Technology of probiotic beverage production based on juice

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In the manufacture of functional products a promising direction is the use of a vegetable base. Plants are the main source of carbohydrates, pectins, natural antioxidants, vitamins and fiber for the human body. A promising way to increase the biological value and improve the organoleptic characteristics of vegetable and fruit drinks is their fermentation with cultures of lactic acid bacteria. During fermentation beverages are enriched with the metabolic products of probiotic microorganisms, including vitamins, essential amino acids, antioxidants, etc. The creation of fermented probiotic beverages on a non-dairy basis is an actively developing direction not only abroad, but also in Russia. The method of production of pumpkin beverage with probiotic and prebiotic properties is developed. It has been shown that pumpkin nectar brand "Fruton Nyanya" is the best basis for obtaining a functional drink. Optimal conditions for production of probiotic pumpkin beverage are established. It is shown that the amount of viable probiotic microorganisms in the finished beverage is $10^9$ CFU/cm$^3$ to the end of the shelf life, which allows to attribute the beverage to functional products.

**The aim of the work is to develop a method for obtaining a functional pumpkin beverage with prebiotics and probiotics.**
Solution methods

- To obtaining the probiotic beverage pumpkin nectar "Fruto Nyanya" (produced by JSC "PROGRESS", Lipetsk) was used.
- As a starter, the preparation "Lactobacterin dry lyophilisate", manufactured by MICROGEN NPO AO, Tomsk, was chosen.
- To rehydrate the starter culture, the contents of the ampoule are added to 20 ml of sterile 0,9 % saline solution and kept at a temperature of 37±2 °C for 2 hours.
- For fermentation, 10 % starter is added to flask with nectar. Lactulose syrup is previously added to the flask so that its concentration in the beverage is 0,45 %.
- The nectar was fermented for 8 h at a temperature of 37±2 °C. Sampling was performed every 2 hours. It were determined the acidity of the beverage by titration, and lactobacilli amount by colony-forming units on elective MRS medium.
Results

Dynamics of lactic acid bacteria growth in nectar pumpkin "Fruton Nyanya" using reactivated starter culture and lactulose syrup addition
Results

Change in titrated acidity during the fermentation of pumpkin nectar "Fruto Nyanya"
| Criteria         | Before fermentation                                                                 | After fermentation                                                                 |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| **External view**| Homogeneous opaque liquid with evenly distributed finely ground pulp. A small sediment is allowed on the bottom of the container due to a slight stratification of the liquid. | Homogeneous opaque liquid with evenly distributed finely ground pulp. A small sediment is allowed on the bottom of the container due to a slight stratification of the liquid. |
| **Gustation**    | Pleasant, well-expressed, typical of pumpkin juice. Foreign taste and smell are not allowed. | Pleasant, well expressed due to the addition of lactulose, characteristic of pumpkin juice, with a slight acidity due to the fermentation process. Foreign taste and smell are not present. |
| **Coloure**      | Homogeneous throughout the mass, characteristic of the color of pumpkin juice. Darker shades are allowed. | Homogeneous throughout the mass, characteristic of the color of pumpkin juice. Darker shades are allowed. |
Results

Change in the amount of lactic acid bacteria during the storage of the drink:
1 – the required content of living microorganisms in the finished product;
2 – the number of viable lactic acid bacteria in the resulting drink.
**Results**

Changes in the acidity of the finished functional drink during storage
Conclusions

• Thus, a method for obtaining of functional pumpkin beverage has been developed. The following conditions are recommended for obtaining the drink:
  1. Recovery of the starter culture for 2 hours in a sterile saline solution at a temperature of 37 °C;
  2. Adding lactulose syrup to pumpkin nectar in an amount of 0,8 % (the concentration of lactulose in the drink will be 0,45 %);
  3. The time of fermentation is 6 hours at a temperature of 37 °C without stirring.

• It was shown that the functional beverage produced on the basis of nectar "Fruto Nyanya" has good organoleptic characteristics, can be attributed to the products of a functional purpose and recommended for industrial production.
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