



Ethnopharmacology of the genus *Taxus*

Aleksander K. Smakosz¹ *

¹ Department of Biology and Pharmaceutical Botany, Faculty of Pharmacy, Wroclaw Medical University, Poland

* Correspondence: aleksander.smakosz@gmail.com

“Root of hemlock digged i' th' dark,
Liver of blaspheming Jew,
Gall of goat and slips of yew
Slivered in the moon's eclipse.”
(W. Shakespeare, *Macbeth*, Act 4 Scene 1)

With these words, one of Shakespeare's witches depicted in *Macbeth* lists the ingredients needed during a magical ritual. The goddess Hecate herself was impressed by the prepared formulation. One of the sources—the yew (*Taxus baccata* L.), famed for its longevity, has been connected for centuries both with world of the dead and immortality. In Celtic culture it was held sacred in pre-Christian times. Simultaneously druids considered described species as the symbol of death and resurrection. Contemporary archaeobotanical records show that *T. baccata* has been growing in the British Isles for at least 8000 years.

The ancient Greek and Roman authors mentioned yew as a wood used both for bows and as a poison. Theophrastus (Greek philosopher called “father of botany,” he lived between 371 and 287 BC) considered the leaves of this plant poisonous to horses. Pliny the Elder (Roman naturalist and encyclopaedist, he lived between 23 and 79 AD) observed, that the “berries” of *T. baccata* are a mortal poison gathered particularly in Spain. Moreover, he was of the opinion, that the word *Toxicon* (lat. poison) was named from this tree. However, it is not so obvious. Some scholars take the view that the name *taxus* was derived from *taxis* (gr.



arrangement of the leaves like teeth of a comb) or *taxon* (gr. a bow). This is especially interesting because Homer himself wrote about soldiers from Crete equipped with this deadly yew-bows. It is worth pointing out that in ancient times botanical preparations based on yew were used as an abortifacient—often with deadly consequences.

Considering this plant as a link between divine and humankind did not disappear during Christianization of the British Isles. Therefore *T. baccata* was planted around churches and cemeteries. It explains why the old specimens of yew are now rare outside of church grounds.

The name *Taxus* was first proposed for the genus by Tournefort in 1717, and in 1753 this taxon was established by Carl von Linné. In his *Species Plantarum* he described two species of yew : common yew and *Taxus nucifera*. The latter is contemporary classified as *Torreya nucifera* (Japanese nutmeg-yew). This *Taxaceae* representative yields edible seeds and cooking oil. It is commonly planted as an ornamental plant. In Japan some esoteric groups are extracting aromatic oil from the crude material (leaves) which is burned by them and used as a meditation agent.

Yew in official medicine

In 19th century yew was not a significant botanical substance, but it was well established in German-language countries. The most common crude drugs obtained from this tree were:

- *Cortex Taxi*—bark
- *Folia Taxi*—leaves (needles)
- *Lignum Taxi*—wood
- *Pseudofructus / Baccae / Fructus Taxi*—the seed cones (strobili)
- *Semen Taxi*—seeds
- *Summitates Taxi*—young shoots

Within the medicines based on yew materia medica the most notable formulations were sirups, tinctures, decoctions, spirits and extracts. Tincture of yew's needles (*Tinctura Taxi*) and extract of yew's needles (*Extractum Taxi*) were mainly used as belladonna (*Atropa belladonna*) substitutes. Botanical preparations based on seeds: *Aqua Taxi seminis* (yew seeds medicinal water), *Extractum Taxi seminis aethereum* (yew seeds ether extract), *Spiritus Taxi seminis* (yew seeds spirit)



were used in similar manner as a foxglove (*Digitalis spp.*, this plant was used for various heart conditions such as arrhythmia), but without its side effects. It is worth to mention that the seed cones were also used in bronchitis and wood for rabies.

If overdosed, the characteristic symptoms of yew poisoning are: vomiting, dilating pupils, nausea, coma and hallucinations. From ancient times *T. baccata* were known for its poisonous properties. In this case these features are known as cardiotoxicity. All organs of this plant (except fleshy seed cones) contain taxine alkaloids. They cause irregular heartbeat and heart and respiratory failure. Survival after yew poisoning is uncommon.

From traditional medicine to antitumor drug

One of the indigenous people group of North America – Iroquois, used other species from this genus (*T. canadensis* = Canadian yew) in their traditional medicinal system. For respiratory tract infections they prepared a branch decoction. The patient was put in a chair, then he was cooled with a blanket and a steeping, hot liquid was placed under the sick person who was steaming until sweating. For numbness of fingers and legs a decoction of twigs was used. According to Iroquois this crude drug was also helpful against powerlessness.

There is another important yew species from “The New World”—*T. brevifolia* (pacific yew). Certain Native American tribes used the bark and wood for stomach pains and poultice of ground leaves for hard-healing wounds. Decoction of bark was taken as a “blood medicine.” In 1960s the National Cancer Institute (US) was screening for American plants with antitumor properties. It came out that the bark extract of Pacific yew stops the growth of several mouse tumours. Furthermore, during the years of research scientists have developed a new antitumor drug for lung, breast and ovarian cancer - paclitaxel. Because of above, most of the original *T. brevifolia* population ceased to exist (it was converted into a drug). Soon the new methods was developed—e. g. semisynthesis from analogue compound extracted from leaves of our European yew. Contemporary most of paclitaxel is produced via semisynthesis from natural precursor obtained from in vitro culture of common yew needle cells.

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References

- CZERWIAKOWSKI, I.R.. Opisanie roślin dwulistniowych lekarskich i przemysłowych. Drukarnia Uniwersytetu Krakowskiego. 1860.
- GEIGER, P.L., MOHR, CF. Pharmacopoea Universalis. Sumptibus Chr. Fr. Winter.Ginsberg, Judah. (2003). The discovery of Camptothecin and Taxol. American Chemical Society. 1845,
- HAGER, H. Handbuch der pharmaceutischen Praxis. Verlag von Julius Springer. 1883,
- KEEN, R.A. A study of the genus Taxus. The Ohio State University. 1956
- LEE, M.R. The yew tree (*Taxus baccata*) in mythology and medicine. Proc. R. Coll. Physicians Edinb. 1988. 28: 569-575