The Use of Grain and Fruit and Berry Raw Materials as a Basis for the Production of Soft Drinks

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Abstract. The production of soft drinks in our country is in demand in the food industry. Non-alcoholic drinks include fermented kvass, fruit and berry drinks, lemonades, carbonated drinking and mineral water, juices and juice-containing products, etc. Recently, consumers increasingly prefer natural drinks consisting of traditional components. Grain raw materials, cereals - are one of the traditional types of raw materials used in Russia since ancient times. However, these raw materials were used mainly for the production of bread, as well as fermentation beverages - kvass and beer. Recently, more and more cereal raw materials have been used by manufacturers for the production of dairy products as a food additive to enrich these products with useful properties and ingredients, improve the taste and expand the range of products. One of the novelties in the food market is the emergence of oat soft drinks. The release of such products requires the use of the latest equipment, automation of production processes, the use of modern technologies. All this allows us to ensure the production of high-quality non-alcoholic products with the longest possible shelf life, excellent quality and taste.

1. Introduction
Non-alcoholic drinks are traditional for our country, our ancestors knew how to prepare them since ancient times. Currently, the market for soft drinks is still in demand and tends to expand from year to year. For many hundreds of years, the quality of the produced beverages has been improved, the search for new tastes, technologies and production methods has been going on [1, 2]. As a result, in the modern world we have a fairly extensive range of natural soft drinks [3].

More and more people tend to eat one hundred percent natural foods or foods with a minimum amount of artificial food additives. This is due to the fact that in recent years there has been an increase in diseases of the endocrine system, oncological diseases associated with unhealthy diet, eating non-natural foods or with E-supplements. In the context of all of the above, it is relevant to expand the range of natural food products, in particular soft drinks.

Soft drinks can be produced from fruits, berries, leaf extracts and other plant materials. The most promising is the production of non-alcoholic beverages from cereal raw materials. This direction of production is promising, the market of soft drinks from such raw materials is still little studied and filled.

Oats is a cereal crop that belongs to the genus Avena, is not a whimsical crop, does not require special conditions for farming, it can be grown on almost all types of soil, in various climatic conditions. It is quite common in many regions of the Russian Federation and is well cultivated in the conditions of the Nonblack Soil Zone of Russia. The most widely cultivated varieties in the Nonblack Soil Zone are
Krechet, Argamak, Berber and others. These varieties are distinguished by increased productivity, relatively short growing season, and are resistant to drought, lodging and diseases of cereal crops [4].

The caryopsis of the hulled and naked oat culture is distinguished by a rather high content of protein, fiber, starch grains, vitamins of groups B, PP, potassium, magnesium, phosphorus, calcium and silicon. According to a number of studies, the fiber contained in oat grain helps to lower cholesterol levels, reduce the risk of cardiovascular diseases, and normalize blood pressure. Silicon contained in oat grain contributes to maintaining the strength of the bone apparatus, raising immunity, strengthening the vascular system [5].

Oat grains can also be used for the production of alcoholic beverages, because it contains carbohydrates, with the proper functioning of enzymes, it is quite well-digested sugars [6, 7].

One of the first enterprises that were able to establish the production of soft drinks from grain raw materials is the production company Sady Pridonya (Russia). This company has developed a product under the Ne Moloko trademark. To date, the production facilities of the enterprise are focused on the production of soft drinks of this series without the addition of fruit and berry raw materials, with the addition of cocoa powder, with the addition of exotic fruits.

Of greatest interest is the possibility of developing a product from raw materials grown in the Northwest region. In the Novgorod region, in addition to oats, sea buckthorn, wild berries, strawberries, garden strawberries, plum and apple trees grow well.

Sea buckthorn in the Northwest region ripens in September. The benefits of the berries of this plant have been known to people for a long time. Despite the fact that the berry has a sour taste, it is valuable for its medicinal properties. The chemical composition of sea buckthorn berries is rich, first of all, in vitamin C, and the berries also contain vitamins of group B, A, E, K and PP. Sea buckthorn berries are rich in minerals, unsaturated fatty acids, organic acids, macro and microelements, active biological substances [8].

Due to such a unique expanded composition of substances, sea buckthorn berries have significant beneficial properties for the human body: a pronounced anti-inflammatory effect, strengthening of the immune system, strengthening of the cardiovascular system, normalization and treatment of diseases of the gastrointestinal tract are noted.

The usefulness of wild berries was already known to ancient people. At a time when medicine was not yet so developed, it was the main source of medicines for humans. Wild berries are rich in vitamin C, fructose, glucose, organic acids, flavonoids, etc. Berries have a general strengthening, antimicrobial effect, restore the functioning of the gastrointestinal tract. Strawberries contain easily digestible sugars, vitamin C, B vitamins, nicotinic, salicylic and other organic acids.

Wild berries contain pectin, which helps to lower cholesterol, improve metabolism and the functioning of the circulatory system [9, 10].

With a high sugar content (up to eleven percent), raspberries are low in calories, since their composition mostly contains the simplest sugars – fructose and glucose. Also, raspberries contain a significant amount of organic acids – malic, citric, tartaric, etc. Raspberries also contain coumarin, which normalizes blood clotting, contains anthocyanins, whose effect strengthens blood vessels, capillaries, and has an anti-sclerotic effect.

The Northwest region is characterized by widespread growth of plum trees. The most frequently grown varieties are Alyonushka, Alleyynaya, Anna Shpet, Vengerka. Plum trees belong to the genus Rosaceae, which includes over 250 species. Plum fruits are very tasty and healthy, they are a source of multivitamins. They contain vitamins of group B, C, A, E, K, trace elements, fiber. Due to its high fiber content, plums are beneficial for improving the functioning of the intestinal tract. Pectin and organic acids help cleanse excess cholesterol from the body.

Apple trees are the most common type of fruit trees that are harvested for the food industry. Apple trees belong to the same genus Rosaceae, the Apple tribe (Maleae) of the Plum subfamily. The most widespread apple tree is Malus domestica, which includes the majority of cultivated varieties.

Apples have less fiber than other fruits. It stimulates bowel movements and helps reduce the risk of cancer. The pectin contained in apples improves the functioning of the intestines, cleanses it of toxins.
In the greatest amount than in other fruits and berries, apples contain iron, which is necessary to maintain a high-quality blood composition, and calcium to maintain the cardiovascular system and the musculoskeletal system. Apples also contain vitamins E, B, A, ascorbic acid, trace elements. The benefits of apple fruits also lie in their antioxidant properties, which prevent the processes of cell oxidation and, as a result, not only the aging of the body, but also prevent the penetration of ultraviolet radiation into the body, and reduce the risk of cancer. The tannins contained in apples do not contribute to the precipitation of salts - taking apples is the prevention of urolithiasis, and tannins have an anti-inflammatory effect in diseases of the genitourinary and cardiovascular system.

2. Results
Currently, there is a wide variety of non-alcoholic beverages, a significant number of industries are engaged in the production of these products not only in Russia, but all over the world. The modernization of the equipment available at the enterprises continues everywhere, new sites are being built and launched. Technological features of the new product “Non-alcoholic drink made from oats and berry-fruit ingredients” will not necessitate a significant changeover of the equipment existing at the enterprises.

The use of the added juice of berries and fruits in the technology of making a soft drink from oats makes it possible to gently veil the lean taste of grain raw materials, to give the product pleasant berry-fruit flavor and aromatic notes. The content of vitamins, fruit acids also increases with an increase in the content of fruit and berry raw materials in the drink. The resulting drink becomes not only tasty, but also healthy.

A series of tastings was held, which helped to reveal the good taste of the new drinks “Soft drink from oats and apples”, “Soft drink from oats and plums”, “Soft drink from oats and strawberries”, “Soft drink from oats and wild berries”. The tasters noted the attractiveness of these drinks for potential consumers in comparison with the sample without fruit and berry additives.

The results of studies on organoleptic quality indicators are presented in table 1.

Table 1. Organoleptic indicators of the quality of the product “Non-alcoholic drink made from oats, juice of berries and fruits”.

| Indicator                | Characteristics of the Indicator                                                                 |
|-------------------------|--------------------------------------------------------------------------------------------------|
| 1. Product appearance   | not transparent liquid; a small amount of sediment is allowed                                   |
| 2. Structure            | the presence of food flavoring fillers (apples, berries, etc.) is allowed on the surface and in the thickness of the drink |
| 3. Color                | Due to the color of the raw materials used from light cream to dark cream                      |
| 4. Taste and aroma      | Taste and aroma corresponding to the taste of an oat drink with a subtle aroma of the corresponding food-flavoring fillers (apples, berries, etc.) and the aroma of the raw materials used. |

The most pleasant taste was found in the prototype oat soft drink with apples. Apples were introduced into the beverage formulation as clarified and unclarified juice. The juice was squeezed from fresh apples of the Antonovka variety, which is widely grown in the Novgorod region. Due to its high yield, keeping quality during storage, high taste and aromatic qualities of ripe apples, this variety is deservedly loved by gardeners, and can be successfully grown industrially in the Northwest region of Russia. Among the tasters, the sample “Soft drink from oats and apples”, containing clarified juice in its recipe, was recognized as the best.

The nutritional and energy value of the product “Non-alcoholic drink from oats and apples” was calculated. The research results are presented in table 2.
Table 2. Characteristics of the finished product “Soft drink from oats and apples”.

| Indicator                  | Nutritional and energy value of the finished drink |
|----------------------------|--------------------------------------------------|
| 1 Proteins, g              | 5                                                |
| 2 Fats, g                  | 3                                                |
| 3 Carbohydrates, g         | 33                                               |
| 4 Energy value, kJ (kcal)  | 250(60)                                          |

The analysis of the data showed that the organoleptic indicators of the experimental batches practically did not differ in all the parameters selected for comparison.

3. Conclusion
Summing up, it can be noted that the raw materials for the production of soft drinks from cereals and berry-fruit components are mainly seasonal. Fresh berries and fruits can be harvested and used in production only in the summer and a little in the autumn. However, the drink itself can be attributed to all-season, because oats have good keeping quality and, if stored properly, retain their quality and useful properties for a long time, and berries and fruits in the off-season can be used frozen or pre-processed from fresh to juice.

Consumption of the product due to its useful, dietary and therapeutic and prophylactic properties can also be attributed to all-season. It does not depend on the time of year, like a non-alcoholic drink like kvass, the highest consumption of which is observed in May and June during the hot period, before the appearance of seasonal berries and fruits. Any person who monitors their health will be interested in including this high-quality and healthy product in their diet.

The technology for the production of a new soft drink from grain raw materials will not require a significant changeover of the equipment operating at the enterprise for the production of drinks from plant ingredients.

The drink can be sold in retail outlets all year round. With a competent marketing strategy, this direction can be successfully developed.

All of the above can lead to an increase in demand, an increase in capacities for the production of non-alcoholic products, the emergence of new enterprises, an increase in the capacity of existing enterprises for the production of non-alcoholic products, the reorientation of some enterprises to the production of this promising product in all respects. The resulting product, in comparison with the existing analogues, has a more pronounced pleasant taste and richness.

Thus, the possibility of expanding the range of drinks based on herbal ingredients exists and can be technically implemented in the production of the Northwest region of our country. Consumers are looking for healthier products, and their choice would be obvious.

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