

| ID | GenBank | Genus | aa position |
|--------|--------------|-----------------|--|
| GMRV | | | 113 -----YRPI-----DVNERL--KMS-----AKYRTVHLDGIMVNCESLMPK---- |
| GGDV | | | 115 -----VYHPI-----DSNERI-----RMR-----KHYRTVHLDGIEVNCESLMPK---- |
| CaLCuV | NP_624353 | Begomovirus | 38 ----LTELILQ-----FPSTAAQF--TARL-----NRSCKMKIDHCVIEYRQQVPI---- |
| CiLV-C | YP_654542 | Cilevirus | 47 ---RIGVGFLT-----PNDMISRL--VGFI--NRKAEDAGVRSVESFRQISDVVLIIVPQIA----- |
| AcVB | YP_004935360 | Vitivirus | 78 ---VDQNIIDL-----DEKTTIDGL-----NEE-----KQPYLHLGCVIAIVIPHGR----- |
| LNyV | YP_425089 | Cytorhabdovirus | 53 ---IMRQVPLF-----DKEDLDAM--KS-----DTT-----SNKYLHIGCITVTSIEPLLHQRYMKN |
| AMV | NP_041194 | Alfamovirus | 60 ---APVVLSLV-----SKEKKSIL--NRML--PKIG-----QRMVYVHSAIYLLYPNLIK---- |
| CMV | NP_040776 | Cucumovirus | 52 ---AISVRLPV-----PEVTHGRI--ASFF--KSGYDVGE-LCSKGYMSVPQVLCVTRTVST----- |
| CaMV | NP_056724 | Caulimovirus | 97 ---GKVVPLLI-----TKEEINKR--LSSL--KPEVR-----KTMSMVHLGAVKILLKAQFRN---- |
| ToTV | YP_001040018 | Torradovirus | 66 ----KKAMELF-----DPEDVHNI--TSLWSSFKKFTSSR-DHGNLFFHLYGVMMFVMPVHVG---- |
| TBSV | NP_062900 | Tombusvirus | 32 ---EDQEVPLL-----PSNFLTQV--RVG-----LSGGYITMRRIRIKIIPLVSR----- |
| RBDV | NP_620466 | Idaeovirus | 138 ---GKNEFSLV-----EASVFDKL--IR-----KDDSPHILNRLLIIVLPAVGK---- |
| PYFV | NP_734443 | Sequivirus | 115 ---RAEITPT-----AASKLDKT--LE-----AHRA-----KFNYMAIDSIRVAVTSIMHQ---- |
| CLBV | NP_624334 | Cittrivirus | 55 ---IKLQANIL-----TADRLQSI--RN-----AKVNGK-----EAYLHLGLFVPIAIRSLPSS---- |
| CCGaV | YP_009407930 | Coguvirus | 122 DDTEQFNLSLA-----VPKKG-----KQYVRLSSVMAYYCPVLVSS----- |
| TMV | NP_597748 | Tobamovirus | 36 -CSKVYDKIMVHENESLSVENLLKGV--KL-----IDSGYC--LAGLVVTGEWNLPD---- |
| RRV | YP_004327592 | Emaravirus | 63 ---KTQLLPI-----VYNEMYKF--YM-----HLK-----QPMTRIASVALFWTPTSK---- |
| PYMoV | YP_008567619 | Badnavirus | 100 ---NQVDRTFI-----QEESHKKF-----VKS-----GIKFIHLGVLQVRLQILHRK---- |
| SDV | NP_733976 | Sadwavirus | 53 ---QQQDIAIP-----LSSRF-----NHQSLHVGELIAVQSSVLT----- |
| ACLSV | NP_040552 | Tricovirus | 62 ---RLASIPVI-----PSSEVQAV-----LRKRE-----STNYVHWGALSISIDALFRK---- |
| RSV | NP_620519 | Tenuivirus | 88 ----ATFNIL-----DPYWFHQPLTHYPF-FRVTHYP-----FFRVETFAMVWIGIKG----- |
| GFLV | NP_733995 | Nepovirus A | 118 -NTLEILYNPV-----SEEMEEY--RDR-----GMSAVVIDALEIATNPFMGMP---- |
| CRLV | YP_081449 | Cheravirus | 109 -DPYVAVYTPLP--HITTEEQARKL--MEK-----GFSNSSNVALDMAVQSHVQG---- |
| CPMV | NP_734000 | Comovirus | 204 ---TVLDIPVT-----DKKTLAMA--SD-----FIRKENL--KTSAIHIGATEIIIQSFASP---- |
| CPsV | YP_089663 | Ophiovirus | 84 ---HKKKLKLG-----TLKSIDTK--LR-----KLGGES-----SQPPIQYKVKQCMYIPLFSRV---- |
| PolV | YP_009032637 | Aureovirus | 30 ---TKAILPLA-----PISQFSKW-----KIP-----KQGFYAPIDVKFVLTPHISE---- |
| OuMV | YP_008567619 | Ourmiavirus | 57 ---VEDPTALI-----PHGWSIF--KSKL--AQMRC-----PKGYITHDKVLISWKPHVAT---- |
| CNSV | NP_733974 | Nepovirus B | 432 ---VNLNRP-----EYNALNKL--A-----EAGWK-----BAKSVVNLNHIRSYLPQ---- |
| CMoV | YP_002302261 | Umbravirus | 42 ---TLTHPTLY-----PRRQLTL--SRFF--SGRWRTK--KTGGMLFIEKLVIVFVPHVPD---- |
| SBWMV | NP_049337 | Furovirus | 44 ---RYVEKALT-----QPGVVTKM--QDAW--TNWTKTNKEEGTPYNMSSCVLLVINPTVPM---- |
| RCNMV | NP_620546 | Dianthovirus | 33 ---GVSEAPLI-----PASMMSKI--TDYA--KTAK--GNSVALNTHVVLSLAPTIGV---- |
| TSWV | AEK06236 | Orthotospovirus | 111 ---ANKVIKIC-----PTWD-----SRKQYMMISIRIIVWCPTIPN----- |

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| GMRV | | | -GSEGFAMITLYDERFISQ-----EKGFLG--LIGFPLSHGV-----SKASLKIN----- |
| GGDV | | | -GSEGFALLTLVDERFVSQ-----EKGFLG--LIGFPLSHGV-----SKASLVVN----- |
| CaLCuV | NP_624353 | Begomovirus | -NATGSVIVEIHDKRMTD-----DESLOA--SWTFPLRCNI-----DLHYFSSS----- |
| CiLV-C | YP_654542 | Cilevirus | --LPAELSLKLVDSANI-----LEAVNQ--EVTVNSTGGP-----CVVVMNCA----- |
| AcVB | YP_004935360 | Vitivirus | -AMKGTQVQIKVEDQRFKE-----GHGTVC--SFKCDLKDAL-----SAYASFPG----- |
| LNyV | YP_425089 | Cytorhabdovirus | FGKTTIAGNCAIISTFRKV-----DQSIIS--LHKYDLSRGR-----ADVSVYPN----- |
| AMV | NP_041194 | Alfamovirus | -SSSGSITLKLNEATGEL-----VDV--DTDHDATQA-----CIFAGRYP----- |
| CMV | NP_040776 | Cucumovirus | -DAEGSLRIYLADLGDKEL-----SPIDGQ--CVSLNHNDLP-----ALVSVQPT----- |
| CaMV | NP_056724 | Caulimovirus | -GIDTPIKIALIDDRINSR-----RDCLLG--AAKGNLAYGK-----FMETVYPK----- |
| ToTV | YP_001040018 | Torradovirus | --GEGSVKISLCSSNDP-----TNPVQLQ--EKVLYFSGGA-----QAVLMSPT----- |
| TBSV | NP_062900 | Tombusvirus | -KAGVSGKLYLRDISDIT--GRKLHC--TESLDLGREI-----RLTMQHLD----- |
| RBDV | NP_620466 | Idaeovirus | -GTPGTARIKILDARLDDG-----YGEFLS--SENVRVDSG-----VIYICINVG----- |
| PYFV | NP_734443 | Sequivirus | -GDSRECIIMYLCRRRFKDP-----LLGAIA--LIGFTLPGMQTHVYKTRGMMAFSRK----- |
| CLBV | NP_624334 | Cittrivirus | GNEQIWGRCALVDSRTTRA-----ETAVID--EFEFKFTKKQPF--ASKLLTINAAVD-----I |
| CCGaV | YP_009407930 | Coguvirus | FSEFTKVSISLHDSRLLS-----KTCVQ--SADFNSNIT-----QMVYIIPD----- |
| TMV | NP_597748 | Tobamovirus | -NCRGGSVSVCLVDKRMERA-----DEATLG--SYTTAAAKKR-----FQFKVVPN----- |
| RRV | YP_004327592 | Emaravirus | -RFNEMATLILMDERFRDDGI--KQGGKELLA--QKGLNLDLMG-----TVITAVFPDPNFQQFVTGSL |
| PYMoV | YP_008567619 | Badnavirus | -EEGTALVLVLDNRWKG-----DKGIIA--TMEVDLTGKC-----QMVYIIPD----- |
| SDV | NP_733976 | Sadwavirus | -GVDTAMAIMVSDASHDRL-----EEGFLS--LTILRLGAGW-----MRHTIPIG----- |
| ACLSV | NP_040552 | Tricovirus | -NAGVSGWCYVYDNRWTF-----EQAMLQ--KFHFNLDLGS-----ATLVTSFN----- |
| RSV | NP_620519 | Tenuivirus | -RASGITTLRIIDKSYVNP-----SDQVEV--EVRYPIKSNF-----AVLGSAN----- |
| GFLV | NP_733995 | Nepovirus A | -GNPTDLTVVATYGERHDM-----TRAFIG--SASTFLGNGL-----ARAIFFPG----- |
| CRLV | YP_081449 | Cheravirus | -GTPLLAMCGIMDSRTDDP-----NEALQV--AGYFDLGRDR-----CDLISLPL----- |
| CPMV | NP_734000 | Comovirus | -ESDLMGSGFLVDSLHTD-----ANARS--IFVAPMRGGR-----PVRVVTFFN----- |
| CPsV | YP_089663 | Ophiovirus | DGDNGEITVSLIDDGKEAA-----GQDPIIQ--SITFDASQM-----AMVELSMN----- |
| PolV | YP_009032637 | Aureovirus | -RAQVRGVVVLVDSDRLSP-----SRLEYR--SKEFNIGHGL-----VIEGSQLP----- |
| OuMV | YP_002019758 | Ourmiavirus | --GLARGQIAVLVDTRVNHTSIEDLHMALWK--TAPVDLGCTY-----TIQGTVP----- |
| CNSV | NP_733974 | Nepovirus B | -QMNAAYAFQVIMWGHSSDA-----QEAALS--GSYVYLGdge-----ATMLQLPL----- |
| CMoV | YP_002302261 | Umbravirus | -TSPGQAVIWWHTALPGL-----EPIGTGQKVCIPLSSGP-----RLVAFYPN----- |
| SBWMV | NP_049337 | Furovirus | -GYAGTVEVSLIDSGLSPL-----ENVIPDQTQMMELGKGP-----NVMCFMFM----- |
| RCNMV | NP_620546 | Dianthovirus | -AIPGHVTVELINPNVEGP-----FQVMSGQTLSWSPGAGK-----PCLMIFSVH----- |
| TSWV | AEK06236 | Orthotospovirus | --PTGKLVVALVDPNMPSE-----KVIL--KGQGTITDP-----ICFVIFYLN----- |

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| GMRV | | | -YSISTADN-----VNWVAIITVYDHCLRD--DMRPCNFHLKAFYKYTNNVRRFIKDEEKSEIG |
| GGDV | | | -YSISTFDE-----VNWVAITVYDHNLRD--DMRPCNFHLKAFYKYTNNVSRFLKNIDETEVG |
| CaLCuV | NP_624353 | Begomovirus | -FFSLKDPi-----PWKLYYRVSDTNVHQ--RTHFAKFKGLK----- |
| CiLV-C | YP_654542 | Cilevirus | -HSIPNEDRTHVNG--SEVHRRLLGIQYQVDCDNISG--RVTTFSITALW----- |
| AcVB | YP_004935360 | Vitivirus | -YFVSTTVKVN-----GYALNLKVKAEGMCMVE--GVHPLSIQMH----- |
| LNyV | YP_425089 | Cytorhabdovirus | -HCLSLTDPMI-----QKRLSVLLGIKIDVEP--GVELFSICIGY----- |
| AMV | NP_041194 | Alfamovirus | -RSILAKDAK-----GHDLKLVVHAVASTNA--NSAVGVLYPIW----- |
| CMV | NP_040776 | Cucumovirus | -YDCPMETVGN-----RKRCFAVVIERRHGYIQY--TGTTASVCSNW----- |
| CaMV | NP_056724 | Caulimovirus | -FGISLNTQRL-----NQTLSLIHDFENKNLNMKGDKVMTITYVV----- |
| ToTV | YP_001040018 | Torradovirus | -ITLPFVKRG-----PMFYTMECLGTRA--QIPCSVVAIW----- |
| TBSV | NP_062900 | Tombusvirus | -FSVSTRSD-----VPYVFGFEELVSPLE--GRELFISISRW----- |
| RBDV | NP_620466 | Idaeovirus | -YSVPKSEI-----DYKINIDFAGVPIKD--GKSPIWVKAFF----- |

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|---------------|--------------|-----------------|--|
| PYFV | NP_734443 | Sequivirus | -EAIAAD-----RLQLYLYVKGAKLERTQNTPTITVNVRT----- |
| CLBV | NP_624334 | Citriovirus | NCKVSVG-----SIQVLELHGVDLRE-ERSVAAIL----- |
| CCGaV | YP_009407930 | Coguvirus | -YCIPTSC-----SKITLNIAREQKFLQE-GEEWATVQLLRL----- |
| TMV | NP_597748 | Tobamovirus | -YAITQDAMK-----NVWQVLVNIRNVKMSA-GFCPLSLEFVSVCIY----- |
| RRV | YP_004327592 | Emaravirus | DFATDTKDI-----NKIKFYISFPDTRM----- |
| PYMoV | YP_008567619 | Badnavirus | -IMMTVNDFY-----HNHISVLTRGYEGWQHGEANLLVTRGM----- |
| SDV | NP_733976 | Sadwavirus | -ITVFPTDPLV-----DRFLRLSVLTGGSPMAD-GRQVARLHYGL----- |
| ACLSV | NP_040552 | Tricovirus | -FPVSLDDPGL-----SNSISVAVMFENLNFKF-ESYPISVRVGN----- |
| RSV | NP_620519 | Tenuivirus | --FLALEDK-----HNLQVSVSVDDSSVQN---CVISRTLWFW----- |
| GFLV | NP_733995 | Nepovirus A | -LQYSQEEPRR-----ESIIRLYVASTNATVDT-DSVLAATISVGT----- |
| CRLV | YP_081449 | Cheravirus | -INFPLNKEDFD-----DYMRLGLYCTMFHNVRGFQNNKALCSYSA----- |
| CPMV | NP_734000 | Comovirus | -TLAPVSCDL-----NNRFLKICSLPNCDIVQ-GSQVAEVSNNV----- |
| CPsV | YP_089663 | Ophiovirus | -FVVEKKDM-----DFIGIHVSAENVPVQ--DRAYGSINLAFF----- |
| PoLV | YP_009032637 | Aureovirus | -FCLPVGD-----YPLQFEVTVLQSQFRE-TANLYSTSVIEW----- |
| OuMV | YP_002019758 | Ourmiavirus | -YCLPFHPKEGGDVKSDLESQNPIRGIVYITDSRY----- |
| CNSV | NP_733974 | Nepovirus B | -LCEYVGHNLDQF---EAYKRSLVLSTVFPEFSGIADGKAMFGITSIEF----- |
| CMoV | YP_002302261 | Umbravirus | -YSIPLSDSAMN-----APRCFSLVTQLEGVRLEQ-GASAFSLYSMW----- |
| SBWMV | NP_049337 | Furovirus | -YSIPLNDKGR-----AVKLAFKIDAEM--ASK-GMSVMNVSYW----- |
| RCNMV | NP_620546 | Dianthovirus | -HQLN--SDH-----EPFRVRI TNTG--IPT-KKS YARCHAYW----- |
| TSWV | AEK06236 | Orthotospovirus | -WSIPKMNTTP-----ENCCQLHLMCSQ-EYKK-GVSVFGSVMSW----- |
| Consensus ss: | | | eee eeeeeee eeeeeee |

Figure S1. Multiple sequence alignment of movement proteins (MPs) encoded by grapevine Muscat rose virus (GMRV), grapevine Garan dmak virus (GGDV) and 30K MPs encoded by viruses representative of several genera. The virus name, GenBank identifier, virus genus and distance in amino acids (aa) from the N-terminus of the protein are shown on the left-hand side of each sequence. Consensus secondary structure (ss) elements, predicted by PROMALS3D, are reported at the bottom, with the strands and helices indicated by “e” and “h”, respectively. Amino acids that fold in strands and helices and are in blue and red, respectively.