

USE OF STEAM AND CONDENSATION CAVITATION FOR CLEANING OF APPLE JUICE

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Abstract. The effective mode of treatment of apple juice is set by a pair in a steam and condensation device for his cleaning. The offered model of cooperation of cavitation bubble is with the colloid particles of juice. It is set that natural properties of juice test minimum changes due to the action of low temperatures during short space of time.

Keywords: Apple juice, cavitation, steam and condensation cavitation device.

I. Introduction. Juice is a liquid product, got from one or a few types of fruit (green-stuffs), by a mechanical action, canned, except for treatment an ionizing radiation, apt at fermentation, without admixtures and preservatives. Depending on content pulps are distinguished by juices defecate, undefecate and with pulp.

Defecate juices, due to application of certain methods, pulps disengaged from hangings up particles and to greater part of colloid matters, after original appearance transparent and more proof at storage, what other types of juices.

Undefecate juices contain all colloid matters and some part of the micronized particles pulps which worsen original appearance and commodity qualities of juice. However, taste and aroma of undefecate juices is more full, than defecate.

Juices with pulp contain all colloid matters and fine-divided pulp of garden-stuffs and berries, after composition near to initial raw material and that is why they are often named liquid garden-stuffs [1].

It is suggested to use steam and condensation cavitation by us for the acceleration of process of defending of juice with the purpose of his lighting up.

II. Task description. Apple juice was got in laboratory terms mechanical a way. Apples ground down on a grater, then pulps was inlaid in linen fabric, and on a type basket the press got juice. The apples of fall-winter sorts were used, because they have dense fabric, which enables to get pulps which is well pressed. An exit of juice from such pulps is 80 % and anymore.

Juice was processed steam with potential of 0,12 MPa; 0,16 MPa; 0,2 MPa at a different temperature overfall (interval of 10°C) on the laboratory setting.

Juice was divided by five standards: one was abandoned as control, and other exposed to steam and condensation cavitation. The set temperature of juice made 20°C.

In every standard determined: table of contents of dry matters; change of volume of juice; general acidity; size of pH; transparency and painted; table of contents of ascorbic acid and content of sediment after the generally accepted methods.

III. Results. As a result of the conducted researches which are presented in a table 1, for pressure of pair of $p=0,2$ MPa there is a minimum size of painted and accordingly maximal size of transparency at the temperatures of 40...50°C, that answers the maximal size of maintenance of sediment after centrifugation.

In relation to other two potentials of pair, it is possible to say that they give a less effect and, as a result, got sizes does not allow to get transparent juice with minimum maintenance of sediment. Acidity of apple juice diminishes due to dilution of juice the runback of pair, but this dilution does not influence substantially on quality of juice, because a difference between a control test and the least value of acidity presents only 0,06 %.

Table 1.

Results of researches on treatment of juice steam at potential 0,2 MPa

Investigational index	Temperature, °C				
	20 (control)	30	40	50	60
Initial volume, ml	—	300	300	300	300
Eventual volume, ml	—	306	315	323	329
Table of contents of dry matters, %	12,2	11,5	11,2	11	10,8
pH	3,68	3,70	3,72	3,70	3,69
Acidity, %	0,48	0,46	0,46	0,45	0,43
Transparency, %	46,4	49,2	51,3	52,7	50,0
Painted, units of absorbancy	0,457	0,43	0,42	0,41	0,45
Table of contents of ascorbic acid, mg/100 gramme	1,4	1,01	1,0	0,7	0,5
Table of contents of sediment, %	1,41	1,43	1,45	1,48	1,38

At steam and condensation cavitation there is breeding of juice the runback of steam. As a result of the conducted calculations on the amount of juice after insufflation of aquatic steam on the basis of law of maintainance of mass of matters ($m_1 \cdot SR_1 = m_2 \cdot SR_2$) and got experimental values on volume of juice and maintenance of dry matters evidently, that these results coincide or lie within the limits of error (table 2).

Table 2.**Values of volume of juice after treatment steam**

Temperature, °C	Pressure 0,12 MPa		Pressure 0,16 MPa		Pressure 0,2 MPa	
	practical	theoretical	practical	theoretical	practical	theoretical
	value	value	value	value	value	value
30	310	310,1	305	304,7	306	305
40	320	321	313	314	315	315,5
50	323	324	320	320	323	321
60	333	333,7	325	325,4	329	327

A decline of maintenance of dry matters is in apple juice, treated by steam and condensation cavitation, aught takes place yet and due to coagulation of colloids.

The mechanism of treatment of juice consists in passing of stream of pair in the volume of juice, his crushing on steam bubbles with their further collapse. As a result of collapse of steam bubbles effects take place cavitation, which initiate the processes of coagulation of matters of colloid dispersion, which fold the albumen-pectin complex of juice.

Table 3.**Table of contents of ascorbic acid depending on a temperature and method of heating**

Pressure, MPa	Table of contents of ascorbic acid							
	Temperature, °C							
	30		40		50		60	
	steam	heating	steam	heating	steam	heating	steam	heating
0,12	1,05	1,03	0,7	0,9	0,7	0,6	0,4	0,5
0,16	1,03	1,03	1	1,01	0,7	0,7	0,5	0,4
0,2	1,01	1,02	1	1,02	0,7	0,5	0,5	0,3

There is ascorbic acid in apple juice, which was by us certain in tests after every insufflation of pair of different potential. It is set that takes place diminishing of its maintenance due to influence of action of cavitation and increase of temperature. Influences badly on maintenance of ascorbic acid has steam with pressure of $p=0,12$ MPa, and at 0,16 and 0,2 MPa the amount of ascorbic acid remains anymore. Also there were the conducted researches about the change of maintenance of ascorbic acid during the simple heating of juice. Coming from the got results (table 3), evidently, that the simple heating and lead through of steam and condensation cavitation with apple juice give the identical values of maintenance of ascorbic acid actually. But taking into account insignificant dilution of juice the runback of pair, it is possible to talk about a few higher values of maintenance of ascorbic acid in juice, treated steam condensation cavitation. Treatment of juice in such cavitation device considerably improves sedimentation properties of the treated juice and, the productivity of a vehicle is for defending rises accordingly.

IV. Conclusions. Coming from the got results, it is possible to do such conclusions:

1. Treatment of apple juice in a steam and condensation cavitation device allows to improve sedimentation properties of the treated juice.
2. The productivity of a vehicle is for defending rises due to such treatment.
3. Findings allow to set the mode of treatment: pressure of pair of $p=0,2$ MPa at the temperature of juice of 40...50°C.
4. The table of contents of vitamin of S in the treated juice is kept better, than at the simple heating.
5. Natural properties of juice are tested by minimum changes due to acting of low temperatures on the short interval of time.

References

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