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**ENRICHMENT BEER WITH NATURAL ANTIOXIDANTS  
FROM ST. JOHN'S WORT**

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There's no doubt that beer is experiencing a renaissance. According to the effective regulation office BRDO (Better Regulation Delivery Office), beer is the leader in sales in the segment of alcoholic beverages with a 35% share. In total, there are 241 breweries in Ukraine, among them there are 204 small breweries with a production volume of up to 300,000 liters [1].

But don't let the numbers fool you: while craft beer might seem trendy, brewing is an ancient art that has been practiced for thousands of years.

The four main ingredients in modern beer are malted barley, water, yeast, and hops – the green, cone-shaped flowers of a plant called *Humulus lupulus*. Before they began using hops, brewers made what were known as gruit ales – beers brewed with a blend of herbs (called a “gruit”) rather than hops. The traditional gruit ale included a blend of myrica gale (also known as bog myrtle), yarrow, and wild rosemary. Another popular herb used in early brewing? St. John's wort. It was especially popular with brewers in Norway and other parts of Scandinavia before hops became widely available in that area of Europe [2, 3].

Antioxidants are a particularly important class of preservatives because, unlike bacterial or fungal spoilage, oxidation reactions still occur relatively quickly, even in frozen or refrigerated beer. But not only the shelf life partially depends on the antioxidant status of the beer, it is known that the antioxidant activity of beer plays a decisive role in ensuring the stability of the beer taste [4].

Taking into account the benefits that antioxidants provide to beer and human health, new trends seek to increase the antioxidant content, creating a beer with new characteristics. One way to achieve this increase is to use St. John's wort for brewing. St. John's wort are potentially rich sources of polyphenols and have good antioxidant properties [5].

According to the developed technology, the extraction of biologically active substances from the herb St. John's wort, which grows in the Kherson region, was carried out. The process result of biologically active substances extraction of St. John's wort is a dark brown powder. The resulting product was named «Preparation Kh HP»: Kh – the first letters of the Kherson city; HP – the first letters of the Latin name of St. John's wort (*Hypericum perforatum*).

Studies of «Preparation Kh HP» qualitative were carried out according to generally accepted phytochemical analysis methods and techniques. Thus, according to the obtained experimental data, the composition "Kh HP" is represented by monomeric and polymeric compounds of phenolic nature. Weakly expressed acidic properties, oxidation, reduction, the possibility of forming internal and intermolecular bonds, the ability to enter into complexation reactions, and contribute to the possible effective use.

In the course of the work, the effect of the «Preparation Kh HP» on oxidative

transformations in beer.

The studies were carried out in laboratory conditions. The «Preparation Kh HP» was introduced into the Yantar beer produced by the Ukrainian branch of the Belgian company – AB InBev Efes. The introduced dose was 5 mg of the «Preparation Kh HP» powder per 1.0 dm<sup>3</sup> beer.

The study of beer samples put into storage was carried out according to the following indicators: turbidity, pH, acidity.

The results of the experimental data are presented in the table.

**Table 1 – Changes in the turbidity of beer samples during storage**

№ sample	Turbidity, units EBC (European Brewery Convention)							
	day							
	0	1	2	3	4	5	6	7
1	0,70	0,74	0,77	0,85	4,05	-	-	-
2	0,75	0,77	0,78	0,80	0,80	0,86	0,89	2,15

Sharp growth of the indicator turbidity for the control sample of beer occurred after 3 days of storage, for samples beer with added antioxidants from St. John's wort – after 6 days of storage.

During storage of experimental beer samples, such indicators as acidity and pH also changed. The growth of these indicators above the maximum permissible technical conditions standards, usually coincided with the turbidity of beer samples.

Given these parameters, the antioxidant from St. John's wort should be considered an effective antioxidant for protecting beer from oxidative spoilage.

In addition, the analysis data of these new beers are satisfactory, which indicates that there would be potential consumers for these new products. The use of new ingredients in the brewing process makes it possible to use the properties of these ingredients and to produce new beers whose antioxidant properties are increased compared to conventional ones.

### References

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