UDC 663.423:633.791

RESEARCH OF BITTER SUBSTANCES OF LUPULIN IN DIFFERENT TYPES OF HOPS

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The main components of hops that are of interest to brewing and other sectors of the economy are unique bitter substances that are not detected in other plants, essential oils and polyphenols.

It is known that these compounds are synthesized and accumulated in the lupulin grains (peltal trichomes), which are located on the inner side of the scions of the cones of hops, as well as on the germ and core of the cone.

Men's inflorescences also contain lupulin glands, their leaves are much smaller and less developed. Therefore, one of the important organoleptic indicators of the quality of hop dolden is the amount and state of lupulin.

The brewing quality of the hops and the products of their processing in the production of beer are determined by the varietal properties of the hop: the biochemical composition of the bitter substances and essential oils, the terms of harvesting, the technology and conditions of processing and storage, as well as the norms and methods for making them in wort. It is known that hop varieties differ not only in the content of α-acids, but also in the concentration of β-acids, essential oils and polyphenols per 1 g of α-acids.

When churning the wort, xanthohumol is converted into isoxanthumol, so the beer is significantly superior to the latter in comparison with a small amount of xanthohumol. The use in brewing varieties of hops with a high content of α-acids and

carbonaceous extracts, which practically does not contain xanthohumol, leads to a decrease in beer of this valuable compound for the human body.

Special attention among researchers was aimed at establishing correlation dependence between the amount of lupulin grains on prikvitkovyh scales of dolden hop and the total amount of bitter substances.

However, studies have not been conducted to determine the amount of α- and β-acids and their composition and xanthohumol in the lupus of aromatic and bitter hops that determine its brewing and pharmacological value, as well as male inflorescences and hops.

The purpose of this work was to study the quantity and qualitative composition of α-, β-acids and xanthohumol in the lupulin of hops, which significantly differs according to these biochemical parameters of quality and their presence in male inflorescences and leaves.

Materials and methods of research. The researches were conducted during 2010-2016 in the certified laboratory of the department of biochemistry of hops and beer at the Institute of Agriculture of the Polissya National Academy of Sciences of Ukraine.

Laboratory methods were used: modern physico-chemical methods for determining the quality of hops, special and generally accepted in the hop industry in accordance with DSTU 4099: 2009 Hops. Sampling rules and test methods. and mathematical statistics using dispersion and correlation-regression analysis to assess the reliability of the results of research.

The samples of hops of aromatic and bitter varieties grown on the experimental field of the Institute were investigated. The selection of samples of each type of hops was carried out in a phase of complete technical maturation. Samples were selected from at least ten bushes from the middle tier of plants according to the current standard. The mass of the average sample for identification and biochemical studies was not less than 1 kg of dry hops. Samples of hops were dried to a standard humidity of 9-12%.

Pure lupulin hops were obtained by sieving the mass of petals of technically ripe cones through a sieve with a diameter of holes 0.25 mm, and from male inflorescences received a mixture of pollen and lupulin. The content and composition of alpha and beta

acids and xanthohumol were determined by the method of high-performance liquid chromatography.

Results. As a result of the studies, the quantity and qualitative composition of the bitter substances and the xanthogum lupulin of the aromatic and bitter hops were determined.

The results of previous studies found that the number of α-acids varies from 1 to 18% depending on the hop variety and 2 to 12% for β-acids.

This indicates that the amount of α-acids in the lupulin of aromatic hop varieties is significantly lower (14.3-26.3%) compared to those of bitter type (30.8-38.4%), while the amount of β-acids, on the contrary, more in the lupus of varieties of aromatic type - 20,1-38,0% at 12,4-22,4% in bitter varieties. That is why the ratio of the amount of β- and α-acids in aromatic varieties is more than one, while in the grades of bitter type it is much smaller. Thus, the amount of lupulin can not predict the content of α- and β-acids. Thus, in the Aroma Polissya variety in cones in some years contained a significant amount of lupulin, but the content of α-acids could not exceed 2%.

The study of the composition of α- and β-acids showed that the share of cohumulon in α-acids and colpulum in β-acids varies considerably and is a varietal sign. Consequently, certain quantity and qualitative composition of α- and β-acids are among the main biochemical parameters of both brewer's quality and identification of breeding hops.

For the first time, the method of high-performance liquid chromatography analyzed the quantitative content of xanthohumol in lupus of different grades. It has been established that, depending on the variety, its quantity ranges from 0.65% in the Alta variety to 3.0% in the Ruslan variety. Since xanthohumol has an intense yellow color, then from its presence in lupulin, the color of lupulin changes from light yellow to golden yellow.

Conclusions

1. The quantitative content and composition of the α- and β-acids, cohumulon in the lupulin of breeding varieties does not depend on its amount in hop cones, but is a varietal sign. Almost half of the mass of lupulin is α- and β-acids.

2. From the investigated varieties of hops most of the xanthohumula was found in the lupulin variety of Ruslan.

3. Lupulin in male inflorescences, obtained from different plants, differs significantly in the number of α- and β-acids. The share of cohumulon in the α-acids and the colupulon in β-acids, as well as in the lupulin, is significantly al in individual plants.

4. In the glands on the leaves of hops, bitter substances are represented only by β-acids, and mainly by lupulone and adulupulone.