

## **Ksantohumul i inne prenyloflawonoidy szyszek chmielu – aspekty biologiczne i technologiczne**

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### **Xanthohumul and other prenylated flavonoids of hop cones – biological and technological aspects**

#### **Summary**

Hops, the female inflorescences of the hop plant (*Humulus lupulus*) are used in the brewing industry to add bitterness and aroma to beer. This raw material is a rich source of terpenoid essential oils and terpenophenolic resins (bitter acids, prenylated flavonoids). Xanthohumul is the most abundant (80-90%) of total amount of prenylated flavonoids in hop cones (up to 1% w/w). Xanthohumul has received much attention in recent years as a cancer chemopreventive agent because of its ability to inhibit initiation, promotion and progression stages of carcinogenesis. It's beneficial effects on health also include antibacterial, antioxidant, and antiinflammatory properties. Hydrophobic xanthohumul cannot be extracted with carbon dioxide under condition used for common hop extract destined for the application in the brew house (300 bar, 50°). This flavonoid remains in the waste product of the hops (spent hops) processing industry. Diverse extraction methods of spent hops by ethanol and supercritical CO<sub>2</sub> at different pressures lead to the residues that contain more than 30% xanthohumul. The multistep process extraction and separation of xanthohumul from natural source (raw or waste hops) with organic solvent have been also conducted. Recently, a synthetic route to xanthohumul has also been described.

The purpose of this review is to provide an overview of the chemistry, biosynthesis, biological activities, and biotechnological aspects of xanthohumul.

#### **Key words:**

hop (*Humulus lupulus*), xanthohumul, biosynthesis, biological activities, isolation methods, chemical synthesis, review

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