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Constituents of the yew trees

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Abstract

Yew trees, taxonomically classified under the genus *Taxus*, are sources of a number of physiologically active compounds of different classes. Taxane derivatives with various carbon skeletons, lignans, flavonoids, steroids and sugar derivatives have been isolated from different *Taxus* species. Compounds isolated from the genus *Taxus* between 1908 and December 1997 have been comprehensively reviewed.

Keywords: Yew; *Taxus*; Taxaceae; Taxanes; Abeotaxanes; Taxoids; Nontaxoidic isoprenoids; Lignans; Flavonoids; Steroids; Sugar derivatives; *T. baccata*; *T. brevifolia*; *T. canadensis*; *T. chinensis*; *T. cuspidata*; *T. floridana*; *T. mairei*; *T. media*; *T. wallichiana*; *T. yunnanensis*.

1. Introduction

The phytochemistry of yew trees has become a hot topic worldwide with the isolation of the active principle against cancer called paclitaxel. It is now being marketed as an antitumour drug (Taxol®, as it is commonly known is now a registered trademark of Bristol Myers Squibb Co.). Taxonomically, the different species of yew are in the genus *Taxus*, which, in turn belongs to the Taxaceae and consist of much branched trees or shrubs. Taxaceae is a family of five genera: *Amentotaxus* Pilger, *Austrotaxus* Compton, *Pseudotaxus* Cheng, *Taxus* Linn. and *Torreya* Arn (Willis, 1996). The species of yew are also identified by the region of their occurrence, i.e. Himalayan yew, European yew, Canadian yew, etc. They are widely distributed in the northern hemisphere, occurring in Europe, North America, Northern India, China and Japan. In India, they grow at an altitude of 1800 m and above and are distributed in the hilly regions of Eastern and Western Himalayas. They are evergreen shrubs or trees with distichous leaves which are linear with recurved margins. The wood of *Taxus* is one of the heaviest of soft woods. It is also mechanically strong and durable, the timber is oily and irregular growth rings in the wood provide decorative value.

Confusion exists in the identification and nomenclature of the various species of this genus (Appendino, 1995). Since all yews look very much alike, the presence of only one collective species, namely *Taxus baccata* is often assumed. One classification of this genus is based on macroscopic characteristics, i.e. morphology (length of the needles, their shape, etc.) that are, at times difficult to interpret. Another classification of the same genus that relies on the microscopic characteristics of plant anatomy has therefore been put forward (Appendino, 1995). Another point of controversy is in the identification of some of the species. For the Himalayan yew, two botanical names are used, viz. *T. wallichiana* and *T. baccata*, and the Chinese yew has three names, *T. chinensis*, *T. yunnanensis* and *T. mairei*. It is uncertain whether they are synonymous. It is an irony that no attempt has apparently been yet made to combine the microscopic, macroscopic and phytochemical data available for taxonomic purposes.

Different *Taxus* species have proved to be of special

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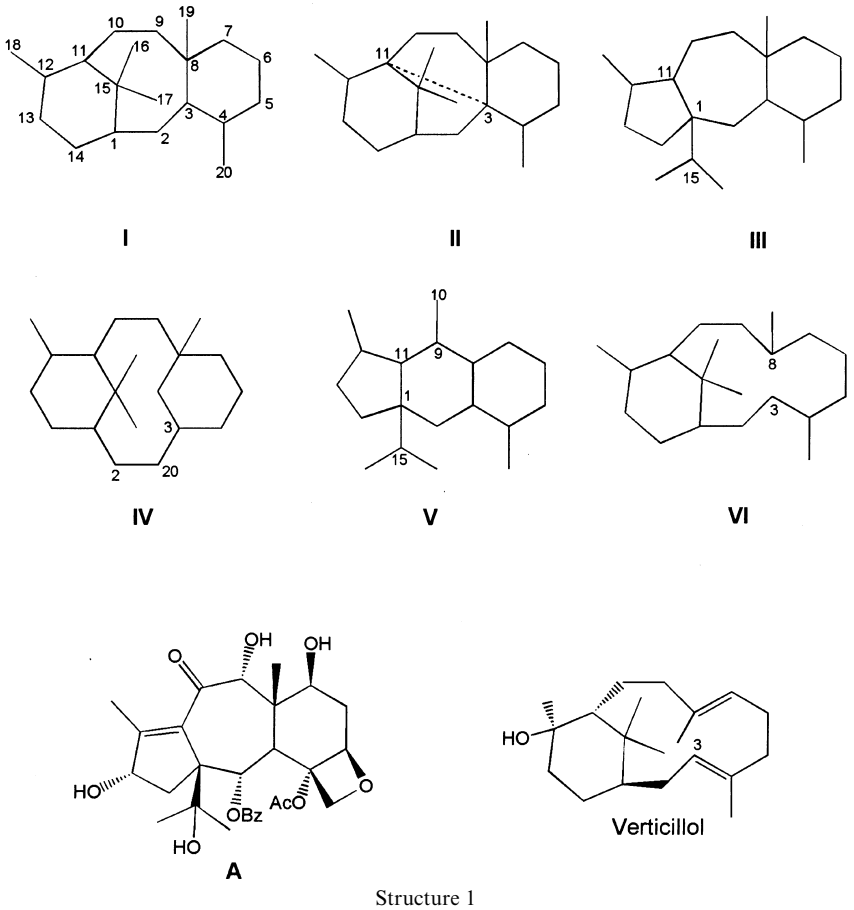
significance among phytochemists in recent years because they have been found to possess a number of biological activities (Vohora & Kumar, 1971; Ambasta, 1986).

The chemical constituents of different *Taxus* species have been studied for over a hundred years. Taxane alkaloids, diterpenoids with taxane skeleton, lignans, biflavonoids, steroids, sugar derivatives and diterpenes possessing the tropone skeleton are commonly found to occur in this genus. The phytochemistry of the genus *Taxus* has evoked a great deal of interest because of the occurrence of antitumour and antileukaemic taxanes, moulting hormones, alkaloids, antineoplastic diterpenes and other physiologically important compounds in the various species, in particular because of the world renowned antitumour drug taxol/paclitaxel. This has made *Taxus* as one of the most intensely investigated genus of all the plant genera.

A few reviews have appeared in the literature (Morelli, 1976; Khan & Parveen, 1987; Appendino, 1995; Das & Kashinath, 1996) on this subject. The one that covered the maximum information on taxoids, the typical secondary metabolites of the yew tree (Kingston, Molinero, & Rimoldi, 1993) was published in 1993. The latest review; Das & Kashinath, 1996), to our knowledge, covers the literature on the subject from 1987 to mid 1995 and at least a hundred new compounds have been reported from different species of the genus *Taxus* after that. There is no updated comprehensive review that lists all the isolates from various *Taxus* species. Our present review covers the literature upto December 1997 listing all chemical constituents isolated from different varieties of yew.

2. Taxane derivatives

Taxanes are typical cyclic diterpenoids. A normal taxane (**I**) contains an eight membered ring sandwiched between two six membered rings, but there are numerous compounds which have rearranged taxane skeleta. 3,11-Cyclotaxanes (**II**) are tetracyclic systems with an additional bond between C-3 and C-11. Taxanes having ring system **III** are called 11(15→1) *abeo*taxane. They have linearly fused five, seven and six membered rings. A six/ten/six membered ring system (**IV**) is known as 2(3→20) *abeo*taxanes. An 11(15→1), 11(10→9) *bisabeo*taxane having skeleton **V** is also known. Compounds with skeleton **VI** are referred to as pretaxanes as the bond between C-3 and C-8 is not yet formed. Certain other isoprenoids include non-taxoid diterpenoids and have been isolated



Structure 1

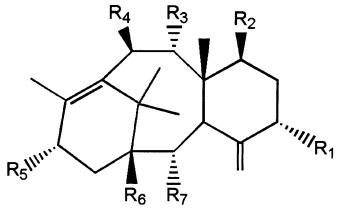
from species of this genus, which are separately classified as 'non-taxoid isoprenoids'.

2.1. Normal taxanes

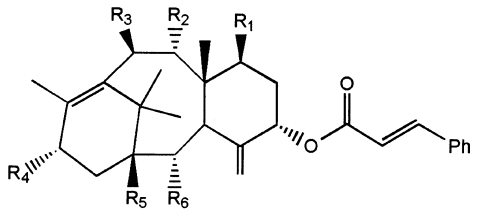
The naturally occurring diterpenoids with the taxane skeleton are the typical constituents of *Taxus*. The constituents of the yew became the active subject of phytochemical and synthetic work since the discovery of terpenes belonging to the taxane group (Lythgoe, Nakanishi, & Uyeo, 1964; IUPAC, 1978; Miller, 1980).

Roberto and Jelmoni (1917) reported a case of poisoning following the ingestion of berries of *T. baccata*. The alkaloid taxine is the toxic constituent that occurs in the leaves and berries, while the aril is free of alkaloids. Taxine is in fact a mixture of at least 11 compounds, only five of which [taxine A (**261**) and B (**78**), 13-deoxo-13α-acetyloxytaxine B (**34**), 13-deoxo-13α-acetyloxy-1-deoxytaxine B (**35**) and 13-deoxo-13α-acetyloxy-1-deoxy-nortaxine B (**40**)] have been structurally characterized so far. The action of the alkaloid was only apparent after ingestion of the berries when the latter were chewed. The symptoms of taxine poisoning are mainly associated with cardiac and respiratory disturbances and death results from heart failure, accompanied by respiratory paralysis (Nicholson, 1934).

The unusual diterpene, taxol (**135**) (Hilton, Chmurny, & Muschik, 1992) was reported in 1971 by Wani, Taylor,

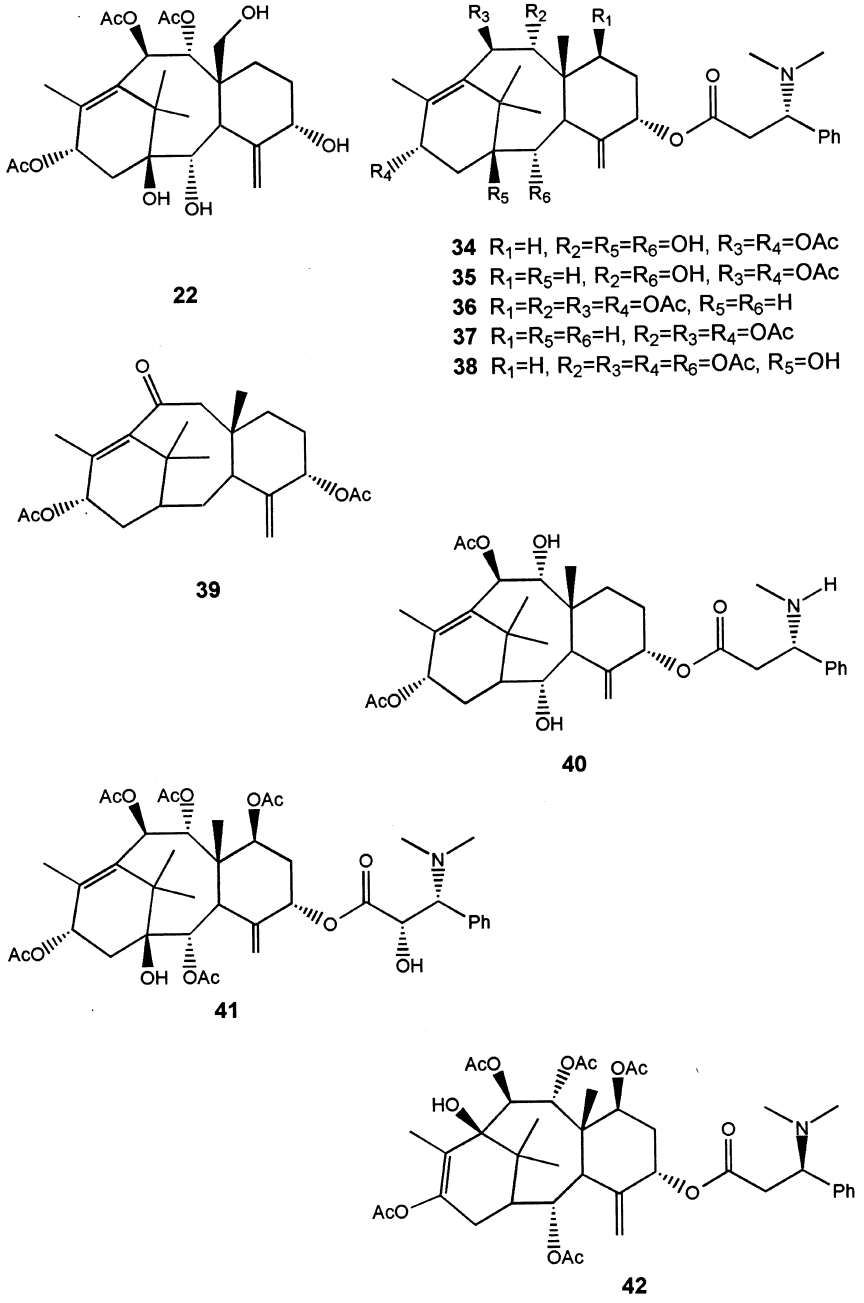


1 $R_1=R_3=R_4=R_5=OH$, $R_2=R_6=R_7=H$
2 $R_1=R_3=R_4=R_5=R_6=R_7=OH$, $R_2=H$
3 $R_1=R_3=R_4=R_5=OAc$, $R_2=R_6=R_7=H$
4 $R_1=R_2=R_3=R_4=R_5=OAc$, $R_6=R_7=H$
5 $R_1=R_3=R_4=R_5=R_7=OAc$, $R_2=R_6=H$
6 $R_1=R_2=R_3=R_4=R_5=R_7=OAc$, $R_6=H$
7 $R_1=R_7=OH$, $R_2=R_3=R_4=R_5=OAc$, $R_6=H$
8 $R_1=OH$, $R_2=R_3=R_4=R_6=OAc$, $R_5=R_7=H$
9 $R_1=OH$, $R_2=R_3=R_4=R_5=R_7=OAc$, $R_6=H$
10 $R_1=OH$, $R_2=R_3=R_4=R_5=OAc$, $R_6=R_7=H$
11 $R_1=OH$, $R_2=R_6=R_7=H$, $R_3=R_4=R_5=OAc$
12 $R_1=R_6=OH$, $R_2=R_3=R_4=R_5=R_7=OAc$
13 $R_1=R_7=OH$, $R_2=R_6=H$, $R_3=R_4=R_5=OAc$
14 $R_1=R_5=OH$, $R_2=R_6=R_7=H$, $R_3=R_4=OAc$
15 $R_1=R_5=OH$, $R_2=R_3=R_4=OAc$, $R_6=R_7=H$
16 $R_1=R_3=R_7=OH$, $R_2=R_6=H$, $R_4=R_5=OAc$
17 $R_1=R_6=OH$, $R_2=H$, $R_3=R_4=R_5=OAc$, $R_7=OBz$
18 $R_1=R_5=R_6=OH$, $R_2=H$, $R_3=R_4=OAc$, $R_7=OBz$
19 $R_1=OH$, $R_2=R_3=R_4=OAc$, $R_5=R_6=H$, $R_7=OCOCH(CH_3)C_2H_5$
20 $R_1=R_2=R_4=OAc$, $R_3=R_5=R_6=H$, $R_7=OCOCH(CH_3)C_2H_5$
21 $R_1=OCOCH[N(CH_3)_2C_6H_5]$, $R_2=R_6=H$, $R_3=R_4=R_5=OAC$, $R_7=OH$



23 $R_1=R_5=H$, $R_2=R_3=R_4=R_6=OAc$
24 $R_1=R_2=R_3=R_4=R_6=OAc$, $R_5=H$
25 $R_1=R_2=R_3=R_4=OAc$, $R_5=R_6=H$
26 $R_1=R_5=H$, $R_2=R_3=OAc$, $R_4=R_6=OH$
27 $R_1=R_5=H$, $R_2=R_4=R_6=OAc$, $R_3=OH$
28 $R_1=R_5=R_6=H$, $R_2=R_3=R_4=OAc$
29 $R_1=R_2=R_3=R_4=OAc$, $R_5=R_6=OH$
30 $R_1=R_5=H$, $R_2=R_6=OH$, $R_3=R_4=OAc$
31 $R_1=R_5=H$, $R_2=R_4=OAc$, $R_3=R_6=OH$
32 $R_1=H$, $R_2=R_3=OAc$, $R_4=R_5=OH$, $R_6=OBz$
33 $R_1=OH$, $R_2=R_3=R_4=OAc$, $R_5=R_6=H$

Structure 3



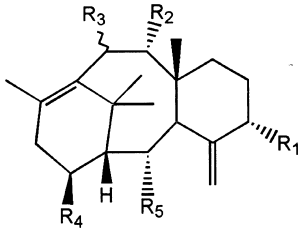
Structure 3

Wall, Coggon, & McPhail (1971) as the major cytotoxic, antineoplastic (Bogdan & Ding, 1992) and antileukaemic constituent occurring in yew (Witherup et al., 1990; Hoke, Wood, Cooks, Li, & Chang, 1992; Iwakuma, 1992).

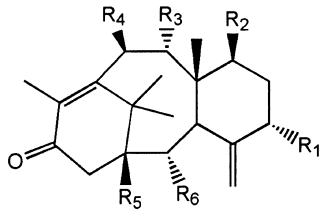
Some of the taxoids isolated recently have been demonstrated to be equally or in some cases more potent anti-tumour agents than taxol. Taxol C (**148**), isolated from the bark of *T. media* possesses antitumour activity higher than that of taxol and is also active against adriamycin resistant cells (Kobayashi et al., 1995). Recently Barboni, Lambertucci, Appendido, and Gabetta (1997) have revised the structure of 5-deacetyl-1-hydroxy baccatin I from *Taxus yunnanensis* (Zhang & Jia, 1990) to 7-deacetyl-1-hydroxy baccatin I (**106**) and that of 7-deacetyl-hydroxy baccatin I from *Taxus baccata* (Senilh et al., 1984b) to 5-deacetyl-1-hydroxy baccatin I (**117**). Table 1 lists the different taxanes isolated thus far from different *Taxus* species.

2.2. 3,11-Cyclotaxanes

3,11-Cyclotaxanes (Table 2) can be formed upon irradiation of corresponding 13-oxo-taxa-11-enes (Appendino et al., 1992c, 1993d; Kobayashi et al., 1994).



43 R_1=$R_{3\beta}$=R_4=R_5=OAc, R_2=H
44 R_1=R_2=$R_{3\beta}$=R_4=R_5=OAc
45 R_1=R_5=OAc, R_2=H, $R_{3\beta}$=R_4=OH
46 R_1=$R_{3\beta}$=OH, R_2=H, R_4=$OCOC_2H_5$,R_5=OAc
47 R_1=$R_{3\beta}$=OH, R_2=H, R_4=$OCOCH(CH_3)_2$, R_5=OAc
48 R_1=OAc, R_2=R_5=H, $R_{3\beta}$=R_4=OH
49 R_1=$R_{3\beta}$=R_5=OAc, R_2=H, R_4=$OCOC_2H_5$
50 R_1=$R_{3\beta}$=R_5=OAc, R_2=H, R_4=$OCOCH(CH_3)_2$
51 R_1=OH, R_2=$R_{3\beta}$=R_5=OAc, R_4=$OCOCH(CH_3)C_2H_5$
52 R_1=R_2=$R_{3\beta}$=R_5=OAc, R_4=$OCOCH(CH_3)C_2H_5$
53 R_1=$R_{3\beta}$=R_5=OAc, R_2=OH, R_4=$OCOCH(CH_3)C_2H_5$
54 R_1=$R_{3\beta}$=R_5=OAc, R_2=H, R_4=$OCOCH(CH_3)C_2H_5$
55 R_1=R_5=OAc, R_2=H, $R_{3\beta}$=OCH_3, R_4=$OCOCH(CH_3)C_2H_5$
56 R_1=$R_{3\beta}$=R_5=OAc, R_2=H, R_4=$OCOCH(CH_3)CH(OH)CH_3$



57 R_1=OH, R_2=R_5=H, R_3=R_4=R_6=OAc
58 R_1=OH, R_2=R_3=R_4=R_6=OAc, R_5=H
59 R_1=R_3=R_4=R_6=OAc, R_2=R_5=H
60 R_1=R_3=R_5=OH, R_2=H, R_4=R_6=OAc
61 R_1=R_5=OH, R_2=H, R_3=R_4=R_6=OAc
62 R_1=OH, R_2=R_3=R_4=R_6=OAc, R_5=H
63 R_1=R_6=OH, R_2=R_5=H, R_3=R_4=OAc
64 R_1=R_5=R_6=OH, R_2=H, R_3=R_4=OAc

Structure 4

However, such naturally occurring compounds have *E*-geometry in the cinnamoyl side chain, while the irradiated products are a mixture of *E*- and *Z*-diastereoisomers. Thus, it is difficult to infer that these compounds are artefacts.

2.3. 11(15→1)-Abeotaxanes

A number of taxoids isolated from different *Taxus* species, on structural reinvestigation were found to contain a rearranged nortaxoid skeleton or 11(15→1)-*abeo* taxoids, as they are more correctly described (Appendino et al., 1993a; Chen & Kingston, 1994; Chu et al., 1994) and not a taxane skeleton as originally proposed. Brevifoliol (**205**) was the first natural taxoid to be described with a 11(15→1)-*abeo*taxane skeleton, which was initially assigned a normal taxane skeleton (Balza, Tachibana, Barrios, & Towers, 1991) but this was later corrected to the 11(15→1)-*abeo*taxane skeleton (Georg et al., 1993; Chu et al., 1994; Zhang et al., 1995d). In a similar way, a number of taxoids whose basic structure, were previously reported as derivatives of brevifoliol with the normal taxane skeleton or by considering them as baccatin VI derivatives have now been proposed to be rearranged 11(15→1)-*abeo*taxanes. Taxchinin A (**213**) was the first naturally occurring taxoid to be correctly assigned the 11(15→1)-*abeo*taxane skeleton (Fuji et al., 1992) and that with an oxetane ring was taxchinin B (**250**) (Fuji et al., 1993). However, the fact that the first example of a taxoid with 11(15→1)-*abeo*taxane skeleton was a rearrangement product of taxol (Hoke et al., 1992), raises the question as to whether all these compounds are simply artefacts. Although this possibility cannot be completely ruled out, the fact that the rearranged taxoids have been obtained from different species by different research groups, coupled with the fact that rearrangement of taxol requires rather vigorous conditions, suggests that some, if not all of the isolated nortaxoids are genuine natural products. Taxuchin B (**229**), a taxoid isolated from *T. chinensis* (Fang et al., 1997) is the first chlorine containing taxoid reported so far. Taxuspine Q (**252**) is the first example of taxoid containing a 5/7/6 membered ring system with a tiglic acid moiety (Wang et al., 1996b). Table 3 lists the 11(15→1)-*abeo*taxanes isolated so far, from various species of yew.

2.4. 2(3→20)-abeotaxanes

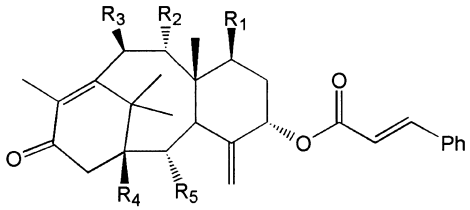
These compounds have a distinct biogenetic origin than the other taxoids, resulting from a transannular cyclisation, which is different from that involved in the formation of normal taxanes (Appendino et al., 1994b). They are tricyclic systems with a ten membered ring sandwiched between two six membered rings. Isolates of this class from *Taxus* species are listed in Table 4.

2.5. 11(15→1), 11(10→9) Bisabeotaxane

The only known taxoid with a 11(15→1), 11(10→9) *bisabeo*taxane skeleton is wallifoliol (**264**) from *T. wallichiana* (Vander Velde et al., 1994). A benzil–benzilic acid type rearrangement of 10-dehydro-10-deacetyl-11(15→1)-*abeo*baccatin III (**A**) might be the biosynthetic pathway of this compound.

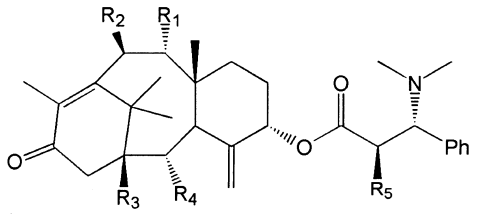
2.6. Pretaxoids

Paclitaxel, because of its unique mode of action and enormous medicinal potential is under an intensive

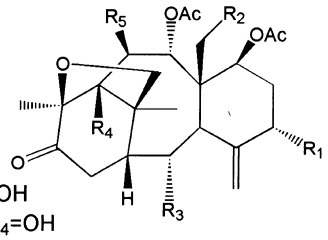


65 R_1=H, R_2=R_3=R_5=OAc, R_4=OH
66 R_1=R_2=R_5=OAc, R_3=OH, R_4=H
67 R_1=H, R_2=R_3=R_4=OH, R_5=OAc
68 R_1=R_4=H, R_2=R_3=R_5=OAc
69 R_1=R_2=R_3=R_5=OAc, R_4=H
70 R_1=R_2=R_3=OAc, R_4=R_5=H
71 R_1=H, R_2=R_3=OAc, R_4=R_5=OH
72 R_1=H, R_2=OAc, R_3=R_4=R_5=OH
73 R_1=H, R_2=R_4=R_5=OH, R_3=OAc
74 R_1=R_4=H, R_2=OAc, R_3=R_5=OH
75 R_1=R_4=H, R_2=R_5=OH, R_3=OAc
76 R_1=H, R_2=R_4=OH, R_3=R_5=OAc
77 R_1=H, R_2=R_5=OAc, R_3=R_4=OH

78 R_1=R_4=R_3=OH, R_2=OAc, R_5=H
79 R_1=R_2=R_4=OAc, R_3=R_5=H
80 R_1=R_2=R_4=OAc, R_3=OH, R_5=H
81 R_1=R_2=R_4=OAc, R_3=H, R_5=OH
82 R_1=R_4=OH, R_2=OAc, R_3=R_5=H
83 R_1=R_3=OH, R_2=R_4=OAc, R_5=H
84 R_1=OAc, R_2=R_4=OH, R_3=R_5=H
85 R_1=R_4=OAc, R_2=R_3=OH, R_5=H



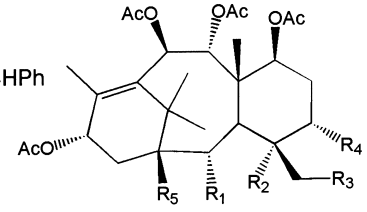
86 R_1=R_4=OH, R_2=H, R_3=R_5=OAc
87 R_1=R_3=R_5=OAc, R_2=H, R_4=OH
88 R_1=R_4=OH, R_2=OBz, R_3=R_5=OAc
89 R_1=R_3=R_4=OH, R_2=H, R_5=OAc
90 R_1=R_4=OH, R_2=R_3=R_5=OAc
91 R_1=OCOCH:CHPh, R_2=H, R_3=R_5=OAc, R_4=OH
92 R_1=OCOCH:CHPh, R_2=OBz, R_3=R_5=OAc, R_4=OH
93 R_1=OCOCH:CHPh, R_2=R_4=OH, R_3=R_5=OAc
94 R_1=OCOCH: CHPh, R_2=R_3=OAc, R_4=R_5=OH
95 R_1=R_2=OH, R_3=R_4=R_5=OAc



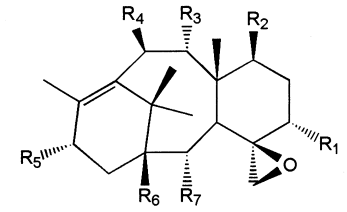
Structure 5

research effort. The core structure of taxol consists of four rings (six membered A and C rings, eight membered B ring and four membered D ring) but very little is known about the biosynthesis of this taxane core. Verticillol, a natural product isolated from *Scidopitys verticillata*, with rings B, C and D not yet formed has been the focus of speculation about the biosynthesis of the taxane skeleton (Zamir, Nedea, & Garneau, 1992; Kingston et al., 1993). Verticillol, however differs in stereochemistry at the C-1 and lacks oxygenation at C-2, C-5, C-7, C-9, C-10 and C-13 and numerous attempts to carry out cyclisation have failed (Begley, Jackson, & Pattenden, 1985). A novel pretaxoid, canadensene (**265**), in which rings B, C and D are not yet formed has been isolated from *T. canadensis* (Zamir et al., 1995b). The isolation of canadensene in the genus *Taxus* and its structural similarity with the core structure of taxol and related taxanes is of considerable importance for biosynthetic studies. A few more such compounds have been isolated thereafter, these are all listed in Table 5.

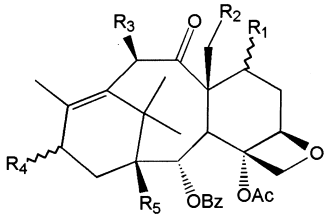
96 R_1=R_4=OAc, R_2=R_5=H, R_3=OH
97 R_1=OH, R_2=R_5=H, R_3=R_4=OAc
98 R_1=R_4=OAc, R_2=R_5=H, R_3=OCOCH:CHPh
99 R_1=OBz, R_2=R_3=OH, R_4=OAc, R_5=H
100 R_1=OBz, R_2=R_4=OH, R_3=OAc, R_5=H
101 R_1=R_2=OH, R_3=OBz, R_4=OAc, R_5=H
102 R_1=R_5=OH, R_2=H, R_3=R_4=OAc
103 R_1=R_3=OH, R_2=R_5=H, R_4=OAc

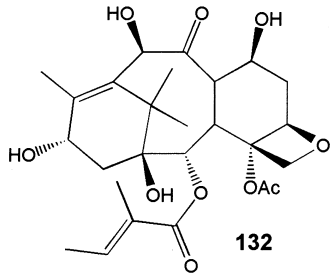


104 R_1=R_2=R_3=R_4=R_5=R_7=OAc, R_6=H
105 R_1=R_2=R_3=R_4=R_5=R_7=OAc, R_6=OH
106 R_1=R_3=R_4=R_5=R_7=OAc, R_2=R_6=OH
107 R_1=R_4=R_5=R_7=OAc, R_2=R_3=R_6=OH
108 R_1=R_5=R_7=OAc, R_2=R_3=R_4=R_6=OH
109 R_1=R_2=R_3=R_5=R_7=OAc, R_4=R_6=OH
110 R_1=OH, R_2=R_3=R_4=R_5=R_7=OAc, R_6=H
111 R_1=R_2=R_4=OH, R_3=R_5=R_6=R_7=OAc
112 R_1=R_2=R_4=R_6=R_7=OH, R_3=R_5=OAc
113 R_1=OH, R_2=R_3=R_4=R_5=R_6=R_7=OAc
114 R_1=R_4=R_5=OAc, R_2=R_3=R_6=R_7=OH
115 R_1=R_2=R_3=R_5=R_7=OAc, R_4=R_6=OH
116 R_1=R_2=R_4=R_5=R_7=OAc, R_3=R_6=OH
117 R_1=R_6=OH, R_2=R_3=R_4=R_5=R_7=OAc
118 R_1=R_2=R_3=R_4=R_7=OAc, R_5=R_6=OH
119 R_1=$OCOCH_2CH(Ph)NMe_2$, R_2=R_3=R_4=R_5=R_7=OAc, R_6=H



120 $R_{1\beta}$=$R_{4\alpha}$=R_5=OH, R_2=H, R_3=OAc
121 $R_{1\alpha}$=$R_{4\alpha}$=R_5=OH, R_2=H, R_3=OAc
122 $R_{1\beta}$=R_2=$R_{4\alpha}$=R_5=OH, R_3=OAc
123 $R_{1\beta}$=R_3=$R_{4\alpha}$=R_5=OH, R_2=H
124 $R_{1\beta}$=R_2=R_3=$R_{4\alpha}$=R_5=OH
125 $R_{1\beta}$=R_3=$R_{4\alpha}$=OH, R_2=H, R_5=OAc
126 $R_{1\beta}$=$R_{4\alpha}$=OH, R_2=R_5=H, R_3=OAc
127 $R_{1\alpha}$=R_3=$R_{4\alpha}$=R_5=OH, R_2=H
128 $R_{1\beta}$=*O*-xylosyl, R_2=R_3=H, $R_{4\alpha}$=R_5=OH
129 $R_{1\alpha}$=R_2=$R_{4\alpha}$=R_5=OH, R_3=OAc
130 $R_{1\beta}$=R_3=$R_{4\beta}$=R_5=OH, R_2=H
131 $R_{1\beta}$=R_3=OH, R_2=H, $R_{4\alpha}$=R_5=OAc





132

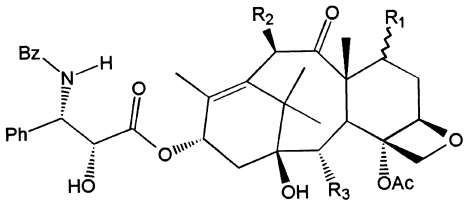
Structure 6

3. Non-taxoid higher isoprenoids

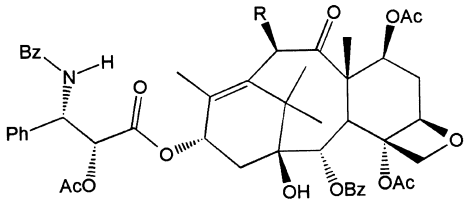
Phytoecdysteroids, the well known moulting hormones are another class of naturally occuring organic compound isolated from *Taxus* species. Insect moult hormone activity associated with extracts of yew leaves has been reported by Takemoto, Ogawa, Nishimoto, and Hoffmiester (1967). The most common of these phytoecdysteriods is ecdysterone (**271**). The diterpenes taxamairine A (**282**) and taxamairine B (**283**) possessing a tropone skeleton, displayed inhibitory activity against hepatoma cells in vitro (Liang, Min, Iinuma, Tanaka, & Mizuno, 1987). The various non-taxoid higher isoprenoids are listed in Table 6.

3.1. Lignans

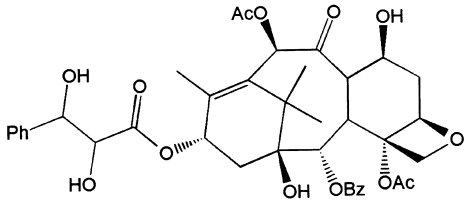
Lignans are found in several species of *Taxus*. Secoisolariciresinol (**287**), isotaxiresinol (**300**), isolariciresinol (**301**) and isotaxiresinol-6-methyl ether (**302**) are found in several species of *Taxus* (Erdtman & Tsuno, 1969; Das,



133 $R_{1\beta}$=R_2=OH, R_3=OBz
134 $R_{1\beta}$=OH, R_2=$OCOCH_2CH(OH)CH_3$, R_3=OAc
135 $R_{1\beta}$=OH, R_2=OAc, R_3=OBz
136 $R_{1\beta}$=*O*-xylosyl, R_2=OH, R_3=OAc
137 $R_{1\beta}$=*O*-xylosyl, R_2=R_3=OAc
138 $R_{1\alpha}$=OH, R_2=OAc, R_3=OBz
139 $R_{1\alpha}$=R_2=OH, R_3=OBz
140 $R_{1\beta}$=*O*-xylosyl, R_2=OH, R_3=OBz
141 $R_{1\beta}$=*O*-xylosyl, R_2=OAc, R_3=OBz

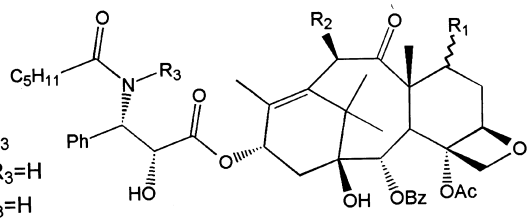


142 R=OH
143 R=OAc



144

145 $R_{1\alpha}$=OH, R_2=OAc, R_3=H
146 $R_{1\alpha}$=R_2=OH, R_3=H
147 $R_{1\beta}$=R_2=OH, R_3=H
148 $R_{1\beta}$=OH, R_2=OAc, R_3=H
149 $R_{1\beta}$=OH, R_2=OAc, R_3=CH_3
150 $R_{1\beta}$=*O*-xylosyl, R_2=OAc, R_3=H
151 $R_{1\beta}$=*O*-xylosyl, R_2=OH, R_3=H



Structure 7

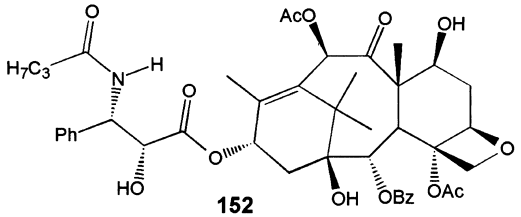
Takhi, Srinivas, & Yadav, 1994b). Table 7 lists various lignans isolated from the genus *Taxus*.

3.2. Flavonoids

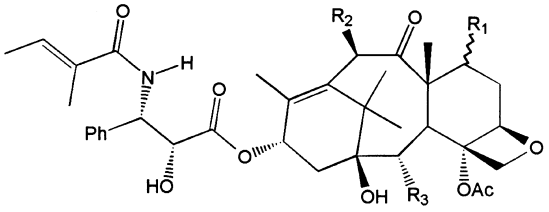
Taxus species contain the biflavonoids mainly of the amentoflavone series. Table 8 lists all the flavonoids isolated from the genus *Taxus*.

3.3. Sugar derivatives

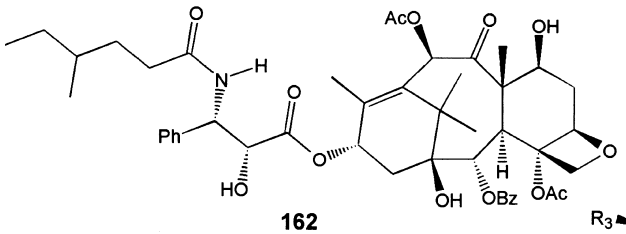
A novel glycoside, taxicatin (**323**) has been isolated from the leaves of *T. baccata* (Herissey & Lefebvre, 1907; Lefebvre, 1907; Merz & Preuss, 1941; Merz & Preuss, 1942). The glycosides of aliphatic and aromatic alcohols, as well as of monoterpene alcohols and eugenol have been detected in Taxaceae (Merkx & Sevendsen, 1990). Recently we have isolated betuloside (**326**) from *T.*



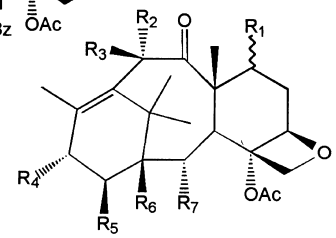
152



153 $R_{1\beta}$=OH, R_2=OAc, R_3=OBz
154 $R_{1\beta}$=R_2=OH, R_3=OBz
155 $R_{1\beta}$=OH, R_2=$OCOCH_2CH(OH)CH_3$, R_3=OAc
156 $R_{1\alpha}$=OH, R_2=OAc, R_3=OBz
157 $R_{1\alpha}$=R_2=OH, R_3=OBz
158 $R_{1\beta}$=*O*-xylosyl, R_2=OH, R_3=OAc
159 $R_{1\beta}$=*O*-xylosyl, R_2=R_3=OAc
160 $R_{1\alpha}$=OH, R_2=R_3=OAc
161 $R_{1\beta}$=*O*-xylosyl, R_2=OH, R_3=OBz



162



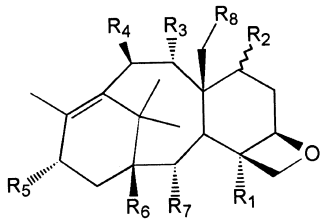
163 $R_{1\beta}$=R_3=R_4=R_5=R_6=OH, R_2=H, R_7=OBz
164 $R_{1\beta}$=R_3=R_4=R_6=R_7=OH, R_2=H, R_5=OBz
165 $R_{1\beta}$=R_4=R_6=OH, R_2+R_3=O, R_5=H
166 $R_{1\beta}$=OAc, R_2+R_3=O, R_4=$OCOCH(OH)CH(Ph)NHBz$, R_5=H, R_6=OH, R_7=OBz
167 $R_{1\alpha}$=OH, R_2+R_3= =O, R_4=$OCOCH(OH)CH(Ph)NHBz$, R_5=R_6=H, R_7=OBz
168 $R_{1\beta}$=*O*-xylosyl, R_2=R_5=H, R_3=R_6=OH, R_4=$OCOCH(OH)CH(Ph)NHCOC_3H_7$, R_7=OBz
169 $R_{1\alpha}$=OH, R_5=R_6=H, R_2+R_3= =O, R_4=$OCOCH(OH)CH(Ph)NHCOC_5H_{11}$, R_7=OBz

Structure 8

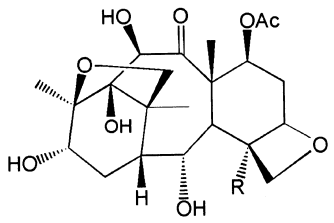
baccata, reported its absolute stereochemistry and have found it to possess hepatoprotective activity (Parmar et al., 1991). Table 9 lists various glycosides and other sugar derivatives isolated from the genus *Taxus*.

3.4. Miscellaneous

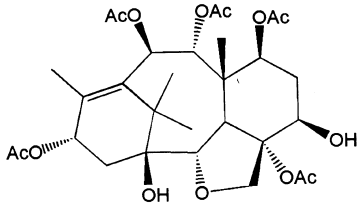
Kojic acid (**337**), a γ-pyrone, isolated from *T. mairei* is a typical microbial metabolite, thus fungal contamination of the plant extract might be a reason of its formation (Yoshizaki, Fufuda, & Hisamichi, 1989). (+)-Abscisic acid (**354**) was extracted from the seeds of *T. baccata* (Jones & Lynn, 1933; Le-Page-Degivry, Bulard, & Milborrow, 1970; Le-Page-Degivry, 1971). The needles of *T. baccata* contained 26 carboxylic acids, 80% of which were shikimic (**372**) and quinic acids (**373**) (Le-Page-Degivry, 1973). Various compounds isolated from genus *Taxus* which are not otherwise classified in the text, are listed in Table 10.



170 $R_1=R_{2\beta}=R_3=R_4=R_5=R_7=OAc$, $R_6=OH$, $R_8=H$
171 $R_1=R_{2\beta}=R_3=R_4=R_5=OAc$, $R_6=OH$, $R_7=OBz$, $R_8=H$
172 $R_1=R_{2\beta}=R_3=R_4=R_5=R_7=OAc$, $R_6=R_8=H$
173 $R_1=R_{2\beta}=R_3=R_4=R_5=R_6=R_7=OAc$, $R_8=H$
174 $R_1=R_6=OH$, $R_{2\beta}=R_3=R_4=R_5=R_7=OAc$, $R_8=H$
175 $R_1=OH$, $R_{2\beta}=R_3=R_4=R_5=R_7=OAc$, $R_6=R_8=H$
176 $R_1=R_4=R_5=R_7=OAc$, $R_{2\beta}=R_3=R_6=OH$, $R_8=H$
177 $R_1=R_{2\beta}=R_3=R_4=R_5=OAc$, $R_6=R_8=H$, $R_7=OBz$
178 $R_1=R_4=R_5=OAc$, $R_{2\beta}=R_3=R_6=OH$, $R_7=OBz$, $R_8=H$
179 $R_1=R_{2\beta}=R_3=R_5=OAc$, $R_4=R_6=OH$, $R_7=OBz$, $R_8=H$
180 $R_1=R_5=OAc$, $R_{2\alpha}=R_3=R_4=R_6=OH$, $R_7=OBz$, $R_8=H$
181 $R_1=R_5=OAc$, $R_{2\beta}=R_3=R_4=R_6=OH$, $R_7=OBz$, $R_8=H$
182 $R_1=R_{2\beta}=OAc$, $R_3=R_4=R_5=R_6=OH$, $R_7=OBz$, $R_8=H$
183 $R_1=R_8=OAc$, $R_{2\beta}=R_3=R_4=R_5=R_6=OH$, $R_7=OBz$
184 $R_1=R_{2\beta}=R_5=OAc$, $R_3=R_4=R_7=OBz$, $R_6=OH$, $R_8=H$
185 $R_1=R_{2\beta}=R_3=R_5=OAc$, $R_3=R_7=OBz$, $R_6=OH$, $R_8=H$
186 $R_1=R_3=R_4=R_5=OAc$, $R_{2\beta}=R_7=OBz$, $R_6=OH$, $R_8=H$
187 $R_1=R_{2\beta}=R_3=R_5=OAc$, $R_4=R_6=OH$, $R_7=OBz$, $R_8=H$
188 $R_1=R_{2\beta}=R_4=R_5=OAc$, $R_3=R_6=OH$, $R_7=OBz$, $R_8=H$
190 $R_1=R_6=OH$, $R_{2\beta}=R_3=R_4=R_5=OAc$, $R_7=OCOC_5H_{11}$, $R_8=H$
191 $R_1=R_{2\beta}=R_3=R_7=OAc$, $R_4=OBz$, $R_5=OCOCH_2CH(Ph)NMe_2$, $R_6=OH$, $R_8=H$
192 $R_1=R_4=OAc$, $R_{2\beta}=R_3=R_6=OH$, $R_5=OCOCH(OH)CH(Ph)NHBz$, $R_7=OBz$, $R_8=H$



193 R=OAc
194 R=OH



195

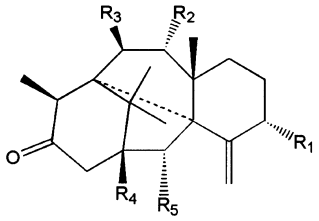
Structure 9

4. Conclusions

This review of literature covering phytochemical investigations on ten *Taxus* species have resulted in the isolation of nearly three hundred and seventy compounds belonging to the classes of taxanes, lignans, flavonoids, steroids, sugar derivatives, aromatic acids, etc.

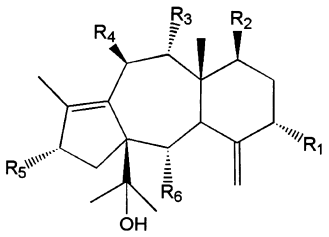
The last few years have witnessed a revolution in the phytochemistry of the yew trees, mainly due to the discovery of the wonder drug taxol/paclitaxel which is now successfully used for the treatment of breast and ovarian cancer. This has resulted in isolation of a number of taxol analogues, chemical modification and biological studies, which have helped in developing a structure activity relationship (Jenkins & Lawrence, 1996). Synthesis of these analogues would otherwise be very difficult. The developed SAR (structure activity relationship) is now a tool for synthetic chemists to find a more viable alternative of taxol, which is now being semisynthetically prepared from the more abundant natural precursor 10-deacetyl baccatin III (**123**), although not in enough quantities to meet the present demand.

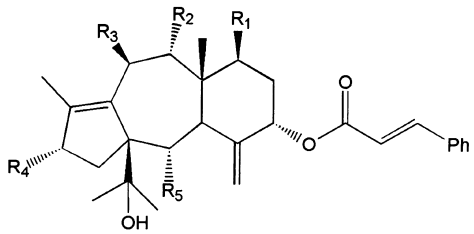
Thus, we clearly visualise that this area demands still more intensive research to make it fruitful and this



196 R_1=OH, R_2=R_3=R_5=OAc, R_4=H
197 R_1=R_2=R_3=R_5=OAc, R_4=H
198 R_1=OCOCH:CHPh, R_2=R_4=R_5=OH, R_3=OAc
199 R_1=OCOCH:CHPh, R_2=R_3=R_5=OAc, R_4=H
200 R_1=OCOCH:CHPh, R_2=OAc, R_3=R_4=R_5=OH
201 R_1=$OCOCH_2CH(NMe_2)Ph$, R_2=R_3=R_5=OAc, R_4=H

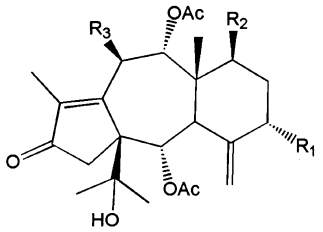
202 R_1=OH, R_2=R_3=R_5=R_6=OAc, R_4=OBz
203 R_1=OH, R_2=R_3=R_6=OAc, R_4=OBz, R_5=OCOCH:CHPh
204 R_1=R_4=OH, R_2=R_3=R_5=R_6=OAc
205 R_1=R_5=OH, R_2=R_3=OAc, R_4=OBz, R_6=H
206 R_1=OH, R_2=R_3=R_5=OAc, R_4=OBz, R_6=H
207 R_1=R_4=R_5=OH, R_2=OAc, R_3=OBz, R_6=H
208 R_1=R_4=R_5=OH, R_2=R_3=R_6=OAc
209 R_1=R_4=R_5=OH, R_2=R_6=H, R_3=OAc
210 R_1=R_4=R_5=OH, R_2=R_3=OAc, R_6=H
211 R_1=R_4=R_5=OH, R_2=H, R_3=R_6=OAc
212 R_1=R_4=R_5=OH, R_2=R_6=OAc, R_3=OBz
213 R_1=R_5=OH, R_2=R_3=R_6=OAc, R_4=OBz
214 R_1=$OCOCH_2CH(Ph)NMe_2$, R_2=R_3=R_5=OAc, R_4=OBz, R_6=H
215 R_1=$OCOCH_2CH(Ph)NHMe$, R_2=R_3=R_5=OAc, R_4=OBz, R_6=H
216 R_1=$OCOCH_2CH(Ph)NMe_2$, R_2=H, R_3=R_4=R_5=R_6=OAc

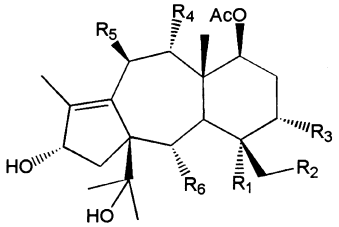




217 R_1=R_2=R_4=OAc, R_3=OBz, R_5=H
218 R_1=R_2=OAc, R_3=OBz, R_4=OH, R_5=H
219 R_1=R_2=R_3=R_4=OAc, R_5=H
220 R_1=R_2=R_4=OAc, R_3=OH, R_5=H
221 R_1=H, R_2=R_3=R_4=R_5=OAc

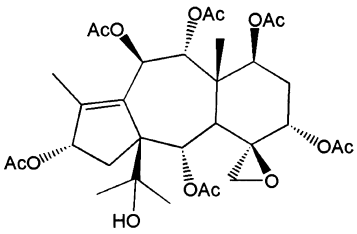
Structure 10



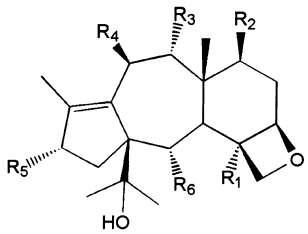


222 R_1=R_3=OH, R_2=H
223 R_1=R_2=OH, R_3=OAc
224 R_1=OH, R_2=OAc, R_3=OBz
225 R_1=*O*-*D*-glucosyl, R_2=H, R_3=OBz
226 R_1=OH, R_2=H, R_3=OBz

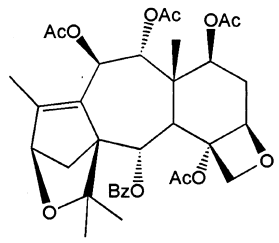
227 R_1=H, R_2=R_5=OH, R_3=R_4=R_6=OAc
228 R_1=R_6=OH, R_2=R_3=R_4=OAc, R_5=OBz
229 R_1=R_3=R_5=OH, R_2=Cl, R_4=OBz, R_6=OAc



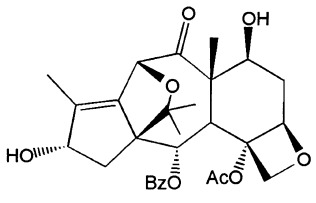
230



231 R_1=R_2=R_3=R_6=OAc, R_4=R_5=OH
232 R_1=R_5=OAc, R_2=R_3=R_4=OH, R_6=OBz
233 R_1=R_2=R_3=R_6=OAc, R_4=OBz, R_5=OH
234 R_1=OAc, R_2=R_3=R_4=R_5=OH, R_6=OBz
235 R_1=OH, R_2=R_3=R_4=R_5=OAc, R_6=OBz
236 R_1=R_2=R_5=OAc, R_3=R_6=OBz, R_4=OH
237 R_1=R_2=R_4=R_5=OAc, R_3=R_6=OBz
238 R_1=R_2=R_5=R_6=OAc, R_3=R_4=OBz
239 R_1=R_2=R_5=OAc, R_3=R_6=OBz, R_4=OH
240 R_1=R_2=R_3=R_5=R_6=OAc, R_4=OH
241 R_1=R_2=R_3=R_6=OAc, R_4=R_5=OH
242 R_1=R_4=R_6=OAc, R_2=R_3=R_5=OH
243 R_1=R_2=R_3=OAc, R_4=R_5=OH, R_6=OBz
244 R_1=R_2=R_6=OAc, R_3=OBz, R_4=R_5=OH
245 R_1=OAc, R_2=R_6=OBz, R_3=R_4=R_5=OH
246 R_1=R_2=R_3=R_5=R_6=OAc, R_4=OBz
247 R_1=R_6=OAc, R_2=R_3=R_5=OH, R_4=OBz
248 R_1=R_6=OAc, R_2=R_3=R_5=OH, R_4=OBz
249 R_1=R_2=R_5=OAc, R_3=R_4=R_6=OBz
250 R_1=R_2=R_3=R_6=OAc, R_4=OBz, R_5=OCOCH:CHPh
251 R_1=R_2=R_6=OAc, R_3=OBz, R_4=OH, R_5=OCOCH:CHPh
252 R_1=R_2=R_3=R_6=OAc, R_4=OCOCCH$_3$:CHCH$_3$, R_5=OH

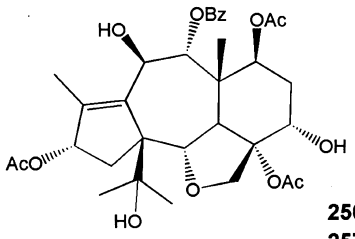


253

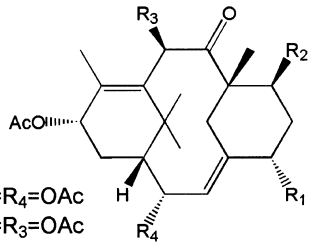


254

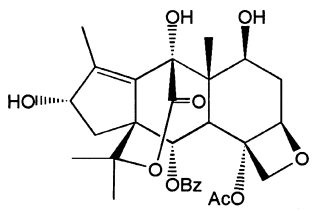
Structure 11



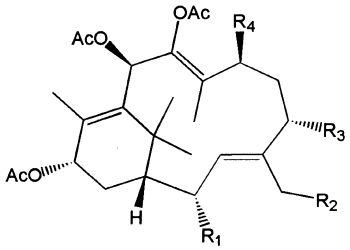
255



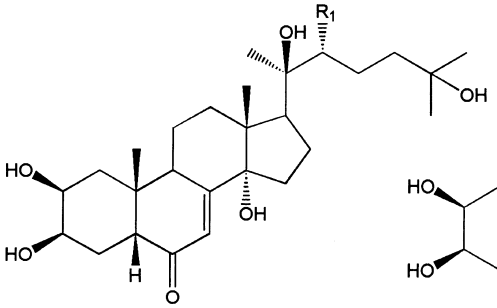
256 R_1=OH, R_2=R_3=R_4=OAc
257 R_1=R_4=OH, R_2=R_3=OAc
258 R_1=R_2=R_3=OH, R_4=OAc
259 R_1=R_3=OH, R_2=R_4=OAc
260 R_1=OCOCH:CHPh, R_2=R_4=OAc, R_3=OH
261 R_1=OCOCH(OH)CH(NMe_2)Ph, R_2=R_3=OH, R_4=OAc
262 R_1=OCOCH(OH)CH(NMe_2)Ph, R_2=R_4=OAc, R_3=OH
263 R_1=OCOCH(OH)CH(NMe_2)Ph, R_2=R_3=R_4=OH



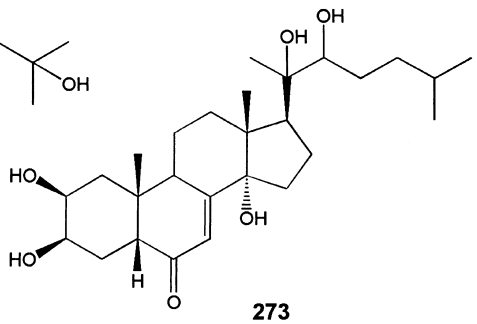
264



265 R_1=R_4=OAc, R_2=R_3=OH
266 R_1=R_2=R_4=OAc, R_3=OH
267 R_1=R_2=OH, R_3=R_4=OAc
268 R_1=R_2=R_4=OH, R_3=OAc
269 R_1=R_2=R_3=OH, R_4=OAc
270 R_1=R_2=R_4=OAc, R_3=OCOCH:CHPh

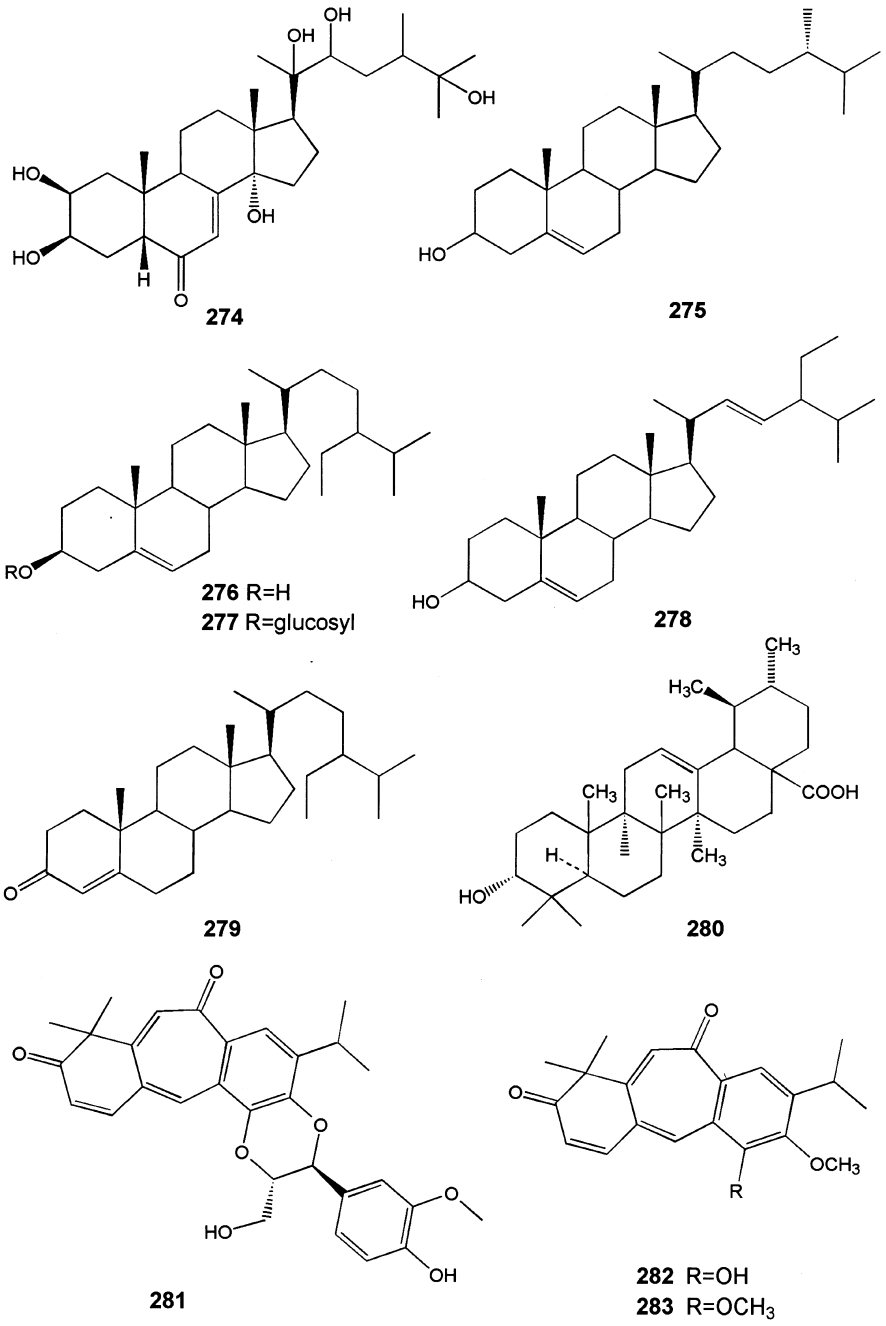


271 R_1=OH
272 R_1=H

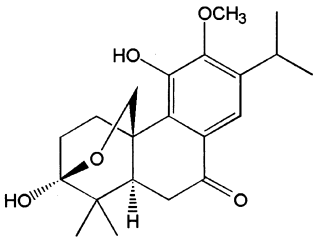


273

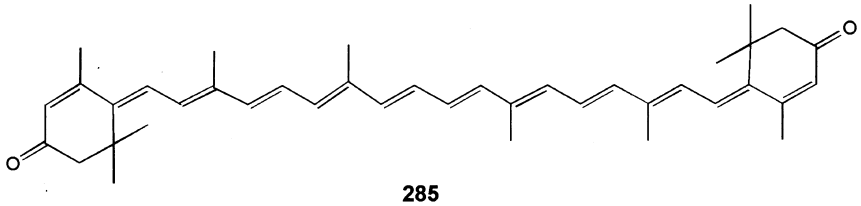
Structure 12



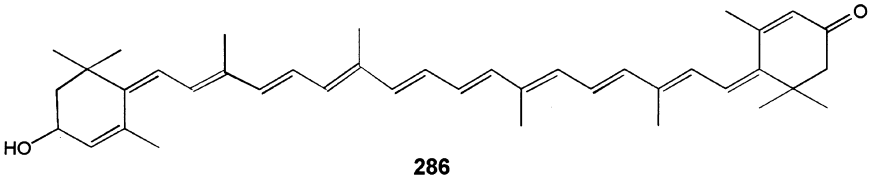
Structure 13



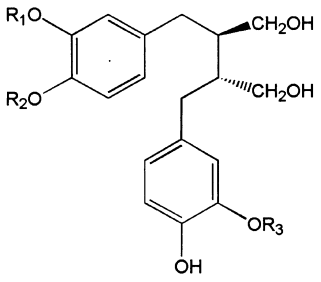
284



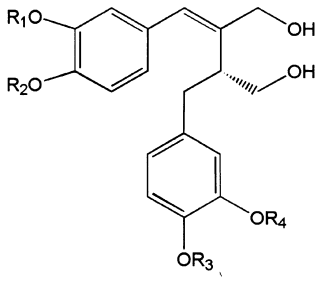
285



286

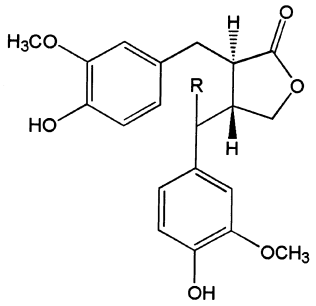


287 $R_1=R_3=Me$, $R_2=H$
288 $R_1=R_2=Me$, $R_3=H$
289 $R_1=R_2=H$, $R_3=CH_3$

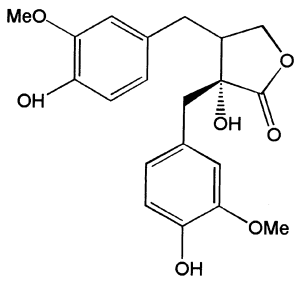


290 $R_1+R_2=CH_2$, $R_3=R_4=CH_3$
291 $R_1=R_2=CH_3$, $R_3+R_4=CH_2$
292 $R_1+R_2=R_3+R_4=CH_2$

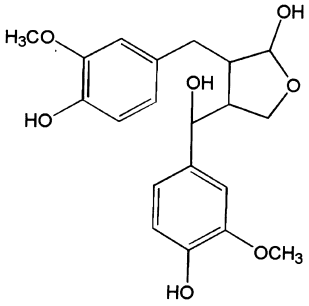
Structure 14



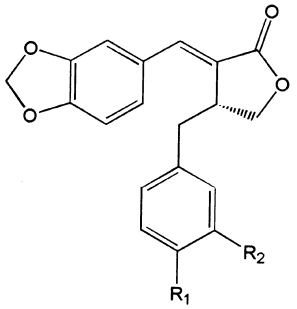
293 R=OH
294 R=H



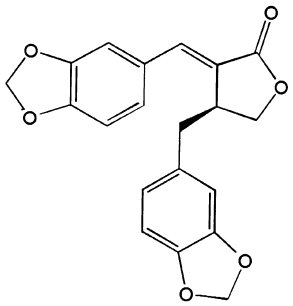
295



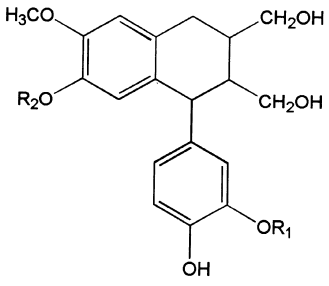
296



297 R_1=OH, R_2=OMe
298 R_1+R_2=OCH_2O

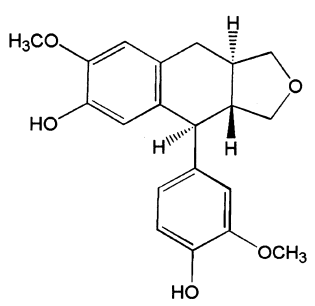


299

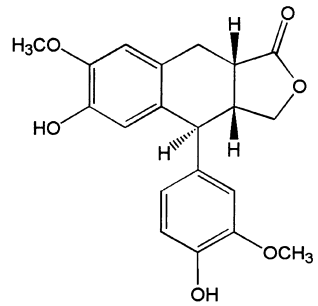


300 R_1=R_2=H
301 R_1=CH_3, R_2=H
302 R_1=H, R_2=CH_3

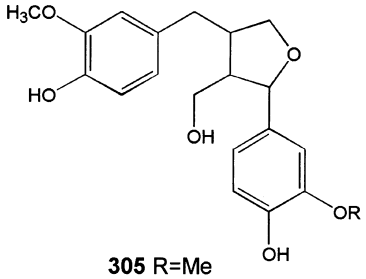
Structure 15



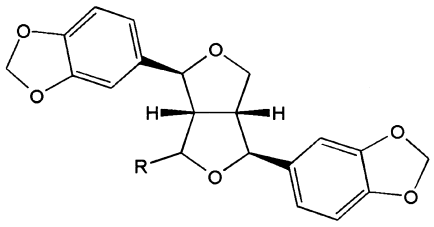
303



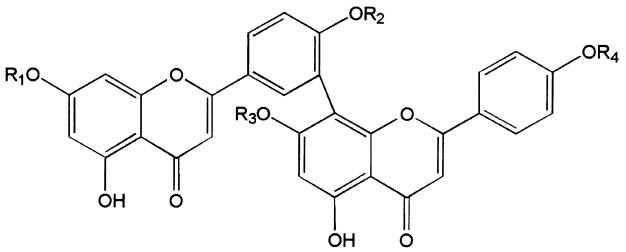
304

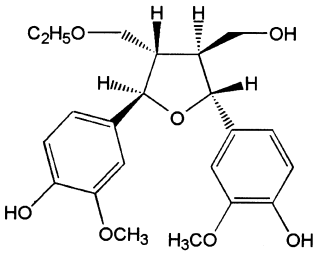


305 R=Me
306 R=H



307 R=H
308 R=OH

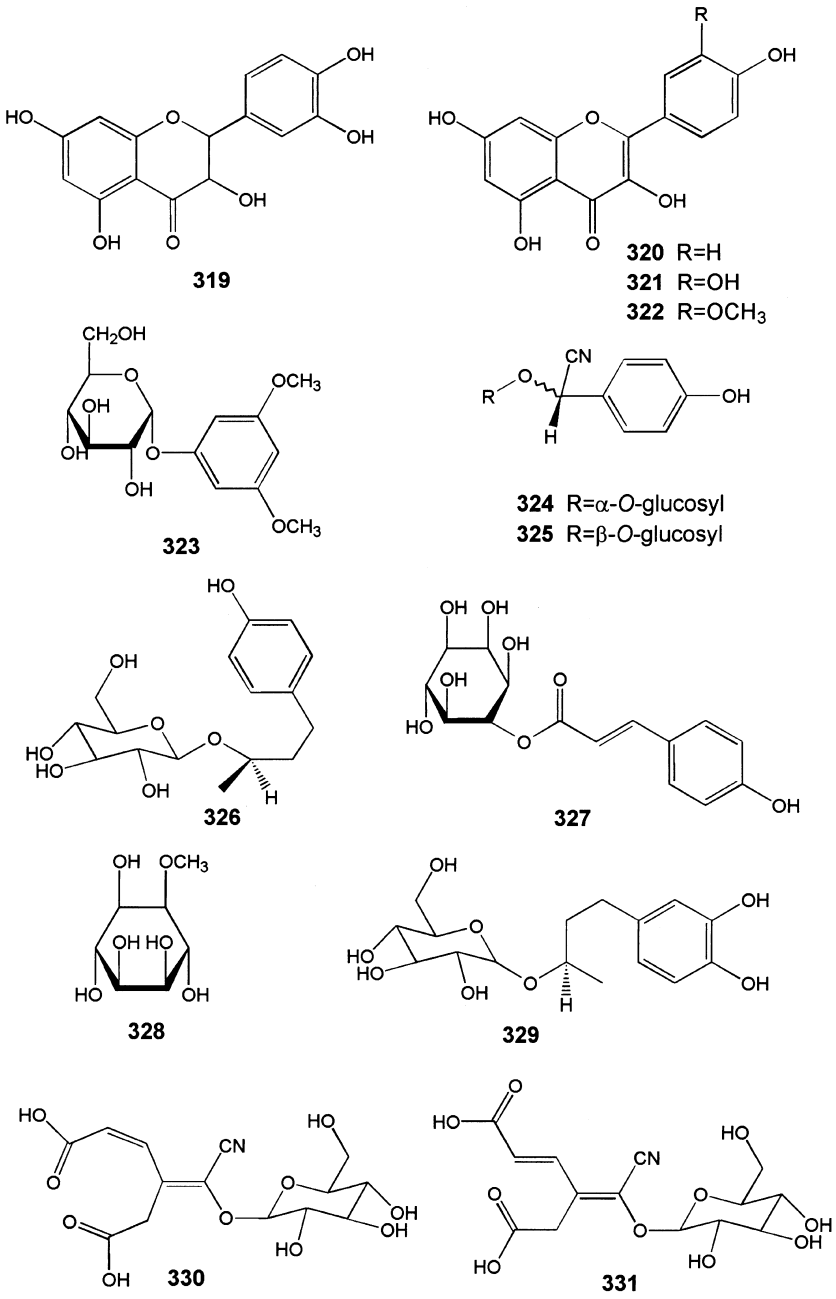




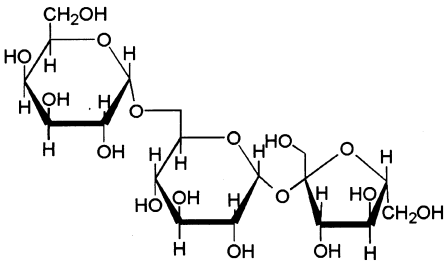
309

310 $R_1=R_2=CH_3$, $R_3=R_4=H$
311 $R_1=R_2=R_4=CH_3$, $R_3=H$
312 $R_1=CH_3$, $R_2=R_3=R_4=H$
313 $R_1=R_2=R_4=H$, $R_3=CH_3$
314 $R_1=R_3=R_4=CH_3$, $R_2=H$
315 $R_1=R_2=R_3=R_4=H$
316 $R_1=R_2=R_3=CH_3$, $R_4=H$
317 $R_1=R_2=R_3=R_4=CH_3$
318 $R_1=R_4=H$, $R_2=R_3=CH_3$

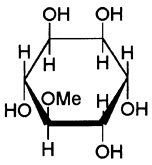
Structure 16



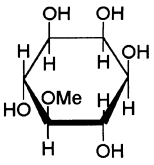
Structure 17



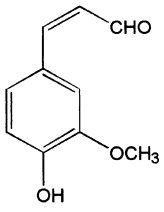
332



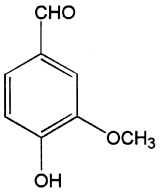
333



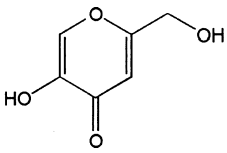
334



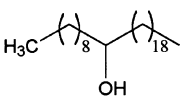
335



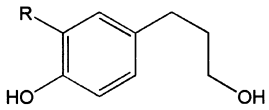
336



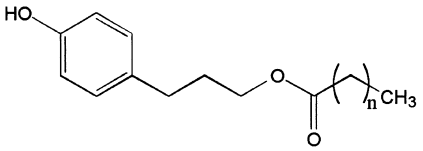
337



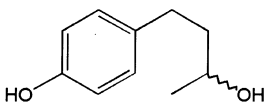
338



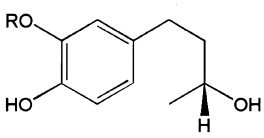
339 R=H
340 R=OH
341 R=OMe



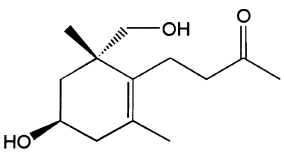
342 n= 22
343 n= 23
344 n= 24
345 n= 30
346 n= 32



347 *R*
348 *S*

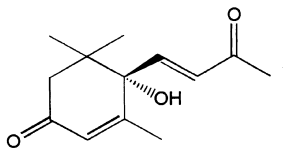


349 R=H
350 R=Me

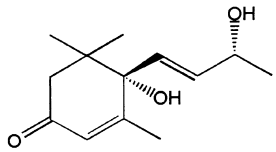


351

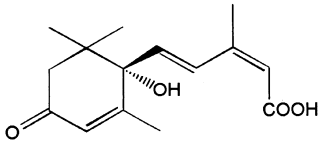
Structure 18



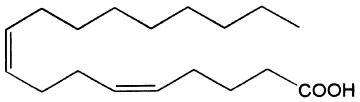
352



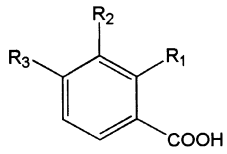
353



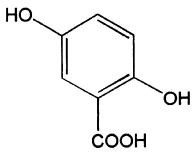
354



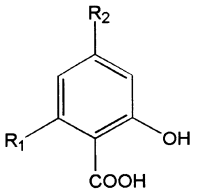
355



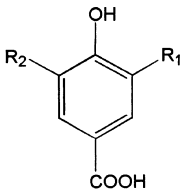
356 R_1=H, R_2=OCH_3, R_3=OH
357 R_1=R_2=OH, R_3=H
358 R_1=H, R_2=R_3=OH
359 R_1=R_3=OH, R_2=H



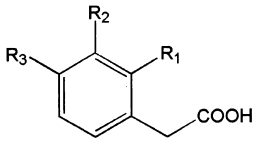
360



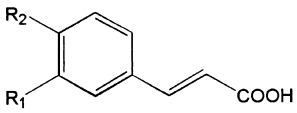
361 R_1=OH, R_2=H
362 R_1=R_2=OH



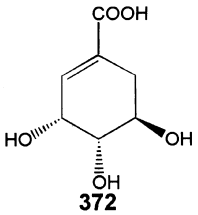
363 R_1=R_2=OH
364 R_1=R_2=OCH_3



365 R_1=OH, R_2=R_3=H
366 R_1=R_2=H, R_3=OH
367 R_1=H, R_2=R_3=OH



368 R_1=R_2=H
369 R_1=H, R_2=OH
370 R_1=OCH_3, R_2=OH
371 R_1=R_2=OH



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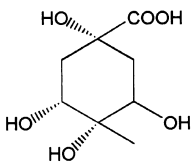

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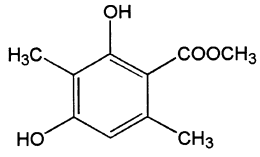

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Structure 19

Table 1. Normal taxane derivatives isolated from different *Taxus* species

Compound	Species	Refs.
Taxa-4(20),11-diene-5α,9α,10β,13α-tetraol (**1**)	*T. baccata*	Chan, Halsall, Hornby, Oxford, & Sabel (1966) and Chauviere, Guenard, Picot, Senilh, & Potier (1981)
1β,2α,5α,9α,10β,13α-Hexahydroxytaxa-4(20),11-diene (**2**)	*T. chinensis*	Zhang & Jia (1991a, b)
Taxusin (**3**)	*T. baccata*	Della Casa de Marcano, & Halsall (1969), Erdtman & Tsuno (1969) and Topcu et al. (1994)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. cuspidata	Miyazaki, Shimizu, Mishima, & Kurabayashi (1968) and Sugiyama, Oritani, & Oritani (1994)
	T. floridana	Erdtman & Tsuno (1969)
	T. mairei	Lee, Hirose, & Nakatsuka (1975), Liu, Lin, Lin, & Chen (1984); Ho et al. (1987a), Chuang, Chen, Lin, & Chen (1992) and Yang, Fang, & Cheng (1996)
	T. yunnanensis	Zhang et al. (1994a)
	T. wallichiana	Chattopadhyay et al. (1996a, 1997)
Taxa-4-(20),11-diene-5α,7β,9α,10β,13α-pentaol pentaacetate (**4**)	*T. baccata*	Della Casa de Marcano & Halsall (1969)
	T. mairei	Liu et al. (1984), Yeh, Wang, Liu, & Chen (1988), Chuang, Chen, Lin, & Chen (1989) and Yang et al. (1996)
Taxa-4-(20),11-diene-2α,5α,9α,10β,13α-pentaol pentaacetate (**5**)	*T. baccata*	Della Casa de Marcano & Halsall (1969)
	T. mairei	Yeh et al. (1988)
Taxa-4-(20),11-diene-2α,5α,7β,9α,10β,13α-hexaol hexaacetate (**6**)	*T. baccata*	Della Casa de Marcano & Halsall (1969)
2-Deacetyl-5-decinnamoyltaxinine J (**7**)	*T. canadensis*	Zamir et al. (1992a, 1995a)
	T. chinensis	Liang, Huang, Gunatilaka, & Yang (1998)
	T. wallichiana	Zhang et al. (1995c)
	T. yunnanensis	Chen, Zhang, & Zhou (1994a)
Taxa-4(20),11-diene-5α-hydroxy-1β,7β,9α,10β-tetraacetate (**8**)	*T. baccata*	Topcu et al. (1994)
5-Decinnamoyltaxinine J (**9**)	*T. brevifolia*	Kingston, Hawkins, & Ovington (1982)
	T. yunnanensis	Chen et al. (1994a)
	T. mairei	Yang et al. (1996)
2-Deacetoxydecinnamoyltaxinine J (**10**)	*T. baccata*	Barboni et al. (1995a)
	T. media	Hall, Tong, & Chang (1997)
	T. wallichiana	Chattopadhyay & Sharma (1995)
Taxa-4-(20),11-diene-5α-hydroxy-9α,10β,13α-triacetate (**11**)	*T. mairei*	Yang et al. (1996)
Decinnamoyl-1-hydroxytaxinine J (**12**)	*T. baccata*	Barboni et al. (1995a)
2-Deacetyldecinnamoyltaxinine E (**13**)	*T. baccata*	Barboni et al. (1995a)
Taxa-4-(20),11-diene-5α,9α,10β,13α-tetraol-9α,10β-diacetate (**14**)	*T. baccata*	Della Casa de Marcano, & Halsall (1969)
	T. mairei	Liu et al. (1984); Yeh et al. (1988); Chuang et al. (1989)
2-Deacetoxy-13-deacetyldecinnamoyl-taxinine J(**15**)	*T. media*	Hall et al. (1997)
2α,5α,9α-Trihydroxy-10β,13α-diacetoxy-taxa-4(20),11-diene (**16**)	*T. chinensis*	Zhang, Wiedenfeld, & Roder (1995d)
1β,5α-Dihydroxy-9α, 10β,13α-triacetate-2α-benzoate taxa-4(20),11-diene (**17**)	*T. chinensis*	Zhang & Jia (1991a) and Jia & Zhang (1991b)
1β,5α,13α-Trihydroxy-9α,10β-diacetate-2α-benzoate taxa-4(20),11-diene (**18**)	*T. chinensis*	Zhang & Jia (1991a) and Jia & Zhang (1991b)
Taxa-4 (20),11-diene-2α,5α,7β,9α,10β-pentaol 7α,9α,10β-triacetate-2α-α-methylbutyrate (**19**)	*T. baccata*	Della Casa de Marcano & Halsall (1969)
Taxa-4-(20),11-diene-2α,5α,7β,10β-tetraol-5α,7β,10β-triacetate-2α-α-methylbutyrate (**20**)	*T. baccata*	Della Casa de Marcano & Halsall (1969)
	T. mairei	Yeh et al. (1988) and Chuang et al. (1989)
Taxuspine Z (**21**)	*T. cuspidata*	Shigemori, Wang, Yoshida, & Kobayashi (1997)
Taxa-4 (20),11-diene-1β,2α,5α,19-tetraol-9α,10β,13α-triacetate (**22**)	*T. chinensis*	Jia & Zhang (1991a)
Taxinine E (**23**)	*T. cuspidata*	Woods, Chiang, Nakadaira, & Nakanishi (1968)
	T. mairei	Yeh et al. (1988)
	T. yunnanensis	Chen, Zhang, Wu, & Zheng (1991)
Taxinine J (**24**)	*T. chinensis*	Liang et al. (1998)
	T. cuspidata	Woods et al. (1968)
	T. mairei	Liang, Min, & Niwa (1988a), Min, Jiang, & Liang (1989) and Yang et al. (1996)
	T. yunnanensis	Chen et al. (1991) and Zhang et al. (1994a)
2α-Deacetoxytaxinine J (**25**)	*T. baccata*	Topcu et al. (1994)
	T. chinensis	Singh, Gujral, Sood, & Duddeck (1997) and Liang et al. (1998)
	T. cuspidata	Kobayashi et al. (1994) and Zhang, Li, & Wu (1996)
	T. mairei	Liang et al. (1988a) and Yang et al. (1996)

Continued on next page

Table 1—*continued*

Compound	Species	Refs.
	T. wallichiana	Chattopadhyay & Sharma (1995), Zhang et al. (1995c) and Chattopadhyay, Saha, Kulshrestha, Sharma, & Kumar (1996b)
	T. yunnanensis	Zhang et al. (1994a)
	T. baccata	Rojatkar et al. (1996)
2α,13α-Dihydroxy-9α, 10β-diacetoxy-5α-cinnamate taxa-4(20),11-diene (**26**)	*T. chinensis*	Jia & Zhang (1991a) and Zhang & Jia (1991b)
10β-Hydroxy-2α,9α,13α-triacetoxy-5α-cinnamate taxa-4(20),11-diene (**27**)	*T. chinensis*	Jia & Zhang (1991a) and Zhang & Jia (1991b)
9α,10β,13α-Triacetoxy-5α-cinnamoyl-taxa-4(20),11-diene (**28**)	*T. chinensis*	Zhang and Jia (1991b)
	T. cuspidata	Kobayashi et al. (1994)
	T. mairei	Yeh, Wang, Liu, & Chen (1988) and Yang et al. (1996)
1-Hydroxy-2-deacetyltaxinine J (**29**)	*T. wallichiana*	Zhang et al. (1995c)
2α,9α-Dihydroxy-10β,13α-diacetoxy-5α-cinnamate taxa-4(20),11-diene (**30**)	*T. media*	Chmurny et al. (1993)
2α,10β-Dihydroxy-9α,13α-diacetoxy-5α-cinnamate taxa-4(20),11-diene (**31**)	*T. media*	Chmurny et al. (1993)
1β,13α-Dihydroxy-9α, 10β-diacetate-2α-benzoate-5α-cinnamate taxa-4(20),11-diene (**32**)	*T. chinensis*	Zhang & Jia (1991a) and Jia & Zhang (1991b)
5α-(Cinnamoyl)oxy-7β-hydroxy-9α,10β,13α-triacetoxytaxa-4(20), 11-diene (**33**)	*T. mairei*	Yang et al. (1996)
13-Deoxo-13α-acetyloxytaxine B (**34**)	*T. baccata*	Appendino et al. (1993c)
13-Deoxo-13α-acetyloxy-1-deoxy-taxine B (**35**)	*T. baccata*	Appendino et al. (1993c)
2′-Desacetoxyaustrospicatin (**36**)	*T. baccata*	Guo et al. (1995)
	T. cuspidata	Kobayashi et al. (1994), Konda et al. (1994) and Zhang et al. (1996)
	T. wallichiana	Barboni et al. (1994a)
7,2′-Didesacetoxyaustrospicatin (**37**)	*T. cuspidata*	Kobayashi et al. (1995)
	T. wallichiana	Barboni et al. (1994a) and Zhang, Fang, Liang, & He (1994)
(+)-2α-Acetoxy, 2′,7-diacetoxy-1-hydroxyaustropicatine (**38**)	*T. baccata*	Doss, Carney, Shanks, Williamson, & Chamberlain (1997)
Taxuyunnanine D (**39**)	*T. yunnanensis*	Zhang et al. (1994a)
13-Deoxo-13α-acetyloxy-1-deoxy-nor-taxine B (**40**)	*T. baccata*	Appendino et al. (1993c)
2α-Acetoxy-2′-deacetyl-1-hydroxy-austrospicatine (**41**)	*T. baccata*	Barboni et al. (1995a) and Doss et al. (1997)
Taxuspine P (**42**)	*T. cuspidata*	Kobayashi, Hosoyama, Katsui, Yoshida, & Shigemori (1996)
Taxuyunnanine C (**43**)	*T. chinensis*	Ma et al. (1994)
	T. mairei	Yang et al. (1996)
	T. yunnanensis	Zhang et al. (1994a)
2α,5α,9α,10β,14β-Pentacetoxytaxa-4(20),11-diene (**44**)	*T. mairei*	Yang et al. (1996)
Taxuyunnanine G (**45**)	*T. yunnanensis*	Zhang & Sun (1995) and Zhang, Sun, & Takeda (1995)
Taxuyunnanine H (**46**)	*T.yunnanensis*	Zhang & Sun (1995)
Taxuyunnanine I (**47**)	*T. yunnanensis*	Zhang & Sun (1995)
Taxuyunnanine J (**48**)	*T. yunnanensis*	Zhang & Sun (1995)
2α,5α,10β-Triacetoxy-14β-propanoyl-oxy-4(20), 11-taxadiene (**49**)	*T. chinensis*	Ma et al. (1994)
2α,5α,10β-Triacetoxy-14β-(2′-methyl)-propanoyloxy-4(20),11-taxadiene (**50**)	*T. chinensis*	Ma et al. (1994)
	T. mairei	Yang et al. (1996)
Taiwanxan (**51**)	*T. mairei*	Ho et al. (1987b) and Yeh, Wang, Yang, & Chen (1989)
Taxuyunnanine B (**52**)	*T. mairei*	Yang et al. (1996)
	T. yunnanensis	Zhang et al. (1994a)
9α-Hydroxy-14β-(2′-methylbutyryl)oxy-2α,5α,10β-triacetoxytaxa-4(20),11-diene (**53**)	*T. mairei*	Yang et al. (1996)
2α,5α,10β-Triacetoxy-14β-(2′-methyl)-butanoyloxy-4(20),11-taxadiene (**54**)	*T. chinensis*	Ma et al. (1994)
	T. cuspidata	Sugiyama et al. (1994)
	T. mairei	Yang et al. (1996)
	T. wallichiana	Chattopadhyay et al. (1996a, 1997)
Taxa-4(20),11-diene-10β-methoxy-2α,5α-diacetoxy-14β-α-methylbutyrate (**55**)	*T. baccata*	Topcu et al. (1994)
Yunnanxane (**56**)	*T. chinensis*	Ma et al. (1994)

Continued on next page

Table 1—*continued.*

Compound	Species	Refs.
	T. yunnanensis	Chen et al. (1991a) and Chen, Chang, Wu, & Zheng (1991b)
	T. mairei	Yang et al. (1996)
Taxinine A (**57**)	*T. chinensis*	Chiang (1975)
	T. cuspidata	Chiang, Woods, Nakadaira, & Nakanishi (1967), Kobayashi et al. (1994) and Tong et al. (1994)
	T. media	Hall et al. (1997)
7β-Acetoxytaxinine A (**58**)	*T. mairei*	Yeh et al. (1988)
Taxinine H (**59**)	*T. cuspidata*	Takahashi (1931)
2,10-Di-*O*-acetyl-5-decinnamoyltaxicin I (**60**)	*T. baccata*	Barboni et al. (1995a)
Triacetyl-5-decinnamoyltaxicin I (**61**)	*T. baccata*	Barboni et al. (1995a)
Taxuspine F (**62**)	*T. cuspidata*	Kobayashi et al. (1995)
	T. media	Hall et al. (1997)
Taxuspine G (**63**)	*T. cuspidata*	Kobayashi et al. (1995)
9α,10β-Diacetyltaxicin I (**64**)	*T. cuspidata*	Tong et al. (1995)
5-Cinnamoyltaxincin I triacetate (**65**)	*T. cuspidata*	Kobayashi et al. (1994)
10-Deacetyltaxinine B (**66**)	*T. cuspidata*	Tong et al. (1994)
2-*O*-Acetyl-5-*O*-cinnamoyltaxicin I (**67**)	*T. baccata*	Appendino, Ozen, Gariboldi, Gabetta, & Bombardelli (1993d)
Taxinine (**68**)	*T. canadensis*	Bourbeau (1954) and Olsen et al. (1998)
	T. chinensis	Chiang (1975)
	T. cuspidata	Takahashi (1931), Kurono, Nakadaira, Onuma, Sasaki, & Nakanishi (1963), Yoshizaki, Madarame, Takahashi, & Hisamichi (1986), Kobayashi et al. (1994), Konda et al. (1994), Tachibana, Itoh, Ohkubo, & Towers (1994a), Tachibana, Matsuo, Itoh, & Oki (1994b), Tong et al. (1994) and Ando et al. (1997)
	T. mairei	Liu et al. (1984) and Yang et al. (1996)
Taxinine B (**69**)	*T. cuspidata*	Woods et al. (1968), Yoshizaki et al. (1986), Kobayashi et al. (1994), Konda et al. (1994), Tachibana et al. (1994a)Tachibana et al. (1994b), Tong et al. (1994) and Zhang et al. (1996)
2-Deacetoxytaxinine B (**70**)	*T. chinensis*	Liang et al. (1998)
	T. wallichiana	Shrestha, Chetri, Banskota, Manandhar, & Taylor (1997)
5-Cinnamoyl-9,10-diacetyltaxicin I (**71**)	*T. baccata*	Appendino et al. (1994b)
5-Cinnamoyl-9-acetyltaxicin-I (**72**)	*T. baccata*	Appendino, Gariboldi, Pisetta, Bombardelli, & Gabetta (1992b), Aljancic, Papovic, Gasic, & Stefanovic (1996)
5-Cinnamoyl-10-acetyltaxicin-I (**73**)	*T. baccata*	Appendino et al. (1992b) and Aljancic et al. (1996)
5-Cinnamoyl-9-acetyltaxicin-II (**74**)	*T. baccata*	Appendino et al. (1992b)
5-Cinnamoyl-10-acetyltaxicin-II (**75**)	*T. baccata*	Appendino et al. (1992b)
1,9α-Dihydroxy-2α,10β-diacetoxy-5α-cinnamoyltaxa-4(20),11-diene-13-one (**76**)	*T. media*	Chmurny et al. (1993)
1,10β-Dihydroxy-2α,9α-diacetoxy-5α-cinnamoyltaxa-4(20),11-diene-13-one (**77**)	*T. media*	Chmurny et al. (1993)
Taxine B (**78**)	*T. baccata*	Graf, Weinandy, Koch, & Breitmaier (1986), Ettouati, Ahond, Poupat, & Potier (1991) and Jenniskens, Van Rozendall, van Beek, Wiegerinck, & Scheeren (1996)
Taxine II (**79**)	*T. baccata*	Lythgoe (1968)
	T. cuspidata	Yoshizaki et al. (1986), Kobayashi et al. (1994) and Ando et al. (1997)
Taxine I (**80**)	*T. baccata*	Graf et al. (1986), Baxter, Lythgoe, Scales, Trippett, & Blount (1958), Appendino et al. (1993f)
2′-Hydroxy taxine II (**81**)	*T. cuspidata*	Ando et al. (1997)
2,9-Dideacetyltaxine II (**82**)	*T. baccata*	Jenniskens et al. (1996)
9-Deacetyltaxine I (**83**)	*T. baccata*	Jenniskens et al. (1996)
2,10-Dideacetyltaxine II (**84**)	*T. baccata*	Jenniskens et al. (1996)
10-Deacetyltaxine I (**85**)	*T. baccata*	Jenniskens et al. (1996)
5-Decinnamoyltaxagifine (**86**)	*T. canadensis*	Zamir et al. (1992a)Zamir et al. (1995a)
	T. chinensis	Zhang et al. (1990)

Continued on next page

Table 1—*continued.*

Compound	Species	Refs.
5-Decinnamoyl-5-acetyltaxagifine (**87**)	*T. chinensis*	Zhang et al. (1990)
Taxinine M (**88**)	*T. brevifolia*	Beutler, Chmurny, Look, & Witherup (1991)
	T. cuspidata	Tong et al. (1994)
2-Deacetyl-5-decinnamoyltaxagifine (**89**)	*T. canadensis*	Zamir et al. (1992a)
	T. chinensis	Zhang & Jia (1991b)
19-Debenzoyl-19-acetyltaxinine M (**90**)	*T. wallichiana*	Barboni et al. (1995b)
Taxagifine (**91**)	*T. baccata*	Chauviere et al. (1981)Chauviere et al. (1982)
	T. cuspidata	Yoshizaki, Fukuda, Hisamichi, Ishida, & In (1988) and Tong et al. (1994)
Taxacin (**92**)	*T. cuspidata*	Yoshizaki et al. (1988) and Tong et al. (1994)
	T. mairei	Yang et al. (1996)
Taxuspine S (**93**)	*T. cuspidata*	Wang, Shigemori, & Kobayashi (1996a)
Taxuspine T (**94**)	*T. cuspidata*	Wang et al. (1996a)
5-Decinnamoyl-11-acetyl-19-hydroxy-taxigifine (**95**)	*T. yunnanensis*	Chen et al. (1994a)
Taxuspine L (**96**)	*T. cuspidata*	Wang, Shigemori, & Kobayashi (1996b)
Taxchin A (**97**)	*T. chinensis*	Li, Tanaka, Fuji, Sun, & Taga (1993) and Fuji et al. (1995)
Taxchin B (**98**)	*T. chinensis*	Li et al. (1993) and Fuji et al. (1995)
5α,7β,9α,10β,13α-Pentaacetoxy-2α-benzoyloxy-4α,20-dihydroxytax-11-ene (**99**)	*T. mairei*	Liang & Kingston (1993)
7β,9α,10β,13α,20-Pentaacetoxy-2α-benzoyloxy-4α,5α-dihydroxytax-11-ene (**100**)	*T. mairei*	Liang & Kingston (1993)
Taxumairol A (**101**)	*T. mairei*	Shen, Tai, & Chen (1996)
Taxuspine R (**102**)	*T. cuspidata*	Wang et al. (1996a)
Taxumairol E (**103**)	*T. mairei*	Shen & Chen (1997a)
Baccatin I (**104**)	*T. baccata*	Chan et al. (1966) and Della Casa de Marcano & Halsall (1970)
1β-Hydroxybaccatin I (**105**)	*T. baccata*	Della Casa de Marcano & Halsall (1970) and Rojatkar et al. (1996)
	T. brevifolia	Chu, Davin, Zajicek, Lewis, & Croteau (1993)
	T. chinensis	Zhang et al. (1994b)
	T. mairei	Yeh et al. (1988)
	T. wallichiana	Miller, Powell, Smith (Jr), Arnold, & Clardy (1981) and Chattopadhyay et al. (1996b)
1β-Hydroxy-7-deacetylbaccatin I (**106**)	*T. baccata*	Senilh et al. (1984)
	T. brevifolia	Chu et al. (1993) and Rao, Bhakuni, Hanuman, Davies, & Johnson (1996)
	T. mairei	Shen & Chen (1997b)
	T. media	Gabetta et al. (1995b)
	T. yunnanensis	Zhang & Jia (1990) and Hongjie et al. (1997)
1β-Hydroxy-7,9-dideacetylbaccatin I (**107**)	*T. canadensis*	Zamir et al. (1995a)
	T. chinensis	Zhang, Chen, & Chen (1992)
	T. mairei	Shen et al. (1996) and Shen & Chen (1997a)
Taxumairol C (**108**)	*T. mairei*	Shen & Chen (1997a)
Taxumairol D (**109**)	*T. mairei*	Shen & Chen (1997a)
5-Deacetylbaccatin I (**110**)	*T. baccata*	Della Casa de Marcano & Halsall (1970)
	T. yunnanensis	Zhang & Jia (1990)
1β-Acetoxy-5,7,10-deacetylbaccatin I (**111**)	*T. canadensis*	Zamir et al. (1992a)Zamir et al. (1992b)
1β-Hydroxy-2,5,7,10-tetradeacetylbaccatin I (**112**)	*T.chinensis*	Jia & Zhang (1991a)
1-Acetoxy-5-deacetylbaccatin I (**113**)	*T. mairei*	Lian, Min, Mizuno, Tanaka, & Iinuma (1988) and Shen et al. (1996)
	T. yunnanensis	Chen et al. (1991)
1-Hydroxy-2,7,9-trideacetylbaccatin I (**114**)	*T. yunnanensis*	Zhang et al. (1995c)
1β-Hydroxy-10-deacetylbaccatin I (**115**)	*T. yunnanensis*	Hongjie et al. (1997)
1β,9α-Dihydroxy-4β,20-epoxy-2α,5α,7β,10β,13α-pentacetoxy-tax-11-ene (**116**)	*T. brevifolia*	Chu et al. (1993)
	T. mairei	Shen & Chen (1997b)
	T. yunnanensis	Hongjie et al. (1997)
Taxuspine V (**117**)	*T. baccata*	Senilh et al. (1984)
	T. cuspidata	Hosoyama, Inubushi, Katsui, Shigemori, & Kobayashi (1996)
	T. wallichiana	Barboni et al. (1997)

Continued on next page

Table 1—*continued.*

Compound	Species	Refs.
Taxumairol F (**118**)	*T. mairei*	Shen & Chen (1997b)
7β-Acetoxy-9-acetylspicataxine (**119**)	*T. media*	Appendino et al. (1994a)
Baccatin III (**120**)	*T. baccata*	Chan et al. (1966), Della Casa de Marcano, Halsall, & Horby (1970a), Della Casa de Marcano, Halsall, & Thomas (1975), Liu et al. (1984), Senilh et al. (1984), Gabetta et al. (1995a) and Lauren, Jensen, & Douglas (1995)
	T. brevifolia	Witherup et al. (1989) and Vance, Kelsey, & Sabin (1994)
	T. cuspidata	Hoke et al. (1992)
	T. wallichiana	Wang (1997)
	T. yunnanensis	Chen et al. (1991), Rao, Liu, Zhang, Chen, & Fang (1991) and Xiang, Zhang, Run, & Sun (1997)
	T. mairei	Shen & Chen (1997a)
Baccatin V (**121**)	*T. baccata*	Della Casa de Marcano, Halsall, Castellano, & Hodder (1970b) and Castellano & Hodder (1973)
19-Hydroxybaccatin III (**122**)	*T. baccata*	Chauviere et al. (1981)
	T. chinensis	Zhang & Jia (1991a)
	T. wallichiana	McLaughhlin, Miller, Powell, & Smith (Jr) (1981)
	T. yunnanensis	Zhang & Jia (1990)
10-Deacetylbaccatin III (**123**)	*T. baccata*	Senilh, Gueritte, Guenard, Colin, & Potier (1984), Chattopadhyay, Tripathi, Thakur, Sharma, & Jain (1994), Lauren et al. (1995) and Guo et al. (1996)
	T. brevifolia	Kingston et al. (1982), Senilh et al. (1984), Rao (1993), Chu et al. (1994) and Vance et al. (1994)
	T. canadensis	Zamir et al. (1992a, 1995a)
	T. cuspidata	Tong et al. (1994)
	T. wallichiana	Vander Velde et al. (1994), Zhang et al. (1995c), Singh et al. (1997) and Wang (1997)
	T. yunnanensis	Zhang & Jia (1990) and Chen, Zhang, Zhon, Liu, & Fang (1994b)
9-Hydroxy-10-deacetylbaccatin III (**124**)	*T. baccata*	Margraff, Bezard, Bourzat, & Commercon (1994)
1-Acetyl-10-deacetylbaccatin III (**125**)	*T. canadensis*	Zamir et al. (1992a)
	T. media	Hall et al. (1997)
1-Dehydroxybaccatin III (**126**)	*T. yunnanensis*	Zhang & Jia (1990)
7-*epi*-10-Deacetylbaccatin III (**127**)	*T. canadensis*	Zamir et al. (1995a)
7-Xylosyl-10-deacetoxybaccatin III (**128**)	*T. yunnanensis*	Chen et al. (1994a)
19-Hydroxy-7-*epi*-baccatin III (**129**)	*T. chinensis*	Fuji et al. (1993)
13-*epi*-10-Deacetylbaccatin III (**130**)	*T. baccata*	Gabetta et al. (1995a)
1,13-Diacetoxy-10-deacetylabaccatin III (**131**)	*T. yunnanensis*	Chen, Gao, & Chen (1996)
2-Debenzoyl-2-tigloyl-10-deacetyl-baccatin III (**132**)	*T. baccata*	Gabetta et al. (1995a)
10-Deacetyltaxol (**133**)	*T. baccata*	Chauviere et al. (1981)
	T. brevifolia	Witherup et al. (1989) and Vance et al. (1994)
	T. canadensis	Zamir et al. (1995a)
	T. chinensis	Liang et al. (1998)
	T. cuspidata	Tong et al. (1994)
	T. wallichiana	McLaughlin et al. (1981) and Wang (1997)
	T. yunnanensis	Chen et al. (1994b) and Hongjie et al. (1994)
10β-Hydroxybutyrate-10-deacetyltaxol A (**134**)	*T. baccata*	Senilh et al. (1984)
Paclitaxel [Taxol (**135**)]	*T. baccata*	Wani et al. (1971), Chauviere et al. (1981), Senilh et al. (1984), Sorochinskii, Prokhnevskii, & Grodzinskii (1990), Vidensek, Lim, Campbell, & Carlson (1990), Witherup et al. (1990), Sorochinskii & Prokhnevskii (1991), Chattopadhyay et al. (1994), Lauren et al. (1995) and Zobel, Furmanowa, Glowniak, & Cragg (1996)
	T. brevifolia	Witherup et al. (1989), Jennings, Deutsch, Zalkow, & Teja (1992), Wheeler et al. (1992), Rao (1993) and Vance et al. (1994)
	T. canadensis	Zamir et al. (1992a)Zamir et al. (1995a)
	T. chinensis	Xu & Liu (1989, 1991) and Liang et al. (1998)

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Table 1—*continued.*

Compound	Species	Refs.
	T. cuspidata	Wani et al. (1971), Witherup et al. (1990), Hoke et al. (1992), Kobayashi et al. (1994), Tachibana et al. (1994b), Tong et al. (1994), Zhang et al. (1996), Zobel et al. (1996) and Kikuchi, Kawamura, Ohira, & Yatagi (1997)
	T. media	Witherup et al. (1990), Vidensek et al. (1990) and Zobel et al. (1996)
	T. wallichiana	Miller et al. (1981), Vander Velde et al. (1994), Zhang et al. (1995c), Singh et al. (1997) and Wang (1997)
	T. yunnanensis	Castellano & Hodder (1973), Chen et al. (1991, 1993, 1996), Rao et al. (1991), Liu, Wu, & Wang (1993), Hongjie et al. (1994), Yan, Fan, & Wang (1996) and Xiang et al. (1997)
7-Xylosyl-10-deacetyltaxol A (**136**)	*T. baccata*	Senilh et al. (1984)
	T. yunnanensis	Chen et al. (1991)
7-Xylosyltaxol A (**137**)	*T. baccata*	Senilh et al. (1984)
7-*epi*-Taxol (**138**)	*T. brevifolia*	Huang, Kingston, Magri, Samaranayake, & Boettner (1986)
	T. canadensis	Zamir et al. (1995a)
7-*epi*-10-Deacetyltaxol (**139**)	*T. baccata*	Zobel et al. (1996)
	T. cuspidata	Zobel et al. (1996)
	T. media	Zobel et al. (1996)
	T. wallicniana	Wang (1997)
	T. yunnanensis	Della Casa de Marcano et al. (1970b)
10-Deacetyltaxol-7-xyloside (**140**)	*T. baccata*	Guo et al. (1995)
	T. brevifolia	Rao (1993) and Vance et al. (1994)
	T. cuspidata	Chattopadhyay et al. (1996a)
	T. wallichiana	Zhang et al. (1995c)
	T. yunnanensis	Chen et al. (1991)
7-Xylosyltaxol (**141**)	*T. brevifolia*	Rao (1993)
	T. yunnanensis	Chen et al. (1994a)
	T. wallichiana	Zhang et al. (1995c)
10-Deacetyltaxol-2′,7-diacetate (**142**)	*T. brevifolia*	Kingston et al. (1982)
Taxol-2′,7-diacetate (**143**)	*T. brevifolia*	Kingston et al. (1982)
Yunnanxol (**144**)	*T. yunnanensis*	Chen et al. (1993)
7-Epitaxuyannanine A (**145**)	*T. yunnanensis*	Hongjie et al. (1994)
7-Epi-10-deacetyltaxuyannanine A (**146**)	*T. yunnanensis*	Hongjie et al. (1994)
10-Deacetyltaxuyannanine A (**147**)	*T. yunnanensis*	Hongjie et al. (1994) and Xiang et al. (1997)
Taxol C (**148**)	*T. media*	Barboni et al. (1994b)
	T. yunnanensis	Zhang et al. (1993) and Xiang et al. (1997)
N-Methyltaxol C (**149**)	*T. media*	Barboni et al. (1994b)
7-Xylosyltaxol C (**150**)	*T. baccata*	Senilh et al. (1984)
	T. yunnanensis	Chen et al. (1996)
7-Xylosyl-10-deacetyltaxol C (**151**)	*T. baccata*	Senilh et al. (1984) and Guo et al. (1995)
	T. wallichiana	Zhang et al. (1995c) and Chattopadhyay et al. (1996a, (1997)
N-Debenzoyl-*N*-butanoyltaxol [Taxol D (**152**)]	*T. media*	Appendino et al. (1994a)
Cephalomannine (**153**)	*T. baccata*	Della Casa de Marcano et al. (1970a), Chauviere et al. (1981), Vanhaelen et al. (1992), Lauren et al. (1995) and Zobel et al. (1996)
	T. brevifolia	Witherup et al. (1989), Stasko et al. (1989), Harvey, Campbell, Kelsey, & Vance (1991), Rao (1993) and Vance et al. (1994)
	T. canadensis	Zamir et al. (1992a, 1995a)
	T. cuspidata	Hoke et al. (1992), Tong et al. (1994), Zhang et al. (1996), Zobel et al. (1996)
	T. media	Zobel et al. (1996)
	T. wallichiana	Vander Velde et al. (1994), Zhang et al. (1995c), Rao et al. (1996), Singh et al. (1997) and Wang (1997)
	T. yunnanensis	Chen et al. (1991, 1993), Rao et al. (1991), Hongjie et al. (1994) and Yan et al. (1996)
10-Deacetylcephalomannine (**154**)	*T. baccata*	Chauviere et al. (1981)

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Table 1—*continued.*

Compound	Species	Refs.
	T. brevifolia	Witherup et al. (1989)
	T. cuspidata	Tong et al. (1994)
	T. wallichiana	McLaughlin et al. (1981)
	T. yunnanensis	Chen et al. (1994b), Hongjie et al. (1994) and Xiang et al. (1997)
10-*β*-Hydroxybutyrate-10-deacetyltaxol B (**155**)	*T. baccata*	Senilh et al. (1984)
7-*epi*-Cephalomanine (**156**)	*T. media*	De Bellis, Lovati, Pace, Peterlongo, & Zini (1995)
7-*epi*-10-Deacetylcephalomannine (**157**)	*T. yunnanensis*	Chen et al. (1994b)
7-Xylosyl-10-deacetyltaxol B (**158**)	*T. baccata*	Senilh et al. (1984)
7-Xylosyltaxol B (**159**)	*T. baccata*	Senilh et al. (1984)
7-*epi*-Taxol B (**160**)	*T. yunnanensis*	Chen et al. (1996)
10-Deacetylcephalomannine-7-xyloside (**161**)	*T. brevifolia*	Rao (1993)
Taxuspinanane A (**162**)	*T. cuspidata*	Morita et al. (1997a)
14*β*-Hydroxy-10-deacetylbaccatin III (**163**)	*T. wallichiana*	Appendino et al. (1992a) and Bombardelli & Gabetta (1998)
2-Debenzoyl-14*β*-benzoyloxy-10-deacetylbaccatin III (**164**)	*T. wallichiana*	Appendino et al. (1993e)
10-Deacetyl-10-oxobaccatin V (**165**)	*T. chinensis*	Fuji et al. (1993)
10-Deacetyl-10-dehydro-7-acetyltaxol A (**166**)	*T. media*	Gabetta et al. (1995b)
10-Deacetyl-10-oxo-7-*epi*-taxol (**167**)	*T. brevifolia*	Huang et al. (1986)
7-Xylosyl-10-deacatyltaxol D (**168**)	*T. baccata*	Guo et al. (1995)
10-Deacetyl-10-oxo-7-*epi*-taxuyannanine A (**169**)	*T. yunnanensis*	Hongjie et al. (1994)
Baccatin IV (**170**)	*T. baccata*	Chan et al. (1966), Della Casa de Marcano et al. (1975) and Rojatkar et al. (1996)
	T. brevifolia	Rao et al. (1996)
	T. mairei	Liang et al. (1988a)
	T. wallichiana	Chattopadhyay et al. (1996b)
Baccatin VI (**171**)	*T. baccata*	Della Casa de Marcano et al. (1975) and Senilh et al. (1984)
1-Dehydroxybaccatin IV (**172**)	*T. baccata*	Della Casa de Marcano et al. (1975)
	T. mairei	Liang et al. (1988a), Chuang et al. (1989) Chuang et al. (1992)
1-Acetylbaccatin IV (**173**)	*T. yunnanensis*	Zhang & Jia (1990)
4-Deacetylbaccatin IV (**174**)	*T. media*	Appendino et al. (1994a)
1-Dehydroxy-4-deacetylbaccatin IV (**175**)	*T. mairei*	Lian et al. (1988)
7,9-Deacetylbaccatin IV (**176**)	*T. brevifolia*	Rao et al. (1996)
	T. canadensis	Zamir et al. (1995a)
1-Dehydroxybaccatin VI (**177**)	*T. chinensis*	Liang et al. (1998)
	T. mairei	Min et al. (1989)
9-Dihydro-13-acetylbaccatin III (**178**)	*T. brevifolia*	Rao et al. (1996)
	T. canadensis	Gunawardana et al. (1992) and Zamir et al. (1992a) Zamir et al. (1995a)
	T. chinensis	Zhang et al. (1992)
10-Hydroxyacetylbaccatin VI (**179**)	*T. canadensis*	Zamir et al. (1995a)
7,9,10-Trideacetylbaccatin VI (**180**)	*T. canadensis*	Zamir et al. (1995a)
7-*epi*-9,10-Trideacetylbaccatin VI (**181**)	*T. canadensis*	Zamir et al. (1995a)
	T. cuspidata	Morita, Wei, Gonda, Takeya, & Itokawa (1997b)
Taxuspine E (**182**)	*T. cuspidata*	Kobayashi et al. (1995)
9*β*-*H*-9-Dihydro-19-acetoxy-10-deacetylbaccatin III (**183**)	*T. baccata*	Appendino et al. (1993d)
9,10-Dideacetyl-9,10-dibenzoylbaccatin VI (**184**)	*T. brevifolia*	Chu, Zajicek, Davin, Lewis, & Croteau (1992)
10-Deacetyl-10-benzoylbaccatin VI (**185**)	*T. brevifolia*	Chu et al. (1992)
7-Deacetyl-7-benzoylbaccatin VI (**186**)	*T. brevifolia*	Chu et al. (1992)
10-Deacetylbaccatin VI (**187**)	*T. yunnanensis*	Hongjie et al. (1997)
9-Deacetylbaccatin VI (**188**)	*T. yunnanensis*	Hongjie et al. (1997)
Taxuspinanane C (**189**)	*T. cuspidata*	Morita et al. (1997b)
Baccatin VII (**190**)	*T. baccata*	Della Casa de Marcano et al. (1975)
Taxuspine N (**191**)	*T. cuspidata*	Kobayashi et al. (1996)
Yunnanxamine (**192**)	*T. yunnanensis*	Hilton et al. (1992)
Taxagifine III (**193**)	*T. chinensis*	Zhang & Jia (1991b)
4-Deacetyltaxagifine-III (**194**)	*T. chinensis*	Zhang & Jia (1991b)
Taxuspine K (**195**)	*T. cuspidata*	Wang et al. (1996b)

Table 2
3,11-Cyclotaxanes isolated from different *Taxus* species

Compound	Species	Refs.
Taxinine K (**196**)	*T. cuspidata*	Chiang et al. (1967)
Taxinine L (**197**)	*T. cuspidata*	Chiang et al. (1967)
5-Cinnamoyl-10-acetylphototaxicin I (**198**)	*T. baccata*	Appendino, Lusso, Gariboldi, Bombardelli, & Gabetta (1992c), Bombardelli & Gabetta (1994) and Aljancic et al. (1996)
Taxuspine C (**199**)	*T. cuspidata*	Kobayashi et al. (1994)
5-α-Cinnamoyl-9-α-acetyl-phototaxicin I (**200**)	*T. baccata*	Appendino et al. (1993d) and Aljancic et al. (1996)
Taxuspine H (**201**)	*T. cuspidata*	Kobayashi et al. (1995)

Table 3
11(15→1)-*Abeo*taxanes isolated from different *Taxus* species

Compound	Species	Refs.
Taxchinin D (**202**)	*T. chinensis*	Li et al. (1993) and Fuji et al. (1995)
Taxchinin E (**203**)	*T. chinensis*	Tanaka et al. (1994) and Fuji et al. (1995)
Taxchinin G (**204**)	*T. chinensis*	Li et al. (1993) and Fuji et al. (1995)
Brevifoliol (**205**)	*T. brevifolia*	Balza et al. (1991), Chu et al. (1994) and Vance et al. (1994)
	T. wallichiana	Vander Velde et al. (1994)
13-Acetylbrevifoliol (**206**)	*T. brevifolia*	Chu et al. (1994)
	T. wallichiana	Chattopadhyay et al. (1996b)
9-Deacetyl-9-benzoyl-10-debenzoylbrevifoliol (**207**)	*T. brevifolia*	Chen and Kingston (1994)
10-Debenzoyl-2α-acetoxybrevifoliol (**208**)	*T. wallichiana*	Barboni et al. (1995b)
7-Deacetoxy-10-debenzoylbrevifoliol (**209**)	*T. wallichiana*	Appendino et al. (1993a) and Barboni et al. (1993)
10-Debenzoylbrevifoliol (**210**)	*T. wallichiana*	Appendino et al. (1993a) and Barboni et al. (1993)
2α-Acetoxy-7-deacetoxy-10-debenzoylbrevifoliol (**211**)	*T. baccata*	Appendino et al. (1993a)Appendino et al. (1993d)
9-Deacetyl-9-benzoyl-10-debenzoyltaxichin A (**212**)	*T. baccata*	Guo et al. (1996)
Taxchinin A (**213**)	*T. baccata*	Appendino et al. (1993a)Appendino et al. (1993f)
	T. chinensis	Fuji et al. (1992, 1993)
	T. wallichiana	Vander Velde et al. (1994) and Chattopadhyay et al. (1996b)
10β-Benzoyloxy-1β-hydroxy-5α-(3′-dimethylamino-3′-phenylpropanoyloxy-7β,9α,13α-triacetoxy-11(15→1)-*abeo*taxa-4(20),11-diene (**214**)	*T. brevifolia*	Chu et al. (1994)
10β-Benzoyloxy-1β-hydroxy-5α-(3′-methylamino-3′-phenyl)-propanoyloxy-7β,9α,13α-triacetoxy-11(15→1)-*abeo*taxa-4(20),11-diene (**215**)	*T. brevifolia*	Chu et al. (1994)
(-)-2α-Acetoxy-2′,7-dideacetoxy-1-hydroxy-11(15→1)-*abeo*-austopicatine (**216**)	*T. baccata*	Doss et al. (1997)
Taxuspine A (**217**)	*T. brevifolia*	Chu et al. (1994)
	T. cuspidata	Kobayashi et al. (1994)
Taxchinin H (**218**)	*T. chinensis*	Tanaka et al. (1994) and Fuji et al. (1995)
	T. wallichiana	Barboni et al. (1995b)
Taxuspine J (**219**)	*T. cuspidata*	Kobayashi et al. (1995)
Taxuspine M (**220**)	*T. cuspidata*	Wang et al. (1996b)
Taxamedin A (**221**)	*T. media*	Gao, Zhou, Ding, & Fang (1997)
Taxacustone (**222**)	*T. cuspidata*	Tong et al. (1995)
Taxuspine O (**223**)	*T. cuspidata*	Kobayashi et al. (1996)
Taxuspinanane B (**224**)	*T. cuspidata*	Morita et al. (1997a)
5-*O*-(β-D-Glucopyranosyl)-10β-benzoyltaxacustone (**225**)	*T. cuspidata*	Tong et al. (1995)
Taxuspine Y (**226**)	*T. cuspidata*	Shigemori et al. (1997)
Taxayuntin G (**227**)	*T. yunnanensis*	Yue, Fang, & Liang (1995)
Yunantaxusin A (**228**)	*T. yunnanensis*	Zhang et al. (1994c)
Taxuchin B (**229**)	*T. chinensis*	Fang et al. (1997)
Taxuchin A (**230**)	*T. chinensis*	Zhang et al. (1994b)
Taxacustin (**231**)	*T. cuspidata*	Tong et al. (1994)
	T. wallichiana	Zhang et al. (1995c)

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Table 3—*continued*

Compound	Species	Refs.
7,9,10-Trideacetyl*abeo*baccatin VI (**232**)	*T. baccata*	Appendino et al. (1994b)
Taxayuntin (**233**)	*T. baccata*	Das, Srinivas, Padma Rao, & Yadav (1995c)
	T. cuspidata	Tong et al. (1994)
	T. wallichiana	Zhang et al. (1995c)
	T. yunnanensis	Chen et al. (1993), Rao, Zhou, Chen, Lu, & Zheng (1994) and Zhang, Takeda, & Sun (1995a)
7,13-Dideacetyl-9,10-didebenzoyltaxchinin C (**234**)	*T. brevifolia*	Chen & Kingston (1994)
4-Deacetyl-9,10-didebenzoyl-9,10-diacetyltaxchinin C (**235**)	*T. media*	Barboni et al. (1994a)
10-Debenzoyltaxchinin C (**236**)	*T. media*	Barboni et al. (1994a)
	T. wallichiana	Chattopadhyay et al. (1996a, 1997)
10-Debenzoyl-10-acetyltaxchinin C (**237**)	*T. media*	Barboni et al. (1994a)
Taxchinin K (**238**)	*T. chinensis*	Tanaka et al. (1994) and Fuji et al. (1995)
Taxchinin I (**239**)	*T. chinensis*	Tanaka et al. (1994) and Fuji et al. (1995)
Taxuyunnanine F (**240**)	*T. yunnanensis*	Zhang et al. (1995a) and Zhang, Sun, & Takeda (1995b)
10,13-Deacetyl *abeo*baccatin IV (**241**)	*T. wallichiana*	Chattopadhyay, Sharma, Appendino, & Gariboldi (1995)
7,9,13-Deacetyl *abeo*baccatin IV (**242**)	*T. wallichiana*	Chattopadhyay, Saha, Kulshrestha, Sharma, & Roy (1997)
Taxayuntin E (**243**)	*T. yunnanensis*	Yue, Fang, Liang, & He (1995a)
Taxayuntin F (**244**)	*T. yunnanensis*	Yue et al. (1995a)
Taxayuntin A (**245**)	*T. yunnanensis*	Chen, Zhou, Zhang, & Fang (1993)
13-Acetyl-13-decinnamoyltaxchinin B (**246**)	*T. baccata*	Das, Rao, Srinivas, Yadav, & Das (1995)
7, 9-Dideacetyltaxayuntin (**247**)	*T. yunnanensis*	Zhong, Hua, & Fan (1996a, 1996b)
10-Benzoyloxy-2,4-diacetoxy-5,20-epoxy-1,7,9,13-tetrahydroxy-11(15→1)-*abeo*taxane (**248**)	*T. brevifolia*	Rao et al. (1996)
Taxchinin C (**249**)	*T. chinensis*	Fuji et al. (1993)
Taxchinin B (**250**)	*T. chinensis*	Fuji et al. (1993)
	T. cuspidata	Bogdan & Ding (1992)
Taxchinin J (**251**)	*T. chinensis*	Tanaka et al. (1994) and Fuji et al. (1995)
Taxuspine Q (**252**)	*T. cuspidata*	Wang et al. (1996a)
13-Deacetoxy-13,15-epoxy-11(15→1)-*abeo*-13-*epi*-baccatin VI (**253**)	*T. media*	Barboni et al. (1994a)
10,15-Epoxy-11(15→1)-*abeo*-10-deacetylbaccatin III (**254**)	*T. wallichiana*	Appendino et al. (1993e)
Taxuyunnanine E (**255**)	*T. yunnanensis*	Zhang et al. (1995a, 1995b)

Table 4
2(3→20) *Abeo*taxanes isolated from different *Taxus* species

Compound	Species	Refs.
Taxin B (**256**)	*T. yunnanensis*	Yue, Fang, Liang, He, & Jing (1995b)
2-Deacetyltaxin B (**257**)	*T. yunnanensis*	Yue et al. (1995b)
Deaminoacyltaxine A (**258**)	*T. baccata*	Appendino et al. (1994b)
	T. media	Hall et al. (1997)
Taxuspine W (**259**)	*T. cuspidata*	Hosoyama et al. (1996)
Taxuspine B (**260**)	*T. cuspidata*	Kobayashi et al. (1994)
Taxine A (**261**)	*T. cuspidata*	Graf (1956, 1958)
7-*O*-Acetyltaxine A (**262**)	*T. baccata*	Barboni et al. (1995a)
2-Deacetyltaxine A (**263**)	*T. baccata*	Poupat, Ahond, & Potier (1994) and Barboni et al. (1995a)

Table 5
Pretaxoids isolated from different *Taxus* species

Compound	Species	Refs.
Canadensene (**265**)	*T. canadensis*	Zamir et al. (1995b)
	T. chinensis	Fang, Fang, & Liang (1996)
Taxachitriene A (**266**)	*T. chinensis*	Fang, Fang, Liang, Lu, & Zheng (1995)
Taxachitriene B (**267**)	*T. chinensis*	Fang et al. (1995)
Taxuspine U (**268**)	*T. cuspidata*	Hosoyama et al. (1996)
5-Deacetytaxachitriene B (**269**)	*T. chinensis*	Fang et al. (1996)
Taxuspine X (**270**)	*T. cuspidata*	Shigemori et al. (1997)

Table 6
Non-taxoid isoprenoids isolated from *Taxus* species

Compound	Species	Refs.
Ecdysterone (**271**)	*T. baccata*	Lloyd-Jones, Rees, & Goodwin (1973) and Kholodova, Pasternak, & Apostolov (1976)
	T. chinensis	Nei (1979)
	T. cuspidata	Imai, Fujioka, Nakanishi, Koreeda, & Kurokawa (1967) and Ripa, Martin, Cocciolone, & Adler (1990)
Taxisterone (**272**)	*T. cuspidata*	Wani et al. (1971) and Nakano, Nohara, Tomimatsu, & Nishikawa (1982)
Ponasterone A (**273**)	*T. brevifolia*	Rao et al. (1996)
	T. cuspidata	Imai et al. (1967)
Makisterone A (**274**)	*T. cuspidata*	Burns & Gilgan (1977)
Campesterol (**275**)	*T. cuspidata*	Yoshizaki et al. (1986)
β-Sitosterol (**276**)	*T. baccata*	Erdtman & Tsuno (1969)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. canadensis	Olsen et al. (1998)
	T. cuspidata	Erdtman & Tsuno (1969)
	T. floridana	Erdtman & Tsuno (1969)
	T. mairei	Erdtman & Tsuno (1969), Liu et al. (1984), Chuang et al. (1989, 1992)
	T. wallichiana	Zhang et al. (1995c) and Shrestha et al. (1997)
Daucosterol (**277**)	*T. wallichiana*	Zhang et al. (1995c)
Stigmasterol (**278**)	*T. cuspidata*	Yoshizaki et al. (1986)
β-Sitostenone (**279**)	*T. mairei*	Guo et al. (1994)
3-*epi*-Ursolicacid (**280**)	*T. yunnanensis*	Chen et al. (1996)
Brevitaxin (**281**)	*T. brevifolia*	Arslanian et al. (1995)
	T. chinensis	Liang et al. (1998)
Taxamairin A (**282**)	*T. mairei*	Liang et al. (1987) and Liang, Min, Tanaka, Mizuno, & Iinuma (1988b)
Taxamairin B (**283**)	*T. mairei*	Liang et al. (1987, 1988b)
Taxamairin C (**284**)	*T. mairei*	Arslanian et al. (1995)
Rhodoxanthin (**285**)	all species	Bourbeau (1954) and Czeczuga (1986)
Escholtzxanthone (**286**)	*T. baccata*	Bodea, Nicoara, & Salontai (1964)

Table 7
Lignans isolated from different *Taxus* species

Compound	Species	Refs.
Secoisolariciresinol (**287**)	*T. baccata*	King, Jurd, & King (1952), Erdtman & Tsuno (1969), Majumdar, Srinivasan, & Venkataraman (1972) and Das et al. (1994b)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. cuspidata	Erdtman & Tsuno (1969)
	T. floridana	Erdtman & Tsuno (1969)
	T. mairei	Liu et al. (1984), Chuang et al. (1989, 1992), Guo et al. (1994) and Shen, Chen, Lin, & Kuo (1997)
	T. wallichiana	Chattopadhyay et al. (1997)
(−)-4-*O*-Methyl-3′-*O*-demethylsecoisolariciresinol (**288**)	*T. baccata*	Das et al. (1994b)
(−)-3-Dimethylsecoisolariciresinol (**289**)	*T. baccata*	Das, Takhi, Srinivas, & Yadav (1993b)
2-(3,4-Dimethoxybenzyl)-3-(3,4-methylenedioxybenzylidene)-butane-1,4-diol (**290**)	*T. baccata*	Das, Rao, Srinivas, & Yadav (1995b)
(−)-2-(3,4-Methylenedioxybenzyl)-3-(3,4-dimethoxybenzylidene)-butane-1,4-diol (**291**)	*T. baccata*	Das, Rao, Srinivas, & Yadav (1995a)
(−)-2-(3,4-Methylenedioxybenzyl)-3-(3,4-methylenedioxybenzylidene)-butane-1,4-diol (**292**)	*T. baccata*	Das et al. (1995a)
Hydroxymatairesinol (**293**)	*T. media*	Appendino et al. (1994a)
	T. wallichiana	Miller et al. (1982)
(−)-Matairesinol (**294**)	*T. baccata*	Das et al. (1995a)
(−)-2-Epinortrachelogenin (**295**)	*T. media*	Appendino et al. (1994a)
Isoliovil (**296**)	*T. wallichiana*	Miller et al. (1982)
4′-*O*-Demethylsuchilactone (**297**)	*T. baccata*	Das et al. (1995b)
(−)-Isohibalactone (**298**)	*T. baccata*	Das et al. (1995a)
(−)-Hibalactone (**299**)	*T. baccata*	Das et al. (1995a)
Isotaxiresinol (**300**)	*T. baccata*	King et al. (1952), Erdtman & Tsuno (1969), Majumdar et al. (1972) and Das et al. (1994b)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. cuspidata	Erdtman & Tsuno (1969) and Zhou, Yu, & Zhu (1982)
	T. floridana	Erdtman & Tsuno (1969)
	T. mairei	Liu et al. (1984), Chuang et al. (1989, 1992), Chen et al. (1991), Guo et al. (1994) and Shen et al. (1997)
	T. wallichiana	Chattopadhyay et al. (1997)
Isolariciresinol (**301**)	*T. baccata*	Erdtman & Tsuno (1969) and Das et al. (1994b)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. cuspidata	Erdtman & Tsuno (1969) and Zhou et al. (1982)
	T. floridana	Erdtman & Tsuno (1969)
Isotaxiresinol-6-methyl ether (**302**)	*T. baccata*	Erdtman & Tsuno (1969)
	T. brevifolia	Erdtman & Tsuno (1969)
	T. cuspidata	Erdtman & Tsuno (1969)
	T. floridana	Erdtman & Tsuno (1969)
α-Conidendrin (**303**)	*T. baccata*	Das et al. (1995a)
	T. mairei	Lee et al. (1975), Liu et al. (1984) and Shen et al. (1997)
	T. wallichiana	Miller et al. (1982)
β-Conidendrin (**304**)	*T. wallichiana*	Miller et al. (1982)
Lariciresinol (**305**)	*T. cuspidata*	Erdtman & Tsuno (1969)
Taxiresinol (**306**)	*T. baccata*	Majumdar et al. (1972)
	T. wallichiana	Chattopadhyay et al. (1997)
D-Sesamin (**307**)	*T. mairei*	Chuang et al. (1992)
4-Hydroxysesamin (**308**)	*T. mairei*	Chuang et al. (1992)
Taxumairin (**309**)	*T. mairei*	Shen et al. (1997)

Table 8
Flavonoids isolated from different *Taxus* species

Compound	Species	Refs.
Ginkgetin (**310**)	*T. baccata*	Khan et al. (1976)
	T. canadensis	Olsen et al. (1998)
	T. cuspidata	Tatsuo & Tokunosuke (1958), Tachibana et al. (1994b) and Konda et al. (1995)
	T. wallichiana	Parveen, Taufeeq, & Khan (1985) and Qiu, Lian, Ma, & He (1989)
Sciadopitysin (**311**)	*T. baccata*	Khan et al. (1976) and Aljancic, Popovic, & Stefanovic (1995)
	T. brevifolia	Tachibana et al. (1994a)
	T. canadensis	Olsen et al. (1998)
	T. cuspidata	Tatsuo & Tokunosuke (1958), Tachibana et al. (1994b) and Konda et al. (1995)
	T. wallichiana	Parveen et al. (1985), Qiu et al. (1989) and Shrestha et al. (1997)
Sequoiaflavone (**312**)	*T. baccata*	Khan et al. (1976)
	T. wallichiana	Parveen et al. (1985) and Qiu et al. (1989)
Sotetsuflavone (**313**)	*T. baccata*	Gactana, Pier, Anna, & Enzo (1962) and Gaetano, Pier, & Annan (1963)
	T. cuspidata	Tatsuo & Tokunosuke (1958)
Kayaflavone (**314**)	*T. cuspidata*	Tatsuo & Tokunosuke (1958)
	T. wallichiana	Singh et al. (1997)
Amentoflavone (**315**)	*T. baccata*	Das, Rao, Srinivas, & Yadav (1994a)
	T. wallichiana	Qiu et al. (1989) and Das et al. (1994a)
4′,7,7″-Tri-*O*-methylamentoflavone (**316**)	*T. baccata*	Parmar et al. (1993)
4′,4″,7,7″-Tetra-*O*-methyl-amentoflavone (**317**)	*T. baccata*	Parmar et al. (1993) and Das et al. (1994a)
4′,7″-Di-*O*-methylamentoflavone (**318**)	*T. baccata*	Das et al. (1994a)
(+)-Taxifolin (**319**)	*T. mairei*	Chuang et al. (1989)
Kaempferol (**320**)	*T. brevifolia*	Tachibana et al. (1994a)
Quercetin (**321**)	*T. brevifolia*	Tachibana et al. (1994a)
	T. cuspidata	Tachibana et al. (1994b)
Isorhamnetin (**322**)	*T. brevifolia*	Tachibana et al. (1994a)
	T. cuspidata	Tachibana et al. (1994b)

Table 9
Glycosides isolated from different *Taxus* species

Compound	Species	Refs.
Taxicatin (**323**)	*T. baccata*	Lefebvre (1907), Herissey & Lefebvre (1907a) and Merz & Preuss (1941, 1942)
	T. canadensis	Olsen et al. (1998)
(*R*)-Taxiphylline (**324**)	*T. baccata*	Nahrstedt (1979)
	T. cuspidata	Rosen, Farnden, Conn, & Hanson (1975)
(*S*)-Dhurrin (**325**)	*T. baccata*	Nahrstedt (1979)
Betuloside [Rhododendrin (**326**)]	*T. baccata*	Khan et al. (1976), Chattopadhyay et al. (1994), Parmar et al. (1991)
	T. canadensis	Olsen et al. (1998)
L-4-*p*-Coumaroyl-*myo*-inositol (**327**)	*T. baccata*	Dittrich & Danboek (1977), Heilemann, Wray, & Strack (1990)
D-1-*O*-Methyl-*muco*-inositol (**328**)	*T. baccata*	Dittrich, Gietl, & Kandler (1971)
Taxuside (**329**)	*T. baccata*	Das et al. (1993b, 1994b)
Triglochinine (**330**)	*T. baccata*	Nahrstedt (1979)
Isotriglochinine (**331**)	*T. baccata*	Nahrstedt (1979)
Raffinose (**332**)	*T. baccata*	Herissey & Lefebvre (1907b) and Merz & Preuss (1942)
D-Pinitol (**333**)	*T. baccata*	Dittrich et al. (1971)
Sequoitol (**334**)	*T. baccata*	Dittrich et al. (1971)

Table 10
Novel compounds of different types isolated from *Taxus* species

Compound	Species	Refs.
Coniferaldehyde (**335**)	*T. mairei*	Tyler (1960) and Jia & Zhang (1991a)
Vanillin (**336**)	*T. mairei*	Liang et al. (1988a) and Guo et al. (1994)
Kojic acid (**337**)	*T. mairei*	Yoshizaki et al. (1989)
10-Nonacosanol (**338**)	*T. mairei*	Yoshizaki et al. (1989)
3-Phenylpropanol (**339**)	*T. baccata*	Das et al. (1994b)
3-(3′,4′-Dihydroxyphenyl)propanol (**340**)	*T. baccata*	Das et al. (1994b)
3-(4′-Hydroxy-3′-methoxyphenyl)-propanol (**341**)	*T. baccata*	Das et al. (1994b)
3-(4-Hydroxyphenyl)propyl tetracosanoate (**342**)	*T. canadensis*	Olsen et al. (1998)
3-(4-Hydroxyphenyl)propyl pentacosanoate (**343**)	*T. canadensis*	Olsen et al. (1998)
3-(4-Hydroxyphenyl)propyl hexacosanoate (**344**)	*T.canadensis*	Olsen et al. (1998)
3-(4-Hydroxyphenyl)propyl dotriacontanoate (**345**)	*T. canadensis*	Olsen et al. (1998)
3-(4-Hydroxyphenyl)propyl tetratriacontanoate (**346**)	*T. canadensis*	Olsen et al. (1998)
4-(4′-Hydroxyphenyl)-2*R*-butanol[(-)-Rhododendrol/betuligenol (**347**)]	*T. brevifolia*	Chu et al. (1994)
	T. baccata	Khan et al. (1976), Das, Takhi, Kumar, Srinivas, & Yadav (1993a) and Das et al. (1994b)
	T. wallichiana	Singh et al. (1997)
4-(4′-Hydroxyphenyl)-2*S*-butanol (**348**)	*T. baccata*	Rojatkar, Sawaikar, Ravindranathan, & Nagasampagi (1995)
4-(3′,4′-Dihydroxyphenyl)-2*R*-butanol (**349**)	*T. baccata*	Das et al. (1993a)Das et al. (1994b)
4-(3′-Methoxy-4′-hydroxyphenyl)-2*R*-butanol (**350**)	*T. baccata*	Das et al. (1993a)Das et al. (1994b)
Deglycosylicariside B_4 (**351**)	*T. wallichiana*	Appendino et al. (1993b)
Dehydrovomifoliol (**352**)	*T. wallichiana*	Appendino et al. (1993b)
Vomifoliol (**353**)	*T. wallichiana*	Appendino et al. (1993b)
Abscissic acid (**354**)	*T. baccata*	Jones & Lynn (1933), Le-Page-Degivry et al. (1970, 1971)
cis-5,*cis*-9-Octdecadienoic acid (**355**)	*T. baccata*	Madrigal & Smith (1975)
	T. cuspidata	Itabashi & Takagi (1982)
Vanillic acid (**356**)	*T. baccata*	Luczak & Swiatek (1995)
Pyrocatechuic acid (**357**)	*T. baccata*	Luczak & Swiatek (1995)
Protocatechuic acid (**358**)	*T. baccata*	Luczak & Swiatek (1995)
β-Resorcylic acid (**359**)	*T. baccata*	Luczak & Swiatek (1995)
Gentisic acid (**360**)	*T. baccata*	Luczak & Swiatek (1995)
γ-Resorcylic acid (**361**)	*T. baccata*	Luczak & Swiatek (1995)
Pholoroglucinic acid (**362**)	*T. baccata*	Luczak & Swiatek (1995)
Gallic acid (**363**)	*T. baccata*	Luczak & Swiatek (1995)
Syringic acid (**364**)	*T. baccata*	Luczak & Swiatek (1995)
o-Hydroxyphenylacetic acid (**365**)	*T. baccata*	Luczak & Swiatek (1995)
p-Hydroxyphenylacetic acid (**366**)	*T. baccata*	Luczak & Swiatek (1995)
Homoprotocatechuic acid (**367**)	*T. baccata*	Luczak & Swiatek (1995)
Cinnamic acid (**368**)	*T. baccata*	Luczak & Swiatek (1995)
p-Coumaric acid (**369**)	*T. baccata*	Luczak & Swiatek (1995)
Ferulic acid (**370**)	*T. baccata*	Luczak & Swiatek (1995)
Caffeic acid (**371**)	*T. baccata*	Luczak & Swiatek (1995)
Shikimic acid (**372**)	*T. baccata*	Le-Page-Degivry (1973) and Luczak & Swiatek (1995)
Quinic acid (**373**)	*T. baccata*	Le-Page-Degivry (1973) and Luczak & Swiatek (1995)
Benzoic acid	*T. baccata*	Luczak & Swiatek (1995)
2-Hydroxy-, 3-hydroxy- and 4-hydroxybenzoic acids	*T. baccata*	Luczak & Swiatek (1995)
β-Orcinolcarboxylate (**374**)	*T. wallichiana*	Shrestha et al. (1997)

updated and comprehensive review will help fellow scientists in locating information in one source.

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