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CHEMICAL CONSTITUENTS OF *Taxus baccata* L. FROM TURKEY

TÜRKİYE'DE YETİŞEN *Tarus baccata* L. BİTKİSİNİN KİMYASAL BİLEŞENLERİ

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From the heartwood of Taxus baccata L., β-sitosterol (1), 2α, 5α, 10β-triacetoxy-14β-(2-methyl)-butıryloxy-4(20), 11-taxadiene (2), taxusin (3), baccatin VI (4), baccatin III (5), 1β-hydroxybaccatin I (6), taxol (7), coniferaldehyde (8), lariciresinol (9), isolariciresinol (10), 3'-demethylisolariciresinol-9'-hydroxyisopropylether (11), taxiresinol (12) and 3-demethylisolariciresinol (13) have been isolated. In addition, 10-deacetylbaccatin III (14) has been obtained from the barks of T. baccata. Among these, compound 11 and 12 were identified as novel lignans. 8 and 9 were isolated from the genus Taxus for the first time. The structures of these compounds were determined by extensive spectroscopic techniques.

Taxus baccala L.'nın odunlarından β-sitosterol (1), 2α, 5α, 10β-triacetoxy-14β-(2-metil butiriloksi-4 (20), 11-taksadien (2), taksusin (3), bakkatin VI (4), bakkatin III (5), 1β-hydroksibakkatin I (6), taksol (7), koniferaldehit (8), larisirezinol (9), izolarisirezinol (10), 3'-demetfilizsolarisirezinol -9'- hydroxyisopropy-lether (11), taksirezinol (12) ve 3-demethylisolarisirezinol (13) izole edilmiştir. Ayrıca, T. baccata'nın kabuklarından da, 10-deasetil bakkatin III (14) elde edilmiştir. Bu bileşikler arasında, 11 ve 12 yeni lignanlar olarak belirlenmiştir. 8 ve 9 no'lu bileşikler Taxus cinsinden ilk defa izole edilen, diğerleri ise daha önce Taxus türlerinden elde edilmiş olan maddelerdir. Bileşiklerin yapıları ileri spektroskopik tekniklerle saptanmıştır.

Keywords: *Taxus baccata; Taxaceae; Taxoids; lignans, phenylpropanoids*

Anahtar Kelimeler: *Taxus baccata; Taxaceae; Taksoitler, Lignanlar; Fenilpropanoitler*

Introduction

Taxus baccala L. belongs to the family Taxaceae which comprises five genera. It is a poisonous plant which is widely distributed from Britain to North Iran (1, 2). *T. baccata* has also been an important plant as the source of baccatin III used in the semisynthesis of anticancer drug paclitaxel (Taxol®) (3, 4). Paclitaxel is an effective drug in the treatment of cancer which was first isolated from the bark of the Pacific yew *(Taxus brevifolia* Nutt.*)* (4, 5). This crucial discovery has prompted the isolation of new compounds from the genus *Taxus*. Until now, a large number of taxoids as well as lignans, flavonoids, steroids and sugar derivatives have been isolated from different *Taxus* species (6, 7).

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Plant Material

Taxus baccata L. (Taxaceae) material was collected from the vicinity of Çamlıhemşin, Rize, Turkey, in June 1995. A voucher specimen (coded GUE 1560) was kept in the Herbarium of the Faculty of Pharmacy, Gazi University, Ankara.

Extraction, Isolation and Purification

The dried and powdered heartwood (3078 g) was extracted with EtOH. The combined ethanolic extracts were evaporated to dryness and a reddish residue was obtained. This residue was diluted with H_2O and extracted with $CHCl_3$. The concentrated $CHCl_3$ extract (49 g) was subjected to column chromatography on silica gel eluted with increasing polarities of different solvents (hexane, acetone, $CHCl_3$, MeOH). Sixtythree fractions were collected according to TLC. Each fraction was further purified by column chromatography, preparative TLC and recrystallisation to give compounds **1** (5.4 mg, 0.0003%), **2** (3.6 mg, 0.0002%), **3** (171 mg, 0.011%), **4** (40.5 mg, 0.0025%), **5** (155.4 mg, 0. 0096 %), **6** (76.4 mg, 0.0047 %), **7** (6.1 mg, 0.0004 %), **8** (34.5 mg, 0.0021 %), **9** (45.7 mg, 0.0028 %), **10** (41.3 mg, 0.0026 %), **11** (62.8 mg, 0.0039 %), **12** (84.6 mg, 0.0052 %) and **13** (71.4 mg, 0.0044 %). In addition, the dried barks (223 g) were extracted with EtOH. The concentrated ethanolic extract (86 g) was diluted with H_2O and extracted with $CHCl_3$. The evaporated reddish $CHCl_3$ extract (3.58 g) was subjected to column chromatography on silica gel eluting with $CHCl_3$:MeOH (100:0.80:20, v/v) to give thirteen fractions. The fractions 25-30 were purified by preparative TLC to yield **14** (4.2 mg, 0.049 %).

Our ongoing studies on *Taxus baccata* growing in Turkey, we have examined the constituents of this plant which have not been studied previously in Turkey. We found that heartwood was richer in terms of constituents than the other parts (8).

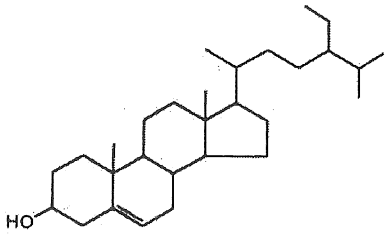
Materials and Methods

The IR spectrum were taken in KBr pellets on a Bruker Vector 22 FT-IR Spectrophotometer. The ^{1}H-, ^{13}C-NMR, DEPT 135, HMQC and HMBC spectra were obtained on a JEOL JNM-ALPHA 500 (500 MHz) FT-NMR Spectrometer m $CDCl_3$, using TMS as an internal standard. The chemical shifts were expressed as ppm. The EIMS was obtained on a Hitachi M-2500. The FAB-MS was measured on a JEOL JMS-SX 102A Tandem Mass Spectrometer. The DCI spectra were recorded on a MS 80 Maspec Spectrometer. Column chromatography was carried out on Silica gel (Kieselgel 60) and TLC was conducted on precoated plates (Kieselgel 60 F254). The spots were detected at UV (254 nm) and spraying with anisaldehyde reagent [methanol 76%, o-phosphoric acid 19%, p-anisaldehyde 5%] followed by heating.

Results and Discussion

Fourteen compounds were obtained and identified by using extensive spectroscopic methods. β-sitosterol **(1)** as a steroid, 2α, 5α, 10β-triacetoxy-14β-(2 - methyl) - butiryloxy - 4 (20), 11-taxadiene **(2)**, taxusin **(3)**, baccatin VI **(4)**, baccatin III **(5)**, 1β-hydroxybaccatin I **(6)** and taxol **(7)** as taxoids; coniferaldehyde **(8)** as a phenylpropanoid and lariciresinol **(9)**, isolariciresinol **(10)**, 3'-demethylisolariciresinol -9'- hydroxy-

isopropylether **(11)**, taxiresinol **(12)** and 3-demethylisolariciresinol **(13)** as lignans were determined. In addition, 10-deacetyl baccatin III **(14)** was isolated from the barks of *T. baccata.*



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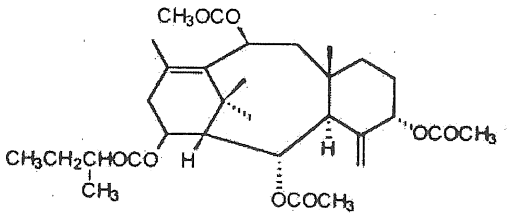

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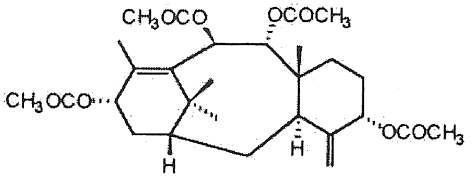

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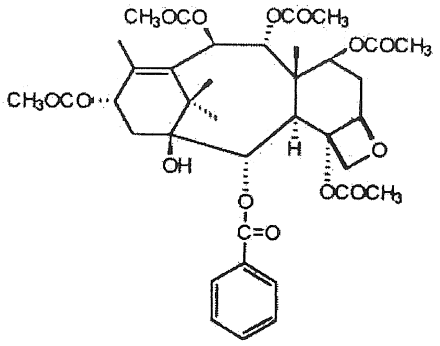

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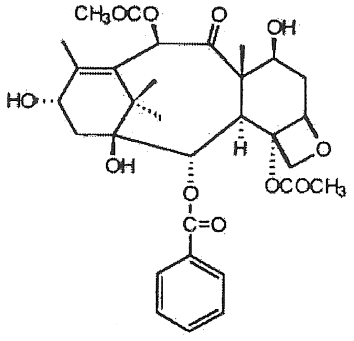

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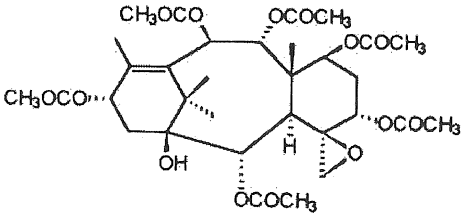

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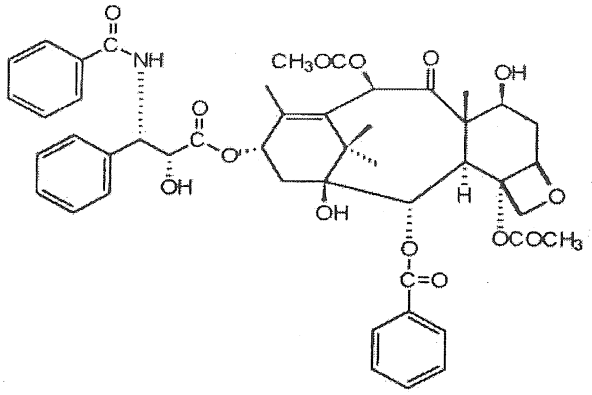

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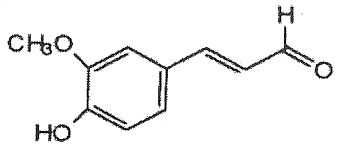

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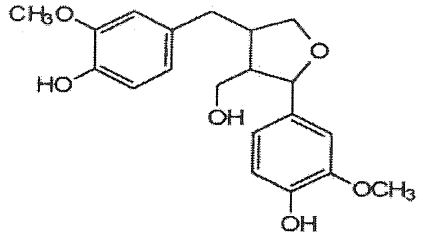

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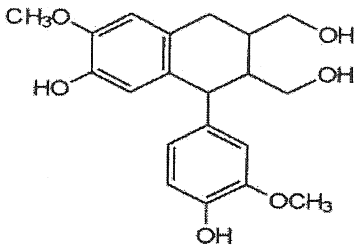

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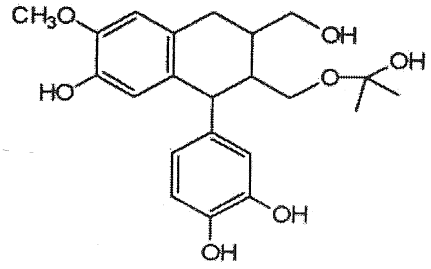

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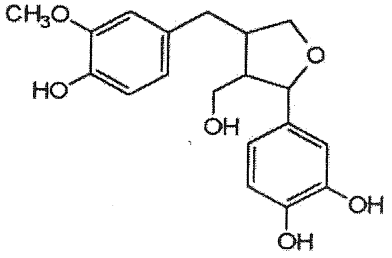

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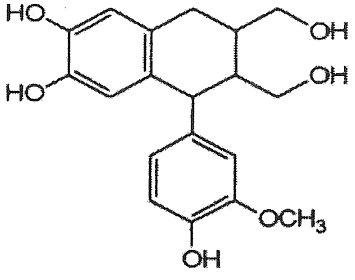

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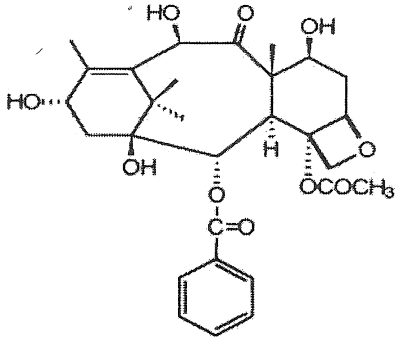

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The presence of **1-7** and **14** has been previously described in this plant (6,7). Compound **8** has been isolated from genus *Taxus* for the first time. However, coniferaldehyde which has been isolated from different plants plays a role in lignan biosynthesis (9-12). This is the first report on the isolation of **9** from the genus *Taxus*, however **9** was previously isolated from different plants (13 -15). The presence of **10** and **12** have been previously reported in genus *Taxus* (16-19). In addition, **10** was also obtained from various plants as well as *Taxus* (14-16,20). Compound **11** and **13** were identified as new lignans. Among these, **3** and **5** were found to be major compounds.

Acknowledgement

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