Proceedings of International Scientific and Technical Conference on
"Problems and Prospects of Innovative Technique and Technology in Agri-Food Chain"
Organized by Tashkent State Technical University, Tashkent, Uzbekistan
International Journal of Innovations in Engineering Research and Technology [IJIERT]
ISSN: 2394-3696, Website: www.ijiert.org, Organized on 24-25 April, 2020

POMEGRANATE JUICE, DEFECTS, IMPROVING OF PRODUCING TECHNOLOGY

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Abstract. It is studied growing volume of pomegranate in Uzbekistan, level of processing, main problem, concluding to increasing of acidity in pomegranate juice and concentrate, influencing acidity to human health. It is proposed method by ion-exchanging removing plenty of organic acids from content fresh-pressed juice. For this, there are experimentally investigated ion-exchange process by testing three kind of epoxy-amide resins. Finally, it recommended including to technology obtaining of pomegranate juice ion-exchange way adsorption of organic acids.

Key words. Pomegranate juice, organic acids, juice acidity, ion-exchange process, adsorption, epoxy-amide resin.

1. Introduction

Processing of fruits and citrus, fruits to juice and concentrates engage weighty place in canned industry. Every year in the world processes more 130 mln tons of apples, 60 mln tons of apricots, 48 mln tons of peaches, 35 mln tons of oranges, 30 mln tons of mandarines, 30 mln tons of pineapples, 6 mln tons of pomegranates to juice and concentrates. In the world proportion of these products correspond quantities of processing raw materials [1].

One of the cause fast appearance and disappearance of pomegranate juice on the market are absence of perfect technology, as a result, of this consumer claim to product quality, and otherwise problems of existing technology processing of pomegranates.

As a rule on processing provides mainly sour kinds of pomegranates (acidity 1,5-4,0%), using which negative influences to human health, moreover, what in standards of European countries to juices limit quantity of organic acids in it no more 0,9%. In clarification technology of juices organic acids of fruits, concentrating in juices hinder normal activity of ferment complexes, using for splitting of natural biopolymers of fruits at their clarification.

We have processed technology of anion-exchange regulation acidity of pomegranate juice. Processing includes determination of optimal parameters of adsorption process by anion-exchange resin type of EDE-10P, IRA-958 и 313 by experimentally [2-5, 8].

2. Methods and materials

Determination of acidity. The active acidity defines by pH-meter, which based on the difference potentials of between electrodes, loaded in a sample solution.

The titratable acidity defines by potentiometric method. The method based on potentiometric titration of researching solution up to pH 8,1 NaOH with concentration – 0,1 mol/l.

The titratable acidity X in an account to dominating acid at a percent defines by following

$$X = \frac{(V \cdot C \cdot M)}{(a)\frac{V_0}{V_1}} ;$$

where, V – volume of titrated NaOH, spent to titration; C – molar concentration of titrated solution of hydroxide sodium; a – sample weight; M – molar weight, g/mole, equally for malic acid - 67,0; wine acids - 75,0; citric acids - 64,0; vinegar acids - 60,0; oxalic acids - 45,0; lactic acids - 90,1; V_0 - volume, which is diluted of sample; V_1 – volume of filtrate for titration.

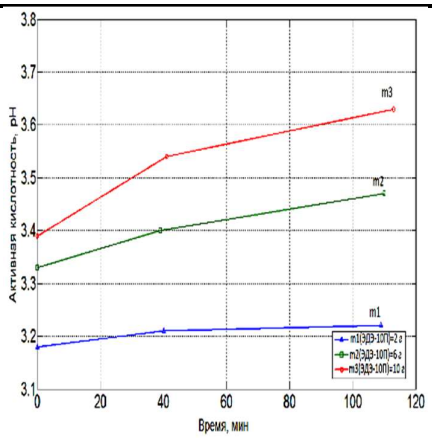
Methodic of anion-exchange process.

Experimental research of anion-exchanging regulation of acidity in pomegranate juices pass in continuous regime with the resins EDE-10P (Russia), IRA-958 (Amberlite, England) and 313 (China). Anionites test in a OH^--form, which they pass by 20%-solution NaOH on methodic, supplied to resins.

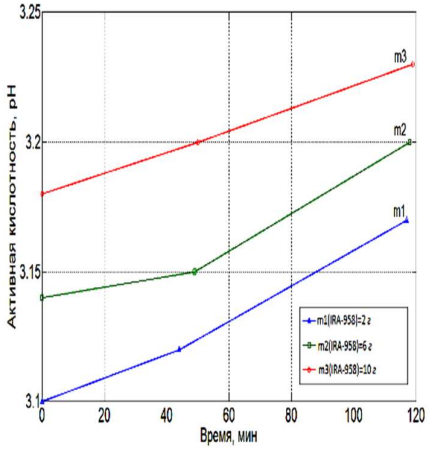
Main reagents and materials, which need for passing experiments: concentrated pomegranate juice with 65^0Bx; distilled water; refractometers (0-90%); magnet mixer; laboratory pressing machine; water-bath; electronic analytical weights; resins type of EDE-10P; IRA-958; 313 in Cl^--form; measuring-glass (100 ml); tripod; *pH*-meter (0-14); solution of NaOH with concentration 0,1; 3; 20 mole*/l*; 1%-ethanol solution of phenolphthalein.

3. Results and discussing

About 75-85% of pomegranate fruits for industrial processing consist of high acidity (citric acid). Their total acidity in an account to citric acid fluctuates between 1,5-2,9% from raw material weight. Juice and concentrate from such fruits consist of plenty quantity organic acids than standard requirements. Firstly, it influences negatively to digestion tract of human organism, secondly, it makes difficult using of products to food processing, also to enzyme technology of clarification. Juice and concentrate from sour kinds of pomegranates content exceeding citric acids, which it makes difficult to clarification technology and using it food purpose. Starch and pectin, which content in pomegranate juice split during it clarification process, further, at evaporation of juice up to high concentration. Ferment preparations which using for this purpose are active at more low pH~4,0-4,6 acidity of solution – acidity of pomegranates – raw materials [6,7].



Pic. 1. Dependence active acidity by time at variation quantity of resin EDE-10P.



Pic. 2. Dependence active acidity by time at variation quantity of resin IRA-958.

These problems decide by removing plenty of organic acids with using anion-exchange technology. There are defined physical and chemical parameters of pomegranate juice and concentrates. The results of changing pH of juice by time for resins type of EDE-10P and IRA-958 represented on the picture 1-2. It is determined total acidity of pomegranate juice, which it treated with resins, and obtained results are included the table 1.

Table 1

Results diminishing of total titrated acidity of investigating pomegranate juice after treatment with resins (Initial acidity of juice - 1,668 %)

Physical and chemical parameters	Resin mass, g		
	2,0	6,0	10,0
Total titrating acidity of pomegranate juice (EDE-10P), %	1,376	1,267	0,947
Total titrating acidity of pomegranate juice (IRA-958), %	1,472	1,44	1,184

Make using with experimental results, which obtained above-mentioned, it can define quantity of citric acid, which adsorbed to resins of EDE-10P and IRA-958 as a form OH^- (table.2).

Table 2

Quantity of organic acids, which adsorbed with resins

Physical and chemical parameters	Resin mass, g		
	2,0	6,0	10,0
Total titrating acidity of pomegranate juice (EDE-10P), %	0,292	0,401	0,721
Total titrating acidity of pomegranate juice (IRA-958), %	0,196	0,228	0,484

It is determined quantity of organic acids, which adsorbed with resins of EDE-10P and IRA-958. It is defined quantity of organic acids, which adsorbed by 1 g of resin and the obtained results shown in table 3.

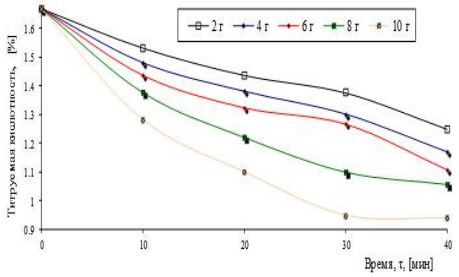
Table 3

Quantity of organic acids, which adsorbed with resins

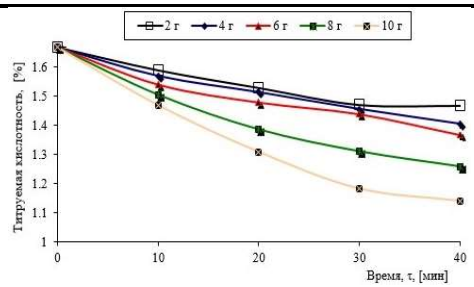
Parameter of adsorbtionality of organic acids	Resin mass, g		
	2,0	6,0	10,0
Quantity of organic acids, which adsorbed with resin of EDE-10P from pomegranate juice in volume 500 ml, g	1,533	2,105	3,785
Quantity of organic acids, which adsorbed by 1 g resin of EDE-10P, g	0,7665	0,3508	0,3785
Quantity of organic acids, which adsorbed with resin of IRA-958 from pomegranate juice in volume 500 ml, g	1,029	1,197	2,541
Quantity of organic acids, which adsorbed by 1 g resin of IRA-958, g	0,5145	0,1995	0,2541

Experiments, which passed with resin of EDE-10P, at temperature 40^0C (pic. 3), there are defined corresponding results: at 2 g - 1,25%; 4 g - 1,168%; 6 g - 1,108%; 8 g - 1,056%; 10 g - 0,938%.

Experiments, which passed with resin of IRA-958, at temperature 40^0C (pic. 4), there are defined corresponding results: at 2 g - 1,469%; 4 g - 1,405%; 6 g - 1,369%; 8 g - 1,260%; 10 g -1,142%. The results of experiments, represented on the pic. 5, there are shown, which adsorbtionality of citric acid of pomegranate juice depends no more to temperature, for adsorption of organic acids chosen optimal temperature 40^0C.

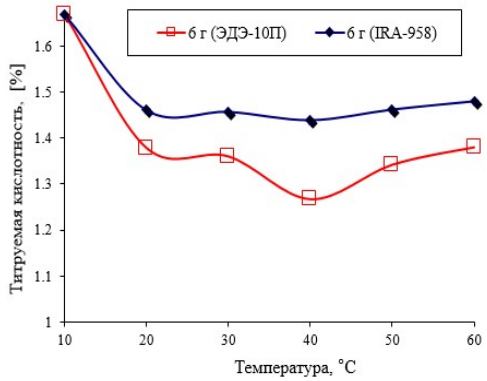


Pic. 3. Dynamics changing of acidity of pomegranate juice at variation quantity with resin of EDE-10P at temperature 40^0C.

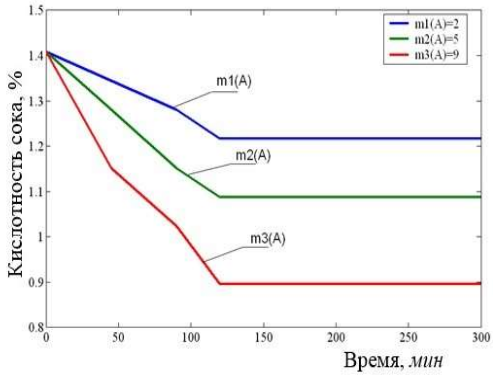


Pic. 4. Dynamics changing of acidity of pomegranate juice at variation quantity with resin of IRA-958 at temperature 40^{0}C.

The resin of 313 (China) used for falling of juice acidity, which it obtained by fresh-pressed from fresh sour fruits. The results of experiments given on the pic.6.



Pic. 5. Dependence of titrating acidity of pomegranate juice to it temperature.



Pic. 6. Dynamics changing of acidity of pomegranate juice at variation quantity of the resin 313.

4. Consolation

The research shows, which adsorption of organic acids by resins proportion to quantity of resin, also it intensifies with increasing correlation quantity of the resin to juice. From analysis, results of experiments can make conclude, which at regulation of acidity of pomegranate juice from sour kinds of raw fruits necessary use maxima possibility, with point of realization, expense of resin. By results of experiments, can process methodic of calculation of anion-exchange regulation of acidity of pomegranate juice for technologists of industry.

There are passed research work on regulation acidity of pomegranate juice by ion-exchange resins, where high level of adsorption of organic acids shown at temperature 40^{0}C and in correlation of resin to juice 10 g / 500 ml, and acidity of pomegranate juice diminishes from 1,668 % up to 0,938 %.

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