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OPTIMIZATION OF THE MATURATION PROCESS OF COGNAC SPIRIT FOR THE PRODUCTION OF VINTAGE COGNACS

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Abstract. The article examines the characteristics of the maturation of cognac spirits in the production of vintage cognacs. It is shown that aging is a key stage determining the formation of the organoleptic and chemical characteristics of the beverage. Particular attention is paid to the processes occurring during aging in oak barrels: extraction of wood compounds, redox reactions, formation of esters, and evaporation of volatile components. It has been established that these processes contribute to the formation of the characteristic amber color, complex aromatic bouquet, and harmonious taste of vintage cognacs. The influence of aging duration, oak properties, and storage conditions on the quality of cognac spirits is considered.

Keywords: vintage cognac, cognac wine material, Bayan-Shirey, mechanical composition, distillate

Annotatsiya. Ushbu maqolada konyak spirtlarining vintage konyaklarini ishlab chiqarish jarayonida pishishi o‘rganiladi. Unda tutib turish ichimlikning organoleptik va kimyoviy xususiyatlarining rivojlanishini belgilovchi asosiy bosqich ekanligi ko‘rsatilgan. Eman bochkalarida tutib turish jarayonida sodir bo‘ladigan jarayonlarga alohida e’tibor qaratiladi: yog‘och birikmalarini ajratib olish, oksidlanish-qaytarilish reaksiyalari, efirlarning hosil bo‘lishi va uchuvchan komponentlarning bug‘lanishi. Bu jarayonlar vintage konyaklarning o‘ziga xos rangi, murakkab aromatik guldastasi va uyg‘un ta’mini shakllantirishga hissa qo‘shishi aniqlangan. Tutib turish davomiyligi, eman xususiyatlari va saqlash sharoitlarining konyak spirtlari sifatiga ta’siri o‘rganiladi.

Kalit so‘zlar: vintage konyak, konyak sharob materiali, Bayan-Shirey, mexanik tarkib, distilyat.

Аннотация. Статья рассматривает особенности созревания коньячных спиртов при производстве марочных коньяков. Показано, что выдержка является ключевым этапом, определяющим формирование органолептических и химических характеристик напитка. Особое внимание уделяется процессам, происходящим при выдержке в дубовых бочках: экстракции соединений древесины, окислительно-восстановительным реакциям, образованию эфиров и испарению летучих компонентов.

ISSN 3030-3907

Установлено, что эти процессы способствуют формированию характерного янтарного цвета, сложного ароматического букета и гармоничного вкуса марочных коньяков. Рассматривается влияние продолжительности выдержки, свойств дуба и условий хранения на качество коньячных спиртов.

Ключевые слова: винтажный коньяк, коньячное вино материал, Баян-Ширей, механический состав, дистиллят

INTRODUCTION.

Vintage cognacs are high-quality cognacs made from aged cognac spirits and subjected to long-term aging in oak barrels. They are distinguished by a more complex aroma, smoother taste, and higher quality compared to ordinary cognacs. Vintage cognacs are produced from cognac spirits aged for at least 6 years. Long-term aging ensures the formation of a complex bouquet, harmonious taste, and characteristic amber color. The main features of vintage cognacs are prolonged aging, high organoleptic evaluation, complex aromatic bouquet, and a smooth, well-balanced taste [1].

High-quality cognac spirits aged in oak barrels are used for the production of vintage cognacs. In addition, blending (assemblage) of spirits of different ages is applied.

Cognac distillate (spirit) is a wine distillate with an ethanol content of not less than 55.0% and not more than 70.0%, obtained by fractional distillation of wine material produced for cognac from grapes of the species *Vitis vinifera*. It may be either continuously in contact with oak wood during the entire aging period or not in contact with oak. Long-term aging of cognac distillates in compliance with quality requirements and storage conditions makes it possible to obtain high-quality Uzbek cognacs [5].

In this context, the preparation of raw materials for cognac wine from various white technical grape varieties using special technologies is highly relevant, as well as the production of cognac spirit from finished wine material in a continuous distillation unit of the Charentais type, followed by long-term aging in oak barrels and in tanks lined with oak wood.

The main objective of the work is the production of various vintage cognacs through the preparation of high-quality wine material, obtaining cognac spirit by double distillation, ensuring long-term aging of the spirit, and blending cognac spirits.

MATERIALS AND METHODS. The object of the study is vintage cognacs aged in oak barrels. The research material included a white technical grape variety — Bayan-Shirey. The homeland of this variety is Azerbaijan. Bayan-Shirey

ISSN 3030-3907

is widely distributed in Uzbekistan, Turkmenistan, Kazakhstan, Tajikistan, and other countries, where it is successfully cultivated and used in winemaking. The vines are vigorous, with shoots consisting of 10–12 buds. The variety is productive on irrigated fertile soils and is late-ripening [4].

The Bayan-Shirey grape variety is widely grown in the foothill regions of the country, and due to its relatively high titratable acidity, it is also used as a raw material for sparkling wines. Sparkling wines produced from Bayan-Shirey grapes grown in foothill areas are rich in extractive substances, have a light straw color, and possess an aroma and taste characteristic of this variety.

Bayan-Shirey grapes contain approximately 16–20% sugars and have a titratable acidity of 5.5–8.0 g/dm³. This variety is characterized by high yield: 15–20 tons per hectare, and in some cases up to 20–25 tons. It is considered suitable raw material for the production of cognac wine materials.

Standard analytical methods used in the wine industry were applied to assess the chemical composition of cognac spirits. The reliability of the obtained results was verified using mathematical and statistical methods [2].

DISCUSSION OF RESEARCH RESULTS. For the production of high-quality cognac wine material, it is essential that the mechanical composition of the grape varieties used, especially juice yield, meets established standards. The mechanical composition of grapes includes the bunch and the stem. The bunch consists of the stem, berries, skin, pulp, seeds, and juice. Depending on the degree of grape maturity, growing conditions, environmental factors, and applied agricultural practices, the percentage of the components of the mechanical composition varies.

Analysis of the literature shows that, depending on the grape variety, the stem accounts for 2.5–5.5% of the bunch, the skin for 6–8%, the seeds for 3–5%, and the pulp with juice for 82–92%.

In studying the mechanical composition of grape varieties, seven indicators were examined: average bunch weight, number and weight of berries, weight of skin, number and weight of seeds, and pulp weight. In addition, juice yield with and without pulp was determined for each variety. The mechanical composition of the studied grape varieties is presented in Table 1. The data in the table show that the mechanical composition varies significantly among the studied varieties. Depending on the variety, bunch weight, number and weight of berries, and pulp and juice yield differ.

ISSN 3030-3907

Table 1.

Mechanical composition of technical grape varieties grown under the conditions of the Parkent district.

№	Indicators	Bayan-Shirey
1	Average bunch weight, g	200.37
2	Number of berries per bunch, pcs	96.5
3	Stem weight, g	6.6
4	Berry weight, g	193.1
5	Skin weight, g	6.50
6	Seed weight, g	4.42
7	Pulp weight, g	25.8
8	Percentage of total bunch weight, %:	
	Stem	3.26
	Skin	3.21
	Seeds	2.18
	Pulp	12.74
9	Juice with pulp, %	88.9
10	Clear juice (without pulp), %	77.23

Thus, as shown in Table 1, the average weight of a bunch of the Bayan-Shirey grape variety was 200.37 g. The number of berries in the Bayan-Shirey variety was 96.5. The research results demonstrated that it is advisable to use the technical grape variety Bayan-Shirey for the production of wine material, since the yield of juice with pulp reached 88.9%.

Further in the study, a technological scheme for the production of cognac wine material using the white method was developed. Distillation was carried out using a VAND-01 unit. Distillation of wine material is an important technological stage in the production of cognac spirits. The chemical composition, aroma, and quality of the final product depend on the distillation режим, temperature, and proper separation of fractions. Distillation increases the concentration of ethyl alcohol, forms the aroma of the future beverage, removes undesirable components, and is a key stage in cognac production. Double distillation is the most commonly used method in cognac production. First, raw спирт (low wine) is obtained, followed by a second distillation. The resulting spirit is then sent for aging.

Aging of cognac spirit is a long-term technological process of storing cognac distillate in oak barrels, during which the color, aroma, taste, and chemical composition of the future cognac are formed. During aging, a complex interaction occurs between the cognac spirit, oak wood, and atmospheric oxygen. As a result, physical and chemical processes take place [1]: extraction of substances from the

ISSN 3030-3907

wood, oxidation, esterification, and evaporation. Tannins, lignin, hemicelluloses, and aromatic compounds (vanillin, furfural) are extracted from the oak into the spirit. A small amount of oxygen enters the barrel through the wood pores, contributing to the formation of new aromatic compounds. Organic acids interact with alcohols to form esters, which shape the cognac bouquet [2]. Part of the liquid evaporates through the barrel walls.

During the aging process, the spirit becomes softer and more harmonious, a characteristic amber color develops, a complex aromatic bouquet forms, and the harshness of the alcohol decreases. The aging process is influenced by the quality of the oak wood, the volume and age of the barrel, the temperature and humidity of the storage помещение, and the duration of aging. Young cognac spirits are typically aged 3–5 years.

Table 2.

Physicochemical and organoleptic indicators of cognac spirit distilled from cognac wine material obtained from Bayan-Shirey grapes.

Indicators	Cognac spirit prepared from cognac wine material obtained by the white method
Alcohol, vol%	62.40
Volatile acids, g/dm³	0.062
Total acidity, mg/dm³	88.4
Acetals, mg/dm³	31.2
Total esters, mg/dm³	152.3
Methyl alcohol, mg/dm³	32.8
Aldehydes, mg/dm³	60.2
Including:	
vanillin	0.5
syringaldehyde	1.1
coniferyl aldehyde	0.8
sinapaldehyde	0.6
Tasting score	8.6

The conducted studies have shown that the accelerated method of aging cognac spirit is based on the treatment of oak staves placed inside oak barrels. These staves are first treated with hot water and steam, then soaked in a 0.3% alkaline NaOH solution for 5–6 days at a temperature of 10–20°C. After that, they are exposed to steam in a free air flow at a temperature of 100–120°C for 6–7 days. Following this period, the oak staves are washed with cold water until discoloration occurs, then reassembled into oak barrels and filled with cognac spirit.

ISSN 3030-3907

A 5% cellulolytic and hemicellulolytic active enzyme complex is added to the oak barrel at a dosage of 0.01%. During storage, the activity of the inoculants increases due to enhanced oxygen supply in the alkaline environment of the cognac spirit stored in the facility. This makes it possible to achieve high quality indicators in the resulting cognac product.

Prospects for application of technologies in Uzbekistan. The development of viticulture and wine material processing in Uzbekistan creates favorable conditions for the implementation of modern aging methods. The use of combined technologies will enhance the competitiveness of national cognac products in the international market.

CONCLUSION. Vintage cognacs belong to the category of high-quality cognac production. They are characterized by prolonged aging, a rich and complex aromatic bouquet, and high organoleptic properties, which are formed as a result of long-term interaction of cognac spirits with oak wood.

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