

## Review

# Chemistry of the Genus *Plectranthus*

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**Abstract:** This review presents the phytochemical constituents of the genus *Plectranthus* reported up to 1999. Only a tetrameric derivative of caffeic acid was isolated from *P. japonicus*, but a group of long-chain alkylphenols, of possible taxonomic significance in the genus, was also isolated. As a genus of the subfamily Nepetoideae, *Plectranthus* is free from iridoid glycosides and rich in essential oil (i.e. > 0.5% volatile oil on a dry weight basis). Diterpenoids are the more common secondary metabolites in *Plectranthus*. The majority of them are highly modified abietanoids. This seems to be similar to the pattern of diterpenoids observed for *Salvia*, but no clerodane diterpenoids were found in *Plectranthus*.

**Keywords:** *Plectranthus*, *Coleus*, Labiatae, phytochemical constituents, abietane diterpenoids.

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## Introduction

Labiatae is a large family that occurs worldwide and has species that are adapted to almost all habitats and altitudes. The genus *Plectranthus* L' He'r. belongs to subfamily Nepetoideae of tribe

Ocimeae [1]. It comprises about eighty species worldwide, as indicated in this review. Taxonomically, *Coleus* Lour. is the closest to *Plectranthus* [2]. *Coleus* species are now generally accepted as belonging to either *Plectranthus* or to *Solenostemon* Thonn. (eds.) [3], and some confusion can arise distinguishing between *Plectranthus* and *Coleus* species [4,5]. In *Plectranthus*, the upper lip of the flower is unusually four-lobed and the large shoe-shaped lower lip is formed from a single lobe, while in *Labiatae* the upper lip often consisting of two lobes and the lower consisting of three [6].

Many *Plectranthus* species are plants of economic and medicinal interest. Several species may be grown as ornamentals, such as *P. tenuiflorus* in Saudi Arabia. The tubers of an unidentified *Plectranthus* species are eaten in Swaziland [7]. Livingstone potato tubers, *P. esculentus* is cultivated in tropical Africa for its edible tubers [8,9]. *P. floribundus* is cultivated in Nigeria for its edible tubers, also relished in Natal [10,11]. In Polynesia, the seed-oil of *P. amboinicus* is applied to the ear for treatment of acute edematous otitis acuta [12]. The leaf extract of *P. tenuiflorus* is also used in Saudi Arabia to treat ear infections [13]. The leaves of *P. asirensis* are used as an antiseptic dressing for wounds in Saudi Arabia [13]. The leaves of *P. caninus* are chewed in Africa to relieve toothache [14]. In East Africa the leaves of *P. elegans* are used as a vermicide [14]. *P. vettiverioides* is prescribed in Indian ayurvedic medicine as a remedy for vomiting and nausea [15]. The East African medicinal plant *P. barbatus* is used as a remedy for stomachache and as a purgative. It is also resistant to insect attack, and an aphid antifeedant diterpene has been isolated from it [16].

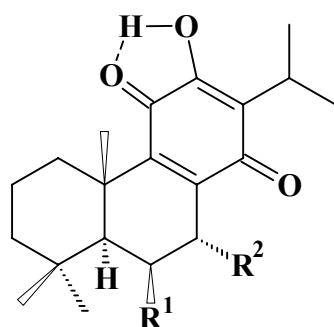
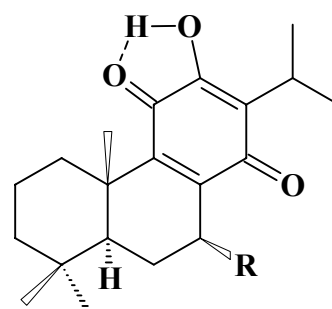
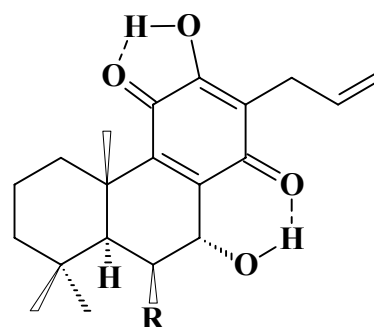
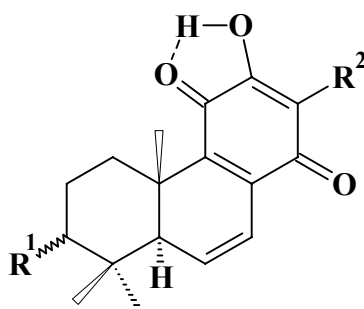
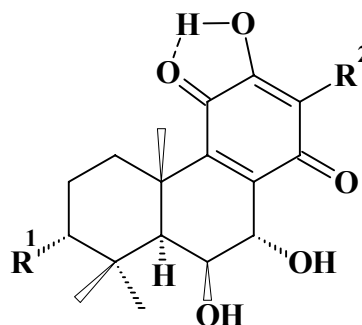
The chemistry of *Plectranthus* is still not well known. This is the first review of chemical constituents of *Plectranthus* species. The main phytochemical constituents of the genus *Plectranthus* are diterpenoids, essential oils and phenolics.

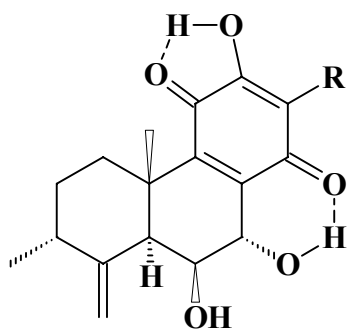
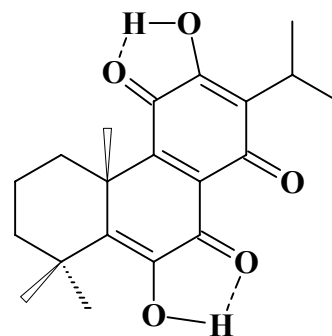
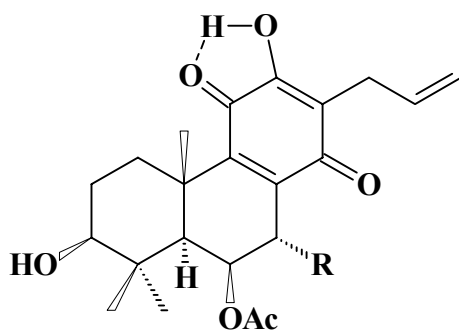
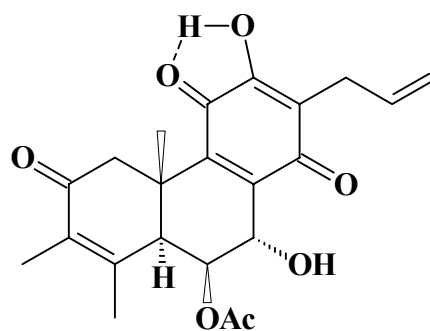
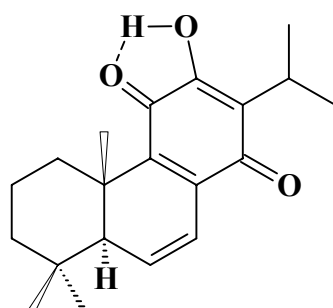
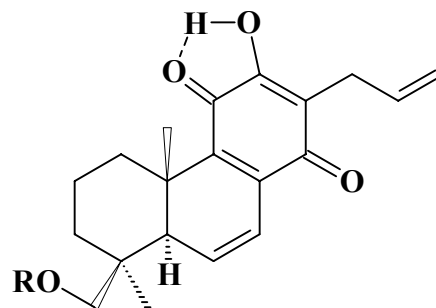
## Diterpenoids

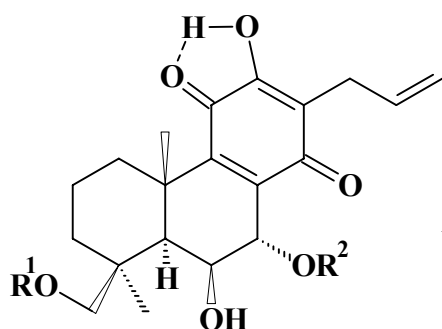
About 140 diterpenoids were identified from the colored leaf-glands of *Plectranthus* species. The majority of them are highly modified abietanoids, in addition to some phyllocladanes (structures **D140-D146**), *ent*-kaurenes (structures **D147-D154**) and a *seco*-kaurene (structure **D155**). The abietanoids, in turn, could be classified, according to structure variation, into royleanones (structures **D1-D37**), spirocoleons (structures **D38-D66**), vinylogous quinones (also named extended quinines, structures **D67-D76**), quinone methides (structures **D77-D93**), acylhydroquinones (structures **D94-D117**), (4→3) *abeo*-acylhydroquinones (structures **D118, D119**), phenolic abietanoids (structures **D120-D122**), 1,4-phenanthraquinones (structures **D123-D127**), dimeric abietanoids (structures **D128-D136**) and *seco*-abietanoids (structures **D137-D139**). Distribution of these diterpenoids and other constituents in species of *Plectranthus* are shown in Table 1. The names of these diterpenoids are listed in Table 2.

Diterpenoids isolated from *Plectranthus*

## Royleanones

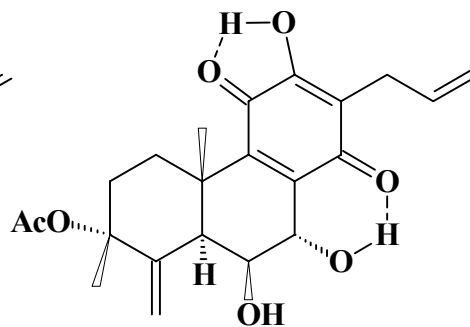
D1;  $R^1 = R^2 = H$ D2;  $R^1 = R^2 = OH$ D3;  $R^1 = H, R^2 = OCHO$ D4;  $R^1 = OH, R^2 = OCHO$ D5;  $R^1 = OH, R^2 = OAc$ D6;  $R^1 = OH, R^2 = H$ D7;  $R^1 = OH, R^2 = =O$ D8;  $R^1 = OCHO, R^2 = OH$ D9;  $R^1 = H, R^2 = OH$ D10;  $R^1 = H, R^2 = OAc$ D11;  $R^1 = OH, R^2 = \text{fatty acid carboxylate}$ D12;  $R = OH$ D13;  $R = =O$ D14;  $R = =O, 8\alpha, 9\alpha\text{-epoxide}$ D15;  $R = OH$ D16;  $R = H$ D17;  $R^1 = H, R^2 = CH_2CH=CH_2$ D18;  $R^1 = \alpha\text{-OCHO}, R^2 = CH_2CH=CH_2$ D19;  $R^1 = \beta\text{-OH}, R^2 = CH_2CH=CH_2$ D20;  $R^1 = \beta\text{-OH}, R^2 = CH_2CH(OAc)CH_3$ D21;  $R^1 = H, R^2 = CH(CH_3)_2$ D22;  $R^1 = OCHO, R^2 = \text{allyl}$

**D23**; R= allyl**D24**; R= CH<sub>2</sub>-CH(OH)CH<sub>3</sub>**D25****D26**; 8 $\alpha$ , 9 $\alpha$ -epoxide**D27**; R= H**D28**; R= OH**D29****D30****D31**; R= H**D32**; R= CHO

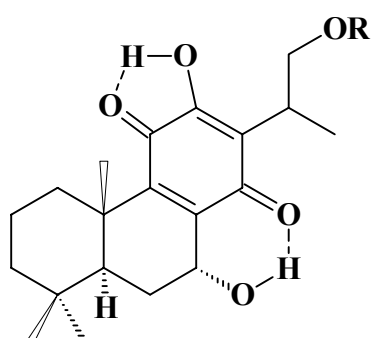


**D33**;  $R^1 = \text{CHO}$ ,  $R^2 = \text{H}$

**D34**;  $R^1 = \text{H}$ ,  $R^2 = \text{C}_2\text{H}_5$



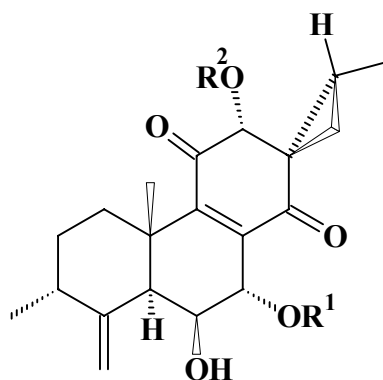
**D35**



**D36**;  $R = \text{Ac}$

**D37**;  $R = \text{CH}_3$

## Spirocoleons



**D38**;  $R^1 = R^2 = \text{Ac}$

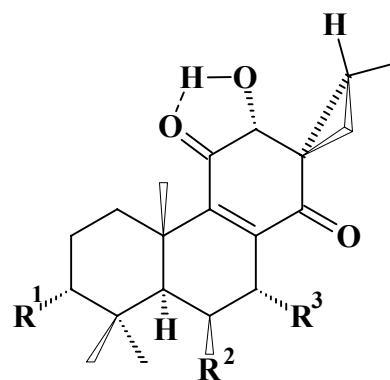
**D39**;  $R^1 = \text{CHO}$ ,  $R^2 = \text{Ac}$

**D40**;  $R^1 = \text{Ac}$ ,  $R^2 = \text{H}$

**D41**;  $R^1 = \text{H}$ ,  $R^2 = \text{Ac}$

**D42**;  $R^1 = \text{CHO}$ ,  $R^2 = \text{H}$

**D43**;  $R^1 = R^2 = \text{H}$



**D44**;  $R^1 = \text{OCHO}$ ,  $R^2 = \text{OAc}$ ,  $R^3 = \text{OH}$

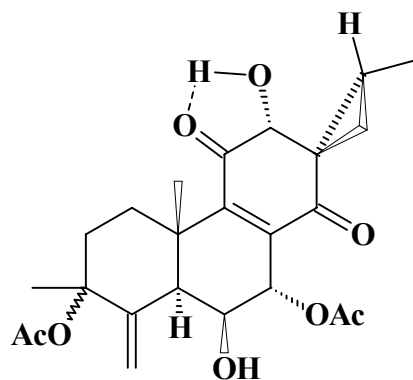
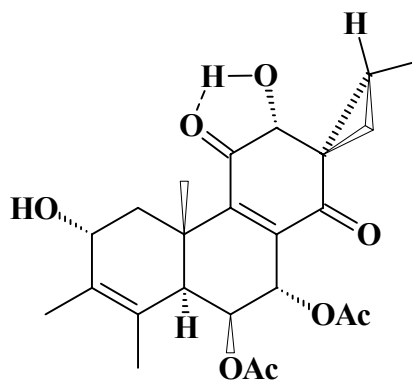
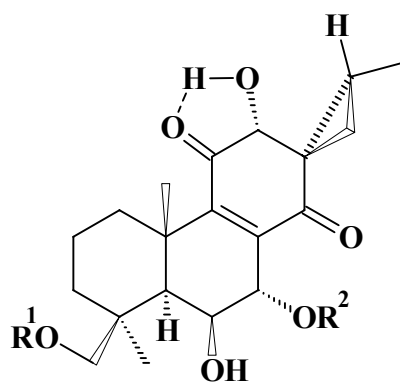
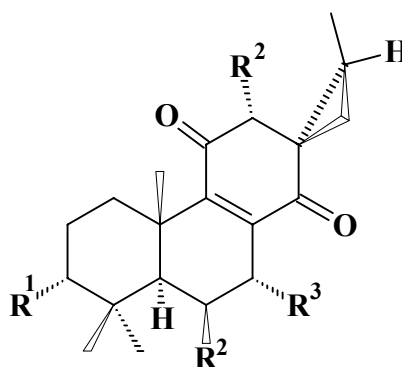
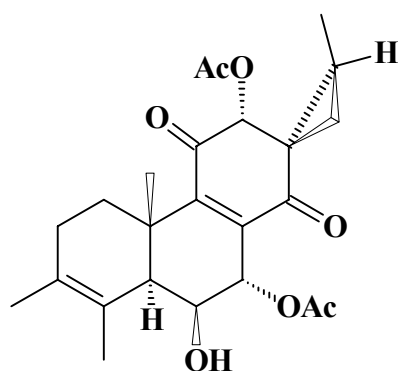
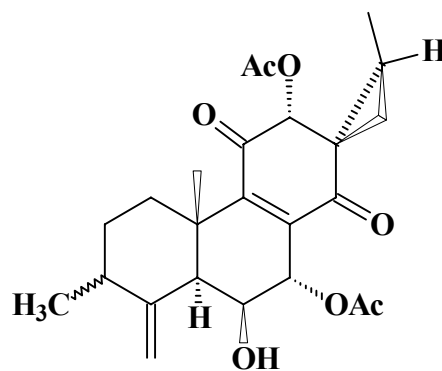
**D45**;  $R^1 = \text{H}$ ,  $R^2 = \text{OH}$ ,  $R^3 = \text{OCHO}$

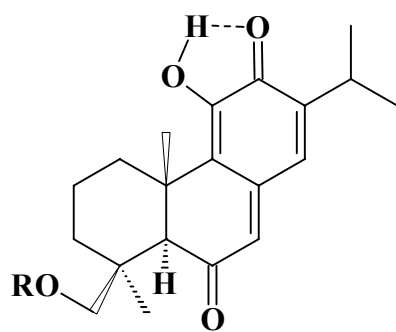
**D46**;  $R^1 = \text{OCHO}$ ,  $R^2 = \text{OH}$ ,  $R^3 = \text{H}$

**D47**;  $R^1 = \text{H}$ ,  $R^2 = R^3 = \text{OH}$

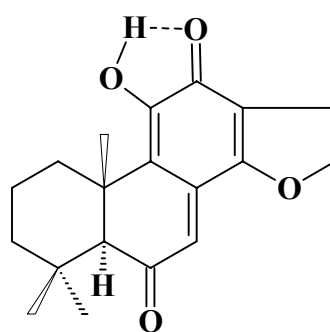
**D48**;  $R^1 = R^3 = \text{OCHO}$ ,  $R^2 = \text{OH}$

**D49**;  $R^1 = \text{H}$ ,  $R^2 = \text{OH}$ ,  $R^3 = \text{OAc}$

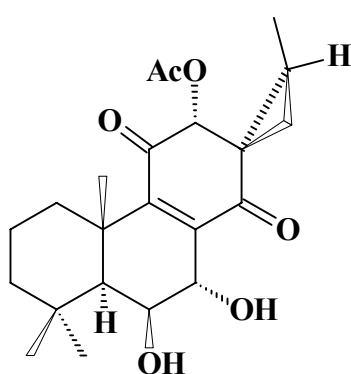
**D50****D51****D52**;  $R^1 = \text{H}$ ,  $R^2 = \text{CHO}$ **D53**;  $R^1 = \text{CHO}$ ,  $R^2 = \text{H}$ **D54**;  $R^1 = R^2 = \text{CHO}$ **D55**;  $R^1 = \text{OCHO}$ ,  $R^2 = \text{OAc}$ ,  $R^3 = \text{OH}$ **D56**;  $R^1 = R^3 = \text{OCOH}$ ,  $R^2 = \text{OH}$ **D57**;  $R^1 = \text{H}$ ,  $R^2 = \text{OH}$ ,  $R^3 = \text{OAc}$ **D58**;  $R^1 = \text{H}$ ,  $R^2 = \text{OH}$ ,  $R^3 = \text{OCHO}$ **D59**;  $R^1 = R^2 = R^3 = \text{OAc}$ **D60****D61**;  $\alpha \text{ CH}_3$ **D62**;  $\beta \text{ CH}_3$



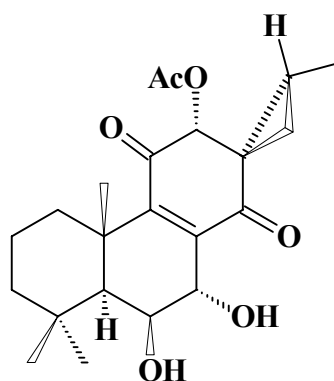
D63



D64

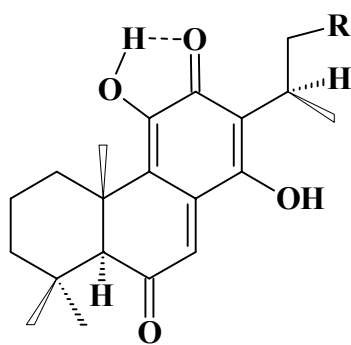


D65



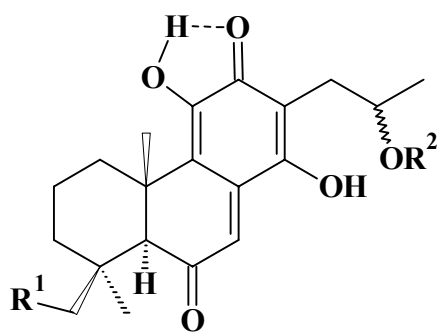
D66

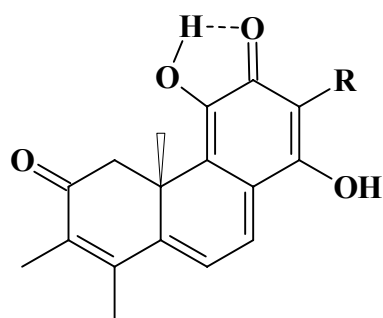
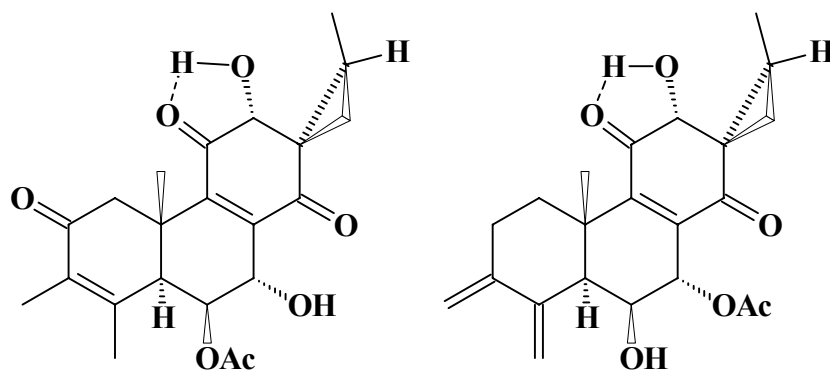
### Vinylogous quinones



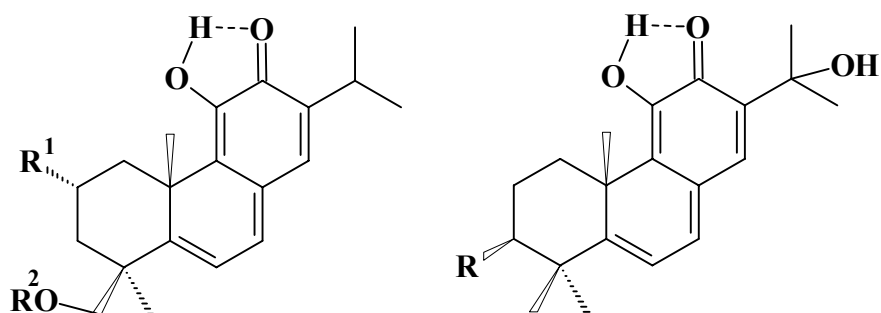
D67; R= OH

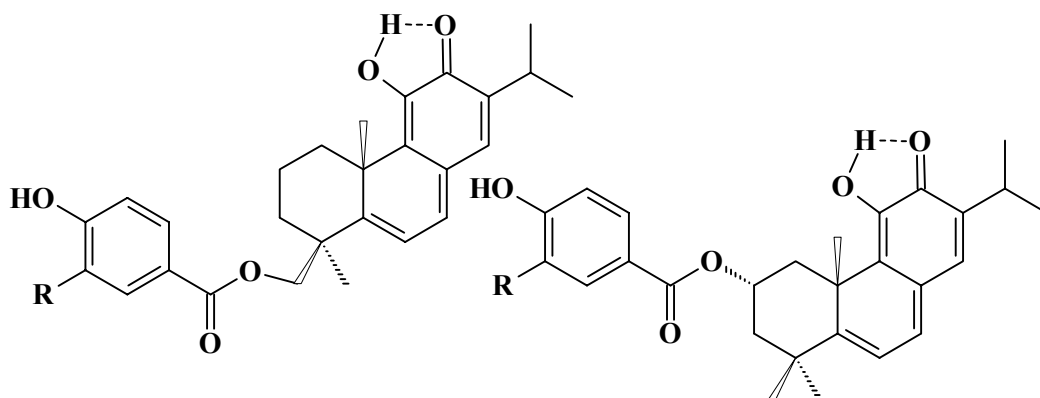
D68; R= H

D69; R<sup>1</sup>= H, R<sup>2</sup>= AcD70; R<sup>1</sup>= R<sup>2</sup>= HD71; R<sup>1</sup>= OCHO, R<sup>2</sup>= H



### Quinone methides



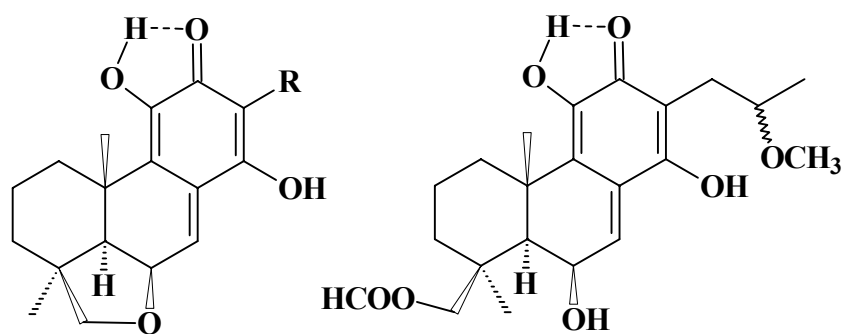


D82; R= H

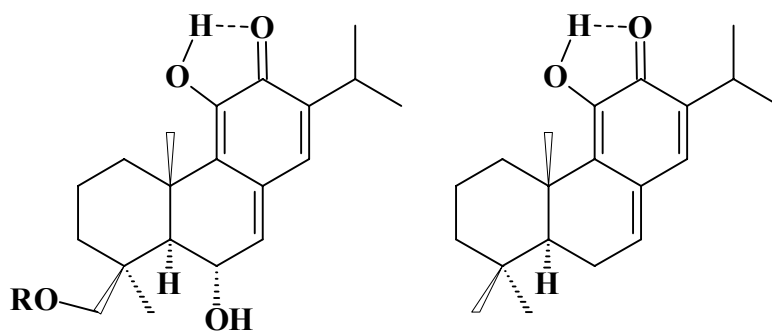
D85; R= H

D83; R= OH

D86; R= OH

D84; R= OCH<sub>3</sub>D87; R= OCH<sub>3</sub>D88; R= CH<sub>2</sub>CH=CH<sub>2</sub>

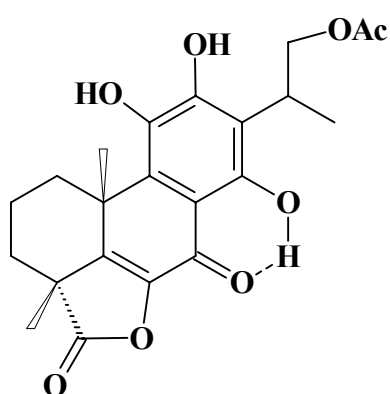
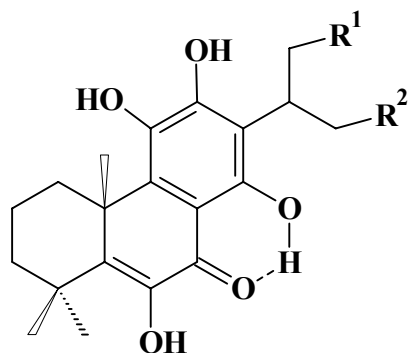
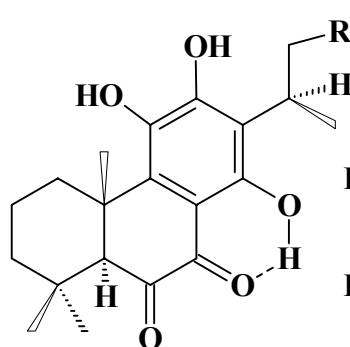
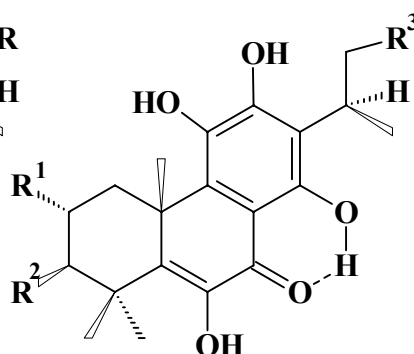
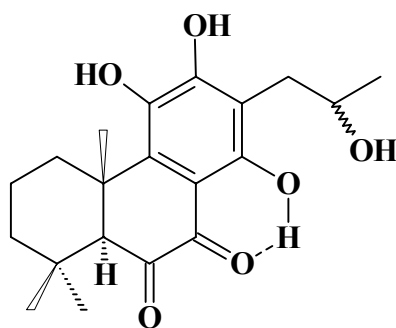
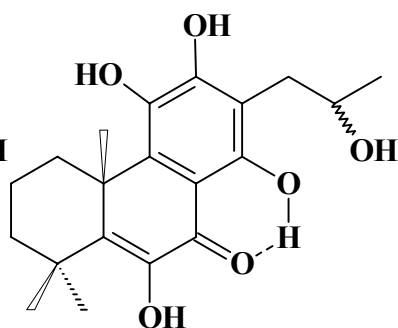
D90

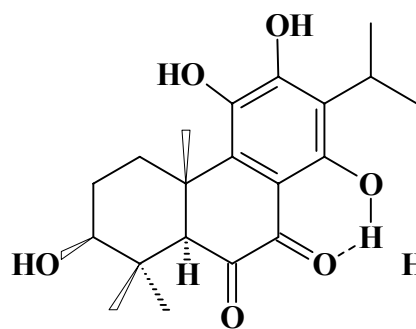
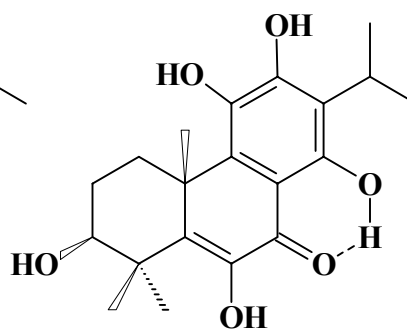
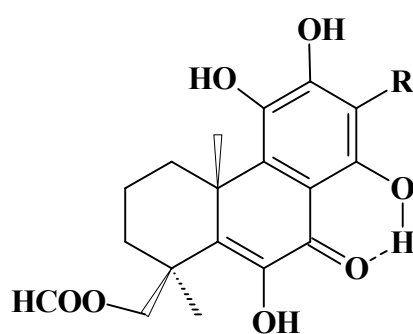
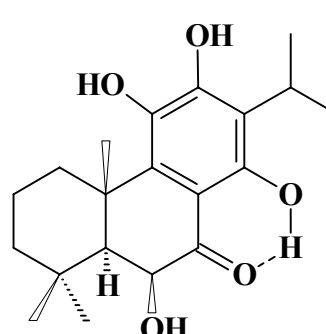
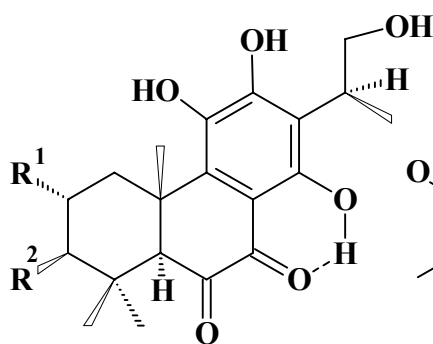
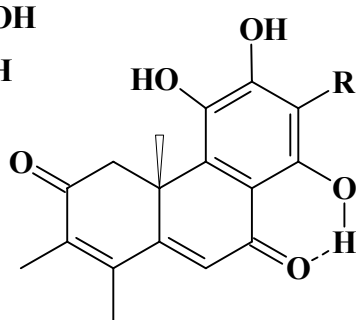
D89; R= (S)-CH<sub>2</sub>CH(OH)CH<sub>3</sub>D91; R= COCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

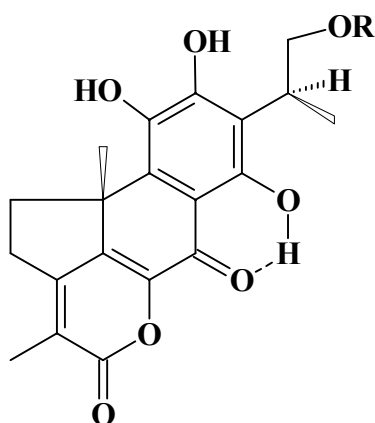
D93

D92; R= COCH=C(CH<sub>3</sub>)<sub>2</sub>

## Acyhydroquinones

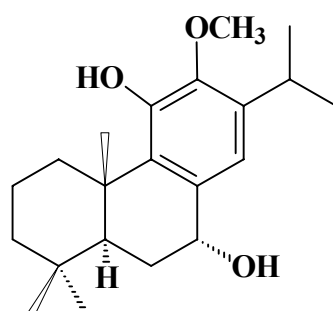
**D94****D95**;  $R^1 = \text{OAc}$ ,  $R^2 = \text{H}$ **D96**;  $R^1 = \text{H}$ ,  $R^2 = \text{H}$ **D97**;  $R^1 = \text{OH}$ ,  $R^2 = \text{H}$ **D98**;  $R^1 = \text{OH}$ ,  $R^2 = \text{OAc}$ **D99**;  $R = \text{OAc}$ **D100**;  $R = \text{OH}$ **D101**;  $R = \text{H}$ **D102**;  $R^1 = R^2 = R^3 = \text{H}$ **D103**;  $R^1 = R^2 = \text{H}$ ,  $R^3 = \text{OH}$ **D104**;  $R^1 = \text{OAc}$ ,  $R^2 = \text{H}$ ,  $R^3 = \text{OH}$ **D105**;  $R^1 = \text{H}$ ,  $R^2 = \text{OAc}$ ,  $R^3 = \text{OH}$ **D106****D107**

**D108****D109****D110**; R = CH<sub>2</sub>CH=CH<sub>2</sub>**D111**; R = CH<sub>2</sub>CH(OH)CH<sub>3</sub>**D112****D113**; R<sup>1</sup> = OAc, R<sup>2</sup> = H**D114**; R<sup>1</sup> = H, R<sup>2</sup> = OAc**D115**; R = CH<sub>2</sub>CH=CH<sub>2</sub>**D116**; R = (S)-CH<sub>2</sub>CH(OH)CH<sub>3</sub>**D117**; R = (R)-CH<sub>2</sub>CH(OH)CH<sub>3</sub>

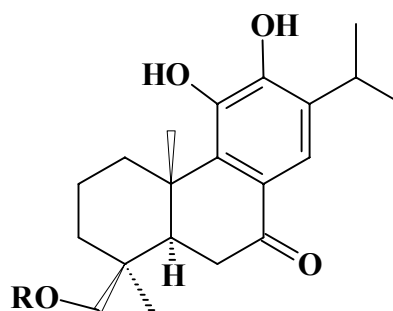
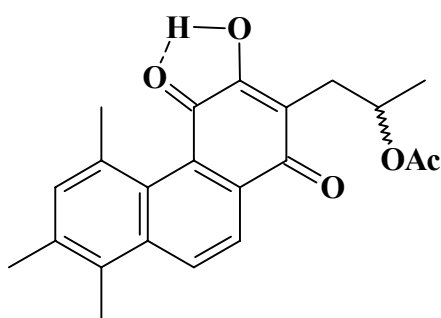
**(4→3) abeo-Acylhydroquinones**

D118; R= Ac

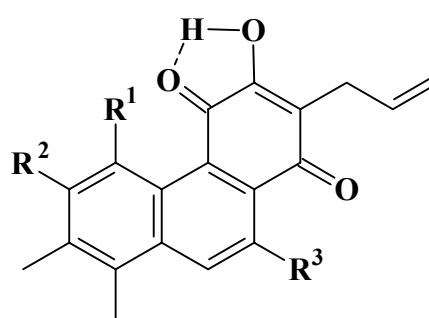
D119; R= H

**Miscellaneous Phenolics**

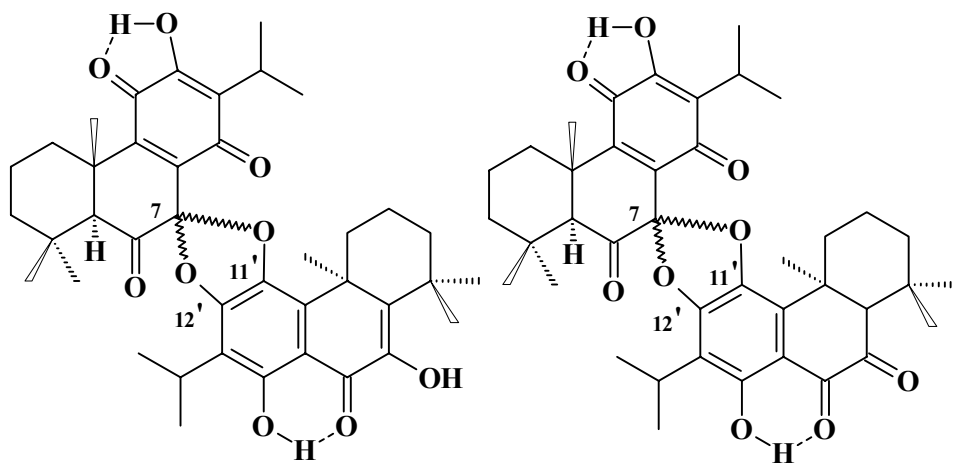
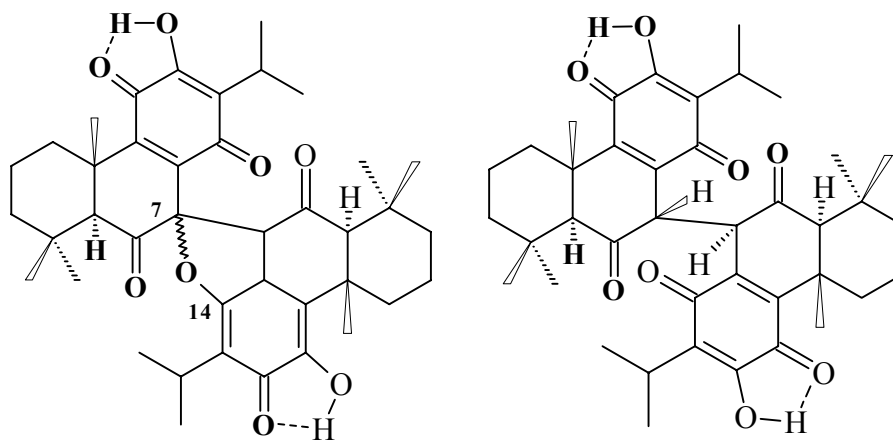
D120

D121; R= COCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>D122; R= COCH=C(CH<sub>3</sub>)<sub>2</sub>**1,4-Phenanthraquinones**

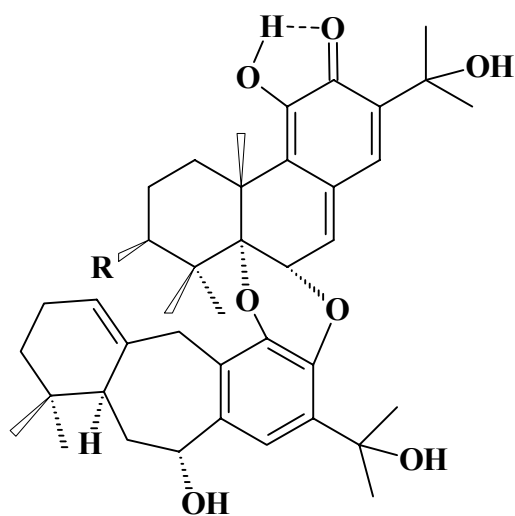
D123

D124; R<sup>1</sup>= CH<sub>3</sub>, R<sup>2</sup>= R<sup>3</sup>= HD125; R<sup>1</sup>= R<sup>2</sup>= R<sup>3</sup>= HD126; R<sup>1</sup>= R<sup>2</sup>= H, R<sup>3</sup>= CH<sub>3</sub>D127; R<sup>1</sup>= R<sup>3</sup>= H, R<sup>2</sup>= OH

## Dimeric abietanoids

D128;  $\beta$ -C(7)-O-C(11')D129;  $\beta$ -C(7)-O-C(12')D130;  $\beta$ -C(7)-O-C(11')D131;  $\beta$ -C(7)-O-C(12')D132;  $\alpha$ -C(7)-O-C(14)D133;  $\beta$ -C(7)-O-C(14)

D134

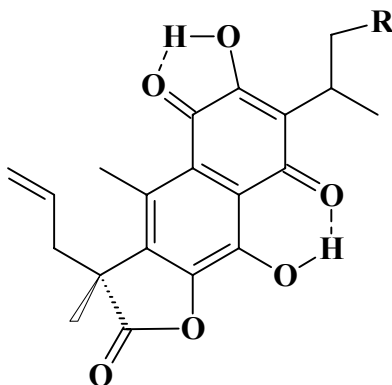


D135; R= H

D136; R= Oac

## Seco-abietanoids

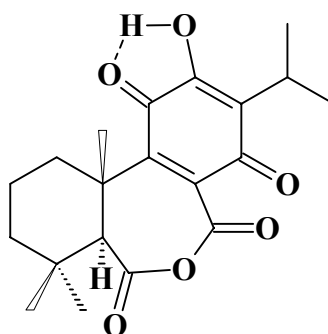
## 1,10-Seco-abietanoids



D137; R= H

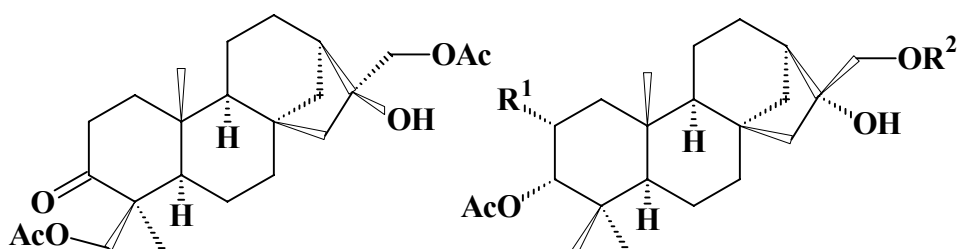
D138; R= OAc

## 6,7- Seco-abietanoids



D139

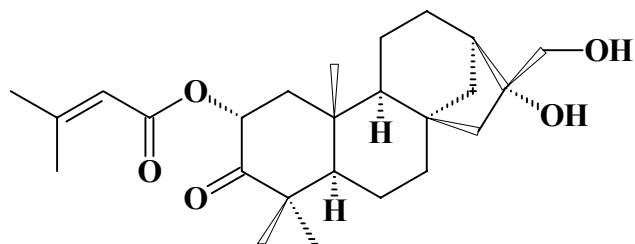
## Phyllocladanes



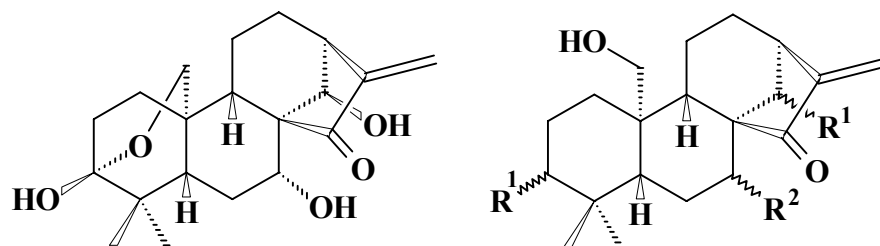
D140

D141; R<sup>1</sup> = OCOCH=C(CH<sub>3</sub>)<sub>2</sub>, R<sup>2</sup> = HD142; R<sup>1</sup> = OCOCH=C(CH<sub>3</sub>)<sub>2</sub>, R<sup>2</sup> = AcD143; R<sup>1</sup> = OCOCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>, R<sup>2</sup> = HD144; R<sup>1</sup> = OCOCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>, R<sup>2</sup> = AcD145; R<sup>1</sup> = R<sup>2</sup> = H

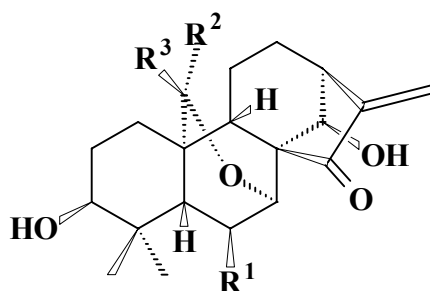
D146



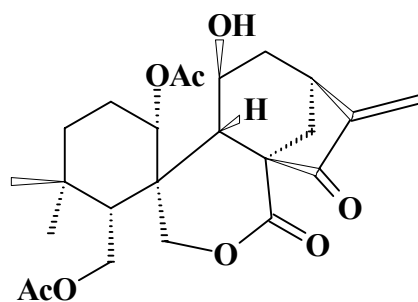
## Ent-kaurenes



D147

D148; R<sup>1</sup> =  $\beta$ -OH, R<sup>2</sup> =  $\alpha$ -OHD149; R<sup>1</sup> =  $\alpha$ -OH, R<sup>2</sup> =  $\beta$ -OHD150; R<sup>1</sup> = H, R<sup>2</sup> = OCH<sub>3</sub>, R<sup>3</sup> = HD151; R<sup>1</sup> = OH, R<sup>2</sup> = OCH<sub>3</sub>, R<sup>3</sup> = HD152; R<sup>1</sup> = H, R<sup>2</sup> = OC<sub>2</sub>H<sub>5</sub>, R<sup>3</sup> = HD153; R<sup>1</sup> = R<sup>3</sup> = H, R<sup>2</sup> = OHD154; R<sup>1</sup> = R<sup>2</sup> = H, R<sup>3</sup> = OH

## Seco-kaurenes



D155

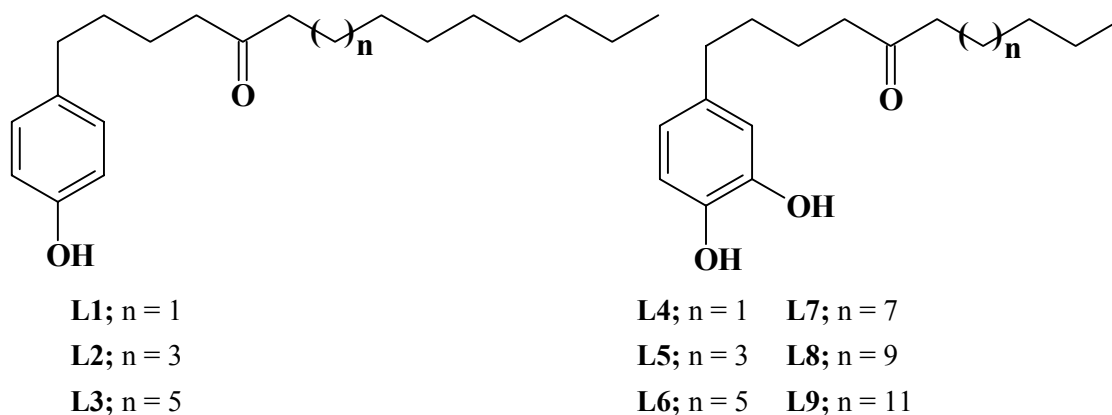
## Essential oils

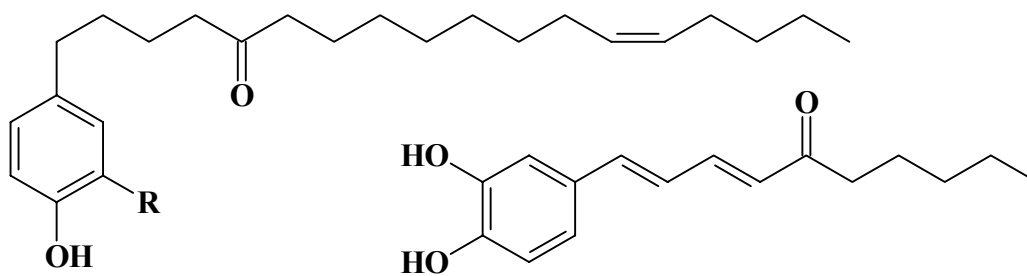
*Plectranthus* is one of the oil-rich genera belonging to the subfamily Nepetoideae [17]. Table 1 lists *Plectranthus* species that have been investigated for essential oils. The main constituents of essential oils of *Plectranthus* are mono- and sesquiterpenes. For example, constituents of essential oil of *P. rugosus* [18], as eluted from fused silica capillary column, are  $\alpha$ -pinene, camphene,  $\beta$ -pinene, sabinene, 3-carene, myrcene,  $\alpha$ -phellandrene,  $\alpha$ -terpinene, limonene,  $\beta$ -phellandrene, *cis*- $\beta$ -ocimene,  $\gamma$ -terpinene, *trans*- $\beta$ -ocimene, *p*-cymene, terpinolene, thujone, 1-nonen-3-ol,  $\alpha$ -copane,  $\beta$ -bourbonene,  $\beta$ -cubebene, linalool, caryophyllene, terpinen-4-ol, humulene,  $\gamma$ -muurolene, germacrene D, piperitone epoxide,  $\alpha$ -muurolene, bicyclogermacrene,  $\delta$ -cadinene,  $\gamma$ -cadinene,  $\alpha$ -curcumene, caryophyllene oxide, T-cadinol, torreyol and  $\alpha$ -cadinol. On the same GC column (fused silica capillary), essential oil of *P. amboinicus* [19] was separated into  $\alpha$ -pinene, camphene, 1-octen-3-ol,  $\beta$ -pinene, myrcene,  $\alpha$ -phellandrene,  $\Delta$ -3-carene,  $\alpha$ -terpinene, *p*-cymene, limonene, (*Z*)- $\beta$ -ocimene, (*E*)- $\beta$ -ocimene,  $\alpha$ -phellandrene,  $\gamma$ -terpinene,  $\alpha$ -terpinolene, linalool, camphor, 1-terpinen-4-ol,  $\alpha$ -terpineol, thymol, carvacrol,  $\alpha$ -cubebene,  $\beta$ -cubebene,  $\beta$ -elemene,  $\beta$ -caryophyllene,  $\alpha$ -bergamotene, (*Z*)- $\beta$ -farnesene,  $\alpha$ -humulene,  $\beta$ -guaiene, (-)- $\alpha$ -selinene,  $\beta$ -bisabolene,  $\delta$ -cadinene, caryophyllene oxide,  $\delta$ -cadinol,  $\alpha$ -cadinol, farnesol, calamenol and (-)-4 $\beta$ -7 $\beta$ -aromadendrandiol. Also on fused silica capillary column, essential oil of *P. fruticosus* [20] gave  $\alpha$ -thuyene, sabinene,  $\gamma$ -terpinene,  $\beta$ -bourbonene, linalool, terpinen-4-ol, sabinyl acetate,  $\alpha$ -humulene, aromadendrene,  $\alpha$ -cubebene,  $\beta$ -bisabolene,  $\gamma$ -cadinene,  $\alpha$ -elemene, *trans*-farnesol and *trans*-copaene.

## Long-chain alkylphenols

A group of long-chain alkylphenols, of possible taxonomic significance in the genus, has been isolated [28,29]. Long-chain alkylphenols **L1-L8**, **L10-L12** were isolated from *P. albidus* and showed a significant in vitro antioxidant activity [28]. Antioxidant activity guided fractionation of extracts of *P. sylvestris* [29] and HPLC separation yielded the oxygenated long-chain alkylcatechols **L9**, **L13-L18**.

## Long-chain alkylphenols

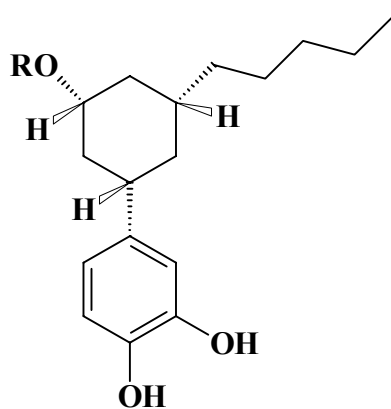




L10; R = H

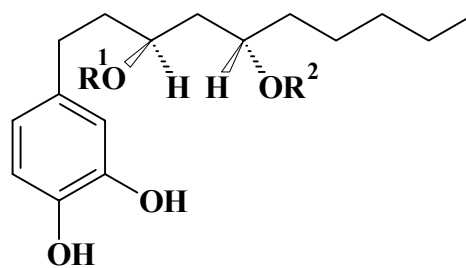
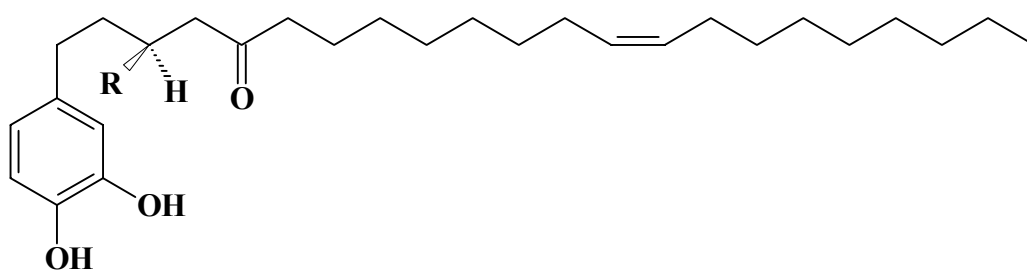
L11; R = OH

L12



L13; R = Ac

L14; R = H

L15; R<sup>1</sup> = H, R<sup>2</sup> = AcL16; R<sup>1</sup> = Ac, R<sup>2</sup> = H

L17; R = OH

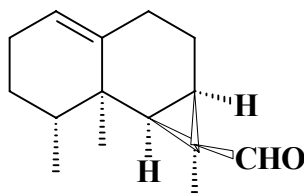
L18; R = H

## Miscellaneous constituents

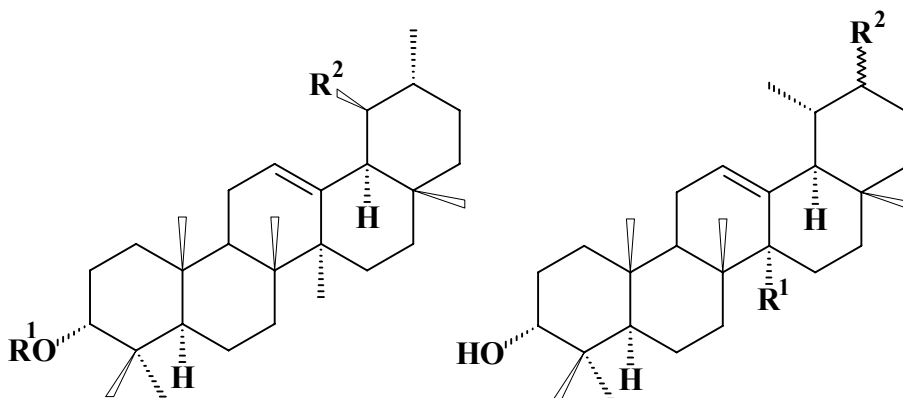
Only one aristolane sesquiterpene, namely 1(10)-aristolen-13-al (**M1**), was isolated from *P. hereroensis* [30]. Five triterpenoids, named plectranthoic acid (**M2**), acetylplectranthoic acid (**M3**), plectranthadiol (**M4**), plectranthoic acid A (**M5**) and plectranthoic acid B (**M6**), in addition to  $\beta$ -sitosterol were isolated from *P. rugosus* [31, 32]. From the same species Misra *et al.* [85] isolated the triterpenoids oleanolic acid (**M7**), ursolic acid (**M8**) and betulin (**M9**), in addition to  $\beta$ -sitosterol and hexacosanol.

Flavonoids seem to be rare in *Plectranthus*. Only two flavonoids were identified, 4',7-dimethoxy-5,6-dihydroxyflavone (**M10**) from *P. ambiguus* [33] and chrysosplenetin (**M11**) from *P. marruboides* [34]. From *P. mollis* (= *P. incanus*), Mahmoud *et al.* reported the isolation of vernolic and cyclopropenoid fatty acids [35]. From *P. japonicus* (= *Rabdosia japonica*), a tetrameric derivative of caffeic acid was isolated [36].

## Miscellaneous constituents



**M1**



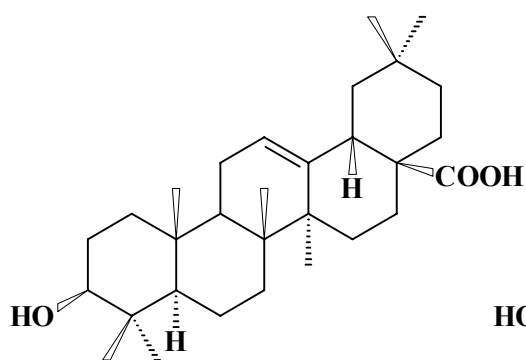
**M2**;  $R^1 = H$ ,  $R^2 = COOH$

**M3**;  $R^1 = Ac$ ,  $R^2 = COOH$

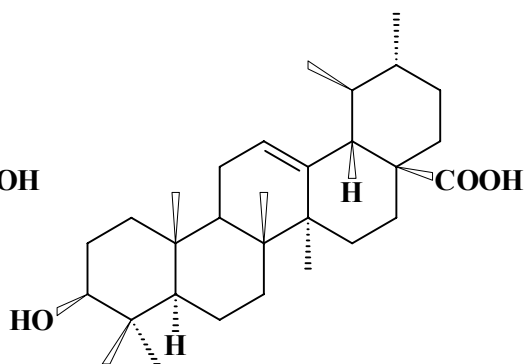
**M4**;  $R^1 = H$ ,  $R^2 = CH_2OH$

**M5**;  $R^1 = CH_3$ ,  $R^2 = \beta-COOH$

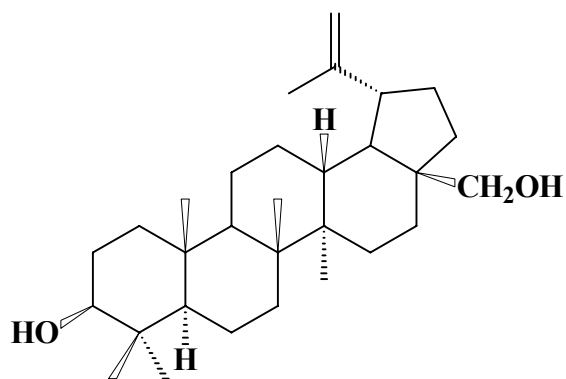
**M6**;  $R^1 = COOH$ ,  $R^2 = \alpha-CH_3$



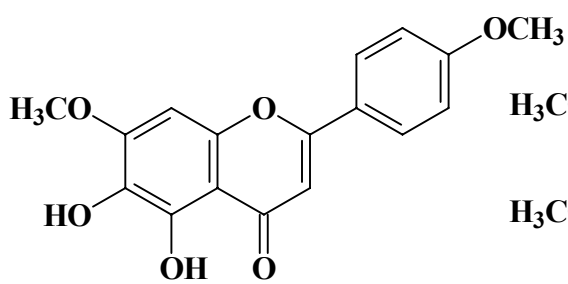
M7; oleanolic acid



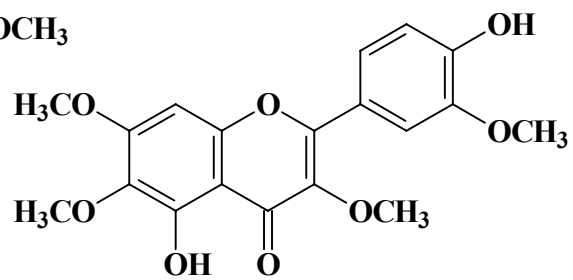
M8; ursolic acid



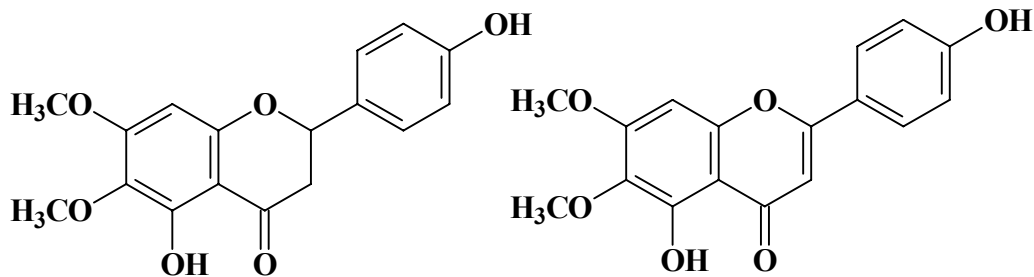
M9; betulin



M10

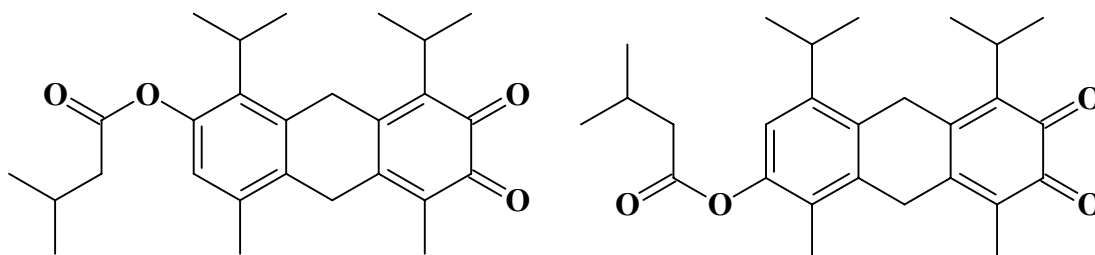


M11



M12

M13



M14; ecklonoquinone A

M15; ecklonoquinone B

## Conclusions

Although the genus *Plectranthus* comprises many plants of medicinal and economic interest [80], its chemistry remains poorly known. Caffeic acid and its derivatives are of widespread occurrence in the Labiatae family and of particular attention as chemotaxonomic markers. Chlorogenic acid appears to be of almost universal occurrence within this family, whereas rosmarinic acid is restricted to the subfamily Nepetoideae [81]. Only a tetrameric derivative of caffeic acid was isolated from *P. japonicus* [36]. But a group of long-chain alkylphenols, of possible taxonomic significance in the genus, was isolated [28,29]. Generally, the subfamily Lamioideae is rich in iridoid glycosides, whereas they are absent from the Nepetoideae [82]. No iridoid glycosides were isolated from *Plectranthus*.

Generally, *Plectranthus* species are essential-oil-rich (i.e. > 0.5% volatile oil on a dry weight basis), in agreement with the general situation that the Nepetoideae are oil-rich, whilst the Lamioideae are oil-poor [83].

Diterpenoids are the more common secondary metabolites in *Plectranthus*. The majority of them are highly modified abietanoids, in addition to some phyllocladanes and *ent*-kaurenes. It seems to be similar to the pattern of diterpenoids of *Salvia* [84], but no clerodane diterpenoids were found in *Plectranthus*.

**Table 1:** Alphabetical list of *Plectranthus* species and compounds isolated from them.

| <i>Plectranthus</i> species | Isolated chemical constituents                                                                                                | References |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------|
| Abyssinian <i>P. sp.</i>    | <b>D1, D5, D9, D10, D12-D14, D21, D30</b>                                                                                     | 37         |
| <i>P. albidus</i>           | <b>L1-L8, L10-L12</b>                                                                                                         | 28         |
| <i>P. aliciae</i>           | —                                                                                                                             | 62         |
| <i>P. alloplectus</i>       | —                                                                                                                             | 63         |
| <i>P. ambiguus</i>          | <b>D141-D146, flavonoid M10</b>                                                                                               | 33         |
| <i>P. amboinicus</i>        | Essential oil                                                                                                                 | 19         |
| <i>P. argentatus</i>        | <b>D4, D5, D8, D21, D25, D101, D102, D112</b>                                                                                 | 38         |
| <i>P. asirensis</i>         | —                                                                                                                             | 13         |
| <i>P. australis</i>         | —                                                                                                                             | 64         |
| <i>P. barbatus</i>          | <b>D29, D65, D75, D76, D115, D117</b><br><b>D65</b>                                                                           | 39<br>16   |
| <i>P. burorum</i>           | —                                                                                                                             | 65         |
| <i>P. caninus</i>           | <b>D108, D109</b><br><b>D59-D64</b>                                                                                           | 40<br>86   |
| <i>P. ciliatus</i>          | —                                                                                                                             | 61         |
| <i>P. coesta</i>            | <b>D148</b>                                                                                                                   | 41         |
|                             | <b>D147</b>                                                                                                                   | 42         |
| <i>P. coetsa</i>            | —                                                                                                                             | 66         |
| <i>P. coetsoides</i>        | <b>D147, D149-D154</b>                                                                                                        | 43         |
| <i>P. coleoides</i>         | Essential oil                                                                                                                 | 25         |
| <i>P. cyrpiculoides</i>     | —                                                                                                                             | 67         |
| <i>P. defoliatus</i>        | Essential oil                                                                                                                 | 26         |
| <i>P. ecklonii</i>          | <b>D86, M12-M15</b>                                                                                                           | 68         |
| <i>P. edulis</i>            | <b>D17, D18, D21, D22, D23, D24, D38-D48, D50, D55, D56, D66, D67, D69, D70, D94-D100, D106, D107, D118, D119, D137, D138</b> | 44         |
|                             | <b>D118</b>                                                                                                                   | 45         |
| <i>P. elegans</i>           | <b>D93, D120</b>                                                                                                              | 46         |
| <i>P. esculentus</i>        | —                                                                                                                             | 69         |
| <i>P. fasciculatos</i>      | —                                                                                                                             | 70         |
| <i>P. floribundus</i>       | —                                                                                                                             | 11         |
| <i>P. fruticosus</i>        | Essential oil                                                                                                                 | 20         |
| <i>P. gandicalyx</i>        | —                                                                                                                             | 65         |
| <i>P. garckeanus</i>        | —                                                                                                                             | 65         |

|                                             |                                                                                                  |        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------|--------|
| <i>P. geradianus</i>                        | —                                                                                                | 71     |
| <i>P. glandulosus</i>                       | Essential oil                                                                                    | 23     |
| <i>P. glaucocalyx</i>                       | An antimicrobial diterpenoid                                                                     | 47     |
| <i>P. grandidentatus</i>                    | <b>D68, D101, D102, D128-D134</b>                                                                | 48     |
|                                             | <b>D5, D11</b>                                                                                   | 49     |
| <i>P. gratus</i>                            | —                                                                                                | 63     |
| <i>P. hadiensis</i>                         | —                                                                                                | 67     |
| <i>P. hereroensis</i>                       | <b>D9, D35, D36</b>                                                                              | 50     |
|                                             | <b>D37</b>                                                                                       | 51     |
|                                             | <b>D9, D16</b>                                                                                   | 52     |
|                                             | Sesquiterpene <b>M1</b>                                                                          | 30     |
| <i>P. hilliardiae</i>                       | —                                                                                                | 61     |
| <i>P. incanus</i> (= <i>P. mollis</i> )     | Essential oil                                                                                    | 27, 79 |
|                                             | Fatty acids                                                                                      | 35     |
| <i>P. inflexus</i>                          | —                                                                                                | 72     |
| <i>P. japonicus</i>                         | <b>D155</b>                                                                                      | 53     |
|                                             | Caffeic acid derivative                                                                          | 36     |
| <i>P. japonicus</i> var. <i>glaucocalyx</i> | —                                                                                                | 77     |
| <i>P. kapatensis</i>                        | —                                                                                                | 65     |
| <i>P. lanuginosus</i>                       | <b>D17, D30-D34, D45, D47, D52-D54, D57, D58, D67, D71, D74, D88-D90, D100, D103, D110, D111</b> | 54     |
| <i>P. lucidus</i>                           | —                                                                                                | 62     |
| <i>P. madagascariensis</i>                  | Essential oil                                                                                    | 24     |
| <i>P. malvinus</i>                          | —                                                                                                | 62     |
| <i>P. marrubioides</i>                      | Flavonoid <b>M11</b>                                                                             | 34     |
| <i>P. melissoides</i>                       | —                                                                                                | 79     |
| <i>P. mollis</i> (= <i>P. incanus</i> )     | —                                                                                                | 79     |
| <i>P. mollis</i>                            | —                                                                                                | 79     |
| <i>P. myrianthus</i>                        | <b>D128</b>                                                                                      | 48     |
|                                             | <b>D2, D4, D96, D98, D101</b>                                                                    | 87     |
| <i>P. neochilus</i>                         | —                                                                                                | 73     |
| <i>P. nilgherricus</i>                      | <b>D82, D83, D139, D140</b>                                                                      | 88     |
| <i>P. oribiensis</i>                        | —                                                                                                | 61     |
| <i>P. ornatus</i>                           | —                                                                                                | 74     |
| <i>P. parviflorus</i>                       | <b>D77, D82-D86</b>                                                                              | 55     |

|                                                     |                                                                               |        |
|-----------------------------------------------------|-------------------------------------------------------------------------------|--------|
| <i>P. pentheri</i>                                  | —                                                                             | 62     |
| <i>P. porpeodon</i>                                 | —                                                                             | 65     |
| <i>P. pseudobarbatus</i>                            | —                                                                             | 65     |
| <i>P. puberulentus</i>                              | —                                                                             | 65     |
| <i>P. purpuratus</i>                                | <b>D72, D73, D77, D79, D91, D92, D121, D122, D140</b>                         | 56     |
| <i>P. purpuratus</i> subsp. <i>montanus</i>         | —                                                                             | 62     |
| <i>P. purpuratus</i> subsp. <i>tongaensis</i>       | —                                                                             | 62     |
| <i>P. reflexus</i>                                  | —                                                                             | 61     |
| <i>P. rugosus</i>                                   | Essential oil                                                                 | 18     |
|                                                     | Triterpenoids <b>M2-M6</b> & $\beta$ -sitosterol                              | 31, 32 |
|                                                     | Triterpenoids <b>M7-M9</b> , $\beta$ -sitosterol & hexacosanol                | 85     |
| <i>P. saccatus</i> subsp. <i>pondoensis</i>         | —                                                                             | 62     |
| <i>P. saccatus</i> var. <i>longitubus</i>           | —                                                                             | 61     |
| <i>P. sanguineus</i>                                | <b>D3, D4-D7, D9, D15, D21, D25, D26, D68, D99, D102, D128-D131, D139</b>     | 57     |
| <i>P. schimperi</i>                                 | —                                                                             | 65     |
| <i>P. sp.</i> from the borders of Lake Kiwu, Rwanda | <b>D19-D21, D27-D29, D49, D51, D75, D76, D104, D105, D113-D116, D123-D127</b> | 58     |
|                                                     | <b>D123-D126</b>                                                              | 59     |
| <i>P. spectabilis</i>                               | —                                                                             | 63     |
| <i>P. stenophyllus</i>                              | —                                                                             | 75     |
| <i>P. stocksii</i>                                  | —                                                                             | 79     |
| <i>P. strigosus</i>                                 | <b>D77, D78, D82-D87</b>                                                      | 60     |
| <i>P. sylvestris</i>                                | <b>L9, L13-L18</b>                                                            | 29     |
| <i>P. tenuiflorus</i>                               | Essential oil                                                                 | 21,22  |
| <i>P. vestitus</i>                                  | Essential oil                                                                 | 76     |
| <i>P. vettiveroides</i>                             | —                                                                             | 78     |
| <i>P. zatarhendi</i>                                | —                                                                             | 67     |
| <i>P. zatarhendi</i> var. <i>tomentosus</i>         | —                                                                             | 67     |
| <i>P. zuluensis</i>                                 | —                                                                             | 61     |

**Table 2:** Names of diterpenoids encountered in *Plectranthus* species.

| Diterp.    | Name of diterpenoid                                                                                                                  | Diterp.     | Name of diterpenoid                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>D1</b>  | Royleanone                                                                                                                           | <b>D79</b>  | (11-Hydroxy-19-isovaleroyloxy-5,7,9(11),13-abietatetraen-12-one)                                                                                   |
| <b>D2</b>  | 6 $\beta$ , 7 $\alpha$ -Dihydroxy-royleanone                                                                                         | <b>D80</b>  | Fuerstione                                                                                                                                         |
| <b>D3</b>  | 7-O-Formylhorminone                                                                                                                  | <b>D81</b>  | 3 $\beta$ -Acetoxyfuerstione                                                                                                                       |
| <b>D4</b>  | 6 $\beta$ -Hydroxy-7 $\alpha$ -formyloxyroyleanone                                                                                   | <b>D82</b>  | Parviflorone C                                                                                                                                     |
| <b>D5</b>  | 6 $\beta$ -Hydroxy-7 $\alpha$ -acetoxyroyleanone                                                                                     | <b>D83</b>  | Parviflorone E                                                                                                                                     |
| <b>D6</b>  | 6 $\beta$ -Hydroxyroyleanone                                                                                                         | <b>D84</b>  | Parviflorone B                                                                                                                                     |
| <b>D7</b>  | 5,6-Dihydrocoleone U                                                                                                                 | <b>D85</b>  | Parviflorone D                                                                                                                                     |
| <b>D8</b>  | 6 $\beta$ -Formyloxy-7 $\alpha$ -hydroxyroyleanone                                                                                   | <b>D86</b>  | Parviflorone F                                                                                                                                     |
| <b>D9</b>  | Horminone                                                                                                                            | <b>D87</b>  | Parviflorone G                                                                                                                                     |
| <b>D10</b> | 7 $\alpha$ -Acetoxyroyleanone                                                                                                        | <b>D88</b>  | Lanugone M                                                                                                                                         |
| <b>D11</b> | 6 $\beta$ -Hydroxy-7 $\alpha$ -acyloxyroyleanone                                                                                     | <b>D89</b>  | Lanugone L                                                                                                                                         |
| <b>D12</b> | Taxoquinone (= 7 $\beta$ -Hydroxyroyleanone)                                                                                         | <b>D90</b>  | Lanugone N                                                                                                                                         |
| <b>D13</b> | 7-Oxoroyleanone                                                                                                                      | <b>D91</b>  | 6 $\alpha$ ,11-Dihydroxy-19-isovaleroyloxy-7,9(11), 13-abietatrien-12-one                                                                          |
| <b>D14</b> | 8 $\alpha$ ,9 $\alpha$ -Epoxy-7-oxoroyleanone                                                                                        | <b>D92</b>  | 6 $\alpha$ ,11-Dihydroxy-19-seneciolyloxy-7,9(11), 13-abietatrien-12-one                                                                           |
| <b>D15</b> | 6 $\beta$ ,7 $\alpha$ -Dihydroxy(allyl)royleanone                                                                                    | <b>D93</b>  | 11-Hydroxy-12-oxo-7,9(11),13-abietatriene                                                                                                          |
| <b>D16</b> | 7 $\alpha$ ,12-Dihydroxy-17(15 $\rightarrow$ 16)-abeo-abieta-8,12,16-trien-11,14-dione                                               | <b>D94</b>  | (2' $\xi$ ,3aR,10bR)-8-(2'-Acetoxy-1'-methyl-ethyl)-3,3a-dihydro-7,9,10-trihydroxy-3a,10b-dimethyl-1H-phenanthro[10,1bc]-furan-4(2H),6(10bH)-dione |
| <b>D17</b> | Lanugone A                                                                                                                           | <b>D95</b>  | 16-O-Acetylcoleon C                                                                                                                                |
| <b>D18</b> | (4bS,7R,8aR)-7-Formyloxy-4b,5,6,7,8,8a-hexahydro-3-hydroxy-4b,8,8-trimethyl-2-(2-propenyl)phenanthren-1,4-dione                      | <b>D96</b>  | Coleon U                                                                                                                                           |
| <b>D19</b> | Plectranthone F                                                                                                                      | <b>D97</b>  | Coleon C                                                                                                                                           |
| <b>D20</b> | Plectranthone G                                                                                                                      | <b>D98</b>  |                                                                                                                                                    |
| <b>D21</b> | 6 $\beta$ ,7 $\alpha$ -Dihydroxyroyleanone                                                                                           | <b>D99</b>  | 16-O-Acetylcoleon D                                                                                                                                |
| <b>D22</b> | (4bS,7R,8aR,9S,10S)-7-Formyloxy-4b,5,6,7,8,8a,9,10-octahydro-3,9,10-trihydroxy-4b,8,8-trimethyl-2-(2-propenyl)-phenanthren-1,4-dione | <b>D100</b> | (15S)-Coleon D                                                                                                                                     |

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| <b>D23</b> | (4bS,7R,8aS,9S,10S)-4b,5,6,7,8,8a,9,10-Octahydro-3,9,10-trihydroxy-4b,7-dimethyl-8-methyliden-2-(2-propenyl)-phenanthren-1,4-dione                                                             | <b>D101</b> | Coleon V                                                                                                             |
| <b>D24</b> | (2'ξ,4bS,7R,8aS,9S,10S)-4b,5,6,7,8,8a,9,10-Octahydro-3,9,10-trihydroxy-2-(2'-hydroxypropyl)-4b,7-dimethyl-8-methylidenphenanthren-1,4-dione                                                    | <b>D102</b> | Coleon U                                                                                                             |
| <b>D25</b> | Coleon-U-quinone                                                                                                                                                                               | <b>D103</b> | (15S)-Coleon C                                                                                                       |
| <b>D26</b> | 8α,9α-Epoxy-8,9-dihydrocoleon-U-quinone                                                                                                                                                        | <b>D104</b> | (15S)-2α-Acetoxycoleon C                                                                                             |
| <b>D27</b> | Plectranthone H                                                                                                                                                                                | <b>D105</b> | (15S)-Coleon H                                                                                                       |
| <b>D28</b> | Plectranthone I                                                                                                                                                                                | <b>D106</b> | (2'ξ,4aS,10aS)-1,2,3,4,4a,10a-Hexahydro-5,6,8-trihydroxy-7-(2'-hydroxypropyl)-1,1,4a-trimethylphenanthren-9,10-dione |
| <b>D29</b> | Plectranthone J                                                                                                                                                                                | <b>D107</b> | (2'ξ,4aR)-2,3,4,4a-Tetrahydro-5,6,8,10-tetrahydroxy-7-(2'-hydroxypropyl)-1,1,4a-trimethylphenanthren-9(1H)-one       |
| <b>D30</b> | 6,7-Didehydroroleanone                                                                                                                                                                         | <b>D108</b> | Coleon T                                                                                                             |
| <b>D31</b> | Lanugone B                                                                                                                                                                                     | <b>D109</b> | Coleon S                                                                                                             |
| <b>D32</b> | Lanugone C                                                                                                                                                                                     | <b>D110</b> | Lanugone R                                                                                                           |
| <b>D33</b> | Lanugone D                                                                                                                                                                                     | <b>D111</b> | Lanugone S                                                                                                           |
| <b>D34</b> | Lanugone E                                                                                                                                                                                     | <b>D112</b> | 5,6-Dihydrocoleon U                                                                                                  |
| <b>D35</b> | 3β-Acetoxy-6β,7α,12-trihydroxy-17-(15→16);18(4→3)-bisabeo-abieta-4(19),8.12,16-tetraen-11,14-dione                                                                                             | <b>D113</b> | (15S)-2α-Acetoxycoleon D                                                                                             |
| <b>D36</b> | 16-Acetoxyhorminone                                                                                                                                                                            | <b>D114</b> | (15S)-Coleon I                                                                                                       |
| <b>D37</b> | 16-Acetoxy-7α,12-dihydroxy-8,12-abieta-dien-11,14-dione                                                                                                                                        | <b>D115</b> | Plectrinone B                                                                                                        |
| <b>D38</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-3',10'-Diacetoxy-4'b,5',6',7',8',8'a,9',10'-octahydro-9'-hydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione | <b>D116</b> | (16S)-Plectrinone A                                                                                                  |

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| <b>D39</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-3'-Acetoxy,10'-formyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-9'-hydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione | <b>D117</b> | (16R)-Plectrinone A                                                                                                                  |
| <b>D40</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-10'-Acetoxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione         | <b>D118</b> | Edulone A                                                                                                                            |
| <b>D41</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-3'-Acetoxy-4'b,5',6',7',8',8'a,9',10'-octahydro-9',10'-dihydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione         | <b>D119</b> | (1'S,10bS)-7,9,10-Trihydroxy-8-(2'-hydroxy-1'-methylethyl)-3,10b-dimethyl-1H-benzo[g]cyclopenta[de][1]benzopyran-4(2H),6(10bH)-dione |
| <b>D42</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-10'-Formyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione       | <b>D120</b> | 7 $\alpha$ ,11-Dihydroxy-12-methoxy-8,11,13-abietatriene                                                                             |
| <b>D43</b> | (2R,2'S,3'R,4'bS,7'R,8'aS,9'S,10'S)-4'b,5',6',7',8',8'a,9',10'-Octahydro-3',9',10'-trihydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione                | <b>D121</b> | 11,12-Dihydroxy-19-isovaleroyloxy-8,11,13-abietatrien-7-one                                                                          |
| <b>D44</b> | (2R,2'S,3'R,4'bS,7'R,8'aR,9'S,10'S)-9'-Acetoxy-7'-formyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',10'-dihydroxy-2,4'b,8',8'-tetramethylspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione     | <b>D122</b> | 11,12-Dihydroxy-19-seneciolyloxy-8,11,13-abietatrien-7-one                                                                           |
| <b>D45</b> | Lanugon G                                                                                                                                                                                              | <b>D123</b> | Plectranthone B                                                                                                                      |
| <b>D46</b> | (2R,2'S,3'R,4'bS,7'R,8'aR,9'S)-7'-Formyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,8',8'-tetramethylspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione                      | <b>D124</b> | Plectranthone A                                                                                                                      |
| <b>D47</b> | Lanugone F                                                                                                                                                                                             | <b>D125</b> | Plectranthone C                                                                                                                      |

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| <b>D48</b> | (2R,2'S,3'R,4'bS,7'R,8'aR,9'S,10'S)-7',10'-Bisformyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,8',8'-tetramethylspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione       | <b>D126</b> | Plectranthone D                                                                                                         |
| <b>D49</b> | Plectranthone K                                                                                                                                                                                     | <b>D127</b> | Plectranthone E                                                                                                         |
| <b>D50</b> | (2R,2'S,3'R,4'bS,7'ξ,8'aR,9'S,10'S)-7',10'-Diacetoxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,7'-trimethyl-8'-methylidenspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione | <b>D128</b> | Grandidone A                                                                                                            |
| <b>D51</b> | Plectranthone L                                                                                                                                                                                     | <b>D129</b> | 7-Epigrandidone A                                                                                                       |
| <b>D52</b> | Lanugone H                                                                                                                                                                                          | <b>D130</b> | Grandidone B                                                                                                            |
| <b>D53</b> | Lanugone I                                                                                                                                                                                          | <b>D131</b> | 7-Epigrandidone B                                                                                                       |
| <b>D54</b> | Lanugone J                                                                                                                                                                                          | <b>D132</b> | Grandidone D                                                                                                            |
| <b>D55</b> | (2S,2'S,3'R,4'bS,7'R,8'aR,9'S,10'S)-7-Formyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-diacetoxy-10'-hydroxy-2,4'b,8',8'-tetramethylspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione   | <b>D133</b> | 7-Epigrandidone D                                                                                                       |
| <b>D56</b> | (2S,2'S,3'R,4'bS,7'R,8'aR,9'S,10'S)-7',10'-Bisformyloxy-4'b,5',6',7',8',8'a,9',10'-octahydro-3',9'-dihydroxy-2,4'b,8',8'-tetramethylspiro[cyclopropan-1,2'(1'H)-phenanthren]-1',4'(3'H)-dione       | <b>D134</b> | Grandidone C                                                                                                            |
| <b>D57</b> | Lanugone K                                                                                                                                                                                          | <b>D135</b> | Nilgherron A                                                                                                            |
| <b>D58</b> | Lanugone K'                                                                                                                                                                                         | <b>D136</b> | Nilgherron B                                                                                                            |
| <b>D59</b> | Coleon R                                                                                                                                                                                            | <b>D137</b> | (3R)-6,9-Dihydroxy-3,4-dimethyl-7-(1-methylethyl)-3-(2-propenyl)naphtho[2,3-b]furan-2-(3H),5,8-trione                   |
| <b>D60</b> | Coleon M                                                                                                                                                                                            | <b>D138</b> | (2'ξ,3R)-7-(2'-Acetoxy-1'-methylethyl)-6,9-dihydroxy-3,4-dimethyl-3-(2"-propenyl)-naphtho[2,3-b]furan-2-(3H),5,8-trione |
| <b>D61</b> | 7,12-Diacetylcoleon J                                                                                                                                                                               | <b>D139</b> | Sanguinon A                                                                                                             |
| <b>D62</b> | Coleon N                                                                                                                                                                                            | <b>D140</b> | (16R)-17,19-Diacetoxy-16-hydroxy-13β-kauran-3-one                                                                       |
| <b>D63</b> | Coleon Q                                                                                                                                                                                            | <b>D141</b> | (16R)-2α-Seneciyoxyloxy-3α-acetoxyphyllocladan-16,17-diol                                                               |

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| <b>D64</b> | Coleon P                                                                                                       | <b>D142</b> | (16R)-2 $\alpha$ -Seneciolyoxy-3 $\alpha$ ,17-diacetoxy-16-hydroxyphyllocladane   |
| <b>D65</b> | Plectrin                                                                                                       | <b>D143</b> | (16R)-2 $\alpha$ -Isovaleroyloxy-3 $\alpha$ -acetoxyphyllocladan-16,17-diol       |
| <b>D66</b> | Coleon Z                                                                                                       | <b>D144</b> | (16R)-2 $\alpha$ -Isovaleroyloxy-3 $\alpha$ ,17-diacetoxy-16-hydroxyphyllocladane |
| <b>D67</b> | (15S)-Lanugone O                                                                                               | <b>D145</b> | (16R)-3 $\alpha$ -Acetoxyphyllocladan-16,17-diol                                  |
| <b>D68</b> | 14-Hydroxytaxodione                                                                                            | <b>D146</b> | (16R)-2 $\alpha$ -Seneciolyoxy-16,17-dihydroxyphyllocladan-3-one                  |
| <b>D69</b> | (4bS,8aS)-2-(2-Acetoxypropyl)-4b,5,6,7,8,8a-hexahydro-1,4-dihydroxy-4b,8,8-trimethylphenanthren-3,9-dione      | <b>D147</b> | Plecostonol (= coetsidin A)                                                       |
| <b>D70</b> | (2'ξ,4bS,8aS)-4b,5,6,7,8,8a-Hexahydro-1,4-dihydroxy-2-(2'-hydroxypropyl)-4b,8,8-trimethylphenanthren-3,9-dione | <b>D148</b> | Coestanol                                                                         |
| <b>D71</b> | Lanugone P                                                                                                     | <b>D149</b> | Coetsidin B                                                                       |
| <b>D72</b> | 19-Isovaleroyloxytaxodione                                                                                     | <b>D150</b> | Coetsidin C                                                                       |
| <b>D73</b> | 19-Seneciolyoxytaxodione                                                                                       | <b>D151</b> | Coetsidin D                                                                       |
| <b>D74</b> | Lanugone Q                                                                                                     | <b>D152</b> | Coetsidin E                                                                       |
| <b>D75</b> | Coleon F                                                                                                       | <b>D153</b> | Coetsidin F                                                                       |
| <b>D76</b> | (16S)-Coleon E                                                                                                 | <b>D154</b> | Coetsidin G                                                                       |
| <b>D77</b> | Parviflorone A (= 11-hydroxy-19-seneciyl-oxy-5,7,9(11),13-abietatetraen-12-one)                                | <b>D155</b> | Rabdosin B                                                                        |
| <b>D78</b> | Parviflorone H                                                                                                 |             |                                                                                   |

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