

## **Effect of various levels of pasteurization, preservative and their combination on organoleptic evaluation of pomegranate juice stored at room temperature**

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### **ABSTRACT**

An experiment was conducted to study the effect of various levels of pasteurization, preservative and their combination on organoleptic evaluation of pomegranate juice during storage. The organoleptic evaluation for colour, flavour, taste and overall acceptability was carried out at 60 days of storage. It was observed that among the various levels of pasteurization maximum organoleptic score for colour, flavour, taste and overall acceptability was obtained with T<sub>2</sub>-70°C pasteurization, while among the various levels of preservative maximum organoleptic score was obtained with P<sub>2</sub>-sodium benzoate at 500 ppm and among the interaction effect maximum score was observed with T<sub>2</sub>P<sub>2</sub> – 70°C pasteurization + sodium benzoate at 500 ppm.

**Key words :** Pasteurization, Preservation, Organoleptic evaluation, Pomegranate juice.

**T**he fruits of pomegranate are mainly used for dessert and juice purpose. Pomegranate fruits are processed into various products like juice, syrup, beverage, confectionery and anardana. The seeds along with aril is crushed and juice is extracted and marketed as a fresh juice due to its excellent flavour, attractive fragrance, delicious taste and high nutritive and medicinal value. Production of juice from juicy arils of pomegranate proved to be one of the important method of value addition.

Preservation of fruit juice by heat is the most popular method. The method consists essentially heating juice to 100°C or slightly below for a sufficient time to kill microorganisms. Pasteurized juice and squashes have a cooked flavour. After the container is opened they ferment and spoil within a short period while juice preserved with chemical *i.e.* sodium benzoate can be kept for a fairly long time even after opening of the seal of the containers and there are large variation in sensory quality in each preservation method which ultimately causes a great set back to a pomegranate industry.

Therefore, it was felt necessary to study the effect of various levels of pasteurization, preservative and their combination on organoleptic evaluation of pomegranate juice during storage.

### **MATERIALS AND METHODS**

The hand picked, firm and healthy fruits of uniform size and maturity, free from pests and diseases injuries, bruises and blemishes were obtained from instructional cum Research Orchard of the Department of Horticulture, Allahabad Agricultural Institute-Deemed University,

Allahabad. The fresh fruits obtained from the garden were subjected to physico-chemical analysis as per the procedure. These fruits were employed for the juice extraction.

The experiment was laid out in 4 x 4 factorial design with three replications in P.G. Research laboratory, Department of Horticulture, Allahabad Agricultural Institute Deemed-University, Allahabad during the year 2006-2007 to study the effect of various levels of pasteurization, preservation and their combination on organoleptic evaluation of pomegranate juice during storage at room temperature. There were sixteen treatments and comprising of two factors with each of four levels one is pasteurization *viz.* T<sub>0</sub>- without pasteurization, T<sub>1</sub>-60°C pasteurization, T<sub>2</sub>-70°C pasteurization, T<sub>3</sub>-80°C pasteurization and another is preservative *viz.* P<sub>0</sub>-Sodium benzoate at 0 ppm, P<sub>1</sub>-Sodium benzoate at 400 ppm, P<sub>2</sub>-Sodium benzoate at 500 ppm and P<sub>3</sub>-Sodium benzoate at 600 ppm. The treated juice was kept for 60 days of storage and juice was used as such for organoleptic evaluation. The colour, flavour, taste and overall acceptability were recorded by the panel of minimum 7 judges using a 9 points Hedonic Scale (Amerine *et al.*, 1965) as : 9. Like extremely, 8. Like very much, 7. Like moderately, 6. Like slightly, 5. Neither like nor dislike, 4 Dislike lightly, 3. Dislike moderately, 2. Dislike very much, 1. Dislike extremely. The overall rating was calculated by averaging the score. Samples obtaining a score of 5.5 and above were considered as acceptable.

The data recorded during the course of the investigation were subjected to statistical analysis as per

the method of analysis of variance technique, the significant differences between the treatment means were tested at 5 per cent level of probability.

## RESULTS AND DISCUSSION

### *Effect on colour:*

The data on effect of pasteurization temperature, preservative concentration and their interaction on organoleptic score for colour of pomegranate juice stored at room temperature found statistically significant at 30 and 60 days of storage except 0 days of storage and initial score for colour was 7.50.

After 60 days of storage as showed in Table 1, the data indicated that among the various levels of pasteurization the maximum score was observed with T<sub>2</sub>-70°C pasteurization and minimum score was observed with T<sub>0</sub>-without pasteurization. In various levels of preservative the maximum score was observed with P<sub>2</sub>-sodium benzoate at 500 ppm. while juice with out preservative *i.e.* P<sub>0</sub>- Sodium benzoate at 0 ppm get spoiled at 60 days of storage. Among the interaction effect the maximum score was observed with T<sub>2</sub>P<sub>2</sub> - 70°C

pasteurization + sodium benzoate at 500 ppm followed by in T<sub>3</sub>P<sub>2</sub>- 80°C pasteurization + sodium benzoate at 500 ppm and minimum score was observed in T<sub>0</sub>P<sub>1</sub> - without pasteurization + sodium benzoate at 400 ppm.

Organoleptic score for colour of pomegranate juice showed decreasing trend in all the treatment and their combination during storage. The pink colour of pomegranate juice is attributed to anthocyanins. The anthocyanins in pomegranate juice were destroyed progressively during storage. The accelerated rate of decomposition of anthocyanins at room temperature might be due to the hydrolysis of the protective 3-glycosidic linkage to give unstable anthocyanidins. Similar results were also reported in phalsa beverage during storage by Waskar and Khurdiya (1987).

### *Effect on flavour:*

The data on organoleptic score for flavour of pomegranate juice showed a decreasing trend in all the treatment. The initial score for flavour was 8.20 while after 60 days of storage as shown in Table 2 among the various levels of pasteurization, significantly the maximum

**Table 1 : Effect of pasteurization, preservative and their interaction on score for colour of pomegranate juice at 60 days of storage (Room temperature)**

Levels of pasteurization (T) (°C)	60 DAYS				Mean (T)
	Levels of preservative (P) (Sodium Benzoate)				
	P <sub>0</sub> (0 ppm)	P <sub>1</sub> (400 ppm)	P <sub>2</sub> (500 ppm)	P <sub>3</sub> (600 ppm)	
T <sub>0</sub> (-)	0.00	5.76	6.26	6.04	6.02
T <sub>1</sub> (60°C)	0.00	5.83	6.32	6.10	6.08
T <sub>2</sub> (70°C)	0.00	5.97	6.40	6.21	6.19
T <sub>3</sub> (80°C)	0.00	5.90	6.39	6.16	6.15
Mean (P)	0.00	5.87	6.34	6.13	
		F-test	S.E. ±	C.D. (P=0.05)	
Pasteurization (T)		S	0.02	0.04	
Preservative (P)		S	0.02	0.04	
Interaction (T x P)		S	0.04	0.08	

**Table 2 : Effect of pasteurization, preservative and their interaction on score for flavour of pomegranate juice at 60 days of storage (Room temperature)**

Levels of pasteurization (T) (°C)	60 DAYS				Mean (T)
	Levels of preservative (P) (Sodium Benzoate)				
	P <sub>0</sub> (0 ppm)	P <sub>1</sub> (400 ppm)	P <sub>2</sub> (500 ppm)	P <sub>3</sub> (600 ppm)	
T <sub>0</sub> (-)	0.00	6.34	6.74	6.55	6.54
T <sub>1</sub> (60°C)	0.00	6.41	6.80	6.60	6.60
T <sub>2</sub> (70°C)	0.00	6.51	7.00	6.70	6.74
T <sub>3</sub> (80°C)	0.00	6.47	6.89	6.64	6.67
Mean (P)	0.00	6.43	6.86	6.62	
		F-test	S. E. ±	C.D. (P=0.05)	
Pasteurization (T)		S	0.02	0.05	
Preservative (P)		S	0.02	0.05	
Interaction (T x P)		S	0.04	0.09	

score was observed with  $T_2$  - 70°C pasteurization and minimum score was observed with  $T_0$ -without pasteurization. In the various levels of preservative the maximum score was observed with  $P_2$ - sodium benzoate at 500 ppm and minimum score was observed with  $P_1$ -sodium benzoate at 400 ppm. Among the interaction effect the maximum score was observed in  $T_2P_2$  - 70°C pasteurization + sodium benzoate at 500 ppm followed by  $T_3P_2$ -80°C pasteurization + sodium benzoate at 500 ppm and minimum score was observed in  $T_0P_1$ -without pasteurization + sodium benzoate at 400 ppm.

Flavour of pomegranate juice were destroyed progressively during storage. Similar results were also reported in pomegranate juice during storage by Deshmukh (1991) and Khurdiya and Anand (1991) in phalsa juice.

#### Effect on taste:

Regarding organoleptic score for taste the initial score was 7.90 while after 60 days of storage as indicated in Table 3 among the various levels of pasteurization the maximum score was observed with  $T_2$ -70°C

pasteurization and minimum score was observed with  $T_0$ -without pasteurization. In various levels of preservative the maximum score was observed with  $P_2$ -sodium benzoate at 500 ppm and minimum score was observed with  $P_1$ -sodium benzoate at 400 ppm. Among the interaction effect maximum score was observed in  $T_2P_2$ -70°C pasteurization + sodium benzoate at 500 ppm followed by in  $T_3P_2$ -80°C pasteurization + sodium benzoate at 500 ppm and minimum score was observed in  $T_0P_1$  - without pasteurization + sodium benzoate at 400 ppm.

Organoleptic score for taste also showed a decreasing trend in all treatment and their combination during storage, taste of pomegranate juice deteriorated during storage. Similar results were also reported by Deshmukh (1991).

#### Effect on overall acceptability:

The initial score for overall acceptability was 7.87 while after 60 days of storage as shown in Table 4 indicated that among the various levels of pasteurization, maximum score was observed with  $T_2$ -70°C pasteurization and minimum score was observed with  $T_0$ -

**Table 3 : Effect of pasteurization, preservative and their interaction on score for taste of pomegranate juice at 60 days of storage (Room temperature)**

Levels of pasteurization (T) (°C)	60 DAYS				Mean (T)
	Levels of preservative (P) (Sodium Benzoate)				
	$P_0$ (0 ppm)	$P_1$ (400 ppm)	$P_2$ (500 ppm)	$P_3$ (600 ppm)	
$T_0$ (-)	0.00	6.20	6.72	6.49	6.47
$T_1$ (60°C)	0.00	6.28	6.80	6.54	6.54
$T_2$ (70°C)	0.00	6.41	6.94	6.68	6.68
$T_3$ (80°C)	0.00	6.35	6.88	6.60	6.61
Mean (P)	0.00	6.31	6.84	6.58	
		F-test	S.E. $\pm$	C.D. (P=0.05)	
Pasteurization (T)		S	0.02	0.04	
Preservative (P)		S	0.02	0.04	
Interaction (T x P)		S	0.04	0.09	

**Table 4 : Effect of pasteurization, preservative and their interaction on score for overall acceptability of pomegranate juice at 60 days of storage (Room temperature)**

Levels of pasteurization (T) (°C)	60 DAYS				Mean (T)
	Levels of preservative (P) (Sodium Benzoate)				
	$P_0$ (0 ppm)	$P_1$ (400 ppm)	$P_2$ (500 ppm)	$P_3$ (600 ppm)	
$T_0$ (-)	0.00	6.10	6.57	6.36	6.34
$T_1$ (60°C)	0.00	6.17	6.64	6.41	6.41
$T_2$ (70°C)	0.00	6.30	6.78	6.53	6.54
$T_3$ (80°C)	0.00	6.24	6.72	6.47	6.48
Mean (P)	0.00	6.20	6.68	6.44	
		F-test	S.E. $\pm$	C.D. (P=0.05)	
Pasteurization (T)		S	0.01	0.02	
Preservative (P)		S	0.01	0.02	
Interaction (T x P)		S	0.02	0.05	

without pasteurization. Among the various levels of preservative the maximum score was observed with P<sub>2</sub>-sodium benzoate at 500 ppm and minimum score was observed with P<sub>1</sub>-sodium benzoate at 400 ppm and among the interaction effect the maximum score was observed with T<sub>2</sub>P<sub>2</sub>- 70°C pasteurization + sodium benzoate at 500 ppm followed by in T<sub>3</sub>P<sub>2</sub>-80°C pasteurization + sodium benzoate at 500 ppm and minimum score was observed in T<sub>0</sub>P<sub>1</sub>-without pasteurization + sodium benzoate at 400 ppm.

Organoleptic score for overall acceptability of pomegranate juice showed a decreasing trend in all the pasteurization temperatures, preservative concentrations and their interaction during storage. The loss of colour in the juice was the main cause of their quality deterioration thus based on the overall organoleptic evaluation score, colour pigment and other pigment stability, the chemically preserved pomegranate juice packed in colourless glass bottles was found to be acceptable only upto 60 days at room temperature. Similar results were also reported in pomegranate juice during storage by Deshmukh (1991).

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