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ПРОИЗВОДСТВО КВАСА ХЛЕБНОГО С ДОБАВЛЕНИЕМ СИРОПОВ ИЗ ЕЛИ ОБЫКНОВЕННОЙ И КОРНЯ СОЛОДКИ, МЯТЫ ПЕРЕЧНОЙ СВЕЖЕЙ И ШИПОВНИКА КОРИЧНОГО (МАЙСКОГО)

THE PRODUCTION OF BREAD KVASS WITH THE ADDITION OF SYRUPS FROM COMMON SPRUCE AND LICORICE ROOT, PEPPERMINT FRESH AND CINNAMON ROSE

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Аннотация. *В статье рассматривается производство кваса с добавлением сиропов из ели обыкновенной и корня солодки, мяты перечной свежей и шиповника коричного (майского). Разработана модель технологического модуля биологической очистки сточных вод при производстве кваса хлебного с добавлением различных сиропов.*

Ключевые слова: квас хлебный, модель технологического модуля биологической очистки сточных вод.

Abstract. *The article deals with the production of kvass with the addition of syrups from common spruce and licorice root, fresh peppermint and cinnamon rose. A model of the technological module of biological wastewater treatment in the production of kvass has been designed.*

Key words: bread kvass, model of technological module of biological wastewater treatment.

The problem of the quality and safety of drinks in modern conditions plays an important role and can only be comprehensively solved, both by manufacturers and various state bodies [4, 5, 6, 8]. Consumers are interested in obtaining high-quality and safe products [7]. High-quality products can only be made from raw materials that meet all quality and safety requirements.

Kvass bread - one of the most popular non-alcoholic national drinks in Russia. It is nutritious, valuable in biological indicators, pleasant in taste, affordable. The raw materials are rye or barley malt, rye flour, sugar, fructose, dextrose, maltose, glucose syrup. Formula may include nutritional supplements.

Kvass is produced as a result of incomplete alcohol or alcohol and lactic fermentation of wort. Manufacturers pay great attention to quality and focus on the naturalness of the drink. Kvass (unfiltered and filtered) made by domestic manufacturers of various brands is presented on the consumer market.

The most popular bread kvass, which is made from kvass wort concentrate (KWC), sourdough and other raw materials that increase the organoleptic characteristics and nutritional value of the drink. Using KWC allows you to reduce time and labor costs for the production of kvass. In order to enrich bread kvass with nutrients, natural plant components are used, for example, products of processing fruit and berry raw materials.

In this article we consider the production of bread kvass with the addition of syrups from common spruce and licorice root, fresh peppermint and cinnamon rose hips.

The technological process for the production of bread kvass consists of the following operations: preparation of raw materials (sorting and washing peppermint, cinnamon rose and spruce); cooking syrups from peppermint, cinnamon rose and common spruce, and KWC; fermentation of KWC for 48 hours at a temperature of 15-20 ° C; blending of kvass wort; filtering, cooling and pouring kvass into PET bottles (polyethylene terephthalate) in accordance with GOST R 51760.

Ready-made syrups have a homogenous liquid consistency, are opaque, do not foam, without sediment and impurities, the color, smell, taste and aroma according to the used ingredients. KWC has a viscous, opaque, dark brown texture, sweet and sour taste and aroma of rye bread. Table 1 presents the content of biologically active substances in syrups from common spruce and licorice root, fresh peppermint and cinnamon rose hips.

Table 1

The Content of biologically active substances in syrups

Syrup	The content of biologically active substances, mg / 100g		
	Vitamin C	Vitamin P	Total flavonoid content
common spruce and licorice root	43,4	0,03	0,1
peppermint fresh	26	0,02	0,2
cinnamon rose	223,8	0,4	2,4

Test samples of kvass were studied after its preparation when 48 hours have passed according to GOST 31494-2012 [1]. The organoleptic characteristics of bread kvass with the addition of syrups from ordinary spruce and licorice root, fresh peppermint and cinnamon rose hips are quite high. The resulting samples taste good, have a rich aftertaste and aroma. Table 2 presents the organoleptic characteristics of the obtained samples of bread kvass with the addition of fresh peppermint, common spruce and licorice syrup, cinnamon rose.

Table 2

Organoleptic characteristics of bread kvass with the addition of fresh peppermint, common spruce and licorice syrup, cinnamon rose

Characteristic	Kvass with syrup		
	from common spruce and licorice root	from fresh peppermint	from cinnamon rose
consistence	homogeneous, liquid, opaque, without sediment	homogeneous, liquid, opaque, without sediment	homogeneous, liquid, opaque, without sediment
color	brown with a greenish tint	brown with a greenish tint	dark brown
taste	refreshing, sweet and sour	refreshing, sweet and sour	refreshing, sweet and sour
aftertaste	spruce and licorice root	mint	berry with a cinnamon rose hip flavor
aroma	rye bread	rye bread	rye bread

The physical and chemical analysis showed that the obtained samples of bread kvass with various syrups meet the requirements of GOST 31494-2012, and microbiological characteristics meet the requirements of SanPiN 2.3.2.1078-01 (Table 3).

Table 3

Physico-chemical characteristics of bread kvass with the addition of fresh peppermint, common spruce and licorice syrup, cinnamon rose hip

№	Name of Indicator	The list of studied kvass and indicator values			Value according to GOST 31494-2012
		Fresh kvass with fresh peppermint	Kvass with the addition of common spruce and licorice syrup	Kvass with the addition of cinnamon rose	
1	Mass fraction of solids (density)	4,8	5,6	4,9	>3,5
2	Acidity, ° T	1,8	1,8	1,9	1,5-7,0
3	Volume fraction of alcohol, %.	0,4	0,4	0,5	<1,2
4	Color	1,2	0,43	1,2	-

The obtained samples of bread kvass can be attributed to sweet and sour (acid content from 1 to 1.3). The study showed that the obtained samples of bread kvass with the addition of various syrups are characterized by a sufficiently high level of vitamins C and P, as well as an increased content of minerals.

In the production of bread kvass, residual organic substances are formed, which are in a different state and enter the water bodies along with the sewage of the enterprise. As they have fell to water, organic substances decompose, forming toxic compounds, violating the flora and fauna of water bodies [2, 3].

Consider the scheme of the biological wastewater treatment plant, which is shown in Fig. 1.

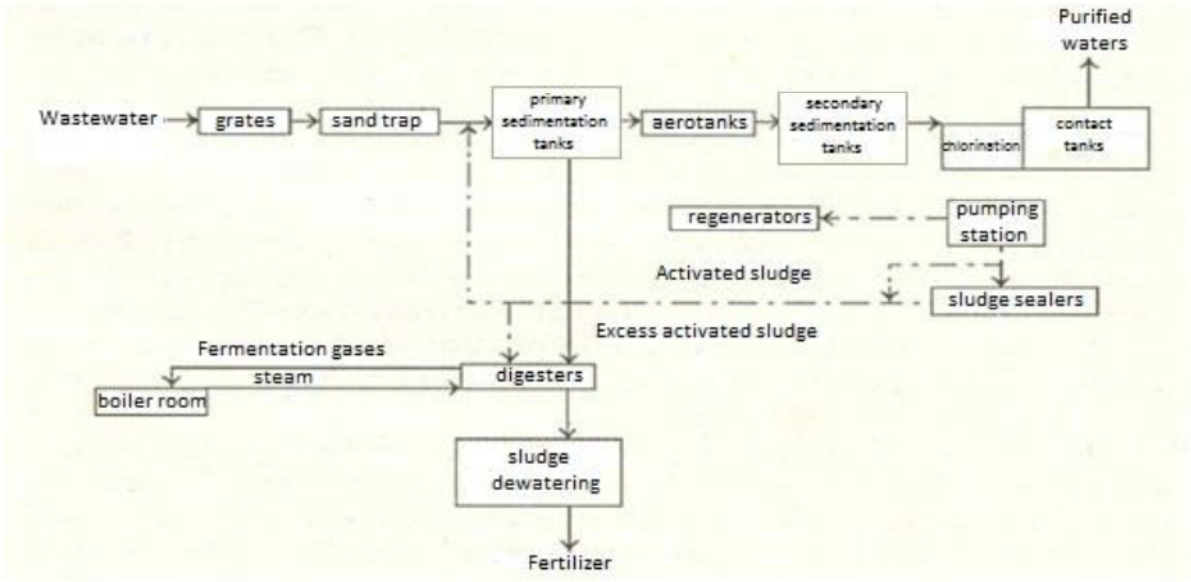


Fig. 1. Scheme of biological wastewater treatment

To control the biological wastewater treatment (BWT) process for the production of kvass, a mathematical model of the technological scheme in the form of a modified Petri net (MPN) was disigned (Fig. 2). On the basis of the Petri net-model, it is advisable to create a software package that allows you to analyze the BWT process, in order to predict the development of emergency situations.

The Petri net C is a five, C = (P, T, I, O, M).

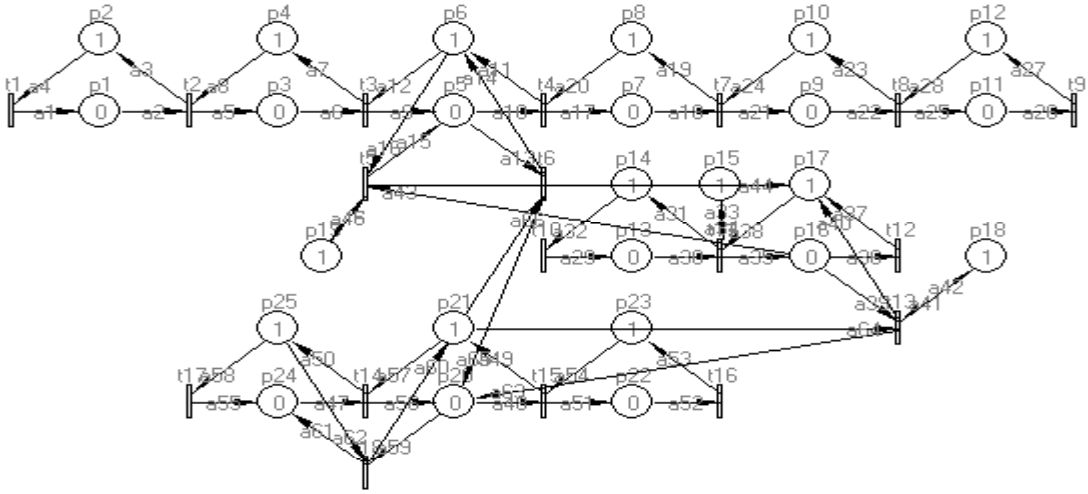
T = {tj} is a finite set of transitions, j ≥ 0.

P = {pi} is a finite set of positions, i ≥ 0.

I: PxT → {0, 1} is an input function that defines the set of its positions for each transition ti.

O: PxT → {0, 1} - an output function that displays a transition to a set of output positions $p_i \in O(t_j)$ displays transition.

M: P → {1, 2, 3 ...} is the network marking function that maps the set of P positions to the set of non-negative integers



N.

Fig. 2. Common Petri net of the entire installation

An analytical description of the common Petri net (Fig. 2):
25 Positions
18 Transitions
1 color
P = (p1, p2, p3, p4, p5, p6, p7, p8, p9, p10, p11, p12, p13, p14, p15, p16, p17, p18, p19, p20, p21, p22, p23, p24, p25)
T = (t1, t2, t3, t4, t5, t6, t7, t8, t9, t10, t11, t12, t13, t14, t15, t16, t17, t18)
O(t1)={p1}
O(t2)={p2, p3}
O(t3)={p4, p5}
O(t4)={p6, p7}
O(t5)={p5, p17, p19}
O(t6)={p6, p20}
O(t7)={p8, p9}
O(t8)={p10, p11}
O(t9)={p12}
O(t10)={p13}
O(t11)={p14, p15, p16}
O(t12)={p17}
O(t13)={p17, p18, p20}
O(t14)={p25, p20}
O(t15)={p21, p22}
O(t16)={p23}
O(t17)={p24}
O(t18)={p21, p24}
I(t1)={p2}
I(t2)={p1, p4}
I(t3)={p3, p6}
I(t4)={p5, p8}
I(t5)={p6, p16, p19}
I(t6)={p5, p21}
I(t7)={p7, p10}
I(t8)={p9, p12}

I(t9)={p11}
I(t10)={p14}
I(t11)={p13, p15, p17}
I(t12)={p16}
I(t13)={p16, p18, p21}
I(t14)={p24, p21}
I(t15)={p20, p23}
I(t16)={p22}
I(t17)={p25}
I(t18)={p20, p25}
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Thus, the new recipes for bread kvass with the addition of syrups from common spruce and licorice root, fresh peppermint and cinnamon rose hips will expand the range of drinks, as well as satisfy growing consumer demand for quality and safe products. All characteristics are within acceptable standards and meet the requirements of state standards.

The developed model of biological wastewater treatment will allow to create a software package that analyzes the BWT process, both in general and in order to predict the development of emergency situations.

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