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Search and analysis of local and international patent works related to the nanofiltration process of grape-derived alcoholic beverage - brandy - under conditions of variable temperature and viscosity.

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Abstract

The local and international patented works discussed in the paper reflect the current global state of development and sector-specific features of microfiltration process methods used in the production of grape-derived alcoholic beverage—brandy—and determine the relevant priorities for ongoing scientific research at the institute.

Keywords: nanofiltration process; alcoholic beverage; variable temperature; viscosity; brandy;

Brandy is an alcoholic beverage derived from grapes, the quality and organoleptic properties of which depend largely on both the raw materials and the technological processes used to produce and process it. Today, the implementation of innovative methods that ensure purity, stability, and the preservation of the desired product properties is of particular importance.

In this context, membrane technologies, including microfiltration and nanofiltration, are considered a promising direction in the processing of alcoholic beverages. These processes allow for the effective separation of unwanted impurities, colloidal particles, and high molecular weight compounds, which directly affects the quality of the final product.

It is especially important to study the influence of physicochemical parameters, such as temperature and viscosity, on membrane processes, as they determine the efficiency and selectivity of filtration. Accordingly, the analysis of local and international research and patent works creates the basis for the development of new technological approaches, which contributes to the optimization of brandy production processes and quality improvement.

The invention relates to the field of brandy aging and describes a method aimed at improving the organoleptic properties of brandy. The method includes the following stages:

1. Placing the distilled brandy in an oak barrel and storing it for 8–12 months;

2. Transferring the brandy obtained in the first stage to an earthenware vessel (of the type of pitcher or ceramic vessel) and storing it for 2–3 months;

3. Transferring the brandy obtained in the second stage back to an oak barrel and aging it for 3–6 years.

According to the method, oak barrel aging and clay pot aging are alternately used, which increases the sensory perception of the same category of brandy. At the same time, the content of aromatic compounds, including neroli and ethyl acetate, increases significantly, as a result of which the brandy acquires pleasant floral (rose, neroli) and fruity (apple, banana) aromas. The aromatic characteristics of the young brandy become more pronounced, the purity, intensity and harmony of the aroma increase, which ultimately improves the overall sensory quality of the product.

In addition, the use of clay vessels significantly reduces costs compared to oak barrels, which ensures both improved quality and economic efficiency of production. [1]

The invention discusses the process of classification and aging after the production of brandy, which belongs to the technological field of brandy aging and includes the following stages:

s1 – mixing and assemblage of the initial brandy wine aged in small oak barrels, resulting in brandy;

s2 – determination of the tannin content and total acidity index of the resulting brandy;

s3 – carrying out classified aging based on the analysis results;

s4 – carrying out organoleptic evaluation and analysis of physicochemical indicators and bottling from the barrel when the parameters characteristic of the finished brandy are achieved;

s5 – carrying out further technological processes to obtain the final product.

The invention is based on the quantitative assessment of tannin content and total acidity, on the basis of which different storage and classified aging regimes are used. This allows the selection of appropriate oak barrels for different types of brandy, improving the efficiency and intensity of aging, and enhancing the quality of the final product. [2]

The invention - Integrated nanofiltration process for reducing the alcohol content of alcoholic beverages, refers to the process of reducing the alcohol content of alcoholic beverages, in particular wine, in such a way as to preserve the organoleptic properties of the original beverage. The process involves the complete or partial removal of ethanol using nanofiltration membranes that pass a mixture of water, ethanol and certain salts, while retaining the aromatic compounds of the original beverage. The permeate stream passing through the membrane, which is a mixture of water and ethanol, is subjected to distillation to remove ethanol. After the ethanol has been separated, the resulting stream is recycled back to the beverage to be processed, which ensures the production of a beverage with a reduced alcohol content while preserving the organoleptic properties [3]

The present invention - high-value nanofiltered botanical alcohol refers to a nanotechnological process aimed at improving the quality of alcohol. In particular, the invention includes a special nanofiltration process using natural materials, through which medicinal and aromatic alcohol is obtained. The developed nanotechnology provides the alcohol production industry with an integrated filtration methodology and equipment, which makes it possible to replace or remove irritating and foreign impurities (such as aldehydes, esters, amines and fusel oils). In addition, the aging period in tanks (VAT) or barrels (CASK) is reduced, which reduces the duration of the technological process, reduces undesirable odors and contamination, and increases the taste, aroma, color and health benefits of the product.[4]

The patent - a system and method for purifying drinking water, ethanol and alcoholic beverages - is based on the effect of hydrodynamic cavitation on microbiological and chemical contaminants, microparticles and colloidal particles.

The fluid flow moves at high speed through a multi-stage cavitation device and a filtration module, as a result of which hydrodynamic cavitation effects are generated in the fluid flow. Cavitation effects cause changes in the fluid velocity, pressure, temperature, chemical composition and physical properties. In addition, cavitation prevents the deposition of contaminants on the surface of the filtration module, ensures the removal of already accumulated impurities, reduces the load on the filter elements and increases the service life of the filtration module. [5]

The invention - separation process - relates to the process of separating compounds with a low molecular weight from compounds with a molecular weight less than 1.9 times the mass of the low molecular weight compounds using nanofiltration.

Low molecular weight compounds are typically characterized by a molecular weight of less than 250 g/mol. In one embodiment of the invention, pentose sugars are separated from hexose sugars.

The method can be used, for example:

• for the recovery of xylose from spent solutions,

• for the recovery of betaine from sugar beet pulp extracts. [6]

In the patent - the method of production of the brand "Vaziani":

1. Technical result:

Simplification of the technological process.

2. Essence:

The method includes the following stages:

• Processing of grapes;

• Obtaining wine material intended for brandy;

• Production of brandy spirit;

• Aging of spirit in two stages:

The first stage:

Aging of spirit for three years at a temperature of 20–25°C, in the presence of treated oak staves;

The second stage:

Adding pre-treated oak chips to the spirit in the amount of 3% of the total volume, after which:

• The resulting spirit is heated at a temperature of 70–80°C for 7 hours;

• Then the mixture is left to stand (rest) for two weeks;

This is followed by:

• Blending of old alcohol, color component, sugar syrup and softened water;

• Resting of the resulting mixture;

• Finally, filtration.

Field of application:

Food industry, in particular, brandy production. [7]

References:

1. Ageing method for improving brandy pleasure - CN113897264B;

2. Classification ageing process after brandy is prepared - CN117363447A;

3 .Integrated nanofiltration process to reduce the alcohol content of alcoholic beverages - Fernando Manuel DA SILVA GONÇALVES, Norberta Neves Correia De Pinnho Maria; WO2004113489A1;

4. High value nano filtered botanical alcohol - KiranVarsith VENKATASUBRAMANIYAN; Revathi DHANDAPANI; SADAIAPPA GOUNDER; Ravishankar RAMADOSS; Indrajith KATHIRESAN - WO2017122219A1;

5. Method for purification of drinking water, ethanol and alcohol beverages of impurities - Roman Gordon; Igor Gorodnitsky; Maxim A. Promtov; Naum Voloshin – US11377371B2 ;

6. Separation process - Heikki Heikkila; Mika Manttari ; Marianne Nystrom; Mirja Lindroos; Hannu Paananen; Outi Puuppo; Hannu Koivikko - US20040060868A1;

7. Method for Production of Brandy "Vaziani"- Kakha Archvadze; Marine Bezhuashvili; Gia Chekurishvili - GEP20002035**B;**

ადგილობრივი და საერთაშორისო საპატენტო ნამუშევრების მოძიება და ანალიზი ყურძნისეული წარმოშობის სპირტიანი სასმელის - ბრენდის - ნანოფილტრაციული პროცესისათვის, ცვალებადი ტემპერატურისა და სიბლანტის პირობებში.

გიორგი ბიბილეიშვილი, ზაზა ჯავაშვილი, ელენე კაკაბაძე, ლეილა თანანაშვილი, მანანა მამულაშვილი, ლიანა ებანოიძე.

საქართველოს ტექნიკური უნივერსიტეტის მემბრანული ტექნოლოგიების საინჟინრო ინსტიტუტი

რეზიუმე

ნაშრომში განხილული ადგილობრივი და საერთაშორისო საპატენტო ნამუშევრები ასახავს ყურძნისეული წარმოშობის სპირტიანი სასმელის - ბრენდის - მიღების მიკროფილტრაციული პროცესების მეთოდების განვითარების დარგობრივი სპეციფიკის თანამედროვე მდგომარეობას მსოფლიოში და განაპირობებს ინსტიტუტში მიმდინარე სამეცნიერო კვლევებისთვის შესაბამისი პრიორიტეტების განსაზღვრას.

საკვანძო სიტყვები: ადგილობრივი და საერთაშორისო საპატენტო ნამუშევრები, ცვალებადი ტემპერატურა, სიბლანტე, ბრენდი.