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Original scientific article

IMPACT OF YEAST SEDIMENT BETA-GLUCANS ON THE QUALITY INDICES OF YOGHURT

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KEY WORDS:
beta-glucan, yeast sediment, yoghurt, fermentation

ABSTRACT

The objective of the study was to investigate the potential application of beta-glucans obtained from yeast sediment resulting from the manufacture of local Viorica wine (2018 harvest). To determine the amount of beta-glucans in the yeast sediment, two were used: the calculation method and the laboratory method, obtaining similar quantities, 29.92±0.47 and 28.17±0.32 respectively. The beta -glucans obtained were incorporated in various concentrations (0.1%; 0.2%; 0.3%; 0.4% and 0.5%) in the yogurt obtained from skimmed milk. The effect of beta-glucan addition on the physicochemical properties of freshly prepared yogurts was investigated. The addition of beta-glucans positively influenced the formation of the gel relay resulting in a decrease in the fermentation time of yogurt. The final pH point of 4.5 was reached one hour earlier (in 4 hours) compared to the control sample (in 5 hours). The results showed that there are no significant changes in physicochemical properties (titratable acidity, pH, viscosity and syneresis). The results obtained report that beta-glucans can be used as a thickening agent for low-fat yogurts by shortening the fermentation period and not essentially changing the sensory characteristics. Experimental results showed that the glycemic index of yogurt samples with the addition of beta-glucans have similar values in the range of 28–30. Respectively, the yogurts under study are attributed to food category with low glycemic index.

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Научная статья

ВЛИЯНИЕ БЕТА-ГЛЮКАНОВ ИЗ ДРОЖЖЕВОГО ОСАДКА НА ПОКАЗАТЕЛИ КАЧЕСТВА ЙОГУРТА

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КЛЮЧЕВЫЕ СЛОВА:
ideal protein, amino acids, combinatorial problem, optimization criterion, plant raw materials, protein structure ranking

АННОТАЦИЯ

Целью исследования было изучить возможности применения бета-глюканов, из дрожжевого осадка, полученных при производстве местного вина Виорика (урожай 2018 г.). Для определения количества бета-глюканов в дрожжевом осадке использовали два метода: метод расчета и лабораторный метод, получив значения 29,92±0,47 и 28,17±0,32 соответственно. Полученные бета-глюканы были введены в различных концентрациях (0,1%; 0,2%; 0,3%; 0,4% и 0,5%) в йогурт, полученный из обезжиренного молока. Было исследовано влияние добавления бета-глюканов на физико-химические свойства свежеприготовленного йогурта. Добавление бета-глюканов положительно повлияло на образование геля, что привело к уменьшению времени ферментации йогурта. Конечная точка pH 4,5 была достигнута на час раньше (за 4 часа) по сравнению с контрольным образцом (за 5 часов). Результаты показали не значительные изменения физико-химических свойств йогурта (титруемой кислотности, pH, вязкости и синерезиса). Полученные результаты показывают, что бета-глюканы можно использовать в качестве загустителя для обезжиренных йогуртов за счет сокращения периода ферментации и без существенного изменения органолептических характеристик. Результаты экспериментов показали значения гликемического индекса в диапазоне 28–30 для образцов йогурта с бета-глюканами. Соответственно, исследуемые йогурты относятся к категории пищевых продуктов с низким гликемическим индексом.

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1. Introduction

Interest in beta-glucans is outlined and argued by biological activities, including anti-cancer [1,2], anti-inflammatory [3] and immunomodulatory [4,5] properties. Due to the specific physical properties of beta-glucan, such as water solubility, viscosity and gelling, they are increasingly used in the food industry.

The following products are well known as sources of beta-glucans, such as: rice, oats, beans, lentils, peas and others [6]. The content of beta-glucans varies in the range from 0.4 to 10% [7]. In recent years, microorganisms, especially yeasts, capable of synthesizing a complex of bioactive substances, including beta-glucans, which have an important role in the vital activity

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of living organisms [8] and their obtaining from the point of view of economically, it is advantageous [9].

Based on the increased interest and the wide possibility of use, new sources of beta-glucans are in high demand today. Particular attention is paid to agri-food waste and by-products. In this context, the yeast sediment resulting from the production of wine can be valuable sources of beta-glucans [10]. At the same time, the wine industry has an essential role in the economy of our country, being one of the strategic branches, including:

- the Republic of Moldova is in the list of the top 10 wine producing and exporting countries in the world;
- wine exports represent 6.2% of the country's export revenues; At present, about 112 thousand ha of vineyards are registered, planted with over 50 varieties of grapes for wine (another 15 thousand hectares will bear fruit in two years);
- in the field of grape processing, manufacturing, storage and wholesale of wines, there are 187 enterprises, of which 22 also produce distillates (strong alcoholic beverages);
- the annual production is about 20.0 million decalitres (daL) of wine raw material and about 900 thousand daL / y of distillates;
- every fourth person from the rural area works in this sector — over 150 thousand people; exports to 68 countries around the world — Moldovan wine accounts for 2% of world wine volume.

It is worth mentioning that in 2019–94652 hl of yeast sediment waste from the manufacture of wines was reported by enterprises registered in the Wine Register of the Republic of Moldova [11].

Use of beta-glucans

Food production is a competitive industry and the manufacturer is always looking to develop new ingredients to reduce the cost of raw materials. In addition, consumers have become interested in "natural" and healthy foods, preferring foods with low cholesterol, calories and fat, but high in dietary fiber. beta-glucan has demonstrable advantages in improving the physical properties of food as a thickening and water retaining agent, it is also a good emulsifying stabilizer and fat substitute [12]. In addition, beta-glucan is nutritionally dysfunctional in the human digestive tract and therefore functions as a non-caloric food [13]. Information about its functional and health-beneficial properties can lead to the development of new food applications.

It should be noted that on 25 April 2016, Leiber GmbH submitted an application to the competent authority of Ireland to increase the use and levels of use of beta-glucans in yeast as a novel food ingredient. In particular, the company requested that the use of yeast beta-glucans be extended to other categories and types of food and that the maximum daily doses for the use of yeast beta glucans be increased for food categories already authorized by Implementing Decision 2011/762 / EU. Regulation (EU) no. Regulation (EC) No 609/2013 of the European Parliament and of the Council lays down general requirements for the composition and information of foods for infants and young children, foods for special medical purposes and substitutes for a total diet for weight control. Those acts also project the beta-glucans in yeast. Therefore, beta-glucans should be authorized without prejudice to the provisions of those acts and any other applicable legislation in parallel with Regulation (EC) No 1234/2007. 258/97 (Table 1).

Research into the possibility of using beta-glucans as a supplement has grown in recent years. Thus, beta-blockers are used as a thickening agent for low-fat or low-fat yogurts [15,16], as a stabilizer for mayonnaise [17], as a supplement in meat products [18] and other uses are considered. in the food industry (for example: bakery and pastry products) [19].

On the other hand, yogurt is a healthy food product, widely consumed worldwide. Its popularity has made it possible to use it as a basis in the production of probiotic preparations. Based on the above, the beta-glucans in the residual yeasts from winemaking can be used as a supplement to obtain novel foods. The results of the research presented in this article had the following decisive arguments:

- the yeasts resulting from the production of wines can serve as a valuable source of beta glucans, at the same time they are accessible and in sufficient quantities;

Table 1

Authorized uses for beta-glucans in yeast (Saccharomyces cerevisiae) [14]

Nr d/o	Food category	Maximum level of beta-glucans in yeast
1	Food supplements as defined in Directive 2002/46 / EC, with the exception of food supplements for infants and young children	1,275 g / day for children older than 12 years and the adult population in general 0.675 g / day for children under 12 years of age
2	Substitutes for a total weight control diet as defined in Regulation (EU) No 1095/2010. 609/2013	1,275 g / day
3	Beverages based on fruit juices and / or vegetable juices including concentrated and dehydrated juices	1,3 g/kg
4	Fruit flavored beverages	0,8 g/kg
5	Powdered preparation for cocoa-based beverages	38,3 g/kg (in powder form)
6	Cereal bars	6 g/kg
7	Breakfast cereals	15,3 g/kg
8	Breakfast cereals made from whole grains and high in fiber	1,5 g/kg
9	„Cookies"	2,2 g/kg
10	„Crackers"	6,7 g/kg
11	Milk based beverages	3,8 g/kg
12	Fermented dairy products	3,8 g/kg
13	Other drinks	0,8 g/kg (ready to drink)
14	Dehydrated milk / Milk powder	25,5 g/kg
15	Soups and mixes for soups	0,9 g/kg (ready for consumption) 1,8 g/kg (condensed) 6,3 g/kg (in powder form)
16	Chocolate and sweets	4 g/kg
17	Protein bars and protein powder	19,1 g/kg
18	Jam, marmalade and other spreads	11,3 g/kg