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DEVELOPING A TECHNOLOGY FOR PREPARING A BEER BEVERAGE BY USING MEDICINAL HERBS

H.Zh. Ter-Movsesyan, M.R. Vardanyan

National Agrarian University of Armenia

The modern trend of expanding the range of beer production is the output of special varieties of beer using non-traditional raw materials in order to form new physicochemical and organoleptic properties.

The goal of this study is the development of the beer technology using medicinal herbs – oregano and basil. They contain a wide range of bioactive compounds, including essential oils, phenolic compounds, have antioxidant activity and are available regardless of season. The materials used were: pale barley malt, caramel malt, hop, dried basil leaves and wild oregano. For giving the drink a harmonious taste, preliminary experiments were carried out to select the time for adding medicinal herbs. It was found that oregano should be added 15 minutes before the end of boiling. Basil should be added to the wort immediately after boiling with hops before fermentation, keeping for 15 minutes. The first group of samples consisted of beer drinks with varying amounts of basil herb, the second - with oregano herb. Wild plants, fruits and herbs play an important role in traditional Armenian cuisine.

For samples of the first group, replacing 30% of hops with basil herb is optimal. For samples of the second group, with the addition of oregano, the optimal dosage is 1.4 *g/l* of hot wort. The resulting drinks had a harmonious taste and aroma characteristic of the introduced medicinal herbs.

The use of the above medicinal plants will add new taste properties to beer, as well as expand their assortment.

Keywords: oregano, basil, beer, physical and chemical parameters.

Introduction. The modern trend of expanding the range of beer production is the output of special varieties of beer using non-traditional raw materials in order to form new physicochemical and organoleptic properties. This can be achieved by using various sources of biologically active substances when developing new types of drinks.

Manufacturers of brewing products are allowed to produce different categories of brewing products, including beer-based drinks (beer drinks), which may contain various components of plant origin that form consumer properties and have a significant impact on taste and aroma [1].

Plants are used medicinally in various countries and are a source of many potent biologically active substances. The use of plants in whole or its individual parts, containing biologically active components of various composition and quantity, allows targeted action against various pathogens [2]. Plant extracts contain a wide range of biologically active compounds: mainly polyphenols, but also iridoids, amides, alkaloids, saponins, glycosides and terpenoids [3].

Due to their antibacterial and antioxidant properties, plant extracts rich in polyphenols can be used in the food industry as natural preservatives, which will significantly reduce the use of chemical preservatives. They are able to extend the shelf life of the finished products and the semi-finished ones by inhibiting the growth of bacteria and thereby slowing down the processes of spoilage [4].

The medicinal properties of herbs depend on biologically active substances, which can have obvious physiological effects even in small quantities. Biologically active substances are synthesized by the plant from soil, water, inorganic substances and carbon dioxide. Phenol compounds and their glycosides are the most active biological compounds of plants; they include phenols, flavonoids and their glycosides, and have a variety of pharmacological activities. Flavonoids are very common in the plant world. The total amount of tannins in the plant is up to 10-30% [5].

The use of aromatic and medicinal herbs in brewing and the production of other drinks, according to biologists, is quite justified, because they contain a number of substances that contribute to the flavoring and preservation of these drinks. The use of wild plants in the preparation of drinks in the past was dictated by an urgent need, but nowdays they help to enrich the assortment of drinks and to increase their taste diversity [6].

In recent years, herbal beer that is made by adding herbs, roots, and berries has become increasingly popular. But, taking into account the complex polyphenolic composition of plant raw materials, it is necessary to work out the regime for introducing these additives, since the technological process can be difficult, and the additives themselves often impart an uncoordinated taste and aroma that is unusual for beer [7].

When using medicinal raw materials, should be considered not only the effect on the organoleptic characteristics of the final product, but also its

availability in the manufacturer's region. Wild plants, fruits and herbs play an important role in traditional Armenian cuisine.

Experimental part and discussion of the results. Based on the analysis of scientific information of the biologically active substances of wild berries and medicinal plants, oregano and basil - were chosen as objects of study. These herbs have antioxidant activity and are available regardless of the season. Oregano is widespread in almost all regions of Armenia. It grows in forests, clearings, bushes, meadows and steppes. The plant contains up to 1.5% essential oil, tannins, flavonoids, terpenes, vitamin C. Carotene is also found in the leaves. Oregano grass and flowers contain up to 1.2% essential oil, which includes aromatic alcohol, phenols, thymol (up to 3.8-10.2%). The oil has a pleasant smell and has bactericidal properties. Polyphenolic compounds (up to 12-20%) and 5 flavone glycosides were isolated from the oregano herb during the flowering phase, Tannins (1.9-4%) were also found in it [8].

Basil is an annual cultivated herb up to 20-60 *cm* high. It is grown everywhere and used as a spice. Contains a wide range of biologically active compounds, including essential oils, phenolic compounds, including flavonoids and anthocyanins. Essential oils add a special aroma, enhancing the spicy value of basil. It is also rich in vitamins and mineral salts.

The goal of this study is to develop a beer drink technology using medicinal herbs - oregano and basil. To prepare beer a drink, the following materials were used: pale barley malt, caramel malt, hops, dried basil leaves and wild oregano herb collected during the flowering phase. The mash for preparing beer wort consisted of 90% pale barley malt and 10% caramel malt and water in a ratio of 1:4. Mashing was done using the infusion method.

Research was carried out in "Brewing and distilling experimental laboratory" of the department of Plant Origin Processing Technologies of Armenian National Agrarian University.

Preliminary experiments were carried out to select time for adding medicinal herbs, to provide a harmonious taste of the drink. It was found that oregano should be added 15 minutes before the end of boiling. As this time increased, the beer acquired a strong bitterness. The time for adding basil herb was determined experimentally. It was found that basil should be added to the wort immediately after boiling with hops before fermentation. When the wort and herbs were boiled together, the aroma characteristic of basil disappeared. The first group of samples consisted of beer drinks with varying amounts of basil herb. The herb was added to the wort after boiling and kept in the hot wort for 15 minutes. The amount of basil

herb and hops for samples of the first group (No. 1, No. 2, No. 3) is shown in Table 1.

Table 1

The amount of basil herb and hop for the first group of samples

Sample number	Amount of basil, *g/l*	Amount of hop, *g/l*
1	1,40	0,80
2	1, 00	0,80
3	0, 80	0,80

The second group of samples consisted of drinks with varying amounts of oregano. The herb was added 15 minutes before the end of the boil. In this experiment, a certain percentage of hops was replaced by an additive. In sample No.4 - 30% of hops was replaced by oregano, in sample No.2 - 20%, and in sample No.3 - 10%. The amount of oregano herb and hops for samples of the second group (No.4, No.5, No.6) is shown in Table 2.

Table 2

The amount of oregano herb and hop for the second group of samples

Sample number	Amount of oregano, *g/l*	Amount of hop, *g/l*
4	0,24	0,56
5	0,16	0,64
6	0, 08	0,72

For comparison, a control sample was prepared with hops without the use of herbal additives. The amount of hops in the sample was 0.80 *g/l*. The intensity of fermentation was determined by the change in the extract content of the wort during the main fermentation.

Beer was prepared from wort with an extract content of 12% in laboratory conditions. The duration of fermentation of all samples was 7 days at a temperature of 18+-2 °C. The intensity of fermentation was determined by the change in the extract content of the wort during the main fermentation. The results of extractivity on the 7th day of fermentation are presented in Table 3.

Table 3

Changes of extractivity during the main fermentation

Sample number	Initial extractivity of wort, %	Extractivity by completion of main fermentation, %
Control	11,8	5,9
1	12,4	6,4
2	12,7	6,2
3	12,8	6,5
4	12,6	6,7
5	12,7	6,4
6	12,5	6,8

The obtained data show that the course of fermentation of all samples is almost identical and differs little from the control sample. The young beer obtained as a result of the main fermentation was removed from the yeast and the post-fermentation of the young beer was carried out for three weeks at a temperature of 5...7°C. After this time, a physicochemical analysis of all samples were carried out (Tables 4, 5).

Table 4

Physico-chemical indicators of ready-made beer drinks with basil

Indicators	Conrol	Sample 1	Sample 2	Sample 3
pH	3,7	3,82	3,8	3,7
Acidity, *ml* NaOH per 100 *ml* beer	2,8	2,7	2,6	2,5
Alcohol content, % vol.	4,9	5,4	5,6	5,3
Initial wort extractivity, %	11,4	11,8	12,1	11,7
Real degree of fermentation, %	65,9	66,3	64,5	67,1

Table 5

Physico-chemical indicators of ready-made beer drinks with oregano

Indicators	Conrol	Sample 1	Sample 2	Sample 3
pH	3,7	3,8	4,0	3,7
Acidity, *ml* NaOH per 100 *ml* beer	2,8	2,6	2,5	2,7
Alcohol content, % vol.	4,9	5,3	5,5	5,4
Initial wort extractivity, %	11,4	12,4	12,3	12,4
Real degree of fermentation, %	65,9	66,1	66,4	66,5

In addition to physical and chemical indicators, an organoleptic assessment of the quality of beer samples was also carried out according to the following indicators: color, transparency, aroma, taste. This is especially noticeable in sample 1, where the most pronounced spicy aroma characteristic of basil is felt.

***Conclusions*.** According to the results of the study, it was revealed that for samples of the first group, replacing 30% of hops with basil herb is optimal. For samples of the second group, with the addition of oregano, the optimal dosage is 1.4 g/l of hot wort. For giving the drink a harmonious taste, experiments were carried out to select the time for adding medicinal herbs. It was found that oregano should be added 15 minutes before the end of boiling. Basil should be added to the wort immediately after boiling with hops before fermentation, keeping for 15 minutes. The resulting drinks had a harmonious taste and aroma characteristic of the added medicinal herbs.

The research results will make it possible to obtain a new variety of beer drink with physicochemical and organoleptic properties. In addition, the use of the above-mentioned plants allows to give the beer drink new taste properties.

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ԴԵՂԱԲՈՒՅՍԵՐԻ ՕԳՏԱԳՈՐԾՄԱՄԲ ԳԱՐԵՋՐԱՅԻՆ ԸՄՊԵԼԻՔԻ ՊԱՏՐԱՍՏՄԱՆ ՏԵԽՆՈԼՈԳԻԱՅԻ ՄՇԱԿՈՒՄԸ

Հ.Ժ. Տեր-Մովսեսյան, Մ.Ռ. Վարդանյան

Գարեջրի արտադրության տեսականու ընդլայնման ժամանակակից միտումը գարեջրի հատուկ տեսակների արտադրությունն է՝ օգտագործելով ոչ ավանդական հումքը՝ նոր ֆիզիկաքիմիական և օրգանոլեպտիկ հատկություններ ձևավորելու նպատակով:

Աշխատանքի նպատակն է դեղաբույսերի օգտագործմամբ գարեջրային ըմպելիքի տեխնոլոգիայի մշակումը՝ խնկածաղիկ և ռեհան դեղաբույսերի օգտագործմամբ: Դրանք պարունակում են կենսաակտիվ միացությունների լայն տեսականի, ներառյալ եթերային յուղեր, ֆենոլային միացություններ, ունեն հակաօքսիդիչ ակտիվություն և հասանելի են՝ անկախ սեզոնից: Գարեջրային ըմպելիքի պատրաստման համար օգտագործվել են բաց տեսակի գարու ածիկ, կարամելային ածիկ, հմուլ, ռեհանի չորացրած տերևները և ծաղկման փուլում հավաքված վայրի խնկածաղիկը:

Ըմպելիքին ներդաշնակ համ հաղորդելու համար նախնական փորձեր են կատարվել՝ դեղաբույսերի ավելացման ժամանակն ընտրելու նպատակով: Հաստատվել է, որ խնկածաղիկը պետք է ավելացվի եռման ավարտից 15 րոպե առաջ: Ռեհանը պետք է ավելացվի անմիջապես քաղցուն հմուլի հետ եռացնելուց հետո՝ խմորումից առաջ, թողնելով հանդարտվի 15 րոպե:

Նմուշների առաջին խումբը բաղկացած է եղել ռեհանի տարբեր քանակություններով գարեջրային ըմպելիքներից, երկրորդը՝ խնկածաղկի: Առաջին խմբի նմուշների համար լավագույնն է համարվել հմուլի չափաբաժնի 30%-ի փոխարինումը ռեհանի տերևներով: Խնկածաղկի ավելացմամբ երկրորդ խմբի նմուշների համար լավագույն չաբաբաժինն է տաք քաղցուի 1,4 *գ/լ*: Ստացված ըմպելիքներն ունեն ներմուծված դեղաբույսերին հատուկ բնորոշ ներդաշնակ համ և բույր: Վերոնշյալ դեղաբույսերի օգտագործումը հնարավորություն կտա գարեջրային ըմպելիքներին հաղորդել նոր համային հատկություններ, նաև ավելացնել դրանց տեսականին:

Առանցքային բառեր. խնկածաղիկ, ռեհան, գարեջրային ըմպելիք, ֆիզիկաքիմիական ցուցանիշներ:

РАЗРАБОТКА ТЕХНОЛОГИИ ПРИГОТОВЛЕНИЯ ПИВНОГО НАПИТКА С ИСПОЛЬЗОВАНИЕМ ЛЕКАРСТВЕННЫХ ТРАВ

А.Ж. Тер-Мовсесян, М.Р. Варданян

Современной тенденцией расширения ассортимента производства пива является выпуск специальных его сортов с использованием нетрадиционного сырья с целью формирования новых физико-химических и органолептических свойств.

Целью данной работы является разработка технологии пивного напитка с использованием лекарственных трав – душицы и базилика. Они содержат широкий спектр биологически активных соединений, включая эфирные масла, фенольные соединения, обладают антиоксидантной активностью и доступны в любое время. В качестве материала использовали: светлый ячменный солод, карамельный солод, хмель, высушенные листья базилика и собранную в фазу цветения траву дикорастущей душицы.

Для придания напитку гармоничного вкуса были проведены предварительные эксперименты с целью выбора времени для добавления лекарственных трав. Было установлено, что душицу следует добавлять за 15 *мин* до конца кипячения. Базилик следует вносить в сусло сразу после кипячения с хмелем перед брожением, выдерживая 15 *мин*. Первая группа образцов состояла из пивных напитков с различным количеством травы базилика, вторая – с травой душицы. Для образцов первой группы замена 30% хмеля травой базилика является оптимальной. Для образцов второй группы с добавлением душицы оптимальная дозировка составляет

1,4 *г/л* горячего сусла. Полученные напитки имели гармоничный вкус и аромат, свойственные внесенным лекарственным травам.

Использование вышеуказанных лекарственных растений позволит придать пивным напиткам новые вкусовые свойства, а также расширить их ассортимент.

Ключевые слова: душица, базилик, пивной напиток, физико-химические показатели.