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PERFECTION OF QUALITY OF POMEGRANATE JUICE

Research article

Abstract

The beneficial properties of pomegranates as a fruit, peel and plant elements are given. Volumes of processing pomegranates into juices and concentrates are given, problems of processing, defects of finished products are revealed. Ways of regulating the acidity of pomegranate juice and concentrate, ways to eliminate the appearance of sediment and clouding of the juice are outlined. The corresponding technology at the production level is proposed. The ways of extracting food coloring and tannin from pomegranate peel are described. As well as processing residues of the peel for animal feed.

Keywords: pomegranate, juice, concentrate, clarification, enzyme, starch, pectin, organic acid, tannin, turbidity, precipitate.

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СОВЕРШЕНСТВОВАНИЕ КАЧЕСТВА ГРАНАТОВОГО СОКА

Научная статья

Аннотация

Приведены полезные свойства гранат как фрукта, кожуры и элементов растения. Приведены объёмы переработки гранат на соки и концентраты, выявлены проблемы переработки, пороки готовой продукции. Изложены пути регулирования кислотности гранатового сока и концентрата, пути устранения появления осадка и помутнения сока. Предложена соответствующая технология на уровне производства. Изложены пути извлечения пищевого красителя и танина из кожуры гранат. А также переработки остатков кожуры на корм животным.

Ключевые слова: гранат, сок, концентрат, осветление, фермент, крахмал, пектин, органическая кислота, танин, мутность, осадок.

1. Introduction

Processing fruits and citrus fruits into juices and concentrates occupies a significant place in the canning industry. More than 130 million tons of apples, 60 million tons of apricots, 48 million tons of peaches, 35 million tons of oranges, 30 million tons of tangerines, 30 million tons of pineapples, 6 million tons of pomegranates for juices and concentrates are processed annually in the world. On the world market, the proportion of these goods corresponds to the amount of processed raw materials [1].

Pomegranate fruits and juices from them are useful for their general strengthening effect associated with the effect on digestion and assimilation of food. It is a biogenic stimulant and treats pancreatic diseases. Juice is also taken for gastrointestinal upsets, after infectious diseases and surgeries, as a general restorative, heals anemia and purifies the blood. These unique properties of pomegranate juice are to some extent explained by the variety of macro- and microelement composition. Pomegranate juice contains a number of macro- and microelements: potassium, sodium, manganese, phosphorus, magnesium, aluminum, silicon, chromium, nickel, calcium, copper, some of which are considered to be very deficient [1], [2], [3].

Pomegranate seeds are surrounded by a layer of juicy sweet, sour-sweet or sour, depending on the variety, pulp. Thus, the entire volume of the fruit is filled with juicy grains with a diameter of 3-6 mm, in each of which seeds with a diameter of 1-2

mm are placed. Pomegranate juice occupies a special place in human nutrition. Currently, pomegranates are mainly processed into juices and their concentrates at special factories [4].

Pomegranate cultivars contain peels 39-51%, grains, i.e. seeds with pulp 49-61%. Pomegranates contain on average, %: moisture - 79.3, sugars - 11.6, including invert sugar - about 11, fat - 1.15, nitrogenous substances - 1.17, free organic acids - 0.77, fiber - 2.79, ash - 0.53. The acidity of the juice of cultivated varieties reaches 3%, and wild-growing even up to 9% [5], [6], [7].

When sorting pomegranate fruits, fruits with an acidity of more than 3% are usually classified as acidic, sweet and sour - from 2 to 3%, sweet - less than 2%. Citric acid can be extracted from the acidic varieties of pomegranates. Fifteen amino acids were found in pomegranates, of which 6 are irreplaceable.

The peel of the pomegranate fruits is characterized by a high content of tannins of 18-20%, in wild-growing pomegranate they reach 28-35%, pectin contains 4-6%, about 16% of cellulose, 7-8% of hemicellulose, up to 20-25 mg% of ascorbic acids, various alkaloids - pelletierin, isopelletierin, methylpelletierin up to 1.80%. A decoction of the pomegranate peel is used as an antiseptic in inflammatory processes and as a remedy against various types of worms, in the treatment of certain gastric diseases. In industry, pomegranate peel is used as a valuable tanning agent for top grades of leather. Non-fading in the sun paints for various fabrics and rugs are made from petals and peel of fruits [8], [9].

2. Materian and methods

Physico-mechanical indicators of fruits growing in Uzbekistan show that the average weight of the fruits varies from 182 to 467 g, the peel with a septum is from 26.6 to 49.8%, seeds with a shell from 5.4 to 15.8%, the yield of juice is 38.2-54.9%.

The total content of tannins and dyes in pomegranate juice is from 0.82 to 1.13% flavonoids, including anthocyanins 34.0-76.5 mg%. Pomegranate juice contains a number of physiologically active compounds: vitamins and minerals. Pomegranate juice contains ascorbic acid (vitamin C) in an amount of 4-15 mg%, thiamine (vitamin B1) - 0.04-0.36 mg%, riboflavin (vitamin B2) - 0.01-0.27 mg% , pyridoxine (vitamin B6) - 0.50 mg%, pangamic acid (B15), traces of vitamin A and folacin [9].

One of the reasons for the inconsistent presence of pomegranate juice on the market is the lack of perfect technology that ensures the acidity level of finished products within the acceptable range. We have deciphered the problem in this way. For processing, mainly pomegranates of acidic varieties are provided (acidity 1.5-4.0%), which is impossible, even harmful for consumption in kind. And in the clarification technology, the organic acids of the fruits that are concentrated in the juices interfere with the active work of the enzyme complexes used to break down the natural biopolymers of the fruits. This problem was solved by anion exchange regulation of the acidity of pomegranate juice [2], [3].

Another problem similar to the acidity of juice is the instability of the quality of pomegranate juice during storage. The fact is that when storing packaged juice for more than one month, turbidity appears, cluttering the natural ruby color of pomegranate juice, a precipitate forms, which sharply worsens the commodity and organoleptic characteristics of the juice [4].

3. Results and discussion

We experimentally studied the origin and deciphered the substances in juices that lead to these problems – these are phenolic compounds, the main share of which is tannin, which is present in the pomegranate skin in the amount of 10-15% and the inner film covering the pomegranate seeds in the amount of up to 30%.

The presence of tannin in the sediment was determined experimentally. The precipitate is separated from the juice, dried and ground to a powder state. The composition of the powder is determined by the following method: A powder of two juices of different origin is prepared – juice № 1 and juice № 2.

A powder of measured weight of 20 g is poured into a flask with a capacity of 100 ml. 50 ml of hot water is poured into the flask and mixed until the powder mass is completely dissolved. Using a pipette, 5 ml of the prepared solution is taken and poured into a Petri dish. The tint of the brownish color of the solution immediately changes and turns into blue-green. The qualitative reaction carried out indicates that tannins, namely tannin, are present in the solution. The sediment of solids at the bottom of the container with juice is from the production month to the fifth month of storage, respectively, from 0 to 0.46% for juice №1, from 0 to 0.5% for juice №2.

The experimental results shown in the graphs of Figs. 1-3 show that during storage the turbidity index and the amount of sediment in both juices increase and the color deteriorates. Solids and titratable acidity of pomegranate juice vary slightly.

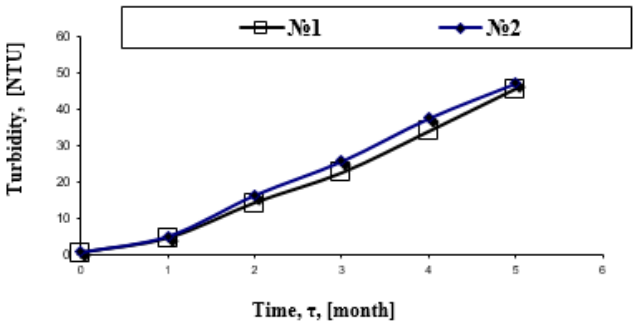

Figure 1 – The graph of the turbidity of clarified pomegranate juice from time to time

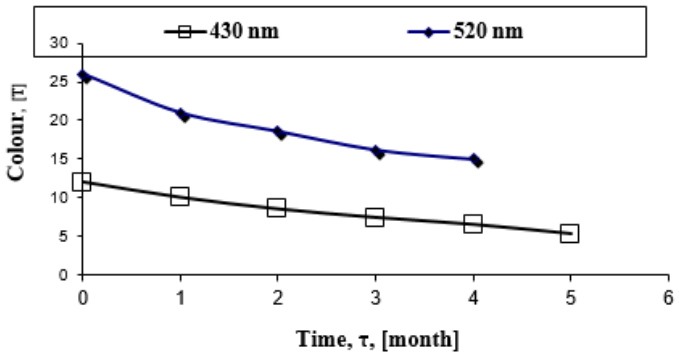

Figure 2 – Graph of the color of clarified pomegranate juice number 1 from time to time

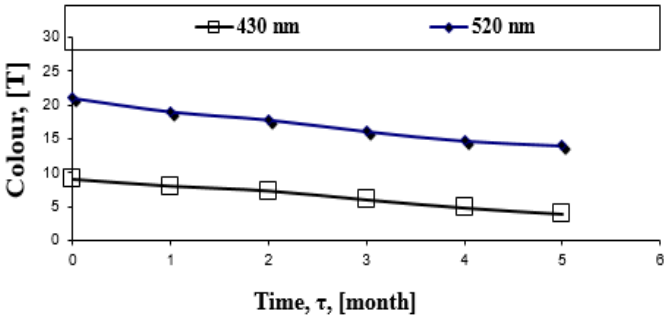

Figure 3 – Graph of the color of clarified pomegranate juice № 2 from time to time

In accordance with this, a series of experiments was carried out aimed at preventing the aggregation of phenolic substances based on tannin. Enzymatic ways have been developed and means have been developed for splitting the links of newly formed biopolymers into lower molecular weight components that dissolve well in juice.

The essence of the experiments are as follows. For the production of enzymes that break down phenolic substances extracted from the peel and internal partitions of pomegranate fruits, enzyme preparations produced by Aspergillus Niger fungi strains were used, which was achieved by screening the emergence of new strains of five different cultures.

The experiments were carried out in the following sequence. Prepared is a medium for growing the following crops based on powders from the rind and pomegranate partition walls: Aspergillus Niger, Pleurotus ostreatus, Aspergillus oryzae, Aspergillus terreus and Sacharomyceus ceresusae.

4. Conclusion

The formation of extracellular tannin acylohydrolytic, proteolytic, pectolytic and cellulolytic enzymes during the deep cultivation of the above fungi was studied. The dynamics of growth and development of fungi within 7-21 days, the utilization of phenolic compounds, proteins, pectin and cellulose were studied. The greatest utilization of phenolic compounds is observed when using Aspergillus Niger fungi. Enzymes of tannin acylohydrolytic, proteolytic, pectolytic, and cellulolytic complexes were found in the fungal culture fluid [5], [9]. The activity of each enzyme preparation in relation to its own substrate was quantitatively studied separately. The obtained results have passed industrial tests.

Conflict of Interest

None declared.

Конфликт интересов

Не указан.

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