

# Fibre-type hemp in the food and beverage industry: from the field to the molecule

## Centre of Food Composition and Process Design



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**A** recent study on the chemical composition of the flowers of different fibre hemp cultivars, grown in the garden of Campus Grüental at the ZHAW in Wädenswil and harvested at different stages, revealed insights into the optimal sowing density and optimal harvest time to maximise the quantity of value-added compounds, such as polyphenols and terpenes. Overall, the results of this investigation were able to prove that due to their chemical composition, hemp flowers can be regarded as a valuable by-product for their valorisation in the food and beverage industry.

### Hemp: a treasure trove of phytochemicals

Hemp (*Cannabis sativa* L.) is one of the oldest cultivated plants known to mankind. This multi-purpose crop has been used for centuries in folk medicine and for textile production. As a well-known source of fibres, nutrients and medicinal compounds, hemp was used as one of the most cultivated crops until the middle of the 20th century. After its recent revival as a plant for medical and recreational purposes, the food industry is becoming increasingly interested in hemp as a raw material as hemp is rich in nutritive components such as

unsaturated fatty acids, proteins and antioxidants, as well as aromatic substances such as terpenes. 71 industrial hemp varieties with a THC content lower than 0.2 % w/w are authorised for cultivation in the European union and mainly used for fibre and seed production. However, the flowers of industrial hemp remain an unexploited by-product.

### Towards hemp cultivation optimisation

In order to investigate the potential of the flowers of fibre-type hemp for use as a raw material in food and beverages, eight different hemp cultivars were cultivated in the garden of Campus Grüental at the ZHAW within the framework of an internally-funded project of the Department-N, run by the Food Chemistry Research Group (ILGI) in collaboration with the Horticulture Research Group (IUNR). The main goal was to gain insights into the optimal sowing density and optimal harvest time of the different hemp cultivars to maximise the quantity of compounds of interest in the final product. For this purpose, the flowers of the cultivated industrial hemp varieties were analysed for total polyphenol content, antioxidative capacity, flavonoid and terpene composition. The morphological parameters of the plant were also studied.

### Findings

It was shown that the contents of the polyphenols and terpenes analysed were mainly influenced by the harvest period and the phenological stage of the plant. Whereas both the content of polyphenols and the antioxidant activity decreased during the flower development, an increase in the terpene content could be observed with maturation.

This increase in terpene content over the flowering period was associated with changes in the monoterpene/sesquiterpene ratio, explaining the different volatiles released by the hemp flowers throughout their development. Early flowers are characterised by a higher amount of sesquiterpenes, therefore expressing a scent described as spicy, hoppy and woody. As the flower develops, the monoterpenes increase, resulting in the change of the aromatic profile toward a more citric and fresher scent.

### Outlooks

It was highlighted during the study that the terpene profile of certain hemp cultivars showed similarities to the terpene profile of hops (*Humulus lupulus*). This finding and the fact that hemp flowers exhibit a bitter taste, which has not yet been characterised on molecular level, indicate the potential of the fibre hemp flowers to be used as a hop substitute during beer brewing. For this reason, the characterisation of the flavour profiles, in particular the bitter tastants of selected hemp cultivars, is the goal of a further investigation of the Food Chemistry Research Group, funded by the SNF-Spark grant.

More information about the follow up study are available under:

[zhaw.ch/en/research/research-database/project-detailview/projectid/3841/](https://zhaw.ch/en/research/research-database/project-detailview/projectid/3841/)

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[digitalcollection.zhaw.ch/handle/11475/21085](https://digitalcollection.zhaw.ch/handle/11475/21085)

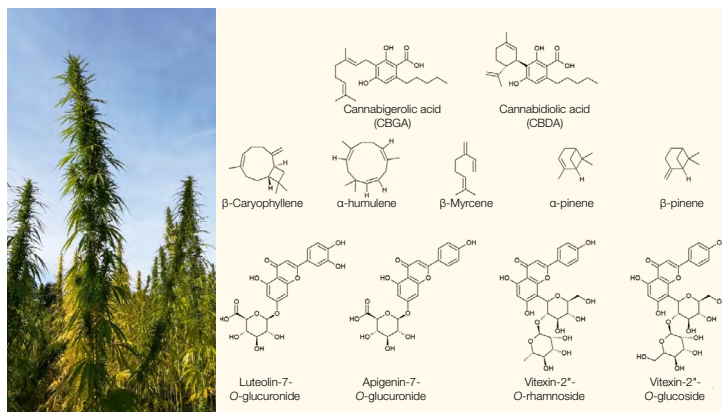


Fig. 1: Flowers of fibre-type hemp grown in the garden of the ZHAW in Grüental, Wädenswil; Chemical structures of the main compounds identified in fibre-type hemp cultivars.