERNGAKYGLVYRTHIFGETNIVLLGP  
EANELVLFDDQQLFSSTHGWNKVLGLLFPRGLMLLDFDEHRLHRKALSVAFKSGPMKSYLSDLDRGISARVAQ  
WKTKQGEMLLYPAMKQLTDLAAASFLGADIGPEVDEINRAFVDMVAAAVAPVRRPLPGTQMARGVKGRKRIV  
AYFREQIPLRRGNHGGDDLFSQLCRATHEDGALLSEQDII DHMSFLMMAAHDTLTSSLTSFIGELAAANPDWQD  
RLRAEVLALGLAPDAPSSFDLEKMPLTEMAFKEALRLKPPVPSMPRRAMRDFSFKGFAIPAGTAVGINPLYT  
HHMKEIWPEPDRFDPLRFTEDAQRNRHRFAFVPFGGGAHMCLGLHFAYMQAKCFARHFLQNIIEVSLEPGYKPD  
WQMWPIPKPKDGLRVRLKAV

>CYP196A2 (RPA0785) *Rhodopseudomonas palustris* CGA009

MSIQVADSSSLVARLSPPKPSALAHVPGDEGWPIIGRTLAVLADPKGEVEKMARTYGPVYRSRVLGETSITLLG  
PEANELVLFDDNTKLFSSSTHGWPILGRLFPRGLMMLDFDEHRLHRRTLSVAFKAGPMQSYLAELNAGIAHRVA  
EWRARPGEMLCYPAMKQLTDLAATSFLGTAIGAETEEVNRAFIDMVAASVAPIRKWPWGTAMARGVKGRQRI  
VAYFAEQIPIIRAKGGDDLFSQLCRATHDDGALLSNQAIIDHMSFLMMAAHDTLTSSLTSFVAALAAHPEWQQ  
KLREEIAGLGLKPGEPISFEQLDALPLTEMAFKEAMRLRPPVPSLPRRATRAFSFKGYTIPAGTMVAVNPLFT  
HHMPEIWPNPDQFDPLRFTDEASRGRHRFAWIPYGGGAHMCLGLNFAYMQAKCFAVHLLQHLDLSLPNYQAS  
WQMWPIPKPKDGLRVNVAPLN

>CYP196A2 (Rpa1\_0853) *Rhodopseudomonas palustris* TIE-1

MSIQVADSSSLVARLSPPKPSALAHVPGDEGWPIIGRTLAVLADPKGEVEKMARTYGPVYRSRVLGETSITLLG  
PEANELVLFDDNTKLFSSSTHGWPILGRLFPRGLMMLDFDEHRLHRRTLSVAFKAGPMQSYLAELNAGIARRVA  
EWRARPGEMLCYPAMKQLTDLAATSFLGTAIGAETEEVNRAFIDMVAASVAPIRKWPWGTAMARGVKGRQRI  
VAYFAEQIPIIRAKGGDDLFSQLCRATHDDGALLSNQAIIDHMSFLMMAAHDTLTSSLTSFVAALAAHPEWQQ  
KLREEIAGLGLKPGEPISFEQLDALPLTEMAFKEAMRLRPPVPSLPRRATRAFSFKGYTIPAGTMVAVNPLFT  
HHMPEIWPNPDQFDPLRFTDDASRGRHRFAWIPYGGGAHMCLGLNFAYMQAKCFAVHLLQHLDLSLPANYQAS  
WQMWPIPKPKDGLRVNVAPLN

>CYP196A2 (RpdX1\_0945) *Rhodopseudomonas palustris* DX-1

MSIQVADSSSLVARPVPPKRSALAHIPGDEGWPIIGRTLAVLADPKGEVEKMGRTYGPVYRSRVLGETSITLLG  
PEANELVLFDDNTKLFSSSTHGWPILGRLFPRGLMMLDFDEHRLHRRTLSVAFKAGPMQSYLAELNAGIARRIA  
EWRSRPGEMLCYPAMKQLTDLAATSFLGTAIGAETEEVNRAFIDMVAASVAPIRKWPWGTAMARGVKGRQRI  
VAYFAEQIPIIRAKGGDDLFSQLCRATHDDGALLSNQAIIDHMSFLMMAAHDTLTSSLTSFVAALAAHPEWQQ  
KLREEIAGLGLKPGEPIGFEQLDALPLTEMAFKEAMRLRPPVPSLPRRATRAFSFKGYTIPAGTMVAVNPLYT  
HHMPEIWPTPDRFDPLRFTDDASRGRHRFAWIPYGGGAHMCLGLNFAYMQAKCFAVHLLQNLDLSLPNYQTA  
WQMWPIPKPKDGLRVQVAPAK

>CYP196A3 (Saro\_3337) *Novosphingobium aromaticivorans*

MASIAPDSRTDLHTERANPHWVRLGGDHKLDHVPGEDGWVLTTLMLQADPLGFQRRMVETHGPVFRTRSFG  
RRGVNLIGADANELVLFDRDRFLFSNEQGWGPVLNLLFPRGLMLMDFEAHRVDRRALSIAFKPEPMRAYCSVLN  
TGIAQAVQGWGGQMRFYDAIKALTDLTAASSFLGLPLGPEADRLNKAFFVDMVQASGGVVRPLPFTRMGKQVA  
GRRLMVEYFGRLVRERRADPGQDMFSQFALATREDGSLLPEDVVVDHMI FLMMAAHDITITSSATVLFWQLARN  
PDWQDRLRAEARAVTGGDGLPLAYEDLGRMELTEMAFKEALRFMPVPVNMPPRRALRDFEFGGYRIPAGTPVGI  
SPA AVHADPAHWPEPDRFDPLRFTPENVSGRHKYAWVPFGGGAHMCLGLHFAYMQVKLLVSHILTRYEVAMQP  
GPAPSWQAWPIPKPRDGLRVEMRRIC

>CYP196A4 (BJ6T\_09060) *Bradyrhizobium japonicum* USDA 6

MSMQNVAPALPFIAPKRNELTHIPGDEGWPIIGKTFQVLADPKGHVEANGAKYGPVYRTHIFGETNVVLLGPE  
ANELVLFDDQQLFSSTHGWNKVLGLLFPRGLMLLDFDEHRLHRKALSVAFKSGPMKSYLSDLDRGIAARVAQW  
KAKPGEMKLYPAMKQLTDLAAASFLGADIGPEVDEINRAFVDMVAAAVAPIRRPLPGTQMAAGVKGRKRIVA  
YFREQIPLRRGNHGGDDLFSQLCRATHEDGALLSEQDII DHMSFLMMAAHDTLTSSLTSFIGELAAANPDWQDR  
LRAEVLALGLAPGSPSSFDLEKMPLSEMAFKEALRIKPPVPSMPRRAMRDTFKGFTIPAGTAVGVNPLYTH

HMKDIWPEPDRFDPLRFTTEEAQRNRHRFAWVPFGGGAHMCLGLHFAYMQAKCFARHFLQNIEVSLEPGYKPEW  
QMWPIPKPRDGLRVRVKAV

>CYP196A4 (RN69\_04425) *Bradyrhizobium japonicum* E109

MSMQNVAPALPFIAPKRNELTHIPGDEGWPIIGKTFQVLADPKGHVEANGAKYGPVYRTHIFGETNVVLLGPE  
ANELVLFDQKQKLFSSSTHGWNKVLGLLFPRGLMLLDFDEHRLHRKALSVAFKSGPMKSYLSDLDRGIAARVAQW  
KAKPGEMKLYPAMKQLTDLAAASFLGADIGPEVDEINRAFVDMVAAAVAPIRRPLPGTQMAAGVKGRKRIVA  
YFREQIPLRRGNHGGDDLFSQLCRATHEDGALLSEQDII DHMSFLMMAAHDTLTSSLTSFIGELAANPDWQDR  
LRAEVLALGLAPGSPSSFDLEKMPLSEMAFKEALRIKPPVPSMPRRAMRDFTFKGFTI PAGTAVGVNPLYTH  
HMKDIWPEPDRFDPLRFTTEEAQRNRHRFAWVPFGGGAHMCLGLHFAYMQAKCFARHFLQNIEVSLEPGYKPEW  
QMWPIPKPRDGLRVRVKAV

>CYP196A7 (LMTR13\_01240) *Bradyrhizobium icense*

MSMQSIASPVYSFTPPRRNSLTHIPGDEGWPLIGKTLEVLADPKGQVERQSKKYGLVYRSHLFGETSLVLLGP  
EANELVLFDQAKQFSSTLWGGRILGLLFPRGLMLLDFEEHRLHRRALSVAFKSGPMKSYLADLDTGIAARVAQ  
WKAQPGPMLLYPAMKQLTDLAATSFLGAGIGPEVDEITRAFVDMVAASVAVIRKPLPGTQMARGVKGRKRIV  
AYFSEQIPIRRAKGGGDDLFSQLCQATHEDGALLSTQDIVDHMSFLMMAAHDTLTSSLTSFVGELAAHPEWQQ  
KLRDEVASLGAAADAPTTFDNLEAMKVTEMAFKEALRLKPPVPSMPRRAIRDFTFKGYAIPAGTMVGINPLET  
HHMPEIWPEPEKFDPTRTDEAQRNRHRFAWVPYGGGAHMCLGLHFAYMQAKCFARHFLQNIEVSLEPGYKPD  
WQMWPIPKPRDGLRVLVKPV

>CYP196A8 (BRADO0504) *Bradyrhizobium* sp. ORS 278

MVSEPIRLTSPRRNSLTHIPGDEGWPIIGKTFEVLADPKGHVERNARKYGPVYRSHMFGEVNVVLLGPEANEL  
VLFDQAKLFSSAHGWGHILNLLFPRGLMLLDFEEHRMHRKALSVAFKAGPMKSYLSGLDHGIAARIAQWRERP  
GEMLFYPAIKQLTDLAATSFLGTEIGPEVD TINRAFIDMVAAAVAPIRKPLPGTQMARGVKGRQRIVAYFSE  
QIPLRRARSDGDDLFSHLCRATDDEGALLSTQDIVDHMSFLMMAAHDTLTSSLTSFVAQLAANPAWQQKLR  
VYSLGLAKDEPMTSEHLEKMKLTEMFAQETLRLMPPVPSLPRRPVRDFTFKGFKIPAGTGVGVNPMYTHMPE  
IWPEPQRFDPDRFTDEAQRGRHRFAWVPFGGGAHMCLGLHFAYMQAKCFARHFLSNVEVSLAPGYQPSWQVWP  
IPKPRDGLKVQLKAV

>CYP196A9 (BBta\_7679) *Bradyrhizobium* sp. BTAi1

MVSDPIRLTAPRRNSLTHIPGDEGWPIIGKTFEVLADPKGHVERNARKYGPVYRSHMFGEVNVVLLGPEANEL  
VLFDQAKLFSSAHGWGHILNLLFPRGLMLLDFEEHRMHRKALSVAFKAGPMKSYLTGLDRGIAARIAQWKQTP  
GEMLFYPAIKQLTDLAATSFLGTEIGPEVDAINRAFVDMVAAAVAPIRKPLPGTQMARGVKGRQRIVAYFSE  
QIPLRAKGDGDDLFSHLCRATDDHGALLSTQDIVDHMSFLMMAAHDTLTSSITSFIAQLAAHPEWQQKLRDE  
VASLGLVAGAPMASEHLEKMKLTEMFAQETLRLMPPVPSLPRRPIRDFTFKGYAIPAGTGVGVNPMFTTHMPE  
IWPEPERFDPLRFTDEAQRGRHRFAWVPFGGGAHMCLGLHFAYMQVKCFARHFLSNIEVSFAPGYRPNWQVWP  
IPKPRDGLRVMLKAV

>CYP196A10 (S58\_71560) *Bradyrhizobium oligotrophicum*

MSMQHVVSDAIRLTAPRRNSLTHIPGDEGWPIIGKTFDVLADPKGHVERNARKYGPVYRTHMFGDVNVVLLGP  
EANELVLFDQAKLFSSAHGWGHILNLLFPRGLMLLDFDEHRMHRKALSVAFKAGPMKSYLAGLDRGIAARIAQ  
WKQAPGEMPFYPAIKQLTDLAATSFLGSDIGPEVDDINRAFIDMVAAAVAPIRKPPWPGTQMARGVVRGRQV  
AYFSEQIPLRAKGDGDDLFSHLCRATDEQGALLSTQDIVDHMSFLMMAAHDTLTSSLTSFVAQLAAHPQWQQ  
KLRAEVASLGLANGDPMSSSEHLEQMKLTEMFAQETLRLMPPVPSLPRRPIRDFTFKGYAIPAGTGVGINPMFT  
HHMPEIWPEPETFDPMRFTDEAQRGRHRFAWVPFGGGAHMCLGLHFAYMQAKCFARHFLSNIEVSFAPGYQPS  
WQVWPIPKPRDGLKVILKPV

>CYP196A11 (LH19\_03345) *Sphingopyxis macrogotabida* 203

MNAPTKINWPEARFGPETQHWLPRNPDAALDHIPGEDGMPVIGNTLQLRDYPAFTRRMVATYGRVYRNNSFG  
GRSVALHGPEANELVMFDRDKIFSSEQGWGPVLNLLFPRGLMLMDFEKHRADRKLLSVAFKPEPMRHYADSLN  
EGIARRVAEWSGSKSFYPAIKELTDLAATSFLGIPWGPEADKVNKAFVDMVQASIGIVRVPLPFTAMGRGA

RGRAYLVDYFGRMVPERREGSGEDMFSQICRTKDDNGDYMSVEAIVDHMNFLMMAAHDITITSSVTSLVYMLGK  
HPEWQDRLREEMLAVAPAGEGVGHNSLGELEMTEWAFKEALRLVPPVPSFPRRALKDFEYGGYRIPAGTSVGV  
SPAFTHMMEEHWPPEKFDPMRFSPEVARERHKYAWVPFGGGAHMCLGLHFAYMQAKIFFHHVVTTHRIVLPD  
GYAPDWQVLPIPRPKDGLTVTFAPL

>CYP196A12 (LH20\_02570) *Sphingopyxis* sp. 113P3

MNAPARIEWSEARFGPDTQHWLPRNPDSALDHIPGEDGLPILGNTLDQLRDYPAFTRRMVAKYGHVYRNNSFG  
GRSVSLHGPANLVMFDREKIFSSEQGWGPVLNLLFPRGLMLMDFEKHRADRKTLVAFKPEPMRHYAESLN  
EGIRHRVAASWGSTFKFYPAIKELTDLAATSFLGIPWGPEADKVNKAFFVDMVQASIGVVRVPLPFTAMGRGA  
KGRAYLVDYFSRMVDPDRREGSGADIFSQICRALDDNGDHLVDAIVDHMNFLMMAAHDITITSSITTLVWQLAD  
HPEWQDRLREEMLRVAPAGEGVGHNSLGELELTEWAFKEALRLVPPVPSFPRRALKDFEFGGYRIPAGTSVGV  
SPAFTHMMEEHWPPEKFDPMRFSPEVARERHKYAWVPFGGGAHMCLGLHFAYMQAKIFFHHVLTTHRIVVAQ  
GYEPEWQILPIPRPKDGLVVTFQPL

>CYP196A13 (SKP52\_05010) *Sphingopyxis fribergensis*

MNAPTNIQPVSSQWSEKRFGPDTLHHLPRNPDSALDHIPGEDGMPVIGNTLEQLGDYRGFTNRMVAKYGRVYR  
NNSFGGRSVALHGPEANELVMFDRDKIFSSEQGWGPVLNLLFPRGLMLMDFEKHRADRKILSVAFKPEPMRHY  
AESLNNEGIRDRIGKWSGKTFKFYPAIKELTDLAATSFLGIPWGPEADKVNKAFFVDMVQASIGVVRVPLPFTA  
MGRGAKGRAYLVEYFGKMVPERRDGTGEDMFSQICRTRDDNGDHMSVEAIVDHMNFLMMAAHDITITSSITSMV  
WELAKHPEWQDKLREEMLAVSPAGEGVGHNSLGQLEMTEWAFKEALRLVPPVPSFPRRALKDFEYGGYRIPAG  
TSVGVSPAYTHMMAEHWPDEKFDPMRFSPEVARERHKYAWVPFGGGAHMCLGLHFAYMQAKIFFHHVVTTHR  
IVVAEGYAPEWQVLPIPRPKDGLTVSFVPLA

>CYP196A14 (Sala\_0663) *Sphingopyxis alaskensis*

MNAPTQIHPASSRWSAARFGPDTQHWLPRNPDSALDHIPGEDGLPIIGNTLEQLRDYPAFARMVAKYGPVYR  
NNSFGGRSVALYGPEANELVMFDRDKIFSSEQGWGPVLNLLFPRGLMLMDFEKHRADRKLLSVAFKPEPMRHY  
ADALNDGIRGRVASWSGRTFQFYPAIKELTDLAATSFLGIPWGPEADKVNKAFFVDMVQASIGIVRRPLPFTA  
MGRGAKGRAFLVDYFSRMVPERREGAGEDMFSQICRTRDDNGDYMVPDAIVDHMNFLMMAAHDITITSSITTLV  
WELARHPDWQDRLREEMLAVAPAGEGVGHNSLGELELTEWAFKEALRLVPPVPSFPRRALKDFEFGGYRIPAG  
TSVGVSPAFTHMMEEHWPPEPERFDPMRFSPEVARGRHKYAWVPFGGGAHMCLGLHFAYMQAKIFFHHVVTTHR  
ISVAPGYAPEWQMLPIPRPKDGLTVTFEPLK

>CYP196A15 (AOA14\_12370) *Sphingopyxis terrae*

MNAPTTIEWSERRFGPETAHWMPRNAETALDHIPGDDGIPVLGTTLAQLKDPVGFTNRMVAQHGVYRAKSFG  
GRGVSILVGPEANELVLFDRDKLFSSEQGWGPVLNLLFPRGLMLMDFEKHRADRKTLVAFKPEPMRHYAGALN  
EGIGSRIGAWSGSKFKFYPAIKQLTDLAATSFLGIPWGPEAERINKAFVDMVQASIGIIRVPMFPFTAMGRGV  
AGRKFLVDYFTRLVPERRASEGEDIFTQICHAKDDDGELYLSVEAIVDHMNFLMMAAHDITITSSITSLVWLLAR  
HPEWQDRLRDEMLSVAPAGEGVGHNSLGELELTEMAFKEALRLIPPVPAIPRRALRDFEFGGYHIPAGTNVGI  
NPSYTHMMAEYWPDPERFDPLRFAPAEAVRGRHKYAWVPFGGGAHMCLGLHFAYMQAKIFFHHVLTTHRIRIAD  
GYAPDWHMWPIPRPKDGLTVTFDPL

>CYP196A16 (SGRAN\_1363) *Sphingopyxis granuli*

MNAPANSMSERRFGPDTAHWLPRGPESALDHIPGDDGIPLLGTTLAQLRDPVGFTNRMVDRHGKVYRARSFG  
GRGVSILVGPEANELVLFDRDKLFSSEQGWGPVLNLLFPRGLMLMDFDKHRADRRTLSVAFKPEPMRLYADALN  
EGIRDRVARWSGTRFAFYPAIKQLTDLAATSFLGIPWGPEAERINKAFVDMVQASVGVVRVPLPFTAMGRGV  
AGRKFLVEYFTKMVPERRASTGDDIFTQICQAKDEEGELYLSVEAIVDHMNFLMMAAHDITITSSVTSLVWLLGR  
HPEWQDRLREEMLRVAPAGEGVGHNSLGELELTEWAFKEALRMIPPVPVPIPRRALRDFEFGGYRIPAGTNVGV  
SPSYTHMMEYWPDPERFDPMRFAPDAAGRHKYAWVPFGGGAHMCLGLHFAHMQAKIFFHHVLTTHRIEAD  
GYAPDWQMWPIPRPKDGLTVTLTPL

>CYP196A17 (BSY18\_484) *Blastomonas* sp. RAC04

MATVLAPQAPAAPREMFPDHSIQRDSGNPHWTPPLPGSNALDHI PGEDGLPILGVTLRMLADPEGFGNEMRAKY  
GPVYRTNAFGRRQVALFGADANELVLFDRDKVFSSEQGWGPVLNLLFPRGLMLMDFDHRADRRALSIAFKPA  
PMRHYAESLNEGIGARVLQWSNKDITFYSEIKKLTDLAATSFLGIPWGPEADKINTAFVDMVQASIGVVRRP  
LPFTKMKGKVAGRKFLVDYFTPQVLQRREQQGPDMFSQFCRATRDDGSLTTDEVVDHMFNLMAAHDITITSS  
ASSLIWLLAKNPEWQDKIRAEELLEHAPAGAMPYDALPNLELTEMFAKEALRLIPPVPSTPRRALKDFEFGGY  
RIPAGTPVSISAAAYTHKQEEHWPEPHRFDPLRFTPEATRNRHKYAWVPFGGGAHMCLGLHFAYMQIKVLLHHV  
LSQHRIVIEPGYEPGWQAWPIPKPDGLKVRFETL

>CYP196A18 (LPB140\_11945) *Sphingopyxis* sp. LPB0140

MSYAHSEEANPHWVRPPSLKDIEHIPGETGLPLIGNTFAVLADPIGFGNKMQANYGKIYRNRAFGQNTVMLLG  
PDANELVLFDRNKLFSNEQGWGPVLNLLFPRGLMLMDFDHRMDRKALSIAFKPEPMRAYCTALSQGIYRRIA  
DWPNDLQFYPAIKQLTDLAATSFLGIDWGPEADKINTAFVDMVAASVGVARTPIPF TKMARGVAGRKYLIDY  
FTPQIAERRRNENMQDMFSQFCRATREDGEYMADEIVDHMFNLMAAHDITITSSITSMVLLAKNPDWQEK  
REECLSIAPAGGAIAYEDLSKFTLTEMFAKESLRLIPPVPSIPRRAVKDFEFGGYHIPAGTAVGVAPSFVHHM  
AEYWPEPEKFDPMRFTPEAIKERHKFAWVPFGGGAHMCLGLHFAYEQMKIFMHLLTSRSIEVNNGYEPKWQA  
WPIPKPDGLHVTLRPL

>CYP196A19 (AZE99\_13075) *Sphingorhabdus* sp. M41

MATIAEKPHGYPYQESANPHWVKPPSQEQLAHIPGEQGLPIVGTTLKVIKDPIGFGQYMFQRYGSVYRTYSFG  
KQNVMMLGADATELVMFNKDKIFSSEQGWGPVLNLLFPRGLMLMDFERHRADRKALSVAFKPGPMKHHCEVLG  
TGILDRVGDWSGTEFEFYPAIKSLSLDTAASAILGIPWGPEADKINEAFVDEVQASIGVV RKPIPF TKMWKGV  
KAREYLLLEYFTPQVKERRAKGGEDIFTQICLATHENGELLTEDEVVDHMFNLMAAHDITITSSATSMTYLLAK  
HPEWQDRRLREECLSVAPAGTVLTIEQLGKLQLTEMFAKEALRMIPPVPSIPRRALKDFTFRNYTIPAGTNIGI  
SPQFVHKMEKHWPDPDKFDPLRFTPENSAGRHKYAWVPFGGGAHMCLGLHFAYMQIKILMHAMLTQHRVVLQG  
GPDYEPNWQVFPIPPQPRDGLPVRLERL

>CYP196A20 (A6F68\_00151) *Altererythrobacter dongtanensis*

MATLAEPPIRTNPTDEIPPANWRVGHPPDDAALAHIPGERGLPLVGNTFRLLADPIAFGWRMYRTYGPVYKNWA  
LGGWHVALIGAEANEMILMDRDKIFSSEQGWGPTLHRLFPRLMLMDFEHRVDRRALSIAFKPEPMRHYAAA  
LDRGIASEVAGWTGDMLFYPAIKQLTDLAAESFLGGGLGPDAPKINQAFVDMVQASVAPIRRPLPFTQMKRG  
VDGRSYLVDLFTRETHRRRAGEGLGQDMFSQFATAIREDGSLLPVDAVVDHMFNLMAAHDITITSSATSLVWL  
LAKNPEWQERLRQEILAVTGGPDASGTPRGAAYYDDLKLELVEMAFKEALRLIPPVPSLPRRALRSFEYKGR  
IPAGTEVGFNVLTHRLEEHWGDDVEAFDPLRFTPEKVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILMAQL  
LQRYRIEVADGYAPEWQPWPIPKPDGLKITLKPL

>CYP196A21 (RPB\_4636) *Rhodopseudomonas palustris* HaA2

MSIQVADSSSLVATLAPPPRSALAHIPGDEGWPIIGRTLHVLADPKGQVEMMGRLYGPVYRSRVLGETSITLLG  
PEANELVLFDN TKLFSSTHGWSILGLLFPRGLMLMDFDEHRLHRKALSVAFKAGPMQSYLAELNSGIARQVA  
QWRAQPGEMLCYPAMKQLTDLAATSFLGTAIGAETAEVNAAFVDMVAASVAPIRKWPWTAMARGVRGRQRI  
VAYFSEQIPIRRAEGGDDLFSHLCRATHDDGALLSTQDIVDHMSFLMAAHDITLTSSLT SFVAALAAPEWQR  
RLCEEIGGLGLKPGEPIAFEQLDALPLTEMFAKEAMRLRPPVPSLPRRATREFSFKGYTIPAGTMVAINPLYT  
HHMPEIWPAPDRFDPLRFTDEAQRGRHRFAWVAYGGGAHMCLGLNFAYMQAKCFVHLLQNLSDLPLPPNYQSS  
WQMWPPIPKPDGLRVRIAPLQ

>CYP196A22 (RPD\_0772) *Rhodopseudomonas palustris* BisB5

MSIQVADSSSLVATPIAPPPRSALAHIPGDEGWPIIGRTLEV LADPKGQVQMMGR TYGPVYRSRVLGETSITLLG  
PEANELVLFDN TKLFSSTHGWSILGLLFPRGLMLMDFEEHRLHRRALSIAFKAGPMQSYLAELNSGIARRVA  
QWRAQPGEMLCYPEMKRLTDLAATSFLGTAIGAETA EINAAFVDMVAASVAPIRKWPWTAMARGVKGRKRI  
VAYFSEQIPIRRAKGGDDLFSQLCRATHEDGALLSTQDIIDHMSFLMAAHDITLTSSLT SFVAALAADPEWQQ  
RLRAEIAALGLKPGEPI SFEQLDALPLTEMFAKEAMRLRPPVPSLPRRATREFSFRGFAIPAGTMIAINPLHT  
HHMPEIWPDPDRFDPLRFTDEAQRGRHRFAWIPYGGGAHMCLGLNFAYMQAKCFVHLLQNLSSLPLPPNYQSS  
WQMWPPIPKPDGLRVNVTPLH

>CYP196A23 (RPE\_0895) *Rhodopseudomonas palustris* BisA53

MSLQFADSSAGSMAPPKRSALSHIPGDEGWPMVGRTFQVLADPKGEVERMAATYGPVYRSRVLGETSITLLGP  
EANELVLFQAKNFSSTHGWGPILGRLFPRLMMLDFDEHRLHRRALSVAFKSGPMQSYLAQLDSGIAARVKQ  
WRGKPGEMLCYPAMKQLTDLAATSFLGGDLGAEVDEITKAFVDMVAAAVAPIRKPPWGTAMARGVRGRQRIV  
AYFSEQIPIRRAKGGDDLFSQLCQATHEDGALLSTQDIIDHMSFLMMAAHDTLTSSLTSFVALLAANPEWQQK  
LRDEVHSLGIGPNEALPFAKLDEMLTEMAFKEAMRLKPPVPSIPRRAVRDFSFRGFTIPAGTMVAVNPIYCH  
HMAQVWPEPDKFDPLRFTEETRKRHKFAWVPFGGGAHMCLGLHFAYMQAKCFTRHFLQNLVSVLEPGYQPQW  
QLWPIPKPKDGLKVQIAPAR

>CYP196A24 (RPC\_4693) *Rhodopseudomonas palustris* BisB18

MSLQIADGSGRPSLAPPKRGALNHIPGDEGWPIIGRTLQVLADPKGEVERMAATYGLAYRSRVLGETSITLLG  
PEANELVLFQAKNFSSTHGWGPILGLLFPRLMMLDFDEHRLHRRALSVAFKAGPMQSYLAALDAGIATRVA  
QWRNEPGEMLFYPAKQLTDLAATSFLGAEIGPEVDDITRAFVDMVAAAVAPIRRPWGTAMAKGVRGRRRI  
VGYFSEQIPIRRAKGGDDLFSQLCQATHEDGALLSTQDIIDHMSFLMMAAHDTLTSSLTSFVALLAANPEWQR  
KLRDEVAALDVPDGTLPFDKLDAMPLTEMAFKEAMRLKPPVPSIPRRAVRDFSFGQFAIPAGTLVAVNPLFS  
HHMPQIWPEPEKFDPLRFTEEAQKARHRFAFVPFGGGAHMCLGLHFAYMQAKCFTRHFVQNLEVSLAPGYAPE  
WQMWPPIPKPKDGLKLTLPTRRD

>CYP196A25 (AM2010\_2618) *Altererythrobacter marensis*

MATLAQESTPGTAQPAPPPRHWRERTLTEADLAHIPGEGGLPFVGNTRMLADPHAFTRRMVETYGVPYRNKA  
FGGWNIALVGADANELVLFQAKNFSSEQGWGPILDRLEFPRGLMMLDFDHHRRADRRALSIAFKPGPMRHYAGS  
LNRGIAQSVKNWGGAPMQFYPAIKALTLDLAADSFIGIPWGPEADRINEAFVDMVQASVAPVRRPLPFTLMRK  
GVTGREFLVEYFTRETHRRRAEGGGQDMFSQFATATREDDTLLPVDEVVDHMFNLMMAAHDITISSATTLVQM  
LARHPEWQERLRAEIVALTGGGGDVDYDDLKGFELTEMAFKEALRMIPVPSTPRRALRAFEFGGYRIPAGAP  
VGINAQYVHHMEEHWPDPERFDPMRFTPDQVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILMAQLLTRYEIV  
TEAGYSPDWQAWPIPRPKDGLKVTFRPL

>CYP196A26 (A9D12\_06330) *Porphyrobacter neustonensis*

MATLAQRPTPEPAAPPAHWGEGRLTDADLAHIPGDAGWPVVGNTFTMLANPHAFATERMIKTHGKVYKNRAFGGW  
QIALIGAEANELLLFNKDKIFSSEQGWGPVLDQLFPRGLMLMDFDHHRIDRRALSIAFKPEPMRHYSGALNRG  
IAREVAGWAGPQEFYPAIKKLTDLAADSFIGLPWGPEADRINEAFVDMVQASVAPVRKPLPFTKMKKGVDR  
AFLVDYFTRETLRRRAEGGGQDMFSQFATATREDGSLLPVDEVVDHMFNLMMAAHDITISSATSLIYHLATNP  
EWQEKLRAEIFAFTGGPDGEGNPRPLDYDDLAKLDLTEMAFKEALRMIPVPSPRRALREFEYGGYRIPAGA  
MVGINIIYTHHSEYWDNPHVFDPMRFTPDQVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILLAQLLQRYRI  
EAPAGYNPDWQDWPIPQPKDGLKVTFTPL

>CYP196A26 (BG023\_11724) *Porphyrobacter* sp. LM 6

MATLAEAPTARDAAPADAPRHWGEGRLTEADLAHIPGEAGWPVVGNTFTMLANPHAFADRMKTHGKVYKNRA  
FGGWQIALIGAEANELLLFNKDKIFSSEQGWGPVLDQLFPRGLMLIDFEHHRIDRRALSIAFKPEPMRHYSGA  
LNRGIAREVAGWAGPMEFYPAIKKLTDLAADSFIGLPWGPEADKINEAFVDMVQASVAPVRKPLPFTKMKKG  
VDGRAFLVEYFTRETLRRRAEGGGQDMFSQFATATREDGSLLPVDEVVDHMFNLMMAAHDITISSATSLIYHL  
ATNPEWQEKLRREEIMAVTGGPDGDGNPRPLDYDDLAKLDLTEMAFKEALRMVPPVPSMPRRALREFEYGGYRI  
PAGAMVGINIIYTHHSEYWDKPFDFPMRFTPDQVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILLAQLLQ  
RYRIEAPAGYNPEWQDWPIPQPKDGLKVTFKPL

>CYP196A27 (ELI\_11310) *Erythrobacter litoralis* HTCC2594

MPDVADIAHIPGEKGWPIVGHFTFTQLRDPHAFTRRMVETYGKVYRVHSFGGWNVALIGAEANELVLFNNDKIF  
SSEQGWGPVLDQLFPRGLMLMDFDHHRIDRRALSIAFKPGPMRHYAGALNSGIAREVAKWDGTMFLQPAIKQL  
TDLAADSFLGIPWGPEADKINEAFVDMVQASVAPVRKPLPFTKMKKGVDRGAFMVDFTRETNRRAEGGGQ  
DMFSQFATATREDGSLLPVDQVVDHMSFLMMAAHDITISSATSMIHKLAQYPEWQEKMRREEIFAFTGGPDGSG  
TPRNLEYDDLGLKLELTEMVFKETLRSIPVPSPRRALKTFEFGGYRIPAGQHVGINIIHYTHHSEYWDPFPA



FDPMRFTPELVKARHKYAWVPFGGGAHMCLGLHFAYMQIKVLMTHLLQRYRIVESEGYDPEWQAWPIPQPKDG  
LKIELKTL

>CYP196A28 (Ga0102493\_11527) *Erythrobacter litoralis* DSM 8509

MATLAHPHAGADARSFDHWSEGRIDDSDLSHIPGEAGWPVVGNTFRMLADPHGFARRMIDTYGKVYKNRAFGG  
WQVALIGAEANELLLFDRNKMFSSEQGWGPILDQLFPRGLMLIDFEHHRVDRRALSIAFKPEPMRHYSGALNS  
GISREVESWEGPMTFYTAIKKLTDLAADSFIGIPWGPEADRINEAFVDMVQASVAPVRKPLPFTKMKKGVDG  
RAYLIDYFTRETHRRRAEGGGQDMFSQFATATREDGSLLPVDEVVDHMNFLMMAAHDITITSSATSLIYYLAKN  
PEWQEKLREEVFVAVTGGPDGSGKARALDYDDLKLELTEMFAKEALRMVPPVPSMPRRALREFEYEGYRIPAG  
TMVGINIYWTHHSEEYWEDPFTFDPMRFTPDVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILIAQLLQRYR  
IEVADGYAPAWQEWPIPQPKDGLKVEFVKL

>CYP196A29 (WG74\_05250) *Citromicrobium* sp. JL477

MATLAHQPANVRPQHWDANPTKADLSHIPGEQGLPVVGNTLKMLADPVGFTKGMVEKYGRVYRNNAFGGTV  
VALIGADANELVLFDNRKIFSSEQGWGPILDKLFPRGLMLIDFDHHRADRRALSIAFKPEPMRHYVGSINRGI  
SERMEEWGAGEMKFYPAIKQLTDLAADSFIGIPFGAEADKVNQAFVDMVQASVAPIRQSLPFTKMKRGTDGR  
AYLVEYFTKETQRRRAEGGGQDMFSQFATATRDNGELLPVDEVVDHMNFLMMAAHDITITSSATSLVYYLARSP  
EWQDKLREELRAITGGEGRALNYYELAKAELTEMAFKEALRMIPPVPTIPRRALEAFEFGGYHIPAGTPVGVN  
PTFVHNDPEIWSDPETFDPMRFTREAEKARHKYAWVPFGGGAHMCLGLHFAYMQIKILMAHMLTRYRIEVAED  
YAPDWQAWPIPQPKDGLQIRLVRI

>CYP196A30 (AMC99\_02233) *Altererythrobacter epoxidivorans*

MATLAAHENAEFRPTHWSQRLPADALDHIPEAGLPVVGNTFRMLADPHGFAQEMVAKYGKVYKGRAFGGWQV  
ALIGAEANELLLFDRDKIFSSEQGWGPILDKLFPRGLMLIDFDHHRADRRALSIAFKPGPMRHYSGSLNAGIA  
REIAKWADREMRFYPAIKQLTDLAADSFIGIPWGPEADKINTAFVDMVQASVAPIRAPLPFTQMKKGVDGRK  
YLVDFYFTRETHRRRAEGGGQDMFSQFATATHEGDSLLPVDEVVDHMIFLMMAAHDITITSSATSLIYYLAKNPD  
WQNKLRQEVISVTGGVDASGKPRPLSYDDLKLELTEMFAKEALRMIPPVPSMPRRALKSFYEGGYRIPAGTS  
VGINIHVMVHHMEEYWPEPEKFDPMRFTPEQVKARHKYAWVPFGGGAHMCLGLHFAYMQVKILMAQLLPQYSIE  
IAEGYDPKWQWPPIPKPKDGLKVAFRRL

>CYP196B1 (RD1\_3506) *Roseobacter denitrificans*

MPPLRPFKARSNMPTRAALSHIPGPPTPPLIGHTLKIARDSYGTQQDYIKRYGPVYKTKMLGVWRVNLCPDA  
LQHVLLDKDKIFSSTGGWDALRRIYPGGLILQDFDKHRQDRRILTAAFRASAIRDYRMRMGEIMDLLQHWPK  
DAPFDFYEAIKDLTLRMGGAVFMGLPLDGD LAKQINRAITDEIRASVTPIRTAIPFTPMWRGIRGRDFLRETF  
RKMIPEERRARGGDDFFSQMCMKAKDEDDGKGWSEDEILNHFNLLIMAAHDTTATSLTVIMAALGTHGDWQQR LID  
EVDGLGDGDLDEEALGQMKETDKVFREALRLVPPVPFIPRMATRDFHWHGYDIPAGTSLALNPGVTMLSPELF  
SNPTQFDPDRFAPDRAEDRIHRFAWTPFGGGAHKCIGMHFATMQVKLF IATLLRQRRIELPGGAPEWHRMPI P  
KPKGGLPVLLPAR

>CYP196B1 (RL0149\_c027090) *Roseobacter litoralis*

MPTRAALSHIPGPPTPPLIGHTLKIADSYGTQQEYIKRYGSVYKTKMLGVWRVNLCPDALEHVLLDKEKIF  
SSAGGWDALRRIYPGGLILQDFDKHRQDRRILTAAFRASAIRDYRVRMGAIMDLLQHWPKDAPFDFYEAIKD  
LTLRMGGAVFMGLPLDGD LAKQINRAITDEIRASVTPIRAPIPFTPMWHGVRGRDFLRETFRKLIPERRKNGG  
DDFFSQMCMATDEDDGKGWSEDEILNHFNLLIMAAHDTTATSLTVIMAALGTHGEWQQR LIDEVDALGDAELNE  
DALGQMKETDKVFREALRLVPPVPFIPRMTTQDFHWQGYDIPAGTSLALNPGVTMLSPELFTNPTQFDPDRFA  
PDRAEDRIHRFAWTPFGGGAHKCIGMHFATMQVKLF IATLLRQRKIELPGGPPPEWHRMPIPKPKGGLPILLPA  
R

>CYP196C1 (RGUI\_0121) *Rhodovulum* sp. P5

MSYPIPDLSHIPAMPRLPVVGNLSLEVVRDPYGFHQKARDRLGPVYRFHFLGRDVVCAHGAEVLEQALLNREGR  
FSNVLGWQVIEDLFSGGLMLRDGADHRAHRRMLQPAFRADV MRNALTLLVDRLQAAIASWPVGQPF SFYTEFR  
GLARAIAAEVFMGITDPAEADRIGRAFLDMLDASAAPIRRPLPFTRMRRGIRARREL R DIFEG LIDERRTGKG

RDLFSELCLKTEDGDWIEKDVLDHFNFFLFAAFDTATTSISAMVDQLSQHPDWQEAMAAEVATLDGDLSE  
ALDRLDVTERVLKEAIRLMPPVPFLPRGVVDGFEHDGHRLPKGTPLTVCPGLVMIDPEIWSDDLAFDPDRFSS  
NRAEDQRHAYAWAPFGGGIHKCLGMNFAIMEAKAFFACLLPRYRIAPRAPAKWRRLPIPSPTDGLQVTLRPAS  
A

>CYP197R1 (METDI0881) *Methylobacterium extorquens* DM4

MLQDSNPASHLDRPVHTDASPPGPKGWPLLGSLLIGFARDPLGFLTACSRQYGDVVAFRTAGQLMLVLTCPREI  
ERVLVKEHQNFPKNEHFWRQVTALFGNGLLTSKGTFWQRQRRLAAPAFAGPMLASYADAMVHESMLTAEGWRA  
GEVRDVHADMMALSLRIAALFGTEVEEDVLVIDDALNNILAEASRVVRPILIPDAVPLPGHVRYRRALCR  
IDWIVARIINERRTLAAGHDFLSALMGARDEDGTAMSDRQLRDEVITFLLAGHETTALVLSWTIHLISRHE  
VDRVLAAEIGEIVVQRAAIDDPRLRF AEHTITESTMRLYPPAWAVGREARCDQCQIGGFDVRPGTPILISPVV  
LHRDPRFFDEPEAFRPERWHQGLAQRLPRFAYMPFGGGPRICIGNRFAMIEAVLILTTLVQRFRFVADTNEPV  
VPIPSMTLRPRGGVRVIERREINSPYG

>CYP197R1 (Mext\_0777) *Methylobacterium extorquens* PA1

MLQDSNPASPLDRPVHTDASPPGPKGWPLLGSLLIGFARDPLGFLTACSRQYGDVVAFRTAGQLMLVLTCPREI  
ERVLVKEHQNFPKNEHFWRQVTALFGNGLLTSKGTFWQRQRRLAAPAFAGPMLASYADAMVHESMLTAEGWRA  
GEVRDVHADMMALSLRIAALFGTEVEEDVLVIDDALNNILAEASRVVRPILIPDAVPLPGHVRYRRALCR  
IDWIVARIINERRTLAAGHDFLSALMGARDEDGTAMSDRQLRDEVITFLLAGHETTALVLSWTIHLISRHE  
VDRVLATEIGEIVVQRAAIDDPRLRF AEHTITESTMRLYPPAWAVGREARCDQCQIGGFDVRGGTPILISLWV  
LHRDPRFFDEPEAFRPERWHQGLAQRLPRFAYMPFGGGPRICIGNRFAMIEAVLILTTLVQRFRFVADTNEPV  
VPIPSMTLRPRGGVRVIERREISSPYG

>CYP199A1 (blr1048) *Bradyrhizobium diazoefficiens* USDA 110

MSAPGSAASGVPHLDVDPFDMNFFADPYAAHELLREAGPVVYLDKWNVYGVARVYAEVHAVLNDPATFCSSRGV  
GLSDFKKETPWRPPSLILEADPPAHTRTRAVLSKVLSPVMKQVRDRFAAAAEEERVDALIEKRSFDAIADLAE  
AYPLSIFPDALGLKSEGREHLIPYASVVFNAFGPPNQLRQEAIARSTPHQAYVAEQCQRENAPGGFGACIHA  
QVDEGAITASEAPLLVRSLLSAGLDTTVNGIGAAVYCLARFPEQWQRLRGDLSLARSFAFEEAVRFESPVQTF  
RTTTREVELSGATIGEGEKVLMFLAAANRDPRRWDPDSYDVTTRSSGHVGFSGSIHMCVGQLVARLEGEVML  
TALARRIAKIEITGEPKRRFNNTLRGLDGLPVTITPA

>CYP199A1 (RN69\_05235) *Bradyrhizobium japonicum* E109

MSAPGSAVSGVPHLDVDPFDMNFFTDPYSTHERLREAGPVVYLDKWNVYGVARVYAEVHAVLNDPATFCSSRGV  
GLSDFKKETPWRPPSLILEADPPAHTRTRAVLSKVLSPTVIKQVRDRFAAAAEEERVDALIERRSFDAIADLAE  
AYPLSIFPDALGLKSEGREHLIPYASVVFNAFGPPNELRREAIARSTPHQAYVAEQCQRENAPGGFGACIHA  
QVDEGAITATEAPLLVRSLLSAGLDTTVNGIGAAVYCLARFPEQWQRLRSDLTLARSFAFEEAVRFESPVQTF  
RTTTREVELSGATIGDGEKVLMFLAAANRDPRRWDPDSYDITRSSGHVGFSGSIHMCVGQLVARLEGEVML  
TALARRIEKIEITGEPKRRFNNTLRGLDSLPTITPA

>CYP199A2 (RPA1871) *Rhodopseudomonas palustris* CGA009

MTTAPSLVPVTTTPSQHGAGVPHLGIDPFALDYFADPYPEQETLREAGPVVYLDKWNVYGVARVYAEVYAVLNDP  
LTFCSSRGVGLSDFKKKEKPWRPPSLILEADPPAHTRTRAVLSKVLSPATMKRLRDGFAAAADAKIDELLARGG  
NIDAIADLAEAYPLSVFPDAMGLKQEGRENLLPYAGLVFNAFGPPNELRQSAIERSAPHQAYVAEQCQRPNLA  
PGGFGACIHAFSDTGEITPEEAPLLVRSLLSAGLDTTVNGIAAAVYCLARFPDEFARLRADPSLARNAFEEAV  
RFESPVQTFRTTTTRDVELAGATIGEGEKVLMFLGSANRDPRRWDDPDYDITRKTSGHVGFSGSVHMCVGQL  
VARLEGEVLAALARKVAAIEIAGPLKRRFNNTLRGLESPIQLTPA

>CYP199A2 (Rpal\_2077) *Rhodopseudomonas palustris* TIE-1

MTTAPSLVPVTTTPSQHGAGVPHLGIDPFALDYFADPYPEQETLREAGPVVYLDKWNVYGVARVYAEVYAVLNDP  
LTFCSSRGVGLSDFKKKEKPWRPPSLILEADPPAHTRTRAVLSKVLSPATMKRLRDGFAAAADAKIDELLARGG  
NIDAIADLAEAYPLSVFPDAMGLKQEGRENLLPYAGLVFNAFGPPNELRQSAIERSAPHQAYVAEQCQRPNLA  
PGGFGACIHAFSDTGEITPEEAPLLVRSLLSAGLDTTVNGIAAAVYCLARFPDEFARLRADPSLARNAFEEAV

RFESPVQTFFRTTTTRDVELAGATIGEKEKVLMLFLGSANRDPRRWDDPDRYDITRKTSGHVGFSGVHMCVGQL  
VARLEGEVLAALARKVAAIEIAGPLKRRFNNTLRGLESPIQLTPA

>CYP199A2 (Rpx1\_3652) *Rhodopseudomonas palustris* DX-1

MTTAPSSVPVTTTPSQHGAGVPHLAIDPFALDYFADPYPEQETLREAGPVVYLDKWNVYGVARYVEVYAVLNDP  
LTFCSSRGVGLSDFKKEKPWRPPSLILEADPPAHTRTRAVLSKVLSPATMKRLRDGFMAAADAKIDELLARGG  
SIDAIADLAEAYPLSVFPDAMGLKQEGRENLLPYAGLVFNAGFPNELRQSAIERSAPHQAYVAEQCQRPNLA  
PGGFGACIHAFTSDTGEITPEEAPLLVRSLLSAGLDTTVNGIAAAVYCLARFPDEFARLRADPSLARNAFEEAV  
RFESPVQTFFRTTTTRDVELAGATIGEKEKVLMLFLGSANRDPRRWDDPDRYDITRKTSGHVGFSGVHMCVGQL  
VARLEGEVLAALARKVAAIEIAGPLKRRFNNTLRGLESPIQLTPA

>CYP199A4 (BRADO6810) *Bradyrhizobium* sp. ORS 278

MNPTALSSAAVASAIPRLAIDPFSYGFFDDPYPAHEQMREAGPVVYLDQWNVYGVARYAEVYTVFNDPQTFCS  
SRGVGLSDFAKEKPWRPPSLILEADPPAHTRTRAVLSKVLSPAVMKRLRDGFMAAAEAKIDDLVARGSFDAIP  
DLAEAYPLSVFPDALGLKAEGRDHLISYASLVFNAGFPNELRQQAIIERSAPHQAYVTEQCQRDNLAPGGFGA  
CIHAFTSDSGEITPAEAPLLVRSLLSAGLDTTVYGIGAAVYCLARFPDQWARLRADPSLARNAFEEAVRFESPV  
QTFFRTTTTRDIELGGVTIPGGEKVLMLFLGSANRDPRRWEQPDSDYDITRKVSGHVGFSGSIHMCVGQLVARLEG  
EAVLTALARKVGSITMSGAPKRRYNNTLRGLESPLVFTTPA

>CYP199A26 (S23\_67580) *Bradyrhizobium* sp. S23321

MSAPGFATSGVPHVDVDPFDMNFFADPYPAHELLRETGPVVYLDKWKLYGVARYAEVHAVLNDPATFCSSRGV  
GLSDFKKETPWRPPSLILEADPPEHTRTRAVLSKVLSPVMKGLRDRFAAAVAEQRVDALLDKGSFDAITDLAE  
AYPLSIFPDALGLKPEGREHLIPYASVVFNAGFPNQLRQEAIARSAPHQAYVTEQCQRDNLTGGGIGACIHA  
HVDEGAITATEAPLLVRSLLSAGLDTTVNGIGAAVYCLARFPQWQLRGDLTLARNAFEEAVRFESPVQTF  
RTTTRVELSGATIGEKEKVLMLFAANRDPRRWDKPDSDYDITRRTSGHVGYGSGSIHMCVGQLVARLEGETML  
SALARRVASIEITGEPKRRFNNTLRGLDSLPTITPA

>CYP199A27 (Swit\_3269) *Sphingomonas wittichii*

MASHAERSPYAIYDSDDPPGVPVLDVDPFVDFADPYPVHEQLREAGPFVWLSRYNIGAVARHEHVRDALTD  
WKTFSSARGVGMEDFVRHGRFRLPSLILEADPPQHSRSRGVLSRVLSPPVLKGLRDRFEVEAEAMVEAVVRK  
RFDGVADLAEAFPLRVFPDAIGMGREGREKLLPHADLLFNSFGPRNELFQAAKEKVSFDWIEEQGKRGNLAPG  
GLGLMIHDAVDRGEISEAEAPVLVRALLQAGLDTTINALGATLYCLARFPSEFDRLRADHKLAKAAFEAAIRF  
EAPVQTFFRATATRLGGTPLNEGDKVLMLFAANRDPQWDRPDVYDIGRRTIGHVGFAGAGIHACVGQLLA  
RMEGELVLTALARRVKTLRIAGTVRRYNNTLRGLASLPLEIELA

>CYP199A28 (RPB\_3613) *Rhodopseudomonas palustris* HaA2

MISNSSAESISAPPNDSTIPHLAIDPFSLDFFDDPYPDQQTLRDAGPVVYLDKWNVYGVARYAEVHAVLNDPT  
TFCSSRGVGLSDFKKEKPWRPPSLILEADPPAHTRPRAVLSKVLSPATMKTIRDGFMAAADAKVDELLQRCI  
DAIADLAEAYPLSVFPDAMGLKQEGREHLLPYAGLVFNAGFPNELRQTAIERSAPHQAYVNEQCQRPNLAPG  
GFGACIHAFTDTGEITPDEAPLLVRSLLSAGLDTTVNGIGAAVYCLARFPGELQRLRSDPTLARNAFEEAVRF  
ESPVQTFFRTTTTREVELGGAVIGEKEKVLMLFLGSANRDPRRWSDPDLYDITRKTSGHVGFSGVHMCVGQLVA  
RLEGEVMLSALARKVAAIDIDGPVKRRFNNTLRGLESPLVKLTPA

>CYP199A29 (BBta\_0729) *Bradyrhizobium* sp. BTAi1

MNPPGLSAGAAGTSPPAIPHLGIDPFAISFFDDPYPAHQQMREAAPVVYLDNRNVYGVARYAEVYAVLNDPLT  
FCSSRGVGLSDFAKETPWRPPSLILEADPPAHTRTRAVLSKVLSPAVMKRLRDGFMAAAEAKVDELVARGSF  
AIPDLAEAYPLSVFPDALGLQPEGREHLIPYASLVFNAGFPNELRQQAIIERSAPHQAYVTAQCQRDNLTGG  
FGACIHAFTSDSGEITPAEAPLLVRSLLSAGLDTTVYGIGAAVYCLARFPDQWARLRADPALARNAFEEAVRFE  
SPVQTFFRTTTTRDVELGGVVIPEGEKVLMLFLGAANRDPRRWERPDSDYDITRKVSGHVGFSGSIHMCVGQLVAR  
LEGEAVLTALARKVGAITMSDEPKRRYNNTLRGLESPLVFTTPA

>CYP199A30 (S58\_06520) *Bradyrhizobium oligotrophicum*

MNPTGLSASPAGAPAI PHLAIDPFSYGGFFDDPYPAHHEMREAGPVVYLDTWNVYGVARYAEVYAVFNDPQTFCS  
SSRGVGLSDFTKEKPWRPASLILEADPPAHTRTRAVLSKVLSPAVMKRLRDGFMAAA EAKVDELVARGAFDAI  
PDLAEEAYPLSVFPDALGLQPEGREHLIPYASLVFNAFGPPNELRQQAIERSAPHQAYVTAQCQRDNLTPGGFG  
ACIHAFSDTGEITPAEAPLLVRSLLSAGLDTTVYGVGAAYVCLARFPDQWARLRADPSLARNAFEEAVRFESP  
VQTFFRTTTTRDVELGGVVIPEGEKVL MFLGAANRDP RRWEQPDSDITRKVSGHVGFSGSIHMCVGLVARLE  
GEAVLTALARKVGSITMSAEPVRRYNNTLRGLASLPVTFTPA

>CYP199B2 (Avi\_7683) *Agrobacterium vitis*

MIEGHRVFEPAEGIPVWDIDPYDEAVLADPNAYYAELRAKGPLVYIPKYSILASGRYEETKEIFSDHARFVSS  
RGVGLNDFRYGTPWRPPSIILEVDPPEHARTRKVMARALSPKAISKFKEDFRVKAVEIVDALLEKRRFEAVVE  
LAEAFPTAVFPEALGMVDHDPRLVDYGAMVFNSMGP DNALRRKAGAMIP EIVPWIMSACARSRLRPDGMGAI  
IYEADAGEITQEEAGLLIRSFLSAGVDTTVTGIGNALWCLASNPAEYERLKVDPSLARPCFEEVLRYTSPVH  
TFGRTA AVDTEIAGLKIAEGSKIICVLGAANLDPEKWEAPESFRIDRRPAGHMAFGAGIHGCVGQNIARLELE  
TLLTVMAAKVDRIEFDGEVVWRPNNAIHALDRMPLEFI AK

>CYP199J1 (Sphch\_3292) *Sphingobium chlorophenolicum*

MCNMCQKSDECSLRQQKVS NLS DQAPPSFDIDPFDNAYLRDPYAWHGFLRQAAPVIHLSKYDCYAVGRYDEVK  
EAMSNHEDFSSADGTGLGSLSKGTAQSRSP IIEVDPP EHNNAVRRPMNNILSPRLVKEWTD AFAASAASV VDA  
ALAKDSFDIIGEIVEPFVLEAFPDFLGIGKEGRENFL LIGDFVLNSLGP DNELYRK TAKAAEPVLGWMMSKYD  
RGAMAPGRLGALIWKGVDEGKIDPSIAETLIRTF LRGGTDTVISGLGTL LAQLVL RPDQWEILKNDRSKMSTA  
IDEAIRLES PAQSMFRNTRRQVKLG GYVLEADKKILCSLGAANRDPDRWRNPDQFDFNRSVQGH LGFGVGVHF  
CIGQRLARAETEAMLGALLDRVDSFEAVGEPEWRMNNVARRLDNFRVSATRLAE CASS

>CYP199K1 (RN69\_13925) *Bradyrhizobium japonicum* E109

MTGIACSQADPFAPDFLIDPYPAYETLRALGPV FRLARYDVWAMAGYAGVEAALKDWKTFISGEGVGLNGMNP  
ALPKPLTLQIDPPDHDKGRRVLGRTLSPGVARKLRET FQQEAERKVSELIDKGTFDAVADLAEAYPMKVFPDA  
IGIRPDGREKLLAWSTFV FDSFGPENEMLAASRKAGLAAQSWIMECCARDALQPDGLGMMIYQAADDGEITEH  
EATHLV RPFLTAGIDTTVNGIGNTLLALATHPDEYRKLHQRP ELARNAFEEGLRYDSPVQTFFR TTSREVETS  
GGVIPAHRKVLLFMASANRDPARWDNADRFEVERSATGHVGF GAGIHACVGM IARLEGE LIFGELARRVKTI  
ELTAEPRRRLNNSLRGLESMPVRVTAA

>CYP199L1 (EP837\_03852) *Sphingobium* sp. EP60837

MSLPASAPAGVPTSEIDLFA PKVLEDPHRFDGELREIGPVVWLEKHGVYAVTRHKAIQSMYADWRNFHNF GSP  
FNPDTLIPAVIIIDNPPQHTRLRSAIMPYVSPAALARYRKDFETTAQLLIEQILDEREFDARDLAASFVLKAF  
PDLLGLPLEGRHFLNLFGEAILNTLGP MNDLTIKSLERAGPAFAWVQSECSREKVLPGKLASKVYALTETADI  
SEEEAGLLVRTL LAAGFDTTILGITAAFYGFTQNPDQWQLLSDPKMVRAAFEEGIRYFPPNRFGGRLVAADTE  
FEGA HFKSGDRITLLAAAGRDP RRWDADVF DITRPARSHLSFGHGIHACLGQVLSRTEYDVLITALFKHVA  
RIEAGPAERAVNNVALGWGKVPIRLTLR

>CYP199M1 (Ga0080574\_TMP462) *Pelagibaca abyssi*

MTTDDIPALDFDPFSVESIAAGPTVFAEIREMAPLVWLKPYGVYATCRHEFAQKALRDWQSFTSTVKAFGERE  
HIPNIMVQEDPPDHS AHRNPVMKFFTPVALNNYRAFFEQSAADHADRLVETGAVDGFDDVASGYILQVFPDIL  
GMKEMDRKQLLLFGDLAFNSTVPVNDLYKACKARSGDVLEW FNRQCQRESVTRDGLAE EIYRLGDSGEVSEQS  
AQLLVRAVFSGGFDTTVLSITSG LKLF AENPDQWDL LREEPKLARNAFEEVIRMEPPSRFLGRGVAAETELAG  
VPLKPGDKFATFLGGVGRDPRQWQDPDRFDIRKKVLGHMSFGHGVHSCLGQGLARIEFASLFTALAKRVKRI  
EITGEIKRNINNQANGFHVLP LRLHAG

>CYP200A1 (blr3832) *Bradyrhizobium diazoefficiens* USDA 110

MAPRLDFTSEAFFRDPPAAIAALRASGPVVATRFLVGDVWITTTTHDATAEVLKDGTTFTTLRKEDGKVAGLRW  
WMPKLVT TIANNM LTMDEPDHTRLRSIVDEAFRRRAIVAMEPRIRAIADGLANDLFADGSPADLVQCYARILP  
VSVICELLGLPAADRPRFIAWANKMSSLTNVVSFFRLLFAFRKM RAYLERQLQIARVRGGEGLIAELVQVELE

GGQITPDEMVMVFLLLAAGSETTTHLISGSVYELLRNPAIRDWLEEDWSRISLAVEEFLRFVSPVQFSKPRY  
LRRDVELAGVRLKKGDRVMVMLAAANMDPAVHDRPERLDLTRKPNRHMSFGTGIHFCLGHQLARIEATCALQA  
LLARWPKLELAVDPAQIHWRKRPGMRAIARLPVVAGGNRRPSRGAAAEPLAD

>CYP200A1 (BJ6T\_60220) *Bradyrhizobium japonicum* USDA 6

MTPRLDFTSEAFFRDPPEAIAALRASGPVVATRFLVGDVWITTTTHDATAQVLKDGTTFTTLRKGDGKVAGLRW  
WMPKLVTTIANNMMLTMDEPDHTRLRSIVDEAFRRRAIVAMEPRIRAIADGLANDLFADGSPADLVQRYARILP  
VSVICELLGLPAADRPRFIAWANKMSSLTNVVSFFRLLLAFRKMAYLEQQQLQVARVQGGEGLIAELVQVERE  
GGQITPDEMVMVFLLLAAGSETTTHLISGSVYELLRNPGLRDWLEQDRSRIGLAVEEFLRFVSPVQFSKPRY  
VRQDIELAGVPLKKGDRVMVMLAAANMDPAVHDQPERPDLTRKPNRHISFGTGIHFCLGHQLARIEAACALEA  
LFARWPKLGLAVDPAQIHWRKRPGMRAIAELPVVPVDSQPVDFRDATTSRSQPNTERPSRSGEASRSPAM

>CYP200A1 (RN69\_29175) *Bradyrhizobium japonicum* E109

MTPRLDFTSEAFFRDPPEAIAALRASGPVVATRFLVGDVWITTTTHDATAQVLKDGTTFTTLRKGDGKVAGLRW  
WMPKLVTTIANNMMLTMDEPDHTRLRSIVDEAFRRRAIVAMEPRIRAIADGLANDLFADGSPADLVQRYARILP  
VSVICELLGLPAADRPRFIAWANKMSSLTNVVSFFRLLLAFRKMAYLEQQQLQVARVQGGEGLIAELVQVERE  
GGQITPDEMVMVFLLLAAGSETTTHLISGSVYELLRNPGLRDWLEQDRSRIGLAVEEFLRFVSPVQFSKPRY  
VRQDIELAGVPLKKGDRVMVMLAAANMDPAVHDQPERPDLTRKPNRHISFGTGIHFCLGHQLARIEAACALEA  
LFARWPKLGLAVDPAQIHWRKRPGMRAIAELPVVPVDSQPVDFRDATTSRSQPNTERPSRSGEASRSPAM

>CYP200A3 (BF49\_1210) *Bradyrhizobium* sp. BF49

MAPRLDFTSEAFFRDPPEAIAATLRMSGPVVAVRFLVGHVWITTTHEATAQVLKDGNTFTTLRKEDGDVAGLRW  
WMPNYVKTIANNMMLTMDEPDHTRLRSIVDEAFRRRAIVAMEPRIRAIADGLADELFSAGSPADLVQRYARILP  
LAVISELLGLPLADRPRFIAWANTMSSLTNVASFRRLLLAFRKMAYLERQLQIARVRGGEGLIAELVQVERE  
GGQITPDEMVMVFLLLAAGSETTTHLISGSVYELLRNPSVRDWLAQDWSRLGLAAEEFLRFVSPVQFSKPRY  
VRRDIELAGVRLKEGDRVMVMLAAANMDPAMHDHPDSDLAREPNRHMSFGTGIHFCLGHQLARIEAACALEA  
LFVRWPKLGLFAVDVDSQIHWRKRPGLRRAIANLPVVPDGHGAAGSMMVHSQPAAC

>CYP200A4 (HYPDE\_32213) *Hyphomicrobium denitrificans* 1NES1

MKIDITNQEFFRDTAAAVAPLRAMGPVAEIHFPVIGKVWITTTYELAGRVLKDSETFTTLRKNGGPVAGLRWWM  
PRIVRAVSNMMLTMDEPDHTRLREIVDEAFRRRAILDMEPRIRAITDTLANELFADGSPADVVDYRSRIPLA  
VICEVLGLPEADRPRFMAWSNSFTRLTNLMGFFGLIPAMVSMKRYLEGQLDVARKNGGEGLIAELVRVEKEGG  
RISGDEMVMVFLLLGAGTETTTTHLISGSVFELLRNSERRDWLEEDWSRINLAIEEFLRFVSPVQFSKPRYIR  
RDIELGGVRLPAGDKIMAMIVAANMDPAESEHPEKLDLDRPNRHILAFGTGIHFCLGHQLARIEGKCALEALL  
TRWPKLELAVPETEIRWRARPGIRAIASLPVISR

>CYP200B1 (USDA257\_c38530) *Sinorhizobium fredii* USDA 257

MIEPHDFDVLSPFEHANPFPTLDRMRAEGAVVRMKLPVIGRTWFAVTHDTCAALLKDHESEFARDPANAGSRTQ  
ARILKLLPRTIGLLALNMIGYDDPEHRRRLRGLVDQAFQRRSIEAMKPMITQIADRLDLRLDGKREVDLMSEFC  
RDLPLSVICAVLGLPEQDHDREKRWLGGLKDTANIGAIIRAVPGVVRVRYLRRVSRAGCRALPDGLVAALRD  
AETDGQTLSEDELVSIMIFLLFGAGQETTTTHLISGGLFALLSHEDELLRLQNDPSLMPTCVEECLRYVSPVQMT  
KPRFARRDMRWQGGQFRRGDMIAAFLAAANCDPAKFEHPHREFDITRHPNPHLSFGTGVHFCLGFLQARAEAAI  
AFERILTRFPMSLNSDLSNIKWRKRLGIRALAQLPVKLAA

>CYP200B3 (BF49\_2022) *Bradyrhizobium* sp. BF49

MSDERRFDILSPFEHANPFPTLDRMRTEGPVVRLRLPIVIGRTWLAASHESCADLLKNSQDFARDPANAGSRTQ  
ERILKVLPRTLGLLASNMLGHDDPEHRRRLRALVDHAFQRRRTIAALKPTIVETADRLLDKLDGKPEADLMAEFC  
RDLPLSVICAMGLPEKDHDREKRWLGGLKDTANVFAVIRAI PGVISVVRHLRCVSRPGGARPEGLIAALRE  
AEIEGQRLSEDEIVSMIFLLFGAGQETTTTHLISGGLYALLTNRDQLSRLRQDPGLMPTCIEECLRHVSPVQMT  
KPRFATRDLVWQGRQVRRGEMFAALLAAANCDPARFEKPHTFDIGRHPNPHLSFGTGAHFCLGFLQARAEASI  
GIQRILDRFPALRLARQPEDISWHKRLGIRALARLPVRLAA

>CYP200C1 (GL4\_3357) *Methyloceanibacter caenitepidi*

MGAGYQKSYSLRAPLRVDLQSKASKQDPFSFFAGLREAGPVVPLKLPFVGRVWATTTYDATAAMLKDNALFVQ  
EGRHAGKSGVAGLSWMPHAIKVLNNMLLKDEPDHRRRLRKLVDQAFQRRLLVRDMRGEIEGLADRILDDIDGR  
DEIDLVASYARRFPLEVICWLLGLPEENRGRFEQWAGYMTSALRGFAVLRVVFTMPGVVNYVREQIEECRRNP  
REGLISELVRAEEDGDKLSEDELLSMVFLLLFAGFETTTTHLIADSVIALEQNPAQKAFLFADPATRMERAVEE  
LGRYMPVQSTKPRYVARNCDFLGQKLKRGENIVGLLAAANS DPAAFDAPDKLKLDRLPNPHLVFGRGIHFCL  
GMQLARVEAQSALSRLYGRYPDLALAAPDDL PWIERFGLRGVFALPVR LNSARARKAA

>CYP201A1 (b110557) *Bradyrhizobium diazoefficiens* USDA 110

MNIASVRRPIVPPTPPRAPDDMSFLGRVAVIRQNMIA TWGQRAYEEDVLEGRFFLHKSFILNRPDAIRHVLLS  
NYENYTRTPAGIRMLRPVLGEGLLIAEGHAWTFQRRTLAPAFTPRATANLVPHMTAVLDETI AKLDARSGETV  
DLRETMQRM TLEIAGRTMFSFGMDRHGPTLRNFVVEYGERLGRPYFLDMLLPVSWPSPMDFARARFRKRWTEF  
VAMLIAERRAAGKKDGAPPRDLFDLMD EARDPETGKGFSDEQLIDEVATMILAGHETTAT ALFWALYLLALDP  
DTQEEVASETRGEHLDSMADIDRQKFTRAVIEETMRLYPPAFLIARAARAKDNAAGIEIGR GDI IMIAPWLLH  
RHEKLWDQPN AFV PKRFMSTEAPDRFAYLPFGAGPRVCVGAPFAQAESVLALARLIGAFRVELVDTPVPIPHG  
VVTTQPDRSPMFRITRR

>CYP201A2 (RPA0421) *Rhodopseudomonas palustris* CGA009

MSIAAIDDRPASRAPLIPPTPPRAPENLSALGRLAAIRHNAIASWGDRA YQDDVVRGRFFAHSSYILNTPDAI  
RHVLVDNTDN YRRTATGIRVLRPMLGEGLLLAEGRAWKHQRRTLAPAFTPRAVATLVPHMASATDEVVEGLRR  
KTGVPLDLRETMQH LALEIAGRTMFSFEMGTHGQALRGFVIDYGTRLASPRFLDLLLP LGWPTPQDVSRALFR  
RRWTRFIGELIAARRAAGKAEGAPPRDLFELMLAARDPETGEAFSDAQLGDQVATMILAGHETTAT ALFWALY  
LLALDPDAQERLANEVR RVGFGGTEIERLPFTRAVLDETLRLYPPAFLIVREAAGPDRVAGFAVRKHDVMLIA  
PWLLHRHDKLWSDPNAFVPERFLPGVPSDRFAYLPFGVGPRVCIGAHFALVEATLALAKIVGTFRIELIDTE  
VPVPIGVVTTQPDRSPLFRLTPR

>CYP201A2 (Rpa1\_0425) *Rhodopseudomonas palustris* TIE-1

MSIAAIDDRPASRAPLIPPTPPRAPENLSALGRLAAIRQNAIASWGDRA YQDDVVRGRFFAHSSYILNTPDAI  
RHVLVDNTDN YRRTATGIRVLRPMLGEGLLLAEGRAWKHQRRTLAPAFTPRAVATLVPHMASATDEVVEGLRR  
KTGVPLDLRETMQH LALEIAGRTMFSFEMGTHGQALRGFVIDYGTRLASPRFLDLLLP LGWPTPQDVSRALFR  
RRWTRFIGELIAARRAAGKAEGAPPRDLFELMLAARDPETGEAFSDAQLGDQVATMILAGHETTAT ALFWALY  
LLALDPDAQERLANEVR RVGPGGTEIERLPFTRAVLDETLRLYPPAFLIVREAAGPDQVAGFAVRKHDVMLIA  
PWLLHRHDKLWSDPNAFVPERFLPGAPSPDRFAYLPFGVGPRVCIGAHFALVEATLALAKIVGTFRIELIDSE  
VPVPIGVVTTQPDRSPPFRLTPR

>CYP201A4 (S23\_02750) *Bradyrhizobium* sp. S23321

MNIASVRRPIVPPTPPRAPDDMSFLGRVALLRQNMIA TWGQRAYEEDVIKGRFFLQHSFILNRPDAIRHVLLS  
NYENYTRTPAGIRMLRPVLGEGLLIAEGQAWTFQRRTLAPAFTPRATANLVPHMTAVLDETI AKLDAQSGAPV  
DLREIMQRM TLEIAGRTMFSFGMDRHGPTLRNFVVEYGERLGRPYFLDMLLPVSWPSPMDFPRARFRKRWTEF  
VAMLIAERRAMGKKDGAPPRDLFDLMDAARDPETGKGFSDEQLVDEVATMILAGHETTAT ALFWALYLLALDP  
DTQEAVASETRGEHLDSMADIDRQKFTRAVIDE TMRLYPPAFLVARAAREKDNAAGVEIGKGDI VMIAPWLLH  
RHEKLWDQPN AFIPKRFMSKEAPDRFAYLPFGAGPRVCIGAPFAQAESVLALARLIGAFRVELADSI PVIPHG  
VVTTQPDRSPLFRITRR

>CYP201A5 (BJ6T\_05270) *Bradyrhizobium japonicum* USDA 6

MNIASVRRPIIPPTPPRAPDDL SFFGRVAVLKQNMIA TWGQRAYEEEV KGRFFLHNSFILNQPD AIRHVLLS  
NYENYTRTPAGIRMLRPVLGEGLLIAEGHAWTHQRRTLAPAFTPRATANLVPHMTAVLDETI TKLDARTSEPV  
DLREAMQRM TLEIAGRTMFSFGMDRHGPTLRNFVMEYGARLGRPYFLDMLLPVSWPTPMDFARARFRKRWTEF  
VAMLIAERRTMGKKDGAPPRDLFDLMDAARDPETGKGFSDAQLVDEVATMILAGHETTAT ALFWALYLLALDP  
ETQEAVASETHGEHLDSMADIDRQKFTRAVIEETMRLYPPAFLVARAAREKDNAAGVEIGKGDI IMIAPWLLH  
RHEKLWDQPN AFIPKRFMSKEAPDRFAYLPFGAGPRVCIGAPFAQAESVLALARLIGAFRIELADRVPVPIPLG  
VVTTQPDHSPLFRITRR

>CYP201A5 (RN69\_02575) *Bradyrhizobium japonicum* E109

MNIASVRRPIIPPTPPRAPDDL SFFGRVAVLKQNMIA TWGQRAYEE EVIKGRFFLHNSFILNQPD AIRHVLLS  
NYENYTRTPAGIRMLRPVLGEGLLIAEGHAWTHQRR TLAPAF TP RATANLVPHMTAVLDETITKLDARTSEPV  
DLREAMQRM TLEIAGRTMFSFGMDRHGPTLRNFVMEYGARLG RPYFLDMLLPVSWPTPMDFARARFRKRWTEF  
VAMLIAERRTMGKKDGAPPRDLFDLMDAARDPETGKGFSDAQLVDEVATMILAGHETTAT ALFWALYLLALDP  
ETQEEVASETHGEHLDSMADIDRQKFTRAVIEETMRLYPPAFLVARAAREKDNAAGVEIGK GDIIMIAPWLLH  
RHEKLWDQPNAFIPKRFSKEAPDRFAYLPFGAGPRVCIGAPFAQAESVLALARLIGAFRIELADRVPV IPLG  
VVTTQPDHSP LFRITRR

>CYP201A6 (BF49\_0293) *Bradyrhizobium* sp. BF49

MNIASVRRPIVPPTPPRAPDDMSFLARLAVIKRNMIA TWGQRAYEEDVIEGRFFFRNSFILNRPDAIRHVLLS  
NYENYSRT PAGIRMLRPVLGDGLLIAEGHSWTFQRR TLAPAF TP RATANLVPHMTAVLDETI AKLDGRTSEPV  
DLREIMQRM TLEIAGRTMFSFGMDRHGPTLRNFVMEYGARLG RPYLLDMVLP LSWPSPMDFARARFRKRWTEF  
VAMLIAERREMGKQDGAPPRDLFDLMDEARDPETGKGFSDEQLVDEVATMILAGHETTAT ALFWALYLLALDP  
DTQEEIASETRGEHLDSMADIDRQKFTRAAIEETMRLYPPAFLIARAAREKDNAAGIEIGK GDIIMIAPWLLH  
RHEKLWDQPNAFIPKRFSSTEAPDRFAYLPFGAGPRVCVGAPFAQAESVLALGR LIGAFRVELADTSPV IPLG  
VVTTQPDHSP RFRITPR

>CYP201A7 (BCCGELA001\_01405) *Bradyrhizobium* sp. CCGE-LA001

MNIASVRRPIIP PAPPRAPDEISFFARVAVIRRNMIATWGQRAYEEDVIKGRFFFRNSFILNQPD AIRHVLLS  
NYENYTRTPAGIRMLRPVLGDGLLIAEGHSWTFQRR TLAPAF TP RATANLVPHMTAVLDETI AKLDPRTGEDV  
DLREVMQRM TLEIAGRTMFSFGMDRHGATLRNFIMEY AARLG RPYFLDMLLPVSWPSPMDFARARFRKRWTEF  
VAMLIAERRAMGKKEGAPPRDLFDLMDEARDPETNKGFSDEQLVDEVATMILAGHETTAT ALFWALYLLALDP  
ETQEEVASETRGEHLDSMADIDRQTFTRAVIEETMRLYPPAFLVARAARDKDNAAGVEIAKGDIIMIAPWLLH  
RHEKLWDQPNAFIPKRFSKEAPDRFAYLPFGAGPRVCIGAPFAQAESVLALARLIGAFRVELADPTSPV IPL  
GVVTTQPDHSP LFRITRR

>CYP201A8 (LMTR13\_38220) *Bradyrhizobium icense*

MSIAEAYDMPVARAPLVPPSPPRAPDDMTVFGRMKAIRESPIG SWGQRAYEEDIVQGRFFGRSTFILNTPDAI  
KHVLVDNYENYTRTPAGIRVLRPILGEGLLIAEGRAWKYQRR TLAPAF TP RAVMPLVRHMLAATDET VAKLRA  
ASNVPVDLREAMQRMAL E IAGRTMFSFGMDRHGAALRDFVMEYGERLARPHFLDLLPLSWPSPQDIARRRFR  
KRWTA FVGMMLMAERRAAGKQEGAPARDLFDLMGEARDPETGEAFTDEQLGDQVATMILAGHETTAT ALFWALY  
LLALDPATQE QVASEVQTATVDGAHDIERLRFTRAVIDETMRLYPPAFLIARAAIGPDTIAGLPVKKKDII LI  
APWLLHRHEKLWRDPNAFIPSRFMTATPPDRFAYLPFGVGARVCIGAHFALVEATLALAKMIGAFRVTLVGKD  
PVMPIGVVTTQPD RSPMFAITPR

>CYP201A9 (Rpx1\_0258) *Rhodopseudomonas palustris* DX-1

MSIAVIDDRPASRAPLIPPTPPRAPDDISALGR LAAIRHNAIASWGDRA YQDDIVKGRFFTHASYILNAPDAI  
RHVLIDNADNYRRTATGIRVLRPMLGDGLLLAEGRAWKHQRR TLAPAF TP RAVATLVPHMLSATEEAIAGLHR  
NAGAPVDLREAMQH LALEIAGRTMFSFGMDRHGALRSFVIDYGTRLASPRFLDLLPLGWPTPQDIARARFR  
RRWTRFVGELIAARRASGKTADAPPRDLFELMLAARDPETGEAFSDAQLGDQVATMILAGHETTAT ALFWALY  
LLALDPDAQERLASEVRR LGPGAVEIERLPFTRAVLDETLRLYPPAFLIVREAAGADQVAGFAVRKHDVMLIA  
PWLLHRHEKLWHEPDAFVPARFLPGAAPPDRFAYLPFGLGPRVCIGAHFALVEATLALAKIVGTFRIELIDTT  
PVMPIGVVTTQPD RSPSFRLTPR

>CYP201A10 (RPB\_0116) *Rhodopseudomonas palustris* HaA2

MSIAEVYAVADRPAPLVPPTPPRAPENISALGR LAAIRRNAIASWGARAYQDDIVKGRFFTHASYILNTPDAI  
RHVLVDNDENYTRTATGIRVLQPMLGEGLLLAQGRVWKHQRR TLAPAF TP RAVGTLVPHMISATEETVAELRD  
SAGAPVDLREKMQH LALEIAGRTMFSFGEMSGHKALRDFVIEYGTRLASPRFLDLLPLGWPTPQDISRAFFR  
RRWTKFVGELIAARRAAGKGE GAPPDRDLFDLMVAARDPETGEAFSDDQLGDQVATMILAGHETTAT ALFWALY  
LLALDPRTQDDLADDEVRAAGSGETPALDRLPFTRAVLDETLRLYPPAFLIAREAAAGPDTVAGHAIHRHDVLLI

APWLLHRHEKLWDNPSAFMPSRFLPGAPPPDRFAYLPFGVGPRICIGAHFALVEATLALARVVGAFRIELIDA  
APVMPIGIVTTQPDSPMFRLTRR

>CYP201A11 (RPD\_0687) *Rhodopseudomonas palustris* BisB5

MSIAEVYDVADRRAPLLPPTPPRAPDNMTALGRLAALRNNAIATWGQRAYQDDLIKGRFFNHASYILNTPDAI  
RHVLIDNYENYTRTAAGIRVLQPILGQGLLLAEGRAWKHQRRTLAPAFTPRAVGTLPVPHMISATEETIAELQG  
SLGAPVDLREAMQRLALEIAGRTMFSFAMGRHGPTLRDFVMEYGMKLASPRFLDLLPLGWSPQDISRAFFR  
RRWTRFIGELMAARRAAGKTEGAPPRDLFDLMVVARDPETGEAFSEDQLGDQVATMILAGHETTATALFWALY  
LLALDPATQQDVADARSAGKDETPAIERLAFTRAVLDETLRLYPFAFLIAREAAGPDSVAGQTIIRKDVMLI  
APWLLHRHEKLWDNPSAFMPARFLPGTPPPDRFAYLPFGVGPRVCIGAHFALVEATLALARIVGAFRIELIDP  
TPVMPIGIVTTQPDHSPMFRLTRR

>CYP201A11 (RPC\_0051) *Rhodopseudomonas palustris* BisB18

MSIAEASQMPLTRRPLLPAPPAPRAPETMTAFGRLLAIRNNVIASWGDRAVQDDVVRGRFFGSSSFILNTPDAI  
RQVLVDNYENYIRTAAGIRVLRLPMLGDGLLLAEGRAWKHQRRTLAPAFTPRAVATLPVPHMRSIDEMLAEFDA  
ARGRPIDLREAMQRMALAIAGRTMFSFAMGRHGRTLRDFVIEYGTRLARPNFLDLLPLAFPTPQDFARAGFR  
RRWTAFLIAQLMAERRAAGKAEGAPPRDLFDLMGAARDPETGEAFSEPQLGDQVATMILAGHETTATALFWALY  
LLALDQHSQDQLAAEVRGQPENHAREVEHLTFTRAVIDETMRLYPFAFLIARAAAGPDVVAGSAVRKGDVMLI  
APWLLHRHEKLWHDPAFIPARFMPGSPPPDRFAYLPFGVGARVCIGAHFALVEATLALSGIVGRFRVELLNA  
APVMPIGVVTTPQDYSMPFRLTPR

>CYP201A12 (RPE\_0057) *Rhodopseudomonas palustris* BisA53

MSPARALLTPSERPPLVPPLPPRASETMSTLQRLSAISANAIASWGDRAVQDDIVVGRFFHRSSFILNAPDAI  
RHVLVDNWNENYARTPAGIRVLRLPMLGQGLLLAEGRPWKHQRRTLAPAFTPRAVASLPVPHMLSAIDDTVTALDA  
ARGGPVDLREATQHMALEIAGRTMFSFGMAEHGKALRDFVMEYGWKLAQPSLLDLLPLSWPTPKDVSRAFR  
RRWTRFIAELMAARRAEGKSDSAPPRDLFDLMVAARDPETGEAFSEPQLGDQVATMILAGHETTATALFWALY  
LLALDPQTQEELAAEARAQAPGPLDVESLKFTRAVIDETLRLYPFAFLIVRAAIGPDVVGGHKVAPHDAMLIA  
PWLLHRHEKLWDQPNAFIPARFLPGAPPPDRFAYLPFGVGPRICIGAHFALVEATLALAKIVGQFRIELTDSV  
PVLPGVVTTQPDSPPFRIITRSEMGSSQS

>CYP201A13 (BBta\_0276) *Bradyrhizobium* sp. BTAi1

MSTAEIHYLPQARAPLVPPMPPPRAPDSMGAFRRVLLMGENAIATWSQRAYEDEIVRGRFFGSSSYILNTPDTI  
KHVLVDNWNENYVRTDGAIRVLRLPVLGEGLLIAEGRAWKHQRRTLAPAFTPRAVAGLIPHMIAVTDVTRLKQ  
QCDAPVDLREIMQRMTLDIAGRTMFSFEMGRHGATLRDFVFEYGERLASPHLLDIVLPLSWPTPRDIARRRFR  
KRWTAFTVLLMAERRAAGKLDDAPPRDLFDLMGAARDPETGAAFTDAQLADEVATMILAGHETTATALFWALY  
LIALDPASQSKLAQEAGAASDLGDPDLFPFTRAVIDETLRLYPFAFLIARAASGPDRLADFPVKRGDVVLISP  
WLLHRHEKLWRAPNAFMPPERFLPGAAPPERFAYLPFGAGARVCIGAHFALVEAVLALARLVGAFKIELIDRAP  
VMPIGVVTTQPDSPPLFRITPR

>CYP201A14 (BRADO0283) *Bradyrhizobium* sp. ORS 278

MSTADVHYLPRSPLVPPMPPPRAPDSMGALRRVLLMMGENAISTWSQRAYEDEIVHGRFFGSSSYILNTPETIKH  
VLVDNWNENYARTVGAIIRVLRLPVLGEGLLIAEGKAWKHQRRTLAPAFTPRAVAGLIPHMVAVTEETVARLQQQC  
GQPLDLREIMQRMTLDIAGRTMFSFEMGRHGATLRDFVFEYGERLASPHLLDIVLPLSWPTPRDFARRRFRKR  
WTDVFGMLMAERRAAGKREDAPPRDLFDLMGAARDPETGAAFTDAQLADEVATMILAGHETTATALFWALYLI  
ALDPANQEKLAEQAATDLSPDLFPFTRAVIDETVRLYPFAFLIARAASGPDQIAAFEVVKRGDVVLISPWL  
LHRHERLWRSPNAFMPPERFLPGAPPPERFAYLPFGAGARVCIGAHFALVEAVLALARLVAAFRIELVDPAPVM  
PVGVVTTQPDSPPLFRITPR

>CYP201A15 (S58\_02890) *Bradyrhizobium oligotrophicum*

MSTADVHYLQARLPLIPPTPPRAPDSMGAFRRVLLMMGENAIATWSQRAYEDDIIRGRFFGNSSSYILNTPDTI  
KHVLVDNWNENYRTVGALRVLRPVLGEGLLIAEGKAWKHQRRTLAPAFTPRAVAGLIPHMVAVSDETVARLQK  
QCGQPLDLREIMQHMTLDIAGRTMFSFEMGRHGATLRDFVFEYGERLASPHLLDIVLPLSWPTPRDFARRRFR



KRWTFVAMLMMAERRAAGKLEDAPPRDLFDLMGAARDPETGAAFTDAQLADEVATMILAGHETTATALFWALY  
LIALDPANQDKLAQEARAATDPSDPDQLPFFTRAVLDETVRLYPPAFLIARAASGPDRIAAFQVKRGDVVLISP  
WLLHRHEKLWEAPNAFKPERFLPGAPPPERFAYLPFGAGARVCIGAHFALVEAVLALARLVGAFKIELVDRVP  
VMPVGVVTTQPSRSPLFKITPR

>CYP201A16 (Y590\_05405) *Methylobacterium* sp. AMS5

MDMQAPPGHAAPRLVPPVPVPPEEELPTLRFIAAMRVNGIACWPASAYESPLRRRRRLFGRARFTVSDPDLVRR  
VLVDNAANYARTPITIRLLRPM LGDLLISEGTAWRHQRRALAPAFTPRAVETLVPHILSASDEAVA ALEGPA  
ARGPVDLFAALQRLALEIAGRTMFSVGMARHGDR LRGFLEAYAARLGRPHLTDLLVPLRFATPLDRARARFRR  
DWVGFLDEVIADRDEGQSGRHVGGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTLLWAC  
TLLALAPETQGAVAAESGSVDKPFTRAVIEETMRLYPPAFVLARRALGPDELAGEAIRPGDSVTISPWLLHRH  
RTLWRDPDAFDPGRFLPGAPPVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADTRPVLPAAV  
VTTQPDHAPAFRLTRRA

>CYP201A16 (METDI1856) *Methylobacterium extorquens* DM4

MDMQAPPGHAAPRLVPPVPVPPEKELPTLRFIAAMRVNGIACWPASAYEAPLRRRRRLGRTRFTVSDPDLVRR  
VLVDNAANYARTPITIRMLRPM LGDLLISEGTAWRHQRRALAPAFTPRAVETLVPHILSASDEAVA ALEGPA  
SRGPVDLFAALQRLALEIAGRTMFSVGMARHGDR LRGFLEAYAARLGRPHLTDLLVPLRFATPLDQARARFRR  
DWVTFLDEVIADRDEGQSGRQVGGHGGGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTL  
LWACTLLALAPETQGAVAAESASADKPFTRAVIEETMRLYPPAFVLARRALGPDELAGEAVRAGDSVTISPWL  
LHRHRKLWRDPDAFDP SRFLPGAPPVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADARPVL  
PAAVVTTQPDHAPAFRLTRRV

>CYP201A16 (Mext\_1270) *Methylobacterium extorquens* PA1

MDMQAPPGHAAPRLVPPVPVPPEKELPTLRFIAAMRVNGIACWPASAYEAPLRRRRRLGRTRFTVSDPDLVRH  
VLVDNAANYARTPITIRMLRPM LGDLLISEGTAWRHQRRALAPAFTPRAVETLVPHILSASDEAVA ALEGPA  
AQGPVDLFAALQRLALEIAGRTMFSVGMARHGDR LRGFLEAYAARLGRPHLTDLLVPLRFATPLDRARARFRR  
DWVGFLDEVIADRDEGQSGRQVGGHGGGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTL  
LWACTLLALAPETQGAVAAESASADKPFTRAVIEETMRLYPPAFVLARRALGPDELAGEAVRPGDSVTISPWL  
LHRHRKLWRDPDAFDP RRFLPGAPAVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADTRPVL  
PAAVVTTQPDHAPAFRLTRRV

>CYP201A16 (Mex\_1p1055) *Methylobacterium extorquens* AM1

MDMQAPPGHAAPRLVPPVPVPPEKELPTLRFIAAMRVNGIACWPASAYEAPLRRRRRLGRTRFTVSDPDLVRH  
VLVDNAANYARTPITIRMLRPM LGDLLISEGTAWRHQRRALAPAFTPRAVETLVPHILSASDEAVA ALEGPA  
ARGPVDLFAALQRLALEIAGRTMFSVGMARHGDR LRGFLEAYAARLGRPHLTDLLVPLRFATPLDRARARFRR  
DWVTFLDEVIADRDEGQSGRQVGGHGGGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTL  
LWACTLLALAPETQGAVAAESASADKPFTRAVIEETMRLYPPAFVLARRALGPDELAGEAVRPGDSVTISPWL  
LHRHRKLWHD PDADFDP SRFLPGAPPVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADARPVL  
PAAVVTTQPDHAPAFRLTRRV

>CYP201A16 (Mchl\_1432) *Methylobacterium extorquens* CM4

MDMQAPPGHAAPRLVPPVPVPPEKELPTLRFIAAMRVNGIACWPASAYEAPLRRRRRLGRTRFTVSDPDLVRH  
VLVDNAANYARTPITIRMLRPM LGDLLISEGTAWRHQRRALAPAFTPRAVETLVPHILSASDEAVA ALEGPA  
ARGPIDLFAALQRLALEIAGRTMFSVGMARHGDR LRGFLEAYAARLGRPHLTDLLVPLRFATPLDRARARFRR  
DWVTFLDEVIADRDEGQSGRQVGGHGGGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTL  
LWACTLLALAPETQGAVAAESASADKPFTRAVIEETMRLYPPAFVLARRALGPDELAGEAVRPGDSVTISPWL  
LHRHRKLWRDPDAFDP SRFLPGAPPVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADARPVL  
PAAVVTTQPDHAPAFRLTRRV

>CYP201A17 (Mpop\_1222) *Methylobacterium populi*

MQAPPAGAVPRLVPPVPAPPERELPTLRFIAAMRVNGIDCWPASAYEAPLRRRRRLFGRTRFTVSDPDLVRHVL  
VDNAANYARTPITIRMLRPMLGDGLLISEGTAWRHQRRTLAPFTPRAVETLVPHILSASDEAVAALLEGPAAR  
GPVDLFAALQRLALEIAGRTMFSVGMMAHGDRLRGFLEAYAARLGRPHLTDLLVPLRFATPLDRARARFRRDW  
VAFLDGVIADRDQGDGRHQGEARDLLDLLRAARDPETGRGFSHEELRDQVATMILAGHETTAVTLLWACTLL  
ALSPETQA AVAAEASAEKPFTRAVIEETLRLYPSAFVLARRALHADVLGGERVEAGDSVTISPWLLHRHRRRL  
WRDPDAFDPGRFLPGAPPVPRFAYLPFGAGPRVCIGAAFALTEATLALSRI VGHFRIERADARPVLPAAVVT  
QPDHAPAFRLTPRA

>CYP201A18 (Mrad2831\_3371) *Methylobacterium radiotolerans*

MPTFS DATATPDRTIPSLAGMPRVVPPHRAPPERELPLAAYLRSIRDNALAGFPERAFEEPVTRRGLLGRSSF  
VLNDPEAIRRVLVENQANYARTTGTTRILRPILGDGLLISEGSAWRHQRRTLAPFTPRAIDGLVPHIAAAVT  
DGMERIAAEAAAGPVDLFTSFYRLALEIAGRAMFSVGMDEHGAELRQFIAEYAERMGRPHLLDIVIPPGWPVP  
LDWSRGRFRRRWIPFLDRIIAARRAERDRSRSGDLLDLAAARNPDTGAAFTPDEL RDQVATMILAGHETTA  
GTLFWAAYLLALAPEVQERVAEEARAADLTDPTGCQSDGRLPLTRAVIDETLRLYPAAFVVVRRALGPDNVAG  
HAVKASDIVMVSPWVLHRHRALWTDPAFDPGRFLPGAPAPRRFAYLPFGAGPRVCIGAQFALSEAVLSLARV  
LQRFRLVLDEREPVLPQAVVTTQPDRPARFRLIPREPLSP

>CYP201A18 (MOC\_3877) *Methylobacterium oryzae*

MPILSDASARPDRTTPSLAGLPRVPPHRAPPERELPLAAYLRSIRDNALEGFPERRAFEEPVTRRGLLGRSSF  
VLSDPEAIRRVLVENQANYARTTGTTRILRPILGDGLLISEGSAWRHQRRTLAPFTPRAIDGLVPHIDAABA  
DGMDRIAEEAATGPVDLFTSFYRLALEIAGRAMFSVGMDEHGAELRRFIAEYAERMGRPHLLDIVIPPGWPVP  
LDWSRARFRRRWIPFLDRIIAARRDAERDRPHAGDLLDLAAARNPDTGAAFTADEL RDQVATMILAGHETTA  
GTLFWAAYLLALAPEMQERVAEEARSADLTDPTGCQSDGRLPLTRAVIDETLRLYPAAFVVVRRALGPDNVAG  
HAVKASDIVMVSPWVLHRHRTLWSDPAFDPGRFLPGAPAPRRFAYLPFGAGPRVCIGAQFALSEAVLSLARL  
LARFRLVLDEREPVLPQAVVTTQPDRPARFRLIPRDPVSP

>CYP201B1 (Mnod\_5133) *Methylobacterium nodulans*

MGLGASAAGDEDELYAPPMPPLAERVGSLRLLRAFRNTLDAFPACLHEPAVTLRLPGGGCVVLLCVPEAVR  
HVLVSAAGDFARLPAGRRVLGP IAGRGLVLAEGEAWRRQRRVLAPFTPRTVPLMAGHIARATEASIRRLDAA  
GGAPVDLQAEMQRLSLDIAASSMFSLETGPFEARIRRMVSGYLGG LGRPQVSDFLPPGWPTPASPRRALFRR  
RWLRLVGEIIAARRAQGHGEAPRDLFDLLSTAHD EADGLLADEVGTMI VAGHETTASTLFWAATLLARAPAVQ  
DALAAEARALDLGEESAADSLPRLSLARAVVQETLRLYPPAYMIARRALRDGATCGAALPAGATVMIPTWVMH  
RNPRWWARPGAFDPQRFLRPGTEPDRYVYLPFGAGPRVCIGAPLALAEATLV LARLARDFVVS LDGDRPVMPV  
ATVTVRPDHAPRFLRRRP

>CYP201B2 (M446\_4522) *Methylobacterium* sp. 4-46

MTSGAVLERADLYAPPMPPLAERVWLRLLSAFRRNTLDAFPGACLTEPTVTLRLPGGGRVVLLCVPEAVRHV  
LVAQGSDFARLPAGIRVLGPVAGRGLVTAEGEAWRRQRRVLAPFTPRTVPLMARHIARATAACLRRLDAARG  
GPVDLHAEMQRLSLDIAASSMFSLEAGPYEARIRAMVSAYLGGLGRPRVSDFLVPPGWPTPAAPRRWLFRRRW  
RALIAELIAVRRAQVAGQGPRDLFDLLAEAHGEEP DGLLADEVGTMI VAGHETTASTLFWAATLLARAPAVQE  
ALAAEARGLDLGEAGAAAALPRLALARAVVQEALRLYPPAYMIARRAVRDGAVCGAAIPAGTTVMIPTWVMHR  
NPRWWPRADAFDPERFLRPGEEPDRFVYLPFGAGPQVCIGAQLALAEATLALAGLARRFALS LDGARPI LPVA  
TVTVRPDHAPPFRLARR

>CYP201B3 (Maq22A\_c18715) *Methylobacterium aquaticum*

MTLTFAAEAYAPPVPDLAERVGWLGLLGAFRNTLEAFPRACLDAPVVTIPLPGGRMVLLSTPAGARHVLLTA  
ADDFERLPAGRRVLGP IAGRGLVLADGEAWRHQRRVLAPFTPRTLPLMLRFVARSAEESCRRL EAGLGAPVD  
LRGEMQQVALDIATTSMFSLETGPLGAEIRALISGYLGRLGRPTVADFLPPAWPTPSSPRRALFRRRWLKTV  
RAVLAARRAQGQGGQGGQGEDGMRRDAPRDLFDLLDAAHGDA PGGLLADEIGTLIVAGHETTASTLFWACTL  
LARAPAVQDALAAEARGLDLTEAGAADTLPHLR LARAVAQEALRLYPPVYVIARRAARTSTVEGVTVPAGSIV  
MVPTWILHRNPRWWDRPAAFDPGRFDRPEPDRFLYLPFGAGPRICIGAQLALAEATLV LARLARDFRLALDG  
NRVLPVATTTVRPDHVPFRFLARRAG

>CYP201C1 (GDI2592) *Gluconacetobacter diazotrophicus* Pal 5 (Brazil)

MLESSPLIPPMPPMLADRAGGLGVLAALRRNGYSAFPRRCFDQSVVSLRALGRPLVLAAGPDSVQNILVTQAG  
GYRRLRVGQVRVLSPIVGRGLLVSEGETWRRQRRAMAPAFTPRGVPVLAGHIAACADRACRALEPDRPVDLFST  
MRRALDVAAVSMFSLDIGSFDRPLRDSVTRFMTGIGTPRPGDFLLPPGMPTLLGWRRRRFRRRWVALIGQII  
AARQALGPTDAPRDLFDLMQAAFGAEGGGTTSELIDEVATMIVAGHETTASVLFWACLLLAQSPRWQDEVARE  
VRDMDLSPAGAATTLPALHVTTAVVRETLRLYPPAFMSGRESVDEADLCGHTVPKGAMVLLPFWMLHRNPALW  
DNPGCFDPARFLDRPDPRFAFLPFGAGPHVCIGAQLAMTEAVLVLARVVQDVSLALVDHAPVLPVGVLSTRP  
SYAPAFRLTRRA

>CYP201C1 (Gdia\_0823) *Gluconacetobacter diazotrophicus* PA1 5 (JGI)

MLESSPLIPPMPPMLADRAGGLGVLAALRRNGYSAFPRRCFDQPVVSLRALGRPLVLAAGPDSVQNILVTQAG  
GYRRLRVGQVRVLSPIVGRGLLVSEGETWRRQRRAMAPAFTPRGVPVLAGHIAACADRACRALEPDRPVDLFST  
MRRALDVAAVSMFSLDIGSFDRPLRDSVTRFMTGIGTPRPGDFLLPPGMPTLLSWRRRRFRRRWVALIGQII  
AARQALGPTDAPRDLFDLMQAAFGAEGGGTTSELIDEVATMIVAGHETTASVLFWACLLLAQSPRWQDEVARE  
VRDMDLSPAGAATTLPALHVTTTVVRETLRLYPPAFMSGRESVDEADLCGHTVPKGAMVLLPFWMLHRNPALW  
DNPGCFDPARFLDRPDPRFAFLPFGAGPHVCIGAQLAMTEAVLVLARVVQDVSLALVDHAPVLPVGVLSTRP  
SYAPAFRLTRRA

>CYP201C2 (A0U92\_00625) *Acetobacter aceti*

MAVLFSPMPALPSDDITGLGVLFRLKRNGFGAFPERCFHEPVLSLRALGKPLVIAAGPEAIKAVLATEAASF  
QRLRMGRRVLSPIVGEGLVSEGDVWRRQRRAMAPAFTPRTVPTLARHIAACADTTLLRISIEKPVDVFALTQ  
TLALDIAAMTMFSMTSETFGVTLLRMVTSFMSGIGQPRPADFLLPPSVPTLTDWRRKHFRRRWVTLEIAIIAE  
RPQRGTEEARDLFDLLMQAAGGEGGLAGQAVVDEVATMIVAGHETTATALFWAVWLLANTPEWQDAIAEEVR  
HIDLSPDHAAAGALSHLPVTTTSVREALRLFPPAFMTGREAVSDGDLGQAI PRGAMILLPFWMLHRNPALWKN  
PAAFDPGRFLNGKEPDRFTFLPFGAGPHVCIGAQLAMTEAVLVLARLVQLYRFKAADEKPVLPVGVLSTRPSR  
SVLFRFSRWNCG

>CYP202A1 (SMc01812) *Sinorhizobium meliloti* 1021

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRTLNVRAFVSRQIEELRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANVSFGAGLH  
FCIGAPLARLELQISLPILFRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (SinmeB\_0879) *Sinorhizobium meliloti* BL225C

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRTLNVRAFVSRQIEELRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANVSFGAGLH  
FCIGAPLARLELQISLPILFRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (C770\_GR4Chr1265) *Sinorhizobium meliloti* GR4

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRTLNVRAFVSRQIEELRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANVSFGAGLH  
FCIGAPLARLELQISLPILFRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (SM2011\_c01812) *Sinorhizobium meliloti* 2011

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRLTLVNRAFVSRQIEELRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANSVFGAGLH  
FCIGAPLARLELQISLPILFRRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (DU99\_06500) *Sinorhizobium meliloti* RM017

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRLTLVNRAFVSRQIEELRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANSVFGAGLH  
FCIGAPLARLELQISLPILFRRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (SM11\_chr2345) *Sinorhizobium meliloti* SM11

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRLTLVNRAFVSRQIEQLRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFADYLGKIIAEK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLLNAGHEATVHQIGNAVRTILQSGLSPAELFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANSVFGAGLH  
FCIGAPLARLELQISLPILFRRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (Sinme\_1049) *Sinorhizobium meliloti* AK83

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRLTLVNRAFVSRQIEQLRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFAGYLGKIIAGK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLLNAGHEATVHQIGNAVRTILQSGLSPAGLFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANSVFGAGLH  
FCIGAPLARLELQISLPILFRRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A1 (BN406\_00987) *Sinorhizobium meliloti* Rm41

MSIAPGITIDGPARRVSLDVRNPRFFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYEQVNSLLRDRRFGRQIL  
HVATREELGMPEPKPHLKDFDALEAHSLLELEPPAHTRLRLTLVNRAFVSRQIEQLRPEIEALSHAVIDGFEKD  
GETELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETEFDANNASAEFAGYLGKITAGK  
RTNPADDLLTHMITSEKDGERLSDAELISTTVLLLLNAGHEATVHQIGNAVRTILQSGLSPAGLFSDEKATERT  
VEECLRFAAPLHIFQRYALMDIELENGIALRKGDKIGLMLGAANVDPRKFSSPDTRPDRNEGANSVFGAGLH  
FCIGAPLARLELQISLPILFRRRLPGMRLKNEPPVKDAFHFHGLERLDLVW

>CYP202A3 (Atu1256) *Agrobacterium fabrum*

MTATFPFLKIDPATRRVSLNARDPAFYNDPNPVYAALHAQCPTFYWEEQRQWFFTCYDHVSTLLRDRRFGRQI  
LHVASREEIGLPEPLEHVKHFDLAEQHSLSLELEPPHTRLRLTLINRAFVSRHVDMKPEIEELANRLIEAFEA  
NGETELLSSYADII PVTMIARMIGIPEEMGPQLLKWSHAYVGYMFKRTPEDELLADKAAQEFSDYVRRVIAE  
RRAEPKDDLLSHMIHTEHKGQYLTDELVSTTIVLLNAGHEATVHQIGNSVRIILESGLDPKTLFHDETATER  
TVEETLRICAPVHIFQRWVLEPVEIDGVQFKRGDKVSLILAAANLDPAKFSDPLAFQPDRNEGANSVFGAGIH  
FCIGAPLARLELNLALPLLFKRLPGLKIAEPPKVKDVYHFHGLERLDLAW

>CYP202A6 (Ach5\_11600) *Agrobacterium tumefaciens* Ach5

MDMTATFPFLKIDPATRRVSLDARNPAFYNDPNPVYAALHAQCPTFYWEEQRQWFFTEYDHVSALLRDRRFGR  
QILHVASREEIGLAEPLHVKHFDAAEQHSLSLELEPPHTRLRLTLINRAFVSRHVDMKPEIEELANRLIDAF  
EGNGKTELLSSYADII PVTMIARMIGIPEEMGPQLLKWSHAYVGYMFKRTPEDELLADRAAHEFSYVRSVI  
AERRAEPKDDLLSHMIHTEHKGQYLTDELISTTIVLLNAGHEATVHQIGNSVRIILESGLAPDTLFDHDETAT

ERTVEETLRICAPVHIFQRWVLEPVEIDGVEFKRGDKVSLILAAANLDPAKFSDPLAFRPNRNEGANVSFGAG  
IHFCIGAPLARLELNLALPLLFRRLPGLKIAEPPRVKDVYHFHGLERLDLSW

>CYP202A6 (AGROH133\_05597) *Agrobacterium* sp. H13-3

MDMTATFPFLKIDPATRRVSLDARNPAFYNDPNPVYAALHAQCPTFYWEEQRQWFFTEYDHVSALLRDRRFGR  
QILHVASREEIGLAEPLEHVKHFDAAEQHSLSLELEPPEHTRLRLTLINRAFVSRHVDKMKPEIEELANRLIDAF  
EGNGKTELLSSYADIIPVTMIARMIGIPEEMGPQLLKWSHAYVGMVMFKRTPEDELLADRAAHEFSYVRSVI  
AERRAEPKDDLLSHMIHTEHKGQYLTDDDELISTTIVLLNAGHEATVHQIGNSVRIILESGIAPDTLFDHDETAT  
ERTVEETLRICAPVHIFQRWVLEPVEIDGVEFKRGDKVSLILAAANLDPAKFSDPLAFRPNRNEGANVSFGAG  
IHFCIGAPLARLELNLALPLLFRRLPGLKIAEPPKVKDVYHFHGLERLDLSW

>CYP202A6 (B0909\_07125) *Agrobacterium rhizogenes*

MTATFPFLKIDPATRRVSLNARDPAFYNDPNPVYAALHAQCPTFYWEEQRQWFFTGYPDHVSALLRDRRFGRQI  
LHVASREEIGLAEPLEHVKHFDAAEQHSLSLELEPPEHTRLRLTLINRAFVSRHVDKMKPEIEELANRLIDAFEA  
NSETELLSSYADIIPVTMIARMIGIPEEMGPQLLKWSHAYVGMVMFKRTAGDELLADTAAREFSYVRSVIAE  
RRAEPQDDLLSHMIHTEHKGQYLTDDDELVSTTIVLLNAGHEATVHQIGNSVRIILESGISPDTLFSDETTTER  
TVEETLRICAPVHIFQRWVLEPVEIDGVTFKRGDKVSLILAAANLDPAKFSDPLAFRPNRNEGVNVSFGAGIH  
FCIGAPLARLELNLALPLLFRRLPGLRIAQPPKVKDVYHFHGLERLDLAW

>CYP202A7 (BN877\_I1238) *Rhizobium* sp. IRBG74

MTATFPFLKIDSATRHVSLDARDPAFYNDPNPVYAALHAQCPTFYWEEQRQWFFTSYDHVSLLRDRRFGRQI  
LHVASREEIGLPEPLEHVKHFDLAEQHSLSLELEPPEHTRLRLTLINRAFVSRHVDKMKPEIEELANRLIDAFEE  
KGETELLSSYADIIPVTMIARMIGIPEEMGPQLLKWSHAYVGMVMFKRTPEDELLADMAAKEFSYVRSVIAE  
RRAKPEDDLLSHMIHTEHKGQYLTDDDELVSTTIVLLNAGHEATVHQIGNSVRIILESGISPQTLFSDEAATER  
TVEETLRICAPVHIFQRWVLEPVEIDGVQFKRGDKVSLILAAANLDPKFPDPLTFRPERNEGANVSFGAGIH  
FCIGAPLARLELNLALPLLFRRLPRLKIAEPPKVKDVYHFHGLERLDLSW

>CYP202A12 (Smed\_0869) *Sinorhizobium medicae*

MSTAPGITIDGPVRRVSLDVRNPEFFRNPLPAYAALHAHCPAFFWEEPQQWFFAGYAQVNSLLRDRRFGRQIL  
HVATREELGMPEPQPHLKDFDALEAHSLSLELEPPHTRLRLTLVNRAFVSRQIEQLRPDIEALSHRVIDGFEKN  
GAVELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSLETELDANQASAEFADYLKGIIDEK  
RVKPADDLLTHMITAEKDGGERLSDAELISTTVLLLNAGHEATVHQIGNAVRTILQSGLSPADLFSNEEATERT  
VEECLRFAAPLHIFQRYALMDMELEDGIVLKKGEKIGLMLGAANVDPKFSDPDTFRPNRNEGANVSFGAGLH  
FCIGAPLARLELQISLPILFQRLPGMRLKNEPPVKDSFHFHGLERLDLVW

>CYP202A13 (NGR\_c10310) *Sinorhizobium fredii* NGR234

MSAVPGITIDGPARRVCLDVRNPDFFRNPLPAYAALHAQCFAFFWEEPQQWFFAGYDQVNALLRDRRFGRQIL  
HVATREELGLPEPKPHLGDFDALEAHSLSLELEPPAHTRLRLTLVNRAFVSRQIEQLRPDIEALSHAIIDSFEAD  
GEVELLKTYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSFETELLEANQASAEFAGYLNDIIAEK  
RAKPADDLLTHMISSEKDGGERLSEAELISTTVLLLNAGHEATVHQIGNAVSTILQSGLFPAALFASSEEATART  
VEECLRFAAPLHIFQRYALS DIELEDGITLRKGDIGLMLGAANVDPKFTAPDMFMPDRNEGANVSFGAGLH  
FCIGAPLARLELNLSPILFRRLPGLRLKHEPPVKDSFHFHGLERLDLVW

>CYP202A13 (SFHH103\_00970) *Sinorhizobium fredii* HH103

MSAVPGITIDGPARRVCLDVRNPDFFRNPLPAYAALHAQCFAFFWEEPQQWFFAGYEQVNALLRDRRFGRQIL  
HVATREELGLPEPKPHLKDFDALEAHSLSLELEPPAHTRLRLTLVNRAFVSRQIEQLRPDIEALSHAIIDSFEAD  
GAVELLKTYAEAIPTVTIIARMLGIPVEAPHLLDWSHRMVKMYVFNPSFETELDANQASAEFAAYLKEIIAEK  
RAKPADDLLTHMIGSEKDGGERLSEAELISTTVLLLNAGHEATVHQIGNAVHAILQSGLSPATLFAGEEATART  
VEECLRFAAPLHIFQRYALSDIVLEDGIALRKGDRIGLMLGAANVDPKFMAPDTFMPDRNEGANMSFGAGLH  
FCIGAPLARLELNLSPILFRRLPGLRLKHEPPVKDSFHFHGLERLDLVW

>CYP202A14 (USDA257\_c32830) *Sinorhizobium fredii* USDA 257

MSAVPAFTIDGPARRASLDVRNPDPFRNPLPAYAALHAQCPAFFWEEPQQWFFAGYDQVNALLRDRRFGRQIL  
HVATREELGLPEPKPHLKDFDALEAHSLELEPPAHTRLRLTLVNRAFVSRQIEQLRPDIETLSHAIIDSFETD  
GEVELLKSYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPTFETELDANQASAEFAEYLKNIITDK  
RTKPADDLLTHMINSEKDGERLSEAELISTTVLLLNAGHEATVHQIGNAVRTILQSGLSPTTLFAGEEATERT  
VEECLRFAAPLHIFQRYALSDIELEDGIALRKGDKIGLMLGAANVDPRKFTAPGKFKPDRNEGANVSFGAGLH  
FCIGAPLARLELNLSLPILFQRLPCLRLKHEPQVKDSFHFHGLERLDLVW

>CYP202A15 (SAMCFNEI73\_Ch1362) *Sinorhizobium americanum*

MSPAPGITIDGPARRVSLDVRNPDPFRNPLPAYGALHAQCPAFFWEEPQQWYFAGYDQVNALLRDRRFGRQIL  
HVATREDLGLSEPKPHLKDFDALEEYSLELEPPAHTRLRLTLVNRAFVSRQIEQLRPDIETLSHAIIDGFKKD  
GEVELLKAYAETIPVTIIARMLGIPVEAAPRLLDWSHRMVKMYVFNPSVETELDANQASTEFAAYLKDIIAEK  
RVSPADDLLTHMIRSEKDGERLSEAELISTTVLLLNAGHEATVHQIGNAVSTILKSGFSPDQLFASEEATART  
VEECLRFAAPLHIFQRYALSDIELEDGISLRKGDKIGLMLGAANVDPRKFTAPDTRPDRDEGANVSFGAGLH  
FCIGAPLARLELNLSLPILFRRLSGLRLKDEPPVKDSFHFHGLERLDLVW

>CYP202A16 (OV14\_2294) *Ensifer adhaerens* OV14

MPPKPAIIIDSARKSVSIDVHDPDFYRAPLSAYAEIHAHCPAFYWSEREQWYFAGYDQVNALLRDRRFGRQIL  
HVATREELGMPAPKPHLKDFDALEEHSLLELEPPHTRLRLTLVNRAFVSRQIEQLRPDIERSHTIIDGFEQD  
GEVELLKTYAETIPVTIIARMLGIPVDAAPNLLDWSHRMVVMYVFNRSHETEFDANQASADFADYLKTIIAEK  
RRKPADDLLTHMITSEKDGERLSEAELVSTAALLLNAGHEATVHQIGNAVRTILQSDHAPGDLFATEATTDLA  
IEECLRFAAPLHIFQRYALSDIELDEGIALRKGDKIGLLLGANVDPRKFSDPDRFKPARDEGVNVSFGAGLH  
FCIGAPLARLELKLSPILFQRLPGMRLKHPPEVKDSFHFHGLERLDLVW

>CYP202A17 (KKY\_1509) *Pelagibacterium halotolerans*

MAAIVQVRPVTDPDGLSASAQPSDPAFFQNPYPFYAARQATHPAFFWSEYGHWCFAADFPTVSALLRDRRFGR  
DILHVATREEIGLPQPKPHTADFDLTKESLLNLEPPAHSRLRLTLVNRAFVSRQVELLRPRIADLVHSIIDDF  
EDQGGVELIRAFAPAPIPAIVIAEMIGLPAEMAPQLLDWSNRMVVMYMFVSHETERDANRAAADFTAYLRQAI  
AERRKLPRDILLSHMIAAEQGGERLSEDEMLSTAILLLNAGHEATVHTTGNAVKAILESgyDPRMLFADDTAT  
AATVEEALRFDAPLHMFTRYALEDLDYNGIALRKGDVIGLMLGAANRDPNRFTNPNTFDPLRTDGANVSFGAG  
IHFICIGAPLARLEMQIALKILFERLPKLRLTAPPRYADIYHFHGLERLDVSW

>CYP202A18 (XM25\_07155) *Devosia* sp. H5989

MISSTDAIAPARRASANPRDPVFYQNPYAFYDGIHATSPTFFWDNYGHWCFAFGFKEVNQLLRDKRFGREILHV  
ATREELGWPERKPHVADFDLAEKYSLLNLEPPAHTRLRLTLVNRAFVSRQVEQLRPRVAALANELIDGFEKDQ  
VELIHAYAAPIPAIVISEMIGVPTMAMQVVAWSNRMVMTMYMFGVTEDTERDANQASADFIAYIRTLIAERRV  
RPTEDLLTHMITAEQDGQKLTDDIVSTAILLNAGHEATVHTTGNSVKTIIESGIDRKAIASFASDEQTAATVE  
ECLRFDAPLHMFTRFALS DIELDNGVSLRKGDQIGLMLGAANRDPVRFANANTFDFPRTDQNVVSFGAGIHF  
IGAPLARIELQISLKTFLDRPLPGLRLAKEPSYNNVYHFHGLEELQVAW

>CYP202A19 (Mesop\_4874) *Mesorhizobium opportunistum*

MTTLPYLAFDPATRHLRLDPHEPAFFLNPYEAYARLHGLSNAFFWEEFGWCFCGGFDDVNRLLRDRRFGRQNP  
AGIPDSRGIGQDRSHLKAFDGIEANSMLLEPPVHTRLRLTLVNRAFVSRQVERLRPRVEALANELIDRFDPAG  
PVDLLPAFAAPLPITIIAEMLGVPVEMGPQLLDWSHQMVAMYIHGRSRETEETANRAAGEFADFLRGYITERR  
KNPGDDLSSLISAQEDGQRLSEDEMVSAILLLNAGHEATVHTTGNAVRSILAQQGDPRRFFTSPEATAATV  
EECLRFDAPLHMFTRYAYQIEVAPGIVVQPGQTI GLLLGMANHDPRAFADPQDFRPDRTDQKNVSFGAGIHF  
CIGAPLARLELQVSLKTLFERQPKHLAESPFRDITYHFHGLETLAVGF

>CYP202A20 (Mesau\_04483) *Mesorhizobium australicum*

MTKSTLSYLAFDPATRQLRLDPREPAFFLNPYEAYGFLHEASNAFFWEEFGWCFGGFGDVNRLLRDRRFGRQ  
NPAGIPDSRGVGQDRTHLKAFDGIEANSMLLEPPVHTRLRLTLVNRAFVSRQVERLRPRVEALANELIDRFEP

GKAVDLLPAFASPLPITIIAEMLGVPVEMGPRLLDWSHQMVAMYIHGRTRETEETANRAAGEFSDFLRGYVTE  
RRKKPGDDLLSLLISAQEDGQKLSDELVSSAILLLNAGHEATVHQTNVHVSILAQGGDPRRFFTSPEATAA  
TVEECLRFDAPLHMFMRYAYEKIQIAPGIVVRPGQTIGLLLGMANHDPHAFAPQTFRPERTDQKNVSFGAGI  
HFCIGAPLARLELQVSLRTLFRHPQLHLAEQPRFRDTHYHFGHLERLAVVFS

>CYP202A21 (Mesci\_4424) *Mesorhizobium cicero*

MSKLTTPPALAFDPATRHRLRDPHEPAFFQNPYDAYAFLHGLSNAFFWEEFGFWCFGGFDDVNRLLRDRRFGRQ  
NPAGIPDSRGIGQDRSHLRAFDGVEANSMLELEPPVHTRLRLTLVNRAFVSRQVERLRPRVEALANELIDRFEP  
GKTVDLLPAFAAPLPITIIAEMLGVPVDMGPQLLDWSHQMVAMYMHGRTRAIEETANRAAGEFADFLRFHVTE  
RRKNPGDDLLSLLISAQEDGKLSDEEMVSSAILLLNAGHEATVHQTNVHVSILMQGGDVSRFFGSPEATAA  
TVEECLRFDAPLHMFTRYAYQEIEVAPGIVVQPGQTIGLLLGMANHDPRAFAEPQAFRPDRPDQKNVSFGAGI  
HFCIGAPLARLELQVSLKTLFRHPKLHLAERPSFRDTHYHFGHLERLAVGF

>CYP202A22 (IMCC20628\_02331) *Hoeflea* sp. IMCC20628

MTSHQLFISQDPREPDEFVQNPYRFYADMHRTSPVFYWEEYSMWCVAGYDLANRLLRDRRLGRENRWGAPLNPV  
EGRQHLADFDRIESGSLLEREPPAHSRLRTLNVNRAFVSRVERLRPRIHALAQELIDALPAGQAFDLLPYFAT  
PIPLTVICELLGVPVARANDLLGWSHAMCEMYVPQRSRETEKRANRASADFGAFLTAHIEHRHTNADDLLSA  
LIAVRDTGEKLSDELISTCVLLLNAGHEATVHQTNVHVSILMQGGDPRRFFETPAASAATVEEALRFDAPL  
HMFTRYAYEIEIDLGPVTLKPGEQVALLLGAANRDPSAFEAPDQFRPGRADQKNVSFGAGLHFCIGAPLARLEL  
QESLAVLFSRLPDLKLTQPPRYRDSYHFGHLESLLARS

>CYP202A23 (Rleg\_1336) *Rhizobium leguminosarum* bv. *trifolii* WSM1325

MMIPSFLSIDRANRHVSLDSRNPAFYGDPNAVYAALHAHCPTFYWSEQKWFFFTGYDHVNGLLRDRRFGRQIL  
HIASREELGLAEPHPHLASFDLSERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFAEK  
REVELLSAFADIIIPVTMIARMIGIPEEMGPQLLTWSHAYVRMYMFGRTRGQEEEAERASKEFSYVKTIVIAER  
RAEPRDILLTHMIHTEHKQYLTTEEELVSTTIVLLNAGHEATVHQIGNSVRTILDSSGDPALFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGISFKRGDKVSLILAAANLDPAKFTDPLTFKPDREANANLSFGAGIHF  
CIGAPLARLELNVLPIILFERLAGLRLAKTPVVKDVYHFGHGLDRDLQW

>CYP202A23 (Rleg2\_1245) *Rhizobium leguminosarum* bv. *trifolii* WSM2304

MMIPPFLSIDRSSRHVSLDARNPAFYGDPNAVYAALHAHCPTFYWSEQKWFFFTGYDHVNGLLRDRRFGRQIL  
HIASREELGLAEPMPHLASFDLSERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANQLIDGFADK  
GEVELLSAFADIIIPVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEDEAERAAKEFSYVRTIVIAER  
RAEPRDILLTHMIHTEHKQYLTTEEELISTTIVLLNAGHEATVHQIGNSVRTILESGSDPADLFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFQRGDKVSLILAAANLDPAKFTDPLAFRDRNEANANLSFGAGIHF  
CIGAPLARLELNVLPIILFERLAGLKLAKTPVVKDVYHFGHGLDRDLQW

>CYP202A23 (RL1686) *Rhizobium leguminosarum* bv. *viciae* 3841

MPHIFPRPGKSAPRGMMIPSFLSIDRANRHVSLDSRNPAFYGDPNAVYAALHAHCPTFYWSEQKWFFFTGYD  
HVNGLLRDRRFGRQILHIASREELGLAEPMPHLASFDLSERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKP  
ELAELANRLIDGFAEKREVELLSAFADIIIPVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEEEAER  
AAKEFSYVKTIVITERRATPRDILLTHMIHTEHKQYLTTEEELVSTTIVLLNAGHEATVHQIGNSVRTILDSG  
CDPAELFRDEATTERTVEETLRICAPVHIFQRWALEPAEIDGVSFQRGDKVSLILAAANLDPAKFTDPLTFKP  
DRNEANANLSFGAGIHF CIGAPLARLELNVLPIILFERLAGLKMAKTPVVKDVYHFGHGLDRDLQW

>CYP202A23 (RLEG3\_17090) *Rhizobium leguminosarum* bv. *trifolii* WSM1689

MMIPSFLSIDRANRHVSLDSRNPAFYGNPNAVYAALHAHCPTFYWSEQKWFFFTGYDHVNGLLRDRRFGRQIL  
HIASREELGLAEPMPHLASFDLSERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFAEK  
HEVELLSAFADIIIPVTMIARMIGIPEEMGPQLLNWSHAYVRMYMFGRTREQEEEAERAAKEFSYVKTIVITER  
RAEPRDILLTHMIHTEHKQYLTTEEELVSTTIVLLNAGHEATVHQIGNSVRTILDSGSDPAELFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFQRGDKVSLILAAANLDPAKFTDPLTFKPYRNEANANLSFGAGIHF  
CIGAPLARLELNVLPIILFERLVGLRLAKKPMVQDVYHFGHGLDRDLQW

>CYP202A23 (RHECIAT\_CH0001657) *Rhizobium etli* CIAT 652

MTIPPFLSIDPALRHVSLDARNPAFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHSVALLRDRRFGRQIL  
HIASREELGLAEPMPHLESFDSLERYSLLELEPPEHTRLRLTLVNRAFI SRHVEKMKPELAELANRLIDGFADK  
REVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEDEAERAAKEFSDYVRTVIAER  
RAEPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTYP AELFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFERGDKVSLILAAANLDPAKFTDPLAFRPDRNEATNLSFGAGIHF  
CIGAPLARLELNVLPI LFERLAGRLAKTPDVKDVYHFHGLERLDLQW

>CYP202A23 (RHE\_CH01585) *Rhizobium etli* CFN 42

MMIPPFLSIDRASRVSLDARNPDFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHSVALLRDRRFGRQIL  
HIARREELGLAEPMPHLESFDSLERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFADK  
REVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEDEAERAAKEFSDYVRTVIAER  
RNAPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTGSDPAVLF RDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANVDPAKFTDPLTFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNVLPI LFERLAGLSLAKTPVVKDVYHFHGLDRDLW

>CYP202A23 (REMIM1\_CH01603) *Rhizobium etli*

MTIPPFLSIDRASRVSLDARNPDFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHSVALLRDRRFGRQIL  
HIARREELGLAEPMPHLESFDSLERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFADK  
REVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEDEAERAAKEFSDYVRTVIAER  
RNAPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTGSDPAVLF RDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANVDPAKFTDPLTFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNVLPI LFERLAGLSLAKTPVVKDVYHFHGLDRDLW

>CYP202A23 (RLEG12\_17290) *Rhizobium leguminosarum* bv. trifolii CB782

MMIPPFLSIDPARRHVSLDARNPGFYGNPNAVYAVLHAHCPTFYWSEQKQYFFTGYDHSVNGLLRDRRFGRQIL  
HIASREELGLAEPMPHLASFDSLERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFADK  
GEVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREQEDEAERAAKEYSDYVRTVIAER  
RAAPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTGSDPAELFRDEATTART  
VEETLRICAPVHIFQRWALEPAEIDGVTFRGDKVSLILAAANLDPAKFTDPLAFRPDRNEAANLSFGAGIHF  
CIGAPLARLELNVLPI LFERLAGLRLARTPVVKDVYHFHGLDRDLQW

>CYP202A23 (IE4803\_CH01583) *Rhizobium etli* bv. phaseoli IE4803

MTIPPFLSIDPASRHISLDARNPAFYGNPNAVYAALHAHCPTFYWAEQKQWFFTGYDHSVNGLLRDRRFGRQIL  
HIASREELGLAEPMPHLASFDSLERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFADK  
REVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTAQEEEEAERAAKEFSDYVRTVIAER  
RAEPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTGLDPATLFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANLDPAKFTDPLAFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNIVLPV LFERLAGRLAKSPVVKDVYHFHGLERLNLVW

>CYP202A23 (IE4771\_CH01635) *Rhizobium etli* bv. mimosae IE4771

MTIPPFLSIDPASRVSLDARNPAFYGNPNAVYAALHAHCPTFYWAEQKQWFFTGYDHSVNGLLRDRRFGRQIL  
HIASREELGLAEPMPHLASFDSLERYSLLELEPPEHTRLRLTLVNRAFVSRHVEKMKPELAELANRLIDGFADK  
REVELLSAFADII PVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTAQEEEEAERAAKEFSDYVRTVIAER  
RAEPRDDLTHMIHTEHKGYLTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSTGLDPATLFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANLDPARFTDPLAFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNIVLPV LFERLAGRLAKSPVVKDVYHFHGLERLNLVW

>CYP202A23 (AMC79\_CH01615) *Rhizobium phaseoli*



MTIPPFSLSIDPALRHVSLDARDPAFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHNALLRDRRFGRQIL  
HIASREELGLAEPMPHLESFDSLERYSLLELEPPEHTRLRLTLVNRAAFVSRHVEKMKPELAELANRLIDGFADK  
REVELLTAFADIIIPVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTREREDEAERAAREFSYVRTVIAER  
RAEPRDDLTHMIHTEHKQYLTTEEELISTTIVLLNAGHEATVHQIGNSVHTILGSGADPVELFRDEATTERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANLDPKFTDPLAFRPDRNEATNLSFGAGIHF  
CIGAPLARLELNVLPLILFERLAGLRLAKTPDVKD VYHFGHLERLDLQW

>CYP202A23 (AMJ98\_CH01614) *Rhizobium* sp. N1341

MTIPPFSSIDPALRHVSLDARNPAFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHNGLLRDRRFGRQIL  
HIASREELGLAEPMAHLESFDSLERYSLLELEPPEHTRLRLTLVNRAAFVSRHVEKMKPELTELANRLIDGFADK  
GEVELLSAFADIIIPVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTRRQEEEEAERAAREFSYVRTVIAER  
RAEPRDDLTHMIHTEHKQYLTTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSCDPAELFRDEAATERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANLDPKFTDPLAFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNVLPLILFERLAGLRLAKTPVVKD VYHFGHLDRDLRW

>CYP202A23 (AMK02\_CH01623) *Rhizobium* sp. N731

MTIPPFSSIDPALRHVSLDARNPAFYGNPNAVYAALHAHCPTFYWTEQKQWFFTGYDHNGLLRDRRFGRQIL  
HIASREELGLAEPMAHIESFDSLERYSLLELEPPEHTRLRLTLVNRAAFVSRHVEKMKPELTELANRLIDGFADK  
GEVELLSAFADIIIPVTMIARMIGIPEEMGPQLLAWSHAYVRMYMFGRTRRQEEEEAERAAREFSYVRTVIAER  
RAEPRDDLTHMIHTEHKQYLTTEEELISTTIVLLNAGHEATVHQIGNSVRTILDSCDPAELFRDEAAAERT  
VEETLRICAPVHIFQRWALEPAEIDGVSFKRGDKVSLILAAANLDPKFTDPLAFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNVLPLILFERLAGLRLAKTPVVKD VYHFGHLDRDLRW

>CYP202A24 (RGR602\_CH01450) *Rhizobium gallicum*

MMIAPFFSIDPATRRVSLDSSDPAFYGNPNEVYKALHCHCPTFYWEQKQWFFTGYDHNGLLRDRRFGRQIL  
HIATREELGLAEPQHLANFDLAERYSLLELEPPEHTRLRLTLVNRAAFVSRHVEKMKPELAELANKLIDGFKDK  
GEVELLSAFADIIIPVTMIARMIGIREEMGPQLLAWSHAYIRMYLFGRTREDEDGAERAASDFS DYVKT VIAER  
RANPRDDLTHMIHTEHKQYLTDAELVSTTIVLLNAGHEATVHQIGNSVRVILES GCDPAELFKDEAAECT  
VEETLRICAPVHIFQRWALEPVEIDGISFKRGDKVSLILAAANLDPARFTDPLSFRPDRNEAPNLSFGAGIHF  
CIGAPLARLELNVLPLILFERLPGLKLAKTPSVKD VYHFGHLDALNLAW

>CYP202A25 (Arad\_1827) *Agrobacterium radiobacter*

MTISSVFSIDPVSRRSLNGRDPAFYSNPNAVYAALHAECPTFYWEEQRRWYFIGYDHNGLLRDRRFGRQIL  
HIANREELGMPAPLPHLKNFDLSEQHSLLEIEPPEHTRLRLTLVNRAAFVSRHVEKMKPELAELANRLIDKFEKN  
GEVELLSAFADIIIPVTMIARMIGIPEEMGPQLLKWSHAYVRMYMFGRTREREDEDAADQAAKEFSYVKS VIRER  
RANPRDDLTHMITTEHKSQYLTEDELVSTTIVLLNAGHEATVHQIGNSVRVILES GYAPSALFKDEATTERT  
VEETLRICAPVHIFDRWCLEPTEIDGVSFQRGDKVAMILAAANLDPKKFSDPLTFKPD RNEAPNLSFGAGIHF  
CIGAPLARLELNVLPLILFERLPGLKLQKTPEVKD VYHFGHLDKLELSW

>CYP202A26 (Avi\_1694) *Agrobacterium vitis*

MPHSSFFSVDPHQRSVSLDTGHPGFFEAPNAVYAMLHAQAPTFFWREQQQWFFTGYDLVNGLLRDKRFGRQIL  
QIASREELGWPEPAAHTRAFDAEAWSLLELEPPEHTRLRLTLVNRAAFVSRHVEKMTPDILALANSLIDDFEAQ  
GKTELLSSFAEIIIPVTMIARMIGIPDEMGPQLLAWSHDYVGMVFNRTAHEDAAERAAREFSYDLRGVIAER  
RSEPRDDLTHMIHTEHKQYLTDEELISTTVVLLNAGHEATVHQIGNAVRIILESGLDPTGLFGDTAATERT  
VEECLRICAPVHIFQRYCLEPCEIDGVSFSQGDKIGLILAAANLDPKFPDPLAFKPQRNDGANLSFGAGIHF  
CIGAPLARLELSLVPLPLFQRLPGLALAGTPKVKDLYHFGLEKLDLVW

>CYP202A27 (BSY240\_1120) *Agrobacterium* sp. RAC06

MTQTSFSLSIDPATRRVSLDARDPAFYSDPNRTYAALHDSCTFYWEEQKQWFFTGYDHNALLRDRRFGRQIL  
HIATREELGMPEPAEHTRHFDKAEHSLEIEPPEHTRLRLTLVNRAAFVSRHVEKMTPEIELLANRLIDDFEKD  
GKTELLSTFADIIIPVTMIARMIGIPEDMGPQLLKWSHDYVGMVFKRTRADEEAADRS AKEFADYVRTVIAER  
RANPSDDLTHMIHTEHKQFLTDEELISTTIVLLNAGHEATVHQIGNSVRVILDSGIDPSTLFSDEKT TERT

VEETLRICAPVHIFQRCLEPCEIDGVSFQRGDKVSLILAAANLDPQKFPEPLAFKPSREEGANLSFGAGIHF  
CIGAPLARLELNIVLPLLFKRLPGLKIAETPTVKDVYHFHGLERLDLTW

>CYP202A28 (BSY16\_1583) *Sinorhizobium* sp. RAC02

MTTDFPFLSIDPASRRVSLDGRNPDPFYRDPNPVYAALHAHCPTFWWEEQKMWYFTGYDHNGLLRDRRFGRQ  
ILHVATREELGMPEPQAHLAHFDAAEAWSLLELEPPEHTRRLTLVNRAFVSRIIDRLTPEITDLCHQAIIDRFE  
KDGKVELLSAFADILPVTMIARMIGIPDEMGPQLLKWSHAYVRMYMFGRTPEDELNADKAAQEFSDYVRSVIA  
ERRAEPRDDLLSHMVHTEHRGQLLTEDELISTTIVLLNAGHEATVHQIGNAVRTILENNADPALLFADEKSTE  
RTVEECLRISAPVHIFDRFALEDVELDGIQFRRGDKVAMILAAANLDPKKFSDPLVFKPARNEG VNLSFGAGI  
HFCIGAPLARLELNIALPILFQRLPRLKIAKKPVVKDVYHFHGLETLKLEW

>CYP202A29 (RG540\_CH11740) *Neorhizobium galegae* bv. *orientalis* HAMBI

MTILPDFLHINPQTRHVS LDGRNPAFYSDPNRVYALLHEHCPTFYWEEQRQWFFTGYDHNGLLRDRRFGRQI  
LHIASREELGLPEPLAHLENFNLAERYSLLELEPPEHTRRLTLVNRAFVSRIIEKLRPEIAKLAERLIDGFEG  
QGETELLSSFADIIPVTMIARMIGIPDEMGPQLLKWSHAYVGMVMFKRTRQDEYAADRAAGEFS DYVKGLIAE  
RRREPREDLLTHMIHTEHKGQYLTDELSTTIVLLNAGHEATVHQIGNSVRVILESGLPADLFRDEAATER  
TVEETLRICAPVHIFQRWALEDVEIDGLSFKRGDKVSLILAAANLDPNKFSDPLAFKPD RQEAQNLSFGAGIH  
FCIGAPLARLELNTVLPILFRRRLPGMRITRTPVVKDVYHFHGLERLDLAWRQGS PAL

>CYP202A29 (RG1141\_CH11450) *Neorhizobium galegae* bv. *officinalis* bv.  
*officinalis* HAMBI 1141

MTALPDFLRIDPDTRRVSLDGRNPAFYSDPNRVYALLHEHCPTFYWEEQRQWFFTGYDHNGLLRDRRFGRQI  
LHIANREELGLPEPLPHLENFDLAERYSLLELEPPEHTRRLALVNRAFVSRIHIERLRPEIAELAEGLIDGFEG  
QGETELLSSAFADIIPVTMIARMIGIPDAMGPQLLKWSHAYVGMVMFKRSADDEHAADRAAEFS DYVKGLISE  
RRREPREDLLTHMIHTEHKGQYLTDELSTTIVLLNAGHEATVHQIGNSVRVILESGLSPADLFRDEAATER  
TVEETLRICAPVHIFQRWALEDVEIDGLSFKRGDKVSLILAAANLDPNKFSDPLVFKSDRQEAANLSFGAGIH  
FCIGAPLARLELNTVLPILFRRRLPGMRITRTPVVKDVYHFHGLERLDLAW

>CYP202A30 (NT26\_1249) *Rhizobium* sp. NT-26

MTDIPSFLPIDPTTRRVSLDGRDPAFYGDPNRVYAALHQHCPTFYWEEQRQWFFTGYHHVNALLRDRRFGRQI  
LHIASREDLGLPEPQPHLANFDLVERHSLEIEPPEHTRRLTLVNRAFVSRIHIERLRPEIAVLAEQLIDGF EK  
DGKTELLSSFADIIPVTMIARMIGIPDEMGPQLLKWSHDYVGMVMFKRTREDELAADRSAREFADYVKTLIAE  
RRNAPRDDLLSHMIHTEHKGQYLSEDELSTTIVLLNAGHEATVHQIGNSVRVILESGLP PAEMFRDEVATER  
TVEETLRICAPVHIFRRWALEDVEVDGVVLKRGDKVSLILAAANLDPNKF AEPLVFNPERQEAPNLSFGAGIH  
FCIGAPLARLELKT VLPILFRRRLPGLRMAKTPRVVKDVYHFHGLERLDLAW

>CYP202B1 (RSP\_1946) *Rhodobacter sphaeroides* 2.4.1

MQTLSQSPHRRFLRNPYRFYREARAAGPFFHWHEELGLVCTTSYAAANAILRDRRF GREVP PGRASAVPDHLA  
PFAAVEAHSMLELEPPRHTRLRNLVLRFTSRRIGTMQPEVAALSESLVAAVPEGPF D LLPAFSQRLPITLIA  
RLIGIPESLAPELLRWSSAMVAMYQAGRTRKTEERAALAAADFSDFLRLHIEARRHAPADDLLTHLIAAEADG  
QQSTDEIVSTCILILNAGHEAAVHAIGNAAVLLRHRTPEALAPPHLLGTVEELLRFDPPLHLFRMAYER  
VEIMGRTIEEGCEVALLLGAANRDPGPWERPDRFLWNRPEKTHLAFGAGLHFC LGAPLARLELATALPILFGR  
LPNLQLVKPPSYGDSWHFRGLERLIVSA

>CYP202B1 (RSKD131\_0258) *Rhodobacter sphaeroides* KD131

MQTLSQSPHRRFLRNPYRFYREARAAGPFFHWHEELGLVCTTSYAAANAILRDRRF GREVP PGRASAVPDHLA  
PFAAVEAHSMLELEPPRHTRLRNLVLRFTSRRIGTMQPEIAALSESLVAAVPEGPF D LLPAFSQRLPITLIA  
RLIGIPESLAPELLRWSSAMVAMYQAGRTRKTEERAALAAADFSDFLRLHIEARRHAPADDLLTHLIAAEADG  
QQSTDEIVSTCILILNAGHEAAVHAIGNAAVLLRHRTPEALAPPHLLGTVEELLRFDPPLHLFRMAYER  
VEIMGRTIEEGCEVALLLGAANRDPGPWERPDRFLWNRPEKTHLAFGAGLHFC LGAPLARLELATALPILFGR  
LPNLQLVKPPSYGDSWHFRGLERLIVSA

>CYP202B1 (Rsph17029\_0597) *Rhodobacter sphaeroides* ATCC 17029

MQTLSQSPHRRFLRNPFYREARAAGPFFHWHEELGLVCTTSYAAANAILRDRRFGREVPPGRAAAVPDHLA  
PFAAVEAHSMLELEPPRHTRLRNLVLAFTSRRIGTMQPEVAALSESLVAAVPEGPFDDLPAFSQRLPITLIA  
RLIGIPESLAPELLRWSSAMVAMYQAGRTRKTEERAALAAVDFSDFLRLHIEARRHAPADDLLTHLIAAEADG  
QQSTDEIVSTCILILNAGHEAAVHAIGNAVAVLLRHRTPEALAPPHLLGTVEELLRFDPPLHLFRMAYER  
VEIMGRTIEEGCEVALLLGAANRDPGPWERPDRFLWNRPEKTHLAFGAGLHFCLGAPLARLELATALPILFGR  
LPNLQLVKPPSYGDSWHFRGLERLIVSA

>CYP202B10 (Rsph17025\_0342) *Rhodobacter sphaeroides* ATCC 17025

MARLRRQRGTLARPMKTLQSPHRRFLRDPYRFYRQARTAGPFFRWEELDVICTTSYAAANAILRDRRFGRE  
VPAERRAPVPAHLAPFAAVAESMLELEPPRHTRLRNLVLAFTTTRLGSMQPQIARLAHGLIDMPPGGPFDL  
LPAFSQRLPITLIARLIGIPETLAPELLRWSSAMVAMYQAGRNRQTEERAAEAAAAFSDFLRLHIADRRDRPA  
DDLTHLIAAEADGQQSTDEIVSTCILILNAGHEAAVHAIGNAVATLLQHRTPEALGPARIAATVEEMLRF  
DPPLHLFRRIAYAPVEIMGQTFAGEGEEVALLLGAANRDPGPWERPDRFLWNRPEKPHLAFGAGLHFCLGAALA  
RLELAMAVPILFTRLPLGLHLVKPPRWSDSWHFRGLERLIVAP

>CYP202B11 (LOKVESSMR4R\_01170) *Yoonia vestfoldensis*

MQQLTQSPVDPAFVQNPYPFYDRARQTGDDFFWWDYAMPCAVSHKAVHAVLRDRRMGRECPSELAPAIPDALR  
PFYEIEAHSMLELEPPRHTRLRALVLAFTSRTIAALAPQITQLCHDLIDRFDEPFDDLTAAYAQPVVVTIA  
RLLGVPEDRADLLRWSNAMVAMYQARRTPEIEAAAIAASTDFSDFMRGYIATRKTTPADDLISTLIAAEEQG  
EKLTTDELITTCILLNAGHEATVHTLGNGTKTLLEQNIRGITDACVEEIIRHDPPLMHMFTRWVYEDVQIGDQ  
HFKRGDQIACLLGAANRDPVYPDPARFDPARSQPNTSFGGGIHFCEVGAAPLARLELKIALDVLFTRCPDRLR  
TAAPGYGDTYHFHGLTRLMVAAR

>CYP202B12 (OSB\_17550) *Octadecabacter temperatus*

MQSLSQSPTDPTFVQNPYPFYDLARAGRDLFFWEDYDAVCAVSHAAVAACLKDKRLGREVPAEFARAIPEHLA  
PFYAVEAHSMLELNPPRHTRLRGLVLAFTSRRIAELEPEIETLCHQLIDAFPTSEFDLLDAYARTVPV IIA  
RLLGVPENRADLLAWSNAMVAMYVSGRTRAIEDHAIEATEAFVTFMRAHVDEKRAKAPADDLMSHLIAAEEGG  
EKLSTDELITTCILLNAGHEATVHTLGNTVKTLLEQIRTADEKIVEEALRFDPPLMHMFDRYVIEDCELFH  
AFKRGDTVKCLLGAANRDPAPYPDPNTFNPTRTGPVNVAFGGGIHFCEVGAAPLARLELRVALQVLFERCPNLAL  
ATPPQYGNTYHFHGLEALRVAT

>CYP202B13 (BVG79\_01175) *Ketogulonicigenium robustum*

MDRISQSPTDPAFVANPYAFYDKARAAGDMFYWTDYDLPCAVTHRAVSALLRDRRLGREAPPECAPTYPDFTR  
DFYALEAHSMLEVEPPRHTRLRGLVLAFTSRRIAAMAEIETLCHSLIDAFPPGPFDDLTHYAQHVPVTVIA  
RLLGVPDSTAPRLLDWSNRMVGMVQARATEAVQORDANAAAAEFRAFMDVYIAQRRVTPGNDDLTELIAAEEEDG  
EKLTTDELITTCILLNAGHEATVHTIGNGIKTLIEQGKPAIDETSVEEIIRFDPPLMHMFRLRWYEDVDLFGH  
TFRRGDRIACLLAAANHDPAAYDAPATFNPARKGPQNTSFGAGIHFCEVGAAPLARLELRVALRTLMARLPALSL  
AEAPRYSNVYHFHGLQRLMVTAR

>CYP202B14 (OA238\_c12900) *Octadecabacter arcticus*

MQTLTQSPTDPAFVQDPYPFYDSARSAGDWGTGDLFYWTDYGAVCAVSHAAVAACLKDKRMGREIPTFAPNI  
PAHIAPFYAVESHSMLELNPPRHTRLRGLVLAFTSRRIAELEPEITALCHKLIDQFPSGEFDLLDAYARTVP  
V I I IARLLGVPETRVQDLLAWSNAMVAMYVSGRTRDIEDKAVAATERFVAFRLRGFVDEKRQTPADDLLSHLIA  
AEEDGEKLTDELITTCILLNAGHEATVHTLGNTVKTLDRDIRAADAQIVEEALRFDPPLMHMFDRYVIEDC  
EVFGHAFKRGDTVKCLLGAANRDPVAYPDPNRFDP SRKGPVNVAFGGGIHFCEVGAAPLARLELRVALQVLFDR  
PTIRLTAPPQYGDYHFHGLDALHVRT

>CYP202B15 (MALG\_01977) *Marinovum algicola*

MAELSQSPTDPGFVQNPYPFYAEARARGAVHQWRDYGIIHCAFSHAAVNAALRDSRMGREAPDELKEPRPAHLR  
DFYAIDDNSMLELEAPRHTRLRKLVLHAFTARGIAGLAPEIEALCHHLIDAFPEGDFDLLPQYATQVPVIVIA

RLLGVPDDMADRLLAWSNDMVAMYQARRDRTIEDGANAAAREFSAFLADYIATRRRTSPSDDLITRLIAAEADG  
EKLSLDELIATCVLVLNAGHEATVHTLGNVVKAMLETGMRPEWTSDSMIDATVEEILRFDPPLHMFTRWVYED  
LEIGRSPLRGRDRIGLLLGAAGRDPEMWVDPDRFDPNRHLKPHVAFGAGRHFVCVGAPLARLELRIALQVLFAR  
LPGLRLAASPRYANLYHFHGLERLMLCAQ

>CYP202B16 (METH\_11685) *Leisingera methylohalidivorans*

MKTLTQSPTGPAFVQDPYLFYAAAREQGQLHHWQDYGMAAAFSGHSAVHMLLRDRRFGREVPEEMRQDGAHLA  
PFLTAEAHSMLEAPPRHTRLRLVLRAFTSREIAALQPGLEVLCHRLIDAFPADPFDLLDAYCTQVPVIAIC  
RLLGVPEEMAPQLLDWSHRMVAMYQASRTEQTEHAAAEASQQFTEFLRGYIGKRRNDPRDDLITRLIAAEEEG  
DKLSTDELIGTCILLNAGHEATVHSLGNVVKMTLQQGWQPDWLAPDGIIEGLVEEILRFDPPLHMFTRYAYEE  
AEVFGHTFQRGDQVALLLAAANRDPSALDRPEVFDPSRPPKVNKSFGGGLHFCVGAPLARLEMQIALPILFGR  
CPDLKLAAEPEYSNTYHFHGLTRLLVSS

>CYP202B17 (PGA2\_c19550) *Phaeobacter inhibens* 2.10

MKTLTQSPTDPDFVQSPYGFYAKARANGHLHYWQDYKMVAASFHPAVHTLLRDRRFGREIPPEMARESPAHLA  
PFLQVEAHSLLEAPPRHTRLRLVLRAFTSREIKALAPGLDTCHELIDAFPDAPFDLLTAYCTQVPVIAI  
CRLGVPPTDAPQLLDWSHKMVAMYQASKTVETEHAAARASQEFIDFLTYYVDERRKTPGEDLITRLIQAEED  
GESLSTDELIGTCILLNAGHEATVHSLGNVVKMTLQQGWDKSWLAPDGDGLVEEILRYDPPLHMFTRYAYE  
EVELFGHTFQRGDEVALLLAAANRDPEMLEDPERFDPTRPAKVNTSFGAGLHFCVGAPLARMEMQIALPILFE  
RCPDLKLAAEPEYNNTYHFHGLTGLMVQV

>CYP202B17 (Gal\_01332) *Phaeobacter gallaeciensis* DSM 26640

MKTLTQSPTDPDFVQSPYGFYAEARAMGHLHHWQDYKMVAASFHPAVHTLLRDRRFGREIPPEMARESPAHLA  
PFLQVEAHSLLEAPPRHTRLRLVLRAFTSREIKALAPGLDTCHELIDAFPTDAPFDLLTYYCTQVPVIAI  
CRLGVPPTDAPQLLDWSHKMVAMYQASKTVETEHAAAKASQEFIDFLTAYVDERRKTPGEDLITRLIQAEED  
GESLSTDELIGTCILLNAGHEATVHSLGNVVKMTLQQGWDKSWLAPDGDGLVEEILRYDPPLHMFTRYAYE  
EIELFGHTFQRGDEVALLLAAANRDPEMLEDPERFDPTRPAKVNTSFGAGLHFCVGAPLARMEMQIALPILFE  
RCPDLTLAAEPEYNNSYHFHGLTRLMVQF

>CYP202B17 (PGA1\_c20710) *Phaeobacter inhibens* DSM 17395

MKTLTQSPTDPDFVQSPYGFYAEARAMGHLHHWQDYKMVAASFHPAVHTLLRDRRFGREIPPEMARESPAHLA  
PFLQVEAHSLLEAPPRHTRLRLVLRAFTSREIKALAPGLETLCHELIDAFPKDAPFDLLTYYCTQVPVIAI  
CRLGVPPTDAPQLLDWSHKMVAMYQASKTVETEHAAARASQEFIDFLTYYVDERRKTPGEDLITRLIQAEED  
GESLSTDELIGTCILLNAGHEATVHSLGNVVKMTLQQGWDKSWLAPDGDGLVEEILRYDPPLHMFTRYAYE  
EIELFGHTFQRGDEVALLLAAANRDPEMLEDPECDFPTRPAKVNTSFGAGLHFCVGAPLARMEMQIALPILFE  
RCPDLKLAAEPEYNNTYHFHGLTRLMVQV

>CYP202B17 (PhaeoP97\_02067) *Phaeobacter porticola*

MGHLHHWQDYKMVAASFHPAVHTLLRDRRFGREIPPEMARESPAHLAPFLQVEAHSLLEAPPRHTRLRLVL  
RAFTSREIKALAPGLETLCHELIDAFPKDAPFDLLTYYCTQVPVIAICRLGVPPTDAPQLLDWSHKMVAMYQ  
ASKTVETEHAAARASQEFIDFLTYYVDERRKTPGEDLITRLIQAEEDGESLSTDELIGTCILLNAGHEATVH  
SLGNVVKMTLQQGWDKSWLAPDGDGLVEEILRYDPPLHMFTRYAYEEIELFGHTFQRGDEVALLLAAANRD  
EVLEDPERFDPTRPAKVNTSFGAGLHFCVGAPLARMEMQIALPILFERCPDLKLAAEPEYNNTYHFHGLTRLM  
VQV

>CYP202B18 (TM1040\_1816) *Ruegeria* sp. TM1040

MRHITKPPPLRPETSAKTDFMKTLTQSPTDPDFVQNPYPFYDAARAAGKLGWEEYKMMAAFGHVHMLLRD  
RRFGREIPAEMATEGPAHLAPFLQVEAHSLLEAPPRHTRLRLVLRAFTSREIKALAPGLETLCHELINAF  
KDAPFDLLSSYCTQVPVIAICRLGVPPTDAPQLLDWSHKMVAMYQASKTTETEHAAAQASAEFIAFLT  
DYVDERRKTPGEDLITRLIQAEEDGESLSTDELIGTCILLNAGHEATVHSLGNVVKMTLQQGWSSEWLQPD  
GISGLVEEILRYDPPLHMFTRYAYEEIEIMGHRFRRGDQVALMLAAANRDPEALERADQFDPTRPPKVN  
KSFGGGLHFCVGAPLARMEMQIALPILFERCPELKLAEPQYSNTYHFHGLTRLWVQTR

>CYP202B19 (RCA23\_c09530) *Planktomarina temperate*

MKIFKQSPTDTSFVQNPYPAYDRARAMGDLVWWDYKMPAAVSYRAVRGLLTNRKFGREALTAPQCPAHLADW  
QANESHSMLELEPPRHSRLRGLVLRRAFTSKKVAAMAPQITETCHRLIDAFPAQPFDFLNAFARPLPVHIIAKL  
LGVPTDRSSDLLSWSNAMVAMYQSNRSYEVEIAANQATLEFTAFLDSYIAHRRSQPRDDLSDLIAEEEAGEK  
LTGAELISTCILLLNAGHEATVHTLGNALKTLLPSPHREVTPQLVEEVLRFDPPLHLFTRFAYEDTTCFGFDI  
HKGQEVACLLAAANRDPAFVENPHVFDPHRKSTAHQSFGAGLHFCVGAPLARLEISLSLQLLFDRCPNLHISQ  
APTYANSYHFHGLDALMVQT

>CYP202B20 (Dshi\_1193) *Dinoroseobacter shibae*

MGAGLPRVTQDPTDAAFVQNPYPVYDRMRALGDLVWWDAYAMPVTPTYAATGAILKDRRFGREPLSPPPVPDH  
LRDFYAVEAHSMLELEPPRHTRLRGLVTRAFTSARIAALAPGIEALCHALIDAFPDTPFDLLPAYCTQVPVRI  
IARLLGVPEdTAPQLLAWSNAMVGMVQAGRSRAMEEAAANTA AHDFRAWLLDLIDARRASPADDLLSALIAAQA  
EDGKLTREDELVTTVILLLNAGHEATVHTLGNVKTLLLETGLRQITPATVEEVLRFDPPLHLFTRIARQEVEVF  
GHRFAPGDTVGCLLAAAGRDPGFAPDPRFDPTRPTKPPHMAFGAGLHFCVGAPLARLEIEIALRVLFARCPG  
LRLAGAPVYAPIYHFHGLQALRVSR

>CYP202B21 (P73\_1592) *Celeribacter indicus*

MKRFSMPSPDPAFVQDPYPFYDRLRAGGRMVHWEELDLPIAGHDGVSMAIRDTRFGREAPGFAPIPDHLR  
PFYEIEAHSMLELEGERHRRRLRSLVLRRAFTSRRVRALLPDLEEITDGLIDRFPAGEAFDLLPAFCQQVPIRVI  
SRLLGVPPEEMGPRLLGWSHAMVAVYTPTRTRAMEEAAAARAATEFAEFLRGYVEERRARPADDLITHLIAAESE  
GERLSTDELISTCVLLLNAGHEATVHALGLAVKTLLERRTPPAFLGADRIDGTVEELLRFDPPLHLFQRWVNE  
DTVFLGQELKRGDRIGLLGAANRDDDADWDPAHFDPAKVKQNMSTFGAGLHFCVGAPLARLEMRVALPRLFD  
RCPGLHLTEPPVYADTWHFHGLDRLMVRL

>CYP202B22 (IMCC12053\_727) *Celeribacter marinus*

MLHFDQDPKDPFVQDPYGFYARLRDSGPLAYWTELGVVLTGYDGVSMALRDNRFGREAPQGFAPIPKGLQ  
HFEYIDAHSMELEGERHRRRLRGLVLRRAFTSRRIKDLMPETAITCDDLLDKIDTHTGETDLLQSFCQPLPVRV  
ISRLLGVPPEEMCDQLLAWSNAMVAVYTPLRTPETIEAAAEQAAREFSTFMRRYVEARRTPRDDLITHLIAAEE  
DGEKLSTDELISTCILLLNAGHEATVHSLGIAVKTLLETETPPDALTDGAIDATLEEVLRYDPPLHFFDRWVY  
KDMCFMGHEFKRGDKVGLLLASANRDETAWDEADRFRPARPIKQNMSTFGAGLHFCVGAPLARLEMRVALPRLF  
ERYPDALAAAPPDYANTWHFHGLRSLRVRLGQK

>CYP202B23 (Jann\_1726) *Jannaschia* sp. CCS1

MITLHQSPDTDDDFVQNPYPFYAAARAHGPLVHWADYAMPCTTTFAATNAILRDRRFGREPVDALPVPDHLQPF  
YDVEAHSMLELEPPRHTRLRGLVLRRAFTNRRIKALAPDITQLTHDLIDAFPDGAHDLLDTFARPLPVTLIARL  
LGVPEEMAPDLLRWSNAMVMMYQAGRTRSDDEDVAVKATEEFVAFMRDYARQRRKDPRDDLITALIAAEEDGEK  
LSTDELITTCILLLNAGHEATVHSIGNGVKLCLOQQHRPPRDPKAFTEELLRIDPPLHMFTRTAYEDVTLHGH  
TFQRGDQVALLAAANRDPAAYPDPDTFDPARKGPAQLAFGAGLHFCVGAPLARLELQIALPILFDRCPNLTL  
TAPPRYADIYHFHGLDALMVQA

>CYP202B24 (RD1\_2962) *Roseobacter denitrificans*

MPLLSQADLKAAMQRLIQSPDPAFVQNPYAFYAEVFTGDTIRYWQDYDMPAIFDAANVQAVLRNRRFGRALP  
ADRIGPPRPHLAFAFDAVEAVSMLDLEPPDHTRLRGLVLRRAFTSRRIKALAPDIHDICDRLIADLPKGGCNLIP  
AFCTALPVRIIARLLGVPAERCGLLRWSNAMVAMYQAGRTLEIEHAANAAASEFTAFLSDYIDIKRRAPQDD  
LISHLLAEENGQKLTRQELIGTCILLLNAGHEATVHTMGNAVKALLEHQTPPQAFTDQNIATVEEVLRFDP  
PLHMFTRYSEDTEIGDHTIRSGQQVALMLGAAGRDPALCKDPDVFDFRAPVPHAAFGGGLHFCVGAPLARL  
ELQIGLQRLFAARPNTLSSPPRFANAYHFHGLERLDVTT

>CYP202B25 (RL0149\_c014660) *Roseobacter litoralis*

MQHLIQSPLDPTFVQNPYALYAEVFTGDTIRYWQDYEMPAIFDAANVQSVLRDRGFRATPADQIEPLRPHLA  
AFNAVEAVSMLDLEPPDHTRLRGLVLRRAFTSRKIKALAPDIHDICDTLIAALPRHGCDLIPAFCTALPVRIIA  
RLLGVPEDISGDLRLWSNAMVMYQAGRTLQTEQAANAAIEFTAFLSDYIDIKRRNPQDDLISQLLRAEDNG  
EKLSRDELIGTCILLNAGHEATVHTMGNAV KALLEHETPAYALTDQNIATTVEEVLRFDPLHMFTRYSYKD  
TTIGGHIIRSGQQVALVLGAAGRDPTLCKDPDVDFPFRAPVAHAAFGGGLHFCVGAPLARLELQIGLQRLFAA  
CPHLALSRSPEFANAYHFHGLKRLDVTY

>CYP202B-fragment1 (roselon\_02610) *Roseibacterium elongatum*

MIVIARLLGVPEGMADLLRWSNAMVMYQAGRTPEDEARAVAATEEFVAFMRDYVRRRRSEPRDDLISALIA  
AEADGDKLTDELITTCILLNAGHEATVHTMGNGVKLALEMVVRPGTAPEAFVEEVLRLDPLHLFTRWVYD  
EVNLFGHRFRRGDAVGLLLASAGRDADCYAQPD RFQPTRQGPPLAFGAGLHFCVGAPLARLELGIAMSALFQ  
ACSGRLRLVEAPRYAEIYHFHGLERLMVTR

>CYP202B-fragment2 (AKL17\_1763) *Defluviimonas alba*

MPEARAPELLAWSNAMVGMYQARRDRATEDAAVAAAIAFSGYLRELVALRRRTPGDDLISHLIAAGDALSPREE  
LISTCILLNAGHEATVHTLGNVKTLLLEAKVAPEALAPDRIEALVEEILRFDPPLHLFWRWIHEDMEIAGHA  
FARGSRIGCLLAGGNRDPQVWERPGRFMPDRLVKPNLAFGGGAHFCIGAPLARLELQVALPILFARLPGMRLK  
GKPRYADLYHFHGLETLRVVR

>CYP203A1 (RPA1009) *Rhodopseudomonas palustris* CGA009

MFSFDPYSPIVDADPFPLYKTLRDEYPVFWSEPAQMWILSRYL DVAGAGSNWQVFSSAKGNLMTELPNRAGAT  
LGT TDPPRHDLRLGLVQHAFMKRNLEALAEPMREIARDAAEALRGRDQFDFISDFSSKFTVRVLFAALGLPMG  
DEQTVRDKAVLMVQSDPVTRAKGPEHLAAYAWMQDYASSVIAQRRAEPKNDLISHFSMAEIDGDRLDEREVLL  
TTTTLIMAGIESLGGFMSMLALNLAD FADARRAVVADPALLPDAVEESLRYNTSAQRFRCLQSDLT LHGV TM  
KAGDFVCLAYGSANRDERQFPNP DVYDVKRKPKGHLGFGGGVHACLGSAIARMAIRIAFDEFHKVVPDYTRTE  
QQLNWMPSSSTFRSPLRLDFAVEQAASRSAA

>CYP203A1 (Rpa1\_1201) *Rhodopseudomonas palustris* TIE-1

MFSFDPYSPVVDADPFPLYKTLRDEYPVFWSEPAQMWILSRYL DVAGAGSNWQVFSSAKGNLMTELPNRAGAT  
LGT TDPPRHDLRLGLVQHAFMKRNLEALAEPMREIARDAAEALRGRDQFDFISDFSSKFTVRVLFAALGLPMG  
DEQTVRDKAVLMVQSDPVTRAKGPEHLAAYAWMQEYASGVIAQRRAEPKNDLISHFSMAEIDGDRLDEREVLL  
TTTTLIMAGIESLGGFMSMLALNLAD FADARRAVVADPALLPDAVEESLRYNTSAQRFRCLQSDLT LHGV TM  
KAGDFVCLAYGSANRDERQFPNP DVYDVKRKPKGHLGFGGGVHACLGSAIARMAIRIAFDEFHKVVPDYTRTE  
QQLNWMPSSSTFRSPLRLDFAVEQAAARSAA

>CYP203A1 (RpdX1\_1170) *Rhodopseudomonas palustris* DX-1

MFSFDPYSPVVDADPFPLYRTLRDEYPVFWSDAAQMWILSRYL DVAGAGTNWQVFSSAKGNLMTELPNRAGAT  
LGT TDPPRHDLRLGLVQHAFMKRNLEALADPMREIARDAAEALRGREQFDFISDFSSKFTVRVLFAALGLPIG  
DEQTVRDKAVLMVQSDPVSRAGKPEHLAAYAWMQDYASSVIAQRRAEPKNDLISHFSMAEIDGDRLDEREVLL  
TTTTLIMAGIESLGGFMSMLALNLAD FGDVRRAVVADPALLPDAVEESLRFNTSAQRFRCLQSDLT LHGV TM  
KAGDFVCLAYGSANRDERQFPNADV DLKRKPKGHLGFGGGVHACLGSAIARMAIRIAFDEFHKVVPDYTRTE  
QHLNWMPSSSTFRSPLRLDFAVESATARSAA

>CYP203A2 (Saro\_1648) *Novosphingobium aromaticivorans*

MATVIERPQFRFDYPYSPADADPFPAKVLRLDEYPCFWSEEAGKWVLSRYDDVLAALQDWRTYSSAKGNLVDE  
FPGRAGSTLGSSDPPRHDLRLALIQSAVTKRALEHI IAPARASAQAHLAALADKPVFDLVGDYTSKLTVDLLF  
YLFALPDEGAQQVRENAVLMVQTD PVTRQKSP EHLA AFHWMADYAEKLVASRKANPGDDLSSFITAEIDG EK  
LLDKEVQLTVTTLIMAGIESLSGFMMFGLNLADY PEAR SALVADPSLIPDAIEESLRFNTSAQRFRKRTLTRD  
VELHGQVMKAGDAVILAYGSANRDERMFENPDVYDITRKPRRHLGFGGGVHACLGSMIGRLATQIAYEELLKA  
VPDFRRADAPLDWVPSSNFRSPKSLMLEKKA

>CYP203A6 (RPB\_1062) *Rhodopseudomonas palustris* HaA2

MTRWEVQPHQHPRNRPMFSFDPYSPAVDADPFFLYKTLRDEHPVYWSEPAQMWVLSRYIDVASAGTNWQVFSS  
AKGNLMTELPGRAGATLGTTDPPRHDLRLGLVQHAFMKRNLEALAEPMRDIAREAAEALRGREQDFDIADFSS  
KFTVRVLFALGLPLGDEQTVRDKAVLMVQSDPVSRAKGPEHLAAYAWMQDYAAKVIAQRRAPQNDLISHFS  
MAEIDGDKLDEREVLLTTTTLIMAGIESLGGFMSMLALNLADYADARRAVVADPARLPDAVEESLRYNTSAQR  
FKRCLQTDLTLLHGVTMKAGDFVCLAYGSANRDERQFPNPDVYDLARKPKGHLGFGGGVHGCLGSAIARMAIKI  
AFDEFHKVVPDYTRVQPRLDWMPSSSTFRSPLRLEMAVERAESRNA

>CYP203A7 (BRADO2350) *Bradyrhizobium* sp. ORS 278

MFTFDPYSPAVDADPFFFYKTLRDEHPCFWSPQAQVWILSRADVAAGTNWQTYSSAKGNLMTELPNRAGAT  
LGTTDPPRHDLRLGLVQHAFMKRNLESLSGPIRDIARDSAESLRGQERDFIEAFSSKFTVRVLFALGLPLG  
DEQTVRDKAVLMVQSDPVSRAKGPQHIAAYNWMQDYAAGVIAERRARPQNDLISHFSMAEIDGDKLDEREVLL  
TTTTLIMAGIESLGGFMSMLAYNLADHDPARRAVVANPDLLTDAVEESLRFNTSAQRFRRCLQKDLTLHGQTM  
REGDFVCLAYGSANRDERQFPNPDVYDITRKPRGHLGFGGGVHACLGSAIARMAIRIAFDELHKVVPYRRTQ  
EQLPWMPSSSTFRSPLYLELTVH

>CYP203A7 (S58\_52490) *Bradyrhizobium oligotrophicum*

MFTFDPYSPAVDADPFFFYKTLRDEHPCFWSPQAQVWILSRADVAAGTNWQTYSSAKGNLMTELPNRAGAT  
LGTTDPPRHDLRLGLVQHAFMKRNLESLSGPIRDIARDSAEALRGQDRDFIEAFSSKFTVRVLFALGLPLG  
DEQTVRDKAVLMVQSDPVSRAKGPQHIAAYNWMQDYAAGVIAERRARPQNDLISHFSMAEIDGDKLDEREVLL  
TTTTLIMAGIESLGGFMSMLAYNLADHAEARQAVVANPDLLADAVEESLRFNTSAQRFRRCLQKDVPLHGQTM  
REGDFVCLAYGSANRDERQFANPDVYDIRRKPRGHLGFGGGVHACLGSAIARMAIKIAFDELHKVVPNYRRTQ  
EQLPWMPSSSTFRSPMYLELAVH

>CYP203A7 (BBta\_2708) *Bradyrhizobium* sp. BTAi1

MFTFDPYSAVDADPFFFYKTLRDAHPCFWSQQAQMWILSRADVAAGTNWQTYSSAKGNLMTELPNRAGAT  
LGTTDPPRHDLRLGLVQHAFMKRNLESLSGPIRDIARASAEALRGQERDFIEAFSSKFTVRVLFALGLPLG  
DEQTVRDKAVLMVQSDPVSRAKGPQHIAAYNWMQDYAAGVIAERRARPQNDLISHFSMAEIDGDRLDEREVLL  
TTTTLIMAGIESLGGFMSMLAYNLADHDPARRAVVANPDLLADAVEESLRFNTSAQRFRRCLQKDVTLHGQTM  
REGDFVCLAYGSANRDERQFPNPDVYDITRKPRGHFGFGGGVHACLGSAIARMAIRIAFDELHKVVPYRRTQ  
EQLPWMPSSSTFRSPMYLELTVH

>CYP203A8 (PP1Y\_Mp110365) *Novosphingobium* sp. PP1Y

MAVLENPGFTFDPYSPAIDADPFPAYKVLRLDKYPCFWSEQAGKWVLSRYDDILAALSNWRVYSSAKGNLVDEF  
PGRAGSTLGSSDPPRHDLRLGLIQSAVTKRALDHLIAPAKASARMHLAALDGCDSDVDFVGEFGSKVTVDLLFH  
LFALPLDNADEVRRNAVLMVQTDVPTRQKAPEHLAAFEWMADYAQDLVHERKKS PGDDL SNFITAEIDGEKL  
LDKEVQLTVTTLIMAGIESLSGFFGMFALNLADYPEARHALVADPSLIADAMEESLRFNTSAQRFKRTLTCDV  
ELHGQTMKAGDAVILCYGSANRDERMFVNPDYDIERRPKRHLGFGGGVHSCLGSMARVATQAAFEELLTAI  
PDFSRFDETLAWTSSSNFRSPKALRLTVG

>CYP203A9 (MGMAQ\_2657) *Magnetospira* sp. QH-2

MFRFDPYSPAIDADPFPAYKTLRDEHPCFWSEEAGMWVYSRYADIVTALNDWETYSSAKGNLVDEL PN RAGNT  
LGTTDPPRHDLRLRALIQKAVTKRALNYLEAPTQAVCGKHLDALAGAKSFDFVND FSSKVTVDLLFFLFNMPTE  
GQQTVRDKAVLMVQTDPKTRKKGPEHIEAYEWMANYAADLVAERKKNPGDDL SNFITAEIDGEKLKDKEVQM  
TVTTLIMAGIESLSGFMSVFGMNLADHDPARRALVADPSLIPDAMEESLRYNTSAQRFRRCVQKDVAIHGQTM  
KAGDFVMLAYGAGNRDERQFANPDVYDIARRPKGHLGFGGGVHACLGTAIARLACKITFETFLGRYPEFTRVQ  
EQLPWVPSSNFRSPLKLELAVD

>CYP203A10 (AZOBR\_p330136) *Azospirillum brasilense* Sp245

MFRFDPYSPAVDADPFFFYKTLRDEHPCFWSEANMWVLSRYDDIVTALNDWETYSSAKGNLMDEMPNRAGNT  
LGTTDPPRHDLRLRSIVQFAFTKKAVEGLTEPVRASANRALDAVQGERTFDFVSDVSSKVTVDVLFGLFNLPRE  
NERMVRDKAVLMVQSDPRTRQKGPEHLAAQWMSEYAKELVELRKREPGDDLITALIQAEVAGEKLADREVQM

TITTLIMAGIESLSGFLAMFALNLADHADARRRLAANPALIPDAIEESLRFNTSAQRFRRCLQKDVELHGQTM  
RAGDFVCLAYGSGNRDERRFANAHLYDIDRKPKGHLGFGGGVHACLGTAFARLAARVACEEFLKRVPEFVRVQ  
DQLPWMPSTTFRSPTRLELAVG

>CYP203A10 (ABAZ39\_27945) *Azospirillum brasilense* Az39

MFRFDPYSPAVDADPFPHYKTLRDEHPCFWSEEANMWVLSRYDDIVTALNDWETYSSAKGNLMDEMPNRAGNT  
LGTDPDRHDLRLSIVQFAFTKKAVEGLTEPVRSANRALDAVQGERTFDVSDVSSKVTVDVLFGLFNLPRE  
NERMVRDKAVLMVQSDPRTRQKGPEHLAAQWMSEYAKELVELRKREPGDDLITALIQAEVAGEKLADREVQM  
TITTLIMAGIESLSGFLAMFALNLADHADARRRLAANPALIPDAIEESLRFNTSAQRFRRCLQKDVELHGQTM  
RAGDFVCLAYGSGNRDERRFANAHLYDIDRKPKGHLGFGGGVHACLGTAFARLAARVACEEFLKRVPEFVRVQ  
DQLPWMPSTTFRSPTRLELAVG

>CYP203B1 (P73\_4763) *Celeribacter indicus*

MPLFDIYSPEFDSNPYPVYATLRNEHPCYWHSGVKKWFLTRHADVSAAAANWKVFSSSQGNLVDEFASRAGNT  
LGTMDPPRHDRLRALVQMAFTRKHLSALEPFVREQVREIIGRQAEARSFEFVSQVSTQITVSALSRLLGIDHD  
DPNELREKALLMVQTDVLRKAPIHLEAMDWMKALAVRHIAARRAQPDVITSLIQAEIDEGELTEDELIL  
TISTVIMAGVESLSGFLTMVALNLADHSQVRRSVAADPSLIPAFIDEVLRYNTNAQRFKRVAMQDIELHGQTI  
KKGDEVVLCFGAANRDERKFENPDSFDLDRPERGHLGFGGGVHMCLGVVLARMVTKLFLEELLKIMPEFSRND  
DTLDWLPSTNFRAPLKLVLRTREGTAWQGIEKVGSDA

>CYP204A1 (Saro\_3659) *Novosphingobium aromaticivorans*

MARAATAAGNGLPLLDGGVPLLGHLAQFFRDPVSVLKRGYRSKGRLFAMNFMGQRMNVMVGPEHNRRFFFEETD  
KLLSIRESMPPFLKMFSPFYSFAEMDEYLRQRSIIMPRFKAASKQYVPVMVEESLNLVERLGEEGEFDLIP  
TLGPVMDIAAHSFMGREFHEKLGHEFFELFRDFS GGMFVFLPLWLPTPKMVKSQRAKRLHAILQSWIDKRR  
AAPLDPPDFFQTMIEKYPDGRVPDEIIRHLILLLVWAGHETTAGQVSWALADLLQNPDYQKVLARGEISSLL  
GGSDGRDLGWEQAVAMEKMDLALRETERLHPVAYMLSRKARADIERDGYVIRKGEFVLLAPSVSHRMEETFRN  
PDAYDPERFNPANPDQAIESNSLIGFGGGVHRCAGVNFARMEMKVLVAILLQNFDMELMDEVRIAGASTYWP  
AQPCRVRVRRRKLDGSEAGADMAALARAAGCPAHT

>CYP204A2 (PP1Y\_Mp13478) *Novosphingobium* sp. PP1Y

MASTAHTSRPLPLVGGASPVIGHLAQFFRDPVSVLKRGYATKGRLFALNLMGRRMNVMVGPEHNRRFFFEETDK  
LLSIRESMPPFLKMFSPFYSFAEMDEYLRQRAIIMPRFKAASKQYVPIMAEALALVKRLGDEGTFDLIPT  
LGPVMDIAAHSFMGREFHKKLGHEFFDLFRDFSAGMEFVFLPLWLPTKQIRSQRAKKLHTILQDWIDNRR  
NPVDPPDFFQTMIASTYPDGTVPDETIRHLILLLVWAGHETTAGQVSWALADLLQNPDYLTIRAEIAAVMG  
SDDGSAFWSWEQALAMGKMDFSLETERLHPVAYILSRKASADIEREGYRIRKGEFVLLAPSVTHRMEETFHNP  
DAYDPERFNPDPNAAQLESNSLIGFGGGVHRCAGVNFARMEMKVLIAILLQHYDMELIDEVRPISGASTYWPA  
QPCRVRVYRKRNRGDARPADTATLARAAGCPAHA

>CYP206A1 (Atu1569) *Agrobacterium fabrum*

MTEIGFRTPTDTTGAQPVSKLATARLALSLIRNPLKALPPEIFSEPAVFTRLGGVMRVHLADPVLIEALVK  
NAALLGKGEDVRRALGPALGQGLLTADGDHWKQWQSQSVAAAFRHEKLLLELLPVMIE TARRTQKRWRSSSTADI  
DIGHEMMRTTFDIIVETMMSGGYGIDIARVEQSITDYLKPTGWTFFALAMLGAPWLPHPGRRKSRAAVDYLRA  
SLATVITGRRKNPTDRPDLVSMLEAKDPETGRMMSDEEIIDNLLTFITAGHETTALGLAWTFHLLSQNPETE  
RKAVEEIEAVTGGEPVAAEHIANLAYVRQVFSEAMRLYPPAPVITRTALQDFRLGEHDI PAGTVLYVPIYAVH  
RHTALWDEPERFDPSPFEPEKVKARHRYAYMPFGAGPRVCIGNAFAMMEAVAILAVILQKNHLENRTMASAEP  
LMRVTLRPQERLMMKITQRQNKSPAV

>CYP206A2 (B0909\_05300) *Agrobacterium rhizogenes*

MIGTGLSTPSMDVTETETPLSKFAAARLAI SLVRNPLKALPPEIFSKPAVFTRLGGTMRVHLADPALIHEALVK  
NAHLLGKGEDVRRVLGPALGQGLLTADGDHWKQWQSQSVAAAFRHEKLLDLLPVMIDTARRTQARWRAPSTGNI  
DIGHEMMRTTFDIIVETMMSGGYDIDIARVEQSITDYLRPTGWTFFALAMLGAPWLPHPGRRKSRAAVDYLRA  
SLAKVIAGRRANPTDRDLDVSMLEARDPETGRMMSDEEIIDNLLTFITAGHETTALGLAWSFHLLSQNRETE



RKIIIEEIEAVTAGEPVAAEHIANLTYTRQVFSEAMRLYPPAPVITRTARQDFRLGEHDI PAGTILYVPIYAVH  
RHAALWDEPERFDPSRFEPEKVKARHRYAYMPFGAGPRVCIGNAFAMMEAVAILAVLLQTIHLENTSPAAAEP  
LMRVTLRPQDRLMMRITQRKNRSPAA

>CYP206A3 (AWN88\_12890) *Agrobacterium tumefaciens* S33

MTDTGLRTPSPEAIGTQTVSKLATARLALSIIRNPLKALPPEIFHEPAVFTRLGDTMRVHLADPVLIIHEALVK  
NAHLLGKGEDVRRVLGPALGQGLLTADGDHWKQQRQSVAGAFRHEKLLDLLPVMIEETARRTEARWRSPSIGDI  
DVGHEMMRTTFDIIIVETMMSGGYGIDVARVEQSITDYLKPTGWTFFALTMLGAPEWLPHPGRRKARIAVGYLRE  
SLAKVIAGRRKNPSENRDLISMLLEARDPETGRMMTDTEIVDNLLTFITAGHETALGLAWTFHLLSKNRETE  
RKILEEIDTIVTAGEPVAAEHIAGLTYTRQVFSEAMRLYPPAPVITRTALEDFRLGGHDI PAGTVLYVPIYAVH  
RHSALWDEPERFDPSRFEPEKAKARHRYAYMPFGAGPRICIGNAFAMMEAVAILAVLLQGLHLENRSTATAAP  
LMRVTLRPESRLTMRIVQRKNKSPAA

>CYP206A3 (BN877\_11537) *Rhizobium* sp. IRBG74

MTDTGLRTPSPEAIGTQTVSKLATARLALSIIRNPLKALPPEIFHEPAVFTRLGDTMRVHLADPVLIIHEALVK  
NAHLLGKGEDVRRVLGPALGQGLLTADGDHWKQQRQSVAGAFRHEKLLDLLPVMIEETARRTEARWRSPSIGDI  
DVGHEMMRTTFDIIIVETMMSGGYGIDVARVEQSITDYLKPTGWTFFALTMLGAPEWLPHPGRRKARIAVGYLRE  
SLAKVIAGRRKNPSENRDLVSMLEARDPETGRMMTDTEIVDNLLTFITAGHETALGLAWTFHLLSKNRETE  
RKILEEIDTIVTAGEPVAAEHIAGLTYTRQVFSEAMRLYPPAPVITRTALEDFRLGGHDI PAGTVLYVPIYAVH  
RHSALWDEPERFDPSRFEPEKAKARHRYAYMPFGAGPRICIGNAFAMMEAVAILAVLLQGLHLENRSTATAAP  
LMRVTLRPESRLTMRIVQRKNKSPAA

>CYP206A4 (Ach5\_15090) *Agrobacterium tumefaciens* Ach5

MPGTDLRTPLPDTSAAPVSKFATARLALSLIRNPLNALPPEIFNEPAVFIRVGGTMRVHLADPALIHEALVK  
NAHLLGKGEDVRRALGPALGQGLLTADGDHWKQQRQSVAAAFRHEKLELLPVMIEAAERTGRRWRASPFEDI  
DIGHEMMRTTFDIIIVETMMSGGHGIDIGRVEQSITDYLKPTGWTFFALAMLGAPPEWLPHPGRRKARAAGVYLRS  
SLSTVIADRRRNPNVERHDLVSMMLQAKDPETGRMMSDKEIIDNLLTFITAGHETALGLAWTFNLLSQHSDVE  
RKVVEEIAAVTGANPVAAEHIAQLTYTRQVFSEAMRLYPPAPVVTRTALQDFKLGDHDI PAGTVLYVPIYAVH  
RHTALWDEPERFDPSRFEPEKTKARHRYAYMPFGAGPRVCIGNAFAMMEAVSILAVLLQNVHLENRSASPAEP  
LMRVTLRPQSRMLMLITDRKNKSPAA

>CYP206A4 (AGROH133\_06357) *Agrobacterium* sp. H13-3

MPGTDLRTPLPDTSAAPVSKFATARLALSLIRNPLNALPPEIFNEPAVFIRVGGTMRVHLADPVLIIHEALVK  
NAHLLGKGEDVRRALGPALGQGLLTADGDHWKQQRQSVAAAFRHEKLELLPVMIEAAERTGRRWRASPFEDI  
DIGHEMMRTTFDIIIVETMMSGGHGIDIGRVEQSITDYLKPTGWTFFALAMLGAPPEWLPHPGRRKARAAGVYLRS  
SLSTVIADRRQNPNVERNDLVSMMLLEAKDPETGRMMSDKEIVDNLLTFITAGHETALGLAWTFNLLSQHSDVE  
RKVVEEIAAVTGPNPVAAEHIAQLTYTRQVFSEAMRLYPPAPVVTRTALQDLKLGHDHDI PAGTVLYVPIYAVH  
RHTALWDEPERFDPSRFEPEKTKARHRYAYMPFGAGPRVCIGNAFAMMEAVSILAGLLQNVHLENRSASPAEP  
LMRVTLRPQSRMLMRLITDRKNKSPAA

>CYP206A5 (Avi\_2585) *Agrobacterium vitis*

MNMPVLSATSEGVVASRRSPVRVIADLIRNPLDALPPQIYDHKLVAQFGDEVRLHVMDPELIHEALVKNAAV  
LGKGEDVRRALGPALGQGLLTADGAHWKQQRQSVAAAGFQWEKLRGFLPAMVAAAERRRDSWQAGETVDIGH  
MQTTFDIIIVETMMTGRDRIDVARVEQSVTDYLEPTGWMFALGMLKAPEWIPYPGKGKASRAVDYLRSMATMI  
AERRAEGVERADLISMLLSAHPDTPDREMNDQIIDNLLTFISAGHETALGLAWTFHLLAKHPAIEQKLLDE  
LDRVVGDPVMAEHVEKLTYYTKQVFNEAMRLYPPAPVITRTANEFTLGQHHIQAGTVLLVPIHAVHRHSLIW  
DRPEVFDPRFAPEAVKARHRYAFMPFGAGPRICIGSAFATMEAVAILAVLAKTFRLRNKSEVTPEPTMRLITL  
RPKKKLIMEIENRRREDVPVSG

>CYP206A6 (BHK69\_15760) *Bosea vaviloviae*

MMAAASAEIAPEIPFRSRRSSLSVLTSLLRNPLEAIPPEAFSEKLVLSRVAEQDSLYICDPALIQEALLRNAG  
ALGKGDTLRRVLAPALGQGLLTADGAHWRWQRRAVAAGFQHDSLTGFLPAMIAAAEATRDGWLKGAGPLDIGH

EMMHTTFAIIVETMLSGSGDFDTVKVESAITDYLEPTNYMFAYSLFRAPEWLPYPGRRRAFASVAYLRETIGA  
MVAKRASGEHRNDLIDMLLASADPESGRAMSDAEIVDNLLTFVVTAGHETTALGLAWTFHLLTQNRAVEDAVL  
AEIEAVTGGGALQPEHVMALPLTKAVFQEAMRLYPAPVVTQVVEEPFQLGGIALKQGMVLYVPIQAVHRHEQ  
LWDQPDFLDPARFAPDAVRARHRYAYLPFGAGPRTCIGSAFATMEAVAILAVLLRAIRLEPLTQEPPEPTLKV  
TLRPKQPLMTAAPRA

>CYP206A7 (BSY19\_1991) *Bosea* sp. RAC05

MTTLEALAATTPDGLVESRRPALSVIASLLRNPLQAMPPEVYRERLVLATTGGRTSLYVCDPALIQEVLTRQA  
GRLGKGNLIRKVLGPAIGGLLTADGAHWRWQRQAVASGFQHERLLGFLPAMIEAAEATRGRWQAASAPLDIG  
HEMMRTTFDII IETMLSGAQALDVGKVEQAISDYLEPSNFMVIYNLFGLPGWLPYPGRARARASVTYLRENLR  
ALVAQRRAEPPEHGDLLDMLLASADPETDRAMRDEEIVDNLLTFVVTAGHETTAVGLAWTFHLLAQNRDWEARV  
LEEIAAVTEGGPLLPRHVAALPLTRAVFQEAMRLYPAPVITREVEEPFTLGGVALKQGMVLYVPIQAVHRHE  
RLWDRPEQFDPSRFLGDAGRGRHRYAYLPFGAGPRICIGSAFATMEAVAILAVLLPALRLDPLPGQVPEPMLK  
ITLRPKQPLRMHASPRG

>CYP206B1 (Bind\_1807) *Beijerinckia indica*

MNSATAPIMTKDSPGIAVNHESTLHFLRKIIISNPLQTIPPEAFHEPLVYSDIGGKPRIYLSDPAAIQDVFINK  
ADFIVKGTMTVQRILGPALGNLLTTDEGSNWRQRQSIGPEFQHARLLDFQAEMIKAAERTRDRWSALGSQAQ  
IDLRHEMMLTTFDVIGETMLSGRQEMDVFAIEQDIATYLKAAGWLMALIMHAPAWTPFPGRRRSMAAARS  
QAVVAMVARRRKENSRRDDLVSRLLATQDLESGKMSDEEITDNLLTFIAAGHETTAQGLSWTFYLLSQHPEI  
ETKVIKEIENVTKGQALRPDHIQQLVYTRQVFSEAIRLYPPVPLFTRKVVKNFTLGDFTIPADAILITPIFAV  
HRHTSLWDQPDQFIPERFDPEQVKARHRFSFLPFGAGPRTCIGNAFAMMEAVAILAVLLPVFHLVYRSRQAPV  
PTLQVTLQPKHKLYIQVHGR

>CYP206C1 (Maq22A\_c17130) *Methylobacterium aquaticum*

MNAHPSHVRPAPEGARPVLARITPPAQPLGPWRFLSTVVRNPLEAWPETIYREPVYTSTVLGNSSLFVMA  
PNLIRRVMVDDADAFEKSEVLRRALSPALGDAILTADGARWRWQRRAAPIFRAERIRSFVPAMIAAAERTRD  
DALADPGTEVDLAQTMMRTTFEIIIVETMLPGAGGIDAARVERGITDYLESTSWVVALTLLRAPAWLPFP  
GRAKAERAKTYLRDELLRLAAEGRRTGTEGRNDLLSLLLAARDPETGQAMDDRDVADNLLTFVVTAGHET  
TALALTWALYLLSHHPESALIAAEVEAATAGGPLAPEHVDALPYTRQVILEAMRLYPVPVVRALRDVLDG  
IPVRAGTPI TIPIYAVHRHAALWDEPERFDPARFAPEAAKARDRYAYLPFAAGPRICIGMGFALSEA  
VAILAVLVRSRSLRFSLRPGYLPVLKQRITLRPSEGMPMRVSR

>CYP206C2 (M446\_6661) *Methylobacterium* sp. 4-46

MTAQPTLPLDWPTTARLDPEAPLAPLRYIRTVVRNPVETWPRAVYRDRVYQSTFLGRATLFVMDPGLV  
RTVLVDRAESFEKSEVLRRSLSPALGDAILTADGARWRWQRRAAPIFRNERILGFLPAMIAAAERTREAL  
KGLPPGTEADLAQVMMRTTFDIIAATMLSSHGRIDVARVERGITDYLESTSWIFALTLLRAPAWMPFP  
GRRRSEAARTYLRLDELLRLVAEGRAGGVEGRDDLSSLLVAARDPESGRAMDDRDVADNLLTFVVTAGHET  
TALALAWTLYLLALH PAIEARVVAEVEAVTGGGPLAPHHVEALGFTRQAIQEAMRLYPAPVLVRAALEE  
VDVGGRIGPGTPVTVPIYAIHRHALLWDEPDRFDPDRFAPEAAKARDRYAYLPFGAGPRICIGMSFALME  
AVAILAVLIRDLRFALRPGFVPTLKQRITLRPAEGMPMRVAPRAG

>CYP206C3 (Mnod\_6754) *Methylobacterium nodulans*

MNAHPTLPLERPPTARLVPEAPLSPLRFFRTVLRNPFETWPRAVYRDPVYRSSFLGRPTLYVMDPALV  
RAVLVDQAESFEKSEVLRRSLSPALGDAILTADGARWRWQRRAAPIFRNERIVSFLPAMIAAAERTRDAL  
AAGPPEAETDLAQMMRTTFDIIIVATMLSGDGQIDVARVEQGITDYLESTSWIFAMTLLRAPAWMPYP  
GRTSRERARGYLRLDELLRLVADMRRTGVEGRNDLMSLLVAARDPETGRAMDDRDVADNLLTFVVTAGHET  
TALALAWTLYLLALH PGIEARVVAEIEAVTGGGSVEPGHVEALAFTRQTILEAMRLYPAPVIVRAALAD  
VEIGGHRVPRGTPVTVPIYAIHRHARLWDDPDRFDPDRFAPEAAKARDRYAYLPFGAGPRICIGMSFAMLE  
AVAVLAVLIRSLHFRALPGFVPTLKQRITLRPAEGMPMRVARRDG

>CYP206D1 (MOC\_4866) *Methylobacterium oryzae*

MAEAIALPSVLVTMLGSLIEAWPRQIYTQPLVTTTRFLGQRTTYVCDPGHIRSLLDQAEALEREFPMLRALAP  
ALGSGVLTADGSHWRGQRRRTASPMFRPDRVRSFVPAMARAAAATRTRWHGADPAGAERDVLHEMMRTTTEVIV  
ATMVSGDPHLEVEFPGRAMDAYLGQTSWKIALAMLRAPAWVPHPGARGGAAAVRHLRGEVARTIARRRARGE  
GTDLLGLLLEARDPETGQPLPEARVDNLLTFVAAGHETTALALAWTLRVLAEHPEVEARVVAEMAQLGDDPA  
ADPEAADRLPYTRQVLLEVMRLYPPAPLIVRRTRAPVRLGDRVVPAGQSVHVPVYALHRHALLWDRPEVDFPD  
RFAPERAAARDRYAYLPFGAGPRVCIGMSLALTECLVILATLLPAFRFRPVTRAMPATQFRVTLRPGGLTMR  
VEPRHVA

>CYP206D2 (Mrad2831\_4212) *Methylobacterium radiotolerans*

MPAVGTFRVCAPGRPPFAAAVAEGVAEVALPSVLVTMLGSLIEAWPRQIYTQPLVTTTRFLGQRTTYVCDPGH  
IRSLMVDQAEALEREFPMLRALAPALGAGVLTADGARWRRQRRTAIPMFRPDRVRSFVPAMARAAAATRARWR  
DADPAGAERDILREMMRTAFDVIVATMVSGDPHLEVEPFGAAMDAYLGQTSWKIALEMLRAPSWVPHPGARAG  
AEAVRYLRGEVARTIARRRARGEPSDLLGLLLQARDPETGAPLPEASLVDNLLTFVSAGHETTALALAWTFR  
VLAEHPEVERRVVAEMARLGDDLAADPEAADRLPYTRQVLLEVMRLYPPAPLIVRRTRAPVRLGDTVVPAGQS  
VHVPVYALHRHALLWDRPEAFDPDRFAPERAAARDRYAYLPFGAGPRVCIGMSLALTECLVILATLLPAFRRLR  
PVTAEMPAAQFRVTLRPGGLTMRVAPRPGAGHVA

>CYP206D3 (METDI1976) *Methylobacterium extorquens* DM4

MVAEGRDGEVADMSSAGTFRVCEAGGPPLQEALAEVALPSVLATMLRSLIEAWPDEVYTRPLVTTTRFLGQRT  
TYVCAPGHIRSLIVDQAGALEREFPMLRALAPALGSGILTADGPHWRGQRRTAAPMFRPDRVRAFI PAMAEAA  
HATRLRWLGQMSAHGSADARFDGERDILPEMMRTTTFDVIVATMVSGDSQLKVEPFGRAIDAYLGQTPWKIALS  
MLGAPAWMPHPPGARAGARAVRYLRSEVARTVERRRRARGE PGADLLGLLLQAKDPETGERLSDES LIDNLLTFV  
AAGHETTALALTWTLRVLADHPAVEARILDEIAGLGADPAPEALDRLAFTTRQVVLEVMRLYPPAPLIVRRTAE  
EVR LGDTVIPAGESVHVPVYALHRHQSLWDRPDVDFDPDRFAPELTASRDYAYLPFGAGPRVCIGMGLALTEC  
LVILATLLPAFRFVPAKAEMPATQFRVTLRPGGMKMKVVRHAH

>CYP206D3 (Mchl\_1531) *Methylobacterium extorquens* CM4

MSSAGTFRVCEAGGPPLQEALAEVALPSVLATMLRSLIEAWPDEVYTRPLVTTTRFLGQRTTYVCAPGHIRSL  
IVDQAGALEREFPMLRALAPALGSGILTSDGPHWRGQRRTAAPMFRPDRVRAFI PAMAEAAHATRLRWLGQMS  
AHGSADARFDGERDILPEMMRTTTFDVIVATMVSGDSQLKVEPFGRAIDAYLGQTPWKIALSMLGAPAWMPHPPG  
ARAGARAVRYLRSEVARTVERRRRARGE PGADLLGLLLQAKDPETGERLSDES LIDNLLTFVAAGHETTALALI  
WTLRVLADHPAVEARILDEIAGLGADPAPEALDRLAFTTRQVVLEVMRLYPPAPLIVRRTAEEVRLGDTVIPAG  
ESVHVPVYALHRHQSLWDRPDVDFDPDRFAPELTASRDYAYLPFGAGPRVCIGMGLALTECLVILATLLPAFR  
FVPAKAEMPATQFRVTLRPGGMKMKVVRHAH

>CYP206D3 (Mext\_1330) *Methylobacterium extorquens* PA1

MSSAGTFRVCEAGGPPLQEALAEVALPSVLATMLRSLIEAWPDEVYTRPLVTTTRFLGQRTTYVCAPGHIRSL  
IVDQAGALEREFPMLRALAPALGSGILTADGPHWRGQRRTAAPMFRPDRVKAFI PAMAEAAHATRLRWLGQMS  
AHR SADARFDGERDILPEMMRTTTFDVIVATMVSGDSQLKVEPFGRAIDAYLGQTPWKIALSMLGAPAWMPHPPG  
ARAGARAVRYLRSEVARTVERRRRARGE PGADLLGLLLQAKDPETGERLSDES LIDNLLTFVAAGHETTALALI  
WTLRVLADHPAVEARILDEIAGLGADPAPEALDRLAFTTRQVVLEVMRLYPPAPLIVRRTAEEVRLGDMVIPAG  
ESVHVPVYALHRHQSLWERPDVDFDPDRFAPELTASRDYAYLPFGAGPRVCIGMGLALTECLVILATLLPAFR  
FVPAKAEMPATQFRVTLRPGGMKMKVVRHAH

>CYP206D3 (Mex\_1p1130) *Methylobacterium extorquens* AM1

MLRSLIEAWPDEVYTRPLVTTTRFLGQRTTYVCAPGHIRSLIVDQAGALEREFPMLRALAPALGSGILTADGPH  
WRGQRRTAAPMFRPDRVRAFI PAMAEAAHATRLRWLGQMSAHGSADARFDGERDILPEMMRTTTFDVIVATMVS  
GDSQLKVEPFGRAIDAYLGQTPWKIALSMLRAPAWMPHPPGARAGARAVRYLRSEVARTVERRRRSRGEPGADLL  
GLLLQAKDPETGERLSDES LIDNLLTFVAAGHETTALALTWTLRVLADHPAVEARILDEIAGLGADPAPEALD  
RLAFTTRQVVLEVMRLYPPAPLIVRRTAEEVRLGDTVIPAGESVHVPVYALHRHQSLWDRPDVDFDPDRFAPELT  
ASRDYAYLPFGAGPRVCIGMGLALTECLVILATLLPAFRFVPAKAEMPATQFRVTLRPGGMKMKVVRHAH

>CYP219A1 (Saro\_2451) *Novosphingobium aromaticivorans*

MEAEAAIPPLDTS DPALIPDPWPTFTTLRERDPFHWSKYGYWVVS RHEHVRDVL MNRKDFGTG DFAANLRLFY  
GPDFDVLANPAYRWLSEVFIMQDPPQHTRIRNLVVGSLTAKVRAMEPRIREIAQALTDGFKARGSADLITEF  
AYKFPVMVICDLMGIDYEASEMADLIAAIP EAF TVFEARILSPEELALANRRILELEAFFQAQFENRLAHPRG  
DLLTSLARTGQEPGGLSVHEAITVTIGLFGAGFETTANIIGNGLHALHANPEQWARLVADPSGMASGACEEAL  
RHQSSLIATYRTALADTSVCGHPVSAGQVRVLT LIG AANRDP RK FADPDRFDIARNDADHLTFGGGIHFCVGAE  
LARIEARVAFEHLARELPQM QVDTGGACWRENFLFRGLTGLEARWPAQA

>CYP219A2 (AMC99\_02081) *Altererythrobacter epoxidivorans*

MAREDVTSFAPDAPGMSLD PYP AF AE LREK DPLHRS DLGYWVVS RHEDV RGVLMGRDSFGQGDFVENIRLFY G  
PDFDVLGQRSYKWLSEVFLMQDPPHHTRV RGMVTGALTAKVRAMEGRICEIADELIDAMLAAGSADLITDFA  
YQLPVRVMCDMLGIDPEDPRLPAVIGAI AQSFIVFEARALTDTELATANEQISILQAFFEDLFEQRM AEPRDD  
LATALVQSGGNEDSLSHDELVTVAIGLFGAGFETTAHMIGNAVLSFARFPDEWAKLVADPSGMAAGAVDET LR  
FESSLIATYRTALAE TQLRGETILPGEKVLT LIGAGNRDPRVFDDPDRFDIARDARGHLSFGGGIHF CAGAE L  
ARLEGRVAFEQLARRIPTLKADASN PQWRD GFLFRGLSSLPVSW

>CYP223A1 (Saro\_3832) *Novosphingobium aromaticivorans*

MHRAMTTTVQDFDPEVPEDFDS PHAEYARLRRECPVAHTNGLGGFWALTRYEDVKRAASDSTTFITSVQNVVP  
KVAFTGRRPPLHLDPPEHTPYRKALNPLLSLSEAFAGKARELTRKLLAPMVENG GGDICVELSSYLPVHVF  
GEWMRMPEEWLDTLHDAGRAFILAVHSNTPERMKETSLRLYDMARGLIAVRREN PQDPALDPTSALLAARHEG  
EPLPEELLVGTVRQVLVVG MVAPMVMIGNICVHLSRDKALQQQLRADPSLVPA AIEEFLRLYTPYRGFARTAV  
CDVDMGGRTIPKDEAIALVYASANRDEDFPDGDKFILNRPNIAQH LAFGRGPHNCPGVHLGRMQLRVALEEI  
LAATREFELSGPVS VSRWPEVGALSVPLRFV

>CYP223A2 (PP1Y\_Mp1590) *Novosphingobium* sp. PP1Y

MKEIMQDFDPERPEDFDSAHA EYARLRRECPVAHTDGLGGFWALTRYDDVKRAASDPLFVTSVQNVVPKVAFT  
GRRPPLHLNPPEHTPYRKALNPLLSQERAEALAPHTRTLARELLAPMVAKGGGDICVEFSSHLPVHVFGEWMR  
MPEESLATLHDAGRAFILAVHSTKPESMKETSLRLYEMARDLIALRHREPQDPAIDPTSALLAARHEGEPLPD  
ELVLGTVRQVLVVG MVAPMVMIGSIAVHLSRDALQQQLRSDPSLIPSAIEEFLRLYTPYRGFARTPVCVEM  
GGRMIDKDEAVALVYASANRDEAVFPNPGEFIMDRPNIAEHLAFGRGPHNCPGLHIGRMQLRVALEELLVATK  
QFDLDGEIMMSRWPEIGALS VPLRFD

>CYP223E1 (WYH\_00908) *Altererythrobacter atlanticus*

MTEDNP NLPDRPEDFDAEAPETFESPHQLYRHLRAECPVAHSNAYGGFWALTRYQDIVDAVTDNETFITSKIN  
VIPNMSMGKRRPPLGKDPPEHTPFRRALDKTLRNARIQALEPVLRAHAVREMSRIVADGVTDISLDFATIFPA  
WVAVEWLNLDETHAPLLAEVARLYNVAWRAEDTEAVVRTSEKLYDIAASVVKDRKANPRSPETDPASALLAER  
TEFGPIPEEYVIATVRQVLVVG LMAPPLFGSMCVHLASDP ELQQLLRDEPQRI PAAIEELLRLYSPYRGFAR  
TTTRDYERHGRITIPAGEPVTMVYSSANRDERVFD DPDSFRFDRENIRSHLAFGRGVHQ CAGSGLVRLELRIFL  
EELLSRTSEIHLNGEIE MARMPELGPAA TPLRLV PAR

>CYP224A1 (Saro\_3682) *Novosphingobium aromaticivorans*

MTLLFQPSPPDHVPGERMVDFDMFHVPEGQDDPVEIWHDLVRRGVPRIFYT PRNGGHWVFLDYADIVEAYRDH  
TVFSTYQTPVPPIEPFPVVPQGVDP PAHNVFRLLAPMFTPTAVRGMIGELERRASELIDRFAARGECDFIT  
EFAERFPTSTFLHLFGLPEEQ LDAFLALANVFFRSTDAETRARNIGE IYAVLDTLFREKERNPGNDIASAIVA  
ARDEEGRQHPWEDILNCGFLLFVAGLDTVTNTMAYIWRYLATT PAARRHFRERLDDPDAFLRAIEELMRINAV  
SNLFRRVTHDCEYKGVQLRRNDRVVL PNTVANRDP RVFSDPQAIDLDRENVNHLTFGVGPHRCIGSVLAKREV  
MVSLQQWLRRIP EFELAPEQPAGSAFGG SVMGFTALRLRWVRVEA

>CYP225A1 (Saro\_2608) *Novosphingobium aromaticivorans*

MQFPFSRSTNP NVLDLSSLD AFNEGAPFATFDRMRREDPMAWSEMVNGDRGFWSVTRHADLLELNRQADLLSSA  
KGIRMEDQTEEEYEARKTFQETDAPHHRGFALVSKAFSGTVAGFEDQIRKIVTDLLDVALAEGEFDAVDRI  
ARRLPMQMLAQIMGV PQEDGFWLVEKGDALISNSDPDYTD FVVDQVDTEAYRMLPFRSPA AVELFDYANGLLD

RMDAGEQIGVLNLVREPTSTGTRMSRDEFNRFFCLLVAAGNDTTRYISISATIHALANNPHLLQALKDGDFTSW  
EAAADEMIRYASPTTHFRRTATRDFTFHDRHVKAGDKVLLWFISGNRDETAILDPTINLRERNPFLSFGQG  
GPHICLGMWLAKEVAIVMQELAKRLSSIEQVAEHSYLRSNFIHGKHLVPRIVAR

>CYP225A4 (METH\_03565) *Leisingera methylohalidivorans*

MTVWTPADDGHADLSSHDAFVHGPPHNTFARLRREDPLHWTEYAGGENFWSVTRYEDITVMNKNTEVFSSARG  
IRMEDQSYEEYLARRTFQETDPPEHSKVRMKLLKAFSKTTMAQYEQDIRDLCADILDQALAKGEFDTREIAR  
QLPMRMLGRVVGLPEADLPWLVEKGDALIAN TD PDFTSHVLD RMQTDEF RMMPFNSPAGAE LYVYAKELMEAK  
AKTGDTAGVLNLILAPAKDGSVITETEFNRFFCLLVAAGNDTTRYISIAAGIQAMCRQPELLAQMQAGGAVWDT  
AADEIIRWATPALYFRRTATRDVEMHGKTIAGDKVLYWVFASANRDDGYFEDPFHVNLRSPNRHLSFGQFGP  
HVCLGMWLARLEVTVL FQELAKRIRHIESAGPHKFLRSNFVGGIKALPVRVEAA

>CYP225A5 (TM1040\_3721) *Ruegeria* sp. TM1040

MTIWTPTDDGYADLSSHDAFANGAPHNTFARLRREDPLHWTEYSDGENFWSVTRYDDITKMKNTEIFSSARG  
IRMEDQTYEEYLARRTFQETDPPEHSQVRMKLLKAFSKTTMAQYEQDIRDLCAEILDEALAKGSFDTKEIAR  
QLPMRMLGRVVGLPDADLPWLVEKGDALIAN TD PDFTSHVLD KMDTDEF RMMPFNSPAGAE LYIYAKELMEAK  
ERAGDTSGVLNMILQPARDGSVITETEFNRFFCLLVAAGNDTTRYISIAAGIQAMCHQPELLAQMQAGGEIWET  
AADEIIRWATPALYFRRTATQDVEMHGKTIREGDKVLYWVFASANRDDS YFDDPF RVNL MRNPNRHLSFGQFGP  
HVCLGMWLARLEVTVL FQELSKRIKSIEPNGAHKFLRSNFVGGIKELPVRVEAA

>CYP225A6 (SPO0764) *Ruegeria pomeroyi*

MTVWTPPTDDGYADLTSHDAFAGGAPHNTFARLRREDPLHWTEYADGQDFWSVTRHADIAEMNRNTAVFSSARG  
IRMEDQSYEEYLARRTFQETDPPEHSQTRMLLMKAFSRTTMAQYEDDIRAICVDILDEVLDKGTDFDTKEIAR  
QLPMRMLGRIVGLPDADLPWLVEKGDALIAN TD PDFTTHVLD KLD TDEYRMPFNSPAGAE LYLYAKDLMEQK  
DKAGDTSGVLHMILQPSKDGSDTETEFNRFFCLVVAAGNDTTRYISIAAGIQAMCHQPELLEQMRAGGDIWET  
APDEIIRWATPALYFRRTALQDHEMHGKTIRAGDKVLYWVSSANRDET VFD DPF RVDLFRNPNRHLSFGQGGP  
HVCLGMWLARLEVTVL FQELAKRLSSIEPAGPHRFLRSNFVGGIKELPVTVRA

>CYP225A7 (LOKVESSMR4R\_00419) *Yoonia vestfoldensis*

MTIWTPTDDGHADLTSHDTFTAGAPHNTFKRLRHEDPIHWTEWDQKGFW SITRHADIMEMNRNTAVFSSEHG  
IRMEDQSPEEVIARRTFQETDPPEHMKTRIKLAKAFSKGVIEGFNSDIRDL CVTILDDVLHEREFDATKRIAR  
VLPMMLGRIIGTPEDDL PWLVEKGD ELIAN TD PDFTDHVLD KIT TDEF RMMPFNSPAGAE LFAYAKEMLERK  
KREGDTSGVLHMILQPGPDGSDTETEFNRFFCLLVAAGNDTTRYISIAAGIQAMCHQPELLAQMQAGGDIWET  
APDEIIRWATPALYFRRTALSDY EIHGKT IKAGDKVLYWVFSSANRDEAVFD DPF RVDLFRTPNKHLSFGQGGP  
HLCLGMWLARLEVTVL FQELSKRITHIEAAGPHQFLRSNFVGGIKSLPVRVTLA

>CYP225A8 (Jann\_2917) *Jannaschia* sp. CCS1

MTIWNAVDDGHADLSNHDTFVAGPPLATFDRLRRDDPLSWTDWDGGTGFW SVTRYHDILEMNRNTKVFSSARG  
IRMEDQSYEEYLARRTFQETDAPDHMQMRIKLARAFSKNVIAEFEE DIRGLCRDILDEVLEDESFDATKRIAR  
ELPMRMLGRILGTPDDDL PWLVEKGD ALIAN TD PDFTSHVLD KMSTDEF RMMPFNSPAGAE LYAYAKDLMATK  
TASGDTNGVLHLILQPGPDGSDTETEFNRFFCLLVAAGNDTTRYISIAAGMQAMCYQPELLDQMKQGD IWETA  
ADEIIRWACPTSYFRRTATQDYDMHGKTIREGDKVLYWVFASGNRDTAYFDSPNRLDLARSPNKHLSFGHGGPH  
LCLGMWLARLEVTVL FQELSRITKIEADGPQQLRSNFISGLKSLPVRITRA

>CYP225A9 (RCA23\_c26300) *Planktomarina temperate*

MHDDGYLNLSSHDSFAGGVPHKTFARLRKDDPLHWNEGDA DTKGFWNLTRHADIAFANKENQIFSSAQGIRLE  
DQSAEEYLARRTFQETDPPEHTKVRRLVNPNAKPIVGEFEPVIRELSSNIVDKALRNTEFDAVEVIAKQLPM  
LMLGRILGVPDEDLDWLVEKGDALIGNSDPDFTTEHVIDQVDT SAYRMPFNSPAGLELYDYASDLLSNRRPLA  
QEGILAKITGDENGLNELEFKNFFCLLVAAGNDTTRYISIAQALSLLAHNPDLIAQLKTGKYWDSCADEFIRLA  
SPTMHFRRTATQDFEMHGKKIRAGDKVLLWFVSGSRDEALFEDPNECILGRSPNRHLAFGQGGI HVCLGMHLA  
KLEVRIAIEELVKRVASF EATADPTWTRSNFICGVKQQHV RVTKVA

>CYP226C1 (Caul\_1912) *Caulobacter* sp. K31

MSTAQMTPNPKDLAEGFAQVGALFAGNDKNIDAIYRDHRQNMPVMRGDICAELGAASFAGQTGRPIYTI FRHAD  
VMKVL RDTKTFTSGILMETGLGQFLDGLMITGLDGDEHRQLRGILQPSFTPAVMEEWRETYIRPLIQRSFVEP  
LVALGKTELIGSVGVMFPIHVYAVLGFQDNDPAALETFATKALKVLGGMADDPDAKRAAFQAFQELYDPTLA  
AVQARRASGAEGADLISRILIRAEFEGRTLNDHQITNFVRMMLPAASETTSRFTATMLTHLFDHPEVLERLRAD  
RSLMRKVLDESVRHDAVATFKVRECQADVTLQDVTIPKGSII SACVASANRDELVFDKPEVFDIDRKQMPAFG  
FGFGAHMCMVGMWLAKVEIEEAVGLLLDMLPNLRDPDHPRPEVRGVSLRGPDAVHVIWDIP

>CYP226D1 (BSY18\_2515) *Blastomonas* sp. RAC04

MTVKLDPLDQMVADYSLVTNGYAGKAPNNPYPM LAEKRSTCPVMHGDILQQHQVPSMADYMMTGRPIVSLFRY  
KDIHAVLMNPADWQSYIVGDGFGA AVDNMLLTAMDGSEHGAFRSTLQKPFMRPQIRKLIDTLIRPVVMNDFVN  
RLRPNGKADLLREFALPFP IRAIYAYFGFPDDKDLLANLASWAIQVVAAPQSDPELAKITVPQSMVAGQSMYD  
TLLPVVQAYRARGEMREDILGYMMQTQHEGQMFTDEEITAYIRMLLLAAGETTTSRFANMMVQLLENPDVLEE  
VRQDRTLIAKAVTETMRRDPTAGALGRIAARDMEIDGITIPKGTAVLLAITAANRDPQVYEAPDRLWLKRPMR  
PLLSFGFGPHMCMGMHMAQAEMEVALDAML DLPNLRFPDPAFPHPPEIRGLNLRGPD A IHVLWDA

>CYP278A4 (Plav\_3499) *Parvibaculum lavamentivorans*

MQEIRKSDRADDLAALVAALPAGDTIASPYALYDRLRPYGPVYGYRDYPPGTVPDADEAVTAWVLLNYDHVSA  
AARDHRIFSSRDPLQE QSSAPTMLLVNHDNPEHDRLRSIVNLAFSRPRIEALDPWVREIVGGMVAGLGDGDE  
VMEALAARIIPARIMVGLLGLPEEVVDRFRHWATAFMLSADLDP AEREASNAELVRYFTETVDSLYGALEAGDP  
VPDGLIAALLKAEVDGEQLTLDEVIRFCITLVVAGSETTTFFLLGNLLHNLAVMPDIRAQLAANRALIGPFIDE  
SLRHSGPPQRLFRIATQDVEVGGARISKGDWVALFFAAANHDPAMFPDPEKFDISRPNLNKQLTFGVGIHHCL  
GSALARMEGRALIEAILDRMDDVSLGALPPVPQRASLLNHGFDSLT LRFTAREDETQ

>CYP278C1 (Hbal\_2472) *Hirschia baltica*

MSNIAEVNIDPDFKVKDLYSPEVIANPYPPYDHLRDKPVQFGLED FPPGTIPGQDKPFP AWVFLKHADVVEVC  
RRADV FSSRDVMQEESDAPTMLLVNHDDPRHAELRKIAQIAFAPKRVM TDVAPWMEKTVAGQLEEYGEELDF  
MQDLAPNLPALVMTKLIGTPESDYKLLRRWANAFMVTSEFTLEERNQC NIDLWQYYSQKVEERYSDIESGKDV  
PDDLMSAFIKAESDGNKLTKEEVVRFC LTLV VAGAETTG YLLGNLIDVLVDNPKLFKLLQDDRTQVRAFIDES  
LRRDGPVQRLHRVCVKDVEVGGASIKAGDWVAIFHASANRDP AVFENPNEFIMGRPNIGKHATFGHGIIHCHMG  
SGIARNEAAQMINGILDYRGVESNGERVRQSGGLLNYGLETCPIKFLK

>CYP286C2 (G432\_16275) *Sphingomonas* sp. MM-1

MATLLERPMAPETSDPSLARPA SEIPLVSVPFLGNTLEMAKDPA AFFLRCYREYGSVFKVKVFGRESIVIAG  
PESALFMTTREGRDALRSKEYNQGVAD EYGATEVINGVDGERHVRRLR TLMRQGF SREAVHGQYDDLVRITDSA  
IARRWQVGSRLPVVSAIQYMIVEQLGMILTGA PLDYVEDIRFAILTILNVLVTRQRPKIMLHDPRFRKARRR  
VEELGHTMIADFQRKVADGTAPKNLITDIIRANLDDKDIMP DQNLILT VTGPYVAGLDTAANTMAACIYGVLK  
NPEVLARVQAEADELFAKETLNEDDIRKLPVINGAVMEAMRLWP IAVAQMRVANFDFEYAGYTI PKDEMIYIG  
TSVPHFMEEFFPDVNKFDVDRYQRPRAEHLQKGAYSPFGRGPHSCLGQGLAEVLMAMSIARIFHRLDLALPHP  
NYELKTKTAPTGPAMDFAVKVIGERRPSGI

>CYP288B1 (BBta\_1606) *Bradyrhizobium* sp. BTAi1

MPGSAAQLARCPYHDAATDFDPFEMRDPFPFYEWARAEAPVFFSDELKYFVVARHADIKAVFDDWRTFSSENA  
QAPLRPMCEEGRIMREGGFTAYSGLSARVPPDHTRIRKLVQGC FGPRRFRAIEPEIKAIVNRAIDTFAERGH  
ADFFREFAYDVPALVLFKLVGIPNIDVPRVKS WAVSRALLTWGDLSDDEQIVHARNMVEYWN YCRALVRQRHD  
DPTDDLPGDLVRLQKDGA EISDEE IAGVLYSALFAGHETTTLMANGMRELLQRRENWEALIAEPQLIPNAVE  
ECLRFSPSIVAWRRRALKDTEIGGV PVPKEANILLIGSANRDET VFSAPARF DVRRTDARSHLAFGYGIHTC  
VGQQ LARIEFAIALGELTRRLPGLRLAADQTDDFVHNISFRVPTALRIEWDVA

>CYP288B1 (S58\_10750) *Bradyrhizobium oligotrophicum*

MPGSAAQLARCPYSDAAKDFDPFEMRDPFFPYEWARAEAPVFFSDELKYFVVARHADIKAVFDDWRTFSSENA  
QAPLRPMCEEKGRIMREGGFTAYSGLSARVPPDHTRIRKLVQGCFGPRRFRAIEPEIKAIVNQAIIDGFADRGH  
ADFFREFAYDVPALVLFKLVGVPNMDVPRVKSVAWSRALLTWGDLSDDQIVHAHNMVEYWNYSRELVRQRHD  
DPTDDLPGDLVRLQKDGAEISDEEIIAGVLYSVLFAGHETTTTLMANGMRELLQRRENWEAIIAEPRLIPTAVE  
ESLRFSPSIVAWRRRALKDARIGGMPVPKDSNILLIGSANRDETVFSAPARFDVRRSDARSHLAFGYGIHTC  
VGQQLARIEFAIALGELTRRLPGLRLAADQSIDFVHNISFRVPTALRIEWDMA

>CYP289A1 (BMEII0879) *Brucella melitensis* bv. 1 16M

MRAGGIMTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
AHLSPVSGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFL  
GWPDSLQGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNL  
HEEIVSILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVV  
VGGREIPAGEKITLMWASANRDEAVFDKPDDELRLNRDPALNLLYGRGIHVCPGAELARAGLRILMEELLGQTR  
KLDLVPGSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK63\_2369) *Brucella melitensis* \_bv. 1 16M

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDDELRLNRDPALNLLYGRGIHVCPGAELARAGLRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BM28\_B0360) *Brucella melitensis* M28

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BM590\_B0358) *Brucella melitensis* M5-90

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BMNI\_II0352) *Brucella melitensis* NI

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BAB2\_0833) *Brucella abortus* 2308

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSSVVSAHLSVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QGPLLDWVHKNHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVGGREI

PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BAbs19\_II07720) *Brucella abortus* S19

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK55\_2790) *Brucella abortus* bv. 2 86/8/59

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DO74\_2104) *Brucella abortus* bv. 6 870

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK49\_2450) *Brucella abortus* 63 75

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK48\_3007) *Brucella abortus* BDW

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK53\_2792) *Brucella abortus* bv. 9 C68

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK51\_2277) *Brucella abortus* BER



MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DO78\_2265) *Brucella abortus* NCTC 10505

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK62\_3038) *Brucella melitensis* bv. 3 Ether

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLILNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BAA13334\_II01526) *Brucella abortus* A13334

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BSSP1\_II0342) *Brucella suis* bv. 2 Bs143CITA

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BSPT1\_II0341) *Brucella suis* bv. 2 PT09143

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BSPT2\_II0343) *Brucella suis* bv. 2 PT09172

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVCCELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKHNAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS

ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BSSP2\_II0347) *Brucella suis* bv. 2 Bs364CITA

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK65\_2119) *Brucella pinnipedialis* 6/566

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (V910\_200853) *Brucella ceti* TE10759-12

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BMEA\_B0369) *Brucella melitensis* ATCC 23457

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVHK NHAATLARDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDRRNLTYEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK67\_2394) *Brucella suis* bv.3

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVHK NHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (IY71\_13010) *Brucella suis* ZW043

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGWPDSL  
QG PLLDWVKN NHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTTRAVVVGGREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (IY72\_12550) *Brucella suis* ZW046

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPPQHTAFRQLVERYFEPERIKAFEPICREISKKLVC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVNKNHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BCAN\_B0391) *Brucella canis* ATCC 23365

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPSQHTAFRQLVERYFEPERIKAFEPICREISKKLAC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKNHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (BCA52141\_II0654) *Brucella canis* HSK A52141

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPSQHTAFRQLVERYFEPERIKAFEPICREISKKLAC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKNHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DK60\_2113) *Brucella canis* RM6/66

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPSQHTAFRQLVERYFEPERIKAFEPICREISKKLAC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKNHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A1 (DA85\_12335) *Brucella canis* SVA13

MTSPTERPKQDWDPRSEAVLSDQIGAYDAMRHQCPVAHSDYLGWSLFSYDDVVRVLDDHETFSSVVS AHL SVP  
SGMDPSQHTAFRQLVERYFEPERIKAFEPICREISKKLAC ELPRDAEIDLVTQFAQLYAVRIQCAFLGW PDSL  
QG PLLDWVHKNHAATLACDTKAMAAIALEFDEYIRDLLDERRKLGADAPDDVTTRLLRDRIDGRNLTHEEIVS  
ILRNWTVGELGTITACVGILCHYLAKSQQTQALMRGGPDLLPAAIDEILRLHAPLISNRRVTTRAVVVG GREI  
PAGEKITLMWASANRDEAVFDKPDELRLNRDPALNLLYGRGIHVCPGAELARAELRILMEELLGQTRKLDLVP  
GSVPALAVYPASGFSRLPARIS

>CYP289A20 (HYPDE\_25418) *Hyphomicrobium denitrificans* 1NES1

MKADSNKREQDWNPRSDLVLSNQIKAYDTMRRRCPVAYS DYLGWSLFRHEDVVRVLNDHHTFSNVVSRHLSVP  
SGMDPPQHTAYRRLIERHFEPMRVQAFEP CRAISADLVSRLERDAEIDLVTQLARLFAVRIQCAFLGW PEEL  
HD PLLRWVRKNHEATLARNVEAMAAVALEFDGYISELLDARRRAGAAAPDDITD LREKIDGRPLSHEEIVS  
ILRNWTVGELGTITACVGILAHYLAERPQIQQLRLNLHQLPAAIDEILRIHAPLISNRRVAISPIEIGGRKI  
AAGERITLMWASANRDEAVFGDPDEFRLDRDPAQNLLYGRGIHVCPGALLARLELRVIMEELLKQTRQIAFVA  
DRPPTLAVYPAGGFATLPMRIS

>CYP289A21 (Hden\_0569) *Hyphomicrobium denitrificans* ATCC 51888

MTADGKLLARGGRNDAKQQSISIVPAECFQEMTVKTELTKREQDWNPRSDLVLSNQIKAYDAMRQRCPVAYS D  
YLGWSLFRHEDVVRVLDDHETFSSVSSHLSVPSGMDPPEHTAYRKLI DRHFEPARVEAFEPQCRAISRDLVS

RLQRNAEIDLVDLARLFAVRIQCAFLGWDELHEPLLQWVRKNHEATLARDVEAMAAVALEFDGYITALLDA  
RRQAGASAPDDITTDLVREKINGRPLKDDEIVSILRNWTVGELGTITACVGILAHYLAEHSQVQQLRANLDQ  
LPAAIDEILRIHAPLISNRRVAHRPVEIDGRKIAAGERITLMWASANRDEAVFENTDELRLDRDPEQNLLYGR  
GIHVCPGAGLSRLELRVIMEELLRATETMAFI PGRPATLAVYPAGGFAALPMRIA

>CYP289A22 (OV14\_a0758) *Ensifer adhaerens* OV14

MESAAGEASNQHKSSMETVSDWDPRSREVLANQIQAYDQMREACPVAYS DYLGWSLFRHTDVLQVLNDHETYS  
NVVSRHPSVPNGMDPPEHKKHYRQMI EPYFAVERIEAFEPACRWIARDLVASLKKDPSSEFLMGFAEPYAIRIQ  
CGFLGWPRSLHEPLRQWVRKNREATLVRDANALASIALEFDGYIRSQLEIRQQAGAAAPDDITTS LVRQAVDG  
RLLRHAEIVSILRNWTVGELGTISACVGIIVHFLAEHPEVQS QLRDR AFLPQAVDEILRLHGPLISNRRVAS  
RSAIGERTIKAGERMTVIWASANRDGAVFEDADQFRPDRDQSQNLLYGAGIHCPGAALARMQLSVVLDELL  
SGIGNFVLPLGTEAIRAVYPAGGYASFNLQIN

>CYP290A1 (CC\_0946) *Caulobacter vibrioides* CB15

MDLISQTVVDGKAGPGAPPTYPTLKDVDLADIFRFTKGQPWADFARMRQEAPVMWHPEPMGGPGFWALTRYED  
VHRVNGDPETFSSQRGGILMSMGAPEKRRHALLFRASMDTMINMDAPHHLQLRREHMPYFTPSYLRGLTERVKG  
EVTRLLEMEPELLANGAEIDMVEHFSSVLPLFTLCEILGVPPEDRPKFLTWMHYLERAQDLAVKQANAPMQPT  
LELMQFVMDFNNNVEEMFEYGRTMLHKKREDPKEDLMTA IARAQLDGAVLPDEYLDGSWLLIVFAGNDTTRNT  
LSGAMRLLTEFPDQKQKLIADPSLLGGAVDEFIRMVSPVYMRRTATRDVEVNGQLIREGEKAIMYYGAANRD  
PAMFENPDQLDVTRANAGKHIAFGYGPHTCIGKRVAQIQLEEAYRQILARFPDLNWTGNIEIAPNNFVHAISK  
LGVKRG

>CYP290A1 (CCNA\_00995) *Caulobacter vibrioides* NA1000

MDLISQTVVDGKAGPGAPPTYPTLKDVDLADIFRFTKGQPWADFARMRQEAPVMWHPEPMGGPGFWALTRYED  
VHRVNGDPETFSSQRGGILMSMGAPEKRRHALLFRASMDTMINMDAPHHLQLRREHMPYFTPSYLRGLTERVKG  
EVTRLLEMEPELLANGAEIDMVEHFSSVLPLFTLCEILGVPPEDRPKFLTWMHYLERAQDLAVKQANAPMQPT  
LELMQFVMDFNNNVEEMFEYGRTMLHKKREDPKEDLMTA IARAQLDGAVLPDEYLDGSWLLIVFAGNDTTRNT  
LSGAMRLLTEFPDQKQKLIADPSLLGGAVDEFIRMVSPVYMRRTATRDVEVNGQLIREGEKAIMYYGAANRD  
PAMFENPDQLDVTRANAGKHIAFGYGPHTCIGKRVAQIQLEEAYRQILARFPDLNWTGNIEIAPNNFVHAISK  
LGVKRG

>CYP290A1 (Cseg\_3349) *Caulobacter segnis*

MDLISQTVVDGVAGPGTPPTYPTLEGVDLADIFRFTKGQPWADFARMRREAPVMWHREPF DGGPGFWALTRYED  
VHRVNGDPEAFSSQRGGILMSMGAPEKRRHALLFRASMDTMINMDAPHHLQLRREHMPYFTPAYLRGLTERVKG  
EVTRLLEMEPKLAGGAAIDMVEHFSSVLPLFTLCEILGVPPEDRPKFLTWMHYLERAQDLAVQQANAPLQPT  
LELMQFVMDFNNNVEEMFEYGRTMLHKKRQDPKEDLMTA IARAQVDGEVLSDEYLDGSWLLIVFAGNDTTRNT  
LSGAMKLLTEFPDQKQQLIADPSLLPGAVDEFIRMVSPVIYMRRTATRDVEVNGQRIREGEKVIMYYGAANRD  
PAMFENPDQLDVTRANAGKHIAFGYGPHTCVGKRVAQIQLEEAYRQILARFPDLNWTGDI E IAPNNFVHAISK  
LGVKRG

>CYP290A2 (Caul\_4405) *Caulobacter* sp. K31

MTMQLVSETATDGVPGPGAPTLFPILADIDLSNIQQFTQGQPYGDFARLRAQAPVMWHHEPYGGPGFWAITRH  
ADIMAVEADPQSFSRKG GILMAHGDPQKRHALLYRASMDAMINLDGAEHMQLRREHMAYFTPAYLRGVTEAV  
RAEVGRLLDEMAPLGHCDLVEAFSSKLPLFTLCEILGVPAEDRGKFLTWMHYLEMAQDLALKQHLAPITPTLE  
LMQFVQDFNTNVEEMFEYGRAMLHKKRLEPKNDLMSA IARAQVDGNLLSDQYLDGSWLLIVFAGNDTTRNTLS  
GVMKLLTEFPDQKARLIADPSLMPGAVNEFIRMVSPVIYMRRTATRDAE IAGQAI REGEKVIMYYGAANRDQA  
VFDNPDQLDITRSNADKHIAFGYGPHTCIGKRVAQIQLEEAYRQILARFPDIHWTGEIEIAPNNFVHAISKLD  
VAFTPGGRA

>CYP290A3 (HNE\_0938) *Hyphomonas neptunium* ATCC15444

MNVTETYQVESPPKEPKFGKAYALT PPLDLTQPTVFSEHG GYTYADFAKMREKAPVMWHPEEYAGGFWAVTSY  
DLVKKVELTPETFSSQKGGILMNYGMEGVPRHPLLHSSSLNSLINLDRPYHTPLRMEHMAYFRADFVAELRKR

VDVEVNRLLDTMEAQGPVDMVEMFSAELPLFTLCEILGVPPADRPKLVHWMHFLETSQYQAQQEGLGNVSQE  
QIMAFLENIQAMFEYGRYLLEERRKNPQPDLLSAIANVQVDGKPLSPEFLDGSWLLIVFAGNDTTRNSLSGTM  
RLLTENPELREQLKEKPERFPNFVHEAIRMVTPVTYMRRTATQDTELGDQKIAEGEKVIMYYAAANRDPSKFE  
NPDRFDIDRSNAKEHLAFGHGPHVCLGQRVANMQLESAYRQILSRFPNVRWTGEQTIAPNNFVHAISSLMVDL  
GK

>CYP290B2 (Mmar10\_1670) *Maricaulis maris*

MQLVSDVILEDRPQTEPGFGATYPGFDDFKLWDPAAWTSGHPHDFFRKMREQAPVMWQSADKSKAGYWSVTRY  
DDIKTVELAPEIYSSERGSINMFVMPRKEWKPKKLI PAAFNSI INLDQPHMQMRIQQKDFFI PRFVSELQER  
VDAKIDDLDEMERRGPVVDVFKLSQELPLFTLCEMLGVDEADRPKI IEWMHYLELANQYFVNPWSLLSRRP  
WFPIKFYHHVNAMFAYGERVMAERRANPRDLMTAIA NTEMAGKPLPQEYLDGSWLLII FAGNDTSRNSLSGT  
IRLMTQFEDQREAILSDPSLI PAMTNEALRMI SPVQHMRRTAMEDTELNGQRIARDEKVVLWYPAANRDPSVF  
PDPDRFDMTRENGDKHLAFGHGAHKCLGSRIAQMQLQSAFRKIFERFPKIAWTGRQTIAPNTLVHAISSEVN  
LYGRDGERPRPVQERWP

>CYP1010A1 (Plav\_0082) *Parvibaculum lavamentivorans*

MAMRAERFDEEAPEIFIPARVPVPKEAPGIGA AVFRPQLLANLIASYPEFWYSARSCPFVRVGIARGGRGMLVN  
DPDAIRRILVSDAEHF PKDDNQLAILKPLLGNGLLTAEGATWRRNRKLA APIFQHSSVRDFAPL FVRAAERSA  
RRALEQQGFFPLDREMTKLTLEIIGETVLSANLEDDIDGISHTVTSVLDKFPAMFLASAF LPGAQLRNRVIDTV  
VRPGRRALDV FARRIID EARKSGEETTLLQRLMVSQSKAGHEMTLDQVRDEVATFLLAGHETTATTMSWVWYL  
LTVHPEWQERLYEEVWAVTEGRRLTIDDPALVETRAVIEEALRLYPPVANLMRRAIKTTELTPDITIERGQT  
VLISPWLLHRHRFFWREPDRFDPTRFLGEEAATRPRHLYIPFGGGPRICIGASFALLEAVLILATFMQRARVK  
VINADQVMPQARIVLRPNVALQAVVTPRRPGG

>CYP1017A1 (Swit\_1021) *Sphingomonas wittichii*

MSGSRDIDHHAVAFARDHLAIYRDARAHCPVLRSDAHGGFAILTRYADNRAALRNHDTFASGRIRAGDRLGGG  
VAIPPNGLRIGMIEMDGAEARALRALLQPWFTIAAVEAAA PRMAQLSAWLVDRI IARGACDVVEDLAKPMPSL  
LILDLGLPLDRWRDYGRVLHEAVAKSSGSIDGLRWLASDLRASVERREVHPEGLIAAMIAAEVDGRPLGDAL  
VCELAMMLLFGGTDTTIAAIGHALRHLTEHPADRAALVARPALIPAAVEEILRLYSPSTGVARTVTAPVEIGG  
ERFEPGQRVLCAINS ANRDEEMFADAERFDLDRPKRPHLAFGWGVHACLGQNLARADLRILLGELLARMPDFA  
VDVAASERYASIPLVNGHARMPPMRFTPGT PAGTGGGELPILTAPRLRPLP

>CYP1036B2 (BF49\_6347) *Bradyrhizobium* sp. BF49

MSTVTNCPAYDVDLYDDDVL RDPYPHYRALRELGA VVWLPRNGLYALGRFEDVRAALRNPGSFSSAEGVAANA  
AVNEMSKGTTLASDAPLHDLRLAI IAPMLPRALEEIGPQIRAEARQLVDGLVRRGQF DAVADLARHLPLTIV  
SKLVGLEDHGRGSMRLRWAAATFNVLGAMNERACAAMTDVQEMRGYLGGAAIRERLRPGSWGERIFEAGDRGEV  
EPERCPVLMRDYLGPSLDTTIFATANLILLFGRHPEQWDLVRQDPALIPNAIN EALRLESPIRGFTRYLAADT  
KIGEAVIPAGNRVLLLYASANRDERKWQDPERFDVRRRASDHLGFGNGTHMCAGLHLARLEMTALLEVLVEKV  
ARFDIGEPVLALNNVLRGLASLPVRVA

>CYP1036C2 (Swit\_3025) *Sphingomonas wittichii*

MAAQAASIDIDLFDAETRDDPYAAYRRLRDAGPVCHIERHGLYAMGRYRDLRDALTNWTD FSSGSGVAMNDLM  
NRLMAGTVLASDPPQHKLRLQILGMPIGPARLGKLRPHMRGLAMERVRELKGGGRFDAMRRLAMLLPLSVVSD  
LVGLPEEGRERMLDWAAAAFNGMAPAGVPLSDGAFFVMKEMVDYITDPDLIGKLRPDGWAAQLWSSVADGTLT  
EEEYRSIIQGYVSPSLDTTIFAVGNLLWLLATHPDQWRALKATPALQARCINESLRHESPALGFSRLAKRDLV  
IDGVAVPAGARIMTVLPAANRDERHYADPERFDIQRDASDHLAFGGGVHRCIGGSLAMLEIGAVLEALVELVD  
HIEPGDGRRADNAVLRGFDHLEISLH

>CYP1061B1 (Jann\_2272) *Jannaschia* sp. CCS1

MAWPHIITDMHDISAGLRHPDLKQALYDDGAVIMADTLLTLHGEPHRNRRKLEFRVFRKDYFHWYERTVFPDT  
VRSSLSDDLAAGRSELVDLG YRVTMNLTADFAGIDRPEQSAEETGRLLRLVATFSEGATIVHSKRPKDDVRAE  
VRAAIADFEPHFLSASVARRRALLADHAAGRIDEDALPRDVLTVILRDGDPTEFTPEVLTREIGFYLQAGAHS

TANSTIHAFHDIYTWAEERSEWRDQLREDPIFFQRCVHESLRLHPASPVAWRAATCPMSLPGAGEVAEGEMVE  
FRLAEANRDPVFGPDADVFNPYRTVKAPTLFPGHTFGTGVHTCLGRDLDDGGAVPKGDVDPETHPYGTITLLL  
RELFAHGARPDPDPPQISTKTERPNWGHYPIIFDPKKAWR

>CYP1061B2 (A6F65\_02129) *Altererythrobacter namhicola*

MQVHRLADYRDCEAALRNTGLRQALYDAGEVITKDTLLVLHGEAHQKRREVEIRVFRNFFKYEKEVFPATL  
EETIAPFVAAGGGDLIELGYRLTVNLTADFAGVDRPARTPEETAQLIRLVKKMSEGATMVHSTRDKDELTAEV  
REALAEFDRDFLQASIIARREDLIAQVERGEVEEDTLPRDVLTVILKAQDELQFTQAQRVREIGFYMQAGSHST  
ANSVVHALEEIQTWAGEDQARWKRLDPVVFVQHCVHESLRLHPASPEAWRKSVCMSVQAGDMPEGDRVELD  
LFNANRSEAIFGSDAGTFNPD RDVPVGMRSGLAFGIGVHVCLGRELDGGLVAKPGTDPAKAQFGIVPLIVIK  
LLELGARRLRDDPPTDPTKTKRPNWGRYPVKFTKEIA

>CYP1068A4 (ACP90\_17935) *Labrenzia* sp. CP4

MSPSTDLSFAPLSDAFARDPYPFYAALRDRKGLTYFEDFDIWLAAATFDDVSEIVQNGKMVRSMDHIAAEEIA  
DMKRAQNWHDMPHHSRFVQFSLDSDGDVHDRLRKQVFRFLT PVMVGKLRDDIQAYVDRLFDSLSDRTEIDFI  
EDLAAHVPGHIIIGRVLGVPDEDCPQLRIWSENIVQYFDIDRTDERKELAEERNTEFYLYLQTLKAERERAPQD  
DLLSLMIEAERAGQMNEDEFISTAMLILMAGHGSTIDVLGSGMHALLKFKPKELQRLREDPTLMKTAVQEMFRY  
ESPLPFFHRYSTENMTVCGDAYPRGTFKGVLYGAANRDPAQFPDADRFDVGRTPNWHIAFGRGAHFCLGNHLA  
RLDMDIIFSTLLKRFSTIELIDDNVYKRGLSVRGPEALRLAWQPA

>CYP1068A5 (OV14\_a0406) *Ensifer adhaerens* OV14

MAETLSTESQVEVAFTPLSPDFARDPYPTYKALRDKDGLHYFEDFDIWLASRFEDVSAIVMDKRMVRSLEDSA  
TSEEIARIQRAANWHDMPHHSRFVQFSLDSDGAVHDRLRRQVFKLFT PAMI AKLRDQIQAYVDRLIDSLADR  
GQIDFVDDLAAHVPGHIIIGRLLGVPDEDCPQLRIWSENIVQFFDVDRSDERKRIAETNTTEFYEYLTALKHER  
ERNPKDDLISVLIEAERAGAMNSDEFISTCMLILMAGHGSTIDVLGSGMHALLRFPEQMARLRKDPALIQTAV  
QEMFRYESPLPFFHRHCIEDVEIGGRTFARGTKFGVLYGAANRD PKQFENADAFD IGRTPNRHLAFGGGVHFC  
LGNHLARLMDIIFSTLLRRFPTIELVDEEPEYKRGLSVRGPKRLQIAIKPA

>CYP1068A6 (RTCIAT899\_PC02800) *Rhizobium tropici*

MAMATPAFDPLSQAFTDDPYASYRVL RASPGPVYYEQFDIWLLSRYQDVAAAAADKTLVRSLEFFLSPEEIRE  
QKVRQNWHDMPNHSRFVQFSLDSDGETHDRLRRKVFREFTPALVARQRGMIQDFVDRLLDRLQAGTIDFVE  
DLASQVPGHIIIGSVLGVP EEEYAGQLRKWSEDDVQYFDVDRSDERKAI AERATTEFYELLKELIVERISTPRDD  
LLCRLSEAHVAGELTEDELVSTCMLILMAGHGSTIDVLGSGMHALLQYPEALKKLRETPTVMSTAIQEMFRFE  
SPLPFFHRYL TEERTIAGKLLPKGTKIGLLYGAANRDPEQFESPDEFDVGRTPNRHLAFGSGAHFCLGNHLAR  
LDMEIIFSTLLQRTSIELLDDNPAYKRGLSVRGPKRLDIRLIAA

>CYP1068A7 (Astex\_0364) *Asticcacaulis excentricus*

MRLPDPSAADPALFDPLGPEFTRNPYPAYARLRALNTPYFAPFDIWL FARFADVQAAALNPLSLRSLDDRLT  
PEEIEADRRAQNWHDMPYHARFVQFSLNDSGAMHQRLRRLVFGEFTPPQVERLKSGVEAYVSDLFDVAGSEF  
DFINDLAVHPGRVIGRFLGVPDADCAQLRIWSEDIVQYFDIDRTDARKALAE RTTRTFYDYLIDLSNERRKR  
PQDDLISRLLRRWDAGELSEDEYISTCMLILMAGHGSTIDAMGNGLTALLNHPEQLQRLRADPGLMPTAIQEM  
FRYDAPLPFFHRLASEDMDVNGWEIPKGTKIGLLYASANRDPEAFDNADRFEIGRTPNRHLAFAAGPHFCLGN  
HLSRMNMEATFMTLLSRFQSIALTAEPQFKPSLSLRGPKALPLRVN

>CYP1075A1 (Swit\_0997) *Sphingomonas wittichii* RW1 *Sphingomonas wittichii*

MPDRNFTQADYNHHDPKIAQDPYGF LAKVRGGQCPLGHSDELGGFYFPTTYDGVKRVFSDYRTFTSNEGAGLP  
AQLVRFPPVDLDPPNHTRWRRTLNRFFTQEAAEADRPRIQGLADKLIDAFVERGSADLVNEFTRPFLAMTMLP  
VIGCPDDDRPMLSEKLMWVHNRLLDHGDGWVRRYTEIGDYL MGLAAARRVAPRRDDLQCLIEEEFDGKRLSD  
MEVYQVLILALFGALDSTSSAMSGSLFHLGQHPEDKRRLLSGEVAPV AIEEFLRFTTPIQTLRRTVVQETEL  
DGGALHPGDIVLCINGAANRD PDKFVDPDRCIIDRDARDHMSFGSGAHVCIGRHYARVMIDTCLKTM LGRIGD  
YRIAPGFTPDYTSSEARALKTLMVEFTPGPRLLAG

>CYP1076A1 (Swit\_1743) *Sphingomonas wittichii* RW1 *Sphingomonas wittichii*

MSYQEHQAAQRLETIPPHVPADRVVDLDYFSPPGVAEDPHLAWKRLHDGPDIIYTPHYGGHWIVTRADDMFAV  
MQDYETFSNWEFTVPKRGPGNPVLMPNQLDPPRHGPIRSVVL RPMSPKAVEPIEPVIRKIMADRIASIVPKGG  
CEFVGEFGGDIPPELFFEHARIPKDKLPEMKRFADAVARSDNEEDRRAARIGGANYYMAILDERRQVEELDDD  
VFSVIVRAEREGRITREESTSIALNVFFGGLETVSSALAFIVLFLARHPEHRRQLIEDASLTQDATEEFLRRF  
GILNLARIATRSTTFKGLTIEQGEQVLLPLHLAGLDERKFPNPLEVDFHRKRAGHFNFGTGPHRCLGSNLARP  
EIRIFIEEWLRQIPDFSVDPD DPKPVGASGVAMTMTRVPLVWPSR

>CYP1077A1 (Swit\_1964) *Sphingomonas wittichii* RW1 *Sphingomonas wittichii*

MASAPDDQADKAVMDFDPAVCTYDRWIEKFGEAREKCPVFASEAHGGYWVAASYEHATNISRDWETFSSRKVW  
DPEAGKLEGGSVIPPFAGPPFVPVETDPPEWKLYRHLLNPFPGPKAVETYRTRARQVMRALVDRVIETGACDI  
VNDLANPLPALSTLDILGIPYDQSNWRRFSDPFHKLAYARGTAEFPQCLADLDWIRGQLAEQVERDRANPREG  
LFSSLCNGEVAGKAFSVPEIVGLGMMVLVGGVGTTNALFSNSCVWLSKHPEVRRKLIDNPDMLPIAREEFVRF  
YSPVHSAARLV TREVVVNGQRLEPGEQIMVAFSSANHDETVFENAGEIDVERFPNPHVGFSGSIHRCCLGSFLA  
RMFFETMFAEVMARMPDFLVDEERAVRYPDISTKNGWITIPATFTPGPRMGEGPTL

>CYP1078A1 (NGR\_b07660) *Sinorhizobium fredii* NGR234

MAHAVPVVSDIAVSDLLADPYPIYKRLREMAPAVYVDSARLALVTRFDDIMAIERDSETFASSNPGSLVNKVM  
GHTMMRKDGEAHAMERRAVEISFRPGTIKNHWAAQFEATSDRLIADIESQGAADLFDTLAAPMASLALIELLG  
LKDVSWQTLACWSQALMDGAGNYSGDPEISARATEAAAAGVDAAIDAVIAWHRENPNPAVLSSMVNAENPMNIE  
QIRANIKV IIGGGLNEPRDSILSLTLGLLSNPAQRAEVMANPDLGLAFEEAIRWISPIGMYPRRVTRDVELS  
GVELRAGDQIGLCVGAANRDDRFDNPD SFDLFRPKQPHLAFGAGPHFCAGAWVARQMVGRIVVPMLFSRLKN  
LRLRPDAPARIHGWVFRGPVSLPVAWDI

>CYP1078A2 (SAMCFNEI73\_pC1877) *Sinorhizobium americanum*

MAHAVLVVSDIAFSDLLSDPYPIYKRLRDMAPAVYVEAARLALVTRFDDIMTIERDCETFASSNPGSLVNKVM  
GHTMMRKDGEAHAMERRAIEVSFRPGTIKNHWAAQFEAISDR LISQIESDGEADLFDALAAPMASLALIELLG  
LKDVSWQTLARWSQALMDGAGNYSGDPEISARATEAAAAGVDAAIDAVLAWHRENPNPAVLSSMVNAEHMPNLE  
QIRANIKV IIGGGLNEPRDSILSLTLGLLSNPLQRAEVMANPDLWLAFEEAVRWISPIGMYPRRVTRDVELS  
GVKLRAGDQIGLCVAAANRDDR FANPDNFDVFRPKQPHLAFGAGPHFCAGAWVARQLVGRIVVPMLFSRLKN  
LRLRPDAPARIHGWVFRGPVSLPVAWDL

>CYP1078A3 (SFHH103\_06380) *Sinorhizobium fredii* HH103

MAHAVPVVSDIAFSDLLADPYPIYKRLRDTAPAVYVDAARLALVTRFDDIMAIERDSETFASSNPGSLVNKVM  
GHTMMRKDGEAHAIERRAIEVSFRPGTIKNHWAAQFEAISDGLISAIENQGEADLFDALAAPMASFALIELLG  
LKDVSWQTLARWSQALMDGAGNYSGDPEISARATEAAAAGIDAAIGAVLAWHRENPNPAVL SAMVNAENPMNLE  
QIRANIKV IIGGGLNEPRDSILSLTLGLLCSPAQLAEVIANPDLWLAFEEAVRWISPIGMYPRRVTRDVELS  
GVQLRAGDQIGLCVGAANRDDRFEKPD SFDLFRPKQPHLAFGAGPHFCAGAWVARQMVGRIVVPTLFSRLKN  
LRLRPDAPARIHGWVFRGPVSLPVTWDV

>CYP1078A4 (USDA257\_c26500) *Sinorhizobium fredii* USDA 257

MALAVPVVSDIAFSDLLADPYPIYKRLRDMASAVYVDTARLALVTRFDDIMTIERDSETFASSNPGSLVNKVM  
GHTMMRKDGEAHAIERRAIEVSFRPGTIKNHWAAQFEAISDR LVSEIESRGEADLFDALAAPMASLALIELLG  
LKDSLWQTLAHSQALMDGAGNYSGDPAISARATGAAAGVDAAIDAVLPWHRQNP NPAVLSSMVNADHPMNLE  
QIRANIKV IIGGGLNEPRDSILSLTLGLLSNPVQLATVMANPDLWLALDEAVRWISPIGMYPRRVTRDVELS  
GVELRAGDQLGLCVGAANRDDR FENPDNFDLFRPKQPHLAFGAGPHFCAGAWVARQMVGRIVVPMLFSRLKN  
LRLQPDAPARIHGWVFRGPVFLPVAWDV

>CYP1078A5 (IE4771\_PD00147) *Rhizobium etli* bv. mimosa IE4771

MLTEETAATPPVISDVTF AELLADPYPTFKRARDMAAVVRIEANMLVATRYEDIMAMERDPELFSSSEN PQSL  
VNKVMGHTMMRKDGEAHARERKAVEPALRPGAMKSCWGPRFETIFDEIVSSFEKHGEADLFDALAAPMAGRAL

AEVLGFLDVDWQTMAFWSQSLIDGAGNYSGDPEISHKAVEAAKGVEEAINRALPYHRQNPNNTSVLSSMIYAED  
PHTIEQIYANIKVAVGGGLNEPRDSILTMVLGLLNPEQLARVKADPNLWPTAFEESSVRWISPIGMYPRRVTR  
DVVVSQVRLREGDQVGLCVSAANRDDS RFVDPDRFDVFREKKSHLAFGAGAHFCAGTWVARHVMGRLVVPRLF  
ERLQNLHLKNTAAARIHGWWFRGPVSLPVVWDA

>CYP1078A5 (IE4803\_PC00147) *Rhizobium etli* bv. phaseoli IE4803

MLTEETAATPPVISDVTFAELLADPYPTFKRRARDMAAVVRIEAAANMLVATRYEDIMAMERDPELFSSSEN PQSL  
VNKVMGHTMMRKDGEAHARERKAVEPALRPGAMKSCWGPRFETIFDEIVSSFEKHGEADLFDALAAPMAGRAL  
AEVLGFLDVDWQTMAFWSQSLIDGAGNYSGDAEISHKAVEAAKGVEEAINRALPYHRQNPNNTSVLSSMIYAED  
PHTIEQIYANIKVAVGGGLNEPRDSILTMVLGLLNPDQLARIKADPNLWPTAFEESSVRWISPIGMYPRRVTR  
DVVVSQVRLREGDQVGLCVSAANRDDS RFVDPDRFDVFREKKSHLAFGAGAHFCAGTWVARHVMGRLVVPRLF  
ERLQNLRLNTAAARIHGWWFRGPVSLPVVWDA

>CYP1078A6 (A6B35\_25075) *Mesorhizobium amorphae*

MSEAVKVVDVDTFEELLANPYPVFKRVRDLGSVVKVDAANIMMVTRFDDIMAIERDPETFSSINPQSLNNTVI  
GPNLMRKDGEDHARERAAMDPSLRPGVVKRCWAEPMQVICDDVISQIEHKGEAELEELAAPIAARALADILG  
FDGVDWQTMALWSQSLIDGSGNYSHDPEIARKAREAAASGVESAVDRMLPHHRANPNPSMLSSMLQADPPQTV  
QIYANIKVAIGGGLNETRDSILTLILGLLQNPDLARVRAEPSLWGQAFEEAVRWISPIGMYPRRLTRDTEIS  
GTLVHKGEQVGLCVGAANHDDRRFSDPKFDVFREKKSHLAFGAGSHFCAGTWVSRAVSQIVVPMVFERLRN  
LRLKDPVLRVRGWVFRGPTHMPVVWDA

>CYP1078C1 (SL003B\_3164) *Polymorphum gilvum*

MTAPNRRINAETVDFDQLWRDPYPTFARLRATNPVAFVPQADHYFITRFDDIAHIERHPAIFRASEPRSLVNR  
VMGHSFMRKDDEEHMVERKIVAPSFSPAAAKKVWSDTFREIAADLLDDLQDRGSADLVADFATPMAARSLCTV  
TGLTNIAWQDIARWSQALMDAVQNYARDPELARLGQEASDGIDAAIDAMIPVRRANPDRSILSMMLAGDMPLD  
SIRANLKVIIGGGQNEPRDANSGLIWALLSNPDQLSAVKADPSLWLRGFEEYVRWVSPIGMYPRTVGQETELA  
GVPLKPGDRLFLLVGSANRDEAQFRDPDRFDLHREESRHLAFGSGPHFCAGAWVARAQVADIAPMLFERLRN  
LELDDSGEPARCGGWAFRGLLTLPARWSA

>CYP1081B2 (AZL\_b06160) *Azospirillum* sp. B510

MAESAEQGPYVDANAI FRRVPAPPHIPADRMIDFDYRHPAGLEEGDVYTALKRLQDGPEIAWTPHNGGHWIVT  
RGEDIKWVQETYEIFSHEEFTIPRGAAPIKMPPLTTDPPDHGRFRSVLNPAFTPVQVNMRDKARTLAIDLIE  
SLRPEGTCEFGDFARVMPVTVFLGIVDLPLDRREEFVEWALTFMVADDMADRLAAQGKIVAYLRTVLDERER  
NPGDDLRSRIVAWRKDPRFGGEHEVMGMALLVFFGGGLDTVASMLS FVAHHLASHPGHVRLREEPGIIPRAAT  
EYLRRFGLSNTGRLIKKDTTYKGVTF LKDEMIMVPIGLSSIDDRLYDDPFTVNFDRVSVLNTFGNGPHRCAG  
APLARVELEIFLAEWTSRMPDIRLDPDRPAITHAGVVNGVERLHLLWDV

>CYP1081B3 (BSY18\_3670) *Blastomonas* sp. RAC04

MANVLTPKPDHVPDHLVVDHDYVDLAGMAELGVYAASKRLHDGPDI IWTQRHGGHWLVTRAEDVKFVQENYAI  
FSHEEFMI PRLLNPFKVPLSVDPPNHARYRAVLNPAFAPS KIAKMRGDAKVLTIELIEQIRPKGRCEVSEF  
ARIMPVAMFLRIVDLPLDRREEFVEWGLAIMSSYEPDERMKANMRVREYLKTVLDEREGGEDLLTRVANWR  
RNPRFESDEETLSMATLLFVGGLDTVASSLSYITHYLAQHPEQQARLRKDKDIIPKAAEEFLRRFGLSNTGRI  
LTRDFEYKGVLFKKDDMIMVPNNLSGIDDRAYPNPLVVDFDRGVGPMDHNTFGNGPHKCIAGLARAEIQVFL  
DEFVGRMPEFRLLDPDQVNVEHCGSVPGFDELHLRWD

>CYP1082A2 (RG1141\_PB00370) *Neorhizobium galegae* bv. officinalis bv.  
officinalis HAMBI 1141

MTIDVNEINLADHSFWRRPDRDEGFALRRKRVPVSWHEFPEGPEQGMQGFWSVTRYDDIVAVSQDAKTFRNSP  
TTYIGDQSVEEARQEGWFLNMDAPEHFKLRQVVS KIFSP TGVQTLARTAAQHAEGVLVLAKEKAACDFATEVA  
QFPFVAVICDILGAPASDRKHLHRLTVTALAGDAPEMGADKVPAAFAELNVYGAELSRRERRKNPKDDVVSFL  
IATEIDGRKFNDDEVGYFFQLLV TAGMETTGTGVGGHMMRLFLENPDQMAIWAADPD AIAQTGEELVRMVSPV



QHMRRTAAANIEIGGQQIAEGDKVVVWYNSGNKDDAKFENPFSFDVKRNPNPFIGFGGGGRHTCLGAHLARLE  
LPMLAKASLQHLKNIEPAGDAVFPVSRFVNGLASLPIRYTA

>CYP1083A2 (TZ53\_18235) *Sphingobium* sp. YBL2

MMFPEQPIPDHVPPELVSRDFPFIFGMTTTEDPFDDLAMQVHEGPDIIYATHAYPGGTPAWVPRRMAHLREIY  
LDTDHFSSTDFSPFSKLVGGNWINS PAELDPPAHGPFRQMVNPAFTPKAMAALEDKIRLYAVEYIDAFAPRGQ  
CEFMGDFAFEFPIKVFMELMGLPHDRMSEFMWEMNLLHNHDL SKIAEATRSVLAYLGGEIEDRRANPRDDLI  
SFGVKGQINGRALTDDDEL LGFMFNLF IGGLDTVSTNMGLHFRHLGSHPDQAF LRANPSEI PHAIDELM RAYG  
AVTTFR TCKKETEVAGIRFMPGDKVAMSTTLAGRDPAEFDAPA EVR LDRRPRHVGF GFGIHTCVGMHLARREL  
RIAMEEFLARIPDFRIAPGHQVECHLGM IQPVALPLVWTPAS

>CYP1083A3 (TQ29\_17635) *Confluentimicrobium* sp. EMB200-NS6

MELDLSPKEVEIPAHVPDELVL PFPFLFGVKTKQDPFGELAAQVHAETPPIFYSKHAYPGGTPAWVVRTAEDL  
KTIHFDTENFSNKGFSFPMIIGETWNLVPAESDPP IAHYRAFVSRVFSPGAIAKLEDKIRGYAREYVEGLK  
DKGKCEFM R DFAFEFPIKVFMELMGLPQSRTKQFLEWEEAMLHSHDLKKMAVATRSVVDYLREELADRRENPT  
DDLFTYGVQAKIDGRELTDDDELVGFTFNLF IGGLDTVSTQMG LQFLHLARNPEHQMLRDDPSLIPAAIDELM  
RAYPAVTVFKT VTQPCELKGVKFMPGDKVMSATLAGRDP AEYDAANEIRFDRES DGHLSFGYGPHLC LGMHL  
ARREMRIAMEEFLRAVPEFRLKDGVEVEHYLGMIQPTAVDLVW

>CYP1083A4 (BSY18\_2514) *Blastomonas* sp. RAC04

MLGVQVTEAPPHVPADLVRDYP IKMGGLVEENPFDRMIPEIHRTPMPIFYALDAYPGGTPAWIVRRVKDLQAI  
YYDTESFSNKDFAPFALLVGESWSSLP AETDPPMHGLYRKWVNPLFSPKEMNKLD RKIRDYARDYCTAIKARG  
SCEFMGEFAFEFPIKV FLELMGLPQEMTAEFLEWEMGLLHTNDLAVIAASTRKVV DYL RGEIADRKANPRDDL  
ISYGVTMPIDGRPLTDDDELVGFTFNLF IGGM DTVSTNMAWQFRHLATHPEDQAMLRAPAMIPDAIEEMM RAY  
PAVTTFRTCSREVTIGGVTFQPGDKIAMPTSLAGRDPEEYPDADKVILGRKSRYLSFGYGPHLCVGMHLARRE  
MRIA LEEFLAAIPPFRIQDGCTVKTH TGGILQPETLPLAWD

>CYP1083C2 (BSY18\_2436) *Blastomonas* sp. RAC04

MTTTLPPPATLPTHVPADKAMRLPFFAREVV RDCPQETLIPQMHSSLGPI TYVTNIFPGDKPGWLLTG YEDTM  
AMLRNADDFTKNGMGQWAQGIGEDWLVIPT EVDPPMHTAYRKALNPHFSPQKMAAMKDDL RKRARDLIDKFQD  
RGSCDFVNEFSERYPIYIVLDLLGLPQDRMAEFLKWEKEMLHTNDWEVRSNAVRVKNYLVEEIAARRAN PQD  
DYITRIFDFEAEDGRKWNDDQEV LGHCFNLYLGGLDTVTTMLGNSFAWLARHPEQQQELRENPDRIVLAVEEFL  
RIFGPVTA FRIATREIEIHGQKIMPGEYVSVCTPVANQDPKIHDHPSQVRFD RKA AHIALGGGIHKCLGMHLA  
RLELQVALEEMLKAVPLFRVRDGF DLGYFVG NITFVPALELQWD

>CYP1083C3 (TZ53\_18635) *Sphingobium* sp. YBL2

MMTQVAQQSLPDHVPPELAMALPLFSRTVIYDNPQEV LIPAMHAELPPITYVTNIFPGDQPGWLLKNAEDVQA  
MLR DADNFTKNGMGKWAQNI GENWLVIPTEADPPIHTGYRKALNSHFAPQKMFAMKEQVRERAQALIDAFKDR  
GQCDFIDEFSEKFPIFIVLDLLGLPQERMTQFLKWEKEMLHSNDWQVRGNVRCVKDYLL EEIEARRQQPRDD  
YISKVLTFEVDGRLWNDDDEVFGHCFNLYIGGLDTVTSLLGNIFNYLASHPDKQNELRADPSLIVLAVEEFLRA  
FAPVTA FRIATKVIEIHGQKIMPGDYVAFSSPVVGRDPAFYEDPQAIRFDRKAPHMSLGS GSIHKCLGMHLARL  
ELQIAVEEFVKAIPEFRIKDGFRVPYVGNILHVPDLHLQWG

>CYP1086B1 (K663\_17251) *Sphingobium* sp. MI1205

MSANDIASQGAIASFNPFPDHLSEPAAGWALMRREAPIMSLNLPGPVPV FVVSRKEIEAIARDTTLFSSKP  
VPSVWRWGD FEP AIADIFATSGYKIVYTLQTTDPPTSLQYRRIAEAA LTRKRVLDLEPEINSIIGKLMDAIPS  
GGRIN FVDAFSVPLTLELICMI LGLPYSDATFIKHFSDEFTFLVDPTHSTERAMEATR TVVEGYRYLADYMR  
FEEAPAENLLSAIAHADIDGRPLTIEEKLSMAHVLT IAGNETTRNALSSAMYMLAIRPDLWAALKAAPERVPD  
YVEEILRVHAPAVTTPTATADTEIDGVAIPKGSALFLLWASAGHDET LFDNPEIDLDRKNKRSHITFGMGI  
HHCVG SFLARAELNAAVLRWITDFDTVELAVPQSEIRYDPVF AFHALSDLPIKVTRVKEKQVVRSEE

>CYP1088B5 (LH19\_02885) *Sphingopyxis macrogoltabida* 203

MTAAQLAAAPVPPHIPAHLVDFDFDIYADPRIGEDVQGTYYAAALEDAPGIFWTRLNGGHWIVKSFDASQIVLD  
PEHFSVREMQUIPRVQNPPFMIPLSLDPPENLPYRRAMMPMFPGPAAIKALEPRIREWAAEFVEAVADKGACDFQ  
ADVSKVFPVSVFMELMGMDLARLQDFRHLAEDFFSAQNDEAELGRLSALILGELKGLIAEKRAVPDGKLMTHF  
ITVEVDGRMTSDDEILAMSFVLFLGGMDTVTNVTGFAFQQLAQMPEVQARLAADPSLI PAFADAEAVRLYGVVN  
TPRLVVQDQQIGEARFREGEMVLNVLCGSRDPAKFEQPNIFDLDRKKTAAHLTFSSGPHLCVGHVVLGRAELRI  
LTEEWVKRVPAPFRPVPGEKHGFRIGTVMALESPLVEWEVAG

>CYP1088B6 (WG74\_06155) *Citromicrobium* sp. JL477

MNAPSKLAPVIPDHVPTDLVDFDFDIYADPRIDSDVQGSYQRAINAPDIFWTPANGGHWVQRMDSIAAITTD  
PEHFSVREMQUIPRVENPPFMIPLSLDPPENLPYRRAMSPMFPGPAIKALEPRLRYWAEKIVDSVADKGECDFM  
AEVAKIYPVSIFMELMGMDLARLPEFRDLAERFFDAQNNNSALLDQLSAQILGILSELIEEKRNPNDEQLMSHF  
VHVDMGEGKPMSDNEILAMSFVLFLGGMDTVTNVTGFAFQQLAQMPDLQKPMADPAGLSTAFADAEAVRAFGV  
INTPRLVVKDIDLLGVPPFRTGDMVLNVLPVGSRRDRKFEHPNLLDIDRKRAAHITFSTGPHLCIGHVVLGRAEI  
RVMAEEWFKRIPSFELVPDSERTFRTGTVMALLENLPLRWDS

>CYP1089A2 (BSY17\_3856) *Sphingobium* sp. RAC03

MDHALSPAAPKPAHVDPDALVYDFDIHADPGLLDDPHVRIMDLLRNAPPVFWTPRNGGGWMLTHAANYEASRD  
TEAFSSEFVPQDKMKAMLASLPPGAPHIPQPIPIITLDPPEHTKYRQPLQKVFSPKTISALRDSIRELAGDLIE  
AIKPDGRCEFMSSAVAEPLPVQVFLKMLGLPLDRLPEYRAIVKEHMEAIDGDRREGSMRRLQTIAAMRDTLLDR  
RDNPRDDIISMLWKLEIDGQPTTLADMENYGVLLFIAGLDTVMNGMGLAMRGLAVDSDLQKRLRAEPKLI AEA  
AEEMLRRTYFTFVPMRVVKRPVELSGAKMMPGDMVKLFLPAADLDAKEFPQPDVYDLDRNNVHIAFGVGPHERC  
LGSHLARVELQVLYEEMLARMPEFRLLDPDHPVVFHGGHVIGIESMHLVWDV

>CYP1090C1 (Ga0102493\_111098) *Erythrobacter litoralis* DSM 8509

MATQAEGSGPQVNLFDPEVQQCPWDAYRTLREEAPVYRIPGTDIFVVSRYEHSVREVLMDPQRFPSAKNELMR  
ASPTDVERGRKVAERFKAAGWLPAPTLAGRDDPNHKQMRAMFNEAFKPSRIKEIDPRVENLAYELIDGFLDEG  
ECDWVSRFCIPLPLFIIGEOMGAKREDMWRIKGWTDAFFHRISMMLPEDRHLEMVDREIEAQHYFQPIFEKLR  
EQPDESLISVLVNTVIEGWGRPLNDNELHAEMMADTFVGGSETTTNALAAGMKLLIENKDVWAKLKSDDPRYM  
RTFVEEVLRLSPVQSLMRFAHEDVELAGVTIPAGSIINVRYGAANRDESAFECPEKLDLDRPRAGAHMAFGS  
GTHHCLGAPLARRELTWGFTA VVDRFEDMDFAEGKNDFTYHPHFLRLSLKQLHITFEPKRR

>CYP1090C2 (BG023\_11286) *Porphyrobacter* sp. LM 6

MNSPTINLFDLPQLQQCPYEAYKTLRDEAPVYNIPGTQIYVVSRYDHSVREVLMDPARFPSTAANELMRASPTDM  
ERGRKVAERFKEKGWLPAPTLAGRDDPNHKQMRAMFNEAFKPSRIKEIDPRVETLAYELIDEFLDDGHCDWVR  
QFCVPLPLFIIGEOMGAKREDMWIKGWTDAFFHRISLMLPEDKHLEMVDREIEAQHYFQPIFERLREHPDGS  
LISVLVNTVIEGWGRPLNDNELHAEMMADTFVGGSETTTNALAAGMKLLIENKDVWAKLKADPDKYLRNFVEE  
VLRLESPVQSLMRFTHKDVELDGVITIPAGSVVNRYGAANRDERFFECPEKLDLDRPKAGAHMAFGSGTHHCL  
GAPLARRELTWGFTA VVDRFEDMEFAEGKNDFTYHPHFLRLSLKQLHITFEPKRR

>CYP1091A2 (Sala\_0903) *Sphingopyxis alaskensis*

MTSLAERCPVARAGADAPPAPAHVPPDLVLDTRFAAGIVPNDLAEYPYRPMDVVRDEAFPRIHYYPWPISGNRH  
GAWVVTRYEDIRRVYEDNELFSSEGVAQFQALAGETFPSPILGIDPPDHGRYRKFLNPWFTPVAMNAREPRIR  
EIIIGMIDQFADRGEVDIAYDFGRVFPVRVFLDLMGFPFTMFQFLDWEFAILHDDRIDKKVEALTAVLAYLR  
GFIADKQASPDANLGSYIANGSIDGVPLTDDEKIGITWFLWLGGLDTVASTVSQMFRRFAMHPQLQKRIREDK  
SLINSAVEEFLRTQPLVNSGRKVKRDFEWHGVQIKAGDWVTAFTNTSGNFDPQQFECPHQFDPERRNNRHFTLA  
GGVHICLGAHLARRELRLVLLDEWFTRIPIYEFVRREGADTTVPVPSLLSIRNLPVWDCKAA

>CYP1091A3 (LH20\_13075) *Sphingopyxis* sp. 113P3

MTSLAERCPVARAGADAPPAPAHVPPDLVLDTRFAAGIVPNDLIEYPYRPVDVVRGDFPRIHYYPWPISGNRH  
GAWVVTRYEDIRRVYEDNDLFSTEGVAQFQALLAGETFPSPILGIDPPDHGKYRKFLNPWFTPVAMNAREPRIR  
EIIIGMIDQFATRGEVDIAYDFGRVFPVRVFLDLMGFPFTMFEQFLDWEWNILHEEDLEKKANALRGVLAYLR

GFIAEKQAAPDDALGSYIANGSVDGRKLTDDDEIIIGMTWFLWLGGLDTVASTVSQMFRRLAMHPELQAEIRTNK  
GLINSAVEEFLRTQPLVNSGRKVKRDFEWHGVEIKAGDWVTVFNTSGNFDEQQFECPHQFNPAKNNRHFTLA  
GGVHICLGAHLARRELRLVLLDEWFDRIQPFRVKQGADTTVPVPSLLSIRNLPVWDTGAAS

>CYP1091A4 (LH19\_08465) *Sphingopyxis macrogoltabida* 203

MTETTLSRCPIAHAPADAPPVPAHVPELVLDTRFAQGQIAYDLDPYLPDVMRDPEVPRILYYPWPTSGRQ  
HGAWTVSHYEDIRRVYEDNDIFSTEGAAQFQALAGETFPSIPLGIDPPDHGRYRKFLNPWFPTVAMNDMEPKI  
RAIVTEMIDAVVKDGEVDIAYDFGRIFPVRVFLNLMGFPPFSMFDQFLEWEYAILHNPDIAAKAEAVKGILAYL  
RGFIAEKQANPDETGLSYIANGQMDGQPLTADETIGMTWFLWLGGLDTVASTISQMFRMALDTELQARIRAN  
PEIINSAVEEFLRVQPLVNSGRRIKKDFTWHGVLDKEGDWIIACINSSGNFDEKQFACPRDFDPERKNNRHFTL  
IGGVHICLGAHLARRELRLVLLAEWLSRVPPFRLKPGADTTVIPGLLSIRNLPVWDTKAVS

>CYP1094A3 (Ga0102493\_111086) *Erythrobacter litoralis* DSM 8509

MNKPEGNVFAPQTLVDPFDYYRAVHDAGIAIEHLPEMNTFVVYSYDLCSEANTKPDIFSNDFTLMGREADEE  
IKEILKEGWDDVPTLLTADAPVHTRNRKLVNLAFSAPRVNAIEEDMRAKSIELIEAFADAGECEFEVQFAVPL  
PVAMIAGQIGLDDNPKKVKEWSDAAVDRFSQMV DHERKKECARSLVEFQHYMKGKIDRRRENGGDDLLTDLVE  
ARVEGETPLTDAEIMSIMQQFMVAGNETTTSTLAGGLLQLIRNPDQMEKAKAAAGGRDPKVITNLVEEALRYE  
TPTAGMWRVVKQDTELGGVKMPAGSVAQLRYAAANRDPKAFEDPDRFDIERKNARAHLAFGKGPHMVCVGNMLS  
RKEMLVAFDELLERLDDFAVADEDGITILPNILLRGVTRLPITFTNTGTQKA

>CYP1094A4 (BG023\_11299) *Porphyrobacter* sp. LM 6

MNKPEGNVFAPETLIDPFDYYRAVHEAGIAIEHLEGMNTWVVYSYDLCSEAASKPEIFSNDFTALMGREADEE  
IQAILAEGWPDLPPTLLTADAPVHTRNRKLVNLAFSAPRVNAIEADMRAKSIDLIEAFADRGECEFEVEEFGVPL  
PVAMIAGQIGLDDDPKRVKRWSDAVDRFSQMVDFERKKECARSLVEFQHYMKGLIDRRRANGGNDLLTDLVE  
ARVEGETPLSDPEIMSLMQQFMVAGNETTTSTLAGGLLQLIRNPDQMAKAKAAAGGRDPKVIIMNLVEEALRYE  
TPTAGMWRIVKADTELGGMKIPNGAVVQLRYAAANRDPKFPDPKFDIERANARTHLAFGKGPHMVCVGNMLS  
RKEMLVAFDELLERLDNFAVADENEIRILPNILLRGVTHLPITFTTRKG

>CYP1094A5 (A9D12\_03595) *Porphyrobacter neustonensis*

MNKPEGNVFAPETLVDPFDDYYRAVHDAGIRIEHLEEMNTWVVYAYDLCSEAAARPEIFSNDFTALMGREADAD  
IQAILAEGWPDLPATLLTADAPVHTRNRKLVNLAFSAPRVNAIEAEMRAKSIALIEGFADRGSCFEVVEEFGVPL  
PVAMIAGQIGLDDDPGRVKRWSDAVDRFSQMV DHERKKECARSLVEFQHYIKGLIDRRRAHGGNDLLTDLVE  
ARVEGETPLEDAEIMSLSMQQFMVAGNETTTSTLAGGLLQLIRNPDQMAKARAATGGRDPKVIIVNLVEEALRYE  
TPTAGMWRIVKQDTELGGMAIPAGSVVQLRYAAANRDPSKFPDPDRFDIERANARTHLAFGKGPHMVCVGNMLS  
RKEMLVAFDELLERLDDIAVTDDSAIRILPNILLRGVTHLPITFTTRKA

>CYP1094B2 (BSY18\_2736) *Blastomonas* sp. RAC04

MTVAAEQKSFFHPDVLSDPFAFYQAMIPSQPVYHDAASGLYLVLSHKLVSEATARTDEFSNNFQAVLSGARSE  
DPQVKAILEDGWFPQVDTLLTADPPVHTRFRKLVNLAFSAPRVNKLEAHIREIAHDLIDIMLAKDDIDFVRDFA  
IPLPIRMISEQLGLTHEDAGTIKRWTDADFVDRLGGMVPLERELQCAREVVEFQHAIIKAQMDLRRATPTDDL  
DLVHAQVDGERPLDDGELLSIVQQLLVAGNETTTATLAEGIIILLARNPDELAKAKADPKIIPNMIEEMLRLAS  
ASSGIWRVMKQDAELGGVTLPRGAMVMMRYAAANRDPEKYADPDFAFIADRANARTHLAFGRGIHMCVGNMLSR  
KEMTVAFEELLPRISAITLTDEAAIAYHPNMMLRGPSVVPVRFGLAS

>CYP1098A2 (Swit\_4559) *Sphingomonas wittichii*

MADAPEGEGFPPTPPYPVPHRSKASLFKRFLTGWNSWIHTLFERSYTMQMGIEIRLPRLDFFIANDLSVVERVMD  
DREKVFPKHRFQHELLDPLIGNSVFSANGKDWEEQREMVNPAFAHTNLKRVFPAMQGAVDLLATIATMDRSK  
PIAVDPLMTHVAADIIYRTIFS VKLDQASADRIYHAFHRYQKNIQPGAMLKLYGLPLFGYRRRAARAAAEIHA  
VFGPIVKARYDAWHS GGGEAGNDILQSLLEARHPASGEPPFSYQAIMEQVSTIFLAGHETAASAMTWALYLLAE  
CPHWQDALLAEIDRETKEPIAFEHRLRALGGVRNLFRET LRLYPPVSFLVREVTAPT TMRDKLLHKGAMIVIS  
PWLIQNRNRRNWKCPHAFAPERFDDPEEAECRRAYMPFGKGPRICIGAGFAQQEGMLILASIVRAFRLRYPDI  
PRPEPVSRLTLRPKSAVQLWFEDRR

>CYP1098A3 (BSY17\_1544) *Sphingobium* sp. RAC03

MTDLFTPPYPQPPRTRKRLIKRFLRGWHSWIHVLFDKSYTMKMGEIRLPGRMTYIANELSLVDQILRGGTAFP  
KHSELVRNLDPLIGNSVFSANGTDWESQRAMVNPFAHTALGRMTPLMVAAADDLVARLEAADRTAPVDIDPM  
MTHVAADIIFRTLFSQALDAARSNI IHIAFGKFQRLAHSASMLRLYGIPAGWFEKTRSKGPARAIHDVFRPIVE  
ARYEGWHARGEAPHRDILQSLIEAKHPDTGEAFTCNQVMEQVSTIFLAGHETSASTMTWALYMLAECRHIQDR  
VRAEISAVAGDAPLTAAMLKEMGQLRNIFRETTLRLYPPVSFLPREVTCMPMDMRDKHLETGSMLVVAPWLTQRN  
KDNWACPHAFDPDRFDDPANADMVKQAWFPFGRGPRVCVGAGFAQQEVMTVIAAVVWRFALSVPPGFKPEPIS  
RLTIRPRTGMPLLFGLDGLD

>CYP1098A4 (SIDU\_16355) *Sphingobium indicum*

MTQPFTPPYPEPPRTRRGLVKRFFRGWHSWIHVLFEKSYTMKLGEIRMPGQMTYIANELPLVDQILRGGTAYP  
KHRELVRNLSPLIGNSVFSANGEDWESQRAMVNPFAHTALNRSMLPMVAAAADDLLARLDAADRSKPVDIDPM  
MTHVAADIIFRTLFSQALDAARSNI IHIAFGKFQRLAHSASMLRLYGIPARWFEKTRSLGPAKAIHDVFRPIVE  
ARHEGFHQGEAPHEDILQSLIEAKHPETGDPFTLQQVMDQVSTIFLAGHETSASTMTWALYMLAECSHIQNA  
ARAEVTEIAGNAPFAATMLKDMGAIRNIFRETTLRLYPPVAFFPREVTCMPMDMRDKQLEEGAMLVVAPWLTQRN  
EDNWACPHSFDPARFDDPANAEMVRQAWFPFGRGPRVCIGAGFAQQEVMTVIAAVLRRYRLSVPEGFKPEPIS  
RLTIRPRTGMKLIFDAVPVDRRTA

>CYP1098A4 (SJA\_C1-33850) *Sphingobium japonicum*

MTDLFTPPYPEPPRTRKRLMKRFLRGWHSWIHVLFEKSYTMKLGEIRMPGQMTYIANELPLVDRIILRGGTAYP  
KHRELVRNLSPLIGNSVFSANGEDWESQRAMVNPFAHTALNRSMLPMVAAAADDLLARLDAADRSKPVDIDPM  
MTHVAADIIFRTLFSQALDAARSNI IHIAFGKFQRLAHSASMLRLYGIPARWFEKTRSLGPAKAIHDVFRPIVE  
ARHEGFHQGEAPHEDILQSLIEAKHPETGDPFTLQQVMDQVSTIFLAGHETSASTMTWALYMLAECSHIQNA  
ARAEVSEIAEDAPFAATMLKDMGAIRNIFRETTLRLYPPVAFFPREVTCMPMDMRDKQLEEGAMLVVAPWLTQRN  
EDNWACPHSFDPARFDDPANAEMVRQAWFPFGRGPRVCIGAGFAQQEVMTVIAAVLRRYRLSVPEGFKPEPIS  
RLTIRPRTGMKLMFDAVPPSVDRRTA

>CYP1098A4 (TZ53\_03240) *Sphingobium* sp. YBL2

MTQPFTPPYPEPPRTRRGLVKRFFRGWHSWIHVLFEKSYTMKLGEIRMPGQMTYIANELPLVDQILRGGTAYP  
KHRELVRNLSPLIGNSVFSANGEDWESQRAMVNPFAHTALNRSMLPMVAAAADDLLARLDAADKKGKPVVDIDPM  
MTHVAADIIFRTLFSQALDAARSNI IHIAFGKFQRLAHSASMLRLYGIPARWFEKTRSLAPAKAIHEVFRPIVE  
ARHEGFHQGEAPHKDILQSLIEAKHPETGDPFTLQQVMDQVSTVFLAGHETSASTMTWALYMLAECAPHIQNA  
ARTEVQQLAGDAPLTAAMLKDMGAIRNIFRETTLRLYPPVAFFPREVTCMPMDMRDKSLEEGAMLVVAPWLTQRN  
KDNWACPHSFMPEFDDPANAEMVRQAWFPFGRGPRVCVGAGFAQQEVMTVIASVLRRYRLSVPDGFRPEPIS  
RLTIRPRTGMKLMFDAVRL

>CYP1098A5 (ATN00\_04210) *Sphingobium baderi*

MTDPFIPPPYPEPPRSKRGLVKRFLRGWHSWIHVLFEKSYTMKMGEIRMPGQMTYIANELPLVDRIILRGGTAFP  
KHRELVRNLSPLIGNSVFSANGEDWESQRAMVNPFAHTALHRSMLPMVAAAADDLARI DAADRG RPIDIDPM  
MTHVAADIIFRTLFSQALDAARSNI IHIAFGKFQRLAHSASMLRLYGLPARWFERRSLRPAKAIHDVFRPIVE  
ARFEGFHQRGDAPHRDILQSLIEAKHPETGAPFTVQQVMDQVSTVFLAGHETSASTMTWALYMLAECPHIQNL  
ARAEVQDVAGGQPLAAGMLKDMGAVRNIFRETTLRLYPPVAFFPREVPCMPMDMRDKHLEEGAMLVVAPWLTQRN  
KDNWACPHAFDPERFDDPANAEMAKQAWFPFGRGPRVCVGAGFAQQEVMTVIASVLRRYRLSVPDGFRPEPIS  
RLTIRPRTGMKLMFEDMKG

>CYP1101A5 (SP01898) *Ruegeria pomeroyi*

MIPPKPPARPDKVSLWRYLRQLFRQDLSAQPARLYRAWMAEFRTPFRRSYLVNQPDLDVTVLKGRPDDFPKSN  
RISEGLRPLLGNVFLTNGETWKRQRRIIDPAFEGGRLRDTFPAMWAASEAAVNRLAAQAGQETETEEVTSHA  
AADVIFRTLFSIPIEHEVAAQVTRFRAYQRAQPLNLAAFPVVPQWVPRFHSRETRRNAAVIRGLIRQLTDT  
RMGEIRAGTAPDDLATKIMTTTDPQTGDRFDTDEMVDQVAIFFLAGHETSASALAWTLYLMALYPDWQEKLA  
EARTLDSGTDFSVMSKLRLSRDVFRREALRLYPPVPMVMVRETTCPERFRDRDVPKGAQIVLSPWHLHRHERLWE

RPDDFDPARWQTENGKTCQRNAYMPFSAGSRVCTGAGFAMVEGPLILSMLLLRFRFERIAGREPVPVAHLTVR  
AADGIWLRVVER

>CYP1101A6 (AKL17\_1859) *Defluviimonas alba*

MTLPPKPPSRPDKVSLWRYLKLFRADILSAQPARLYRAWMAEFRTPFRRSYLCNDPQLIDIVLKDRPGDFPKS  
NRIREGLAPLLGNSVFLTNGEVWKRQRRIIDPAFEGGRLRDTYPAMLEASLAARDRLMKNASQDVEIEQETSH  
AADVIFRTLFSIPIDHHVAAEVFTQFRDYQRTQPLLNLAAFLVPKWMPRFHRSTRETAKAIRALITGLTT  
ARMQEIAAGTAPDDLATKIMTTADPVTGDRFGIEEMVDQVAIFFLAGHETSASALAWALYLLATHPDVQDKVA  
AEVADLGETPDFSAVSRLKFTRDVFREALRLYPVPMVMVRENSCPETFRGRAVAPGAQVVISPHWVQRHERIW  
TDPDAFDPERWQAEACRRAAREAWLPFSAGPRVCTGAGFAMIEGPLILAVLVRAFRFEPVAGRVPVPVAHLTV  
RAKDGIWLRPVPRLPCSKYPRGPRGAESPRLRRKAVLR

>CYP1101A7 (IMCC12053\_2062) *Celeribacter marinus*

MSDRAKFTPPKPAARPEKTSLRNYLRLFRKDILSAQPAKLYRAWMAEFKTPFFRSFLVNQPDLVKTVLNTRPM  
EFPKSNRIAEGRLRPLLGNVFLTNGETWLRQRRIIDPAFEGGRKIDAFAPMLAAGHDMVARLGEMDGGDFVEP  
HTSHAAADVIFRSLFSIPITDETARAVFHEFQAHQKAQPIILNLAAFIPLPKWVPRFHSRETAKRTARVIRGLIT  
RLTREMAQIAAGTAPDDLATKIMTTADPQTGARFDMDEMVDQVAIFFLAGHETSASALAWALWLMANPDVA  
DRVAAEGAALGDAPTFSDLSKLRYTKDVFRETLLRLYPVPMVMVREAAACPEHFRDRDVPKGSQIVLSPWHLQRH  
ERFWEDADVDFDPRFKTDNGKQCLRDAFIPFSSGARVCPGAGFAMVEGPLILALVARAFHVSTLAQHTVPVVA  
HLTVRAQNGIWIISCTKRDAASNAALV

>CYP1101A8 (P73\_1746) *Celeribacter indicus*

MTEAGPDAGMPRPASRPEKTSLRTYLKLFRRDILSAQPDKLYGAWMAEYRTPFRRSYLVNQPALVKTVLNER  
PMDFPKSARIAEGLRPLLGESVFLTNGETWLRQRRIIDPAFEGGRLKDTFPAMLAAGREMVARGAEEGDFDV  
EPHASHGAADVIFRTLFSIPITHHTARAVFDEFQSYQRAQPIILNLAAAFVPLPKWVPRFHRRARRGARAIRRL  
ITGLTAERMAAIRAGTAPDDLATKIMTTTDPVTGARFSTEEMVDQVAIFFLAGHETSATALGWALWLLAAYPE  
VQERVAAEAATLPEVPEFSDDLKSLRFTKDVFRETLRLYPVPMVMVREAAACPVFRARDVPKGAQIVLSPWHLG  
RHRHLWERPDADFDPDRFATANGRQCLRDAFIPFSSAGPRVCTGAGFAMVEGPLFLALILRAFRIETVEGRRPVP  
VAHLTVRSRDGIWLRRLAPRG

>CYP1101A9 (RCAP\_rcc03256) *Rhodobacter capsulatus*

MKDAAADRATEAPQCPFAHRRPVKPAPRPERVGRDFFRLIRQDILAVQPARMFRAWMAEFHSPFFTSFLCND  
PDLVDLILTRRPEDFPKSLRLFEGLTPLLGHISIFITNGPEWERQRRIIDPAFDGGRTKDVLPAMWDAALSGVE  
RLKPLADGRPVDVEGQASHIALDVIFRTLFSIPVENATANAVFDAFRAHQASRPMVNTGTLFSLPRWLPRRLRF  
GATAKTAKQIRGFISALVEARAAEIAAGTAPDDLATRIMSTPDPEKGKCFSPGEMVDQVGIFLLAGHETGAAA  
LAWSLYLMALYPEWQDKLAEAEETVIDVEKIYASSVPRLKLARAVFRESMRLYPVPMYLRETVEETFRGRK  
VPKGALVVVSPWHLHRHERIWKDPDDFDPTRWDTPEGRESSRLAYVPFSAGPRVCPGAGFAMAEGPLLLAMML  
KHFRVALVPGREPMPVAQLTVRGRDGIWLSLTPR

>CYP1101A10 (TM1040\_1455) *Ruegeria* sp. TM1040

MTLRPPKPPVRPDRVSLWRYLKLFRADILSAQPQRLYRAWMAEFRTPFRRSYLVNQPALLDVILKERPDDFPK  
SNRVGEGLRPLLGNVFLTNGETWKRQRRIIDPAFEGGRLKESFPAMRAAAEAGVARLRPHADGSELEIEAEA  
SHIAADVIFRTLFSIPIEHEVAAEVFSRFRAYQQAQPIILNLAAAFVVPVRWMPRFYPKGTRQNARHIRRLIADL  
TKARMAEIAAGTAPDDLATKIMTTLDPETGKGFGAEEMVDQVAIFFLAGHETSASALGWALYLLALYPEWQEK  
LAAEVAEHGAEEFADLSKLRLTRDVFRETLLRLYPVPMVMVREAVQTERFRDREVLGRSQMVLSPWHLHRHERL  
WERPDEFDPGRWQSENGKACARNAYMPFSAGSRVCTGAGFAMVEGLILAQILRHYRITPVEGRSPEPVAHLT  
VRSRTGIWLRFSHR

>CYP1101A11 (roselon\_02748) *Roseibacterium elongatum*

MILPPKPPARPDRVSLRQYLKLFRQDILSAQPARLYRAWMAEFRTPFRRSYLVNQPISLVDEVLKARPMDFPKS  
DRVGEGLRPLLGNVFLTNGAAWLRQRRIIDPAFEGGRLRDTFPAMWAAGEAAVARMGTGEVEVEAEEMSHAAA  
DVIFRTLFSIPIENEVAAETFHQFRAYQRTQPIILNAAAFVPLPRWMPRGFAAETKRTARAIRGLIETLTAERM  
ALIQAGTAPDDLATKIMTTSDPETGECFTTEEMVDQVAIFFLAGHETSASALGWTLYLLALFPDWQDKVAAEA

EAVLAGGMDFAVMSRLKLARDVFREALRLYPVPMVRETVRPERFRDRDLPVGSQVVLSPWHLHRHERVWDN  
PDGFDPGRWATENGKTCLEAWIPFSTGARVCTGAGFAMVEGPLFLAMLLRAFRFERIDGKDPVPVAYLTVRA  
KDGIWKLAPR

>CYP1101A12 (PGA2\_c13430) *Phaeobacter inhibens* 2.10

MVDLPQSDDHPNSAPVAPVASSAIIPPKPAARAARVSLWRYLRLFRADLLSAQPAKLYRAWMAEFRTPFRRSF  
LVNQPDLVRTLKDRPEVFPKSNRIGELRPLLGNVFLTNGEVWKRQRRIIDPAFEGGRLRQIYPAIHAAAE  
AAVTRLSDQVHQTPNAPIEIEAETSHAAADVIFRTLFSIPIEHMAQEVFHRFRAYQQAQPIILNLAAAFVPLPR  
WVPRFHRPATRRNAARIRGLIRDLTQQRMEAIASGHAPDDLATKIMTTQDPETGELFTTDEMVDQVAIFFLAG  
HETSASALAWALYLVALAPEWQDKIAKEAAGLSLDQFAEAGRLRISRDVFREALRLYPVPMVREASCPQQF  
RGRTLPPQGAQVVLSPWHLHRHERLWENPDGFDPGRWQTENGKTCQREAYIPFSAGPRVCTGAGFAMIEGPLIL  
SMILQFRFRVEPVAGQEPPIVAHLTVRSQNGIWLRLIPR

>CYP1101A12 (PGA1\_c13490) *Phaeobacter inhibens* DSM 17395

MGDLPHVDDRPDSEAAASAGGPVIPPCKPAARAARVSLWRYLRLFRADLLSAQPAKLYRAWMAEFRTPFRRSF  
LVNQPDLVRTLKDRPEVFPKSNRIGELRPLLGNVFLTNGEVWKRQRRIIDPAFEGGRLRQIYPAIHAAAE  
AAVTRLSDQVHEIPDAPIEIEAETSHAAADVIFRTLFSIPIEHMAQEVFHRFRAYQQAQPIILNLAAAFVPLPR  
WVPRFHRPATRRNAARIRGLIRDLTQQRMEAIASGHAPDDLATKIMTTQDPETGELFTTDEMVDQVAIFFLAG  
HETSASALAWALYLVALVPEWQEKIAKESAGLSLDQFAEAGRLRISRDVFREALRLYPVPMVREASCPQQF  
RGRTLPPQGAQVVLSPWHLHRHERLWENPDGFDPGRWQTENGKTCQREAYIPFSAGPRVCTGAGFAMIEGPLIL  
SMILQFRFRVEPVAEQEPVPVAHLTVRSKNGIWLQLIPR

>CYP1101A13 (Ga0080559\_TMP3540) *Salipiger profundus*

MTPPKPKSRPDRVSLRRYVKLFREDILSAQPARLYRAWMAEFRTPFRRSYLVNQPELVRTLRLRERPLDFPKSS  
RISEGLRPLLGDVFLTNGAQWQRQRRIIDPAFEGGRLRETYPAMWEAAQAALARLRGQAGGVVEIEEHTSHA  
AADIIFRTLFSIPIEDALAQKVFHEFRAYQRTQPIILNLAAAFVPLPRWMPRRFRSDTKAAKRIRALITELTER  
RMAEIAAGTAPDDLATKIMTTTRDPETGETFSTEEMVDQVAIFFLAGHETSASALAWALYLVALHPEWQARLAD  
EAQVLGDTPDFGDMAKLRLSRDVFREALRLYPVPMVRETTCPERFRDRDVPKGAQIVLSPWHQHRHARLWD  
NPDGFDPARWSTENGRACLRDAYMPFSAGPRVCTGAGFAMVEGPLMLSLILRDLKLTALPDRVPEPVAFLTVR  
ARDGINLRVDPR

>CYP1101A14 (Ga0080574\_TMP4053) *Pelagibaca abyssi*

MSLRRYVKLFRADILSAQPARLYRAWMAEFKTPFFRSYLVNQPDVKTVLKDRPLDFPKSGRISEGLRPLLGD  
SVFLTNAGLWQKQRRIIDPAFEGGRLRETYPAMWEAAQAALARLTARTGEVVEIEEQTSAAAADIIFRTLFSI  
PIEDALAQKVFHEFRAYQRTQPIILNLAAFLPLPRWMPRRFRADTKAAAKRIRGLITELTERRRAEIAAGRAPD  
DLATKIMTTTRDPETGERFSTEEMVDQVAIFFLAGHETSASALAWALYLVALHPEWQERLAEQAALGDAPDFA  
DISKLKLSRDVFREALRLYPVPMVRETTCPERFRDRDLPARGAQVVLSPWHQHRHERLWDNPDGFDPARWST  
ENGRQCMREAYMPFSAGPRVCTGAGFAMVEGVLMLSLILRDLKLTALPDKVPEPVAFLTVRARDGIHLAVDRR

>CYP1101A15 (Gal\_02054) *Phaeobacter gallaeciensis* DSM 26640

MMTDLPHPKRPPDSVPVTPAEGTPVIPPCKPASRAAKVSLWRYLRLFRADLLSAQPAKLYRAWMAEFRTPFRRS  
FLVNQPDLVRTLKDRPELFPKSNRIGELRPLLGNVFLTNGEVWKRQRRIIDPAFEGGRLRQIYPAMYAAA  
EAAVARLSTQLEQQPDRPIEIEAETSHAAADVIFRTLFSIPIDHETAQEVFHRFRAYQQGQPIILNLAAAFVPLP  
RWLPRFHRPATRRNAARIRGLIKGLTEQRMAAIDAGHAPDDLATKVMTMQDPETGELFTTDEMVDQVAIFFLA  
GHETSASALAWALYLVALAPDWQEKIAEAAAALSLDQFAAAGRLRISRDVFREALRLYPVPMVREASCPQQ  
FRGRAVPKGAQVVLSPWHLHRHERLWENPDGFDPGRWQTENGKTCQREAYIPFSAGPRVCTGAGFAMIEGPLI  
LSMILERFRVEPVADQQPIPVAHLTVRSKNGIWLQLIPR

>CYP1101A16 (PhaeoP97\_01348) *Phaeobacter porticola*

MDNAPISEPATAPIGAADTTSASQSGQQEVLPPKPTARQEKVSLWRYLRLFRADLLSAQPAKLYRAWMAEFRT  
PFRRSYLVNQPELVDTVLKSRPDEFKSNRVSEGLRPLLGNVSVFTNGATWKRQRRIIDPAFEGGRLKHSYPA

MHAAAQAAVARLTDRIAAAPDNSIEIEAETSHAAADVIFRTLFSIPIEHHLAQEVFHRFRAYQQGQPILNLAA  
FVPLPRWLPRFHRRDTRRNAAHIRALITRLTEERMQAIAAGSAPRDLATKIMTTADPETGERFSTDEMADQVA  
IFFLAGHETSASALAWALYLVALAPKWQDRIAEAAADLPLETFSASKLRISRDFREALRLYPVPMVMVREA  
TCPQQFRGRTLPGAQVVLSPWHLHRHTRLWDNPDGFDPGRWETDNGKTCQREAYIPFSAGPRVCTGAGFAMI  
EGPLILSMILQFRFRVEPVAGQEPIVVAHLTVRSKNGIWLHLAPRQREAAQPDNDR

>CYP1101A17 (Jann\_2396) *Jannaschia* sp. CCS1

MNDLPPKPPARADHVSLWRHMKLFRQDILSAQPARLYHAWMAEFRTPFRRSYMINEPALIDEVLRARPMDFPK  
SDRVGEGLRPLLGDVFLTNGETWARQRRIIDPAFEGGRLRDTFPAMWAAGEASVARMVPLHEIEEEMSHTA  
ADVIFRTLFSMPIEADIAGR VFHQFRAYQRTQPILNAAAFVPLPRWLPRGHRAPTRETARNIRALITEMTRAR  
TVEIEADIAPDDLATKIMTTDPETGACFTTDEMVDQVAIFFLAGHETSASALAWALYLLARYPDWQDKVAEE  
ASGLPETPEFSSMSRLKHTRDVFRET LRLYPPVPMVMVRETTGPETFRNRRAIRRG SQVVISPWHLHRQNRLWDN  
PDGFDPGRWETENGKACL RDAFI PF SAGARVCTGAGFAMVEGVLLLAMLVRAFRFRERITGDDPVPVAHLTVRA  
KDGIRLRVTAR

>CYP1101A18 (TQ29\_08885) *Confluentimicrobium* sp. EMB200-NS6

MTTPPKPASRPERVGLRLRYLFRRDILSAQPARLYRAKMAEFRTPFRRSYLINQPDLDVLV LKERPMDFPKS  
GRVGEGLRPLLGDVFLTN GADWQRQRIIDPAFEGGRLRDTFPAMVAAGKAASARLSEGVTEIEAQTS HAAA  
DVIFRTLFSIPIEHEVAAQVFTRFRDYQRSQPVLNLAAAFVPLPGWMPRFHRSRTKASARAI RALITRLTADRA  
AAIAAGTAPDDLATKIMTTADPETGRRFGTGEMVDQVAIFFLAGHETSASALAWALYLLALYPDAQERVAAEA  
TALGENPAFSDISKLTFTTRDVFREALRLYPVPMVMVRQATRGERFRNRDVAPGSQIVISPWHLHRHALLWDRP  
DAFDPGRYGTEAGRACLRAAYIPFSTGPRVCPGAGFAMLEGPLLLLALLLKDWRLEPVQGRAPVPVAHLTVRAK  
DGIWLRRLHRR

>CYP1101A19 (METH\_10465) *Leisingera methylohalidivorans*

MLPPKPPARPD RVSFWRYLKLFRQDILSAQPARLYRAWMAEFRTPFRRSFLVNQPDLVKTLLKERPD DFPKSD  
RIAEG LKPLLGN SVFLTNGEAWKRQRRIIDPAFEGGRLKDTFPAMRAAADA AAVARLKG RQG PVEIEEETSHAA  
ADVIFRTLFSIPIEHEVAVQVFSRFRDYQRSQPLLNLAAAFVPLPRWMPRFRRGTRRNAEMIRGLIAQLTCER  
MNAIRAGTAPDDLATKIMTTDPETGSTFDSAEMVDQVAIFFLAGHETSASALAWALYLMALYPEWQEK VAVE  
AEALEDESFAAVSKLKISRDFRET LRLYPPVPMVMVRQAACPEQFRNRNV PKGAQMVLSPWHLHRHERLWENP  
DRFDPARWGTENGRQCQREAYIPFSAGARVCTGAGFAMVEGPLILSMILRQFRITPVAGRVPVPVAHLTVRSK  
NGICIH LTER

>CYP1101A20 (MALG\_01463) *Marinovum algicola*

MKRPPKPPARADKVSLRLYMSLFRKDILSAQPARLYRAWMAEFRTPFRRSFLVNQPDLVRAVLKERAD DFPKS  
DRIGEGLRPLLGN SVFVTNGETWKRQRRIIDPAFEGGRLRHGF PAMRAAAEAAVQRTAAHSGETLEVEAETSH  
AAADVIFRTLFSIPIEHEIASQVFAEFRHYQRSQPI LNLA AFVPLPKWMPRFRRDTRASAKTIRRLITRLTT  
ARMAEIAAGTAPDDLATKIMTTDPETGETFTTEEMVDQVAIFFLAGHETSASALAWTLYLMALYPEWQERLA  
EEAQCLPELLSEANGSAQAAPDFGVM AKLRLSRDFREALRLYPVPMVMVREAQC PESFRDREV PKGSQIVLS  
PWHLHRHERLWERPDEFDPGRYATENGKTCLEAYLPFSAGARVCPGAGFAMVEGPLLLSYLLRHFRFALGAG  
PAPVPVAHLTVRS DNGIWL RVAPRLSPDP

>CYP1101A21 (RCA23\_c13370) *Planktomarina temperate*

MSPPLLPPKPPARPGRVSLWRYVKLFRRDLLSAQPAKLYRAWMAEFKTPFRRSYLVNQPELVDLV LKRRPRDF  
LKS NR VSEGLRPLLGN SVFLTNGAEWERQRRIIDPAFEGWRLREAYPAISAAAEAAVARLAPKAGGGPVEIEA  
ETSFAAADVIFRTLFSIPIEDRMARQVFEEFKTYQRSQP VVNLA AFFSLPSWVPRPFSRRTRRS AEVIRRLIT  
ELTDKRAEALAAGTAPNDLATKIMTTKDPITGQLFSASEMVDQVAIFFLAGHETSASALSWALYLMATHPDYQ  
EKVAREGAALGPQARFEDLRALRVTRDVFRET LRLYPPVPMVMVREAAQAERFRGRDVASGSQVVLSPWHLHRH  
MRLWDNPDGFDPERWHS ENGKHCQRAAYIPFSAGPRVCTGAGFAMLEGVLLLARLCAAYELTPIAEQVPQ PVA  
HLTVRAQSGIWLNL RPRGI

>CYP1101A22 (OA238\_c12850) *Octadecabacter arcticus*

MYAAGEAAVARMAANTGVQDIEPETSHAAADVIFRTLFSIPIEDETATAVFEKFRDHQRTQPILNLRAFIPGP  
RWMPRFFSRATKSTARDIRRLITDLTERRMFEIDAGTAPDDLATKIMSTADPVTGQTSTQEMVDQVAIFFLA  
GHETSASALAWTLYLLAMHPEWQDRLAVEAAAVTPDFASVSKLRLSRDVFREGLRLYPPVPMVMVRETKCREEM  
RGRAAPKGAQIVLSPWHLHRHERLWDNPDGDFPTRWGTENGKQCQRVAYIPFSAGPRVCTGAGFAMVEGPLLL  
SMLVARFRFELTDRVPVPVAHLTLRAKDGIWLKITERD

>CYP1101A23 (BVG79\_01360) *Ketogulonicigenium robustum*

MAEMRTPFFHFSFMVNDPALTKVVLKERPDDEFKSDRIAAGLIPLLRDSVFLTNGAQWKQQRRIIDPAFEGGR  
LREIFPVIWESAAAVARLGATPAGSVVEIDHSHAAADVIFRTLFSIPIESDVAREVFEEAFRDHQRSRPVM  
NLGAFINLPAWVPRFSPRKTGETARRIRRLISKMVDERQAQIAAGTAPDDLATKIMTTADPETGALFTPAEMV  
DQVAIFFLAGHETSASALAWALYLVALYPEWQDQAAREAQGMAAEFSALSCLRINRDI FRET LRLYPPVPMV  
REATAPETFRDRAVPVGAQIVLSPWHLHRHTRFWQSPDDFDPARWSTPECRASARDAYMPFSEGRVVCVGAGF  
AMLEGTLLILAMLLRDRFREVVEGRDPVPVAYMTVRAKDGIWLRVTGRGPVNPPAQTTG

>CYP1101A24 (EIO\_1648) *Ketogulonicigenium vulgare* Y25

MKPPKPEAREGKVS IWRYLR LFRQDILSAQSGKLYRAWMAEMKTPFFHFSFMINDPALTKTVLRERPDDEFKSG  
RIAAGLIPLLGKDSVFLTNGAQWKQQRRIIDPAFEGGRLRHIFPVIWDAAESATHRLQEAVGDEATEIDMHAS  
HAAADVIFRTLFSIPIESDTAREVFD AFREHQRSRPVANLGAFVKLPWVPPQFSPFHTRRRTARQIRRLITAIV  
EERRAQIAAGTAPDDLATKIMTTPDPETGTLFTPAEMVDQVAIFFLAGHETSASALAWSLYLVALYPEWQEQA  
ASEAAGMAPAFSALSCLRINRDI FRET LRLYPPVPMVREATQREDFRGRTVPEGAQIVLSPWHLHRHERFWD  
TPDDFDPGRWSRPEARLSARDAYMPFSEGRVVCVGAGFAMLEGTLLILAMLLRDYRFELVAGRDPVPVAYMTVR  
AKDGIWLKVTRRAAIAPADPPAQTDG

>CYP1101A24 (KVU\_1119) *Ketogulonicigenium vulgare* WSH-001

MKPPKPEAREGKVS IWRYLR LFRQDILSAQSGKLYRAWMAEMKTPFFHFSFMINDPALTKTVLRERPDDEFKSG  
RIAAGLIPLLGKDSVFLTNGAQWKQQRRIIDPAFEGGRLRHIFPVIWDAAESATHRLQEAVGDEATEIDMHAS  
HAAADVIFRTLFSIPIESDTAREVFD AFREHQRSRPVANLGAFVKLPWVPPQFSPFHTRRRTARQIRRLITAIV  
EERRAQIAAGTAPDDLATKIMTTPDPETGTLFTPAEMVDQVAIFFLAGHETSASALAWSLYLVALYPEWQEQA  
ASEAAGMAPAFSALSCLRINRDI FRET LRLYPPVPMVREATQREDFRGRTVPEGAQIVLSPWHLHRHERFWD  
TPDDFDPGRWSRPEARLSARDAYMPFSEGRVVCVGAGFAMLEGTLLILAMLLRDYRFELVAGRDPVPVAYMTVR  
AKDGIWLKVTRRAAIAPADPPAQTDG

>CYP1101A25 (Dshi\_2337) *Dinoroseobacter shibae*

MRPPAPKPVARQDRVSLWQYLKLFKRDILSAQPARLYRAWMAEFRTPFRRSYLVNDPVLVREVLHDAPEDFPK  
SDRIAEGLRPLLGESVFLTNGATWARQRRIIDPAFERGRVRESFAAMQDAARNAVARLEARRAADLVEIEEVC  
AHAAADVIFRTLFSVPIDDMAAVVYRAFAHQRSQFILNLGAFLPLPRWMPRMHRAETKETAAHLRALIAQM  
TARRQAEIAAGTAPRDLATKIMTTPDPETGARFSTDEMVDQVAIFFLAGHETSASALAWALYLLGAAPDVQAR  
VRAEVAAVAPLEMTFSDSLKLPRTRDVYREALRLYPPVPMVMVRQVEAARVWRGRKIRRG AQVVLS PWHLQRHT  
RLWSAPDVFDPDRWQREETQQSQRDAYMPFSAGRRVCPGAGFAMAEGTLMMLAAFLQAFRFEADPNHVPVPEAH  
LTVRARHGIWLRVGAAGQEF

>CYP1101A26 (RCAP\_rcc03254) *Rhodobacter capsulatus*

MTDETAAPVQGAILPPKPQARAGKVS LLEYLR LFRQDILSAQPAHLYRAWMAEMKTPFFRSFLCNEPELVHRV  
LRGSPHDFPKSERIRFGLKPLL RDSVFITNGALWEHQRRIIDPAFEGGRLREVFPAMWDSGVAVERLRKAD  
GQPLEIEAETSHVAMDVIFRTMFSPMIEHEIAQAAFEFGFRAHQAAHPVANLAAIPLPKWVP AFH SKQTRDTA  
RAIRALIGQLATMRAGEIENG TAPDDLATKIMTTPDPETGRVFETGEMVDQVAIFFLAGHETSAAALAWSLYL  
LATHPDWQDKLAAEATEVLGDDVPVFSIINRLKLSRAVFREAMRLYPPVPMFVREAACPMTFRGRSVKKGAI  
IVSPWHLHRHERIWDNPDADFDPGRWETENGKAGLRDAYVPFSEGRVCPGA AFAMAEGPLILSMFLRAFRFEP  
VPGAVPMPVAHLTVRSDAGIRLKLTPRA

>CYP1101A27 (P73\_0363) *Celeribacter indicus*



MSAALASAAPLPKPAARAGRVSLFGYLRLFRRDILSAQPGHLFRAWMAEMRTPFFRSFLCNDPELVHRVLRG  
PVRDFPKSERVRIGLRPLLRSSVFISNGALWEHQRRIIDPAFEGGRLREVL PAMWQAGRAAVARLAPLADGRA  
LEIEAQ TSHVAMDVIFRALFSQPIESGIAQAALVAFRDHQA AHPVANAAAILPFPKWVPRCHSRRAVRSAAARI  
RTLIVRLTTMRAAEIAAGTAPDDLATRIMTTPDPETGRVFDTAEMVDQVAIFFLAGHETSAAALAWALYLLAT  
HPDWQERVA AEAGAVLGAGAEPDLATLKRLETSRAVFREALRLYPVPMYVREAACPMRFRARRVPKGAQIVI  
SPWHLHRHERI WENPDGFD PARWKTGNGREGLRLAYIPFSEGRVCPGAGFAMAEGPLLLSMLVHVFRFDPVA  
GDVPVPAARLT LRSADGIRLRLRPRLPTPSA

>CYP1101A28 (Pden\_3985) *Paracoccus denitrificans*

MIPPKPPARQGRGSVWR FIRD FRDILSAQSDKLYRAWMAEF RGPFIHSFTCNDPALVDMILRERPMDFPKSP  
RMAAGLQPLLGNSSFISNGETWLHQRRIIDPAFEGGRLREAF PAMWEAALAGTARLQPLADGA EIDIEPQTSH  
IAADVIFRTLFSIPIEDEIAVQVFQAFREHQEAQPMVNLGGLMALPRWARLHTRRVRETARRIRGLIRQLVSV  
RAAQIRAGTAPQDLATKIMTTPDPQTGDLFTEAEMIDEVATFFLAGHETGASALAWALYLLAENPDWQDR LAE  
EARLNLAADFAATRNLPLARAVFREALRLYPVAMTVRQCRQAETLRDRKAPRGAQLVLS PWHLHRHERLWVN  
PDGFDPSRWETENGKTCLRRAFIPFSAGARACPGAGFAMVEGPLIL AALVRAYRLEPGRERLVPIMRLTLRGK  
DGIRLRLPRG

>CYP1101A29 (JCM7686\_1890) *Paracoccus aminophilus*

MIPPKPPARS GKPSLWRFIRD FRDILSAQSGKLYRAWMAEFKSPLIHSFTCNDPALDLILKKRPLDFPKSG  
RMAAGLTPLLGNSSFISNGETWRHQRRIIDPAFEGGRLREAF PAMLAASDAAVARIAPLATGHEIDIEPETAH  
VAADVIFRTLFSLPIEDETASGVFTA FRAHQDAQPMVNLGGLMALPRWLHFHSRRRTKRTAKHIRGLIERLVRA  
RAGQIAVG TAPDDLATKIMTTPDPETGTRFTEVEMVNEVATFFLAGHETAASALAWSLYLLSQSPEWQDRVAA  
EPEVRDFGGIRNLGAARAVFREALRLYPVAMTVRECKHAETLRDRQAPKGAQLVISPFHIHRHERLWDNPDG  
FDPARWETENGKACQRDAFLPFSAGPRACPGAGFAMIEGPLLLSALVRAYHIAPGQEV PVPVMRLTLRGKGGI  
RLKLIPRQA

>CYP1101A30 (BHK69\_25865) *Bosea vaviloviae*

MERRGPGEFV PCHPEPLRKDPNLVQIVLGARHNLI GGWMAEHYRSGIDSFRIARRQIVVNSPEYIKYVLVTR  
HANFERKSPQMRRALEALLGDGLFISDGDVWKKRRPLVADIVHKRRLPEFGQTMEEAALSVADEWARLPEGAE  
VELTEEMGR LTAAIISRAVFGKSIAREAAQQVVDGFSAYQRAADSFNLGYFLGADEGW PALGGRKRRQAIAMV  
HGVVENVNAHLAGEGDAGSMVDLLIRRNQRSAAAPLDVTALRNEAATIFMAGHETTATTLTWAWYLLANAPW  
VAQKLHEEIEAVCGSRPPTLS DLPQLGW CRAVIQEALRLYPVPLLPRQAIEADRIGHINVEKSALIMIAPWL  
LHRAADLWDKPNHFLPERFLNGASINPFAFIPFAVGPRICPGMNFGQDEATLCLAILAQRFDVIPRKDYKVEP  
VCRLTLRPNGGLPARVMQRSTERRM

>CYP1104A2 (AZC\_0056) *Azorhizobium caulinodans*

MLQLLQKPAPILEERGP DWFAPARPRPHDKRLPPLDLILA AKRNLI SLWHVNDYRPTHGDMRLFGRQVFLANS  
PETVKYVMATRH DNYERKSPQMRRALENLLGDGLFISDGETWRRRRPLVSDIVHKNRVPAFGLTMEAVTLSFV  
ERWRARPAGEPFNALTEMAELTAEIISRAVFGNELGARA AHDVDAFTRYQGLIDNFNIGYFLGANEGLPVFR  
GPRLRRSVAQLDRVIDKVVT DHLEGRGEHDSMLDLLVKRQQKSPDLGLDVSALRNEAATIFMAGHETTAGVLT  
WAWYLISNAPWVEEAVLAELDRVCGSRTPTVDDVAQLDWCRSVIEETLRLYPPVPILARQAKDADTIAGIDID  
PAALVVVPWLLHRSEGLWDQPERFRPERFLTDRPTPYTYIPFAIGPRICAGLAFGLTEAILCFAILIQQFRI  
RVLPGTKVEPVSRLTLRPAGGLPVTAERRV

>CYP1104A3 (RTCIAT899\_PC05630) *Rhizobium tropici*

MLAWLDQKTEIVEHTDQSSRYFEPAAHAAYYNGKPGQPLKMLQARSDFLSIWRRADYREHVAEFKLLGRQLII  
VNSPEAIRYVVAKRHENFERKTPQMRRALEYLLGDGLFISDKETWKQRRPLVSDIVHKNRVPAFGAIMQSTAS  
ELADRWQSLGEGA EVNALFEMAGLTAEIISRSVFGNDLGEESANAVTEGFASYQSLVDSVNFYFLGFDEGLP  
IVKTPSLSRSVKRIHRIIDQVIEDHLAGKGDNSSMVELLIRRQQRNPELKL DVVALRNEAATIFMAGHETTAA  
TLTWAWYLLAGAPWVEEAVHAEIDAVCGDRVPSIDDVAKLDWCRAVIEETLRLYPPVPILARQAAEADQIGDV  
KVRKAALVLIVPWILHRTDSLFP EPHRFHPERFLGEARPAPYSYIPFAAGPRVCPGLQFGLTEAILCLAILAQ  
RFRVRITDGHKVQPQCRLTLRPREGMPVTLHRRRG

>CYP1104A4 (FA04\_04645) *Ensifer adhaerens* Casida A

MLAWLQQSVNFTEELLEGKFAPVRADYYTGPPGKPLRLLLQARTDFLSIWRASDYTETISQTRILGRQIIIVVN  
SPDLIRQVVVKRHNENFERKSPQMRRALEFLLGDGLFISDGTWKQRRPLVADIVHAKRVPSFGPVMENNTSEL  
VERWNRMPDGAEVNALHEMAGLTAEIIARSVFGNQLGDSAAAVTEGFTSYQSLVDSINIGYFLGFDDGLPVL  
RTPSLRRSVKRIHATIDKVVEDHLAGRGDHNMSMVELLIRRQQRNPELKLDLVALRNEAATIFMAGHETTAATL  
TWTWYLLSKAGWVEKAVHDEIARVCGDRPTPTIDDPQLEWCRAVIEETLRLYPPVPILARQTRADMIGDVAA  
EPGSLVLIVPWLHRTESLFQDPHHFHPERFTEGRRPTPYSFIPFASGPRVCPGLHFGLTEAILCLAIIAQRY  
RVRVSRHAVEPICRLTLRPNGLPVTLHKREAPSHGAG

>CYP1104A5 (OV14\_2228) *Ensifer adhaerens* OV14

MAGWFHQPVKFREEELSEEKFEPARAEYYAGPPGKPLRLLLQARTDFLSIWRNNDFTTEKVSQIRLIGRQVILVN  
SPDLIRQVVVKRHNENFERKSPQMRRALEFLLGDGLFISDGETWKQRRPLVADIVHAKRVPAFGPVMERTTTTEL  
VERWNGMPDGTQVNALHEMAGLTAEIIARSVFGNQLGDDSAAAVTDSTSYQSLVDSINLGYFLGFDDGLPIL  
RTPTLRRSVKRIHQIIDKVVEDHLEGRGDHNMSMVELLIRRQQRNPELKLDLVALRNEAATIFMAGHETTAATL  
TWAWYLLSRAKWVEKALHEEIGRVCGDRVPTIDDPQLEWCKAIIIEETLRLYPPVPILARQTRQAEMIGDIAA  
ERGSLVLIVPWLHRTESLFEDPHHFRPDRFMGGRRPTPYSYIPFASGPRVCPGLHFGLTEAILCLAIIAQQF  
RVTVVDGHKVEPICRLTLRPGGLPVTLHRRQKASHDH

>CYP1104C1 (ACP90\_15940) *Labrenzia* sp. CP4

MTVSAQISGDTQKAEPATKAEDFVPPYPFRYEKMPFVWSLIGMAKRNFLSIWGVDDFQSRLRSKKIIFTREL  
ICNRPDVVREAFQTNHEVLQRKSPQMRHALQPLLGDGLFISDGTWAKRRKVVAPIIHGSRVKGFAPIMIETI  
EEQRADWASQGEAEVDALADMAHLTAEIIICRTIFGRQLGKDHAEEVVGFSYQRHIDQVDILSLFGLPEWL  
PRFRGRAIKKPVERIMTVLDKIIANYEAQKEKGEASVIGGLLEARDENGEPLSREAIISEAAVIFMAGHETTA  
NTLAWAWFLLSQCDKSRAKLQAELDTVLAGRSPTFQDVPNLPTYKAVIEETLRLYPPVPILAREAMADTSIGG  
KSVPKGSLVMVWPWLMHRNPVLWSKPDVDFDGRFLNPKSKKPNKYGYVPFSIGPRICAGLQFGMTEAILSLAI  
LAQDFELKLKDGTDVQPVARLTLRPGENLPMTHLPHRS

>CYP1104C1 (B0E33\_27775) *Labrenzia aggregata*

MTVSAQISGDTQKAEPATKAEDFVPPYPFRYEKMPFVWSLIGMAKRNFLSIWGVDDFQSRLRSKKIIFTREL  
ICNRPDVVREAFQTNHEVLQRKSPQMRHALQPLLGDGLFISDGTWAKRRKVVAPIIHGSRVKGFAPIMIETI  
EEQRADWASQGEAEVDALADMAHLTAEIIICRTIFGRQLGKDHAEEVVGFSYQRHIDQVDILSLFGLPEWL  
PRFRGRAIKKPVERIMTVLDKIIANYEAQKEKGEASVIGGLLEARDENGEPLSREAIISEAAVIFMAGHETTA  
NTLAWAWFLLSQCDKSRAKLQAELDTVLADRSPTFQDVPNLPTYKAVIEETLRLYPPVPILAREAMADTSIGG  
KSVPKGSLVMVWPWLMHRNPVLWSKPDVDFDGRFLNPKSKKPNKYGYVPFSIGPRICAGLQFGMTEAILSLAI  
LAQDFELKLKDGTDVQPVARLTLRPGENLPMTHLPHRS

>CYP1104C2 (SL003B\_1954) *Polymorphum gilvum*

MDQSVAAVVAEREPTYVPPHPYRHETMPSVIELMGLARKNFLSIWSKGNFSSRLMSQQVLRLLVVCNSPDVV  
QEAFTQNHAVLQRKSPQMRHALEPLIGDGLFISDSDIWRRRRKVVAPIIHGSRVPGFAPIMVDTIEEKRAEWA  
ARGAGGEVDALAEMAHLTAEIIICRTIFGRNLGRNYASEIVEGFSDYQRYIDQVDLPAMLGLPEWLPRFRPAV  
HRSVKRILGVLDEIIDSYQAMKDSGEVSVIGGLLEARDEDGAPLSREAIRNEAAVIFMAGHETTANTLAWAWF  
LLSQAPRVRRERLHAELDSVLGDAPPSFADVARLPYTKAVIEETLRLYPPVPILAREAMADTTVGGKRIPKGTI  
LMVVPWLLHRNPTLWPDADAFRPERFLEGEGRPSKYGYVPFSIGPRICAGLQFGLTESILSLAILARAFDLR  
LKPGADIQPVCRLLTRPGDALPMTLHPRTA

>CYP1104E1 (GDI2364) *Gluconacetobacter diazotrophicus* Pal 5 (Brazil)

MNFRLCADRWNSEFIPFPFPRPKTSLSVFELLRRGTQNFNLNIWEEKAFEYQTMMSQVRLARQVFICNSPDTVR  
HAFITRAENFQRKSPQIRNALSPLLGDGLFVSDGETWKQRRQMVSPVLHTSRMDQFAPAMVETVGELADRWAA  
LPDGATFDVLKVMQTLTAEIICRAVFGRTLGAEHAREVAEAFTEYQKYVDQSDLASFGLPSWVPRNRGAKTRR  
ATARIHAVLDGIIADLQRTEDDGSVIRMLMRDGVLDATLRNEAAVIFLAGHETTANCLSWVWYLLSQAPEVE  
ARLHEELDTVLGSRAPTFADVSQLVYTRAIVEETLRLYPPVPLLAREAKEDDITRSRKVKAGALVMVVPWLLH

RHRLYWRKPDHFMPPERFLPGSPDAPQKYTYVPFSIGPRICPGLSFGLVEAIIICLASLARGTTLRLAPGAVVEP  
VCRLTLRPGDTLPMTVWKRTAAAGTRPVPAAASAQRCPVHHG

>CYP1104E1 (Gdia\_0609) *Gluconacetobacter diazotrophicus* PA1 5 (JGI)

MEFIPFPFPPRPKTSLSVFELLRRGTQNFLNIWEEKAFEYQTMSMQVLARQVFICNSPDTVRHAFITRAENFQR  
KSPQIRNALSPLLGDGLFVSDGETWKQRRQMVSPVLHTSRMDQFAPAMVETVGELADRWAALPDGATFDVLKV  
MAQLTAEIICRAVFGRTLGAEHAREVAEAFTEYQKYVDQSDLASFGLPSWVPRRNGAKTRRATARIHAVLDGI  
IADLQRTEDDGSVIRMLMRDGVLDATLRNEAAVIFLAGHETTANCLSWVWYLLSQAPEVEARLHEELDTVLG  
SRAPTFADVSQVLVYTRAIVEETLRLYPPVPLLAREAKEDDTIRSARKVKAGALVMVVPWLLHRHRLYWRKPDHF  
MPERFLPGSPDAPQKYTYVPFSIGPRICPGLSFGLVEAIIICLASLARGTTLRLAPGAVVEPVCRLTLRPGDTL  
PMTVWKRTAAAGTRPVPAGASAQRCVHHG

>CYP1104E2 (CAK95\_26735) *Pseudorhodoplanes sinuspersici*

MWEEDAYDDYEFVSTQVLARKVILCNSPESIQFAFSTRNASFERKSPQERFALAPIIGDGHFITDGETWKRRR  
RLIAPIIHVSHLAEFAPTMEVAGETRDRWLKRPAGQSFDVLTEMAQLTAEIICRSVFGRELGHEHAQQVVD  
FSEYQRQIAQLDMFSFLGLPDSFPRPRSRALRRVQGIHDVLDGIIIDSYQTRKKDKNDASLVGRLMEAHDEET  
GERIQGEALRNEVAVLFMAGHEGNANALTWTWYLLSQAPDVEARLHDELDRVLGDSMPTFSDLPRLTYTRAVL  
DESMRLYPPVPFLSREAIVDENYKGESIPRGLIFVVPWLIHRHKKFWDKPDHFIPERFLPGNGPTPSKFAYI  
PFSIGPRVCSGLGFGSAEGILCVATIAQALRLRLKQGYKVEPVCRLTLRPAGGMPMSVEPRQHAQVAPPDEP  
AAMACPFHG

>CYP1107A3 (A6J80\_12355) *Paracoccus yeei*

MTRYPARVPLHRKPLGVIGSALVARRNVLELIPEIAVRQPMVSGKVGRWHMVMDPDALRVVLKDRVEDYPKS  
LVTKLLLEPAVGESLFVAEGAHWRWQRRAAAPAFARHVEALAPVMTAAAEASARRLSAAAGGTVDFVAETVA  
ATFEVISDVTFSGDEGFDRDAVHHADAYIESTARISVLDILGLPGWIIPRGRRLRSGDLRRMKRVADDAIRA  
RARSGPRPVPDLLDLRAGEDPETHRRMTPGELRDNLLTFIVAGHETTALTAWAFYLLAFDPAVQDRAAAEA  
RAALGDRAATAADLPRLPYVRQIVDEALRLYPAAFLSRTARIHDSLGGREVLPGDVTMLPIYALHRHLLWD  
DPDAFDPDRFAPGVTRDRFAFLPFGAGPRICIGASFALQEAVIILATLVARLRFDLTARQPQPRMILTLPHG  
GLWLSVRARA

>CYP1107A4 (Pden\_2272) *Paracoccus denitrificans*

MSPDHPPERYPARVALHRQPMGVIASAMTARRNVLELIPEIATRQPMVSGKTGKRWHMVMDLGALRRVLKDRV  
EDYPKSLVTRLILEPAIGNSMFVAEGAHWRWQRLAAAPAFARHVEALGPVMTAAAEASAQRLAAADGPVDVF  
AETVAATFEVISDVTFSGDEGFDRDAVHHADAYIAGTARISVLDILGLPGWIIPRGRFLFSGDLRRMKRVAD  
EAIARARSGPRPVPDLLDLRAGEDPETHRRMTPAELRDNLLTFIVAGHETTALTAWALYLLAFDAQVQHR  
AASEAVAALGGRAATAADLPRLTYIRQVVEEALRLYPAAFLSRTARIHDLRGREVRPGDTIMMPIYALHRH  
HMLWDDPDRFDPGRFAPGVTRDRFAFLPFGAGPRICIGASFALQEAVIILATLVSRFRFELTGRQPQPRMILT  
LRPHGGVWLKVAERS

>CYP1107A5 (BMG03\_18115) *Thioclava nitratreducens*

MDYAATDDTHRLPARAPLAEHPLGILASFRAARRNLEIIPELATHAPIISGNTGARWHMVMDPDSLRLHILKT  
RVEDYPKSVVTKLILGPAVGEGLFVAEGAERWQRRASPVFAARNMEALAPVMGAAAEASAARISTAADTGR  
AVDLHQEMVAATFEVISDVTFSGDEGFDRDAIHRAIDAYIAQTAKVSLDLFALPAWVPRPHRVISSGVVRDL  
KRHADSIEARRASEAKAVPDLDDLGAQDPETGREMSPAELRDNLLTFIVAGHETTALTAWALYLCAFDPA  
AVQEAARSEAQAALGAHAATVDDLPMPLVAQIVNESLRLYPAGFLSRTARKPDTLLGREVRAGDVTMLPIY  
ALHRHHALWDDPHAFRPDRFADPTHDRFAFLPFGAGPRICIGAGFAMQEAQIILATLLARFRFTAVPGREPVP  
EMILTTRPKGGIWLTVKRA

>CYP1107A6 (JCM7686\_0408) *Paracoccus aminophilus*

MLSDPALLPPRVPAAHTKPLGVIGSALTARRNVLELIPEIAYRQPMVSGRTGKRWHMVMDPEALRRVLKDRVAD  
YPKSLVTKLILGPAVGQSMFVAEGAHWRWQRLAAAPAFARHVEAMAPVMTAAAAASLRRIAAAQGEVDVFAE

MVAATFDVISDVTFSGGEGFDRDAVHTAIDSYIAGTARISLLDILGLPSWVPRPGRLVAGRELRLKRTADHV  
IDERKRQGAQPVPLDLLDLQAGEDPETGRMTTPELRDNLTLTFIVAGHETTALTALAWALYLCAFAPEVQERAS  
AEARAALGDRIAGAADLPALPYLRQIVEEALRLYPPAAFLSRTALAADELGGREIRPGDTVMLPIYALHRHHL  
LWEEPDRFDPERFAPGVTRDRFAFLPFGAGPRICIGAGFAMQEAVIILASLLARFRFETTARVPTPRMILTLR  
PEGGVWLRAIPR

>CYP1107A7 (AKL17\_0406) *Defluviimonas alba*

MDARTPPATPVQVPLATVPLGILGSLRVAQRNLELIPEIALRQPMVSGRTGKRWHMVMDPAALRRVLKDRVD  
DYPKSDVTKLILGPAIGDSLFLVAEGAHWRWQRRAAAPAFSVRNVESLAPVMSLAADRASARIAAAHGRAANLF  
DEMVTATFEVIADVTFSGGEGNGGLERDAVHKAIDSYMAQTAKLSVLDIIGAPMWVPRPSRMRSRGPVMRQMKQ  
VANAAIDQRRSDGPRPVPLDLLDLGSGVDPETRRTMDTAE LRDNLLTLTFIVAGHETTALTALAWALYLCAFDQDV  
QDQARAEAQGVLDRAATAADLSQLPLIHRIVEETLRLYPPAAFLSRTALAADELTCGREIRPGDTVMLPIYAL  
HRNHALWKDPHCFDPSRFEDRSFDRYAFLPFGDGPRICIGASFAMQEAVIILATLLARHHFALVPHRAPKPV  
ILTLRPEGGVWLMVEPARNAGVGQGSNLGEERS

>CYP1107A8 (ROSMUCSMR3\_03777) *Roseovarius mucosus*

MSPIPRQTPQTLPAHVPLVTEPMGVLASLKAARRNLSIIPETIATRQPMVSGRTGKRWHMVMDPGAIRRMILLE  
ELDNYPKSIVTKNLLRPAIGESLFIAEGAHWRWQRRTAAPVFSHRNVMNLAPIMTAAAEQSAARVAAAGPRAV  
DMAAEMVRTTFDVIADVTFSGDGMFDDAVHGRIDAYISEAGKISLFDILGFPDWVPRPGRVMSGGSVAEMKR  
VADEAVEARRARGSEGVPDLLDLLDGEDPETKRRMSTPELRDNLTLTFIVAGHETTALTALGWSLYLCAFDQAV  
QDRARAEAQAVLGGRAATGADVRLPYIRQIIDEALRLYPPAGIISRTAQVADTLCGRNIRPGDTVMIPIYAL  
HRNHQLWPEPDAFNPDRAFDRKTIERYAYLPFGDGPRICIGASFALQEAVIILATLLSRFRFTVPVGRDPDPV  
MILTLRPEGGVWLMVAEPV

>CYP1107A9 (MALG\_03152) *Marinovum algicola*

MPDCTLPPRLPVHVPLGTRPLGLLASLSAARRNLSIIPKIATTQPMVSGRTGARWHMVMDPAIRAMLLERL  
DDYPKSLVTKNLLRPAIGESLFIAEGAHWRWQRRAAAPVFSHRNVMNLAPIMSAAAERCCARIAAAGPRAVNL  
HDEMVTTFDVISDVTFSGDSVFDKSGVHRAIDDIYIAAGKISLFDMLGFPDWVPRPGRLLSGNAVVRQMKSV  
DSIDAARAARGHDGVPDLLDLLLAGEDPETKRRMSVAELRDNLTLTFIVAGHETTALALSWSLYLCAFDQEVQE  
RARAEAQSLQGRAAGGEDVAELPYIRQIVDEAMRLYPPAGIISRTARKADTLCGREVRPGDTVMPVIYALHR  
NALLWQEPDAFRPERFADRKAVPRYAYLPFGDGPRICIGASFALQEAVIILATLLSRFRFTVPDGRTPPEPVM  
ITLRPEGGVWLEAEAV

>CYP1107A10 (BO069\_01850) *Sulfitobacter* sp. AM1-D1

MSTTLPVVRPLVTEPWGILKSLAEARRNVLSIIPDIATRQPMVSGKTGKRWHMVMDPQAIREVLLDRLDDYPK  
SLVTKNLLKPAIGESLFIAEGAHWRWQRRAAAPVFSHRNVMNLSPIMTAAAEARTVARIEAAGPRAVNMLDEM  
TTTFDVIIGDVTFSGGDTFDRDKVHGAIDDIYISEAGKISLFDVLGFPDWVPRPGRLMSGALKEMKSMADSAIE  
ARAERGHGVPDLLDLLLEGVDPKTKRQMSAE LRDNLLTLTFIVAGHETTALTLWAMYLGLFDPVAVQARARAE  
VQDVLQGRACGTGDDVEKLPYIRMIIDETLRLYPAAGIISRTAQKHDTLCGREIRPGDTVMIPIYALGRNKLLW  
DDPDRFDPDRFADRKSIDRYAYLPFGDGPRICIGASFALQEAVIILATLLSKFEFAPVPGKEPKPVMILTLR  
EGGVWMTAKPVQRTAAG

>CYP1107A11 (AYJ57\_06345) *Yangia* sp. CCB-MM3

MIETSSEPQSPAPLPVRAPLVTEPLGILASLRAARRNLLAIIPDLATRTPMVSGRTGARWHMLMEPGAIREVL  
LERLDDYPKSMVTKNLLRPAIGESMFVAEGAQWRWQRRAAAPAFSARNMSNLGPIMAGAADRQAQRIAAQQR  
AVDLYEEMVTTFDVI SEVTFSGGEAFARDAVHRAIDGYIAEAGRISLFDVLGLPDWVPRPGRMRSAGGLTEM  
KRVADAAIDRAARGPREVPDLLDLLLAGEDPETTRRMNTAE LRDNLLTLTFIVAGHETTALTLWALYLLAFDP  
EAQERARDEVMAGVSGGTASAAEVAELPYLRVIDETLRLYPPAGIVSRTAQVPDELTCGREIKPGDTVMIPIY  
ALHRSHRLWEDPDAFRPDRFLEKPPRYAYLPFGDGPRICIGAAFALQEALIVLASLLKRFRFSAVEGRAPEPV  
MILTLRPEGGVWLEAEPL

>CYP1107A12 (RL0149\_c033920) *Roseobacter litoralis*

MAKDELTDKGRI PV RVPLV N A P V G I L K S W Q M M R E N V L N I I P E Q A T E Q P V V S G K T A K R W H M V M D P A A I Q R M L L D  
R V E D Y P K S T V T K N L L R P A I G E S L F I A E G A H W R W Q R R A S A P V F S H R N V A A L G P V M T A A A D R T S Q R V A Q A G P R A V  
N M L D E M I T A T F D V I A E V T F S D D G S F D R Q A V H D A L E T Y V N D A G R I S L L D V L G L P D W I P R P G R T T A S A E M T Q M K Q  
D A D A A I E A R A A R G P G D V P D L L D L L L T S Q D P K S G R S M T T S E L R D N L L T F I V A G H E T T A L T L A W S F Y L C A F D Q D V  
Q D K A R A E A Q D V L G G R A A T T T D V D H L P Y I R Q I I D E A L R L Y P P A G V V S R T A Q K P D T L C G A D I Q P E D T V M I P I Y A L  
G R H K L L W E N P D Q F D P D R F E D R K S I K R Y A Y L P F G D G P R I C I G A S F A V Q E A V I I L A T L L S R F R F T P V R G R D P K P V  
M V I T L R P E G G V W L M A E P V

>CYP1107A13 (RD1\_1394) *Roseobacter denitrificans*

MAKDAFTDDNRT PV RI P L A T E P V G I L K S W Q M M R E N V L N I I P E Q A T E E P V I S G K T A K R W H M V M D P G A I Q Q I L L D  
R V E D Y P K S T V T K N L L R P A I G E S L F I A E G A H W R W Q R R A S A P V F S H R N V A A L G P V M T A A A E R T A Q R V A Q A G P R A V  
N M L D E M I T A T F D V I A E V T F S D D G S F D R N A V H K A L E T Y V N D A G R V S L L D V L G M P D W I P R P G R T T A S A E M A Q M K Q  
D A D A A I E A R A A R G P G D V P D L L D L L L A G Q D P K S G R S M T T S E L R D N L L T F I V A G H E T T A L T L A W S F Y L C A F D S R V  
Q D K A R A E A Q K V L Q G R A A T T A D V E N L P Y I R Q I I D E A L R L Y P P A G V V S R T A Q K R D T L C G A D I Q P D D T V M I P I Y A L  
G R H K L L W D N P D Q F D P D R F Q N R K S I K R Y A Y L P F G D G P R I C I G A S F A V Q E A V I I L A T L L S R F R F T P V K G R D P K P V  
M V I T L R P E G G V W L M A E P V

>CYP1107A14 (BWR18\_13465) *Tateyamaria omphalii*

M P D T A L P R P L P V R V P L V N E E W G I W K S L Q M A R S N V L R I I P E L S T R L P I V S G K T G K R W H M V T D P A G I K R M V L D N L  
D I Y P K S V V T K N L L K P A I G E S I F I A E G A D W R W Q R R T A A P V F T H R N M M N L A P I M T G A A E R C A D R I A A A G P R A V N L  
L D E M V N T T F D V I A D V T F S G G E A F D R S G V H R A I E D Y I S E A G K I S L F D I L G A P D W V P R P G R V V S G Q A M R E T K A V A  
D R A I E E R A A R G H D G V P D L L D L L L A G E D P K S G R K M T T A E L R D N L L T F I V A G H E T T A L T L A W S M Y L L A F D P A I Q D  
R A R A E A Q A V L Q G R A A T G E D V E H L P F I R C I I D E A L R L Y P P A G M V S R T A M E D D V L C G R E I R K G D T C I I P I Y A L H R  
S K L L W D D P D T F D P D R F A D R K S V D R Y A Y M P F G D G P R I C I G A S F A L Q E A V I I L A T V I S R F R F T P V P G K E P E P V M I  
L T L R P E G G V W L T A E P A

>CYP1107B1 (Ga0080559\_TMP3064) *Salipiger profundus*

M S D F V P P T V T P P G K P L G I M A S L R A V R R N V L N I I P A I S Y T Q P I V T G T T G S A R W H M V Q G P E A L R R I Y L D N V D N Y P  
K S E V M L R M L R P A V G N S L F T S E G A H W R W Q R R A I A P V F A A R H V E A L A P M M T Q T A E R A A G R L A A S G G Q A E L V R E M L  
S A T F D V I C D V A L S G R E H F D A E V Y G E A I T R Y F L T V G R A S L L D F L E V P P W V P R P A E L F G R S A V K T M H S M V S R A I D  
A R R V R G A G P M D D L L D H M L K A K D P E T G R T M S P Q E L L H N M Q F F I V A G H E T T A L A I T W A L Y L L A N D P K A Q E R A H A E  
A R A V L G D R P A E H A D L A R M P Y I E Q V L D E S M R L Y P P V G F L A R N V L A T D Q L Y D R E I R R G E T V F L N V Y A L H R H R M L W  
N A P D A F D P D H F S P E A K A G R D R Y S Y S Y L P F G A G P R V C V G A N F A M M Q A Q I I L S T L L A R F R F H S T G E R P E P V M H M T  
V R P D P G V T L R V E P V

>CYP1107B2 (Ga0080574\_TMP976) *Pelagibaca abyssi*

M T Q P L P P R I E P A T Q P L G M L A S L R A A R S N V L R I I P A I A Y T Q P I V T G T T G H A R W H M V Q G P E G M K R L F L D N V E N Y P  
K S E V M L R M L R P A V G D S L F T S V G A Q W R W Q R R A I A P V F A A R N V E A L A P M M T A T A E R A C E R L A G A G S A E M V A E M L S  
A T F D V I C D V A L S G R E H F D A E T Y G E A I T R Y F L T V G R A S L L D F L E V P H W V P R P A E L F G R G A V K T M H T M V A R A I E A  
R R R E A T G G A D D L L D H M L A A R D P E S G R T M S P R D L L H N M Q F F I V A G H E T T A L S L A W A L Y L L A H D Q P A Q D R A R E E A  
K D V L Q G G P C G H E E L D R M P G I T A I L D E T M R L Y P P V G M L A R N V R E A D T L Y D R E I R P R E T I F V N T W S L H R H H D Y W E  
R P D H F D P T R F G P D Q Q R N R Y L H L P F G A G P R V C V G A N F A M M Q A G I I L A T L L S R Y R F A P K G P R P E P I M H M T V R P D P  
G V T L E I T P H

>CYP1107B3 (Ga0080559\_TMP4197) *Salipiger profundus*

M Q P V M D P A V P D F V N K L Q R I D T Y D E I E E I M K S Q D F V M A G A D E R F I F L E D T L I M A E G E Q H S E L T R L F A P L M S R Q A  
V A Y Y E L K L V E P A I E A S I N D M R S K R G E D G K V R T D V V P L I H A A L V R I A S K V T G V D G V D S L E D T E R F R D M V L A V S A  
A T T A S Y S S A S D P G R I I Q K G K D A L Q A L V D E W M Q A S L D R R I E L A A K H K A G E I P A E E L P R D V L M S L C L A E D L S R P D  
D G T R I P Y V W R Q C A Q F L T G S I K T T S H M L P H A F I H I D E W I K E H P E D R P N L T D P E W L H K A A A E S F R L H Q T T P A R F R  
K A V K D L E L S T G R K V D A G E M V A I H A P V A N V E A F G D D G R Y F N P Y R E V P K G K K A W G M T F G I G K H S C I G Q N L V T G I M  
N K G D A K H G T H G T A V R L L K A M Y E L G A E L D P D N P P Q R P H D N L H D T W E S V P V I L H K A

>CYP1107C1 (RGUI\_1731) *Rhodovulum* sp. P5

MIHGGAGQWGAAVALDSGAMTRVPVGVVPANGPLGPLAAYRTARRNVLELIPAEAYSAPFVFHDGSPSWLYVT  
EPAAVQHVLTEHEAYPKSAMPLRLMQPRRGSNLAVTSGADWRRQRKALAPAFTPQALAAMGPATGAAARDAAE  
RLATRSGEVVDVLPHEATTDVICEVMLSGRDVIDRRALTQSVDRLVGAITRVSVFDLFIKIPNRVPRPAEVF  
DQSRARMRLADRLIADRRSRGPSDPPDVLDLMIGPRSDCGLDDLEIRNNLLGFLFAGHEPTALSLTWALYL  
LAFDPEVQAQARGEADAAISGGVARHDDLRLGLYIRQVVEEALRLYPAGFLTRTAARDGEIGPHFVPGKANV  
VLPVYAMHRHEGLWTAPNAFDPGRFGPDRLTPREKSAFLPFGGGPRICIGATMAVTEATLILATLLTRLSFAL  
PPGFSPQPMWFTLRPGTGMKLRISKRPS

>CYP1111A4 (BSY18\_3618) *Blastomonas* sp. RAC04

MMPSPQLEDLSDPGFDPFVIEKLSTGDCHDPYPQIHALMQRGVPVEGSYRSQFTSVDPVQMGHLPQVMVLGYD  
AVLHVLTHPEIFTNKEAFSPNLGRAFGNTVTVMDAPEHPRYRKIFQKAFLPQVVSKWGETTVVDPVVDRLMAKF  
LPHGRADLIEDFTHHYPFQVIYAQVDLDPAQAPVFHKLAIQAQLLSSIGAPQGGQEASKKLGDFFGALVEQKRAK  
PGTDLISHLATVEADGERLPDDVLISFLRQLMNAAGDTTYRGTSVLLTGLLTHPEQLKAVAEDRSLIPQAIDE  
ALRWEGPVASTFRYASVDTEIAGVPIKKGTFVNTVLASANRDPKFPKPDSDIFRSRTPRHLAFASGPHLCI  
GQHLARVEMTRALSALLDRLVNLRLDPDKPEPRVTGHILRAPEHLWVRFDS

>CYP1111A5 (Swit\_0364) *Sphingomonas wittichii*

MESAVRIQEFDDPNYDPFNSDEINFGDHADPYPLIARWRAEAPVIEGGYRPLMGLPAALYPDRKMFTTVVGSRE  
VNEVLTDTRFSNAGYKFNLGVTFGQGSISTMDNPEHGRWRRIFQKIFLPQYVKKWGETIVDPVVHGLMGKFL  
PLGRADLIEQFTLRYPFEVIYHQDLDPEDVRTFQRLALGQTDYVNHEKAIEAGRKLGDYFTALVEERRRDPG  
DDLVSLLASTEADGEYLPHEVLISFLRQLMNAAGDTTYRGTSILLTALLEHPDQMEAIRADRGLIPQAIEEAL  
RWDGPVAVQMRMAAVDTELAGVAIPAGSLDDVAGAANRDPEIYSDPDRFDIFRDRKPHFAFSRGPICVGGQH  
LARVEMTRALHAVLDHLPGLRFDPEPRPRIQGSMMRVPRHLHVRFGD

>CYP1111A6 (AZL\_b01530) *Azospirillum* sp. B510

MNASAPRIRDFDDPSFDPFSAVDEGFPGHVLDPYQRLAELRREAPVHHIDYRVLFGLEPDITLGGLPHALVVS  
YDAVAQVYNDPVTFNSNTIYERNLGIAGFRSISVMDAPEHPRYRRIFQKAFLPNIVSKWGESLVAPVIDRLLER  
FIDRGHADLVKEFTALYPFQVIYEQLGLPKGEVEVFHKLAAALTTFSDVPYAMEASAKLGEYYDALTDLRAQ  
QPGDDLISLLATAEVDGERLPKDVVVSFLRQLNNAAGDTTYRATSCMMGLLSNPEQFDAVRRDRSLIPAVIE  
EAIRWECPVLVGSRQAIRDVTLCGVDPAGTVIDVGNGAANRDEARYPDPDRFDIFRPAGGARHFGFAYGPHV  
CIGQHLARVEMTRALTGILDRLPNLRLDPERPAPQIRGINLRAPSALHVVFG

>CYP1111A7 (Sphch\_3576) *Sphingobium chlorophenolicum*

METAVRIQEYDDPSYDPFGADDLNFGLDMLDPYPEIAKWRAQAPVLEGDYRPKMGLQSATYPDRKMFTTVVGSDE  
ILTVLTDTRFSNHGYKFNIGETFGQGSISVMDNPEHGRWRKIFQKIFLPQYVKLWGETIVDPVVHKLMDKFV  
GTGRADLIEQFTLLYPFEVIYQQDLPESDVNTFQRLAIGQTDYMHIDKAQEASRKLGEYFTALVDERRRNPG  
DDLVSLLANTEVDGDLPLVLISFLRQLMNAAGDTTYRGTSVLLTALLENPDQLDAIRADRKLIPVAIEEAL  
RWDGPVAVQLRMAKQDVVLGGLEIPAGSLDDVAGAANRDPAIFDPDRFDIFRERKAHFSFSRGPICVGGQH  
LARVEMTRALHAVLDNLPLNLRFDPPDKPRPEIRGSMMRVPRHLHVRFGD

>CYP1111A7 (TZ53\_05360) *Sphingobium* sp. YBL2

MEPAVRIQEYDDPSYDPFSADDINFGDTLDPYAKIAKWRAQTPVLEGDYRPKMGLQSATYPDRKMFTIVGSDE  
ILTVLTDTRFSNHGYRFNIGETFGQGSISVMDNPEHGRWRKIFQKIFLPQYVKTWGETIVDPVVHKLMDGRFM  
GTGRADLIEQFTLLYPFEVIYQQDLPESDVRTFQRLAIGQTDYMHIDKAQEASRKLGEYFTALVDERRRNPG  
DDLVSLLANTEVDGDLPLVLISFLRQLMNAAGDTTYRGTSVLLTALLENPDQLDAIREDRKLIPVAIEEAL  
RWDGPVAVQLRMAKQDVVLGGVEIPAGSLDDVAGAANRDPAIFDPDKFDIFRERKAHFSFSRGPICVGGQH  
LARVEMTRALHAVLDHLPNLRFDPPDKPRPEIRGSMMRVPRHLHVRFGD

>CYP1111B1 (JI59\_21480) *Novosphingobium pentaromativorans*

MATIAPIEYFDEADFDPFVIDDDVFGEIEDPYAIFDRARANGPVQPGTILELLGAPADSIVAGIPQFRVIGHA  
EVQAVMRNAALFSNDVLKMNLGVTFGDTISAMNPPKHTQVRGLFQSTFMPKQVAKWSETLVDPVVNDLIGRFI

GDGRAELVEQFAKRYPFEEIIYRQLGLPQRDVQTFHRLAVTLTFNSDYIRYGKEASRKLG VYFQNLLEERRRNP  
ADDLVSLGQLGGDNGLSDETIVSFFRGLINAAGDTTYRATGCMLMALLNPEQLEAVRQDRSLVPLVLEETL  
RWNGPIIFTQRMVMQDTELGGVRMPAGAI VNVSM AANN DPAVHENPRKFDLFRGTKSHFGFGLGPHMCLGQH  
LARLEMSRALNAILDRLPGLRFDPM PKPTVKGGLMRTPRDIHVLFDP S

>CYP1111C1 (J159\_21655) *Novosphingobium pentaromativorans*

MKHQPVIQGFDDVDFDPFAFFAASFGEIRDVYSLYDRLRQQGTVVEGSVLDLLCGVTEPQLEGLRQFTVLGYE  
EAMAVNRDPALFSNATLNDYLSITFGPTLTALDPPVHTEVRRVFQRI FLPAQVAKWSETFIDPVIDRLVTDLA  
TAGKAELVEDFAKKYPFQIIYRQLALPEQDIETFHKLAVAQGLMGEYRHHAVEASQKLGAFLTDIVAERRRNP  
GADLISTLATSEVDGARLEDQFIIAFLRQLTLAAGDTTFRATGTLFAGLLSTPGLLDEVNRNDRSLVAPLIEET  
LRWDGPSGYTLRTATRDTELGGVAI PAGSVNVVSFSAANRDPNAPNAPNADFVHRPKKPHMGFNTGPHMCVGQ  
HLARLEMSRAVNAMLDRFPNMRFDPAQPRPHIEGVVFRTPYNVHVLLD

>CYP1116B1 (Mesci\_0689) *Mesorhizobium cicero*

MSFAENITVEALEADPYPIYAE LRRSAPVAFVPAVNLWFVTRWKDVESVAKSPEIFS AVVGSSPVERSFGKPT  
ILTTDGETHKQLRQGVDPKYRPRTVAA YAGDLVRSIAEPFLDR IANQGS AELMADYFEPVSTLSLARS LGLAG  
IDMPTLRRWFYGLAQGAINFENDPKRQEIADAI SAEVGDAILPTLERLARQPDD SALS HMLHDGMPEGTT RPI  
DFLMP SIKVILLGGMQEPGHGAGSILAGLLAHPKQLRQVLADPETFVPRAVDEGLRWVAPIGTQTRQTTRA VE  
LGGVTIPAGAAVAALVASASRDES RFADPDRFDINRNEGNHAAFGFGHHFCSGRFFAREQMCLAVRLLLQRFP  
DLSLVPSREP VF RGWEFRAPTTLHVS LGVRHQ

>CYP1116B2 (Mesop\_0704) *Mesorhizobium opportunistum*

MSFAENITVEALEADPYPIYAE LRRSAPVAFVPSVNLWFVTRWKDVELVAKSPDIFSAIVKAGVSPVERSFGK  
PTILTTDGEIHKHLRQGVDPKYRPRTVASYAGDLVRSIAEPYLDRIASQGS AELMADYFEPVSTLCLARS LGL  
ADIDMPTLRRWFYGLAQGAINFEKDPKRQEIADAI GA EVGDAVTP TLERLVREPDD SALS HMLHDGMPEGKTR  
PIEFLMPTVKVILLGGMQEPGHGAGSILVGLLRSPDQLRKVLDDPETFVPKAVDEGLRWVAPIGTQTRQTTTRA  
VEIGGATIPAGAPVAALVSSASRDERRFADPDRFDIDRDEGNHAAFGFGHHFCSGRFFAREQMCLAVRLLLER  
FPDLRLVPGKEPVFRGWEFRAPTTLHVSFGVGPK

>CYP1116B3 (Rleg2\_4431) *Rhizobium leguminosarum*\_bv. *trifolii* WSM2304

MTSPETVTVEDLEADPYPIYAQLRREMPVAYIPAVNLWFVTRFKDVEYLSKTPEIFTAAVESSPLDRTWGKPT  
ILTADGPVHKNLRS GVDPKYHPKRVAAYMDDLVLPIAREYHDRLLASGGGDLMSDYFEPISILSLTRSLGLGH  
VDLET LRRWFFGLAQGAINFECDPERQAVADAISTEITGIVTPVMQKLIIEPDD SALS HMLHDGMPEGETRTI  
DFVLPTLKVLLL GGMQEPGHGAGS IMAGLLQNP DQFAEVKGDPDALLPRAVDEGLRWVTPIGTQTRQTTKAVE  
IGGV TIPANQPVAALVASASRCESRFTDPGRFNIHRNEGSHAAFGFGHHFCAGRWFAREQITSALRYLIDRSP  
EIALRDDGPVQFRGWEFRAPSTLNVTLR

>CYP1118B1 (A6F68\_01696) *Altererythrobacter dongtanensis*

MAQTTPLPTGIRLTSLDAEYREN PAGIYDRLRSEDPVHFDEQFQRYFVTRAADIQEVLKDRSMGRDPDKARPD  
SYVKFFIDEASFEKSMLFLDDPDHARLRSLVTQAFGFRAISELRPHIAEVANRLLDQLEGQDEFDVI SEFSSP  
LPIIIIAEMLGVDPADKDDFIRWSQATDVA FSPMRTE DQNRQLITARDSMSEYFYAAIAERRREPRDDL SAL  
IEAADGQHRLSDQEIVVSARLLL VAGNVTTTDLIGNAVRLLLEDD EQRRRLEAEPELIDNAVEEVLRLDPPVT  
AVARITSQPVTVADTAVPAGENLFLATHSAALDPDLNPNPGRFDIARDKPKHIAFGGGAHFCLGAQLARAE AQ  
IAIPLLLARFPGLRLVEAPERKIAPGFNGYKSLKVAVR

>CYP1135A1 (Jann\_2276) *Jannaschia* sp. CCS1

MAEHFVTEYRDAEQTLRLPDLHQALYDADTVFLPRTVVCLHGEAHARKKRIFSGVFNRRFFKH YQNHVFPRAI  
KESIDPVLAEGRGDMAKFAYRVLINLTADSAGIDRRHTQEDTDRLLALLAKLGHAPTMGQLRDP SERETLLAE  
LEDALAAFRDEFFEP SLARRRGLVAQYEAGEIERSDL PQDAIVAQLLAMPTDEDI PYDERMKDSAFFILAGAF  
TTANVLMNFTKNLLDWFDDHPEDRANLLADPIMMQRFIWENTRLHPASPVTKRRALCPMHL PDGHDAEQDEYV  
TMDLTRINRNAELFGEDPEAFDPNRDLADNMPLHGLSFGGGAHVCLGKLLAVGVKITDDNKDAEETE VGTMAL  
VARELLRLGIARDPGHEAEIDESTDRRHFKTL PFI FDP AVAVG

>CYP1137A1 (G432\_10785) *Sphingomonas* sp. MM-1

MNQPRFSGAYTDAANWLYRMAREHNGENIRAEVNGADVLLVQRLDAEHVLRRRADNYRKNMHWFHMLGPSR  
FSEVGEAWEIRRELTQHLYLAKFDRERTHGLAVRYADEAVGGLAGRSAAGDAVLDESLLRRMTVSVLIENFFGV  
PLAETRVDIDRLATLMFEFGSEYAFAPTVDTSALNHRHLAALPRLRREIFDDFRLFREGALPDNAMLEGMLAAD  
RDPENDIMLEHELLTFFAAGAETTASGIGWACYLLARHPDVQRGRLDALASFWESPRDWAHLSTIAPLEAFV  
SEALRLYPPTPLVTRLATGPDRIGDHAI AEGDNIFVSI PGVQHDARLHPDPWALHLD RYRNNASAGSNI AFIF  
GPRVCGGKKFALVELAAAFVATFLKRADFALTS DAPPRFHWKSLMLREGGQPV RVTLRD

>CYP1138B1 (Xaut\_0387) *Xanthobacter autotrophicus*

MSAATEGPATGCNGTASPTPLLDRLAALRPAERWPLARDFIANEARAFFAELRAYAPIYETSEVTLIAKRA DV  
IEVLSLPKVFTVDLYKPKMGDFMLAMDETIVNYRDKSVMRAILAWDDLPKIRAVAAEVADAALDAAGCEIEAV  
QQLARHVPMRIVQRCFGIHGPDQDLLDWSYANQMDQFNNLPYDDRPDADAIHQAAEDSRVKLRNLFAQLIPAR  
IAEIKAGTAPDDSLTRILSLNLPAADHFGMDRVVINVGGLLIGAIETTAEAVINALAE L FARPEALAGARAAA  
EAGDDAAFDGYVWEALRFSPIVAFMFREAASTITIGQGT DREKVIGTGT VVLP LSLSAMFDPDFVPDPEAFRP  
DRPFHTYLHFGYGHHECLGRYVGGVMIPEIVKRV LK RPAARPLAPVDMAGTPFPQNYRIGLE

>CYP1138B2 (Mrad2831\_5959) *Methylobacterium radiotolerans*

MRAAAPETPCLTFLEALPVSERWQRARDWIARAPRPFFAQLRARRTALDCGAAILVAGRAEVEEILSLPQVFS  
VALYKPKMGEFMLALDGT EVNYRDKAVMRAVLSWRDLPAIRDLGAVTDAALDAGEGSIDVVASLSRLVPLRI  
VQRFFFGFAAPDADLLRWSYANQFDQFNNLPFDARPDAAEIHAAADRARQEMRAAFARIIPARVAAIEAGADLP  
DDVLTRLLRLHLPAAGFGMDRVVINVGGLLIGAIETTSEAVVNALAE L LGRPQVLEAARAAARTGPAAFDGY  
VWEALRFAPIVAFMFRQAETDHVLGRGSPAESRIAKGRIVLPLSLSAMFDATGVPEPDRFDPTRPDQTYLHFG  
RGHHECLGRYVAGAMIPEIVRRILLRDAVRAEGAVEDGGTPFPPTAFRISYAGRSAGAAAPG

>CYP1141A1 (MGMAQ\_0954) *Magnetospira* sp. QH-2

MFSDLPAFRRDTLGFFLDKCKNATAPLEKLHVGPHP IYLVADPDLVKPVFNAP ESEIDKGR LIYKMREVLGRS  
SLTLNGDEHKERRAAIHARLAKGMTTTYVPEISAI VRRYTMMAAQQGSFDAHGIGAPLALRVICDVLFGREAL  
SRGDEAALVNTIKLVEDDVAEKIFRVFPDLPWVAKRKKEKLRQGREIMMQVVERARQKASDASILQGLLELNL  
DDEGLRDEILLIILAGHHTTGSAAAWIFYMALYPDLVENLAKEAADIGDETGEI IPEKLYRDA PVSRAFANE  
VLRLFPSSYWMSRET MADVELGGM PVKAGTSLIICPWA FGRDPKFWDDPEEFRLDRSYANRA FVPFGAGPRVC  
VGGQLAMVELQLMALEFASAFEFTGVT PNPAPLPKPSLTLVPPRMEVTVK PRAHRAEPLISTHAA

>CYP1145A1 (PSE\_0379) *Pseudovibrio* sp. FO-BEG1

MPEPILYRPPAPT PCKPLRGLRLFRVFWARNVLNLIPEEFFNSPMERVYFTRRPCFLVNAPDLVNEVLVEKRL  
SFPKSDVMVDTLKP VIGESTIIASGPKWEEQREMIAPVFSHVGVRS AFKHIQDACNEFLAYLDKAAEFGKSIS  
LRDEMSRLTADII FRTIFSHPIDSMRARKVFTQAMQYQAITTTWARKMILRG TGEGPNRPMPEAEILRDEIR  
LLLTDLVDEHTADRF GQHDDMCQRLLDARHPQTGLPFSKEQLVDHIATFFLAGHETTS AVLNW AFFILSQRPD  
YSERIRRETDSITNGEMLEYKHL SKLRFTRNIFRETTRLYPPIAFLSRMAVEETTIGGHKIPRGALIIISPWI  
VHRHRSYWHPDHFDPDRFERDDDPMTGAYMPFGIGPRVCAGASFSTVEATSVLAGVTRHYNFKA EKPEEVFP  
ETGIALRSQSEIRCKLIK RSHMTH

>CYP1155B1 (BG023\_112535) *Porphyrobacter* sp. LM 6

MGNVAAFGR LAPATDKKSAAKDPGSFDPTLLQSSGITARIVEWVVRHPFALMAFARHFWPIPTFKGWAIITRF  
DDVAEALQNDKAI AVPFGEQIKTLNGGPNFVLGMADGPEYQALHKATMAVFP PRADNAAIVGPMAYHEASNLLE  
LGEGKIDGVRGLLTLPVTRICEKYGLTIPDEPNFARWTIAMSSYMFGNPNNDPNLEKAALAAGALVRPIMDD  
AIAKAKAAPDADTIAARLVQKQMEDPSAMPDEIIRAILIGMVTGFVPTNTMASGHMLDLLLDNPDWMAQAQEA  
ARSDDDDLLQRCLFEAMRFWPLNPGPFRVA AEDVTIAAGTRRAKTIKKGTKLLVSTQSAMFDP RRV EHPMRFD  
PNRKPVDYMLMGFGLHWCIGAPLAYAQITQTFKPLLRNRVRRAPGKDGKMT RF GPFPESLWVLYDH

>CYP1170A1 (HYPMC\_4126) *Hyphomicrobium* sp. MC1



METTPSHTLGLGDESSIWFNLTPLLRGDPDNPMRILMQMMDRYGPVLPVNMANQRVVLI SEPEYFKHVLVTKA  
DNYIKYFDGLKPIFGKSMITNDGALWQKIRMPQQPAFHPDMFAEYIPYFLRAIDTKMALWADLAKSGETVEMV  
EQTWTLAADMICKALFDRMPFNPHVVFVKCVKTYTDVMNHRDIRLRKQAGEVFEMTDEDPKAMEVWASVPPA  
VMGADPREMRERTLLKMIEATVADPSVPEFDQQAIDELKQYLWAGTETTALTALAWALYETSSRRPEMAERIRQ  
EGEQVYGDREPTAADYSGLAYTRAVIQETMRIYPPVWVSLIRIAAAAEDEIGGVKINPGDRVSIFSYGAHHNPKF  
WPEPESFQPERWMAGNAKKQVKYSYLPFGAGKRSCIGGAMSQVENTLALSRLRRFRPEYVGKDPAGLNATVT  
LTPKGGLKFKIHEL

>CYP1170A2 (GL4\_2417) *Methyloceanibacter caenitepidi* BAQ17853.1  
*Methyloceanibacter caenitepidi*

MADMTVAYSPSHGLGEEDSIWFKLSALLNQEDPMQVLMALCEKYKGVLNVNKNQRIVLLSEPEHAERVLVTN  
ADNYTKYFDGLRPVFGSMITIDGALWQKIRVPQQAAFHPKMFEEYFPYLMSAIDSKMDRWQKLADSGETVEM  
VEETWTMAADMVCRALFDREMPFNPHVVFVKQVKTITDVVNHNKVRNVRGELEEITAEDPAKAMEIWHSVPD  
TVISANVIDHREKTLTAMQEAADPDFPEFDHRQVIDEMKQYLWAGTETTALTALAWSLYLLSQHPEAMQVRV  
EEAHRVCGDADPDWNQVQQLSYTRMVIQETMRLYPPIWGLIRIAAGDDEIAGHKINAGDKVSILTYIAHHS  
YWEPEKFDPERFAPERAKKRRKYSYLPFAAGKRACIGGALSQIENTLALVQLLRRTPEYVGPTPAKIRATV  
TLCPQGGPLPFKIRKLS

>CYP1170A3 (Hden\_2852) *Hyphomicrobium denitrificans* ATCC 51888

METTPSHTIGLGEESSIWFKLTPLLRGDPENPMRILMHMMMDRYGPVLPVNMAHQRVVLI SEPEYFKHVLVTKV  
DNYVKYFDGLKPIFGKSMITNDGVLWQKIRMPQQPAFHPDMFAEYIPYFLKAIDTKMALWGDLAKSGETVEMV  
EQTWTLAADMICKALFDRNMPFNPHVVFVKCVKTYTDVMNHRDIRLRKQAGEVFEMTEENAAKAMEVWASVPPA  
VIGAHPREERERTLLKMIQDAVDDPSVPEFDAAQAVDELKQYLWAGTETTALTALAWALYETSSRRPEAAERIRR  
EGEEVYGDREPTAADYSGLVYTRAVIQETMRIYPPIWGLIRVAVGEDEIGGVKINPGDRVTLFAYAAHHNPKF  
WPEPESFQPERWMAGNAKKQVKYSYIPFGGGRSCIGGAMSQVENTLALSLLLRRFRPEYVGTDPARLNATVT  
LTPKGGLPFKIRELG

>CYP1170A3 (HYPDE\_37808) *Hyphomicrobium denitrificans* 1NES1

METTPSHTIGLGEESSIWFKLTPLLRGDPENPMRILMQMMDRYGSVLPVNMAHQRVVLI SEPEYFKHVLVTKV  
DNYVKYFDGLKPIFGKSMITNDGVLWQKIRMPQQPAFHPDMFAEYIPYFLKAIESKMAWADLAKSGETVEMV  
EQTWTLAADMICKALFDRNMPFNPHVVFVKCVKTYTDVMNHRDIRLRKQAGEVFEMSEENAAKAMQVWGSVPPA  
VIGADPREERERTLLKMIQAAVEDPSIPEFDAAQAIIDELKQYLWAGTETTALTALAWALYETSSRRPEAVERIRR  
EGQEVYGDREPTAADYSGLAYTRAVIQETMRIYPPIWGLIRVAVGEDEIGGVKINPGDRVTLFAYAAHHNPKF  
WPEPETFQPERWMAGNAKKHVKYSYIPFGGGRSCIGGAMSQVENTLALSRLRRFRPEYVGADPVRLNATVT  
LTPKGGLPFKIRELS

>CYP1170A4 (W911\_06550) *Hyphomicrobium nitrativorans*

MTAESTAQQSGFGLGDESSVWFNLTPLLKDPDNPMRLLMQMAERYGPVLPVNMAHQRVVLI SEPEYFKHVLVTKV  
KVDNYVKYFDGLKPIFGKSMITHDGLWQKIRMPQQPAFHPDFAEYIPYFIEAIKSKMAHWAEFARTGETFE  
MVEQTWTLAADMICKALFDRMPFNPHVVFVKCVKTYTDVSNHKDIRLKRQADALFEVGDEDTAKAVEAWWSVP  
PALFAADPREEREKTLKMIQNAMADPSIPEFDEQQAIDEIKQYLWAGTETTALTALAWALYLTSKNPEAAERI  
RREGETVYGDREPTAADYSALQYTRAVIQETMRLYPPVWVSLIRVATEPDVIGGKEIKPGDRIVLFSYGAHHNP  
RFWKDPEEFIPERWMDKTQKQVKYSYVFPFGAGKRSCIGGAMSQVENTLALSILLRRFRPEYVGLEPPGLNATV  
TLTPRGGLLFRVQELS

>CYP1170A5 (BN1229\_v1\_3930) *Filomicrobium* sp.W

MSMIESPSSQFGEESIWFKLSPLLKDPNTNPMGMLMQMSERYGPVLPVNMAHQRVVFI SEPEYFKHVLVTKTDN  
YVKYFDGLIPIFGKSMITLDGALWQKIRMPQQAAFHPDMFAEYIPYFNQAIQAKLQWADLAKSGEEIEMVEQ  
TWTLAADMICKALFDRMPFNPHFIKCVKTYTDVSSHKEIRVKKQHGELEFEVAGADTAKAVESWWSVPPAVM  
GADPREEREQTLKMI EAAAADPEMPEFDHQQAIDELKQYLWAGTETTALALAWALYLVSKHPEAAERIRREG  
EMVCGDREPTAHDYSALVYTRAVIQETMRMYPPVWVSLIRTAAGPDEIDGKKIEAGDRIVLFSYGAHHNPRFWD  
APEEFRPERWMDAACKRVKYSYIPFGAGKRSCIGGAMSQVENTLALSLLRRFRPEYVGPEPAPLNATVTLT  
PKGGLKFRIRELS

>CYP1170A5 (BN1229\_v1\_3918) *Filomicrobium* sp. Y

MSMIESPSSQFGEESIWFKLSPLLDPTNPMGMLMQMSERYGPVIVPNMARQRVVFISEPEYFKHVLVTKTDN  
YVKYFDGLIPIFGKSMITLDGALWQKIRMPQQAAFHPDMFAEYIPYFNQAIQAKLQRWADLAKSGEEIEMVEQ  
TWTLAADMICKALFDRDMPFNPHFIFKCVKTYTVDVSSHKEIRVKKQHGGELFEVAGADTAKAVESWWSVPPAVM  
GADPREEREQTLLKMIEAAAADPEMPEFDHQQAIDELKQYLWAGTETTALALAWALYLVSKHPEAAERIRREG  
EMVCGDREPTAHDYALVYTRAVIQETMRMYPPVWSLIRTAAGPDEIDGKKIEAGDRIVLFSYGAHHNPRFWD  
APEEFRPERWMDAAKKRVKYSYIPFGAGKRSCIGGAMSQVENTLALSVLRLRRFRPEYVGPEPAPLNATVTLT  
PKGGLKFIRELS

>CYP1171A1 (Jann\_2670) *Jannaschia* sp. (strain\_CCS1) ABD55587.1 *Jannaschia*  
sp. CCS1

MLRKWARFMVYKLNDAFLENPADQLARMRAEGPLVRMKIPLLGTMWATTTDEATRKLKSPDLFRRDPGPIT  
GRSLAQKFWWLPRVIKPLHTMIVTDDPAHARQRRLEIAFARTSIEDMRPRIEIAIAHRLLDALPQTGPVDIV  
AHYTRQLPFLAICELLGIPESAHAAALTRRIAPLSAVSNPITAVYAMARLGGVQRDFHAMFARARAEPGPGLI  
SALVHTDDNGAKLSEEEELSLTLLLFLAGHETT VH LINAGIVALAGDAALTRHFINTPDTRHLFVEEIMRSTT  
PVTLT KPMFAAQD TDVLGANIRK GEMVAALLIAANHDPDRVDAPQELRPERRPNAHLGFGFGPHVCLGMQLAR  
VEAVTALTALFARHPDLRLARPPGWLNRAGFRAPGRVVDLRR

>CYP1173A1 (TM49\_07375) *Marteella endophytica* AJY45550.1 *Marteella*  
*endophytica*

MPMFSSSINVPVVAACDLEADAHETFAWYRRSFPFIALDTGGYVVLRHGDVARLMHDPRLQATEIAMPAQAGI  
TQGALFDIFAHGMLTANGEAHARRRSVSRALAGQVSEQFRQHMRRAAQGLIEDCYARGRLELVSGYAEKLPV  
MALASLLGVGDADLLAFMQYVYAMNAFFRPKPTADQVAAAEAAAGSWIRDYLDGLLADAERGRSHGFLARYAEF  
AGQERLSRLEALVQIVQLIIGGTESVRTALVAQIAHLMTNRDQWRAVCVDPTLVGKAVSEGLRFEPGIAGAIR  
VSVAEIEIDGLTLPAGQLVLLSSLSALRDET VFD RP NVFDISRPNLELSRLVFGGGAHRCVADVMGRIELEEA  
LLALVERLPWLRIDGLPAFHGHMFVRSVGEWCWCWE

>CYP1174A1 (BN69\_1943) *Methylocystis* sp. SC2

MFHDPDFMPFAPNERPSWRSKRNFLENWPPAAYRETYFTLDGFWPFVGRTHYLADPELIEDMLITRAESFTR  
DFITIGALSSVINRDALFFVEGADWKWQRRALAPAFRHDNLLALTPTFVDCAKAQAEVLRASPHATPVDVMNA  
TSNVT LAVIEKAVLGVGTGAFDRGKFVAALQESFAAISWQRIFILLRLPTRLPPFGSSKINRDMRYLYDETARL  
LAARRASGGRTQAIIDRLAAKDPESEGRSMTDAELIANLYGFLVAGHETSAVALGWSLWLLAKDQASQERVRE  
EARAIAAGDADISDDTIEKLQFTKQVIQESMRLFPFAAAGRQPREDMMLGPHKISKNEPVYAALWALHRHEKL  
WDAPNAFDPDRFAPDKAKTRHRCAYMPFGAGPRICIGMGFAMLEMVAILATLVREFRFTPVGDHRLLELAPDFT  
TRAKGGLPLHVRPL

>CYP1174A2 (B1812\_07240) *Methylocystisbryophila*

MFHDPDLMPFTPLEKPSLWAMRENFLVNYPRAAYREDRSVLPGFPPVTPKINLIMSPALIEEMLVTRAEFSR  
DRLTVSTLSGPKINKESLFFAEGADWKWQRRRAVSAAFRHENLLAQVETFAACAREQAALWRRLEAGRPVDVAPA  
MSRVTFEVLRSVLGAAPSFDRGRFVAELAPALGAIGWRRICAIIGLPPDLIPHGFSFRAAAALRYLSQATRA  
LIEERRASGVARNDLLQLLSARDPETGRVMTDAELEGNLYTFLVAGHETSAVAMSWSLWLLAKDQATQERLR  
EEVRVAVAGEEEIGPATVEKLVFTRQVLQESMRLFPFAAGFARQPRERTTLGPYHFSKGETIAVLIWCLHRHEK  
LWDDPHGFDPRFAPEKVKARHRYAYIPFGAGPRICIGMSFAMLEMTLLATFVREFRFTSTAPGHRLVIDARF  
TTRAKGGMPLLIPIRPTAEGELAPAA

>CYP1175A1 (BN69\_1113) *Methylocystis* sp. SC2

MFETINSSPFYPPFVKPAARPLRFPANLIALNNNLEAIP EQAYFETLVVAPGPPRMAFFTGPDLVKELLVTR  
PNDFPKGKLQVEVLRPMFGDAMISSEGGDWRWQRSVAAPLFRHEEILQFGSIMSDAAAGIVAQWRAAAPGVTH  
PIHRQMMRAAFHVISNTMLVGGARQMLDAIEVGHADYYRGANWWVAYKLLGLPHWLPRPGGRRMRAHERRLRE  
AVSQIVRQRKDSAAADNDLLGRMLRARDPDTGQSITHELLVDNIVSFLVAGYDTTAFALTWTLYLLSQSPKWE  
ARILEEVERVVGDAVASIHVANLVVVQVQLNESLRLFP TAPIVIRDIVEDMEFNGTIVPAGSIGIPIYAIH

RHRRIWEDPNRFDPSRFAPDSTKKPTRFEYLPFGAGPRICIGASFATIEATIMLATFVRAAHFELAQEQQVRP  
AGRMFLFPKDGMPMRVALRKTAPHA

>CYP1181A1 (PSE\_2866) *Pseudovibrio* sp. (strain\_FO-BEG1)\_AEV37374.1

MENKISLYRPPAPYPGEAAEGWRNFSNYLSSDPLGVIPKELYECAIFQFDDDDPRKFLVNEPKLLSRVLEEQQ  
AIFPKGGGIAELLKPILHNGLVSAEGVDWQDQHEMVAPIFSNSSVRISFGYLQEALSSFVERLLTYSETGQTI  
KLAEEINFLVADVNFRCVFSKPIEIQLEHQCFNSIMKYEEEVAGTALDLKRFSGGGQPAFTEAALKTAENVRA  
VISQIIDEHMYNKPNTQNFFQIFQEARVPSTGKRFTKSQLVDQVASIFLSSHETTSAAALCWSVYILAQCPEI  
VERIRTEVQLVTACGRISYEHLPRLRFTRDVFKEVLRLYPPVLYLSRIAREDTTLGDTLIPKESMVIISPWVV  
HRHRSFVENPDMFDPDRFSRGEAKATLGSYFPFGLGPRMCTGASYVTFLGIKVIARLCSMFDFETVNTDEVVP  
DSTLYLKPSRPVLCKVHKRKF

>CYP1182A1 (PSE\_0230) *Pseudovibrio* sp. (strain\_FO-BEG1) AEV39812.1

MDTNNSLYRPPAPHPYTEGTGDFDGVETNLLKHLPEELYKADVVDISTSDRTNYLVNDPDLISVIFEEKPEIF  
VKAEGMIELLRPLLGDHPVITSNNRCLDQDRMIRPIGTMRTOQQVNFHEHIQDSIGRFSYCEEIQNENRVIDLS  
LLLRLNADIAYRMLFSNELPKDVFKEINSHARDFELRISQLIRETAEQGVAVQLPKLPQTAMYAAQQLRYLV  
SMLIDGNIQSNSFSHSHFLHKFLIARSPETNIPFTRKQLIDHVTILNSQELAAAVLMWAFFVLSQCPEAKQK  
IREEVVRKVAGHDDIHFEQLSRLRYTRNVFREILRLYPPIPHLTRRASRPLKLGKLDLQEGTQITVSPWIVHRH  
KQYWFNPDRFDPERYMRKDQHIIMKSFLFPFGRGLRMCTGASSAILQGTLLILARIVSKFDIDILNADKVEPEGV  
LFLEPTRPIVCKVTPV

>CYP1186A1 (SLG\_20150) *Sphingobium* sp. SYK-6 BAK66690.1 *Sphingobium* sp.  
SYK-6

MARDIPDYPLDIFTHDAVRNARDVDDALREFAPAVRLADGTVMIGRHAHVAPGLMDWKSFSSTSRPWHPASL  
RPEILLTDDPPRHTRVRRVIGDALSPRTLDMKTVFTAGAQALVAELKARDGKEIDAVEDVTRRFVYTVFPDA  
LGLPPGDRTHMHGFSNMVWATMGPENALFREAMVEDFGPVIITWLNEVCDREVLNPDGFGMLLFRAADEEKITL  
DEAKLLLQITLSAGADTTYITMANALRAWAEFPQEFQAKVQADPKLVNRAFDESLRWDSPSRMAGRITTVDPV  
DDMVVPAGTRVGLMFAAANRDPFWDPLDYRIGRDLRHS LGFGYGIHACVGRTLAYMEADALLGALAQELDS  
IELTGPEPVMTTVGHGPARVPVRLHFR

>CYP1186A2 (WYH\_02150) *Altererythrobacter atlanticus*

MTSPIPEFPADIFTPEAVRNAREVDDELREFAPVVRLRDGTVMLGRHEHVAAGLLDWKAFSNTSRPWHPGSP  
RPEILLTDDPPRHTRVRRVIGDALSPRALERVKAIFQQAAREFVDELRLARQGEVVDGVDITQAYIFRVLDPDI  
LGLPQEGRHHMHGFSQMVWATMGPPGELYDEAMQND FSGVIAWLERTCEREALDLEGIGAEFFRAADRGQVTL  
DEAKLLLQITVLSAGTDTTYITMANAIRAWASFDEYAKLRADPAKLRGAFDESLRWDSPSRMAGRITMRDAI  
EDYVIPSGTRCGLMFGAANRDPFWDAPGEYRIERDTKHS LGWGYGVHGCVGRVLAQMEAQALLGAIVREVES  
FELAGDYEPWMTTVGHGPIRLPVRLNFA

>CYP1187A1 (SKP52\_13590) *Sphingopyxis fribergensis*

MTSTVQDADPAQLDFANPQVMECPYPIYESLREKAPVYFAEKLGFWLITRYDDCLNAIRDPQVFSSKMGRFPG  
SVPDEVMRIYNEEGFGDLPDTLVSNDPPSHTRYRKLVDRAFTAGRVRQMEDYMVVVVRELIDAFIEKGRLSVM  
QDFAVPVPYVIADQLGVPRSHRDRFKEWSDSAVAPLGLLLSDEKIECAKSAVEMQHYFVEVFADRRANPRD  
DMISDLVTKEIDGAPLSIPELLSILNQLLVAGNETTSAIAASIVRLANEPELVELLAKPEGKCDNFAEEILR  
HESPVQGLFRMTTADVEVAGVTIPKGSVLNRLYGSANRDERKYECPEVFNVARANASSHLAFGAGIHHICIGAQ  
LARREIAIAARELTARLKDRLVEADKISHAPSVILRALNEFEIEFSKR

>CYP1204A3 (Ga0102493\_111100) *Erythrobacter litoralis* DSM 8509

MERELENASGSRAAPRRLEDVDLFAPGAQEHWDAYAILHEHAPVQRLPGEGLTPESDAFVLTKYEDIKRVV  
RDWERFPPTLSLLVAQILES GEMPAHIPDIDAMVASIVSLRPTPELWRAHRKELTDPWVGPGCTRHAAMIERH  
VDDLGLPMIDRARAGETIDFVAEFARPLPQVRMASVLGFPQVDIPELEEWGNAQVMSYVHGRTHRNLLTPEQT  
AEKFRLLDGMKDYVAEKTREKRANPKEDMISFLTQTRYEALGRTLTDDEVGGIVYAMVIGGLETTQYAI AEQA

QLACEREGLFDAIRADRTAIRTFIEEGMRLRSPTQGLSTRICARDEVFQGVVRVPAGSMLHLRWAAANIDPDEF  
ENPLEVKLDRRAATRHAFSQQPRSCPGSNLSRLEQTIAWNRLCDTSLSGIAYAPGNSFAHQGGIMLGIRELWL  
DLTPA

>CYP1204A4 (BG023\_11284) *Porphyrobacter* sp. LM 6

MGTEGAPRSLEEVDLFAPGAQEHWDAYAILHAESPVQRLAGEGLTPGTDAFVLTKYDDIRRVMDWDRFPPT  
LSLLVAHIQQSGEMPTHIPDIDAMVASIVSLRPDPPELWRAHRKELTDPWVGPGCTRHAAMITGHVDDLIAGML  
AKARAGEPVDFVADFARPLPQVRMASVLGFPQEDIPRLEQWGNAGVMSYVIGTTHKNILTPEQSAEKFRLLAG  
MKEYVAEQTAKKRARPQDDMVSLTQVEYQALGRKLTDDINGVVYAMVIGGLETTQYALAEQAQLLCERPGM  
FGTLRGDRGAIRTFIEEGMRLRSPTQGLSTRICAHDEVFQGVHVPAGSMLHLRWAAANIDEEEFEDPLDLKLN  
RKAATRHAFSQQPRSCPGSNISRLEQMIAWDKLADAFADMEYAAGNDFRHQGGIMLGIFRLLNLTPA

>CYP1206B1 (HNE\_2797) *Hyphomonas neptunium* ATCC 15444

MPDIASLTSLES LGFTGGRDSFRAFCARVFADDAPRLLRTEAGELVVFRHGD LRAFGALPEVGALPPGVMFPG  
LHQLPPGAPLPPGGGIGGVISHQVFTANPPIHMPVRLTLLRQLSPKQAALLEPVARNVVQGLLDTLKHRDEID  
LVEDIAERLTARFWGALIGMTETEMAEALAVRDMTAMFLIQMTRGDLQTADTATATYGRLVETAALRSLAAG  
THPFVTELAADLAKIEAQDDPDEAGIVPPNVGKLLAGNLVDGFHTAAIGAVNTLFALLQHPDTFTEVLAAPEK  
LPAVIMEALRLEPPVLFRLRYMLRDL DYAGIHIPKGTQVLM LWAAAGNHDP AVFPKPQIFRLDRDRHGITTFFG  
GAHICPGRHVALMLIRLLLEEIAARGLRLSFTDAPYAWLGNHAMSQ LPHMRFRVG

>CYP1221B1 (HYPMC\_2525) *Hyphomicrobium* sp. MC1

MSTSIATSHTAKLHKGLPPGPKGT LIGGNLSQIGPRRVDFFLKLAQTYGPIASFRA GRWRLFLVSDPELIQQV  
LVT DARSYIKHFGARTFKPVLGNGLVTSEGDFWLTQRLLQPAFLKTQVLSYAPVMAELTEAMLAKWVPGTSV  
DIAFEFSALTS AIALKTLFGLDDHGDRVRVDESRLTFELLTHRLDSL FQVPLVFPTPANLRLKRAIADVNAV  
IDGFIAQKQAASPGNDLLSTMIAAQREDGTQMTAQQLRDEAMTLYLAGHETTALTLTWSWYLLSQHPDVEQKL  
VAEWQRVLGGRAARASDLSALTYTAAVINEAMRLYPVYVIGREATTDLELGGRVVKGYTILMSQWVNHRDP  
KYFPEPERFLPERWLDGLASRLPKFAYYPFGGGQRLCIGVHFALMEAAI VLATVGGQFKFTLAPDAVIDIMPQ  
ITMPPKYGM PATLMRR

>CYP1221B2 (HYPDE\_29763) *Hyphomicrobium denitrificans* 1NES1

MSKAVIVSRHGLPPGPKGSLIGGNLGQVGPRRVDFFLDLARTYGPLASFRIGRWRLFLASDPDLIHQVLVTDA  
KCYIKHFGARTFKPVLGNGLVTSEGDFWLRQRLLQPAFLKAQVQSYAPV MANLAEAMLAKWHTGKSVNLEFE  
FSSLTSAIALKTLFGLDDQGDRE RIDESLRQVFDLLTARLDMPFQWPLWLP TPTNIRLNALTDVRHVVDGFI  
AAGRARPRGSDLLSTMIAAQHDDGTGMSDQQLRDEAMTLYLAGHETTALTLTWSWYLLSQHPAIEKKLVEEWQ  
RVLSGRAPT PSDLTALPYTAAVINEAMRLYPVYVIGREATTDLELGGRVVKRGYTVLMSQWVNHRDPKYFAE  
PERFSPERWLNGLAARLPKFVYYPFGGGQRICIGSHFALMEAAIILSTVGQKYKFTLSPDAVIDIKPQITLPP  
KYGMPATLERR

>CYP1229A2 (M446\_3515) *Methylobacterium* sp. 4-46

MAAPDPAPADTAPVARAALEADPHGMLARLRAAVPFIRTDDGVVMLLRAADIQALVTDPRTRQVETEFAMLRG  
ITEGPLYEFFRLTALLSNGEVHRRRRAPMARSFAFQAVAAALRPRVRALAEDLVAARAARGRMNLVADYASPLP  
ARAIAAIILGLPERDVPDFTRLVYAMARTLSSAYRPEDRPEAEAAACRLTDYVDRLVAERRRAPRDDLISAFVP  
LIDAGDAEAAAETRMQIVSLILAGSDTTAALAIQIGLLLSHPAQWQAVCRDEALIPGAVAEALRYEPAVGSY  
PRFTLEAIPLDGGVLPAGALVSFSTLSALRDPALCARPEVFDIRRS DHPRWHLVFGGGAHRCLGEALARMELE  
EGMRALTARLPGLRLDAPLTVRGSAGIRRVEEVPVSWPA

>CYP1229B1 (Mnod\_4829) *Methylobacterium nodulans*

MERQVRRSDDDPRTAEQPD AIPILSVAELEADPHGVFRHYRPRMPFVAHEAGGFLVLR SRNVEQLMRDP RARA  
TETAYPEMRGIHDGALFDLFEHGMLTANGTVHRRRRSPFTRTFAARLIEDLRPRIRATAEALVGSWMDEGEVD  
LVEHYTALIPARTIAGLLGLPQADI PHFTRLAYEVSRLSFAFGPEDIPDLQAAAGELKDYVARLIEERRRAP  
GDDFLSRYRAEAE EASDLSPLEIIAQIVQLIIGGTD TTRVAGAMQVALLLQHREQWEAVCRDPALIPRAVTEA

LRFEPSSAASSARLTQEDIALDGHVLPAGAVIILSTMSAMRDEQVYARPDVFDIHRTDHPRLHPVFGGGAHRCI  
GEALARAEELEGLAVLARHLPQLRLTGAMPKLGHGSGIRRIDRMCVTSCTPRMLRATLDAGWPQTMRLDK

>CYP1229B2 (Mrad2831\_2099) *Methylobacterium radiotolerans*

MNATEDLTRQAGPPGSPADVPTLTVAEELEADPHGVFRAWRPRLPFVGHIEIAGVLILRARDVDPLMRDPRAQAT  
ETLYPESRAIPEGALFDIFAHGMLTANGAVHRRRRSPFTRTFARLIEGLRPRIRVAAEGLVRDWLGDGEVDL  
VARYTAQIPAQAIADILGLPRDDIPRFTHLAYEVSRLSFTFGPEDIPDLEAAAVALQDYVAAILAARRSAPR  
DDFLSRFLAEAEAAGELTPQEVVIQLVQMIIGGTDTRVAGAMQVALLLQHPEQWAAVSRDPELIPAAVAESL  
RYEPSAGSAGRVAREDIPLDGHVVPAGSLMLLSTLSAMRDETQYARPDFTDIRRTDLRPLHPVFGGGAHRCIG  
EALARIELEEGGLAVLRLAPRLRLTGAMPVLRGHSGIRRIDALRVAA

>CYP1229C1 (BSQ44\_01320) *Mesorhizobium* sp. B7

MTATATRKRPVKVDPDDFRPDPHAGFARHRPLSGVLQIGAGFPTVVRYADIMALMTDTHTRQLETEALVHRGI  
TKGSLDFDYANSLLLSNAPAHARRRAPLSRAFAFRLIQDLRPHIRALVGGMLDEIGTRGETDFLAASFPLPA  
RLIADILGIPREEAPDFAAKVYTMTRGLGGFRDEDFPAIEAAAADLVRYVENLLEERRRAPREDFLSSYLARV  
DEDGTLISAIETLMQIVSVIVGGSDDTRFGLTSTVSQLLQORRAQWEALTADPALAPGAVLEGLRYEPPVGAIGR  
VVTVPVEIDGVRLEPGTVVNLISILSGQRDETQFAEPDVFDIRQDHPRWSLSFGHGVHRCVGEALARAEMEEA  
LIVLSQRLPELRLAGDPPIAKGHTGIRGITAMPVAVG

>CYP1246A3 (BSY19\_2521) *Bosea* sp. RAC05

MTESRATHLTACPHLEGASLCPAAGESTAPARPTGAPDYEPPRPRPLGPLSALLRAAWRGDGDLLSLLPKEA  
YEVDVSPGLGYSRRSILIVNAPELRTVLTNPTEIYPKNDLMVGALRPLVGDSIFVSDGAPWRRQRRMIDPAFS  
HIRLTRAFGAMTAALDDCEARLASAARSGESFSIDLSMSQLTADIICRTVFSTSLDTRDVARVFTSFHFERR  
VAHVEIRRLIFDRAFKDIPQKADVLESCRLIRAHMGTLTLDHSLAAGASFDDICSAVIAARDAETGAFTREEL  
IDQLGVFFLAGHETTASALTWAMFIAAERPEVAQRIRAEVEDVAGTGEIGFEAVKRLTYTRNVFKESMRLYPP  
ITFIPRVAAEATTIGRYKVKRGAMIMIAPWTIHRHEKLWRDPHRFDPDRFLPEREHMVPAYLPPFGFGPRIC  
VGAAAFATLEATLILARLFRFRFDVHPLEPGKVEPVARLTTRPKHEIMAQARLRAG

>CYP1246A4 (AEM38\_14625) *Hyphomonadaceae bacterium* UKL13-1

MGPLASLVRVIRQGDGDLSSLMPADAYLLPMGPLGYSRRSIQIVNDPALTKPILADPEDIFPKNDLMVGALTP  
LVGDSMFVSSGSLWRQRRMIDPAFSHIRLAKAFPSMVGALDDFEVRLQAAAASQGEMSLDLAMGQLTADIIC  
RTVFSASLANDTARDVFESFAFFERSVAHVELVRLIFGKPFDEIPQRAADVLEACARIRGHIGRLLDTHLEAGA  
QFDDIAAAVIAARDLETDRFTREELIDQLGVFFLAGHETTASALTWAFPIAAMQPAVADKVQAEAVAVAGSG  
PIEFDHVKRLTYARNVFKEALRLYPITFIPRVAAATMIGSKKIKRGTMVMIAPWAVHRHQSLWPSPDVDFP  
DRFLPEREHEILPGSYIPFGAGPRVCVGAATTEATLILARILRTYRIEVQQPELVPRVARLTTRPAQEVMM  
KVSLRT

>CYP1250A3 (BSY18\_805) *Blastomonas* sp. RAC04

MRIDPANPVAPTNIIVRRFGMDQVPDHPPELVLRQAGLIYSPEFLADPYTFFPAMHERFPPIFYDVGPFGNAWV  
LTKHEDALFALRHAIFYSNEDATPFPRDPNNYFYFIPIEIDPPEHRKYRNIVDPVVSPPQGVKLEERIRALAN  
ELIDEVIEKGECEFEVFGFRPLPVLVFLDLMGLPRDMCDTFVSWAMALLHSNDRKIMGDTLKTIGDYLTIAIA  
EKEANPDDGLVSRIVHAEFDGKRISDKEAFGFVTFLEFIAGLDTVFATLNNIWLWLARNPERRQEIIDNPDNIN  
AQVEELLRVFSVTFSGRTVAQDVEVRGVQMKKGDKVTSILPACNYDPDVPNPVDFNRPKKIILAFTVGIH  
SCMGAHLARLEIKIALQEWLKRIPDFKVRPGAETVYRPGGVIGPESVPLVW

>CYP1258A1 (Mex\_2p0017) *Methylobacterium extorquens* AM1

MFIKVSQVSGLELNKPTHIEVEGIDLVLGLTGSKISLFESRCPHQGAFLHEGAVRNGALVCRAHGWAFFDADTG  
VCRGKQGIALTSIPLRIEGDDILADAEAVRALADRRKTEGRSSETVASVIQSQRTINDLPGPAGLPVLGNAHQ  
INLEQLHVTMENWHEQYGSFFKFRILRQNAIAVAHPLIRMVLRERPHNFRRISIESVFQEMHAQGLFSVEK  
EEWRYQRRIVAQALNARQIRLFFPKMQQITERLMRRWSRASEDGRVVDVQEDLMRYTVDVTSNLSFNNDMNTV  
EKEGDVIQDHLHVFPMSRRVNSAVPYWRYFKFQRDRDLKALVALKGIIDDIIDKSRDLKQNGGNVEAGN  
LVEAMLQLQETEGAITNDIAIFGNVFSLLIAGEDTTANTMVWILHFLSSRPEVFKRMQEEADEVLGGSDVLPDL

ETANRLIYHDAVINEALRLKPVASIWPMEACSDVVMGVAVPAGTPVFLLTRIPTLVDENGVPAPFEFDPERWL  
RKDASTTHFDNMVVPFGAGPRLCPGRSLSLEIRAVMSMVSRRFELELPTDGPSVGERFAFTLIPTNVRLRFK  
ERNKYPAGPQFIAPTAESVRLGA

>CYP1275B1 (HNE\_1343) *Hyphomonas neptunium* ATCC15444

MPAAPALQKLTVGGQAFRLRDPHARLTCALAGPLAQTRLLVFGRITAVLSHAGITEMMKDAGRFTVDARNAGH  
SSALGMPFLPKSLKLLAENLLTLDEPHHTRLRLRADAPFRRAAIEGMRPAVEAQCARLLDEMARGNTDLVSG  
LCRPLPIQVICDLLGLSDARREGLVRVFSGFSGAGTLEAIGVLMKTGWVQSELRQEFAEVRAVPRPGLITELV  
HAAEDGRLTEDELLSMVFILFAAGHETTTTHFISSSVWTMLTQPGAREIAAMDGEALNVAVDELMRFSGPVQ  
FTKPRYAREDETEFLGQPIKRGKPMALLAAGNLDPAAFDDPLTLNLGRRPNRHLSWGWGPHLCLGMHLAKAEC  
EIALRQILERWPGVEIDGDPAALKWSQRPGVRGLARLPLQLKS

>CYP1281A1 (Sphch\_2114) *Sphingobium chlorophenolicum*

MSARSMALVESGELTLKDEEIVKCPYEAYDYLLLEERPVIYDAGGDFYVVTRYDDLRAALKDTTMFNSDGASA  
KHRANVNPERNKKIEDLFLEQGWPRERPIGNYEGAHEKDRRMIFESFLRASKAREYDDVIEQIANS�VDGFVE  
DGHAIEVSQYSEMLSIKTICHLLNAPDDAIPIVKRSMDAMLANIGGIMTDEEAFENARREIDAQRYFKAMIDR  
LREAPEDTLLSALVNAKLPSGEMTDAQLLRHVMLDMFMAGAETSAKAITSGLIILARNPQLRAEIAADIKGL  
QPFIEEVLRLLEGPASQATRIAVKDVELHGVAIPKGSMTVIFRLAAANRDSRKFGCPANLDIGRKNAQHLSPGS  
GPHACVGAPLARRELWYGFKALLDRMEDIALAPDATVNYLPMVMVFRGIDALKITFRPRADRPQP

>CYP1291B1 (HYPMC\_1141) *Hyphomicrobium* sp. MC1

MTPALYPPTVTPPAQPLPLLPFLRRFIRNPLRAIPQAVYEEPVVITYGKKRPLLAWVTNPALIENTLVKNAEQF  
PKTRLDLRLVLRPIVGDGLLTAQNESWRWQRKIASPPFRHTELLTYVPTMVDAADDECIAQWRQSGSAPFTTDE  
AAMTDATFAVVARTVLAGINTAEGDRIKASSSYLDPISEWEVAASMLQYPETYWHPGKARMRSADLRAIMR  
RLVAHRRSGGASGNLVARMLAAKDPDTGEPMSDDMLADNLATFLFAGHETTAKALTWTLYLLARAPWQDRL  
RDEISAVAGSAPITPETVTKLPTVSRVLKEAMRLYPPAPVMTRVTAVEMDIGGKTLPKSTLIVMPIFIIHRHR  
ALWEDPNRFDPPDRFLPEKEARYARTQFMPFGYGQRICIGSSFAILEATAILATLLRHARFEWDGKFAPEPVS  
VTLRPGGMPLTVRPL

>CYP1291B2 (Hden\_0645) *Hyphomicrobium denitrificans* ATCC 51888

MVGVRDVNTIPPPEKLYPPTVQPPERALPLPRFIARFIRNPLQALPRAVYTEPVVITYGSKRPLVTWVTDPALI  
ERILLKDVEHFPKTPLDRRVLTPLMGNGILTAEGESWRWQRKIASPMFRIAELAYVPAMVEATEQLLDTWKQ  
RGHAFTTDEDAMTETTFSVIARTVLAGIDETEASAVKHAARTYLDRISEVAAAAILRLPPTMWHPGKANMRT  
SAKEVRTIVERLLAQRRAPQPGSGNDLVARLISARDPATGEQMSDATIVDNLATFLFAGHETTAKALTWTLYLL  
ARAPQWQDRLRDEVRHALRTSQRVSPGTIERLPLTLRLVLKESRLYPPAPVMTRLANQDLDLAGTHVPRGSLI  
VIFI FVLHRHQRLWDDPGRFDPDRFLPENEAKYPRTOFMPFGFGPRICIGSSFALIEATAILATLLQGARFEW  
DGRHAPEPVSRTLRPKGGMPLIVKPL

>CYP1291B3 (HYPDE\_35128) *Hyphomicrobium denitrificans* 1NES1

MNALPTSETFYPPTVQPPDRALSIPRFFARFIRNPLQALPRSVYSEPIVAYGKKRPLVTWVTDPELIERILLR  
DVERFPKTPLDRRVLTPLMGNGILTAEGDSWRWQRKIASPMFRIAELLSYVPTMVEAAEQLETTWKPRGQKFT  
TDVEEAMTETTFSVIARTVLAGIDENEAGAVKRSARIYLDRISEVAAAAILHLPATMWHPGKANMRSSAREVR  
AIVQHLLAQCRKARGPNGDLVARMIAARHPTTGEQMSDTAIVDNLTTLFAGHETTAKALTWTLYLLARSQW  
QDRLRHEVQHAILSSQRVGPGTIERLPLTLRLVLKEALRLYPPAPVMTRLAKEDTDLAGTHVSRGSLIVIFI  
LHRHRLWDDPDRFDPDRFLPENEAKYPRTOFMPFGYGPRICVGSFALIEATAILATLLQSARFEWDGRHVP  
EPISRVTLRPKGGMPLIVKAL

>CYP1291C1 (BN1229\_v1\_2138) *Filomicrobium* sp. W

MPTRLTPNTDVQFVPATSDGNGLYPPSITPPDQPLGFFDFLRQFIANPLRGLPRQVYEDLTLYRPTKKLTVL  
WVSGPAIVEELLVGKANLLVKSPLEKQVFAATLGDGVLTSDGALWRWQRRVMAPLFRHNEILSYVPTMAQVAE  
EQVTEWRRAFAGSQAIDEQMMTSTFKVIMRTMLVGGDRSEGEAIMRGGSEYLARVSWEMAHALLHLPTWLPHP  
ASRQMRRASQTVRSALSDIITRRRQSAVEGTDLLARLLNARDPDGGEPMPTQDQLVNNLSTLLEAGHETTAKAL

TWTLYLLARAPEWQQSVRDEVNRIVGPTSIRAEHIDKLVLTTRVLKEAMRLYPPVPVVARQPKEAFELAGTPV  
PANAQIVVPIFAIHRHRKLWKDPDRFDPDRFLPDRETEMARTQFMFPGAGPRICIGQSFAMIEAVTLLATFVR  
GARFDWDGEHLPEPISRITLRPKGGMPLTVTPIL

>CYP1291C1 (BN1229\_v1\_2138) *Filomicrobium* sp. Y

MPTRLTPNTDVQFVPATSDGNGLYPPSITPPDQPLGFFDFLRQFIANPLRGLPRQVYEEDLTLYRPTKKLTVL  
WVSGPAIVEELLVGKANLLVKSPLEKQVFAATLGDGVLTS DGALWRWQRRVMAPLFRHNEILSYVPTMAQVAE  
EQVTEWRRAFAGSQAIIDEQMMTSTFKVIMRTMLVGGDRSEGEAIMRGGSEYLARVSWEMAHALLHLPTWLPHP  
ASRQMRRASQTVRSALSDIITRRRQSAVEGTDLLARLLNARDPDGGEPMQTQDQLVNNLSTLLEAGHETTAKAL  
TWTLYLLARAPEWQQSVRDEVNRIVGPTSIRAEHIDKLVLTTRVLKEAMRLYPPVPVVARQPKEAFELAGTPV  
PANAQIVVPIFAIHRHRKLWKDPDRFDPDRFLPDRETEMARTQFMFPGAGPRICIGQSFAMIEAVTLLATFVR  
GARFDWDGEHLPEPISRITLRPKGGMPLTVTPIL

>CYP1302A1 (LH19\_08305) *Sphingopyxis macrogoltabida* 203

MTESSAQPVRTPVHEFDYIADPGVLADCHARYWELKETAPPVFWTNAHGGHWVCNTGSSVQNVVRHPEIFSSR  
YLSIPPNDQPKMIPPEMLDPPEHRPYRQMLRPFFESKAIEPLEDRVTAWTDQLLDGVTGKGECEFEVAIGSRL  
PVAVFMELFGFPMKEKFDEFRLVLTGFFHSQASNEVRNNLAQQIVGHLAELIQQRMAEPRDDMISKIIVSEVDG  
RKLGFEEELMSIGFLMFLAGLDTVTNAMSFGMRHLAHD DTLRQRAIDDP SVIPNLVEELLRRYAFVATPRYVVE  
DTELEGVKLFAGDCILAPLPLVGWDEGLTEDPKTVLVERQFYRHA AFGSGIHTCLGLHLARMELIVFYRAWFG  
RIGHFRQVTKGDETCRGGSVMALEHLHLAWDA

>CYP1302A2 (Sala\_0872) *Sphingopyxis alaskensis*

MSESPVQPARSPVFEFDYIADPGILADCHARYWELKETAPPVFWTNAHGGHWVCNTGASVQHVVVRHPEIFSSR  
YLSIPPNNPQPKMIPPEMLDPPEHRPYRQMLRPFFESKAIEPLEGRVAEWDRLLESEVADAGECEFEVA AVASRL  
PVAVFMELFGFPMERFDEFRLVVDFFGARASPEERNLLAQRI LGHIAELIQARMAAPEDDMISKIIVSEVDG  
RRLQFDELM SIGFLMFLAGLDTVTNAMSFGMRHLAHD SALRQRAIDDPGVIPDLVEELLRRYAFVATPRYIVQ  
DTELEGAQLRAGDCILAPLPLVGWDEALNPD PATVSVERQFYRHA AFGSGIHTCLGLHLARMELIIFYRAWFS  
RIGHFRQVETGDESCRGGSVMALEHLHLAWDA

>CYP1312A1 (K663\_17821) *Sphingobium* sp. MI1205

MTLSDLAPVPPHVDPALVRDFDIYNDMGLLTDPHARYVELLRDAPSFFWTPRNGGHWVACGYQTVSKVYRDFR  
VFGNDNLGIPKPPVMPARKAFIPSQLDPP EHAAYRRLVDTLFTPARLAAMEEDVRALCNSLIDEFIDKGRCEF  
VSQFALPLPVLIFLNRMGIPSDRYEELAGWVQEHNSGKTAEARLAALDRIASFMRAILDRAIDGHDDWVSEL  
LQMR LGDQLLPRDDVVLPMAITIFFGGLDTVKNALAHIALVLASRPDLQTM IARREVNLANAVEELLRFRLV  
NQQRIVRQDTAFEGAQIRVGEMVHICNGTSGLD PKANACPM AIDLERTGIKHNTFGQGRHFCAGAPLARLELR  
IFLEEFARIPQFR LANDKIERSTGLINTIESLHLAWKD

>CYP1326B1 (TMO\_0531) *Tistrella mobilis* KA081020-065

MTVDYDPRDPQIRNNPFPSFRRLQDEDPVHWNPHLRAWVITRYADVRKVALSRMSPDRLTPFYDSLPEARRG  
VVGELIRYLNLMVFRDPPEHTRLRLRMNEAFTPKAVERLRPNVERIVGRLLDDLLPRGEMDLVRDFAYPLPA  
TVIMDMLGVPHDQLDRFKDWSDDLALFLGSARDVPDKYERARRGALEMSSYFREV IADRRRRPGEDVLSALIA  
VGTPEERLTEDELIAAAMLFLFAGHETTNNLISNGIYSMRMHADAWARLVADPSP ELLATAVEECLRYDGP SG  
GIARVVVRVTHEMEGRELKEGDRVFAMLNAANRDP RVFEAPDDFVIDRSPNRHLTFGQGIHFCLGAPLARLEAE  
IACREIARRIPDLTLGTTAPDWHDSLIMRGITSLPVHFRPVKSAAA

>CYP1326B2 (RPD\_0041) *Rhodopseudomonas palustris* BisB5

MPNLDFADPKINADPPVFVAQLRESDPVHWSVPLKAWVITRYDDVRRVAVSNADMSAERLAPFFATVPAESQS  
GFANLMTYLGKWMVFRDPPEHTRLRLRFTKAFTSR SVMALEPNVGEIVALLFDEMEQKARSTGVVDWIAD FAY  
PLPATVMMDLLGVPRDDLHRVKDWSNDIALFIGT SRATADKYLRAEAGAKAMA EYFRGIIASRTVDPQDDIIS  
QLVTEPDKREALTDDEVIATCILLFAGHETTNNLNGNGFYTMNAPEQWARVKDDPSLAETAVEEWLRYDGP

SGALVRVVTADVEFGGRTMLQGQRVFAFINSANRDPEQFGDADRLDLGRSPNPHLTFGHGHIHFCLGAQLARLE  
GQIALRALIERFPGISLATDSAPGWRDSIILRGMQSLPIRLR

>CYP1330A2 (K663\_17521) *Sphingobium* sp. MI1205

MSKATDTADAPLSFADPAVQRCPFSSYDRLREERPVIYHDPVTGNYVLTRYEDVRKALLNVKALRNRTGINSTR  
SDPTANRIYEEKGWLPIDTLVSNDDPHRIYRTLVDKVFTPPRVAALEPRIKEIIDELIDNFVDAPEIDFLEA  
FAVRLPMYVIAEQLGVSRAHMDRFKLWSDVSVESVSPVLTSEREVEIAEILTEMQRYLAAEIESVRQTPNDTL  
ISHLANTD TDGRLLMRELLSIIHQLLVAGNETTTTTLASGMKLFIEQPALAEIIRQDPARAKPFVEEVLRTL  
APIQTLFRRVAEDVEIAGVTIPAGSLVEVRYGAANRDPKQYAEPAKVLDLRTNAASHLAFGAGPHLCIGNQLA  
RGELRLAFQMLTRRLTNFRATRGGDSYSWMTSYIAHGPDQLWMAFDRL

>CYP1337A2 (K663\_20558) *Sphingobium* sp. MI1205

MEITQDDLGTIASGEVQRCPPFLNRLLEEAPVYRDPGTGMYIVSRYDDIHYVNSHPEIFSSKTPIMINRQTS  
VSEEVAKRYRERGWPEEHVLAFAADPPEHGLHRALVDKVFTPSYVKKLEPYALKLVDELIDGFIEQGESDLGSG  
FAVHLPMYIISDQLGVAREDYEQFKLWSTAWVDRNDPNCPPDRELMLTDRMIDMQNYLAARAREYEAAPNDNM  
LSRLVHAENVGEKLTMGQLLMIAQLILVAGNETTTTGITSAMYIMILTDPAKARLLGDPTMIPAVIEEMLRAH  
APVPHQYRYTTQDTELQGVSI PKESVVQVSYLAGNYDKAKWECPEKIDIDRKGVNRHLAFGRGIHFCVGNQLA  
RMEMRVAIARLLERLQNIQISDKHPAPKFMEHFQIHALES LNVTFTPGPRTAG

>CYP1349A2 (Ga0102493\_111520) *Erythrobacter litoralis* DSM 8509

MKPRAAGFMRAPWEAYAAMREEAGPLWTEPETGVVFLDYALAEVVRNHQRFSSFADRAAMRKGGPLPAEVLE  
IKAQGWPLALTMVQNDAPDHDDYRKLVGPFFLPRRLKLMEPFVAGRIGELLDAIDDKGGRSDFFPDFAVPLPV  
SVIGEYLGMRHLGDDTVKRWSDAFADEIGFLTSDERAVEIAKLTLECHRAMVALCDGRRRGEGKDIITALANA  
TRPDGERLGNPELLSILTQLMVAGNETTTSTLGFALLRLARDPALYARLSAEPEKIAPFLEEVLRLD SPIQGG  
FRKAVGDQQLGGHTIPDGTM LHVRFGAANRDP RVWGAGAGDVQLDRRPPKPHMAFGNGIHF CVGAALSRL EMR  
VALGEILSRYRSVRLACAEEDLPFRTNFHQRGMTSLPLEFER

>CYP1350A2 (K663\_18056) *Sphingobium* sp. MI1205

MDGTVPHAFYERDNLNPFPLMAQMRAEAPVERTIDPAGREIFVVTDVRLIEEVAKRTGDFS NRFGHLLMAGG  
GADQEVASILASEPLEATLLLTSDDEPHQRYRALVNAAFATGRVSHMEDRIGELIDELIDDFIEDGRVDFVDQ  
FAVLLPTYIIADILGLPRDKYDKVLWSDAVITVVGMRGTREQEIDAARLMVEFRRYVKQTVRERRQEPRDDL  
ISDLVTARVDGVSPLTDDEAAALAFETGVAGNETTRNTLMSGMVQLLRPDQMQUALIDDPKLVGNAVEEILRY  
ETPASSMWRIARHDTKLAGVSI PAGATLLLR YDGGNRDPQRFEEDSFDIRRKNARLHIAFGAPSMHRCLGQM  
LARKELTMAFPRLLARMKNIRIAEGSVTDYQPSLLFHTIGSLNLSFDPGPRLTKRAG

>CYP1376B1 (IE4771\_PB00087) *Rhizobium etli* bv. mimosa IE4771

MSFLQEYDSISTNDPSAQAAAFVIKWLRGNPTAMFDELRADRP IFINPVFTMVVRATDVLDILSQHQLF SVRLN  
AKSMDPAVGPFMLARDETELNWHEKSIMRAVLRHDDLPRLKAFVGSIVTSELSTSEGGLDVVARISRLVPLRI  
VQSFFGFAAPDELM LKWSFATQHAMFRNLGGDPVVERACIDAGVEMRNWLWPFLAAKWADPGLSDDTPVDRLI  
RLSRNCDLAIATDRVVS NVCGLLVGAIETMSQAIVQSLEQLLQRNDVLPAAIKAAKDLGSDDIHSYALEALRF  
NPITAMQIRYAERDCQLGVGTPYATKITRGSRIA ACTGPAMFDEGLFREASAFKVDRPRESYLHLGFGHHECL  
GKYVALVAIPETVRHLLSMPGIRRAAGDSGKIDFAGGPFPEHFSIEWDQAKLQ

>CYP1376C1 (Maq22A\_c15690) *Methylobacterium aquaticum*

MTFLDNFGSIDPENGPARTAMFFRHLRADWRGLFAELRAERPILDLAPFAVVS RWSVDMSALSRPSTFQV TYR  
PHMDPSVGPFMLARDDSELNWQDKAVMRSLLRWDDLPAIRDFVGRTVAAALAVEGDTV DVVGLASRLAPLRVV  
QQSFGFYGPDDAAML RWSRATQADM FHNL TGDP AVKADNVAAGTEMRAWIRRF LARRQPWAEARGEDAVSRLL  
RLAGTGGAGFDAERVVSNIAGLLVGAVETTSQA IANATEQILLRPDVRAEAVEAARSPTDRFDAIVWEALRF  
NPMTTFVLRIAAEPARLAPGTEHEVAVPPGRVVALAIGSAMFDPALFPDPESFKPRARLDYLHMGFGQHRC LG  
QYVGYAIIPETVRQILRLPGVRLLGGEAGRIDD RGGPFAERFVLGITP

>CYP1384A1 (TMO\_1336) *Tistrella mobilis* KA081020-065



MTVIGQGNKAGNGGQAEPIDFGSAAFRTPWPAYASARRDRPVWWSDRLGQLCVVRHADVMRVLTDPVFTVEY  
PFKRTRQAFGETLLDIDGARHLAQRRAAQHLLGFEGVAAAVAGLAPGIIGATISGLPAGRPVDAVAALAEPIA  
RGVIRGLFGIDAETGDRLARHLSRVSRYIETADVLDGVDVEDRRALEAEIGRLIDEGLSPRPAALALRVQMA  
SELERTQLMRLMLLMMAAGVETPLSAIANALAVLLDHRHLIDRLAVEPSLADSFALVEMRFQPPQHDTTFRFVR  
GHTMLGGIEVRRGTSVRVFLASANRDESVFRAADRFDPERFLPGRPPVPVLSFGAGRHCPCGRPLASAI IAEA  
LRRLAGGFQDIRPAEDCDPTITGEGFRRPQRLTLVLDPRRRPATASLPGAAVA

>CYP1396A1 (Mesop\_5506) *Mesorhizobium opportunum*

MFRTKYSBGVKNAREAQKPVAELPPFDPERLRSKGLLAGLLSRVLENPRGWLALLRRFWPTVIGRIALVTKA  
ADVRDILERQEFETPFGRDMAEMAGGVNFILGMQDGS DYRRMKSVILSAFPPEVEEARVRPIARLHRSRALART  
AMPGFNAIELLKIVPVRI CRDYFGLAFDNDEEFADWSIALSSQLFFNPFEKAATRELASVAAYRMRDVINQSI  
ETVLAGSKTDKPLARLVAIHEAGRLSLDDIRSIMGMVSSFAPTNLLAGGNALDVVLNRTDARKAVQDAIDSG  
NDAALDKAILEAMRFKPIYLGPLYVARDAVIASGTRREKTLRAGTIVIPSILSAMFDKDAVIDPERFDTSRP  
GRDYLLYGHGLHLCIGAEVARVQIAESFRALFAKAGLQRAAGSIGRLTRRGTYPERLCVEFDVADAWKTSLDL  
SQYDPSISSLCELIIRFLIARSSTHSDRISLSRLCGITGKRAPVDLMTAITILTQSRQPVL SVAYYSIDKYG  
RFEKVN RKDINTESFIDDDIDKQPLMFKDTFPIFYASDEFKVNIGVKRT

>CYP1405B1 (Mesop\_2125) *Mesorhizobium opportunum*

MIRLKYFDAVRAGQENQRPLAEMPPFDLERLRSKGIVSRIIGVLFNDPRWMLALLRRFWPNLAIGNFLLVTRN  
ADVREILERGDEFETPYGPEMAELARGSNFILGMQDGADYRRMKSSVLGAFFPGEVEALVRPIAARHSQEIMM  
RASPGFDAITDLIKIVPVRI CRDYFGLEIDDESEFADWAIALSALFFSDPTASPTTRQLAVVAGDRLIRVIDR  
SIDAIRERKGA KDRPLARLVLDLLDQDRLSLPDIHSIMLGMIA GFVPTNVLAGGNCLDVILSRADARQAIDAA  
LAKNDTGSLDRAILEAMRFKPIWIGPWRYTARDATIAMGTRRERLVKAGTVVMPATLSAMFDPEAVQSPNHFD  
TSRPHRDYLVFGYGIHQ CIGAEIARIQIGESLRALFQKNNVRRARGKAGRMTHIGAYPDSLKVDFERPALCRT  
VIHSMATVVCPITRPASLDAIREEVAGFGNPASDEIRAALNATGIIHFASLAVVPTGEVGNAPADEKGALVLE  
VSGDGSTEDVINAVAHAIGDRLRPILKDVC DLPDGLVLDAFLRKHNVEISPSFGSNAGLVFSGTPGHSVQRI L  
AEAELADAVRLLVEQPCATKGGAAAALDEARRHVSLEKFDWAFGPAESLLERPPGKWWQAIITTTLLAPAVLA  
AVALLVLAFWMMTYVLVFGDPPGLTLGTIAIAGTALLLAVLGILALAAVILGLCFLALRRLEDIDVPHSTPVD  
LGDLDKILVREDQPGQAQNH LTAISTMKVGILRRLALRLSFYLISISAQKVFRPGFLATINTIHFARWVLLPG  
TNRLMFFSNYGGSWESYLEDFIAKAAAGLTGVWSNTEGYPRTRWLFLDGARDGDRFKRWARRQQVPTLFWYSA  
YPALNTLRIRANSRIRHGIATATGSEARDWLSLFGSLPRPQARKADAGPAAPDPLPVEQLETGEIQSLFFGPF  
GSLGHAHMLAIAIPENLSRGRRRRAWLEFIVEQTSFGDGPAGRAMSVAFGPDGLRRLGLDGSVDDNPLDTFPV  
AFRHGMGNPERSRILDDLGESVPQKWQWGSPPQKPVDAVVVCYAESPERLKVEVGTA KAKLTAAGMDLVSELPL  
ATKRDGKRAVEHFHFGVDGVSQPIVRGTARANVGAAPMHLVAPGEFLFGYRDEHGFYSSPSVEASLDRTGILS  
AVRRNRQIPGLPPRRDFGRNGTFLVMRQFEQHVDTFNAYCKAAVQAASETDDPAITPRWVA AKMLGRWPDG  
SSLVRNPDGRPGRGADNDFAFGTEDPQGHRCPLGAHVRRSNPRDSLGEDRETQIRIGKRHRIIRVGRSYEKQD  
KKGGKVEKGLLFMC LNADIERQYEFIQQTWVSSTS FQGLVAEKDPTIGSRDGNGRFTIP SWEKVTVLKGIPQF  
VTTRGGGYFFMPSRSALRFLISRL

>CYP1406B1 (RPB\_0862) *Rhodopseudomonas palustris* HaA2

MFTLKYYDAIKKAQSDTASAPPAPILPFNLDDL GADTT LKRWTSWGFGWLMRGALHVFREVWPNPQFGRLIIV  
TRET DVRDVLAQPGLYEVPYGP EMTELAGGTNFVLGLEGPEHQRQNAIIRSVLRPADLDRIELSAHYTTILL  
DASGGRIDVMKDL MTRVATETCCGYFGLEPEDPDAFAEWAMSI SALLFADPFGDAA TRRLALNGAAQVREVID  
RAIARAKAAPETDTVVGR LVQAHDGVVTEDEIRAIIVGLVTGFIPTNTLAAGKMLDELLRRPKVWAEAIACA  
GRDDVAGLQAILLEAGRLNPALAPGQWRYATQDGVIAHNTSRQRRVKAGSVLMVATMSALRDKRAFVAPGSFR  
ADRPND SGLMFGDGAHVCLGKHVAITQITQVFRGLLQQPNLRTASGKDGAIGWVGFPFRRLDMEFESRVAPQT  
QNMVVICAPVRPGADLDTLRTQITALGNPARPELVAAFEATGIVHFASMTLIDAGTPEQPAPHLLLELNVDGT  
PDGAIRAVA EVAGQWLAPIFAQADAPAGAALIDILRDNTLDLQTRPWGAIGLNFNGTPEFAVGDIIRQRELAQ  
FAQDALEDYLENHACLGSRAMVALGYVRKLIRQDPALKRTIDESPDSPRRARLQALFARGAAFTQYLIRPSRR  
RLKISDWVPRSGTDSL SLLGSPTFQWIGAIVAALVLIAGQAIYFAIEPFSDATYLGRIALALVGGILLVALI  
LAALGGLFLLVLNDYESRDVPDDSDPDLGKVREIAASENHGPGFIQNHITAVTT LKPGWFRKLT LALS LWG IKE  
LVTHWYRPGFVLNMGTIHKAKWFRPPGTDKLI FLANYDGSWESYLEDFVMKAHAGQSAAWSNGVGFPRTRFLI  
FDGAQDGRDFKRWVRQQVPTQFWFNRYPQLTTDDIRRNAMIH DGLVRASTDS AARAWLDCFGSMTRPNYAIE  
TPEVQSLVFRAMGQLDHTATALLRLPADRGAGKEWLRAIMPEAGLLQDPQAPRPAIGAITFGDRPFVGGDAAH

NVATFVAFSASGLGKLGLSARNANDGLTTFPTAFNIGMSQRANILRDTGASKPERWDWVDAALEGSDGAAAAD  
ATLFLVYGKSAEVCRKALDAHAALLGGRDALLYVNETSPPTVDTDPDGPKTSLEYEHFGFVDGISQPVIKGTQRF  
AKGVPPARDIVEPGEFILGYRNNQGYFPPSATVASSSDPANHLPIPLDLLPSRFPNFRADTPAKPVRDFGRNGT  
FLAIRQFVQDVGDFKAFTEAKAQELSKYRDLAAVIGETPTAEWVAAKMMGRWRNGVPLVDKPNSTTFNTRRGK  
SRSDARDPYDRDNDFAYGQDDPQGLHCPFGAHIRANPRDSLQPDPTQQQLTARHRLRLRRGRSFEEAGQSGG  
PGRGGKPEKGLLFVAVCADVERQFELVQQSWVSSPSFHGLSHEPDPIIASAPDDPAKKRVFTIPTAAGPLTLH  
GIHSYVTVTGGGYFFMPSRSALQYLIDLE

>CYP1406B2 (RPD\_0969) *Rhodopseudomonas palustris* BisB5

MFTLKYYDAIKKAQSDAASAPPPPLVPFDLDDLGDATTCLKRWSTTAFSYVLRGALYLFREFWPNPQFGRIVIV  
TRETVDREVLAQPGVFVFPYGPETELAGGTNFVLGLEGEHQRNNAIIRSVLRPTDLDRIKSLARHYAQILI  
DGSGGRIDVMDLMTVRATETCCGYFGLAPEDPDFAFEWAMSISALLFADPFGNAATRRLALNGAAQVREVID  
RAIARAKAAPETDTVVGRLLVAQSSDGAATEGEIRAILVGLVTGFIPTNTLAAGKILEELLRRPKVWAEADCA  
GRDDSGLEAILLEAGRLNPALAPGQWRYATKDGVIHNTSRQRKVRAGSVLMVATMSALRDKRAFVSAGSFR  
ADRPNQSSLMFGDGVHACLGMHVAIAQITEVFRVLLRQPNLRRASDRSGAIGWVGPFPRRLDMEFEPKIAFQT  
QNMIVICAPVRPDTDLALRAQITALGNPARPDVVAALQATGLIHFSMTLIDAGTPDQPPHLLLELNVDS  
PESAIRAVVNEAGEWLAPIFAHADERAGAALGDILRRNMLDLQTKPWGAIGLNFNGTPEFAVADIVRQRELAR  
FTQDALEAYLENHAGLGSRAVALGYVRKLIRQDPALKRIIDQSPDSTRKARLQALFTRGAFTDYILIRPSRR  
RLQISDWVPRSGAESLLAMFNSTTFRWIGAIVIGLVLIASQAIYFAIEPYSDATYIGRIALAVVGGLLLVALK  
LAALAGLFLVLRYENGDPDDSDPDIAVRREIAASENHGPFVQNHITAVTALKPGAFRKLTALSLWGIKE  
LVTNFYRPGFVLNMGTIHKAKWFRPPGADKLIFLANYDGSWESYLEDFVMKAHAGQSAAWSNGVGFPRTRFLI  
YDGAQDGRDFKRWRRQQVPTQFWFNRYPRLTDEIRRNALIHGDLVRASTDSAAQAWIDCFGSMTRPVDAIE  
TPEVQSLVFRGMQLAYTATALLRLPADKAASKTWLRAIMPEPGLLPDSSGAAPRAVGAVTFGDRPFAGGDA  
PHHVATFVAFSASGLARLGMSRSNANDGLTTFPTAFNIGMANRANILRDTGASAPERWDWVDAALDGRDDVAA  
ADAALFVYGRSAEDCRAALDNHAALLGGSDALLYVNETRPAVTEDEGPKTSLDYEHEFGFVDGISQPVIRGTQ  
RFAKGVAARDIVEPGEFILGYRNNQGYFPPSATVRSSSDPADHLPIPLDALPGRFPKFCSDTPAKPVRDFGRN  
GTFLAIRHFVQDVGDFRSFTEAKAAELGRYRDLAAVIGEEPTAEWVAAKMMGRWRNGVPLVDQPNSTTFNRR  
GPSRDDVDRAVDNDNDFSYGQDDPQGLHCPFGAHIRANPRDSLQPDPTQQRLTARHRLRLRRGRSFESQQGD  
AGRPEKGLLFVAVCADVERQFELVQQSWVSSPSFHGLSDEPDPIISATPDDPAEQRVFTIPTAAGPLTLHGIQ  
SYVTVKGGGYFFMPSRSALQYLIDLE

>CYP1406C1 (Saro\_3798) *Novosphingobium aromaticivorans*

MFEPKYLRMQWLGARRKKERGSMDFSLDLMRPGKVAGQVAAALFRLLVPVLFVLQCFWPVLRWRRFLLVTRA  
DDVAAAILGDPEGFPVPFPGPEMQSLGAGATFLLGLEGPDHQRRIITSVVKRSDLAGLEAQADSFALLESS  
KGRIDAQRDLVQRVAAETCARYFGLPIDDPDLYAEWTIACSQLLFADPLGDPVARDMAEAAAARIGALIDRTV  
AATQSGGHEHAAPPETLVARLVELQAAGGADAPTNEEIRAILLGLSVGFVPTNSMAGGKILDLLSRKGARE  
AIEAARAGDAQHFEQVLRAMRLAPAIAPGQWRWTRQDTQWIRPGGRTRFRVRNLTVMVATQIALRDPKVV  
PWRFEYDRDTPPLVFGNHAHSCIGEHIAIAQLRGLSLMPLLAQDGIEDSLNRLRVKWLGAFFEAWLQFDHDE  
GAQKGQFIVIEAKAGTTAELNARIAEIDARLERLRPRLDQAGLLHFCSMATAIDAPTTRPPEERGDGRTTDTLL  
VIEVNGDGEGTRIAAFVRAMNAELRALLAAAGVEPGLDLVTYLLDKRLDLTSAPWGATALQFYGHQGLSARD  
IAAQDELAGIASEALQATLQANIGLVAASATLREVRRIVARPDGARWAAAYMLKPSQARMDLSWDDPLDGG  
FVLRLLRTRAMKRVGLVLVAVALASAWAIGRSEGFTWGGLVSLPHLLWLGIAGVMVSLSGGALVAGGFVAMLR  
LKESRDVPDGAAPSLDHLRECAAHEDKPDHVNHLVVTPLKKGLIRRLALALALWGIAIVTFRFRPGFVLN  
MGTIHFARWVRLPGRDTPVQSNYDGSWESYLEDFITRAHWGQSAAWSNNGEGFPTRFLISGGAEDGDNFKRY  
VRRKQVLTRFWYARFRNLTSAMRRNALIHGDLARARTESEARSWLALFGSGQLTRDRLESDEIQSLVFTGFG  
KLRHSTALLIRFGEQADDNRKWLRLNLTGFRNATPDKSLLFEMDEVRERRRLGRVTFGEAERFGTAVSLGLSAEG  
LRVLEMPASHPERGFNALPGPFAFGMTNRARRLGDDGEEAPQNRWRDAEDGAVHAILLLYAADEEGLARLAA  
LHRRFAERAGVSVDVPTTALPQNGHAYDHFGFRDGIQVPIAGTAKAALNRVPSDIIPGEMVLGYANAQG  
YLTGPIPVKADDPFDRLPPEMPREPQRYPRFGGDEGARGPRDFGRNGAFLAVRQLEQHVVRFSEAMEAAANQI  
HDNYPELPSSLGHVDANWVAARLVGRWKNAGPLMRNPLEPDRKSPELPMFLFGADDPGSLQCPLGAHVRRANP  
RDSFEPGDPTELGIIVNRHRLVRRGRSYERPASDGAPEQGLLFMAVCEDLERQFEFVQRSWLDSAPAFHDLDR  
NDPIVGRCPAGHKRSFRIPTSSGPIQVDGLPQFVTLRAGGYFFLPSRSAMLWLARV

>CYP1460C1 (AZL\_f00700) *Azospirillum*\_sp. B510

MSVTSERAILPGPFAPPGVGHRWQGLQMLSDQIGFFVRMQRRYGEICSWAKNDQKFINIYGPRYNRLLLSDPE  
TFVIDAFREHHLPGVSSFERLTLSLMLRLNGNAHQHRKMIQPAFRTYQLERYRQIIVDETDRFLAGWQPGESR  
QLDEDFLKLVTLSMRMTFGMEAETDGERLVALIKQLIRQFSSPLILLPFNVPLPFRAILDTTDKIERFVM  
DAIERKRADLDYDDVLAEMMKARDETGSGFTNEELVAHAYTILCQEAASALLWTFLLDCHPDVYRRVAEE  
IDEKLHGAPPGMNDLKELTLYLDRVLKEALRLFSSPFGRLYAVRDCTLDGHDLLKKGTFIFFSSYVTHRMPEIF  
ENPLAFDPDRWTSAAACSPFEYLPFGAGAHHCIGQGLALVELKVILAMILQRFMVRLQPKTRIDLTVKISLVPK  
QGLAAVLRREAGHDGTVPEISGNVLSAVIVSGSTAIEGS

>CYP1515A1 (SGRAN\_3518) *Sphingopyxis granuli*

MMTDTNMDMVAGVGREDWERRTTSRTGAGRVADPYPKLAELRRQGPIHRGSTFDLFGVPDPMAEVWPDAPRFI  
SVGYDVTEQILQDNIGFSNAGIRKMTEYVFGEVSLMGSSDDPEHRKFRALVQPAFTRHGLDLWRGFVRPRLDHL  
IEGFKAKGRDLDLYFEYCAEFVYVIAMVLGIRPQDLERFHEWAAMLQIAAATPDEARNARLAVEEYMRGIIED  
RRRNPRDDIVSMLLEREIELDGVHQKISERHLLGLINNLLPAGAGTTYRSLGILLVTLLERPELLERLYHDRD  
RIPRVIEELLRWNGPVLFAAPPRLATRDMVAGVEIPAGSIVEPAIGAANRDPARFEDPDSFIADRNPRVTLSE  
STGVHYCAGSQVARMELTAALNALLDHLPHLRFDDSQPPPQITGLMYRMPTGVPAMWG

>CYP1515A1 (Swit\_1995) *Sphingomonas wittichii*

MSGSACPVAPYPAKELLSNAFARCPFAKLGAQAEAPVHQVENLPWYLVTRFDDCVEALRNPQVFSSEHRDFG  
PALKAIGLTPTPQTHARMLEIGGDRGAMFDIVLHRDPPAHSRQRRLLINKALTARVNLWERFIEDQVRTLLARF  
GEEGEADFMDFAVPLPIAVIADILGVAEEHHGKIKSWSDDSARASGRLSSDEEWLAMARSMREQGDFFASEL  
RKRLAEPSSDDLVGMLARATQEGPSPETGDEPLTFDEAVEMLVLLLVAGNETTTQLLGQVMMELATRPGLIARV  
RADDSIANDLIEECLRIATPIATMMRFVKQDTEIGGLPIPKGSIVSFCFNQANRDPRMFEDGDGFRPDRDRVR  
HHLSFGSGIHNCPGARLARLEARIAARAARVHFKDLSLAGKDAARYDMASLAVRGMTGLRLRYVTESAEARAA  
LSGPTPA

>CYP1591A2 (Swit\_2020) *Sphingomonas wittichii*

MDSKAQSGCPVAGIDIKELMSREFAACPYPKLAELQGEAPVHQVGDKPWYLVTRHDECLRVLMDEHFSSEHD  
DFGPALKAIGITPTPDQVERMQALGGNRSNMVDVIPHRDPPVHTRQRKVIKAVTARFRRWEEFIEEQSARLL  
ARFEGRTEIDLIAEAAAPLPPIAVIADILGIPDDYLPKIKQWSDSSQTSGRYASDEDMALAKAMSEQRAMFA  
SEVRKRLADPSDDLIGRIAAMTQEPVDEATGEGPLDFDEGVELLTLAMLGGNETTTQLIGAAMFYLATEPGLL  
DRVRTQPDIIIPGIVEESLRLTAPVFTMMRFCKQDAEIGGVPIPAGSIVSVCFNQANRDPKVFPDPDTFVAERT  
NTRRHLSFGQGIHVCPGAQLARLETRIWIARLAERVKHMELAGPDAVRYDLASLAVRGMTSLRVRYELFDKQS  
QQLGEAA

>CYP1597A2 (MGMSRv2\_1643) *Magnetospirillum gryphiswaldense*

MAETTTGPVTGHDWWAMLTDRAFLENPYADLRRLQQQGPIHLDEQSGIYFVLGHEAFGAIKSPKIGRDTHYW  
NPGWNNDEYRQRDPVGHELYQGVPQMINVDGADHKMRRAVWEDAFKLPAVKDMAPMIEAEARLVAELPDEG  
EIDLIRDFAAAMPMPRVLCNLLNPSSMDDTIHGWSEALIRVADVMISPEDKQRALDAMKASKDFLRGFLAERR  
AAGDASLTGIIIRAQDDGVVSEETLTNMSMLIAGHETTVTLLIGNGMRLLLDNPEQMARLRADRSLVRSARE  
EFMRCEPGNMILRVAREEVEICGTVIPAGAPILGMIGAVNRDPARFDNPDLDIGRVGNAHFTFGGGPHVCL  
GAPLARLEGLVAINALLDRWPSITLAGTPVWRTDRLNARGLATLPVKVGR

>CYP1371B1 (REMIM1\_Pf00891) *Rhizobium etli*

MSDIVERARGCPVMSFDYAKIRPCGSYRQKAMELRDDGRPIWVNTFAQGFWVVTQELVREVYLKADIFTTDS  
VMAVEPETNPRHILLPLNVNPPHHRKYRNLLAPWFSQAKVKELEPLLRASARDLVEGFLPAGKVDAAWDFCAL  
LPINSLGAANMPMSVAPQLMQAINDFTRGFSGLEASETGGTAGMDAAVEAIHAVTDEMIASERRARPLDPKGD  
FYTYLTTELIEGRLLTDEIRQIGLIYVAGMETIRAQLGWLLYHMAKVPEDRRRVLADPSLIPAAVEESIRY  
YTVIWGVGRKIGQDVHWHGVDLKKGDMIALNDAFNDRDPKRFEDPDRFDLDRKMAPHLSFGFGAHSCIGMHLA  
RTQLEVALEEFHRLIPDYAIEDSAVIEERGSEVTIQSLPLVWNAGA

>CYP1732A1 (NGR\_b14810) *Sinorhizobium fredii* NGR234

MEMASDASALTGANLYNDPYPVYARLRREAPVAFFAGTNEYFVTRYEDCRTVGANDRVFGPSGAPDRPEARVM  
GMPNVLTMSGEEHACLREGIDLNLTQERVRSYVDRLTRPVVQRFIDEIRPKGAANLTTELFEPISVRCIGDVI

GLTETSNDNLVEWFHAMALGLQNVSNDAQVWDRDLDAALADIDNQLGALYDAALSKPNHTLM SHVMHGGMPGEGK  
ARSLKEISPTMRV IILGGLQEPGHAAANACAGLLSNPEQAKVMAEDPSAHALKAFDEGLRWIAPIGVTPRVAA  
QDFEIASTVIPAGSSVAIVMG SANRDEARFENADQFDM LRKKKQHVSFGFRPHFCSGHFLSRAMGEIALEEAF  
RQLPNLRDLDP EQEVKAKGWRFRGVNVLP AKWDA

>CYP1732A2 (NGR\_b16290) *Sinorhizobium fredii* NGR234

MANDASALTGANLYNDPYPVYARLRSEAPVALFEGTNEYFVTRYDDCRTL VGATDRVFGPSGAADRPEARVMGM  
PNVLTMSGEEHACLREGIDLNL TQERVRSYVERLTLPVVQRFLDEIKPKGEANLTTELFEPI SVRCIGDVIGL  
TETSNDNLVEWFHAMALGLQNVSN DQTVWDRLDVALADID DQLGALYEAALSKPNSTLM SHVMHGGMPGEGQVR  
SLKEISPTMRV IILGGLQEPGHAAANACAGLLSNPEQAKVMAEDPSAHALRAFDEGLRWVAPIGVTPRVALED  
FEIAGTTIPAGSSVAIVMG SANRDEARFENPDRFDMFRKKKQHVSFGFRPHFCSGHFLSRAMGEIALQEAFRQ  
LPNLRDLDP EQEIKAKGWRFRGVNVLP AKWDA

>CYP1732A3 (RGR602\_PC02305) *Rhizobium gallicum*

MTGSHTELTGENLYRDPYPVYSRLRSEQPVAFFEGTKEYFITRFDDCRTL VGGN DKVFGPSGSTDRPEARVMGM  
PNVLTMSGEDHQCLREGIDQNL TQERVRSFVEGLTRPVVQRYIDS IKKNGEANLTVELFEPI SVRCIGDVIGL  
TETPNETLVEWFHAMALGLQNVSN DAAIWKRLDDALAEIDRQMGDLYQACLT KPNNSLLSHVMYGGMQKGEVR  
SWEEISPTMRV IILGGLQEPGHAAANACAGLLSSSDQAKIMAEQPQENAMRAFDEGLRWIAPIGVTPRVARED  
FEIAGTVIPQ GASVAIVMG SANRDATRFEDADKFD MFRRKKQHLSFGFRPHFCSGHFLSRAMGEIALAEVFRQ  
LP ELRLDPSREMKGKGWRFRGISDLPAKWNA

>CYP1733A1 (SGRAN\_0231) *Sphingopyxis granuli*

MLDTRTRPFDLTRSETFRDGHPPFAVYDAIRAAEPVYRNPGDGRSPPIWVLTRHRDVEAVSRDTANFTSTQGFR  
VFEQGGVAALKPHIREAITSTLLTMDPPDHTRIRRPQAHFLPSALHRLEARIDSFVRDMVAALPANAEIEFV  
TRVAAVVP IRTLCLLLDIPEADRARVFDW TNRLVGTSDPEY GASAEDSNAVFEFVDYGTRLLERRSAEPGDD  
LLSVVAQMFGGEEAGMRNVRRGMFTLLLAAGNETTRNSLSGSIVALSAAPDQRRMLAENPDLIARAIPELLRF  
VTPVIQMMRVARS DVEVGGQPIAAGDRVAMLYGAANRDPEIFDDPHRLDIARPNAARHLSFGIGIHHCLGARI  
AALQLNAILRALLGRFPEIGAVRDPAYLQSNFVCGIKHLAVHLGPERR

>CYP1733B1 (SGRAN\_0226) *Sphingopyxis granuli*

MTVAAAPSPAPSADAAAGATGRFDLVDPCFRAGHPHAA YDALRRQGPVVPVEGADGERLWLATDHEAIRAIS  
ADSAHFSTARGFRVHTAHRASMDPEIGKVL SRFMLSMDPEHEAPFRRLVTPFFMPSGIAAVEPLVRQGVDRLM  
AGLAGRDRVEFVEEIGARVPISTICAIIGVPPED EWRFVEFTNAVFGTDDPELAPSKAVANERYLAIFDYGWS  
LLESRRREPRDDVIS CIAHATLPDGRPLSRTEQVS YFSNLIAAGNETTRSSLSGAIWLLANHPDQRCALVDDP  
ALIPRAVQEILRRFSPVIHMARTATQDVEVGPAQVVAGERVAMLYGAANHDPALFADPYALDVGRANANRHIA  
FGYGIHHCLGSR LAMLQLALILEALLRRFP RYEVVSDPAYIRSNFVLAMKRLDISLSPGGR

>CYP1734A1 (BSY18\_3531) *Blastomonas* sp. RAC04

MEVRRGNPPRALRTQAPDVSTAPGASGLAPEVHFAQLRAQCPVALQAGSGTNGAGRAAWVLTRYDDIVAAAND  
PKTFGQSQRFAGERRPPLESNPPEHRIWRRMLQPYFLPKAINQMEPFTRALARDLLAPILATGSGDAAHGVAR  
PLPPQIILLRWLGQPS EDWETIKLACEHAYFQGS PDPAERAAFEAEALLWRYARDTVASRIERGTHEADDDPV  
SAML AAMPTEPAVTRPLIDGVVRLLLAAGHDSTTSALGMCIGFVAGDGD LQQSLRSDPTRI PA AIEEMLRLRT  
PVLQMPRTVMADTVVGGRELAAGDSVLLAFASGNRDASAFENAE CFDMGRRSGQHIAFGVGIHRCIGNILARQ  
EIRVVLEELLAATHSFRPDGEIEHEFWHPYGLRRLPLSLVPR

>CYP1735A1 (K663\_17741) *Sphingobium* sp. MI1205

MTSTAEPIDPIDFTSVMQQGCPYQTYTRMHADGRKVYQDPGN GYYVVTDYAEVRKIAADTKRFSNKTGILVQR  
DTPLQKQIDAMYAKDAWPQMHTLV TNDPPSHRMFRSLVDRLFTAQRVAQMETYIQMLVDEAIDRVIDTGEIDV  
ARDLAGVFPAIIAGDFLGLPREDQEKLDWTNASNALTEPTFDEENEIAMNRKVIELLNYMVERANVSAAAED  
GSFMHHARTFEVDGRRLTDQELAWFLQPLYVGGHDSITLLIPTGMLRIEQPGLEQRLREDPALITNFIEELM  
RFDAPVQALWRRALQEVEIDGVVIEGGIIQLQWAAANRDPDKFDHPDEFIVDRPNARQH LAFGTGAHLCIGN  
QLARAEMRIAFETMLRRMRNFRLSDEEGAVQMRRHYMQWGA EKLLRFDKIA

>CYP1736A1 (Cseg\_3016) *Caulobacter segnis*

MSHLPRRIEDLPSLGAAELAGWAADLEGSLARLFERYPDGLAQGAGSRLLVFGAEPLRRIAATEAAGNMPADV  
LSSSAFNVGPDGAPVEPEISAASSLAKLVSNQVFTANPPLHGPTRQLFMRQFMPKQLPRFAALIEGAVTALLQ  
EAGARGRVDFGTDVAERLTARFWAQVLGLTADDEETRARHLISALSPMFYLVRTPEETLSADAAAAEYLAMVSA  
AVERGLAQGDQPILRDMAADFS AIVEPGRPESLGMMMLAANLIDGFHTAAVAVVNAVYGLACNPEVLAQVRADQ  
SLVPAVFFETIRLNPPVVLTRQRYALRDFEYDGLMVPADTPLVMLWIAGNRDPKAF AEPHRMDLSRPQRGDVTF  
GGGAHICPGRNIARSLVEAVLRGVTAPGVQIEAVAAMDDWTPRSSMRQLSQSPMRVSVGI

>CYP1737A1 (Swit\_0359) *Sphingomonas wittichii*

MTGAAQARPRDEAVERELKTGADHAFDPLDPETVRNPGPAYSELAACKPFYHYQGDEYQFYITSYKEIRDKV  
LSDNPVWSFKWGDGPIDWAEFSDFGILTDPFFHLEYIAALRKGMTPSRMKFYQPEVEAIAEELVAGLEARADK  
SGNFHDLFALPLPARTMCFMLGADQAMYADYKRWADELQSLLFNNDKNPAEQSLIAEIMPHFMGLIEERKALL  
RDAGIDDPTHEHWGTVLFPFDYISLGLVSRVEGRRFNDQELFQICTAFLTGGQETTTSLLTNVVWRLLEKPELW  
EQLKAHPFELVENAIEESLRFDPINSHFRTSLCPVTMHGAELPERSKLMFSMMGANRDP AIFEDPDFTFRIDRP  
LNQVKRHL SFGYGVHFCLGAPIARLEAQIGLRKLVERLPNLRLTGETERIDSWMYWGRRLPVAWG

>CYP1737A2 (Sphch\_3675) *Sphingobium chlorophenicum*

MTEITEAKAQEPEERRLKTAADHIFDPLDPETVRNPGPAYSALAGQCPFYHYKGEEYQFYITSYKEIRDKIL  
SDNPTWSFKWGDAPMDWETFSDFGILTDPFFHLEYIAALRKGMTPARMYYLPEVEAIAEDLVSGLENRTDRQ  
GNFHDLFCLPLPARTMCFMLGADQALYADYKRWADELQSLLFNNDKNPSAEQTLIAEIQPHFMGLIEARKQMLR  
DAGIDEPTHEHWGTVLFPFDYISLGLVSRVEGRRFNDMELEFQICTALLTGGQETTTSLLTNVIWRLLEVPERWE  
RLKAEPHLVENVIEESLRFDPINSHFRTSLCPVKMHGAELPERSKLMFSMMGANRDPDIFPDADSFIMDRPL  
NQVKRHL SFGYGVHFCLGAPIARLEAQVGLRKLVERLPNLRLTGPTERINSWIYWGQRELPAWG

>CYP1738A1 (HNE\_2953) *Hyphomonas neptunium* ATCC 15444

MADDSRPAGAVQSILELSAFNPAARDNPHMLKTMREDCPVFRDEAAKVWLLSRYKDVRETVDNRSFVRHPTK  
AEEGSL SARFVEERQERGTSILFLDDPDHARIRQPLAKAFYARINRMRPEIEAMIDAIIEKAPASGPFELMAE  
IAVPVPVLVIARILGVDEARLDDFRQWSEEIVLGLNPVRTPEEDEALIRGAYALDAYFAELMEARRKAPQDDL  
VSDMVQLQGSGEAEISDGELRNLEALLVGGNLTTTDLIGNGVWFLTHPGQIRTFRDNPGLAQAVEEVLRF  
EAPVSITSRILPDDRVDVGGCPMKARQPVWMSLAGANRDPEVFEEAETFDITRKRASHVAFGGGPHICIGAPLA  
RIEARHVYLKLFERYPDLRLAEQELAWRTL PFFRGLEKLIVEG

>CYP1739A1 (OV14\_b1284) *Ensifer adhaerens* OV14

MSEPIPEALRGGAAELFGRLVRLRDDEAHGKLKEAVTNALRSVDLGQVANLARMRAAELDNEGRPLDEAKI  
MQFMFAMPVQVVAQLLGIPRERFGDAMAWLGDYGAAAAAAGTGIPAPTPELLARGHGAQALFDLVSAIKNDD  
EQRGSLLDALAREATHVGCDDDEKDIIANAIGYMIQGYAGMASLIGLTLALARRPALHAQVDADRTLLRPLIQ  
EVVRCDTVTSSTFRFMARDGEIAGHKLRQGEMIIVLLAAANRDPALNPDPDRFDIARADRKYLEFGAGAHACP  
ADKAASLIVEIAVDHLLAGGAPLERLETSLSYAASGHVRTPLFKR

>CYP1739A2 (OV14\_a0596) *Ensifer adhaerens* OV14

MRLRDDDIGNTLRRAVASALRGVDLGQLAVVAHRRAMELDGDAQEMFSVDRTMTFMFALPVQVVAQLLGIPKA  
SFGDVMAWLGDYGAAAAAATGIPALTAELLARGHHGAQALFELVMKIRRDSQCGPLLHALANEARRVGCDD  
ETDVVNAIGYLVQGYVAMASLIGSTLLALARQPALRTQVADPTLLRPLIQEVLRCDPVTNSTFRFMARDAE  
IAGHRVRQGEMIIVLLAAANRDPALNPDPDRFDITRADRKFLFEGAGVHACPAEKFAPLIVEVAVAHLLRRGL  
PFEQLESSLTAAASGHVRTPLFKR

>CYP1740A1 (RHPLAN\_40630) *Rhodoplanes* sp. Z2-YC6860

MQPTRLNHLES AWCLTRFLFDPLGTLARCHRERGRVVIITAPIRWPIKRRSRHSPFIIISGVGADFNRAVLSD  
PTIWRTRSLGPGGPRGSAAREVSTGIFSLHDETHKHYSRLIVPPLSQRSISAQSSRMGDAAA EVERWPIHET

IDLWAYSRRLIQTLSISLLFGNDRERGLPVAELVDHFYNHAFSWKVFLCPFNVRGAPYHMLRDGRHLKVRLLDWLKRKRGSADSNDLFAIVANNPDEKGRSLSDIETIGHIPPLMVAAFETCQNALMWTLLVCQHPKVARDLLDELEGRLAGATPSVDRIGDLPLFDGVINESLRLFPVPVQQFRVAARDTTIGDIPVAQGTKAVLSPLTNRDPDLYPDPDCFKPERWANLNPSLYEFFRFSAGPYTCPGSNFGTSLLKVMVATILTRFRVALAPDIPIDYKVTLTLTPQGRIPATLFPQDRAFAGSHVRGSIRKLVQLPN

>CYP1741A1 (SJA\_C2-04160) *Sphingobium japonicum*

MDDMIISAPPILEFDPYAEDVILDPAPFLESVRNAGVAYLPANEAYAVGGMDEAVQLSKDFDSFTSSHGIGLLDITKPGLLRPTNALQECDDPPQHSQRLKVVQKILSPSRVRGFQELLAERARILVDDLLEKGSVDGTRDIAQAFILDVFSVAGIDLPAEPAIATSNMMLNLMGPVNAVVSQRAMAAAEPLPWFNEAITRRNAAPGGLVDLAYQAEELGLLPEGIGGNMAIVFVGGGFDSIAGIANALRLLALHPAEWARLRS DPTLVPA AINEAIRFDPPFRVYYRMTTRPVKLGAFDLAPQTKIGVWMGAVNRDPRHFDRPDEFDVSRRGAHAGLGFGTGPHNCVGQILAKAETEAIISALVRKVARLELTGT PQYEAHNQVRMPGKLPRLHPG

>CYP1742A1 (RCAP\_rcc02437) *Rhodobacter capsulatus*

MVDFGSFNSLAPLLRDDPYPVYAQLRARAPVFWTETEQA WVL LRHQEVSA AFCNPGLLTLDLGQFVADV SQALGDHPVELLRLLDMAIFFRNPPAHGPLRALVARLLALRPQAACAAEVARIARSLHAPLVRDGGDLMTGFADPLPPLFMGWLLGLADADALWLAKT LSGVPVILNRGASIRDFRAAERRLTEAHAF LRAEITARRLAPRDDGLSLIVSRNDASEAPFDDDRLTALTSFVFMAGFETTSALIGNALWLLLDHPDQCDRVAADRKLLASAAEEALRLEAPIQQVRRRAATDMTLAQEIRAGQQIVLMIAAANRDPQAYPDPDLYLPGRGTGRPVQSFGGGLHHCLGAWVARMEAEIALGTVLDGPRPRLCIDRPGWRALHNQRRMTNLPVQV

>CYP1743A1 (LH19\_26540) *Sphingopyxis macrogotabida* 203

MQQDL DVFRMVPLETDPPIHTKIRSVLTPFFVPSALDPLDDAIRKITVDLIDECVRNSPVDFATQFSIILPSRVFFEIILGEDPK EIQWIVDLTQVLITDPATAEQGAPKLLQWCADTLEGRKRKGQTEDLIGVVAHMGNGPELFL EERERIEILNLLILAGMETTANGISSVVHTFATNP DARAE LR DADPQRIDKV VDEF LRYASPVTSAGRTLVSND E SFGCPMQKGERVTL SWTAANHDPATFPNP DVLDLNRNASQH LAFGVGHKCLGMHLAKREMRIAIQELRKL KIFELVENTRIRYRSGPQQGIISLPIH CAR

>CYP1744A1 (RHPLAN\_11270) *Rhodoplanes* sp. Z2-YC6860

MSSPAEFDR LAELDRRNVDVDLGSDTFKAN AHRHMAEWASRPFFYVLGKGPPQVVVGRYADVHRVFSDTETFASEMPTGPGWEQFHKFMDAQFITQMDGSQHARLRLLMPAFSSRRIDQLKASITTIIEKMLDRIEAKGPDFDGMGDLGSHLVVDALLEAMIQMDPRRKAVFVAFHDVLPATTYTKPGEFPFENCVRVAMQHVMD EIKV IIEERTKPHSDFISDLVNAREAGDKLTDKELFDQIFGLAGGSLSAT SRAAGGALLLLYTHDDQRQQLIDNPALIPDALEEC LRLGSNGYFTFPRIAVKDTEVGGTRILKGMVVRPSPLSPNYDADVFPDPLRFDIHRKPKRILSFGAGPHHCIGNILGRTAITIAITRLIARFPKAHISEPNFTPVYGGAVGELRLQRLPMRTH

>CYP1745A1 (Arad\_7831) *Agrobacterium radiobacter*

MVAGVAIEEAPTHMRLIFGPALQSDPHSTYRLFRENWPVARIDWPHRGSGEYLITRYSDVISIATSQGVSIDRSLAALPLSKQNRIEPLFGTVLTDNSVHANARRVLSSRLHRRTSALEPVLERTFAQLVGN YADGC ELDIIEDLAEPICETMVAWITGFDLAAVKAMQVPSEKFVSKGFTFGSEFVSPGVLD CVAYLKDAIRRLMSSLPDETLLEARLASGDRDVASYDINTCLLVITAGLQTTKHSIGNVLATLLEHPK LIEELRTSPTSVP SAVEECLRFDGPSQAVGRVLLRDTFMRDVLLKKGAFVRLALSAANRDPEHFPDPVPNIHRESCRHLAFGFSQHACLGARITRICLNVVVQGLLNEFP AIELSPRGSERLLGSSSLRGYRSYFVTVKRA

>CYP1746A1 (Swit\_1027) *Sphingomonas wittichii*

MGAQEAMDERTGGIEDVRFADPAFLADPWTP LIRLQEEAPVFYSRNQGGWIIISRYDDVRAAFADRRLSASRVDQLFRGMPEELQKQLEAVRLYTGLIVNRLDGRDHTRIRVLM LKAFDAAVVRTVQGFIGDVIDEILDECERLGEFDFMQAVSATLPTRVMQKLFDL PDEYRPLLFKLASDFTSASSAANVTPELLLKL DATIRTMNDVFNAIIPEREKNPGDDLISMMVNARDGLNKL SNDEMLAQLHGMV VAGAETTAHTLATQLVQIVRQEKLLATLRETPERAFDLVTELLRYPGTVKCMTRFAGEDIELHGQTITKGDLLWIMHAGANVDTRHWDDPFGTDIDRHNLRDSMAFGPGLHFCVGHMLARTELTEFFTRALRRFDVEILQQDFEMVPSYIFYGYKELRV RFTPRAA

>CYP1747A1 (Hba1\_0119) *Hirschia baltica*

MSVIDFTDKDYLRSPQQVLFELSQKGPILPVKIPKIGKAVLISGNDALIDLLKSPHRFTTDSKTVGKDAIFAS  
AGIIPFENPGNGSLFLKDGKDHDIRQHLDQALRKSGLSLRPNIALADQLLETHTPAKRLAANQRDLVLQF  
AMPLPAMVMIELLGIPKDVAPNLIKWAIQISFSPGILGNRHAQSARKHLYDYLKEFFSTPSLLPPESLGAKLL  
ENKPAASADQNANIVDIAFFLILAGHATTSSLISLGCLTLLDHPAQLELLKQDWTRVPDVVEEILRFASPAQT  
TAPRYAKDTFDFHGHTFKRGDIAFGFLAASNMDPASNKNPLEFDITRDQNRQISFGAGAHFCGGAQLAHIIAE  
IALQRLFSKWPEMRLSSEAAGSLAWSKKFGVRNLNKMIVETQQSTSRF

>CYP1748A1 (TMO\_3386) *Tistrella mobilis* KA081020-065

MIDIASAFGVLPPGAIEYAADPHPVLSALRNTPPIRTGTGGDVWLVARHADILSVLLAEPGSTASFNAFDTAGGD  
RHRGLVRRRLRSWVSRLSDADVMPAVQGVVDDLTARLVREGTADLVRDFADRVPMAVMRDLLGIPPADVPVLET  
MAGRILSGYDPGWTGQSASVGPACTMLDAYFRQRLAAARKGGATPLLATILETGTADGLDDAALADICSKLLV  
TGTTTTAGCIANILVRRRLRDGIALPSDPENHMLVDELVRDLTPVLGVRRRLLRPFHLSGDGADGTILLPKDAV  
VYLMTSIADRDPAIVGDVGTSCPLGSRVPHLAFGRGAFHCLGAPLARLEIAALLVAGAPLMDRLCTAGPIRWR  
EAWLLHEPSALPVQIIANPSESASR

>CYP1749A1 (NHU\_00153) *Rhodovulum sulfidophilum*

MPAVNSSAWTDPDRFLTDPDDVAAVLRDPHFTVSQTLAHLDEIVARGGPRFPHLEAMARHAFQSGEPHLAA  
RRATAPFFAAPALAAWTPVAELAIAAALASLETSRFPDLMRDYCEAAFLDFIRAFCGCPGGADDRVLDLIRLA  
NETTRPMLSLKALGRIDAALGELLDHLSTAPVPGLEPGLVSFPAFLGRRADRLADPEAAPYIALSALVGSHTV  
AQSLALALHGMLLGLDGAQAAARPGWTDGTGLDRAISLYPSTLTLVRIAGDGARIGGCPCHKGETAVMDVVG  
NAALRRRVDPGSAHLSFGAGRHKCPGAPLSRMFLARAIIPALARRFPRLALHRDGVRFHVTPLVQYPVALPVTR  
DARSRLTGRMVEIRDLDEARAIVNDDATWSPPRMEPYLETLAERSGRDLGLARLVARNAMFFMSGPRHAAIR  
RAVADSLGGNRLACWQPLIEAETRALTALRLASVPAPDLIADYAEPLFRGIAGPVGLAPVDPERFDALAPILQ  
DVLEPWLPIRELDRLQEVIGEILAGLGLPATEGLPSTPLLTRLMEEDLPETDPEDLRALVLMYGASFNMAHT  
LGNILHLLSLPPEDRRDAADPAWIDAELEGLISLCASPKYIYRMARGPARIGEIEIRTDETLRLQLLSIDRG  
IGTGNLAFGHGLHRCVGAALSKRMLRTALPALFARFPGALALRPQRHRYLDMTQTVALATLPCRLGPSKDRP

>CYP1749B1 (ROSMUCSMR3\_02121) *Roseovarius mucosus*

MRGNIWADPTSFFSTPSDAAAVLRDLELPRIDQYLAALSDNSDIKLENLNRLSANTLVAMTGDDHLKTRRVIA  
PFFSKDGLKHWADMLDAGVSHALAQLAAPKPDVNTFTIPLFLRVMPQMFLKIDESEAHFRAIETVQRLTE  
PYLSVPTLRKLEHAVGLLIRTFPDPSEHQSPDKPETLIEYLYRRRSDDLPAGLDARYLVLGILVGSNSATQSV  
FALYGLLTGPPRNWQDAARPGWAERELPRLLSLYQSTRTLVRVAPKATTIAGCFPHKGQAAVVDIVKTNCLR  
SDTKSGVRHMSFGSGAHKCPGSFLSEMVFQSIIPALARRFPSIVLNKEQCSFVQTPMMQAPTALPCETAQGS  
RATSRLCDIRDTALAHEVVRDNDRFSPQMNTNYLSTLAQHSGRDLTIAVKISQNALFFMDGPRHEALRTAIGR  
RLGATRLQDWTDLADTAIADALDNLTRMPNPDVLTGFTDLLRQTVIAPILGVFPSPDPSQFERLAPELQAVLEP  
WLSMRDLLAVQEKFNEMALMTVPTTANCSSLSDLLAEPPEGFSTDDLKAVVLVLYGASFNLSHTLANILHLI  
LSDPVEERANIETPDWISTRLEELIALCASPKYIYRMARADLELAGMAMKAGDTARLTQAINRDRNPGALHL  
SFGQGMHRCVGAALSRLIIRRAIPAVFERFPNLSLVNQGRYFPMSTVVALSALPCVLSS

>CYP1750A1 (Swit\_1847) *Sphingomonas wittichii*

MEYDPFSDEAMRDPHALYTRLRQAPGPHFIEKYNAWALVHFEDVWTVSVKHEADITFTAGQPLTNVLLGEPI  
HAFPSMDMSEHRKWRRVVHADYTKGNVEKDRDRITALARELLAPLAARKRFDYFYTDYVNRLFAINAGHNLGID  
RDNAIEWRRLIDETMHRNPGQVGTSSARNQQAGMELHRQLHAYVERIRRDPTLAGGHCAKYLDAEVEGRLEN  
QDIVNIIIIFLTVGSGTTPNVCAGTVYYLARHPEQRDAVLADPALIPKAFFEAARIDQPTNMLCRRAVNDFSV  
RGAEIKAGQNLLMIYASANRDEAEFERADAFDIFRSYPRDLTYGIGGHKCLGMHLATMAGTIALEEFFKVS  
GRYEVDAAHCTRAYGEFLSGFDHLPVILGA

>CYP1751A1 (K663\_20498) *Sphingobium* sp. MI1205

MDTAPQAPQSKCPVSRVTIDTLDTMQTVLRSKAVEENADVADNYVCPSALAEINVREFQQGNLAMSNGDVHR  
QRRRLNLSLVRPEQLVRFREDIILPSVDRWMGRAVKRNEEGAFGCDLAGVVELIFLEFAAKIIIGIEGVESEEG

MARLRGCALPIFGGLSAAHFEDREGVTTAGIEAKKVFEVFYRPSLEHTRRQLQRLAAGELTEDDVPLNLLQM  
IATQAHEHYADEDDVGIKEAILFFVATTGTSVQAVLSTVEYLLDWFEEKYPADRACIEDMEFVSNALQEALRLRA  
PFVFPFLTRLAVDDLADGVQLKAGDEVQAWVARAGRDRAIFGDDANEFNPRREIPEGISRYGLAFATGAHQCL  
GLRAVLGNDGKSGSHLKLVLQGLFRAGIRRDPKLQAQTLPLKASDDPRDQIPTYISFPVILDNWSARA

>CYP1752A1 (PhaeoP97\_01374) *Phaeobacter porticola*

MTRKEIPIFDANSTMFQNIIGLLKVAETATRQHGDIVAIRVSDTRDLYIAGSPECFHYWRGHQGHFQTDLG DIA  
SNQAITRMLLGDELQDPRWSDVWVLTANRMSAIARDFDGLWLETALADATRTLIAELPQDGTAAADLRD ICRDWS  
IRAVCPAIFGADLDVAEIAQGVADVEGFYFAMSTKDAAETADHETLAEFKAARGFLDKAITTALRNSTPSPDN  
LIAQIATVIPQDVSEADRLNLLRPTVGHVITEKLNIGGLSLLWTLVQLAQDPQLAADISAECHGNDPLTMRDA  
DSPALALSSVKEGLRLFPPELPFIYRITSEEVPIDYVIPSATVVFAPWLVHRDPRFWESPFRFQGDRLDEAQ  
HRAHYYPFGVGARIRSRANFMLHQLTLAARSICAAHSLALSPDCPRGNIRPLLRSAIIPRGVVPVVFAPRDAS  
AMAADDQSFADATQ

>CYP1752A2 (PGA2\_c13670) *Phaeobacter inhibens* 2.10

MTRKEIPIFDANSTMFQNIIGLLKVAETATRQHGDIVAIRVSDTRDLYIAGSPECFHYWRGHQGHFQTDLG DIA  
SNQAITRMLLGDELQDPRWSDVWVLTANRMSAIARDFDGLWLETALADATRTLITELPQDDTAADLRD ICRDWS  
IRAVCPAIFGADLDVAEIAQGVADVEGFYFAMSTKDAAETADHENLPEFKAARGFLDKAITTALRNSTPSPDN  
LIAQIATVIPQDVSEADRLNLLRPTVGHVITEKLNIGGLSLLWTLVQLAQDPQLAADISAECHGNDPLTMRDA  
DSPALALSTVKEGLRLFPPELPFIYRITSEEVPIDYVIPSATVVFAPWLVHRDPRFWESPFRFQGDRLDEAQ  
HRAHYYPFGVGARIRSRANFMLHQLTLAARSICAAHSLALSPDCPRGNIRPLLRSAIIPRGVVPVVFAPRDAS  
AMAADDQSLADAIQ

>CYP1752A3 (PGA1\_c13770) *Phaeobacter inhibens* DSM 17395

MTRKEIPIFDANSTMFQNIIGLLKVAETATRQHGDIVAIRVSDTRDLYIAGSPECFHYWRGHQGHFQTDLG DIA  
SNQAITRMLLGDELQDPRWSDVWVLTANRMSAIARDFDGLWLETALADATRTLITELPQDGTAAADLRD ICRDWS  
IRAVCPAIFGADLDVAEIAQGVADVEGFYFAMSTKDAAETADHENLPEFKAARGFLDKAITTALDNSTPSPDN  
LIAQIATVIPQDVSEADRLNLLRPTVGHVITEKLNIGGLSLLWTLVQLAQDPQLAADISAECHGNDPLTMLDA  
DSPALALSTVKEGLRLFPPELPFIYRITSEEVPIDYVIPSATVVFAPWLVHRDPRFWESPFRFQGDRLDEAQ  
HRAHYYPFGVGARIRSRANFMLHQLTLAARSICAAHSLALSPDCPRGNIRPLLRSAIIPRGVVPVVFAPRDAS  
AMAADDQSLADAIQ

>CYP1752A4 (Gal\_02028) *Phaeobacter gallaeciensis* DSM 26640

MTQKEIPIFDANSTMFQNIIGLLKVAETATRQHGDIVAIRVSETRDLYIAGSPECFHYWRGHQGHFQTDLG DIA  
SNQAITRMLLGDELQDPRWSDIWLVTANRMSAIARDFDGLWLETALAEATQTLIRDLPQDGSAVDLRDL CRDWS  
IRAVCPAIFGADLDVAEIAQGVADVEGFYFAMSTKDAAETADHEMPEFQAARGFLDKAITAALNDSSASDRN  
LIAQIATVIPPDVSEADRLNLLRPTVGHVITEKLNIGGLSLLWTLVQLAQDPQLAADIAATECHGSDPMTLRDA  
ESPLALSTVKEGLRLFPPELPFIYRITSEAVPIDYVIPSATVVFAPWLVQRDPRFWDNPKRFQGDRLDEGR  
HRAHYYPFGVGARIRSRANFMLHQLTLAARAICAAQTFALAPDCPRGNIRPLLRSAIIPRGVVPVVFHPRAQA  
DATTDGDRALADAAQ

>CYP1753A1 (RPE\_0081) *Rhodopseudomonas palustris* BisA53

MPLPRFDPFHPDFGRDPFAVYRRYRDAGPLHWGKPSNPGLPGTWYAFDQRGSSIILKNDAFGREAHNRNADKDL  
LAPELRWLIDHVDWRVWMFRDPYPYHRHLRAPLSGFFSAPNAARYDAQRADLVATRLAALRDRSAFDVHHLAAP  
LSAAALAMIVGLPADELAIRGWTRYLTQVLDLKRDRRLYAYCGAVAHDLGGRLRHKIINSRDRGGDHLLGRL  
HDRVATEQLTLDEASSTLMLLLATGETTVRGVIANGLLTLEHPDQLALLAAQPELAEEAAVEEVLRFAPPVHM  
AGRIARDDIELSGTLLRRGDAVVACLASANRDGRMVREPDRFDITRARNRHISFGSGRHICLGMWFARAMARD  
TFRAVAPWLVYRLSGAPLWRDSILFRALASLPLERRPSAVPIRKKTRHEPVSAV

>CYP1754A1 (BSY17\_3197) *Sphingobium* sp. RAC03

MTSITDPDAPISPAMPFRSEGNPWWITRHADASLILRSPAFTASPMMGIERIADRAKRDYSDLLALLDQT  
MVFQNGSAHLVSRQAVRHIVQQSMARWPASTILAEARHIATSVPSGGAIDAVVHLADPLPSRILASMLGLPVD



QAMALRADAMLVTRAWSHSCSLRDYDACQDAARRLRRLRGLRSGLQORDSIETDDASFDLIAFLLVAGADSIAGTI  
SAALDLLARNPAWQARLRSEPTLMPGFIRETLRLAGPLRRLNRRVAQAQAVDIGGVSIAPGDLVLLRIDRAHRD  
AEAFADPDQIDPGRKNAPLLAFGGGAHMCQGPLLGAMEAEMMVTAIIDRFQIHFAAARGVLLDHEDWRVFAHL  
PLILTPVAAEQ

>CYP1755A1 (Msil\_0731) *Methylocella silvestris*

MTGADKEIFWFKTATRRGPRGWPLLGLPHLRDVLKTVREACAYGDLVELKSPLFSLLLLNSADHVARVLQT  
NSANYGRTRFHAMLKPVLGNGLLTSEGLWRAQRRIIQPAFLFARLPAYAVFEAKALARLCQRWEQAARSQEP  
VDVAAEMSALSVEVIVGALFGDSAPGAALNVRDINLLQDYITGRFWSVVPKLAELLPAGNLAYQGARQRL  
DRLIYSLIEAHRQTPVPGAILSLMLDYRDPETGAGMGERQIRDEVMTLFLAGHETTATALTWLWLLLAENPES  
RARVEGEADAAQGLAGNLPEQNFIKRAAQEALRLYPPIWSFSRHALGDDMLGEHFVGKDSNLMVCPTYLHRHP  
DYWTDPERFDPDRFLPARAERRPRFAYVPFGGGPRICVGGFLAELVNTTTTIAARFRLEPISADVQPEALV  
TLRPGGGLMKISER

>CYP103A4 (aro:B0909\_23830) *Agrobacterium rhizogenes*

MISASIDPDNVSIADLDRFGHAIFKEWRPKRPFLRRQDGVYLVLRADDVLGLSSDPRTRO  
IETELMLNRGVNEGAVFDFVRYSMFLSNKETHSRRRSPFTRTFAFRMIENLRPQIRQLTE  
ILFRDLKELGSFNFVGEYASKLPVAVTASLLGLPPSDIPYFTQLVYRVARCLSPSWRDAD  
FPDIEKSAVEFKNYVQAVIDDRRTDPRDDFLSSYINATREAEDLSPVEGLTQLMLIILAG  
TDTTKTGLTALTGQLLQHRQAWDALLNDGTLVAAAEEGLRFEPPVGSYPRSTLADIDL  
GFILPKNSLLALCTMSALRDEKHVHPQLFDIHRKQMRWHMVFGTGEHRCLGEALARLEL  
QEGLATVLRHAPNLSIEGEWQAVQGHGGVRRIAEMRVGFNREN

>CYP1101A28 (pye:A6J80\_18645) *Paracoccus yeei*

MIPPKPASRQKGKSVWRVFVRDFFRDILSAQSERLYRAWMAEFRGPGVHSFTCNDPALVAL  
ILKQRPMDFPKSPRMAAGLQPLLGNSSFISNGETWLHQRRIIDPAFEGGRLREAFAPAMWD  
AAQSGVVRGLKLADGQDFDIEPHTSHIAADVIFRTLFSIPIEDATAAQVFSAFRDHQDAQ  
PMVNLGGLIALPRWARYHSRRVRHSARRIRGLIRQLVSRRASQIAAGNAPQDLATKIMTT  
PDPQTGAVFSDREMIDEVATFFLAGHETGASALAWALYLLAENPEWQEKLAKARENLRP  
DFAAIKSLPLSRAVFREALRLYPVAMTVRQCAAPETLRGRKAPRGAQLVLSPFHLHRHE  
RLWNNPDHFDPARWETENGRACMRDAYIPFSAGARACPGAGFAMIEGPLILSALLAAYRL  
EPGVERPVPIMLRLTLRGKNGIHLRLLLKR

>CYP152E (pye:A6J80\_21040) *Paracoccus yeei*

MPETPLNERLPIPSDGVLDSTLAFLRDGYLFVSKRCDRLDSDLFSTRMLLRRAVCMRGAV  
AAELFYGSDHFTRVGAMPVTVARLLQDYGSVQTLDGAPHRQRKRMFMSLVKPEAVARLAE  
LTEAEWLRLPLNWARAPKIVLFDEVRAILAQAVCAWAGVPLEGAETARTRELSMIESA  
GSVGPRNWRGQLLRARSERWARDLVRARAGTLPLGEDAPLRVIATHLDHGDGRLLDVKVA  
AVELNLNLRPTVAVARFMVFAALVLHRHPDVRQVRLNEGEPYLEAFAQEVRRQAPFFPII  
GGRVKEPFDWRGHRFAQGDWVILDLYGTNHDPRSWSAPKAFRPERLLERRPSPFDLIPQG  
GGEHLQGHRCPEGIAIELTKLATRMLTGRMRYDVPAQDLLIDLARVPALPESGFVIKHV  
AATRA

>CYP2140A1 (sbd:ATN00\_08815) *Sphingobium baderi*

MTAESITLESSYWDTADKPPFDYEEVQSMGGIAWDDRMRSWIVANYNLAQEVCLKDDEL  
QHPYMSMKAGGDYMKIRSDNPRSSMFLKGERHRAFHKKWLVELLSPKVVREYRKDLVDPW  
IDHLIKGLEDRPAFDLVEDFAERVPMGIFAQLLGLPQHDHAYLDHVKALNDAIGRFASVA  
NALQLEGEASAEARRVADEAIAAAEELNDILKPLVSEKNGEGSDFISQLWRGGHRVFDD  
WNELDTLDACRLLFAGVDTTTHAISNAFHMLLTDDSLMAQVRDEGSRYLDRFVEEVRL  
NGSIQFRPRRASASTELNGKSIAQGDMLTVAIIGANRDPRHYGCPHAYDLERARPHDHLA  
FAYGPRTCLGAHLARAEIASAVSKMLVRFAPMRLDPSRPAPAFSGFLMRSWRPLHVLG

>CYP1311A1 (spmi:K663\_03440) *Sphingobium* sp. MI1205

MSYNPLDPAVTANPYPHYAKLRAEEPVKWLDMMQGFVSRWDDVEEVLGDGKTFSSAQFW  
PALLGEYDPVPEVQPMISLDPGPHVRIRKLANKAFVPSRVGALQDRIRTVTHELIDGIFA  
RHGKEGEFDFVWEFSGLFPVSVIAEVLGVDIERRVDFKRWVDDLLAAGNRAAYGPERLAE  
IDSSRSIRAYFEQVYDERSANPGDDLISGFIQAEVNGERLSRSEVLNMAILLIGGVET  
TTNLLGITFAHFKTHPEIAAAIWADPTRIPLLEEMLRFDGPVQMLFRHTTRDTLAGVA  
IPKGSVLPLLLGSANHDERKFDRSEELVLRDPKEIMSFQGQPHFCLGSYLSRMEARSAL  
EILTSRFESLEAVSDTVKWSDSYFARGPKTLPVRFKAR

>CYP1311A1 (K663\_02370) *Sphingobium* sp. MI1205

MNTLQISGNFYDRETLANPYPLMAEFREQAPVMRTVDPAGRAIFVVTEMALIEQVAKRTDAFSNDFGHLFVAG  
NEHPEVAGILDQEPLRATLLLGSDAPDHTRYRALVNAVAFATGRVAHLTPMIEALTDELIDGFIEKGQCNFVDE  
FAVLLPTYIIADILGLPRDKYDQVKKWSDAVIMVVGRGTGKEDEIHAAHEIVDFRRYLRETVAARRIEPRDDL  
ISNLVTVKTEGVQPFDDIEATALAFEIAVAGNETTRNTLMSGLVQLLRHPDQMQUALIDDSSLVDNAVEEILRY  
ETPASSMWRIAREDMTLGGTDIPAGSTLLLRDYGGNRDPRRFEDPDRFDIRRRNARTHIAFGAPSVHRCLGQM  
LARKELVVGFRQLLKRLRNIRIVEGSDTSYQPSLMFHTIGSLHIAFDPGERVHR

>CYP1326A2 (APE42395) *Sulfitobacter* sp. AM1-D1

MPDTSRPEELVYDPTDPAVMADPPFPVYARLREEDPVHWSPLRSWIITRYTDVRDLLLLSD  
TMSVNRLQFYESLPPADAMLLRDIVHYLNWLAFRDPPDHTRVRRIMRHAFTADAIATM  
RPQIHEISDLLLLDLAAAGTDDVDLIREYALQLPAFVIMDLLDVPRDMLDEFKEWSDDMA  
VFIGGARNSDDKYERAARGCRHMSDYFRKLIERTANPKPGFLMDLINARDEGDKLSDDE  
LVATCILVLFAGHETTTNLIGNATLLLLRHPEQLDRLRADPELVDPMIEEVLRFDGPTNA  
LVRVVARHDHLHGRTLREGERVFVMVNSANRDPMFDDADRFDITRDQNRHLTFGQGIHL  
CLGAKLAREEGRIAVRKLFERFPDLTLNPAEPPEWLDAM

>CYP195A21 (APE42395) *Sulfitobacter* sp. AM1-D1

MFDLSHPPVDFLENPFPHYDRLLAEAPVCPQPDGSLVSRHADLNAIYRDTGLYISDKKQ  
AFAPKFGPGSPLYEHHTSLVFNDPPLHTRVRRIMTSALTPKALARMEPGLIATVDTLLD  
SMPENPDLVEDFASTIPIQIIGNLLDVMAERAPLRDWSLAILGALEPTLTDAQLERGHA  
AVRDFKAYLQDLIARRRAAPGDPETDVLTRLIKGDDTGRLTEVELIQNCIFILNAGHETT  
TNLIGNGLALLHDHPDQKRRLMDDPALIDTAVEEVLRLRSPNQFGNRETTAPVEIGGHAI  
PAGTNLHLCIGAANRDPVFDAPGTFDIARRPNRHAFAGGPHVCVGLTLARMEGRIAIA  
RFLRRYPGYALTGDRVPGGRIRFHGYRHLPARLGKARGQ

>CYP2334A1 (APE42395) *Sulfitobacter* sp. AM1-D1

MRTSEINSQAFGPSTIREAADANRPILVGTWPWRRGYGHWQVSRMRDVRAVLAHPGTTTD  
DLAFRVFSRFRERRGGLDIFHLSRQISRAHRTPNDAERMDAITVTKRLMECLPAQDFRS  
PLAALVSSGETEADAMVTVVQKPIMEWRAAALGINAALGQEIEIDSIDILASLDRTAIPD  
FIKLEPKAARITGNLSAMNVTWPAGQTIPLMHLISPAFLAIEPLSKTAGMLAHLADNPD  
LQERLRNRAELRTAYLQEVERLLGAVRYVARQIGPAGLDLGEIRLPPHSLVSSDLAAANR  
DPELWDDPEAFRFRDRPRLQATFSFGSLACTGSQLSRLFLSTLLDATLATVRLAAPFTGQ  
QNDRKFSRWSIIRGYESCRLRFAAT

## Short P450s

Species name	Short P450s protein ID	Count
<i>Bradyrhizobium oligotrophicum</i>	(aol:S58_14600)	1
<i>Bradyrhizobium japonicum</i> E109	(bjp:RN69_37425)	1
<i>Bradyrhizobium diazoefficiens</i> USDA 110	(bja:blr2143)	1
<i>Sphingopyxis macrogoltabida</i> 203	(smaz:LH19_26550)	1
<i>Sphingobium</i> sp. MI1205	(spmi:K663_02365)	3
	(spmi:K663_17471)	
	(spmi:K663_18021)	
<i>Sinorhizobium fredii</i> NGR234	(rhi:NGR_a02720)	1
<i>Rhizobium etli</i> bv. phaseoli IE4803	(rep:IE4803_PB00358)	2
	(rep:IE4803_PB00400)	
<i>Rhizobium tropici</i>	(rtr:RTCIAT899_PB00445)	1
<i>Rhizobium</i> sp. N1341	(rhn:AMJ98_PC00305)	1
<i>Rhizobium phaseoli</i>	(rpha:AMC79_PC00282)	1
<i>Rhizobium</i> sp. N731	(rhx:AMK02_PC00300)	1
<i>Methylobacterium aquaticum</i>	(maqu:Maq22A_c28670)	1
<i>Porphyrobacter</i> sp. LM 6	(porl:BG023_11390)	1
<i>Rhizobium etli</i> CIAT 652	(rec:RHECIAT_PB0000292)	1
<i>Sinorhizobium meliloti</i> GR4	(smeg:C770_GR4pB068)	1
<i>Methylobacterium extorquens</i> AM1	(mea:Mex_1p4500)	7
	(mea:Mex_1p4502)	
	(mea:Mex_1p4503)	
	(mea:Mex_1p4504)	
	(mea:Mex_1p4505)	
	(mea:Mex_1p4506)	
	(mea:Mex_1p4508)	
<i>Salipiger profundus</i>	(tpro:Ga0080559_TMP4501)	9
	(tpro:Ga0080559_TMP4502)	
	(tpro:Ga0080559_TMP4503)	
	(tpro:Ga0080559_TMP4504)	
	(tpro:Ga0080559_TMP4505)	
	(tpro:Ga0080559_TMP4507)	
	(tpro:Ga0080559_TMP4508)	
	(tpro:Ga0080559_TMP4509)	
	(tpro:Ga0080559_TMP450)	
<i>Pelagibaca abyssi</i>	(paby:Ga0080574_TMP4500)	
	(paby:Ga0080574_TMP4501)	
	(paby:Ga0080574_TMP4504)	
<i>Sinorhizobium meliloti</i> SM11	(smx:SM11_pC0152)	2
	(smx:SM11_pC0153)	
<i>Phaeobacter inhibens</i> 2.10	(pgl:PGA2_95p450)	1
<i>Octadecabacter temperatus</i>	(otm:OSB_05620 K20497)	1

<i>Azospirillum brasilense</i> Sp245	(abs:AZOBR_p450001)	11
	(abs:AZOBR_p450002)	
	(abs:AZOBR_p450003)	
	(abs:AZOBR_p450006)	
	(abs:AZOBR_p450007)	
	(abs:AZOBR_p450008)	
	(abs:AZOBR_p450009)	
	(abs:AZOBR_p450010)	
	(abs:AZOBR_p450011)	
	(abs:AZOBR_p450013)	
	(abs:AZOBR_p450014)	
<i>Brucella abortus</i> 2308	(bmf:BAB1_0684 K03584)	1
<i>Candidatus Puniceispirillum marinum</i>	(apb:SAR116_0659)	1
<i>Bradyrhizobium</i> sp. ORS 278	(bra:BRADO7133)	1