UDC 663.423:006.015.5

RESEARCHINH QUALITY OF HOPS AND HOP'S PRODUCTS WHICH USED IN BREWING

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The results of biochemical studies hops and ho's products of home manufacture and foreign production that using in brewing were presented. On results of biochemical indexes of hops and hop's products that must be considered during the storage, processing and brewing were established their advantages and disadvantages.

Keywords: Quality, hops, ho's products, hop cones, hop's pellet type 90, hop's pellet type 45, ethanol extracts, carbon dioxide extract.

Hops and its products (ho's products) – the most expensive and scarce raw materials used in the production of beer.

The use of hop and its products in brewing due to the fact that the hop cones contain a large number of biologically active substances such as bitter substances, polyphenols and essential oil. Specific substances give beer bitterness unique and specific flavor, involved in foaming and light, increase its stability during storage [5].

The trend growth of beer production in Ukraine stimulates demand for hop growing industry, necessitates sustainable development of the industry to meet the needs of the brewing industry. However, competition in the market wins not the one who produces more, but mediocre hop, but the one who does it better quality and cheaper price. Even in the current difficult circumstances there are opportunities for the production and reserves of high quality hops trade, including aromatic [8].

In brewing uses about 90 % of the hop. Demand for hop growing, but the industry is not fully satisfy the domestic market. Today, the brewing industry in Ukraine is not used more than 20 % of domestic products. The overwhelming share of imported raw materials, creating dependence on world markets. This area is divided between countries such as Germany, Czech Republic, Poland, Austria, USA, Canada, Australia and China [2,3,5].

As the market research, the global market comes only about 10 % natural cone's hops, granulated and recycled in hop extracts – 90 % of the total number of received hop's products. Only breweries remained low power classic technology of making beer in which added hops to beer wort is traditionally used cone's hops pressed hops. Powerful breweries Ukraine switched to different types of granules, carbon dioxide and ethanol extracts of hops [7,8].

However, despite the fact that in the world more than 90 % of native cone's hops processed into hop preparations, almost no research data that devoted to the study of quality in terms of breeding varieties that have different content and composition of bitter substances, polyphenols and essential oil. Skilled agricultural and brewing industry needs to know the basic advantages and disadvantages of these products, especially in literature, especially in advertising media tend to write more about their benefits, not focusing attention on shortcomings.

The aim of research was comprehensive biochemical assessment of hop cones aromatic and bitter varieties of hop pellets type 90 and type 45, carbon dioxide and ethanol extracts.

Material and methods research. Research carried out in 2012 – 2014 rr. At the department of technology of storing, processing and product standardization Ya. prof. B.V. Lesik National University of Life and Environmental Sciences of Ukraine and in certified laboratories of the Department of Biochemistry hops and beer Institute of Agricultural Polissya NAAS (m. Zhitomir). Given the significant differences in the biochemical composition of aromatic and bitter varieties of hops for experiments as research objects were taken, and cones of hop pellets type 90 typical representatives of these groups of aromatic varieties (Slavyanka, National,

Zahrava) and bitter (Al'ta, Hercules) types most common in industrial conditions; pellets type 45 varieties Tradytsion and Spalt Selekt; carbon dioxide and ethanol extracts variety Hercules.

We used the well-known and common in industrial practice and research quality assessment methods envisaged existing regulatory and technical documents, and used in the world for more in-depth evaluation of quality hops and hop's products [5].

Results. Biochemical characterization of the most common hop's products used in the brewing industry in the table. From the data table shows that the studied ho's products α-acid content ranged from 3.8 to 52.8 %. The highest content of α-acids observed in the extract carbon dioxide – 52.8 %. Among granules in this figure the maximum hop pellets type 90 bitter varieties Hercules – 13.6 %.

Type 90 pellets hops domestic production can accommodate the full range of necessary materials for brewing and hop cones are equal. A characteristic feature of cone's hops and hop pellets type 90 and type 45, including aromatic varieties have high positive rate of aromaticity between the contents of β- and α-acids is from 0.9 to 1.8. This is a crucial feature in assessing the quality of hops and brewing ho's products. On average over three years of research a higher index of aromaticity characterized as bumps and pellets of hops varieties Slavyanka and National.

Unlike cone's hops and granular aromatic hop varieties, lumps and pellets bitter hop varieties are characterized by sharp flavor and high in α-acids. Value β-acids to α-acids in hop cones and pellets and extracts of bitter varieties was less than 1 (Table.). From 0.26 in type 90 pellets hops varieties Hercules to 0.53 in type 90 pellets hops varieties Alta.

Brewers give special attention to the indicator index oxidation bitter substances, because they consider it a major quality indicators hop cones and hop's products. When purchasing hops and parties hop's products necessarily control the

Biochemical characterization of hops and brewing hop's products (average for 2012–2014).

№ p/p	Samples of hops and hop's products	a-acids, %	β- acids, %	Value β/a (EBC method 7.7)	Index oxidation, Io	General polyphe-nols, %	Essential oils, mg/100 g	Loading polyphenols to 1 g a-acids, %	Loading essential oil, 1 g ml a-acids, %
1	Cones of hop varieties Slavyanka	3.8	5.4	1.79	0.34	5.0	0.78	1.3	0.21
2	Cones of hop varieties National	5.4	5.4	1.15	0.37	5.5	0.48	1.0	0.09
3	Cones of hop varieties Zahrava	5.7	4.7	1.06	0.33	6.6	0.67	1.2	0.12
4	Cones of hop varieties Al'ta	8.8	4.0	0.52	0.36	5.9	1.22	0.8	0.14
5	Hop's pellet type 90 varieties Slavyanka	4.6	4.2	1.28	0.50	6.0	0.36	1.3	0.08
6	Hop's pellet type 90 varieties National	6.3	5.1	1.17	0.41	4.9	0.51	0.8	0.08
7	Hop's pellet type 90 varieties Zahrava	6.4	4.3	0.92	0.45	6.5	0.49	1.0	0.08
8	Hop's pellet type 90 varieties Al'ta	10.1	4.3	0.53	0.40	4.5	0.87	0.4	0.09
9	Hop's pellet type 45 varieties Tradytsion	8.2	6.3	0.92	0.47	11.0	0.22	1.3	0.03
10	Hop's pellet type 45 varieties Spalt Selekt	6.2	4.3	0.89	0.49	9.9	0.33	1.6	0.05
11	Hop's pellet type 90 varieties Hercules	13.6	3.4	0.26	0.37	4.2	0.52	0.3	0.04
12	Ethanol extract varieties Hercules	41.8	17.0	0.38	0.40	-	0.75	-	0.02
13	Carbon dioxide extract varieties Hercules	52.8	18.8	0.34	0.27	-	2.5	-	0.05
NIP_{05}		0.16	0.26	0.06	0.03	0.38	0.08	0.07	0.01

figure along with the content of alpha acids. The lower rate of oxidation index bitter substances considered hop's products the better.

According to the table index oxidation during both years of observations cone's hops, granular and extracts of hops ranged 0.27–0.50, and did not exceed the norm standards [1,9]. Minimum oxidation index set to extract carbon dioxide – 0.27, the maximum hop in granules type 90 varieties Slavyanka – 0.50. Established that hop in granules oxidation index slightly higher compared to cone's hops. This indicates that the quality of hop pellets type 90 is virtually identical to cone's hops, and quantitative and qualitative composition of bitter substances depends on breeding varieties from which they are derived.

At the organoleptic properties of beer made from various different hop's products also affects the content of polyphenolic compounds. Along with bitter substances polyphenols play an important role in shaping the fullness and purity of taste of the drink, but also directly affect stable foam and stability of beer during storage. Always gets better assessment beer made from hops polyphenols containing at least 4.5 % [6].

The content of polyphenolic compounds studied hop's products according to the table ranged from 4.2 to 11.0 %. However, the main feature hop's products on this indicator is not determined by their common content, polyphenolic compounds and a load of 1 g of α-acids. If the aromatic varieties of hop cones, this value is from 1.0 to 1.3, type 90 pellets hops from 0.8 to 1.3, the hop pellets type 90 bitter varieties from 0.3 to 0.4, that is, 2.5–3.0 times less. In ethanol and carbon dioxide extracts polyphenolic compounds available. Therefore, for the smooth implementation of the process of brewing beer and obtaining full has added a number of cone's hops or granulated hops.

The content of essential oil in hop's products studied ranged from 0.22 to 2.5 mg / 100 g highest content of essential oil was observed in carbon dioxide extract of hops varieties Hercules. However, the importance in brewing also has loads of essential oil per 1 g of α-acids as normal hops that bring in beer wort is calculated taking into account the contents of α-acids. Unlike grains and hops

extracts in cone's hops traced more load of essential oil per 1 g of α-acids, which gives a more flavored beer.

Conclusions

1. As a result of studies found that hop cones Ukrainian varieties used in brewing meet the requirements of ISO 7067: 2009 Hops. Specifications. Unlike grains and hops extracts in cone's hops traced more load of essential oil per 1 g of α-acids, which gives a more flavored beer.

2. Hop pellets type 90 domestic production can accommodate the full range of necessary materials for brewing and hop cones are equal. Its quality conforms to the requirements of ISO 707028: 2009. Wood hops. Specifications. It was established that the domestic hop pellets type 90 Alta bitter varieties have a higher aromaticity compared with granules hops type 90 foreign-bitter varieties Hercules.

3. Hop pellets type 45 foreign-enriched content of α-acids in its composition contain fewer essential oil compared with cones of hops and pellets type 90, due to the technology for this type of pellets.

4. Carbon dioxide and ethanol extracts with α-acid concentration of 50 % or more, providing the benefits of these products storage, transportation and use in brewing. However, these extracts do not have some kind of polyphenol compounds hops required for smooth implementation process of brewing beer and obtaining full. Immerse unknown number of essential oils, but insufficient for optimal value of alpha acids. Therefore, in the manufacture of beer have to add a certain amount of cone's hops or granulated hops.

5. Given the advantages and disadvantages of hops and processed products for rational use in brewing is necessary to produce different types of hop preparations to implement and consume a particular drug or combination thereof, depending on the market situation and customer requirements.

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