

## PUBLICATION CZECH HOPS

Traditionally like each year was edited international publication Český chmel – Czech hops. This publication has been officially published at fair Drinktec in Munich last week. As is well known by many studies and response on the world confirmed Czech hop is a sign of quality and finally superiority as evidence by both the czech hops districts by law No. 97/1996 and particular „Žatecký poloraný červeňák“ minutes to the list protected Designation of origin by Regulation No. 503/2007. This publication is published by the Ministry of Agriculture of Czech Republic in cooperation with the Hop Growers Union. Editor-in-chief is Mgr. Zdeněk Rosa, BA. that already the introduction captures the uniqueness of Czech hops and its rich history. Further, he deals with overview of information that reader can find.

Introductory speech to the publication contributed Minister of Agriculture Ing. Jakub Šebesta that highlighted importance quality and growing tradition of hops in Czech Republic. Further, his words summarized statistics hops variety and areas at our land.

Beer is, without a doubt significant drink by czech man and czech hop is closely related with czech beer. The „České pivo“ was registered to the protected designation in year 2008. And under this authorization in addition to many other parameters focus on raw materials including the czech varieties. Ing. Jan Veselý deals with protected geographical indication (PGI) in this publication. Ing. Josef Patzak, PhD., from Hop Research Institute Co., Ltd. in Saaz introduced individual departments and their head employees. This record gives some insight about activity and importance of the work Hop Research Institute.

Scientific articles afforded Ing. Karel Krofta, PhD., Content of prenylated hop flavonoids in czech and foreign beers and Ing. Josef Ježek, Utilization of irrigation systems in hop growing.

Further publication content description czech variety of hops from authors Ing. Vladimír Nesvadba, PhD. and Ing. Karel Krofta, PhD. Description is including characteristic of varieties or content individual components.

From historical site (like importance part) Ing. Zdeněk Tempír, CSc. written articles called: The tradition of „Dočesná“ (Hop harvest festival) and further Antonín Mohl that like teacher, researcher and mainly the most significant hop grower its activity has helped raise the profile of the field.

It should be stressed that the Czech hops still maintains its uniqueness and quality even during extreme adverse climatic effects which are evidence of the harvest results of the last two years both in revenues and in the quality and content of alpha acids are above-average results of the last crop year. Information that the questions of the quality of Czech hops, depending on global warming is not authentic and not based on long-term follow facts and not based on concrete facts found in the long-range observation. Czech beer drinkers therefore does not need to worry

about the future, that the Czech hop growers fail to deliver high-quality raw materials to produce high-quality Czech beer. Similarly, the foreign customer is always satisfied by the traditional quality Saaz hops. The quality of hops is evaluated not only for the content of alpha acids which is typical for aromatic and delicately flavored hops Czech variety hops are a group of aromatic varieties, and especially the variety Saaz is considered the best aromatic variety of the world due to its ratio of alpha and beta bitter acids, due to essential oil content, where the main feature this variety contains high levels of farnesene. For variety Saaz is also a high content of polyphenols, which have a many beneficial health properties. Breweries, which bought Czech aromatic hops evaluate especially his exceptional sensory characteristics and its contribution to a balanced and pleasant bitterness of beer, which ensures high consumption.



CONTENT OF PRENYLATED HOP FLAVONOIDS IN CZECH AND FOREIGN BEERS

OBSAH PRENYLOVANÝCH FLAVONOIDŮ CHMEVĚV ČESKÝCH A ZAHRANIČNÍCH PĚVECH

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Abstract

Content of isoxanthohumol (IX) in most of Czech and foreign beer brands did not exceed 500 µg/l. Concentration of xanthohumol (XO) was up to 150 µg/l. The majority of prenylated flavonoids were of the isoprenylated type with the exception of 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediol (DBO) and 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediol (DBO). On average, prenylated flavonoids were found in 40% of samples and their total amount did not exceed 1000 µg/l. The majority of prenylated flavonoids were found in 40% of samples and their total amount did not exceed 1000 µg/l. The majority of prenylated flavonoids were found in 40% of samples and their total amount did not exceed 1000 µg/l.

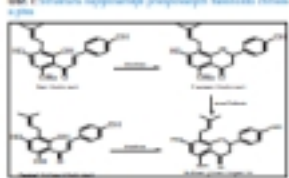
Abstract

Obsah isoxantohumolu (IX) v většině českých a zahraničních piv značek nepřesáhl 500 µg/l. Souhrlný obsah xantohumolu (XO) byl až 150 µg/l. Většina prenylovaných flavonoidů byla isoprenylovaná s výjimkou 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediolu (DBO) a 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediolu (DBO). Průměrně prenylované flavonoidy byly nalezeny v 40% vzorků a jejich celkový obsah nepřesáhl 1000 µg/l. Většina prenylovaných flavonoidů byla nalezena v 40% vzorků a jejich celkový obsah nepřesáhl 1000 µg/l.

Úvod

Člověk jako státní tvorina při výrobě piva je přirozeně vystaven prenylovaným flavonoidům, isoxantohumolu a 8-prenyloxanthohumolu (IX) a xantohumolu (XO) a jejich prenylovaným derivátům. Tyto látky jsou obsaženy v pivu a jejich obsah je závislý na množství prenylovaných flavonoidů v chmelech. Většina prenylovaných flavonoidů je isoprenylovaná s výjimkou 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediolu (DBO) a 11 3,3'-di-*n*-butyl-4,4'-oxy-1,4'-diphenyl-1,3-propanediolu (DBO). Průměrně prenylované flavonoidy byly nalezeny v 40% vzorků a jejich celkový obsah nepřesáhl 1000 µg/l.

Fig. 1. Structure of the most important prenylated hop and beer flavonoids



Introduction

Hops, as a raw material in beer production, are the only source of prenylated flavonoids, isoxanthohumol and 8-prenyloxanthohumol (IX) in the brewing. The importance of the above mentioned agents has been rapidly growing in the past decade by reason of the discovery of numerous health effects. As for xanthohumol, this is especially the ability to act on some types of cancer, as well as anti-infective, anti-inflammatory and anti-oxidative effects. The chemopreventive effect of xanthohumol in the case of carcinogenesis may consist in the inhibition of metastatic activation of pro-carcinogens, increasing of the activity of carcinogen-detoxifying enzymes and/or some growth-inhibitors in the final stage [1]. Xanthohumol together with some hop resin components also inhibits migration of tumor cells. The health effects of isoxanthohumol are similar to those of xanthohumol, but the prenylated IX is a more potent, a more effective compound with higher concentrations and may stability in beer for many years. Xanthohumol was considered a source of estrogenic hop effects. However, based on extensive research in mice of increased hop content, Pilsner and 11 identified 8-prenyloxanthohumol as the main of the estrogenic effects based on the comparison of the estrogenic effects of 8-PN and other agents reported in literature or used in human clinical trials. In the most effective phytoestrogen discovered so far, 8-prenyloxanthohumol are natural substances, structurally and functionally similar to estrogen of the mammalian origin. They are used, e.g. in the case of substitution treatment of women in order to reduce health complications in the postmenopausal period. The bioactivity of 8-PN in beer is the concentration of 8-prenyloxanthohumol (8-PN), contained in hops in the quantity of 10 to 100 µg/kg weight, is around 100 to 200 µg/l in beer. It has been found that women reach the regular physiological level of 8-PN consumption in beer only 0.7%. Therefore, due to regular beer consumption, the daily intake of phytoestrogen may increase as much as to a physiologically active level [2].

In spite of the fact that xanthohumol is contained in hops in the greatest amount, its concentration in beer is lower due to thermal isomerization to isoxanthohumol. On the contrary, isoxanthohumol is a dominant hop prenylated flavonoid. During the brewing process, by means of prenylation side effect, caused by an imperfect isomerization to isoxanthohumol, absorption to malt protein and yeast. Several studies show that the total xanthohumol and isoxanthohumol in beer is 20 to 30 µg/l. Total xanthohumol and isoxanthohumol in beer is 20 to 30 µg/l. Xanthohumol concentration in chemical beer is thus lower than 10 µg/l. The content of isoxanthohumol does not normally exceed the level of 100 µg/l [3]. The structure of the most important prenylated flavonoids contained in hops and beer is shown in Fig. 1. Analytical determination of hop prenylated flavonoids in beer is carried out. Various techniques using liquid chromatography coupled to