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FORMATION OF ORGANOLEPTIC PROPERTIES OF GRAIN WHISKEY DISTILLATES OBTAINED BASED ON THE TRITICAL OF THE BELARUSIAN SELECTION

This article discusses the influence of technological factors at different stages of obtaining grain whiskey on their organoleptic profile. The feature of these studies is the development of a technology for producing grain whiskey based on Belarusian triticale. The relationships between the quality of the mature mash and the component composition of the volatile impurities of the middle fraction of the temple distillate used to produce whiskey are established and analyzed.

Keywords. *Triticale, mature mash, quality indicators, temple distillates, volatile impurities.*

Relevance of the research topic.

Current trends in the development of the alcohol industry of the Republic of Belarus include the development of new technologies for the production of such «elite alcoholic beverages» as whiskey, cognac, rum, which are imported into the country and are new to domestic production sites. The production of these beverages is not only distinguished by applicable technologies and organoleptic properties, but also by its raw material base (cereals, grapes, cane sugar). Considering that the soil and climatic conditions of the Republic of Belarus are most favorable for growing crops, the production of whiskey is the most profitable in comparison with the production of cognac or rum.

Thus, in connection with the active development of whiskey production by Belarusian enterprises, scientific research aimed at establishing the «technological adequacy» of the domestic raw material base and all technological factors that influence the quality indicators of finished products is very relevant and of great scientific and practical importance.

Formulation of the problem. It is well known [2] that whiskey is a strong alcoholic beverage with a strength of 40 to 60% vol., Made by blending whiskey malt aged distillates, temple grain aged distillates or mixtures thereof with corrected water with or without sugar color. Thus, the basic basis of whiskey is a distillate, obtained from both bioactivated and unmalted grain raw materials.

To obtain malt whiskey distillates, such types of malt are used as: light barley, chocolate, fried, crystal, etc., which form certain taste shades of the finished whiskey [3].

The basic ingredients of the production of cereal distillates are also different crops – barley, rye, wheat, corn. However, there are other types of cereals that are potentially applicable to the production of whiskey. In this regard, triticale is a promising grain crop, which is a wheat-rye hybrid [8].

Considering that scientific studies regarding the use of triticale in whiskey production technologies are practically absent, in this connection the aim of this work was to study the technological features of the processing of Belarusian selection triticale in obtaining whiskey grain distillates and their effect on organoleptic characteristics.

Analysis of recent researches and publications.

A review of literature indicates the ongoing research in the field of technology of grain whiskey, mainly related to the study of the fractional composition of distillates [4-6] production methods [7], the acceleration of technologies for producing the finished drink [1]. There are no scientific data on the production of cereal whiskey distillates based on Belarusian selection triticale and the influence of technological factors on the production of mature mash on the aromatic profile of temple distillates.

Materials and research methods. The object of the study was the Antos triticale grain crop with a starch content of 58. 0% (hereinafter referred to as triticale) obtained in the scientific and practical center of the National Academy of Sciences of Belarus for agriculture and included in the State Register of the Republic of Belarus, as well as mature brews obtained on the basis of the studied grain culture, temple middle fraction distillates with a strength of 58 – 69%vol.

When carrying out the studies, generally accepted and special research methods were used: the mass fraction of solids according to GOST 6687.2, the concentration of ethyl alcohol and volatiles by the distillation method according to GOST 6687.7 and others. Statistical processing of the research results and the formation of a database with the research results were carried out using the program MS Excel.

Presenting main material. To identify the patterns of technological processing of triticale in the preparation of grain distillate whisk, wort was prepared using a mechanical-enzymatic scheme. For this, the crushed grain was mixed in water at a temperature of 50–55 °C (heating time – 40 min), enzyme preparations were introduced into the batch: Viscoferm (0.22 units/t) and Likvaflo (2 units/g conventional cr). After that, the temperature in the batch was raised to 65–70 °C (heating duration – 60 min). Subsequent heating is 90 °C, duration is 60 minutes. Then, the boiled mass was cooled to a temperature of 65 °C and saccharification was carried out using the enzyme preparation Sakhsime Plus 2x (8 units/g conventional cr). Sugared wort was fermented periodically for 72 hours. In the obtained wort samples and mature mash, the following indicators were controlled in dynamics: dry substances (solids), soluble carbohydrates, titratable acidity, ethanol concentration, soluble non-fermented carbohydrates, yeast cell concentration, etc.

At the end of the fermentation process, the mature mash was distilled in two stages. At the first stage, a distillate of the first distillation was obtained in an amount of 40% of the initial volume of mature mash. At the second stage, a second distillation of the obtained distillate was carried out with its separation into three fractions: head, middle and tail. The middle fraction was used as a finished viscose distillate, in which the concentration of ethyl alcohol and the fractional composition of volatile components were determined.

Studies of the organoleptic profile of temple distillates depending on the parameters of the technology used were carried out in relation to the following technological factors:

– the 1st factor (grinding with particle sizes of 2 mm (f 1. 1), grinding with particle sizes of 1. 5 mm (f 1. 2), grinding with particle sizes 1,2 mm (f 1. 3));

– the 2nd factor (hydraulic module 1: 3 (f 2. 1), 1: 3,5 (f 2. 2));

– the 3rd factor (low temperature cooking mode (90 °C) (f 3. 1), high temperature cooking mode (110 °C) (f 3. 2)). The research results are presented in table 1.

The obtained experimental data testify to the prospects and feasibility of using Belarusian triticale for the production of temple distillates. The use of triticale as a basic raw material component provides all controlled technological parameters at the normative level.

However, it was found that technological measures aimed at increasing the dry matter in the wort and, accordingly, the concentration of ethyl alcohol in a mature mash lead to a change in the organoleptic characteristics of the obtained grain temple distillates, which in some cases worsen the quality of the product.

Table 1

Characterization of the organoleptic characteristics of cereal temple distillates depending on technological factors

The studied factor	SV in the wort, %	Concentration of ethyl alcohol, % об			Fractional composition of volatile impurities of the average fraction of distillate of the second distillate, % mass				Concentration of yeast cells, CFU/cm^3
		mature brew	distillate I otgon	distillate II otgon	AA, $_x10^{-4}$	EA, $_x10^{-5}$	HA, $_x10^{-1}$	FF, $_x10^{-4}$	
f 1. 1	19,2	9,4	25,0	59,0	1,6	3,3	1,4	4,1	164,5
Characteristics of the distillate aroma - strong aroma of bread crust, moderate floral tones, weak biscuit tone									
f 1. 2	20,0	9,6	28,0	60,0	5,6	3,1	4,1	3,01	168,0
Characterization of the aroma of the distillate – a moderate aroma of bread, mild floral tone									
f 1. 3	20,6	10,0	30,6	64,0	3,8	1,5	5,1	5,6	175,5
Characterization of the aroma of the distillate is a strong bread aroma									
f 2. 1	22,0	11,2	28,6	56,0	4,2	1,1	5,4	2,5	178,0
Characterization of the aroma of the distillate is a strong alcohol tone, slight bread flavor									
f 2. 2	20,4	10,0	30,0	66,0	3,2	1,22	5,2	5,2	180,0
Characterization of the aroma of the distillate is a strong bread aroma									
f 3. 1	22,0	10,8	29,0	58,0	4,4	1,17	5,5	2,9	176,5
Characterization of the aroma of the distillate is a strong alcohol tone, mild bread flavor									
f 3. 2	24,0	11,6	29,6	69,0	7,8	1,2	6,61	1,1	162,0
Characteristic of the distillate's aroma is a strong rough tone of burnt rubber									

Conclusion. The studies carried out allowed us to establish the influence of a number of technological factors (particle size of the grinding, hydromodule, hydrothermal treatment modes) on the organoleptic background of the resulting temple distillates. It has been established that an increase in the size of grinding particles in combination with low-temperature hydrothermal processing of the kneading ensures the production of a distillate with the most harmonious bouquet, pleasant bread aroma in combination with soft alcohol tones.

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