

A Research On The Possibility Of Using Watermelon In The Fruit Juice Industry(1)

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ABSTRACT

In this research an investigation on the possibility of using watermelon in the fruit juice industry was carried out. For this purpose watermelons of «Halep karası» variety widely grown in the Çukurova Region were used.

To obtain the juice samples the red fleshy portion of watermelons was passed through the pulper. After preheating the juice at 95°C for 10 sec. necessary adjustments were made to obtain the predetermined sugar acid ratio of 11 to 0.8 %. The bottled juice samples were heated in hot water at 70°, 80°, 90° and 100°C for 5 to 20 minutes. One half of the pasteurized samples were stored at room temperature whereas the second half were stored at +5°C. All samples of various heat treatments were evaluated by sensory tests once a month during the 3 month - storage and by chemical analyses.

The results obtained were as follows :

- The natural sugar - acid ratio was found to be weak. However, among a widely adjusted range of sugar - acid ratios, the 11 to 0.8 by percentage was determined to be best by sensory evaluations for fresh watermelon juice.
- Pasteurization of the juice was found to affect the taste and color varyingly depending on the temperature applied.
- The control which was unheated and kept at -20°C possessed the natural characteristics of the watermelon juice throughout the 3 month - storage and was easily differentiated among o group of samples at each taste panel.

ÖZET

Karpuzun Meyve Suyu Sanayinde Kullanım Olanakları Üzerinde Bir Araştırma

Karpuzun meyve suyu sanayinde kullanım olanaklarını konu alan bu çalışmada karpuz suyu ön ısıtmadan sonra tat dengesi ayarlanmış

ve şişelenerek 70 - 100°C'ler arasında pastörize edilmiştir. Oda şartlarında ve +5°C'de 3 ay saklanan örneklerde ayda bir gerekli analiz ve ölçümler yapılmıştır.

Karpuz sularında en çok tercih edilen şeker - asit oranı 11/0.8 (%) olarak belirlenmiş, 70°C'de 5 ve 10 dk.'lık ısıtma işlemi uygulamasının yeterli olmadığı ve tüm pastörize karpuz sularının tat ve aromasında zayıflama olduğu görülmüştür. Saklama sıcaklığına bağlı olarak pastörize karpuz sularının duyu özelliklerinin değişmediği ve derin dondurucuda (-20°C) saklanan taze karpuz suyu örneklerinin, renk ve tat özellikleri bakımından herhangi bir değişim göstermediği belirlenmiştir.

1. Introduction

Watermelon (*Citrullus Lanatus*) as a refreshing and popular fruit has been known for centuries. It is known to be originated in Africa and carried to America and Europe in time. Ware and Mc Collum, (1980).

Turkey, in terms of annual production, has an important place among the watermelon producing countries. (Abak and Pakyürek, 1988). Presently all watermelons produced are consumed as fresh but yet no attempts have been made in consuming watermelon in the fruit juice industry.

Watermelon juice has moderate vitamin C and provitamin A contents whereas it is fairly rich in potassium content. (Gussina and Trostinskaya, 1974; Scatkett, 1975). Because of high potassium content watermelon juice is considered to have valuable diuretic properties (Huor et al., 1980-a). It is reported that Texas and Colorado States of the USA have established «watermelon banks» for people suffering from kidney ailments.

Watermelon juice has been processed in the past. A weak organic acid was added to lower the pH of the juice to 4.0 before bottling

(1) Yüksek Lisans Tezi - MSc Thesis

and thermal temperatures ranging from 87 to 100°C. The final products containing pulp solids ranging from 0.06 to 10.2 % exhibited stable suspensions, and good natural color, flavor and aroma (Huor et al., 1980 b). More recently Russian investigators recommended the use of fruit products having high natural acidity such as plum puree or apple paste to increase the sourness of watermelon juice (Huor et al., 1980 b).

In a research study Huor et al. (1980 cv) consumed watermelon juice concentrate to improve the color and flavor qualities of white grapefruit juice.

The purpose of this study is to investigate the possibility of preserving watermelon juice by pasteurization. The best combinations of heating temperature and time will be determined to preserve the fresh characteristics of the juice.

2. Material and Methods

Material

Watermelons of «Halepkarasi» variety widely grown in the Çukurova Region were used as the material. Fruits were obtained from the local wholesale market of Adana.

Method

The juice was obtained by following the processes shown in Figure 1. For this purpose, watermelons were first washed to clean the surface and dried. Clean watermelons were cut into 6 to 8 slices and fleshy portions were removed which were then passed through a pulper having holes 0.9 mm in diameter to obtain the juice. The juice was preheated at 95° for 10 sec. by passing it through an Alfa-Laval Centrifugal Evaporator.

In order to characterize the watermelon juice soluble solids, pH, total acidity, L-ascorbic acid, total solids and ash contents were determined. To improve the taste, sugar and citric acid were added to adjust the sugar-acid ratio to 11 to 0.8 %. The juice were filled into 300 ml capacity transparent glass bottles. After closing the bottles with suitable caps sufficient number of bottled samples were held in waterbaths having temperatures of 70°, 80°, 90° and 100°C for periods ranging from 5 to 20 min.

After cooling the pasteurized juice samples sufficient number of samples were stored at room temperature and at +5°C. All samples were analyzed by sensory evaluation for color, taste, flavor and general acceptability every month. Chemical analyses were run on pH, total acidity, L-ascorbic acid and potassium contents. At each evaluation unheated watermelon juice kept at -20°C was used as control after adjusting the sugar-acid ratio to 11 to 0.8 %. The results were statistically analyzed.

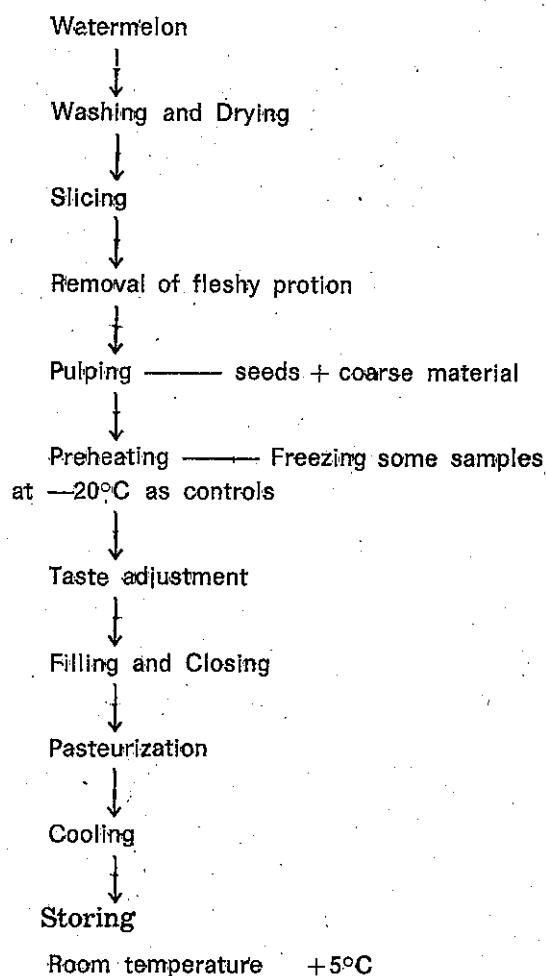


Figure 1. Processing steps of watermelons into juice

3. Results and Discussion

Chemical Evaluation

The watermelon juice yield was found to be 50 %. The average soluble solids, total solids, pH, total acidity (as citric), ash, L-ascorbic acid and potassium contents of unheated

and pasteurized juices prior to storage were shown in Table 1.

Soluble solids content of fresh watermelon juice was found to be 8.5 %. Since the total acid content was very low (0.05 %) and the pH value was high (5.2) for pasteurization the adjustment of sugar - acid ratio was necessary to improve the taste and to preserve the juice by pasteurization. Because of these samples

having adjusted sugar - acid ratio of 11 to 0.8 % maintained these values during the entire storage period without any significant change. Heat treatments at various temperatures for varying time periods had a lowering effect on ascorbic acid content from 6.4 mg to 3.2 mg per 100 ml. Potassium content was not affected from pasteurization treatments and remained constant (120 mg for 100 ml).

Table 1. Composition of unheated and pasteurized watermelon juice sample.

	Unheated Sample	Pasteurized Samples			
		70°C	80°C	90°C	100°C
Soluble solids (%)	8.5	11	11	11	11
Total solids (%)	8.7	—	—	—	—
pH	5.2	3.2	3.2	3.2	3.2
Total acidity (g/100 ml)	0.05	0.8	0.8	0.8	0.8
Ash (%)	0.35	—	—	—	—
L - ascorbic acid (mg/100 ml)	6.4	3.2	3.2	3.2	3.2
Potassium (mg/100 ml)	120	120	120	120	120

Sensory Evaluation

All watermelon juice samples were subjectively evaluated for color, flavor, taste and general acceptability on a 100 point basis for

each variable. The average results obtained the entire storage period for unheated (control) and pasteurized watermelon juice samples were shown in Table 2.

Table 2. Average results of sensory evaluations of pasteurized and unheated watermelon juice samples (on a total 40 point basis)

Pasteurization Time (min)	Past. Temp (°C)								Control
	70		80		90		100		
	Room	+5	Room	+5	Room	+5	Room	+5	
5	—	—	20.2	21.8	17.4	17.3	20.6	20.7	34.3
10	—	—	19.4	21.8	18.0	18.7	20.2	20.9	34.3
15	19.7	20.5	20.4	20.0	18.3	18.6	—	—	33.0
20	19.9	22.1	—	—	—	—	—	—	33.1
X	19.8	21.3	20.0	21.2	17.9	18.2	20.4	20.8	33.7

The effect of storage time on the average sensory characteristics of unheated and pas-

teurized watermelon juice samples heated for 5 to 20 min. were given in Table 3.

Table 3. Effect of storage time on sensory characteristics of watermelon juice samples pasteurized for periods ranging from 5 to 20 min. (on a total 40 point basis)

Storage Time (Month)	Pasteurization Time (min.)					Control
	5	10	15	20	X	
1	20.6	21.0	19.9	19.9	20.4	33.4
2	18.2	18.8	21.3	21.3	24.5	32.5
3	20.2	19.8	21.9	21.9	21.0	35.0

As shown in Table 2 the average score of subjective evaluations of pasteurized watermelon juice samples, regardless of storage temperature, were considerably lower than the average score of the unheated (control) watermelon juice. The general average sensory scores of pasteurized watermelon juice samples were found to range from a value of 17.9 to 21.3 whereas the control samples gained an average score of 33.7 during the same taste panel trials. In all evaluations the unheated (control) watermelon juice was easily differentiated from the pasteurized juice samples by its bright red color and taste and flavor resembling to the fresh taste and flavor. Ho-

wever heat treated watermelon juice samples were not found to be statistically different from each other. Among a wide range of heating parameters pasteurization at 80°C for up to 10 min. was found to be sufficient to preserve watermelon juice. Storing at +5°C was found to be more satisfactory than room temperature.

Results in Table 3 showed that storing pasteurized watermelon juice, either at room temperature or at cold storage for up to 3 months did not cause any significant change in sensory properties of pasteurized watermelon juice.

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