KIRKUK UNIVERSITY JOURNAL
FOR AGRICULTURAL SCIENCES

Design and manufacture of a device for pasteurizing orange juice and its effects on the qualitative characteristics of fresh orange juice

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- Date of research received 01/08/2023 and accepted 24/10/2023**.**

Abstract

The research project was conducted on the Batch Ohmic Heater, which was designed and manufactured in the laboratories of the Department of Food Sciences/College of Agriculture and Forestry/University of Mosul, to be used in sterilization of orange juice. The study included the effect of Ohmic heating at voltages of 80, 110 and 220 volts on the chemical, physical and sensory properties and compared them with samples of orange juice treated by the conventional heating method (95 C°/15 s). Ohmic heating with the applied voltage gradients (9.2, 12.64 and 25.28 V/cm) significantly ($p\leq0.05$) preserved the total phenols content of the orange juice samples compared with the samples treated with conventional heating immediately after treatment, however, voltage gradient (12.64) acquired significantly ($p\leq0.05$) higher in average total soluble solids (TSS) over other treatments for average refrigeration period (14 days) Using a voltage gradient of 12.64 V/cm for orange juice samples showed a significant decrease ($p\leq0.05$) in the pH values compared with the other used voltage gradients. There was the highest significant increase ($p\leq0.05$) in the concentration of vitamin C for orange juice samples treated by Ohmic heating at voltage gradient 9.2 V/cm compared with the other samples. In the study of sensory evaluation of orange juice treated by Ohmic heating at a voltage of 12.64 V/cm, which obtained the highest degree of sensory evaluation with two grades of excellent and very good within the evaluation scores used for that (1 unacceptable - 8 excellent) by the arbitrators compared with the rest of the orange juice samples.

Key words: *Ohmic Heating, Pasteurization, Vit C, Phenols, pH*
Citation: Ahmed, H., Sedeeq, A., & Khalil, T. (2023). Design and manufacture of a device for pasteurizing orange juice and its effects on the qualitative characteristics of fresh orange juice. *Kirkuk University Journal For Agricultural Sciences*,14(4), 43-54. doi: 10.58928/ku23.14404
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Introduction

Ohmic heating of food products involves the passage of alternating current through them, thus generating internal heat as a result of electrical resistance [1]. This technology provides fast and uniform heating, resulting in less thermal damage to the product. In addition, the lack of a hot surface in ohmic heating reduces contamination problems and thermal damage to the product. Therefore, a high quality product can be manufactured with minimal or minimal histological changes nutritional sensory in a short run time. The key to the successful implementation of the Ohmic process is the rate of heat generation, and the electrical conductivity of the nutrients. changes were studied in conductivity electrical samples Vegetables and meat MIt turns out that it is affected by a number of factors, for example, field strength, dissolved solids, and ratio Lipids, cell structure changes [2].

Locate palan Iappan and Sastary (1991) [3] also reported the electrical conduction of orange and tomato juice using a device Ohmic heating in batches, they concluded that the electrical conductivity of tomato and orange juice increases linearly with temperature and decreases with solids content. In addition, they determined that the electrical conductivity tends to increase with decreasing particle size, but that a general conclusion cannot be reached without taking into account particle shape and orientations. Although ohmic heating technology appears to be very promising and effective, there is little information regarding the effect of this technology on specific food products compared to conventional pasteurization. Therefore, orange juice was chosen as the system KA model for investigating the effects of ohmic heating technology on liquid food products. Quality standards related to orange juice, such as inactivation of microorganisms and enzymes, heat-sensitive compounds, and physical properties, play an important role in the industry as well. And between [4] Ohmic heating has an effect on the vitamin content C, where heat treatments affected the decrease in vitamin C by 15%.

The aim of the study to Design and fabrication of an orange juice pasteurizer and effects of ohmic heating on organoleptic properties to heated orange juice Ohmic method It is traditionally pasteurized compared to the quality of fresh orange juice including vitamin C and solids Sensory qualities such as color and flavor.

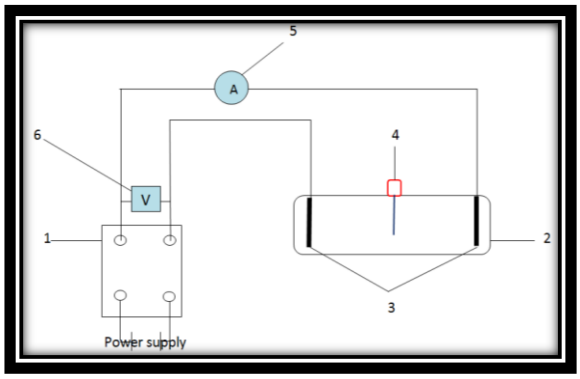
Materials and Methods

Prepare orange juice samples

Fresh oranges were obtained from the local markets of Mosul, Iraq, and maintained at 4 °C until completion of the experiments in one day.so Manual orange juice Use a plastic squeezer after cleaned under running water, Gauze was used to filter the juice.

Ohmic heater

Deafness Experimental figure for constant ohmic heating (Fig. 1) And then manufacture it in the Department of Food Science, College of Agriculture and Forestry, University of Mosul, Iraq. The device consisted of a source of energy electrical AC 60 Hz, tube of Heating (2-1/2 in. die, 10 cm long and 0.4 cm thick) Made of PVC with Apair of electrodes Electrodes in Stainless steel (0.5 cm in diameter and 5 cm in length) Two anchors at the end heating tube, And free Thermocouple temperature monitor, screen electronic follow-up registration electric current (amps), and a voltage converter Volt transformer. Figure 2 shows the real ohmic heating device used in this research.



Experimental design for constant ohmic heating shape (1):1- The source of electrical energy(power supply) and change the electric potential 2- Ohmic heating tube 3 electrodes(electrodes) 4- Thermometer 5- A device for reading electrical current 6- Voltmeter device

Figure (2): factory ohmic heater

Ohmic heating of orange juice

Valuable Performing an Ohmic heating unit using the batch method. To monitor the temperature of the sample continuously, insert the thermometer and fix it in the geometric center of the heating tube me, then put 300 ml of samples into an ohmic heating tube. All checks started by standardizing the temperature of orange juice samples at a temperature of 20 °C. Using different voltage gradients (9.20, 12.64 And 25.29 V/cm), orange juice samples were heated to the pasteurization temperature (95 C° for 15 sec). at each10A rise in temperature, the current is recorded (1.07, 1.43, and 3.49 amps) and time (13.39, 6.49 and 1.27 min). Results were Compared Inclusion Transactions Different strains of orange juice compared to the results of conventional pasteurization of orange juice.

Determine the characteristics of ohmic heating

Physical and chemical tests

1- Ph: Been appreciated exponent pH using a portable pH-meter after titration on standard solutions of pH 4 And pH 7).

2- Total soluble solids (TSS): Use the device Hand Refract meter in the determination of total dissolved solids after calibration and filtering using distilled water.

3- The total content of phenols

I followed the method [5] in the method for the determination of total phenols of orange juice.

For standard curve work Standard curve (Fig.3) of gallic acid solution with different concentrations of gallic acid, be taken 0.2, 0.4, 0.5 And 0.6 ml each for me Limit Hand mixed with 5 ml of reagent solution Folin -Ciocalteus and 1 ml of Na2Co3 sodium carbonate solution and in the same way above Optical absorption is read at a wavelength of 725 nanometers, [6].

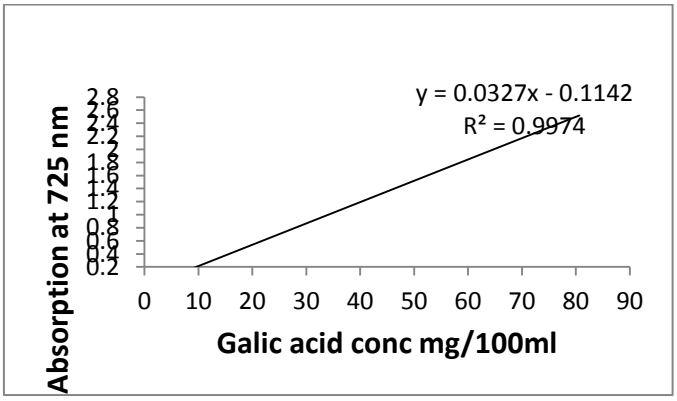


Figure (3): The standard line for phenols (Standard curve)

4- Vitamin C

Vitamin rated C using the iodine titration method [7]. Flush 25 ml of orange juice with iodine solution (a mixture of potassium iodate KIO3 and potassium iodide KI after addition Drops of starch solution (1%) until the juice changes color blue. The amount consumed from the iodine solution is compared with the equivalent amount consumed from the iodine solution of the standard vitamin solution (0.250gm vitamin C pure dissolved in 100 ml distilled water). Vitamin C was estimated in 1g/100ml of orange juice.

Sensory evaluation

The descriptive sensory evaluation method was used [8] on heat-treated orange juice samples mean

Table.1 impact Ohmic heating at a voltage gradient (9.20, 12.64 And 25.29 V/cm) and traditional heating (95 C° for 15 sec) and storage time in the proportion of phenolic compounds of orange juice

Transactions	Storage (day)			Average duration storage
	0	7	14	
Fresh juice	1.78 a	1.40 bc	1.14 ef	1.44a
9.2 (V/cm)	1.49b	1.50b	1.29 cd	1.43 a
12.64 (V/cm)	1.40 bc	1.44 BC	1.14 e f	1.33b
25.28 (V/cm)	1.31 cd	1.20 def	0.90 g	1.13 c
conventional heating (95 C° for 15 sec)	1.12e	0.80 gc	0.70c	0.87 d

• Averages that share letters the alphabet Similar, there are no significant differences between them according to the Duncan test at the level of probability 5%.

conventional heating and compared with orange juice samples fresh Immediately after the treatment and after the storage period in the refrigerator for 14 days. The number of arbitrators was 10, and it has been provided arbitrators with information about the evaluation score for each trait before the testing process, with the need to drink water between

evaluation and another. Evaluation scores began with 1 (Unacceptable) and ended with 8 (Excellent).

Statistical analysis

Experimental data were analyzed using software SAS for the year 2009 and tested the averages of the studied traits Dunkin' multiple range test under the 5% probability level to find out the significant differences between them The average readings were taken for three replicates for all tests above for orange juice samples.

Results and discussion

Effect of ohmic heating on the chemical and physical properties of orange juice

1- Total phenolic compounds

The table shows (1) impact Heating orange juice the traditional way (95 C° for 15 sec) and ohmic heating with a voltage orange juice the traditional way (95 C°) for orange juice the traditional way (95 C° for 15 sec) and ohmic heating with a voltage gradient (9.2, 12.64 and 25.28 V/cm) and stored at different time intervals (0, 7 and 14 days).

Notice that there are significant differences ($p \leq 0.05$) between different coefficients in the proportion of phenolic compounds college, where Table indicates (1) to moral decline ($p \leq 0.05$) Percentage of total phenols in orange juice treated by conventional heating and ohmic heating at a voltage gradient (9.2,12.64 and 25.28 V/cm) Immediately after treatment (0 time) compared to juice fresh, and was 1.12,1.49,1.40,1.31 and 1.78respectively. He wasto effect traditional heating the most A deterioration in the percentage of phenolic compounds compared to the treatments other. pointed out [9] to increase Loss of some anti-nutrient compounds to oxidation (including phenolic compounds) when using high temperatures. The reason is due to the decrease in the proportion of phenolic compounds when using ohmic heating Compared to traditional heating, to the ohmic heating speed (Any accomplished shortly) [10].

These results agreed with previous studies which confirmed on that Vehicles are affected by different manufacturing processes [11]. Aguilar-Rosas et al. (2007) [12] found that Ohmic treatment of her apple juice impact Less in the breakdown of phenolic compounds compared to conventional heating. Through the average values of phenols for time rates preheating, notice that There is a significant decrease ($p \leq 0.05$) in the percentage of total phenolic compounds, which was at the voltage gradient (9.2 V/cm) compared to ohmic coefficient so there (12.64 and 25.28 V/cm) and traditional heating (95 C° for 15 sec), and she was1.43%, %1.33,1.13%and 0.87% respectively. The degradation of phenolic compounds increased significantly ($p \leq 0.05$) end of storage period (14 days) For fresh orange juice treated with traditional heating (95 C° for 15 sec).

2- Total soluble solids ratio

The table shows (2) impact Heating orange juice the traditional way (95 C for 15 sec) and ohmic heating with a voltage gradient (9.2,12.64 and 25.28 V/cm) and stored at different time intervals (0,7 and 14 days).

Table indicates (2) to moral decline ($p \leq 0.05$) in the proportion of solids dissolved kidney (%) for orange juice treated by conventional heating (95 C° for 15 sec) and ohmic heating (9.2,12.64 and 25.28 V/cm) immediately after the transaction (0 times) compared to juice fresh, And she was10.14%, 10.61%, 10.80%, 10.40% And 10.20% respectively. Notice a significant decrease ($p \leq 0.05$) in the percentage of total dissolved solids for juice treated by the conventional method (95 C° for 15 sec) studied compared to transactions other. is found that The percentage of total dissolved solids is affected during various manufacturing processes [13]. Through average total dissolved solids values for duration rate spore heating, notice that There is a significant increase ($p \leq 0.05$) in the percentage of total dissolved solids at the ohmic treatment (12.64 v/cm) compared to ohmic coefficients other (9.2 and 25.28 V/cm) and traditional heating (95 C° for

15 sec), And she was11.09%, 10.42%, 10.31% and 10.38% respectively. Also is found that rate Total dissolved solids of heat treated fruit juice ohmic and stored late different time increased with increasing period store it, in comparison with orange juice and pomegranate juice, the levels in orange juice were higher than in pomegranate juice [14].

Table.2 impact Ohmic heating (9.2,12.64 and 25.28 V/cm) and conventional heating (95 C° for 15 sec)and duration Storage in percentage of total dissolved solids for orange juice.

Transactions	Storage (day)			Average duration storage
	0	7	14	
Fresh juice	10.20 g	10.14 g	9.90d	10.08 d
9.2 (V/cm)	10.61 d	10.29 g	10.35 gf	10.42b
12.64 (V/cm)	10.80 b	10.73 bc	11.75a	11.09 am
25.28 (V/cm)	10.40 f	10.20g	10.34 gf	10.31 d
conventional heating (95 C° for 15 sec)	10.14 g	10.65 cd	10.34 fg	10.38b

• Averages that share letters the alphabet Similar, there are no significant differences between them according to the Duncan test at the level of probability 5%.

Led Storage of untreated (fresh) juice decreased significantly ($p\leq0.05$) At the end of the storage period (14 days) compared to transactions other studied in search, where it was 9.90%, It may be attributed to the lower total dissolved solids in the orange juice samples fresh to Exposure to some chemical reaction microbial contamination.

Material shown total dissolved solid down morally ($p\leq0.05$) end of storage period (14 days) For fresh orange juice treated with heating Ohmic at a voltage gradient (9.2 and 25.28 V/cm), It was 9.90%, 10.35% and 10.34%. Presence notes Significant differences ($p\leq0.05$) between Ohmic heating at a voltage gradient (12.64 V/cm) and traditional heating (95 C° for 15 sec), And she was 11.75% and 10.34%. pointed out [15] This indicates that there is a continuous significant increase in the total solids of grape juice treated with ohmic heating stored in the refrigerator for a period of time12 day, where it was the result of evaporation that may occur as a result of high temperature preheating, which then can that It helps in increasing the concentration of the juice and thus increasing the percentage of total dissolved solids. researchers found others [16] indicated that there were no significant differences in total dissolved
solids in apple juice treated with Ohmic heating at a voltage gradient rate. (30-40 V/cm) As well as with traditional heating (95 C° for 15 sec).

3- pH

The table shows (3) impact Heating orange juice the traditional way (95 C° for 15 sec) and ohmic heating at difference voltage (9.2,12.64 and 25.28 V/cm) and stored at different time intervals (0,7 and 14 days).

Table results shown (3) There are significant differences ($p\leq0.05$) between different transactions in value exponent pH or orange juice treated with conventional heating and ohmic heating at voltage difference (9.2, 12.64 and 25.28 V/cm) immediately after treatment (0time) compared to juice fresh, was to pH 3.53, 3.51, 3.54, 3.50 And 3.75 respectively. by average value exponent pH for a while preheating, notice that less drop in exponent pH It was at a voltage gradient (12.64V/cm) compared to ohmic coefficients other (9.2,25.28v/cm) And heating up traditional, it was 3.54%.,3.53%,3.52% and 3.48% respectively. An increase in pH is observed pH Morally ($p\leq0.05$) end of storage period (14day) for orange juice treated with ohmic .

Table.3 impact Ohmic heating at a voltage gradient (9.2,12.64 and 25.28 V/cm) conventional heating (95 C° for 15 sec), and storage time in pH of orange juice

Transactions	Storage (day)			Average duration storage
	0	7	14	
Fresh juice	3.75 a	3.59b	3.48 g	3.61 a
9.2 (V/cm)	3.51 ef	3.48 g	3.59b	3.53 c
12.64 (V/cm)	3.54 cd	3.52 ef	3.58b	3.54b
25.28 (V/cm)	3.50 eg	3.52 ef	3.55c	3.52 c
conventional heating (95 C° for 15 sec)	3.53 df	3.49 g	3.44 c	3.48 d

• Averages that share letters the alphabet Similar, there are no significant differences between them according to the Duncan test at the level of probability 5%.

Heating at a voltage gradient (9.2,12.64 and 25.28 V/cm) Compared to freshly squeezed orange juice processed by conventional heating (95m for a while15second), Where she was3.59%,3.58%,3.55%,3.48% and 3.44%respectively.has in decided [17] This leads to an increase in the pH with an increase in the storage period in the refrigerator (21 days), as this change in pH may be due to decomposition. Watery hydrolysis is of juice during aluminum heating. On the other hand, pointed out [18].

Ohmic heating and when rate of conductivity Electrophoresis (0.209 to 1.013m/s) may be has increased the pH with increasing voltage gradient (30-55 V/cm), but the electrical conductivity of pomegranate juice increased with increasing temperature (20-85M) although lighter the pH It may indicate a decrease activity microorganisms and lead to an increase in the quality of orange juice, however There was no significant decrease in pH when using ohmic heating [19].

4-vitamin C

The table shows (4) impact Heat the orange juice the traditional way (95 C° for 15 sec) and ohmic heating when voltage difference (9.2,12.64And25.28 v/cm) And stored in different time periods (0,7And14 days). table indicates (4) to a significant decrease($p\leq0.05$) in vitamin concentration C for orange juice treated by conventional heat (95 C° for 15 sec) Ohmic heating at a voltage gradient (9.2,12.64 And 25.28 V/cm) Immediately after treatment (0 time) compared to fresh juice 6.64 ,8.27, 7.26, 6.97 And 10.23 respectively. The effect of conventional heating was the lowest on vitamin concentration C for orange juice compared to other treatments. Increasing the voltage gradient in the ohmic heating led to an increase in the decrease ($p\leq0.05$) in vitamin concentration, and maybe happened highest increment in vitamin C concentration at a voltage gradient of 9.2 V/cm compared to a voltage gradient and 12.64 and 25.28 V/cm, where it was 8.27,7.26 and 6.97g/100ml juice. This result agreed with results [20] There is a high level of vitamin deficiency C during ohmic heating when a high voltage difference is used high degree The heat from the ohmic heating process.

Table.4 impact Ohmic heating at a voltage gradient (9.2, 12.64, and 25.28 V/cm) and

conventional heating (95 C° for 15 sec) in a vitamin concentration C (g/100ml juice).

Transactions	Storage (day)			Average duration storage
	0	7	14	
Fresh juice	10.23 a	6.86 cd	5.19 g	7.42 a
9.2 (V/cm)	8.27b	7.14 cd	7.05 cd	7.49 a
12.64 (V/cm)	7.26 c	7.09 cd	6.67 d	7.01b
25.28 (V/cm)	6.97 cd	6.00 e	5.34 ef	6.10 d
conventional heating (95 C° for 15 sec)	6.64 d	5.75 ef	5.13 g	5.84 d

• Averages that share letters the alphabet Similar, there are no significant differences between them according to the Duncan test at the level of probability 5%.

It is believed that there are electrochemical interactions between the nutrient solution and the electrodes used in ohmic heating, which may affect the compounds of the food, including vitamins [21] Through averages of vitamin concentration values C for the heating time, it is noted that the least significant decrease ($p \leq 0.05$) in vitamin concentration C was at the ohmic treatment in the voltage gradient (9.2 v/cm) compared to other ohmic treatments(12.64 and 25.28 V/cm)and traditional heating, It was 7.49%.,7.01%,6.10% and 5.84%g/100ml juice an orange once sportively. A decrease in the vitamin concentration is observe B Heed C morally ($p \leq 0.05$) The end of the storage period (14 days) for fresh orange juice treated with conventional heating (95 C° for 15 sec) and ohmic heating (9.2, 12.64, and 25.28 V/cm), and it was 5.19%, 5.13%,7.05%,6.67% and 5.34%. notice Ayoub et al (2017) that There is a change in the vitamin content C of orange and pomegranate juice treated with aluminum heating after a period of storage in the refrigerator for 21 days, where the concentration of vitamin C in orange and pomegranate juice decreased from 53 mg/100 g to 43 mg/100 g and from 10 mg/100 g to 6 mg/100 g, respectively. These researchers indicated that there was a gradual decrease when the storage period progressed, and pomegranate juice had the largest share in the deterioration of vitamin C. And in another study, Vitamin content was not C after aluminous heating was significantly different from fresh citrus juices, while conventional heating resulted in a degradation of vitamin C by 13.58%, due to a faster, more uniform heating rate and higher retention of vitamin C content compared to conventional heating [22].

5-Sensory evaluation of fresh orange juice and labs by ohmic heating

Sensory tests were carried out for orange juice treated with ohmic heating and conventional heating and compared with fresh juice .Sensory tests were used in a number of sensory characteristics to indicate the percentage of acceptability or non-acceptance of the juice treated with the above-mentioned treatments Color, taste, texture, and general acceptance were among the ten assessors elected to evaluate orange juice samples She gave evaluation scores from 1 to 8, where the number 1 represented the unacceptability of the orange juice samples, and ending with the number 8, which represented the degree of acceptability, excellence (Table 5).

Table.5 The effect of ohmic heating at a voltage gradient (9.2,12.64 and 25.28 V/cm) and conventional heating (95 C° for 15 sec) in adjective sensory evaluation.

transaction	evaluation adjective	Sensory Rating Score %																							
		unacceptable			very lousy			lousy			Acceptable			Middle			good			very good			Excellent		
		0d	7d	14d	0d	7d	14d	0d	7d	14d	0d	7d	14d	0d	7d	14d	0d	7d	14d	0d	7d	14d	0d	7d	14d
without treatment	The color	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	10	15	20	80	70	60	0	10	20
	Taste	0	0	0	0	0	0	0	0	0	0	15	30	10	40	70	10	5	0	80	40	0	0	0	0
	Texture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	0	60	70	80	20	20	20
	General admission	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	40	70	90	60	30	0	0	0
	average	0	0	0	0	0	0	0	0	0	0	3.75	7.5	5	11.25	17.5	12.5	17.5	22.5	77.5	60	42.5	5	7.5	10
conventional pasteurization	The color	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	90	85	80	0	10	20
	Taste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	50	80	80	50	20	0	0	0
	Texture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	20	0	30	45	60	30	35	40
	General admission	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	30	100	85	70	0	0	0
	average	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.5	22.5	27.5	75	66.25	57.5	7.5	11.25	15
9.20V/cm	The color	0	0	0	0	0	0	0	0	0	0	0	0	30	15	0	40	20	0	20	45	70	10	20	30
	Taste	0	0	0	0	0	0	0	0	0	0	25	50	20	35	50	70	35	0	10	5	0	0	0	0
	Texture	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	20	10	0	70	65	60	0	20	40
	General admission	0	0	0	0	0	0	0	0	0	0	0	0	20	10	0	80	70	60	0	20	40	0	0	0
	average	0	0	0	0	0	0	0	0	0	0	6.25	12.5	22.5	16.25	12.5	52.5	33.75	15	25	33.75	42.5	2.5	10	17.5
12.64V/cm	The color	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	60	40	20	40	60
	Taste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	95	90	0	5	10
	Texture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	50	40	40	50	60
	General admission	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	75	100	50	25	0
	average	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72.5	70	67.5	27.5	30	32.5
25.64 V/cm	The color	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	70	60	50	20	35	50
	Taste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	35	20	50	65	80	0	0	0
	Texture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	60	50	40	30	45	60
	General admission	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	30	10	50	70	90	0	0	0
	average	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	18.75	7.5	57.5	61.25	65	12.5	20	27.5

The table shows (5Sensory evaluation scores for the characteristics of the juice (color, taste, texture, etc.). the general acceptance) to Samples of orange juice treated with conventional heating (95 C° for 15 sec) Ohmic heating coefficient gradually effort (9.2, 12.64 and 25.28 v/cm) compared to fresh juice at storage periods (0, 7 and 14 days). Sensory results shown,The evaluation score for fresh juice was at an average of 77%, for the evaluation score is good Very much, while the samples treated with conventional heating and ohmic heating (9.2,12.64 and 25.28 V/cm) are the highest ratings immediately after treatment very very(75%) and good (52.28) and good Very (72.5%) and good very (57.5), respectively.

It was found that the sensory evaluation score (excellent) was calculated in descending order with the rates of juice Heating factor ohmic gradually voltages (12.64 v/cm) and heat treatment Ohmic with a voltage gradient (25.28 V/cm) and the coefficient of conventional pasteurization (95 C° for 15 sec) and for fresh juice (without the treatment) Finally for juice samples Heating factor Ohmic with voltage gradient (9.2 V/cm), and it was 27.5%, 12.5%, 7.5%, 5% and 2.5%, respectively. It is noted that the juice treated with ohmic heating at a voltage gradient of 12.64 V/cm, whereHe obtained a percentage of the evaluation score (excellent) compared to the rest of the studied samples.

Freshly squeezed and heat treated orange juice samples were obtained traditional heating Ohmic when graduated an effort (9.2, 12.64 and 25.28 V/cm) after a 14-day storage period. On higher rate to Rating average score sensual so good, and she was 42.5%, 57.5%, 42.5%, 67.5%And65% respectively.

notes that The degree of very good with which the juice samples treated with ohmic heating with a voltage gradient of 12.64 volts / cm was recorded is the highest compared to the rest of the averages at this degree. Furthermore, it These samples had the highest scores the Evaluation (excellent) compared to other samples. Mentioning the comparison between the different samples treated by different methods of fresh orange juice samples stored for a period of (14 days) to obtain an average score (excellent) in the sensory evaluation in a descending manner, which is the samples treated with ohmic heating (12.64).,25.28 and 9.2 v/cm) and conventional heating and juice fresh, and it was 32.5%,27.5%,17.5%,15% and 10%. We can conclude by reviewing the table (5) that samples Processed juice ohmic heating 12.64 V/cm and after Duration Storage 14day, it maintained the highest evaluation of the studied sensory traits rate compared with other orange juice samples. pointed out [23] Pan ohmic and traditional heating methods lead to little difference in organoleptic qualities and vitamin contents C for orange and pineapple juices.

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Kirkuk University Journal for Agricultural Sciences, Vol. 14, No. 4, 2023 (43 - 54)

تصميم وتصنيع جهاز لبسترة عصير البرتقال وآثاره على الصفات النوعية لعصير البرتقال الطازج

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•تاريخ استلام البحث 01/08/2023 وتاريخ قبوله 24/10/2023

المستخلص

أجري مشروع البحث على جهاز التسخين الاومي على دفعات Batch Ohmic Heater الذي تم تصميمه وتصنيعه في مختبرات قسم علوم الأغذية / كلية الزراعة والغابات / جامعة الموصل، لاستخدامه في دراسة تاثير المعاملات الحرارية في الصفات النوعية لعصير البرتقال. اشتملت الدراسة على تأثير التسخين الاومي بفرق الجهد 80 ، 110 و 220 فولت على الصفات الكيميائية والفيزيائية والحسية ومقارنتها مع عينات عصير البرتقال المعاملة بطريقة التسخين التقليدية (95 مْ/ 15 ثانية). حافظ التسخين الاومي بتدرجات الجهد المستعملة 9.2 ، 12.64 و 25.28 فولت/سم بشكل معنوي $p\leq0.05$ على نسبة الفينولات الكلية لعينات عصير البرتقال مقارنة مع العينات المعاملة بالتسخين التقليدي بعد المعاملة مباشرة، وقد تفوق معنويا ($p\leq0.05$) استخدام فرق الجهد 12.64 فولت/سم في متوسط نسبة المواد الصلبة الذائبة الكلية لمعدل مدة الخزن بالثلاجة (14 يوم) مقارنة مع عصير البرتقال الطازج والتسخين التقليدي. استخدام فرق الجهد 12.64 فولت/سم لعينات عصير البرتقال إذ حصل انخفاض معنوي ($p\leq0.05$) في قيم الأس الهيدروجيني pH مقارنة مع تدرجات الجهد الأخرى المستخدمة. حصلت اعلى زيادة معنوية ($p\leq0.05$) في تركيز فيتامين C لعينات عصير البرتقال المعامل بالتسخين الاومي عند فرق الجهد 9.2 فولت / سم بالمقارنة مع المعاملات الاخرى من فرق الجهد. في دراسة التقييم الحسي لعصير البرتقال المعامل بالتسخين الاومي عند فرق الجهد 12.64 فولت/سم إذ حصل على اعلى درجة للتقييم الحسي بدرجتي ممتاز وجيد جدا ضمن درجات التقييم المستعملة لذلك 1- غير مقبول- 8 ممتاز من قبل المحكمين مقارنة مع بقية عينات عصير البرتقال.

الكلمات المفتاحية: التسخين الاومي؛ البسترة؛ فيتامين C؛ الفينولات؛ الاس الهيدروجيني.