

CHAPTER II HISTORICAL

1. Chemical constituents of *Dendrobium*.

According to previous reports, the chemical constituents in plants of the genus *Dendrobium* could be classified into several categories, such as, bibenzyls , fluorenones, lignans, phenanthrenes, phenylpropanoids, sesquiterpene derivatives, and miscellaneous compounds, as shown in Table 1.



Table 1 Distribution of chemical constituents in the genus *Dendrobium*

Category and compound	Plant	Plant part	Reference
Aliphatic acid			
Aliphatic acids [1]	<i>Dendrobium clavatum</i> var. <i>auranteacum</i>	Stem	Chang, Lin and Chen 2001
Malic acid [2]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
Shikimic acid [3]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
(-)-Shikimic acid [3]	<i>Dendrobium fuscescens</i>	Whole plant	Talapatra, Das and Talapatra, 1989
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> , 2013
(3 <i>S</i> ,4 <i>S</i> ,5 <i>R</i>)-3,4,5- trihydroxy-1-cyclohexene carboxylic acid (Shikimic acid) [3]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Aliphatic alcohols [4]	<i>Dendrobium clavatum</i> var. <i>auranteacum</i>	Stem	Chang <i>et al.</i> , 2001

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Aliphatic ester			
Dimethyl malate [5]	<i>Dendrobium huoshonense</i>	Aerial part	Chang <i>et al.</i> , 2010
Isopentyl butyrate [6]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
Anthracene			
3,6,9-Trihydroxy-3,4-dihydroanthracen-1-(2H)-one [7]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
Anthraquinone			
Chrysophanol [8]	<i>Dendrobium thyrsiforum</i>	Stem	Zhang <i>et al.</i> , 2005
Emodin [9]	<i>Dendrobium thyrsiforum</i>	Stem	Zhang <i>et al.</i> , 2005
Physcion [10]	<i>Dendrobium thyrsiforum</i>	Stem	Zhang <i>et al.</i> , 2005
Aromatic compound			
<i>N</i> -phenylacetamide [11]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Benzoic acid derivative			
Gallic acid [12]	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
3-Hydroxy-2-methoxy-5,6-dimethylbenzoic acid [13]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Protocatechuic acid [14]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
Salicylic acid [15]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
Syringic acid [16]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Vanillic acid [17]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Vanilloside [18]	<i>Dendrobium denneanum</i>	Stem	Pan <i>et al.</i> , 2012
	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Benzoic acid ester			
Bis (2-ethylhexyl) phthalate [19]	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
Dibutyl phthalate [20]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
Diisobutyl phthalate [21]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
Benzoquinone			
2,6-Dimethoxy benzoquinone [22]	<i>Dendrobium chryseum</i>	Stem	Ma <i>et al.</i> , 1998
Bibenzyl			
Aloifol I [23]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Amoenylin [24]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Betatacin [25]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
Batatacin III [26]	<i>Dendrobium ophyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
	<i>Dendrobium coriniferum</i>	Stem	Chen <i>et al.</i> , 2008a
	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
	<i>Dendrobium draconis</i>	Stem	Sritularak <i>et al.</i> , 2011a
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pa 1992

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Brittonin A [27]	<i>Dendrobium secundum</i>	Stem	Sritularak <i>et al.</i> , 2011b
Chrysotobibenzyl [28]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> , 2012
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium chryseum</i>	Stem	Ma <i>et al.</i> , 1998
	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> , 2013



Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Chrysotoxine [29]	<i>Dendrobium aurantiacum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>var. denneanum</i>		
	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> , 2012
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium chryseum</i>	Stem	Ma <i>et al.</i> , 1998
	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> , 2013
Crepidatin [30]	<i>Dendrobium aurantiocum</i>	Whole plant	Liu <i>et al.</i> , 2009
	<i>vor.denneanum</i>		
	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Cumulatin [31]	<i>Dendrobium crepidatum</i>	Whole plant	Majumder and Chatterjee, 1989
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> 2013
	<i>Dendrobium cumulatum</i>	Whole plant	Majumder and Pal, 1993
Dendrocandin A [32]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
Dendrocandin B [33]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
Dendrocandin C [34]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009a
Dendrocandin D [35]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009a
Dendrocandin E [36]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009a
Dendrocandin F [37]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009b
Dendrocandin G [38]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009b
Dendrocandin H [39]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009b
Dendrocandin I [40]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2009b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Dendrobin A [41]	<i>Dendrobium nobile</i>	Stem	Wang, Zhao and Che, 1985; Ye and Zhao, 2002
Dendrophenol [42]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
Densiflorol A [43]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
3,4-Dihydroxy-5,4'-dimethoxybibenzyl [44]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
	<i>Dendrobium moniliforme</i>	Stem	Bi <i>et al.</i> , 2004
3,4'-Dihydroxy-5-methoxybibenzyl [45]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
4,4'-Dihydroxy-3,5-dimethoxybibenzyl [46]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
3,4'-Dihydroxy-5,5'-dimethoxydihydrostilbene [47]	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
4,5-Dihydroxy-3,3'- dimethoxybibenzyl (Dendrobin A) [48]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
Erianin [49]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Gigantol [50]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Whole plant	Liu <i>et al.</i> , 2009
	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012
	<i>Dendrobium cariniferum</i>	Stem	Chen <i>et al.</i> , 2008a
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium draconis</i>	Stem	Sritularak <i>et al.</i> , 2011a

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b
4-Hydroxy-3,5,3'- trimethoxybibenzyl [51]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
4-[2-(3-ydroxyphenol)-1- methoxyethyl]-2,6- dimethoxyphenol [52]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
5-Hydroxy-3,4,3',4',5'- pentamethoxybibenzyl [53]	<i>Dendrobium secundum</i>	Stem	Phechrmeekha <i>et al.</i> 2012
Isoamoenylin [54]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Loddigesiinol C [55]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Loddigesiinol D [56]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Longicornuol A [57]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
3-O-Methylgigantol [58]	<i>Dendrobium candidum</i>	Stem	Li <i>et al.</i> , 2008
	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
Moscatilin [59]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999
	<i>Dendrobium aurantiacum</i> <i>var. denneonum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
	<i>Dendrobium loddigesii</i>	Whole plant	Chen <i>et al.</i> , 1994 ; Ito <i>et al.</i> , 2010

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
	<i>Dendrobium moscatum</i>	Whole plant	Majumder and Sen, 1987
	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007 ; Hwang <i>et al.</i> , 2010
	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> , 2013
	<i>Dendrobium secundum</i>	Stem	Sritularak <i>et al.</i> , 2011b
Nobilin A [60]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2006
Nobilin B [61]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2006
Nobilin C [62]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2006
Nobilin D [63]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
Trigonopol A [64]	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b
Trigonopol B [65]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
3,3',4-Trihydroxy bibenzyl [66]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
3,3',5-Trihydroxy bibenzyl [67]	<i>Dendrobium cariniferum</i>	Whole plant	Liu <i>et al.</i> , 2009
3,5,4'-Trihydroxy bibenzyl [68]	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
4,5,4'-Trihydroxy-3-3'- dimethoxybibenzyl [69]	<i>Dendrobium secundum</i>	Stem	Sritularak <i>et al.</i> , 2011b
Tristin [70]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Bibenzyl glycoside			
Dendromonilaside E [71]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
Biphenanthrene			
2,2'-Dihydroxy- 3,3',4,4',7,7'- hexamethoxy-9,9',10,10'- tetrahydro-1,1'- biphenanthrene [72]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
2,2'-Dimethoxy-4,4',7,7'- tetrahydroxy-9,9',10,10'- tetrahydro-1,1'- biphenanthrene [73]	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
Denthyrsinol [74]	<i>Dendrobium thyrsoiforum</i>	Stem	Zhang <i>et al.</i> , 2005
Denthyrsinone [75]	<i>Dendrobium thyrsoiforum</i>	Stem	Zhang <i>et al.</i> , 2005
Flavanthrin [76]	<i>Dendrobium ophyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Bisbibenzyl			
Dencryol A [77]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Dencryol B [78]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Dendrofalconerol A [79]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
Dendrofalconerol B [80]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
Dengraol A [81]	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
Dengraol B [82]	<i>Dendrobium gratiosissimum</i>	Stem	Zhang <i>et al.</i> , 2008a
Nobilin E [83]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Coumarin			
Ayapin [84]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
Coumarin [85]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium clavatum var.</i> <i>auranteacum</i>	Stem	Chang <i>et al.</i> , 2001
Denthyrsin [86]	<i>Dendrobium thysiflorum</i>	Stem	Zhang <i>et al.</i> , 2005
Scoparone [87]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium thysiflorum</i>	Stem	Zhang <i>et al.</i> , 2005
Scopoletin [88]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
Flavanone			
Naringenin [89]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Flavone			
Apigenin [90]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
5,6-Dihydroxy-4'-methoxy-flavanone [91]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Luteolin [92]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Whole plant	Liu <i>et al.</i> , 2009
Vicenin-2 [93]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
Flavone glycoside			
6-C-(α -Arabinopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -galactopyranosyl]apigenin [94]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010



Table 1 (continued)

Category and compound	Plant	Plant part	Reference
6-C-(α -Arabinopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -glucopyranosyl] apigenin[95]	<i>Dendrobium huoshonense</i>	Aerial part	Chang <i>et al.</i> , 2010
6'''-Glucosyl-vitexin [96]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Isoschaftoside [97]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
Isoviolanthin [98]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
6-C-[(2-O- α -Rhamnopyranosyl)- β -glucopyranosyl]-8-C-(α -arabinopyranosyl) apigenin [99]	<i>Dendrobium huoshonense</i>	Aerial part	Chang <i>et al.</i> , 2010



Table 1 (continued)

Category and compound	Plant	Plant part	Reference
6-C-(β -Xylopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -glucopyranosyl] apigenin [100]	<i>Dendrobium huoshanense</i>	Aerial part	Chang <i>et al.</i> , 2010
Flavonol Kaempferol [101]	<i>Dendrobium aurantiacum</i> var. <i>denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
Flavonol glycoside Kaempferol-3-O- α -L-rhamnopyranoside [102]	<i>Dendrobium secundum</i>	Stem	Phechrmeekha <i>et al.</i> 2012
Kaempferol-3,7-O-di- α -L-rhamnopyranoside [103]	<i>Dendrobium secundum</i>	Stem	Phechrmeekha <i>et al.</i> 2012

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Kaempferol-3-O- α -L-rhamnopyranosyl-(1 \rightarrow 2)- β -D-glucopyranoside [104]	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012
Kaempferol-3-O- α -L-rhamnopyranosyl-(1 \rightarrow 2)- β -D-xylopyranoside [105]	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012
Quercetin-3-O- α -L-rhamnopyranoside [106]	<i>Dendrobium secundum</i>	Stem	Phechrmeekha <i>et al.</i> 2012
Quercetin-3-O- α -L-rhamnopyranosyl-(1 \rightarrow 2)- β -D-xylopyranoside [107]	<i>Dendrobium capillipes</i>	Stem	Phechrmeekha <i>et al.</i> 2012

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Fluorenone			
Denchrysan A [108]	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
Denchrysan B [109]	<i>Dendrobium chrysotoxum</i>	Whole plant	Chen <i>et al.</i> , 2008c
Dendroflorin [110]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium chrysotoxum</i>	Whole plant	Chen <i>et al.</i> , 2008c
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dengibsin [111]	<i>Dendrobium ourantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
Nobilone [112]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
1,4,5-Trihydroxy-7-methoxy-9H-fluoren-9-one [113]	<i>Dendrobium chrysotoxum</i>	Whole plant	Chen <i>et al.</i> , 2008c

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
2,4,7-Trihydroxy-5-methoxy-9-fluorenone [114]	<i>Dendrobium chrysotoxum</i>	Stem	Yang <i>et al.</i> , 2004
2,4,7-Trihydroxy-1,5-dimethoxy-9-fluorenone [115]	<i>Dendrobium chrysotoxum</i>	Stem	Yang <i>et al.</i> , 2004
Ketone			
Dehydrovomifoliol [116]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Lignan			
7-7'-bis-(4-hydroxy-3,5-dimethoxyphenyl)-8-8'-dihydroxymethyltetrahydrofuran-4- β -D-glucoside [117]	<i>Dendrobium chrysanthum</i>	Stem	Ye <i>et al.</i> , 2004

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Dehydrodiconiferyl alcohol-4- β -D- glucoside[118]	<i>Dendrobium chrysanthum</i>	Stem	Ye <i>et al.</i> , 2004
Episyringaresinol [119]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Episyringaresinol [120]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Lioniresinol [121]	<i>Dendrobium chrysanthum</i>	Stem	Ye <i>et al.</i> , 2004
Lirioresinol A [122]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
(-)-Medioresinol [123]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
(-)-Pinoresinol [124]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Pinoresinol [125]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
Syringaresinol [126]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
	<i>Dendrobium secundum</i>	Stem	Sritularak <i>et al.</i> , 2011b
Lignan glycoside			
Acanthoside B [127]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Episyringaresinol 4''-O- β -D-glucopyranoside [128]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Erythro-1-(4-O- β -D-glucopyranosyl-3-methoxyphenyl)-2-[4-(3-hydroxypropyl)-2,6-dimethoxyphenoxy]-1,3-propanediol [129]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
(-)-(7S,8R,7'E)-4-hydroxy-3,3',5,5'-tetramethoxy-8,4'-oxyneolign-7'-ene-7,9,9'-triol 7,9' bis-O- β -D-glucopyranoside [130]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
Liriodendrin [131]	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> 2013

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
(-)-Syringaresinol-4,4'-bis- O- β -D-glucopyranoside [132]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
Syringaresinol-4-O-D- monoglucopyranoside [133]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
Long chain hydrocarbon <i>n</i> -Nonacosane[134]	<i>Dendrobium moniliforme</i>	Stem	Bi <i>et al.</i> , 2004
Naphthalene Palmarumycin JC2 [135]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Neolignan glucoside Denchryside B [136]	<i>Dendrobium chrysanthum</i>	Stem	Ye <i>et al.</i> , 2004

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Phenanthrene			
Amoenumin [137]	<i>Dendrobium amoenum</i>	Whole plant	Veerraju <i>et al.</i> , 1989
Bulbophyllanthrin [138]	<i>Dendrobium nobile</i>	Stem	Yang, Sung and Kim, 2007
Coelonin [139]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008c
	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007; Hwang <i>et al.</i> , 2010
Confusarin [140]	<i>Dendrobium chryseum</i>	Stem	Ma <i>et al.</i> , 1998
	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
Chrysotoxol A [141]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Chrysotoxol B [142]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Crystalltone [143]	<i>Dendrobium chrysotoxum</i>	Stem	Wang <i>et al.</i> , 2009
	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
Cypripedin [144]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Denbinobin [145]	<i>Dendrobium moniliforme</i>	Stem	Lin <i>et al.</i> , 2001
	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007 Ye and Zhao, 2002
Dendrochrysanene [146]	<i>Dendrobium chrysonthum</i>	Stem	Yang <i>et al.</i> , 2006b
Dendronone [147]	<i>Dendrobium cariniferum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Densifloral B [148]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
Denthysinin [149]	<i>Dendrobium thysiforum</i>	Stem	Zhang <i>et al.</i> , 2005
9,10-Dihydromoscatin [150]	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
9,10-Dihydro phenanthrene-2,4,7-triol [151]	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
4,5-Dihydroxy-2,3- dimethoxy-9,10- dihydrophenanthrene [152]	<i>Dendrobium sinense</i>	Whole plant	Chen <i>et al.</i> , 2013

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
4,5-Dihydroxy-2,6-dimethoxy-9,10-dihydrophenanthrene [153]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
4,5-Dihydroxy-3,7-dimethoxy-9,10-dihydrophenanthrene [154]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
2,5-Dihydroxy-3,4-dimethoxyphenanthrene [155]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
2,5-Dihydroxy-4,9-dimethoxyphenanthrene [156]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
3,7-Dihydroxy-2,4-dimethoxyphenanthrene [157]	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
4,5-Dihydroxy-2-methoxy-9,10-dihydrophenanthrene [158]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
4,7-Dihydroxy-2-methoxy-9,10-dihydrophenanthrene [159]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
2,7-Dihydroxy-3,4,6-trimethoxy-9,10-dihydrophenanthrene [160]	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pa 1992
2,8-Dihydroxy-3,4,7-trimethoxy-9,10-dihydrophenanthrene [161]	<i>Dendrobium nobile</i> <i>Dendrobium longicornu</i>	Stem Stem	Yang <i>et al.</i> , 2007 Hu <i>et al.</i> , 2008a

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
4,7-Dihydroxy-2,3,6-trimethoxy-9,10-dihydrophenanthrene [162]	<i>Dendrobium sinense</i>	Whole plant	Chen <i>et al.</i> , 2013
2,6-Dihydroxy-1,5,7-trimethoxyphenanthrene [163]	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
2,7-Dihydroxy-3,4,6-trimethoxyphenanthrene [164]	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pal, 1992
2,8-Dihydroxy-3,4,7-trimethoxyphenanthrene [165]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
5,7-Dimethoxyphenanthrene-2,6-diol [166]	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Ephemeranthol A [167]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007; Hwang <i>et al.</i> , 2010
Ephemeranthol C [168]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007; Hwang <i>et al.</i> , 2010
Ephemeranthoquinone [169]	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
Epheranthol B [170]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
Erianthridin [171]	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010
	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996
Fimbriatone [172]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
	<i>Dendrobium pulchellum</i>	Stem	Chanvorachote <i>et al.</i> 2013
Fimbriol B [173]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007; Hwang <i>et al.</i> , 2010

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Flaccidin (Amoenumin) [174]	<i>Dendrobium omoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999
Flavanthridin [175]	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010
Flavanthrinin [176]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008b
Hircinol [177]	<i>Dendrobium draconis</i>	Stem	Sritularak <i>et al.</i> , 2011a
	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010
2-Hydroxy-4,7-dimethoxy-9,10-dihydrophenanthrene [178]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
5-Hydroxy-2,4-dimethoxyphenanthrene [179]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
2-Hydroxy-3,4,7-trimethoxy-9,10-dihydrophenanthrene [180]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
3-Hydroxy-2,4,7-trimethoxy-9,10-dihydrophenanthrene [181]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
3-Hydroxy-2,4,7-trimethoxyphenanthrene [182]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
Loddigesiinol A [183]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Loddigesiinol B [184]	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
Lusianthridin [185]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
	<i>Dendrobium loddigesii</i>	Whole plant	Ito <i>et al.</i> , 2010
	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007; Hwang <i>et al.</i> , 2010
	<i>Dendrobium plicatile</i>	Stem	Yamaki and Honda, 1996

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
7-Methoxy-9,10-dihydro phenanthrene-2,4,5-triol [186]	<i>Dendrobium draconis</i>	Stem	Sritularak <i>et al.</i> , 2011a
5-Methoxy-7-hydroxy- 9,10-dihydro-1,4 phenanthrenequinone [187]	<i>Dendrobium draconis</i>	Stem	Sritularak <i>et al.</i> , 2011a
Moniliformin [188]	<i>Dendrobium moniliforme</i>	Stem	Lin <i>et al.</i> , 2001
Moscatin [189]	<i>Dendrobium aphyllum</i>	Whole plant	Chen <i>et al.</i> , 2008b
	<i>Dendrobium aurantiacum</i> <i>vor. denneanum</i>	Whole plant	Liu <i>et al.</i> , 2009
	<i>Dendrobium chrysanthum</i>	Stem	Yang <i>et al.</i> , 2006b
	<i>Dendrobium chrysotoxum</i>	Whole plant	Li <i>et al.</i> , 2009c
	<i>Dendrobium densiflorum</i>	Stem	Fan <i>et al.</i> , 2001
	<i>Dendrobium loddigesii</i>	Whole plant	Chen <i>et al.</i> , 1994; Ito <i>et al.</i> , 2010
	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Nuddol [190]	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pal, 1992
	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pal, 1992
Plicatol A [191]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007
	<i>Dendrobium plicatile</i>	Stem	Honda and Yamaki, 2000
Plicatol B [192]	<i>Dendrobium plicatile</i>	Stem	Honda and Yamaki, 2000
Plicatol C [193]	<i>Dendrobium plicatile</i>	Stem	Honda and Yamaki, 2000
Rotundatin [194]	<i>Dendrobium rotundatum</i>	Whole plant	Majumder and Pal, 1992
2,3,5-Trihydroxy-4,9-dimethoxyphenanthrene [195]	<i>Dendrobium nobile</i>	Stem	Yang <i>et al.</i> , 2007

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
3,4,8-Trimethoxy phenanthrene-2,5-diol [196] Phenolic compound	<i>Dendrobium nobile</i>	Stem	Hwang <i>et al.</i> , 2010
Antiarol [197]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Ethylhaematommate [198]	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
<i>p</i> -Hydroxybenzaldehyde [199]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
Methyl β -orsellinate [200]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Tachioside [201]	<i>Dendrobium denneanum</i>	Stem	Pan <i>et al.</i> , 2012

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Phenylpropanoid			
Alkyl 4'-hydroxy-transcinnamates [202]	<i>Dendrobium clavatum</i> var. <i>auranteacum</i>	Stem	Chang <i>et al.</i> , 2001
Alkyl trans-ferulates [203]	<i>Dendrobium clavatum</i> var. <i>auranteacum</i>	Stem	Chang <i>et al.</i> , 2001
Defuscin [204]	<i>Dendrobium aurantiacum</i> var. <i>denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
Docosanoyl (<i>E</i>)-ferulate [205]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
<i>n</i> -Docosyl trans-ferulate [206]	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
Ferulaldehyde [207]	<i>Dendrobium longicornu</i>	Whole plant	Li <i>et al.</i> , 2009d
Ferulic acid [208]	<i>Dendrobium secundum</i>	Stem	Sritularak <i>et al.</i> , 2011b

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
1-[4-(β -D-glucopyranosyloxy)-3,5-dimethoxyphenyl]-1-propanone [209]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
2-(<i>p</i> -Hydroxyphenyl)ethyl <i>p</i> -coumarate [210]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
3-(4-Hydroxy-3-methoxyphenyl)-2-propen-1-ol [211]	<i>Dendrobium trigonopus</i>	Stem	Hu <i>et al.</i> , 2008b
3-(3-Methoxy,4-hydroxyphenyl)-1-propanol [212]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
<i>n</i> -Octacosyl ferulate [213]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Yang <i>et al.</i> , 2006a
Salidrosol [214]	<i>Dendrobium moniliforme</i>	Stem	Bi <i>et al.</i> , 2004
Shashenoside I [215]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Syringin [216]	<i>Dendrobium aurantiacum</i> <i>var. denneanum</i>	Stem	Xiong <i>et al.</i> , 2013
Syringoside [217]	<i>Dendrobium chrysotoxum</i>	Stem	Hu <i>et al.</i> , 2012
Tetracosyl (<i>E</i>)- <i>p</i> -coumarate [218]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
Tetracosyl (<i>Z</i>)- <i>p</i> -coumarate [219]	<i>Dendrobium falconeri</i>	Stem	Sritularak and Likhitwitayawuid, 2009
<i>n</i> -Triacontyl <i>p</i> -hydroxy-cis-cinnamate [220]	<i>Dendrobium moniliforme</i>	Stem	Bi <i>et al.</i> , 2004

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Purine			
9- β -D-allofuranul syguanine [221]	<i>Dendrobium denneanum</i>	Stem	Pan <i>et al.</i> , 2012
Guanosine [222]	<i>Dendrobium denneanum</i>	Stem	Pan <i>et al.</i> , 2012
9- β -D-Ribofuranosyl-9H- purin-6-amine [223]	<i>Dendrobium longicornu</i>	Stem	Hu <i>et al.</i> , 2008a
Sesquiterpene			
Aduncin [224]	<i>Dendrobium aduncum</i>	Whole plant	Gawell and Leander, 1976
Amoenin [225]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999
Amotin [226]	<i>Dendrobium amoenum</i>	Whole plant	Majumder <i>et al.</i> , 1999
α -Dihydropicrotoxinin [227]	<i>Dendrobium moniliforme</i>	Stem	Bi <i>et al.</i> , 2004

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Dendrobane A [228]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
	<i>Dendrobium wardianu</i>	Stem	Fan <i>et al.</i> , 2013
Dendronobilin A [229]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin B [230]	<i>Dendrobium crystallium</i>	Stem	Wang <i>et al.</i> , 2009
	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin C [231]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin D [232]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin E [233]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin F [234]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin G [235]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin H [236]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin I [237]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
	<i>Dendrobium wardianu</i>	Stem	Fan <i>et al.</i> , 2013b
Dendronobilin J [238]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007b
Dendronobilin K [239]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008c

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Dendronobilin L [240]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008c
Dendronobilin M [241]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008c
Dendronobilin N [242]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2008c
Dendrowarnol A [243]	<i>Dendrobium wardianum</i>	Stem	Fan <i>et al.</i> , 2013
Dendrowarnol B [244]	<i>Dendrobium wardianum</i>	Stem	Fan <i>et al.</i> , 2013
Dendrowarnol C [245]	<i>Dendrobium wardianum</i>	Stem	Fan <i>et al.</i> , 2013
Corchoionoside C [246]	<i>Dendrobium polyanthum</i>	Stem	Hu <i>et al.</i> , 2009
Crystallinin [247]	<i>Dendrobium findlayanum</i>	Whole plant	Qin <i>et al.</i> , 2011
Findlayanin [248]	<i>Dendrobium findlayanum</i>	Whole plant	Qin <i>et al.</i> , 2011
10- β ,12,14-Trihydroxy-alloaromadetrane [249]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002



1909630293

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Sesquiterpene alkaloid			
Dendrobine [250]	<i>Dendrobium nobile</i>	Stem	Zhang <i>et al.</i> , 2007a
3-Hydroxy-2-oxodendrobine [251]	<i>Dendrobium nobile</i>	Stem	Wang <i>et al.</i> , 1985
Sesquiterpene glycoside			
Dendromoniliside A [252]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
Dendromoniliside B [253]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
Dendromoniliside C [254]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
Dendromoniliside D [255]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
Dendronobiloside A [256]	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002
Dendronobiloside B [257]	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002
Dendronobiloside C [258]	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002



190930293

Table 1 (continued)

Category and compound	Plant	Plant part	Reference
Dendronobiloside D [259]	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002
Dendronobiloside E [260]	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002
Dendroside A [261]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
	<i>Dendrobium nobile</i>	Stem	Zhao <i>et al.</i> , 2001; Ye and Zhao, 2002
Dendroside B [262]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
Dendroside C [263]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
Dendroside D [264]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002
Dendroside E [265]	<i>Dendrobium nobile</i>	Stem	Ye <i>et al.</i> , 2002a
Dendroside F [266]	<i>Dendrobium moniliforme</i>	Stem	Zhao <i>et al.</i> , 2003
	<i>Dendrobium nobile</i>	Stem	Ye <i>et al.</i> , 2002a
Dendroside G [267]	<i>Dendrobium nobile</i>	Stem	Ye and Zhao, 2002

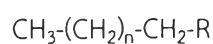


Table 1 (continued)

Category and compound	Plant	Plant part	Reference
7,12-Dihydroxy-5-hydroxymethyl-11-isopropyl-6-methyl-9-oxatricyclo [6.2.1.0 ^{2,6}]undecan-10-one-15-O- β -D-glucopyranoside (Dendromonilaside D) [268] Triterpene	<i>Dendrobium nobile</i>	Stem	Shu <i>et al.</i> , 2004
Taraxerol [269]	<i>Dendrobium aurantiacum</i>	Stem	Yang <i>et al.</i> , 2006a



1909630293

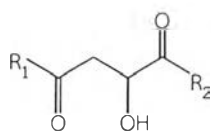


[1] Aliphatic acids:

R = COOH, n = 19-31

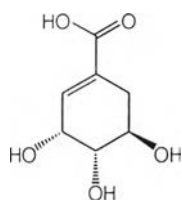
[4] Aliphatic alcohol:

R = OH, n = 22-32

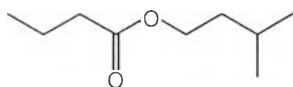


[2] Malic acid: R₁ = R₂ = OH

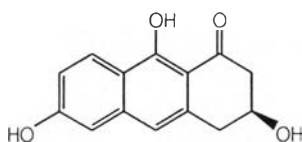
[5] Dimethyl malate: R₁ = R₂ = OMe



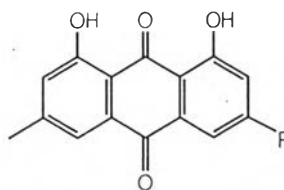
[3] (-)-Shikimic acid



[6] Isopentyl butyrate



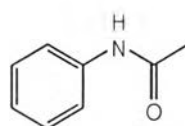
[7] 3,6,9-Trihydroxy-3,4-dihydro
anthracen-1-(2H)-one



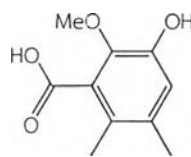
[8] Chrysophanol: R = H

[9] Emodin: R = OH

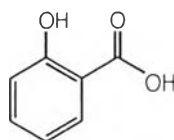
[10] Physcion: R = OMe



[11] N-Phenylacetamide



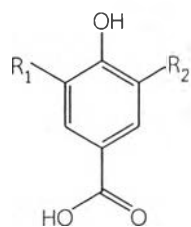
[13] 3-Hydroxy-2-methoxy-5,6-
dimethylbenzoic acid



[15] Salicylic acid



Figure 2 Structures of compounds previously isolated from *Dendrobium* species

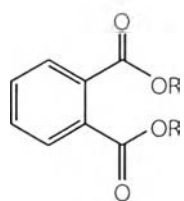


[12] Gallic acid: $R_1 = \text{OH}$, $R_2 = \text{OH}$

[14] Protocatechuic: $R_1 = \text{H}$, $R_2 = \text{OH}$
acid

[16] Syringic acid: $R_1 = \text{OMe}$, $R_2 = \text{OMe}$

[17] Vanillic acid: $R_1 = \text{H}$, $R_2 = \text{OMe}$

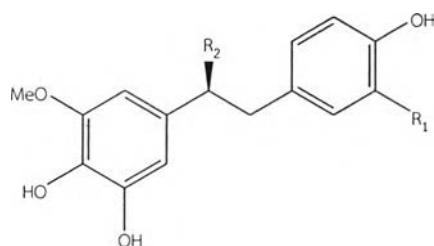


[19] Bis(2-ethylhexyl)phthalate:

$R = \text{CH}_2\text{CH}(\text{C}_2\text{H}_5)(\text{CH}_2)_3\text{CH}_3$

[20] Dibutylphthalate: $R = (\text{CH}_2)_3\text{CH}_3$

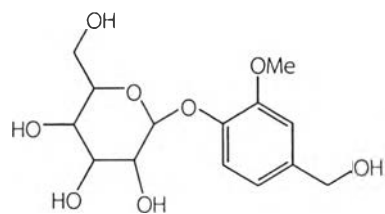
[21] Diisobutylphthalate: $R = \text{CH}_2\text{CH}(\text{CH}_3)_2$



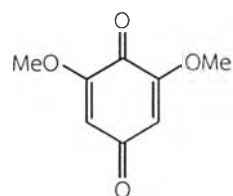
[34] Dendrocandine C: $R_1 = \text{H}$, $R_2 = \text{OMe}$

[35] Dendrocandine D: $R_1 = \text{H}$, $R_2 = \text{OCH}_2\text{CH}_3$

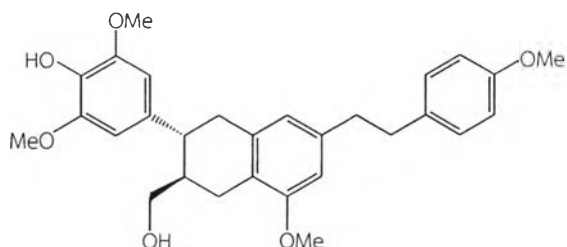
[36] Dendrocandine E: $R_1 = \text{OH}$, $R_2 = \text{H}$



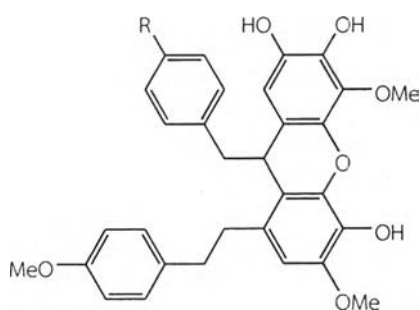
[18] Vanilloside



[22] 2,6-Dimethoxybenzoquinone

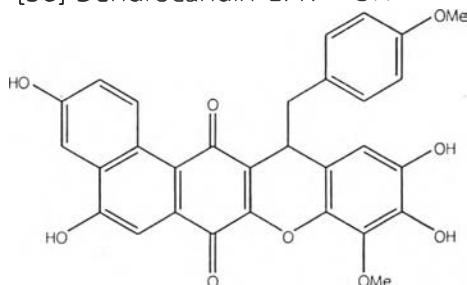


[33] Dendrocandine B



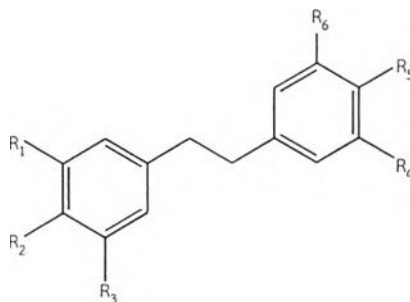
[37] Dendrocandine F: $R = \text{OMe}$

[38] Dendrocandine G: $R = \text{OH}$



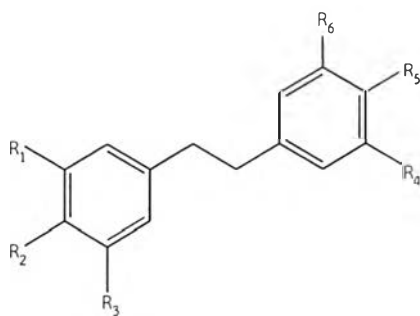
[39] Dendrocandine H

Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)

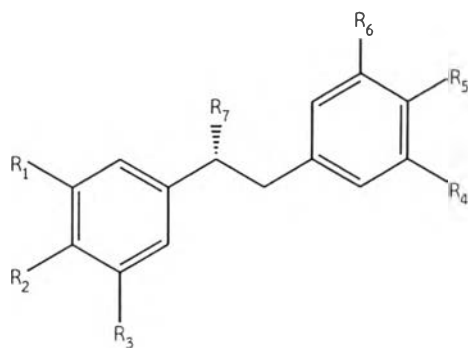


	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[23] Aloifol I	OMe	OH	OMe	OH	H	H
[24] Amoeylin	OMe	OH	OMe	H	OMe	H
[25] Betatasin	OMe	H	H	OH	H	OH
[26] Betatasin III	OH	H	OMe	H	H	OH
[27] Brittonin A	OMe	OMe	OMe	OMe	OMe	OMe
[28] Chrysotobibenzyl	OMe	OMe	OMe	OMe	OMe	H
[29] Chrysotoxine	OMe	OH	OMe	OMe	OMe	H
[30] Crepidatin	OMe	OMe	OMe	OMe	OH	H
[31] Cumulatin	OMe	OMe	OH	OH	OMe	OMe
[41] Dendrobin A	OH	OH	OMe	H	H	OMe
[45] 3,4'-Dihydroxy-5-methoxybibenzyl	OH	H	OMe	H	OH	H
[47] 3,4'-Dihydroxy-5,5'-dimethoxy Dihydrostilbene	OH	H	OMe	OMe	OH	H

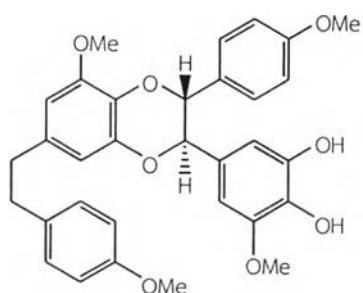




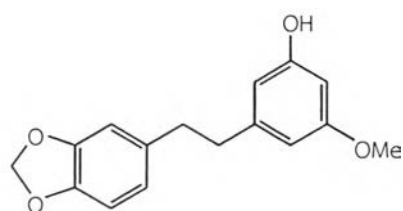
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[48] 4,5-Dihydroxy-3,3'-dimethoxybibenzyl (Dendrobin A)	OMe	OH	OH	H	H	OMe
[49] Erianin	OMe	OMe	OMe	H	OMe	OH
[50] Gignatol	OMe	H	H	H	OH	OMe
[51] 4-Hydroxy-3,5,3'-trimethoxybibenzyl	OMe	OH	OMe	H	H	OMe
[53] 5-Hydroxy-3,4,3',4',5'-pentamethoxybibenzyl	OMe	OMe	OH	OMe	OMe	OMe
[54] Isoamoenylin	OMe	OMe	OMe	H	H	OH
[59] Moscatilin	OMe	OH	OMe	H	OH	OMe
[66] 3,3',4-Trihydroxybibenzyl	OH	OH	H	H	H	OH
[67] 3,3',5-Trihydroxybibenzyl	OH	H	OH	H	H	OH
[68] 3,5,4'-Trihydroxybibenzyl	OH	H	OH	H	OH	H
[69] 4,5,4'-Trihydroxy-3,3'-dimethoxybibenzyl	OMe	OH	OH	H	OH	OMe
[70] Tristin	OH	H	OH	H	OH	OMe
[71] Dendromonilside E	OGlc	OGlc	OMe	H	OMe	H



	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇
[32] Dendrocandin A	OMe	OH	OH	H	H	H	OMe
[42] Dendrophenol	OMe	OH	OMe	OH	OH	H	H
[44] 3,4-Dihydroxy-5,4'-dimethoxybibenzyl	OH	OH	OMe	H	OMe	H	H
[46] 4,4'-Dihydroxy-3,5-dimethoxybibenzyl	OMe	OH	OMe	H	OH	H	H
[55] Loddigesinol C	OMe	OH	OMe	H	OH	OMe	OMe
[58] 3-O-Methylgigantol	OMe	H	OH	OMe	OMe	H	H

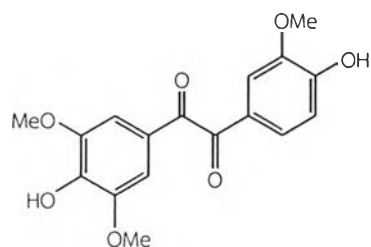


[40] Dendrocandin I

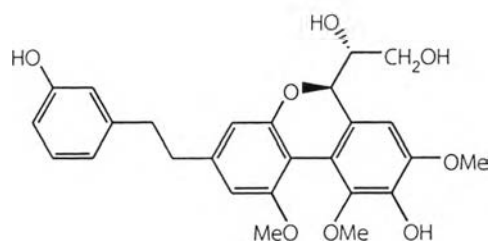


[43] Densiflorol A

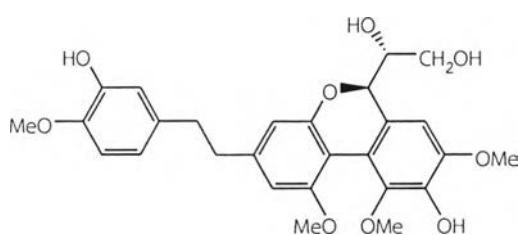
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



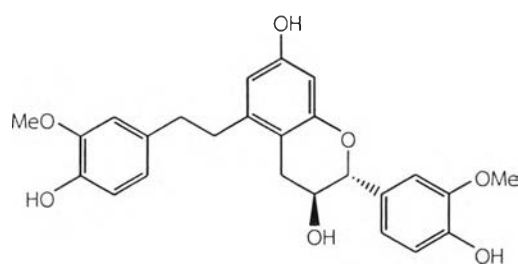
[56] Loddigesiinol D



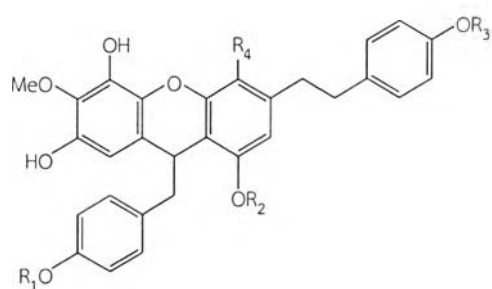
[57] Longicornuol A



[64] Trigonopol A



[65] Trigonopol B



[77] Dencryol A:

 $R_1 = \text{Me}, R_2 = R_3 = R_4 = \text{H}$

[78] Dencryol B:

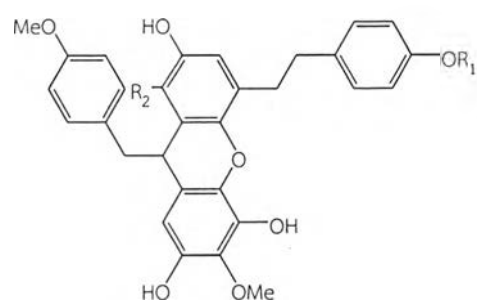
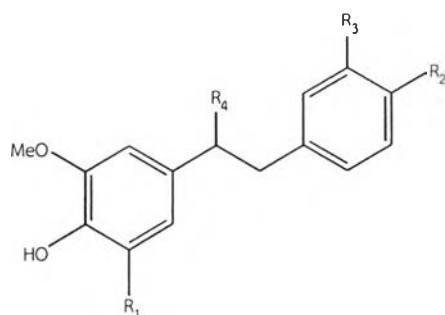
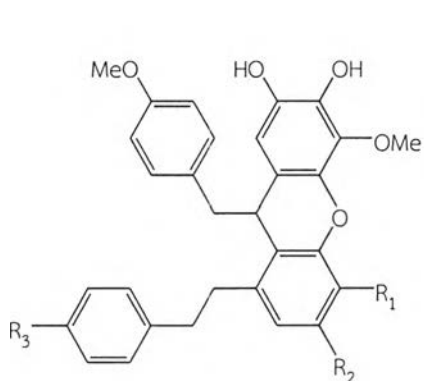
 $R_1 = \text{H}, R_2 = R_3 = \text{Me}, R_4 = \text{OH}$
[81] Dengaol A: $R_1 = R_2 = \text{H}$ [82] Dengaol B: $R_1 = \text{Me}, R_2 = \text{OMe}$

Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



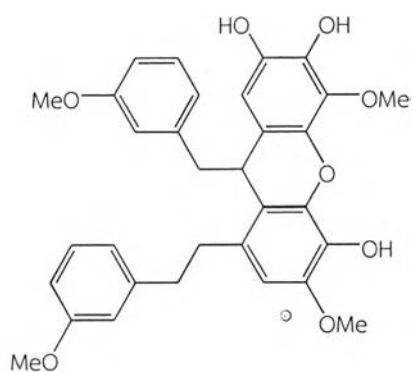
	R ₁	R ₂	R ₃	R ₄
[52] 4-[2-(3-Hydroxyphenol)-1-methoxyethyl]-2,6-dimethoxyphenol	OMe	H	OH	OMe
[60] Nobilin A	OH	H	OMe	OMe
[61] Nobilin B	OMe	OH	OMe	OMe
[62] Nobilin C	OMe	OMe	OMe	OMe
[63] Nobilin D	OMe	OH	OMe	OH



[79] Dendrofalconerol A:

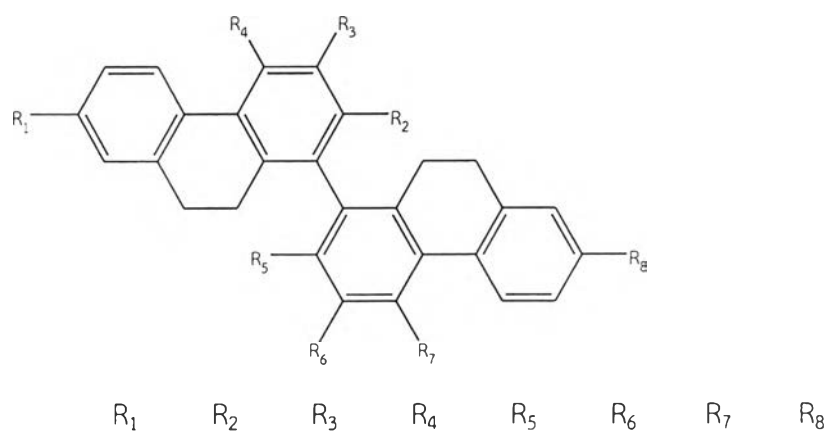
R₁ = OH, R₂ = R₃ = OMe

[80] Dendrofalconerol B:

R₁ = H, R₂ = R₃ = OH

[83] Nobilin E

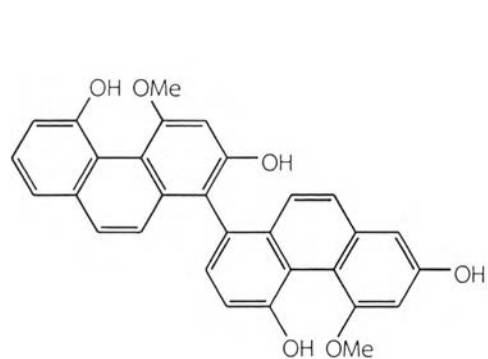
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



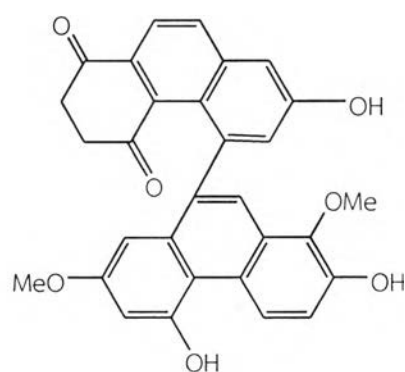
[72] 2,2'-Dihydroxy-3,3',4,4', 7,7'-hexamethoxy -9,9', 10,10'-tetrahydro-1,1'-biphenanthrene

[73] 2,2'-Dimethoxy-4,4',7,7'-tetrahydroxy-9,9',10,10'-tetrahydro-1,1'-biphenanthrene

[76] Flavanthrin

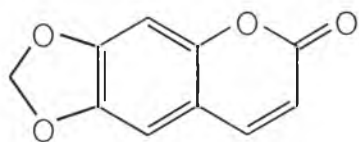


[74] Denthysinol

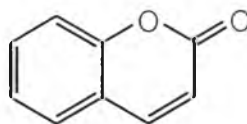


[75] Denthysinone

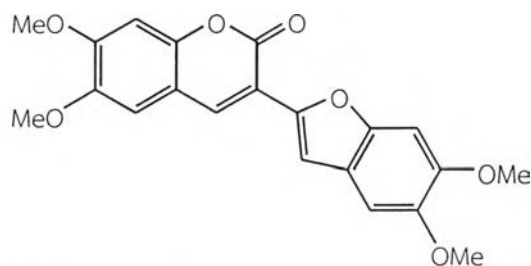
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



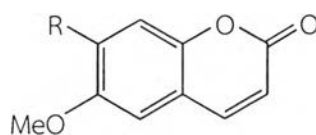
[84] Ayapin



[85] Coumarin

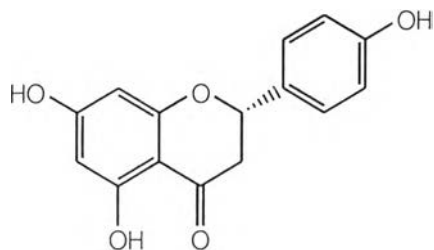


[86] Denthysin

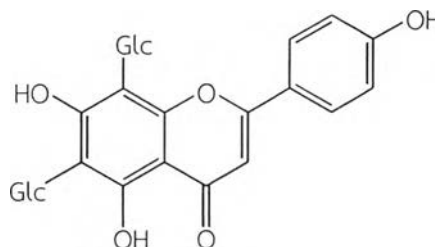


[87] Scoparone: R = OMe

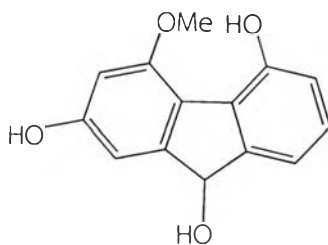
[88] Scopoletin: R = OH



[89] Naringenin: R = H

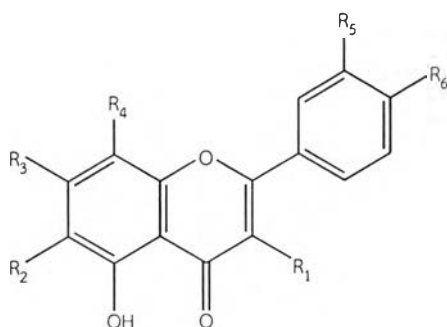


[100] Vicenin-2

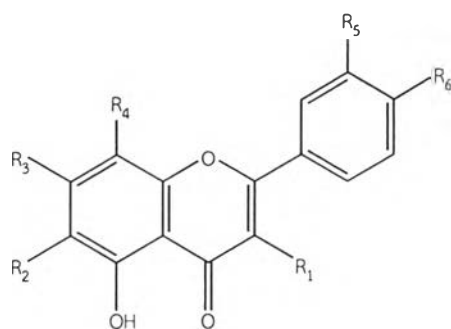


[110] Denchrysan B

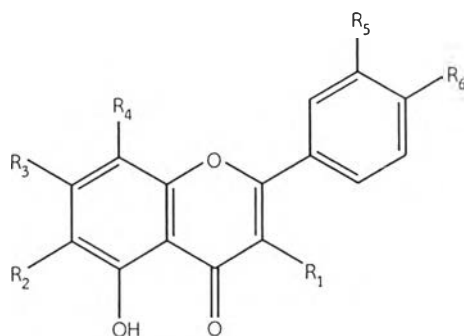
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



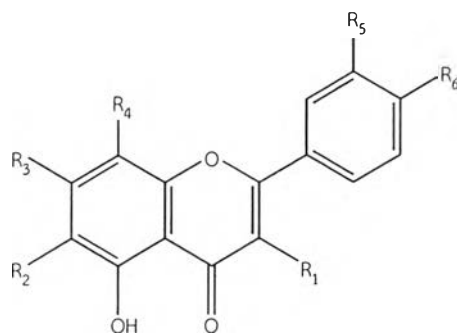
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[90] Apigenin	H	H	OH	H	H	OH
[91] 5,6-Dihydroxy-4'-methoxy-flavanone	H	OH	H	H	H	OMe
[92] Luteolin	H	H	OH	H	OH	OH
[93] 6-C-(α -Arabinopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -galactopyranosyl]apigenin	H	α -Ara	OH	β -Gal-O- α -Rha	H	OH
[94] 6-C-(α -Arabinopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -glucopyranosyl]apigenin	H	α -Ara	OH	β -Glc-O- α -Rha	H	OH



	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[95] 6'''-Glucosyl-vitexin	Glc-O-Glc	H	OH	OGlc	H	H
[96] Isoschaftoside	H	α -Ara	OH	β -Glc	H	OH
[97] Isoviolanthin	H	Rha	OH	Glc	H	OH
[98] 6-C-[(2-O- α -Rhamnopyranosyl)- β -glucopyranosyl]-8-C-(α -arabinopyranosyl)apigenin	H	β -Glc-O- α -Rha	OH	α -Ara	H	OH
[99] 6-C-(β -Xylopyranosyl)-8-C-[(2-O- α -rhamnopyranosyl)- β -glucopyranosyl]apigenin	H	β -Xyl	OH	β -Gal-O- α -Ara	H	OH
[101] Kaempferol	OH	H	OH	H	H	OH

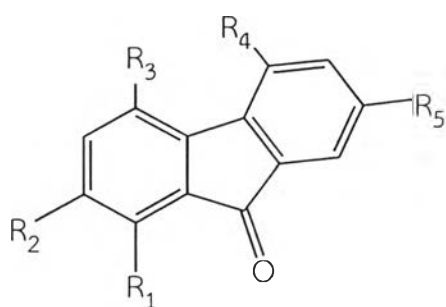


	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[102] Kaempferol- 3-O- α -L- rhamnopyranoside	O-Rha	H	O-Rha	H	H	OH
[103] Kaempferol- 3,7-O-di- α -L- rhamnopyranoside	O-Rha	H	OH	H	H	OH
[104] Kaempferol- 3-O- α -L- rhamnopyranosyl- (1 \rightarrow 2)- β -D- glucopyranoside	O-Rha-Glc	H	OH	H	H	OH
[105] Kaempferol- 3-O- α -L- rhamnopyranosyl- (1 \rightarrow 2)- β -D- xylopyranoside	O-Rha-Xyl	H	OH	H	H	OH

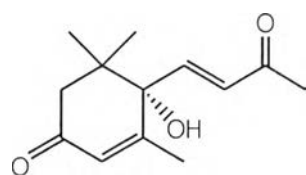


	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[106] Quercetin-3- <i>O</i> - α -L- rhamnopyranoside	O-Rha	H	OH	H	OH	OH
[107] Quercetin-3- <i>O</i> - α -L-rham nopyranosyl- (1 \rightarrow 2)- β -D- xylopyranoside	O-Rha-Xyl	H	OH	H	OH	OH

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



	R ₁	R ₂	R ₄	R ₃	R ₅
[108] Denchrysan A	H	OH	OMe	OH	OH
[110] Dendroflorin	OH	H	OMe	OH	OH
[111] Dengibsin	H	OH	OH	OMe	H
[112] Nobilone	H	OH	OMe	H	OH
[113] 1,4,5-Trihydroxy-7-methoxy-9H-fluoren-9-one	OH	H	OH	OH	OMe
[114] 2,4,7-Trihydroxy-5-methoxy-9-fluorenone	H	OH	OH	OMe	OH
[115] 2,4,7-Trihydroxy-1,5-dimethoxy-9-fluorenone	OH	OMe	OH	OH	OMe



[116] Dehydrovomifoliol

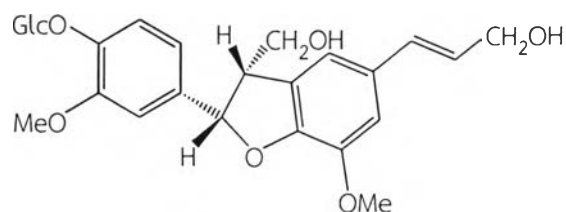
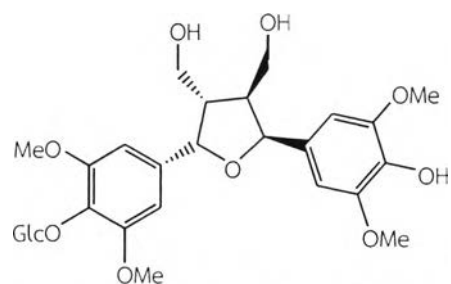
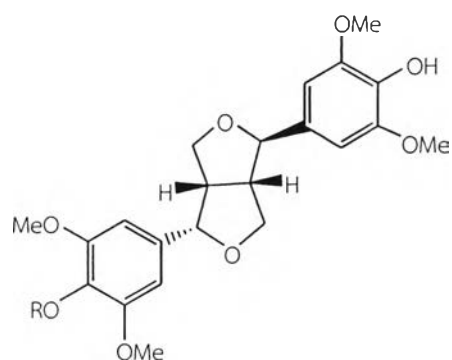
[117] 7,7'-bis-(4-hydroxy-3,5-dimethoxyphenyl)-8,8'-dihydroxymethyltetrahydrofuran-4- β -D-glucoside

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



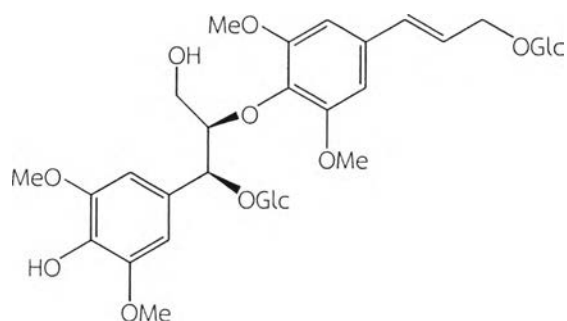
[118] Dehydroniciferyl alcohol-4- β -D-glucoside



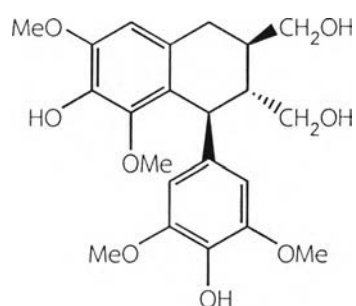
[119] Episingaresinol: R = H

[122] Lirioresinol A

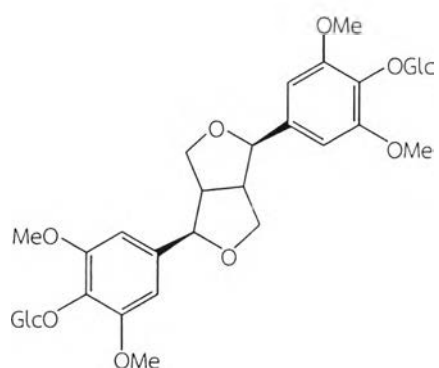
[128] Episingaresinol 4''-O- β -D-glucopyranoside: R = β -D-Glucose



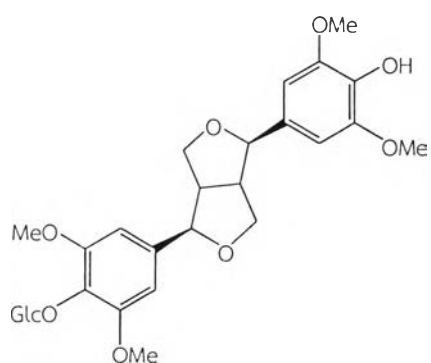
[130] (-)-(7S,8R,7'E)-4-hydroxy-3,3',5,5'-tetramethoxy-8,4'-oxyneolign-7'-ene-7,9,9'-triol-7,9'-bis-O- β -D-glucopyranoside



[121] Lioniresinol

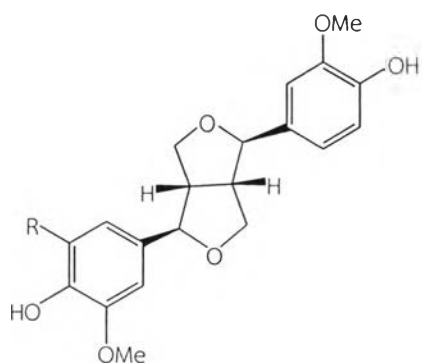


[132] (-)-Syringaresinol-4,4'-bis-O- β -D-glucopyranoside



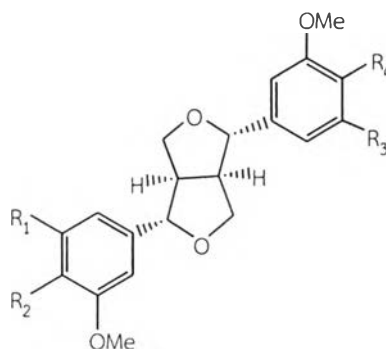
[133] Syringaresinol-4-O-D monoglucopyranoside

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



[123] (-)-Medioresinol: R = OMe

[124] (-)-Pinoresinol: R = H



[125] Pinoresinol:

R₁ = H, R₂ = OH, R₃ = H, R₄ = OH

[126] Syringaresinol:

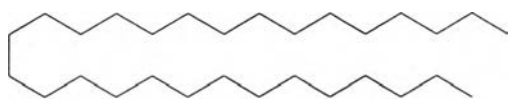
R₁ = OMe, R₂ = OH, R₃ = OMe, R₄ = OH

[127] Acanthoside B:

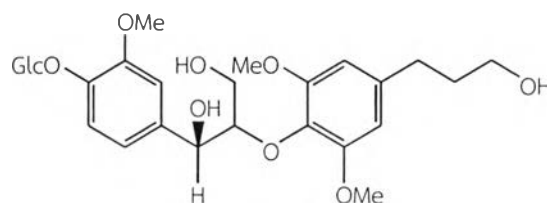
R₁ = OMe, R₂ = OGlc, R₃ = OMe, R₄ = OH

[131] Liriodendrin:

R₁ = OMe, R₂ = OGlc, R₃ = OMe, R₄ = OGlc

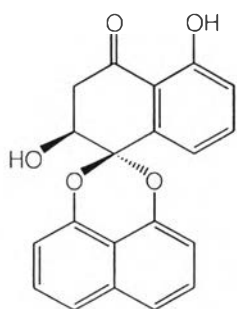


[134] *n*-Nonacosane

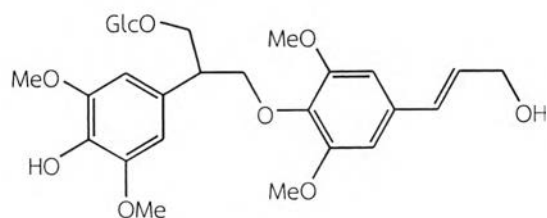


[129] Erythro-1-(4-*O*- β -D-glucopyranosyl-3-methoxyphenyl)-2-[4-(3-hydroxypropyl)-2,6-dimethoxyphenoxy]-1,3-propanediol

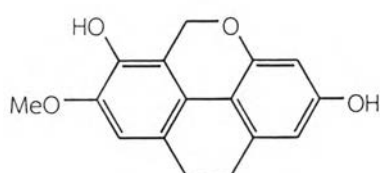
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



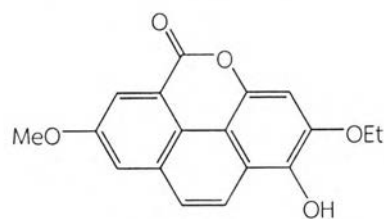
[135] Palmarumycin JC2



[136] Denchryside B

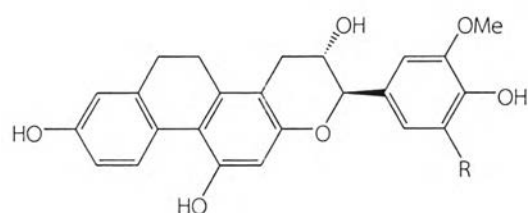


[137] Amoenumin



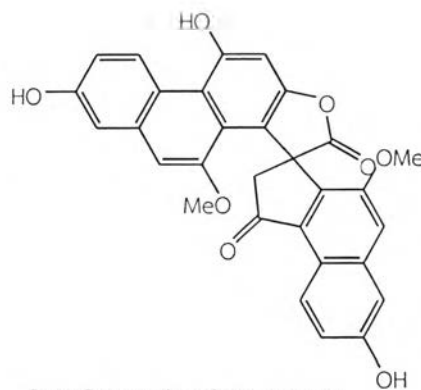
[143] Crystalltone

[174] Flaccidin

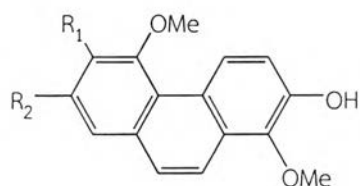


[141] Chrysotoxol A: R = H

[142] Chrysotoxol B: R = OMe



[146] Dendrochrysanene

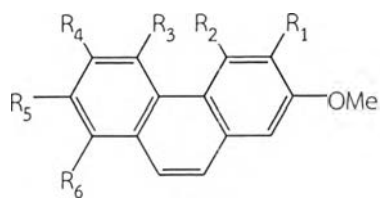


[140] Confusarin

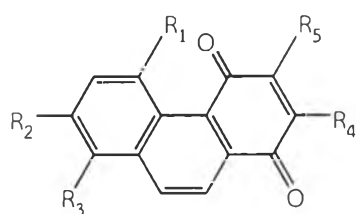
[163] 2,6-Dihydroxy-1,5,7-trimethoxyphenanthrene

R ₁	R ₂
OMe	OH
OH	OMe

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)

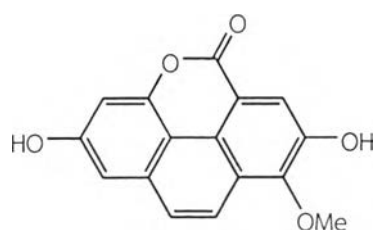


	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
[138] Bulbophyllanthrin	OH	OMe	OH	H	H	H
[149] Denthyrsinin	OH	OMe	H	H	OH	OMe
[179] 5-Hydroxy-2,4-dimethoxy phenanthrene	H	OMe	OH	H	H	H
[181] 3-Hydroxy-2,4,7-trimethoxy-9,10-Dihydrophenanthrene	OMe	H	H	OMe	H	OH
[182] 3-Hydroxy-2,4,7-trimethoxy phenanthrene	OH	OMe	H	H	OMe	H

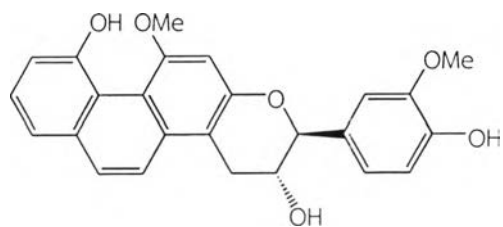


	R ₁	R ₂	R ₃	R ₄	R ₅
[144] Cyripedin	H	OH	OMe	OMe	H
[145] Densifloral B	H	OH	H	OMe	H
[148] Denbinobin	OH	OMe	H	H	OMe

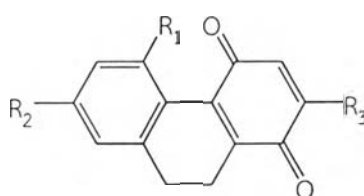
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



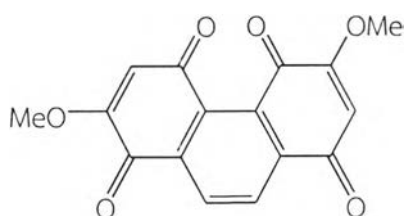
[172] Fimbriatone



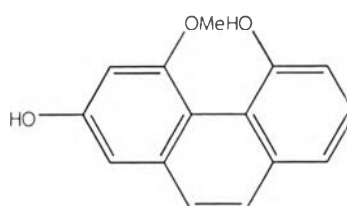
[184] Loddigesiinol B



	R ₁	R ₂	R ₃
[147] Dendronone	OH	OMe	H
[169] Ephemeranthoquinone	H	OH	OMe
[187] 5-Methoxy-7-hydroxy-9,10-dihydro-1,4-phenanthrenequinone	OMe	OH	H

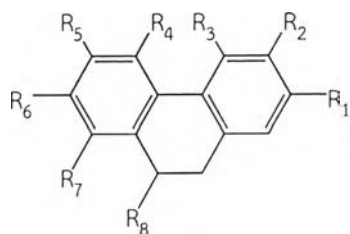


[188] Moniliformin



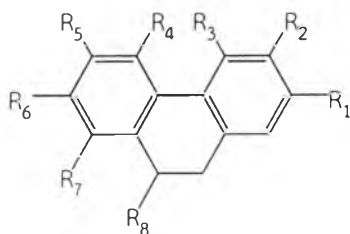
[189] Moscatin

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



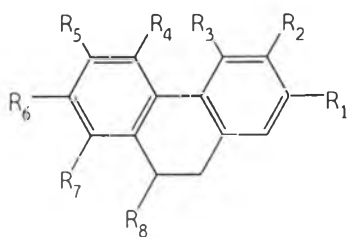
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
[139] Coelonin	OH	H	OMe	H	H	OH	H	H
[150] 9,10-Dihydromoscatin	H	H	OH	OMe	H	OH	H	H
[151] 9,10-Dihydrophenanthrene-2,4,7-triol	OH	H	OH	H	H	OH	H	H
[152] 4,5-Dihydroxy-2,3-dimethoxy-9,10-dihydrophenanthrene	OMe	OMe	OH	OH	H	H	H	H
[153] 4,5-Dihydroxy-2,6-dimethoxy-9,10-dihydrophenanthrene	OMe	H	OH	OH	OMe	H	H	H
[154] 4,5-Dihydroxy-3,7-dimethoxy-9,10-dihydrophenanthrene	H	OMe	OH	OH	H	OMe	H	H
[158] 4,5-Dihydroxy-2-methoxy-9,10-dihydrophenanthrene	OMe	H	OH	OH	H	H	H	H

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



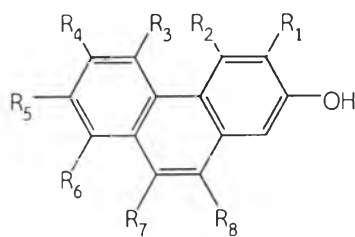
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
[159] 4,7-Dihydroxy-2-methoxy-9,10-dihydrophenanthrene	OMe	H	OH	H	H	OH	H	H
[160] 2,7-Dihydroxy-3,4,6-trimethoxy-9,10-dihydrophenanthrene	OH	OMe	OMe	H	OMe	OH	H	H
[161] 2,8-Dihydroxy-3,4,7-trimethoxy-9,10-dihydrophenanthrene	OH	OMe	OMe	H	H	OMe	OH	H
[162] 4,7-Dihydroxy-2,3,6-trimethoxy-9,10-dihydrophenanthrene	OMe	OMe	OH	H	OMe	OH	H	H
[167] Ephemeranthol A	OH	H	H	OH	OMe	OMe	H	H
[168] Ephemeranthol C	OH	OH	OMe	OH	H	H	H	H
[171] Erianthridin	OH	OMe	OMe	H	H	OH	H	H
[175] Flavanthridin	OH	H	H	OMe	OH	OMe	H	H
[177] Hircinol	OH	H	OMe	OH	H	H	H	H

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



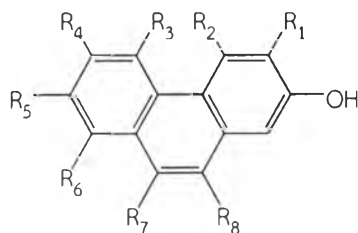
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
[178] 2-Hydroxy-4,7-dimethoxy-9,10-dihydrophenanthrene	OH	H	OMe	H	H	OMe	H	H
[185] Lusianthridin	OMe	H	OH	H	H	OH	H	H
[186] 7-Methoxy-9,10-dihydrophenanthrene-2,4,5-triol	OH	H	OH	OH	H	OMe	H	H
[193] Plicatol C	OH	H	OMe	OH	H	H	H	OH
[194] Rotundatin	OH	H	OMe	OH	H	H	H	OH

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)

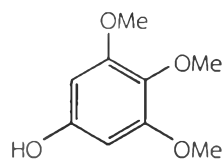


	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
[155] 2,5-Dihydroxy-3,4-dimethoxyphenanthrene	OMe	OMe	OH	H	H	H	H	H
[156] 2,5-Dihydroxy-4,9-dimethoxyphenanthrene	H	OMe	OH	H	H	H	OMe	H
[157] 3,7-Dihydroxy-2,4-dimethoxyphenanthrene	H	H	OMe	OH	OMe	H	H	H
[164] 2,7-Dihydroxy-3,4,6-trimethoxyphenanthrene	OMe	OMe	H	OMe	OH	H	H	H
[165] 2,8-Dihydroxy-3,4,7-trimethoxyphenanthrene	OMe	OMe	H	H	OMe	OH	H	H
[166] 5,7-Dimethoxyphenanthrene-2,6-diol	H	H	OMe	OH	OMe	H	H	H
[170] Epheranthol B	H	H	OMe	OH	OMe	H	H	H
[173] Fimbriol B	OH	OMe	OH	H	H	H	H	H
[176] Flavanthrinin	H	H	OMe	H	OH	H	H	H
[180] 2-Hydroxy-3,4,7-trimethoxy-9,10-dihydrophenanthrene	OMe	OMe	H	H	OMe	H	H	H

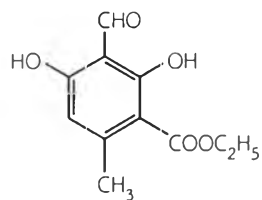
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
[183] Loddigesiinol A	H	OMe	OMe	H	H	H	OH	H
[190] Nudol	OMe	OMe	H	H	OH	H	H	H
[191] Plicatol A	H	OMe	OH	H	H	H	OMe	OMe
[192] Plicatol B	H	OMe	OH	H	H	H	H	H
[195] 2,3,5-Trihydroxy -4,9-dimethoxyphenan threne	OH	OMe	OH	H	H	H	OMe	H
[196] 3,4,8-Trimethoxy phenanthrene- 2,5-diol	OMe	OMe	OH	H	H	OMe	H	H



[197] Antiarol



[199] Ethylhaematommate

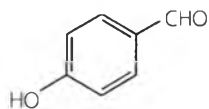
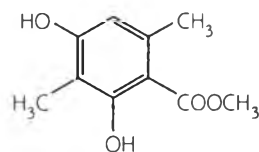
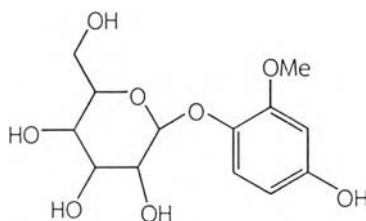
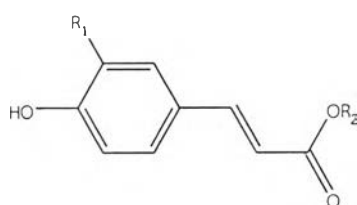
[198] *p*- Hydroxybenzaldehyde[200] Methyl β -orsellinate

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



[201] Tachioside



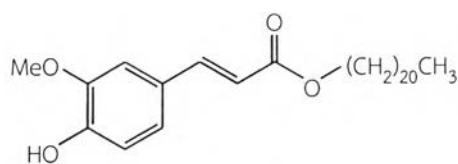
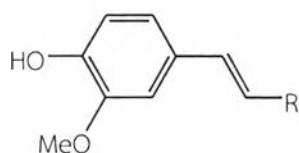
[202] Alkyl 4'-hydroxy-*trans*-cinnamates: $R_1 = \text{H}$, $R_2 = \text{C}_n\text{H}_{2n+1}$, $n = 22-32$

[203] Alkyl *trans*-ferulates: $R_1 = \text{OMe}$, $R_2 = \text{C}_n\text{H}_{2n+1}$, $n = 18-28, 30$

[204] Defuscin: $R_1 = \text{OMe}$, $R_2 = (\text{CH}_2)_{27}\text{CH}_3$

[213] *n*-Octacosyl ferulate : $R_1 = \text{H}$, $R_2 = (\text{CH}_2)_{29}\text{CH}_3$

[220] *n*-Triacontyl *p*-hydroxy-*cis*-cinnamate: $R_1 = \text{H}$, $R_2 = \text{C}_n\text{H}_{2n+1}$, $n = 30$

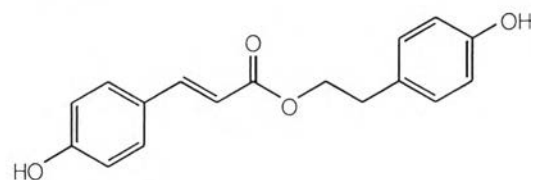
[205] Docosanoyl (*E*)-ferulate

[206] *n*-Docosyl *trans*-ferulate:

$R = \text{COOCH}_2(\text{CH}_2)_{20}\text{CH}_3$

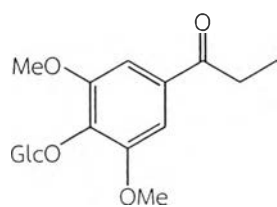
[207] Ferulaldehyde: $R = \text{CHO}$

[208] Ferulic acid: $R = \text{COOH}$

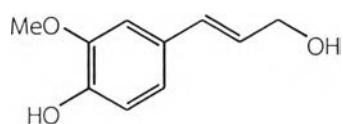


[210] 2-(*p*-Hydroxyphenyl) ethyl *p*
coumarate

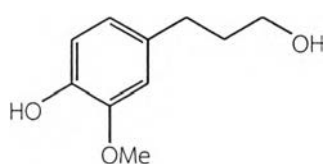
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



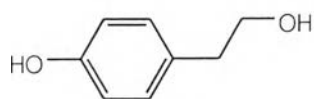
[209] 1-[4-(β -D-glucopyranosyloxy)-3,5-dimethoxyphenyl]-1-propanone



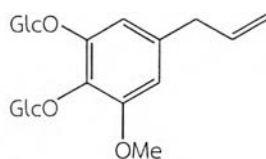
[211] 3-(4-Hydroxy-3-methoxyphenyl)-2-propen-1-ol



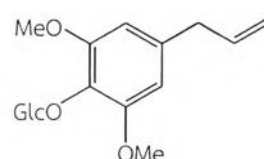
[212] 3-(3-Methoxy,4-hydroxyphenyl)-1-propanol



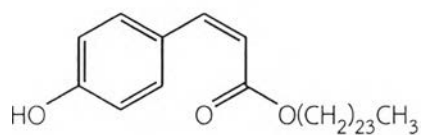
[214] Salidrosol



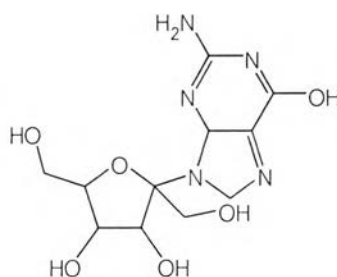
[215] Shashenoside I



[216] Syringin

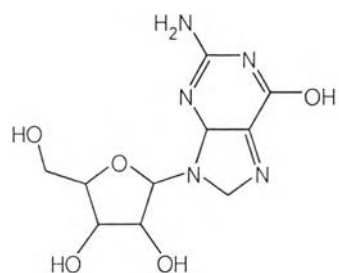


[219] Tetracosyl (*Z*)-*p*-coumarate

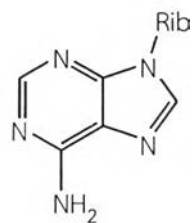


[221] 9- β -D-allofuranosylsyguanine

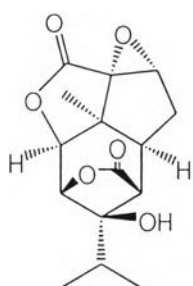
Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)



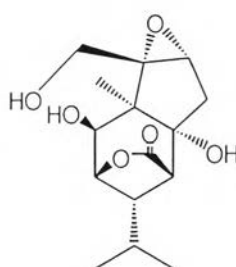
[222] Guanosine



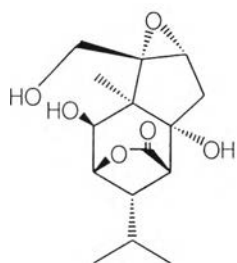
[223] 9-β-D-Ribofuranosyl-9H-purin-6-amine



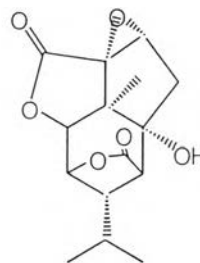
[224] Aduncin



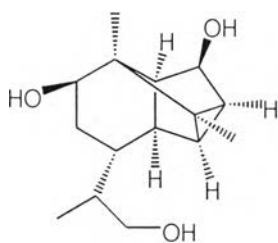
[225] Amoenin



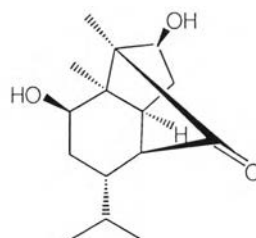
[226] Amotin



[227] α-Dihydropicrotoxinin

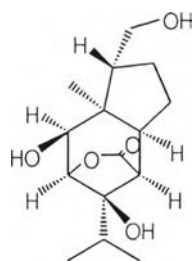


[228] Dendrobane A

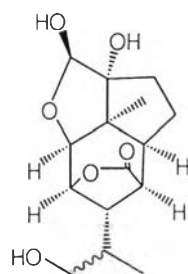


[229] Dendronobilin A

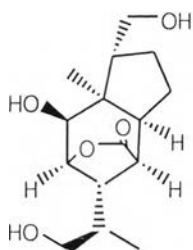
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



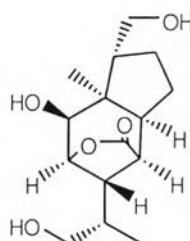
[230] Dendronobilin B



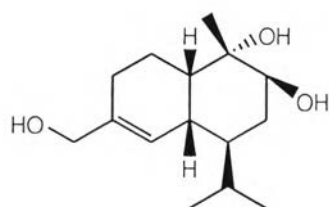
[231] Dendronobilin C



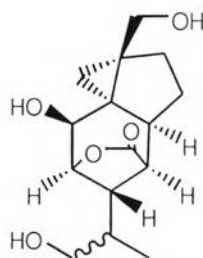
[232] Dendronobilin D



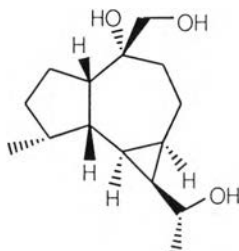
[233] Dendronobilin E



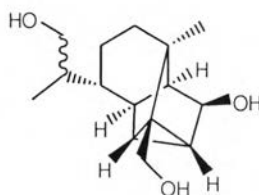
[234] Dendronobilin F



[235] Dendronobilin G

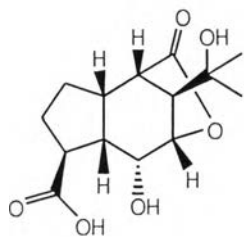


[236] Dendronobilin H

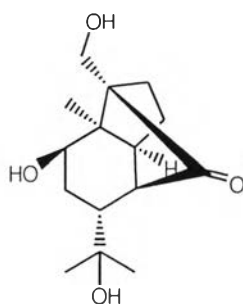


[237] Dendronobilin I

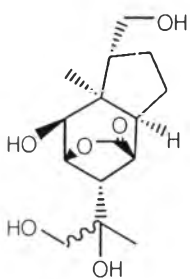
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



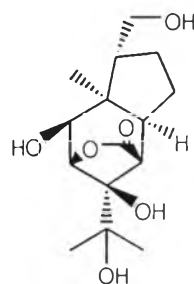
[238] Dendronobilin J



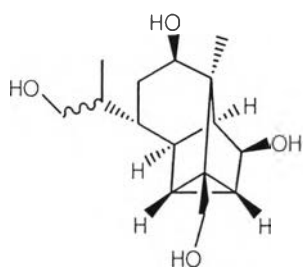
[239] Dendronobilin K



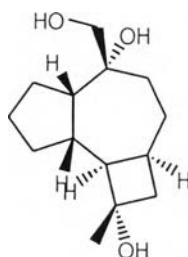
[240] Dendronobilin L



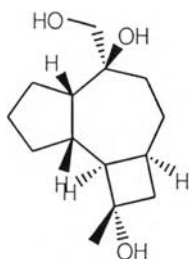
[241] Dendronobilin M



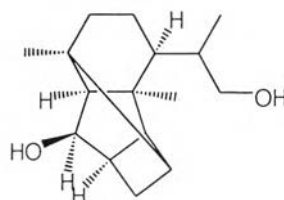
[242] Dendronobilin N



[243] Dendrowardol A

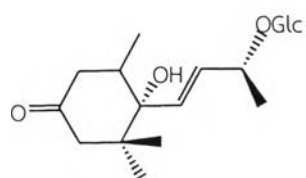


[244] Dendrowardol B

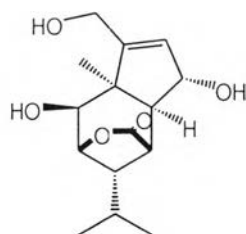


[245] Dendrowardol C

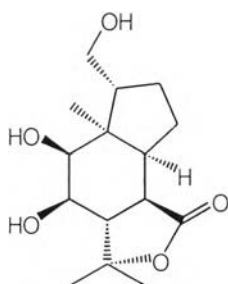
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



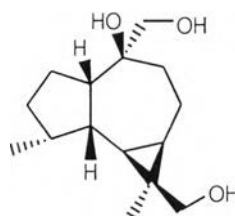
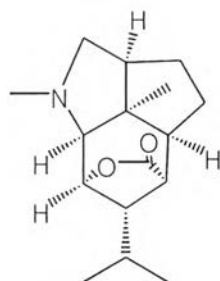
[246] Corchoionoside C



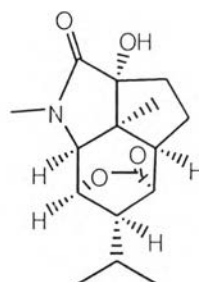
[247] Crystallinin



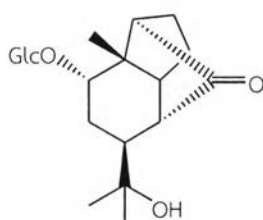
[248] Findlayanin

[249] 10 β ,12,14-Trihydroxyalloaromadendrane

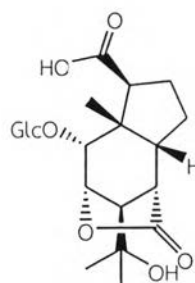
[250] Dendrobine



[251] 3-Hydroxy-2-oxodendrobine

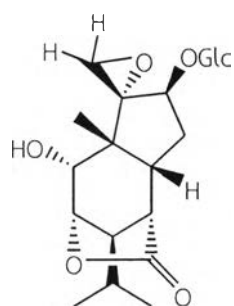


[252] Dendromoniliside A

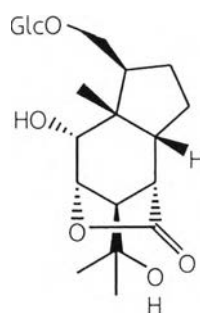


[253] Dendromoniliside B

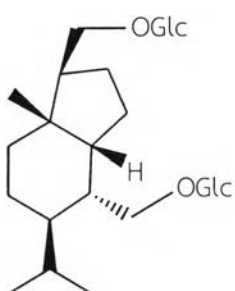
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



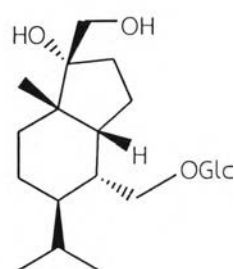
[254] Dendromonilide C



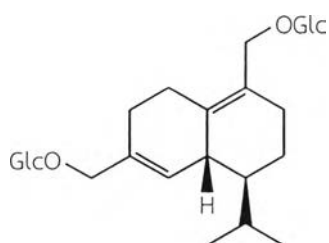
[255] Dendromonilide D



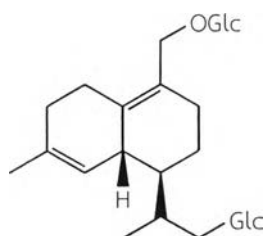
[256] Dendronobiloside A



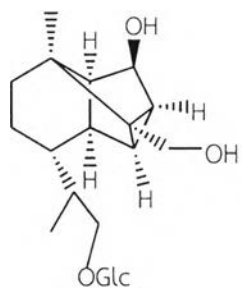
[257] Dendronobiloside B



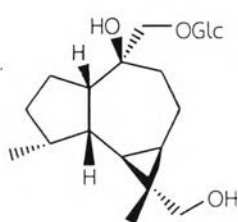
[258] Dendronobiloside C



[259] Dendronobiloside D

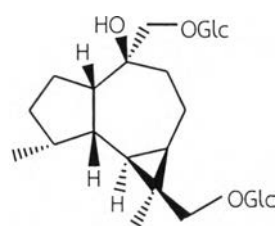


[260] Dendronobiloside E

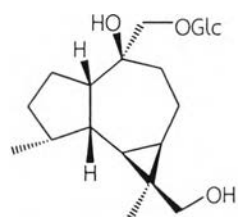


[261] Dendroside A

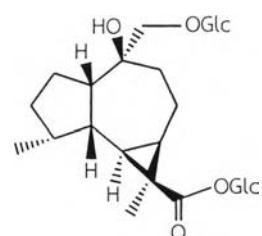
Figure 2 Structures of compounds previously isolated from *Dendrobium* species
(continued)



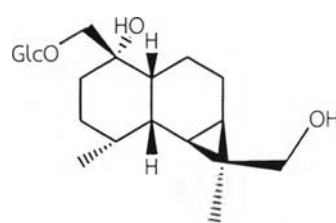
[262] Dendroside B



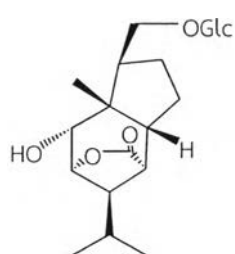
[263] Dendroside C



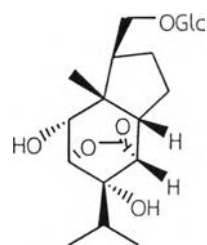
[264] Dendroside D



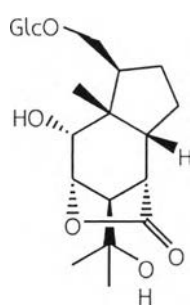
[265] Dendroside E



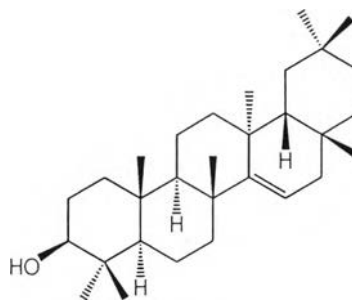
[266] Dendroside F



[267] Dendroside G



[268] Dendromonilide D



[269] Taraxerol

Figure 2 Structures of compounds previously isolated from *Dendrobium* species (continued)

2. Traditional uses and biological activities of *Dendrobium* species

Orchids have been used as a source of herbal remedies in China since 2800 B.C. Chinese were certainly the first to cultivate orchids and describe them for medicinal uses (Bulpitt., 2005). The well-known formulation, Shi-Hu, comprises several *Dendrobium* species including *D. loddigesii*, *D. fimbriatum*, *D. chrysanthum*, *D. candidum*, and *D. nobile*. It is included in the Chinese pharmacopoeia and considered as an important remedy for kidney, lung, and stomach diseases, fever, red tongue, dry mouth, swelling, atrophic gastritis, and hyperglycemia (Hossain., 2011).

Several biological activities of the compounds isolated from *Dendrobium* plants have been reported, for example, antioxidative, antiplatelet aggregation, anti-inflammatory, immunomodulatory, and cytotoxic effects (Gutierrez., 2010).

Several studies on antioxidative property showed that the bibenzyl derivatives and phenanthrenes obtained from *Dendrobium* plants were potent antioxidants. For example, crepidatin [30], gigantol [50], moscatilin [59], tristin [70], confusarin [140], and moscatin [189] showed stronger antioxidative activity than BHA by the ferric thiocyanate method (Ono *et al.*, 1995). Chrysotoxine [29], crepidatin [30], moscatilin [59], nobilin D [63], nobilin E [83], and dendroflorin [110], bibenzyl and fluorenone derivatives, which were isolated from *D. nobile*, exhibited significant free radical scavenging activity higher than or equivalent to vitamin C in the DPPH assay. In the ORAC assay, chrysotoxine [29], crepidatin [30], gigantol [50], moscatilin [59], dendroflorin [110], nobilin D [63], and nobilone [112] showed antioxidant activity higher than vitamin C (Zhang *et al.*, 2007a). From *D. candidum*, dendrocandins C [34], D [35], and E [36] were evaluated for their antioxidative potencies by DPPH free radical scavenging assay. The results showed that

dendrocandin E [36] had significant scavenging activity while dendrocandin C [34] and D [35] were moderate antioxidants (Li *et al.*, 2009a). The phenanthrene derivative named 7-methoxy-9,10-dihydrophenanthrene-2,4,5-triol [186], which was isolated from *D. draconis*, exhibited comparable antioxidant potency to Trolox when tested by the DPPH radical scavenging assay (Sritularak *et al.*, 2011a).

From *D. densiflorum*, the bibenzyl derivatives, gigantol [50] and moscatilin [59], and the coumarins scoparone [87] and scopoletin [88], were preliminarily investigated for their antiplatelet aggregation on SD rat platelet *in vitro*, and the results showed that these compounds possessed antiplatelet aggregation activity (Fan *et al.*, 2001). Moscatilin [59] and moscatin [189] were found to have strong inhibitory effect to arachidonic acid and collagen induced platelet aggregations (Chen *et al.*, 1994).

In the anti-inflammation studies, the compounds isolated from *D. nobile* were examined for inhibitory effects on lipopolysaccharides-induced nitric oxide generation in macrophage cells (RAW 264.7). The results indicated that the 9,10-dihydrophenanthrene structures, such as, coelonin [139], ephemeranthal A [167], erianthridin [171], and lusianthridin [185] showed more potent inhibitory activity than phenanthrenes and bibenzyls, such as, moscatilin [59], and fimbriol-B [173] (Hwang *et al.*, 2010). In addition, another study on inhibitory effects on nitric oxide production also showed the strong inhibitory activities of nobilin D [63], E [83], and dendroflorin [110], which were more potent than that of resveratrol (Zhang *et al.*, 2007a).

In a preliminary *in vitro* biological evaluation, it was found that dendrosides D-G [264-267], the sesquiterpene glycosides isolated from *D. nobile*, stimulated the

proliferation of murine T and/or B lymphocytes (Ye and Zhao., 2002), confirming another study which described the stimulatory activity of dendronobiloside A [256] from *D. nobile* on the proliferation of B lymphocytes (Zhao *et al.*, 2001).

Regarding cytotoxicity, many compounds isolated from *Dendrobium* plants, interestingly, were reported to have this activity. The bibenzyl derivative erianin [49], which was isolated from *D. chrysotoxum*, was assessed for cytotoxic activity against A549 (human lung carcinoma) and HL-60 (human promyelocytic leukemia) cell lines. This compound, even at the low concentration of 10 μ M, exhibited cytotoxicity against these cell lines (Li *et al.*, 2001; Hu *et al.*, 2012). The compounds from *D. gratiosissimum*, which were gigantol [50], moscatilin [59], dengraol A [81] and B [82], displayed inhibitory activity on the proliferation on HL-60 cells (Zhang *et al.*, 2008a). Two phenanthrenes from *D. nobile*, denbinobin [145] and 4,7-dihydroxy-2-meyhoxy-9,10-dihydrophenanthrene [159], were found to be cytotoxic against A549, SK-OV-3 (human ovary adenocarcinoma), and HL-60 cell lines (Lee *et al.*, 1995). Three fluorenones obtained from *D. chrysotoxum*, denchrysan A [108], dendroflorin [110] and 1,4,5-trihydroxy-7-methoxy-9H-fluorene-9-one [113], exhibited cytotoxicity against BEL-7402 (human hepatoma) cell line (Chen *et al.*, 2008c). Furthermore, from *D. thyrsiflorum*, denthysin [86] and the phenanthrene derivatives named denthysinol [74], denthysinone [75], and denthysinin [149] were found to be cytotoxic against Hela (cervical carcinoma), K-562 (human acute myelocytic leukemia), and MCF-7 (human breast adenocaecinoma) cell lines (Zhang *et al.*, 2005). Moscatilin, [59] a well-known bibenzyl derivative found in several species of *Dendrobium*, exerted potent cytotoxic effect against cancer cell lines derived from various tissue origins, such as H23, NCI-H187 (lung cancer), and KB (oral cancer)

(Phechrmeekha *et al.*, 2012; Chanvorachote *et al.*, 2013), and those from the placenta and stomach, but not those from the liver (Ho and Chen., 2003). Therefore, moscatilin [59] is now considered as a potent cytotoxic compound which can be a promising chemotherapeutic agent for some cancer types.

