# RESEARCH ON BIOTECHNOLOGICAL PRODUCTION OF CITRIC ACID FROM KHOREZM RED POMEGRANATE JUICE

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## ABSTRACT

*This article presents the results of a study of the possibility of obtaining citric acid from pomegranate juice. The composition of red pomegranate in khorezim was analyzed. According to this, it was shown that up to 9% of citric acid can be obtained from the pomegranate.*

***Keywords:*** *Citric acid, vacuum filter, crystallization, aspergillus niger, gypsum, evaporation, activated charcoal, neutralization refractometer.*

## АННОТАЦИЯ

*В данной статье представлены результаты исследования возможности получения лимонной кислоты из гранатового сока. Проанализирован состав красного граната хорезима. По этому было показано, что из граната можно получить до 9% лимонной кислоты.*

***Ключевые слова:*** *лимонная кислота, вакуум-фильтр, кристаллизация, aspergillus niger, гипс, выпаривание, активированный уголь, нейтрализационный рефрактометр.*

## INTRODUCTION

Sour fruit juice is rich in antioxidants, carbohydrates, vitamins, citric acid is one of the most important organic substances in the human body. The most convenient sour fruits for the separation of citric acid are pomegranate and lemon. Because their concentration of citric acid is 6-9%. In terms of applications of citric acid, citric acid is used in the food industry in confectionery, soft drinks, manufacturing, textiles, dyeing, photography and medicine. According to estimates, Uzbekistan's demand for citric acid is more than 10,000 tons a year. These raw materials are mainly exported to our republic from russia at the expense of currency. Therefore, the launch of citric acid production is a topical issue today.

Pomegranate juice, citric acid, vacuum filter, crystallization, aspergillus niger, gypsum, evaporation, activated charcoal, neutralization refractometer.

**DISCUSSION AND RESULTS**

The neutralization process is carried out in a special equipment neutralizer, which in turn is equipped with a mixer and steam batteries. The separation of citric acid from pomegranate juice is based on the formation of its low solubility in the three calcium salts of citrate. The liquid is heated to boiling point and lime or chalk milk is added under continuous stirring. Neutralization is completed when the nutrient pH is 6.8–7.5. The following acid salts are formed.

$C_6H_8O_7 + 3Ca(OH)_2 = Ca_3(C_6H_{11}O_7) + H_2O$

Citric acid calcium carbonate

$C_6H_{12}O_7 + Ca(OH)_2 = Ca(C_6H_{11}O_7) + 2\ H_2O$

Gluconic acid calcium gluconate

$C_2H_2O_4 + Ca\ (OH)_2 = CaC_2O_4 + H_2O$

Oxalic acid calcium oxalate

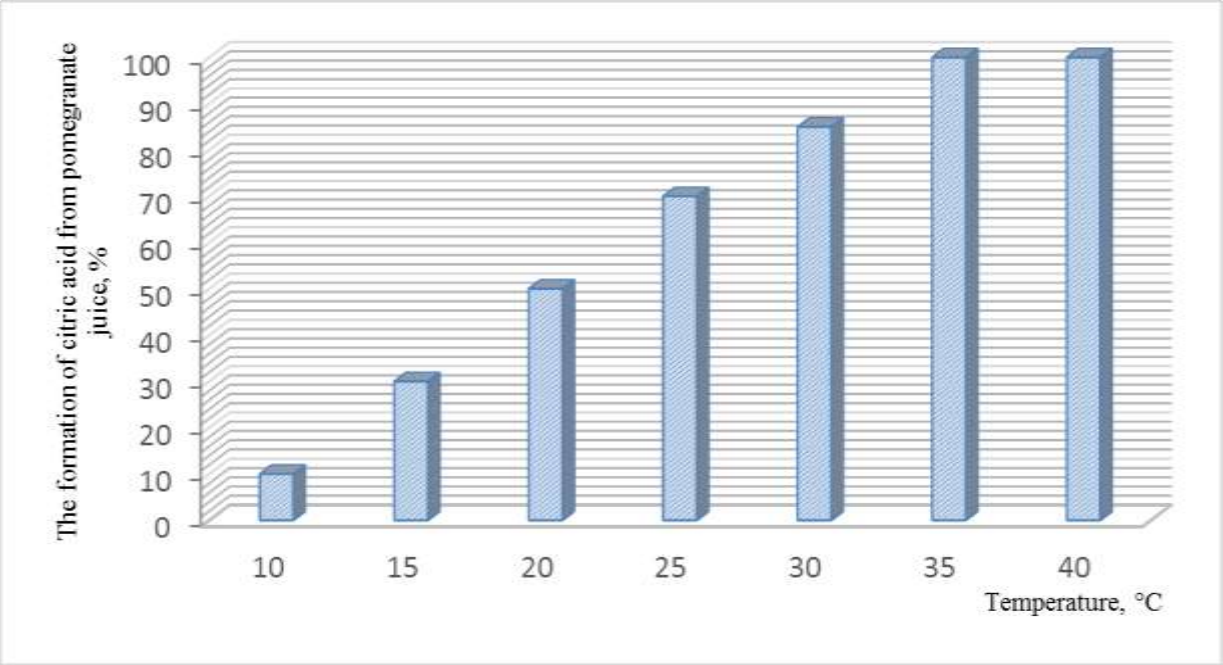
Calcium citrate and oxalate precipitate, and mineral residues remain in solution in the form of calcium glucanate. Calcium citrate, oxalate solution is separated in a vacuum filter and thoroughly washed in hot water. Calcium citrate and a certain amount of water are mixed in a flask and activated charcoal is added. The mixture is heated to 60 0 c and poured into it while mixing sulfuric acid. The mixture is boiled for 10–20 minutes. Calcium citric sulfuric acid decomposes according to the following equation.

$$Ca_3(C_6H_5O_7)_2 + 3\ H_2(SO_4) = 2C_6H_8O_7 + 3CaSO_4$$

Pomegranate has many useful properties. it contains vitamins, macro-elements and amino acids. these inorganic substances have a positive effect on human health. 100 g of fruit contains 14% carbohydrates, 1% protein, 72% water, potassium from macro elements, maintains optimal blood pressure, improves heart function. Calcium and phosphorus maintain the strength of bone tissue, magnesium prevents the development of allergies, participates in sodium water metabolism, iron is an integral part of hemoglobin and prevents the development of anemia.

We took red pomegranate juice and determined the extraction of citric acid in it and the amount of sugar in the laboratory under a refractometer. To obtain citric acid, we took 400 ml of pomegranate juice in a measuring tube and placed it on a water bath heated to 30-40 ° c, poured 30 ml of a saturated solution of calcium chloride into the juice, stirring well, and again stirred a little. After adding the required inorganic

substances to the solution, we boiled it in a water bath for another hour, and we see that a precipitate begins to form under the boiling tube. the precipitate at the bottom of the tube is a mixture of calcium salt and gypsum. In a separate flask, pour 200 ml of water and 200 ml of sulfuric acid in equal amounts and add 1 g of activated charcoal, then lower the flask into a water bath heated to 75 ° c for 10-15 minutes. The formation of citric acid under the influence of temperature is shown in the diagram below.




The effect of heat on the formation of citric acid from pomegranate juice

We filter the citric acid in the mixture through a filter to separate it from gypsum and coal. The sediment in the filter is thoroughly washed three to four times with clean water. Since the gypsum and coal have not been completely removed, the precipitate is filtered in a buchner funnel, and the precipitate is thoroughly washed with boiling water until the reaction of the chloride ions with the silver nitrate salt is complete. Filter the precipitate, add 4 g of barium chloride, filter again, the solution becomes syrupy and cool to 6-8 °C. When we cool, we add less citric acid crystals to form crystals faster. We filtered the precipitated crystals and dried them on filter paper. When we measured the crystals, 8 g of citric acid was formed.

Composition of pomegranate juice

| Vitamins | | |
|---|---|---|
| | Vitamin PP | 0.4mg |
| | Vitamin A | 0.03 mg |

| | | |
|---|---|---|
| | Vitamin $B_1$(Thiamine) | 4mg |
| | Vitamin $B_2$(riboflavin) | 0.04mg |
| | Vitamin $B_5$(pantothenic acid) | 0.01mg |
| | Vitamin $B_6$(pridoksin) | 0.5mg |
| | Vitamin $B_9$(polar acid) | 05mg |
| | Vitamin C | 18mg |

Prof Vinarova developed and implemented methods of optimal technological design of modular devices for the production of citric acid from various substrates. Thus, to date, it has gained considerable experience in the field of extraction and production of citric acid. However, under industrial conditions, aspergillus niger is mainly produced by periodic underwater fermentation of sugarcane in an environment containing sugar and starch.

## CONCLUSION

Pomegranate and lemon fruits grown locally contain more than 10 macro and micro elements necessary for the human body, 2-3% of sugar and 7% of citric acid. Physicochemical parameters of citric acid obtained on the basis of local sour fruit juices were determined mainly in accordance with GOST 31 726-201 2.

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