

TECHNOLOGY OF RESOURCE-SAVING PROCESSING OF WINE PRODUCTION WASTE IN RESTAURANT ESTABLISHMENTS

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ABSTRACT

Every year, it is becoming more and more popular for restaurants to open their own wineries. This makes it possible to produce brand-name wine according to autor recipes, which significantly increases the company's competitiveness.

Today, restaurant establishments are trying to follow eco-trends, so they pay due attention to the problem of recycling of secondary raw materials.

Unfortunately, there are currently very few technologies for the utilization of secondary raw materials of winemaking in small productions.

Keywords: restaurants, winemaking, waste-free technologies, eco-trends.

АНОТАЦІЯ

З кожним роком у закладах ресторанного господарства стає все більш популярним відкривати власні виноробні. Це дозволяє виготовляти фірмове вино за авторськими рецептурами, що значно впливає на підвищення конкурентоспроможності підприємства.

На сьогодні заклади ресторанного господарства намагаються слідувати за екотрендами тому приділяють проблемі утилізації вторинної сировини належну увагу.

Нажаль, зараз існує дуже мало технологій утилізації вторинної сировини виноробства на невеликих виробництвах.

Ключові слова: заклади ресторанного господарства, виноробство, безвідходні технології, екотренди.

Formulation of the problem. The problem of full and rational use of secondary material resources of the food industry exists in all countries where this industry is sufficiently developed. Scientists are constantly paying attention to this problem, various approaches are proposed to maximize the use or involvement of secondary material resources in the production cycle, and therefore, to minimize waste and prevent its formation. In addition, the demand for natural ingredients forces manufacturers to look for cheap and simple raw material processing technologies.

In Ukraine, the problem of disposal of secondary raw materials of winemaking is not given due attention. Traditional domestic technologies for the processing of secondary raw materials were developed in Soviet times and are now technologically, economically and ecologically inefficient. Despite the indisputable value and significance of the volume of secondary raw materials of winemaking in Ukraine, there are no specialized enterprises for its complex processing. In particular, in most cases, untreated grape pomace is exported to agricultural lands without control, which leads to acid erosion of the soil, pollution of the environment with metabolites of micromycetes and exacerbates one of the global problems of mankind - ecological. There is no comparative analysis of innovative domestic and foreign technologies and equipment for processing secondary raw materials of winemaking.

Analysis of recent research and publications. At the moment, there are a number of scientific developments on obtaining valuable products from secondary winemaking raw materials, but they cannot be implemented because there is no

necessary equipment of domestic production, and imported equipment is too expensive. Another restraining factor is the weak interaction between wineries, scientific institutions, business structures and administrative authorities. The processing of secondary raw materials of winemaking into products with high biological and consumer value is an important scientific and practical problem. Its effective solution is the introduction of waste-free technologies, which is considered as a strategic direction of rational use of limited raw materials and environmental protection[1-5].

Secondary winemaking raw materials remain rich in biologically active compounds (phenolic, nitrogenous substances, sugars, acids, minerals, lipids, etc.). Therefore, scientists are working on the development of new and improvement of existing technologies for processing winemaking waste as a secondary raw material for obtaining useful drugs, in particular medicinal and biologically active substances in the pharmaceutical, cosmetic or food industry to increase physiological value and nutritional characteristics); in agricultural production for soil treatment and feed additives, for obtaining alcohol, biogas, etc [6-9].

Wine lees is a sludgy material that mainly consists of dead yeast that settles to the bottom of tanks. Along with grape pomace and fruit stalks, it is one of the main by-products of the wine industry. Given that wine yeast sediment is considered a soil pollutant, its disposal is costly for wineries [10]. In addition to yeast cells, wine lees contains alcohol, tartaric acid salts, minerals, polysaccharides (pectic substances, gums, mucus), phenolic compounds, proteins, products of their interaction, lipids, phosphates, sulfates, and other substances. Alcohol, tartaric raw materials, feed proteins, enanthic ether are obtained from yeast sediments [11, 12].

Taking into account the nutritional value of the composition of wine yeast sediment, food manufacturers often use yeast autolysates and extracts as food additives. According to the regulation of the European Council No. 1334/2008 [13], yeast extract as a flavoring additive can be labeled with the term "natural".

Previous studies [14, 15] showed that yeast autolysate from dry wine materials contains many valuable biologically active substances: a wide range of B

vitamins, amino acids (lysine, arginine, asparagine, threonine, glutamine, proline, etc.), mineral elements (potassium, calcium, magnesium, sodium, phosphorus, zinc, etc.). The conducted studies showed the expediency of production of two forms of release of the finished product: in the form of a liquid food concentrate, as well as a dried powder product. In the first case, the concentrate is obtained by vacuum evaporation of the purified autolyzed product at temperatures that ensure the preservation of vitamins [16]. In the second case, a dried product is obtained from the concentrate using spray dryers [17].

Complexes of food substances obtained from the sediments of wine yeast in the form of a food concentrate or in a dried form are promising biologically active dietary supplements to ensure adequate human nutrition [18].

The purpose of the work is to develop a technology for comprehensive waste-free processing of wine yeast

Results. As a result of the processing of grapes or fruit and berry raw materials into wine or non-alcoholic products, a significant amount of secondary products remains, for example, on average, 3.5 kg of ridges remain for 100 kg of grapes, 10 kg of sweet pomace (after pressing the grapes), 13 kg of pomace after fermentation muscles, 3 kg of seeds, which creates serious problems in terms of ecology.

For the purpose of comprehensive processing of wine production waste, namely, wine yeast, an equipment-technological scheme is presented that can be used in restaurants.

Mixing tank 1 is an apparatus with a stirring device. As a mixing device, it is advisable to use propeller stirrers. Pressed wine yeast or thickened sediments after settling are fed into the upper loading devices of the apparatus.

A water supply pipeline for dilution is also connected to the upper part. Yeast suspension pump 2 is connected to the lower part of the collector via a tap.

The battery of reactors 3, into which the yeast suspension is fed, is intended for yeast autolysis. The battery is equipped with appropriate fittings and pipelines. The battery reactors are equipped with stirring devices, heat exchange jackets, and

an automated system for regulating temperature and suspension flow. The reactors are connected to each other in series in such a way that the yeast suspension is fed into the lower part of the reactor, and the discharge is from the upper part of the reactor. In all reactors, with the exception of the last one, the temperature is maintained at 48 °C. In the last reactor, the temperature is maintained in the range of 65-70 °C. After the autolysis process, the suspension is submitted to vacuum distillation.

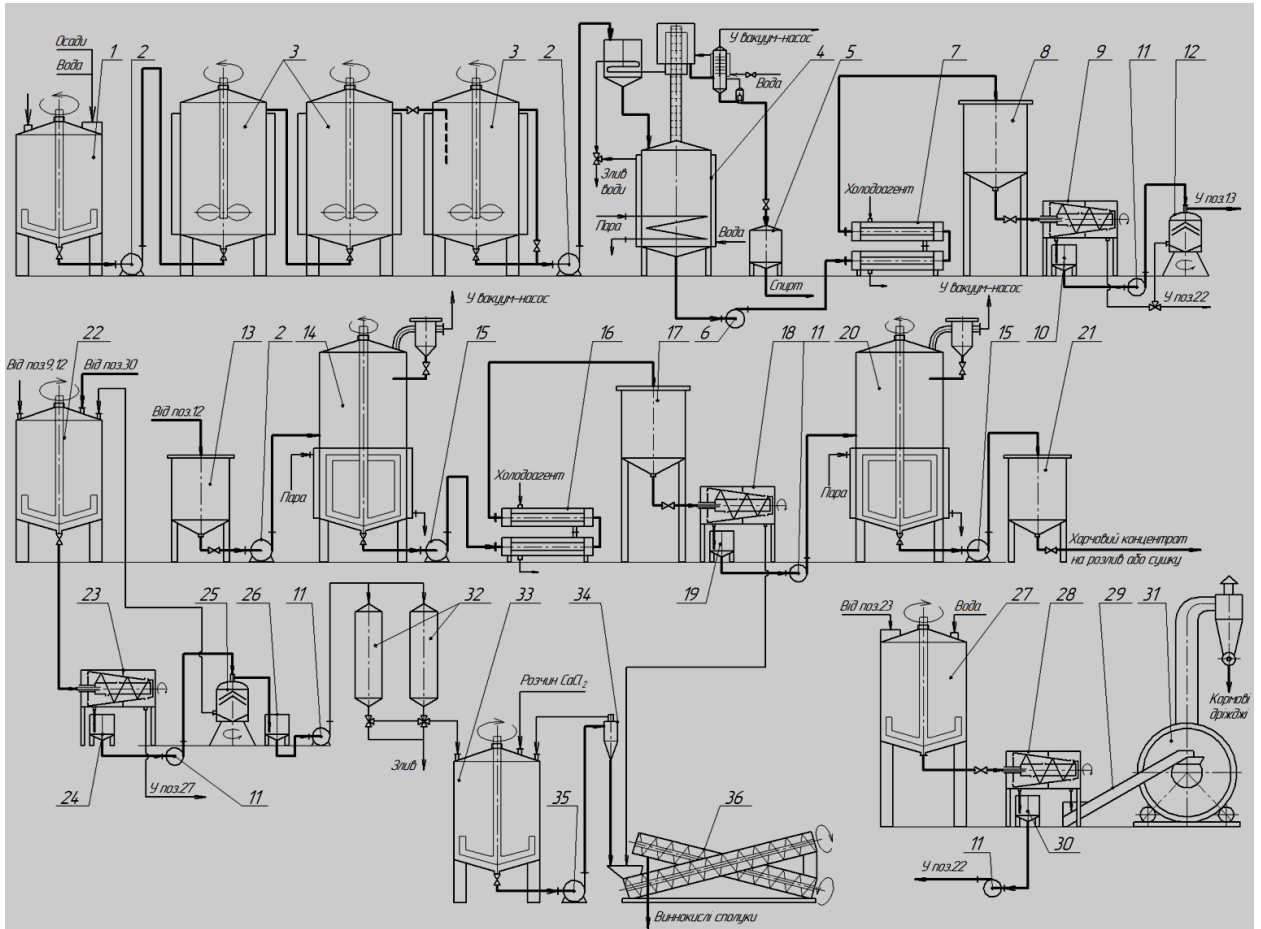


Figure 1. Scheme of complex processing of yeast sediments*

* Source of literature [19]

Vacuum distillation unit 4 is designed for vacuum distillation of alcohol from autolyzed yeast suspension. The design of the installation is adapted to work under vacuum. The obtained alcohol enters the vacuum collector 5.

A pump 6 is connected to the drain pipe of the installation cube 4 for pumping the yeast suspension for cooling to low temperatures in the direct cooling heat exchanger 7. The cooled yeast suspension is fed into the pressure collector 8,

equipped with a stirring device and fittings for smooth supply of suspension to centrifugal decantation.

Decanter 9 is intended for separation of yeast suspension. The decanter is equipped with a conical decantation collector 10 with a pump 11, as well as vehicles for transferring the thickened sediment to subsequent operations.

The plate separator 12 serves for finer clarification of the decantate obtained in the decanter 9. The separator is connected by pipelines to the pump 11, the collector of the clarified part of the autolyzed yeast suspension 13, as well as to the transport line of the decanter 9, or the conveyor for returning the thickened sediment to the collector 22.

The collector 13 of the lighted part of the suspension that has undergone autolysis is connected by a pipe fitting to the vacuum evaporator of the first stage 14. To remove the partially concentrated autolysis product from the vacuum evaporator 14, a pump 15 is used, which supplies the autolysis product for cooling in the heat exchanger 16. From the cooled product of autolysis, the thickened sediment is separated in the decanter 18, and the decantate from it is transferred to the vacuum apparatus of the second stage 20.

Pump 15 is used to pump out the obtained food concentrate, which directs the concentrate to the pressure collector 21. Depending on the form of release of the finished product, the concentrate is directed to bottling as a finished product or to drying to obtain a soluble powder form of the product.

The section for obtaining compounds of tartaric acid and fodder yeast from thickened sediments of yeast suspension consists of the following equipment.

The collector-diluent 22 is connected by a drain pipe to the decanter 23, which is equipped with a decantate collector 24 with a pump 11 that supplies the decantate to a plate separator 25. The clarified solution of tartaric compounds is fed into the collector 26 with a pump 11, from where it is fed to the ion exchange unit 32. Transport the sediment discharge line from the decanter 23 is connected to the second stage mixing collector 27, in which the spent yeast sediments are diluted with water. The mixer collector 27 is also the pressure collector of the

decanter 28, equipped with a sediment conveyor 29 and a decantate collector 30 with a pump 11. To obtain feed yeast, it is recommended to use a spray dryer 31.

The clarified solution of tartaric compounds from the collector 26 of the decanter 25 is fed to the ion exchange unit 32.

The process of complex processing of yeast sediments is carried out according to the equipment and technological scheme (Fig. 1).

Yeast sediments from dry wine materials in liquid form are fed into the mixing tank 1, where dilution is carried out with water or a spent solution of tartaric acid compounds to a dry matter content of 8-10% by weight. at a temperature of 20-30 °C. There should be at least two mixing collectors to ensure continuous operation.

Pump 2 continuously feeds the suspension of yeast sediments into the battery of reactors-autolyzers 3, where autolysis of yeast cells takes place at a temperature of 48-50 °C and a suspension with the products of yeast autolysis is obtained. This process takes 3-5 days. At the end of autolysis, enzymes are inactivated in the last autolyzer reactor at a temperature of 70 °C. The autolysis process should be carried out with thorough mixing in hermetically sealed reactors. From the autolyzer reactors, the suspension containing alcohol is fed by pump 2 to the vacuum distillation unit 4, which operates under a vacuum of 300-400 mm Hg and a temperature of 70-80 °C.

Raw alcohol with a concentration of 60-80% vol. obtained from autolyzed yeast suspension. The suspension is fed into the vacuum distillation unit 4. The crude alcohol obtained during the distillation process is fed into the vacuum collectors 5. After distillation, the bard of the yeast sediment suspension is cooled in the cube of the unit 4 through a heat exchange jacket and through the drain pipe of the cube connected to the atmosphere by a pump 6, the yeast wort is fed to the direct cooling unit 7, where the wort (yeast suspension) is cooled to low temperatures of $0 \div (-2)$ °C.

The cooled yeast suspension with autolysis products is fed into the pressure collector 8 of the decanter 9. The solid part of the autolyzed yeast suspension is

separated from the liquid in the centrifugal decanter 9 with a screw discharge of sediment. The partially clarified liquid from the collector 10 is fed by the pump 11 for further clarification in the plate separator with automatic discharge 12. The sediment containing protein substances and tartaric acid compounds from the decanter 9 and the separator 12 is fed into the collector-diluent 22.

The clarified solution of autolysis products from the separator 12 enters the collector 13, from which it is fed into the vacuum apparatus of the first stage 14. Before entering the vacuum apparatus, the autolysate can be heated by the yeast autolyzate leaving the apparatus on the heat exchanger.

Conclusions. Therefore, the introduction of new technologies for complex processing of secondary winemaking resources into production is relevant and will allow enterprises to carry out loss-free processing of raw materials with maximum mechanization of technological processes and obtain both new and traditional products with improved properties. .

The use of the proposed method of complex zero-waste processing of winemaking waste, in particular yeast sediments, will enable restaurant establishments to be environmentally responsible.

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