



STUDIES ON EFFECT OF DIFFERENT EXTRACTION METHODS ON THE QUALITY OF
POMEGRANATE JUICE AND PREPARATION OF SPICED POMEGRANATE JUICE

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ABSTRACT

The present investigation was carried out to standardize the method of extraction of juice and to study the effect of extraction method on yield and quality of pomegranate juice. Also the efforts were also made to standardize the recipe for preparation of spiced pomegranate juice by using selected processing techniques and explore the prepared product for commercial use. Further efforts were made to evaluate the chemical quality of prepared pomegranate juice enriched with spices for their nutritional and organoleptic quality. The juice was also analysed for shelf life study on both i.e. at room as well as refrigeration temperature and techno-economic feasibility of spiced pomegranate juice was also assessed.

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INTRODUCTION

Pomegranate is an important crop for dry land areas in India. The two varieties i.e. Ganesh and Arakta were used for the present study. Kandhari/ Arakta which is large sized with deep red rind, arils dark blood red, hard seeds and slightly bitter juice. And Ganesh variety with Medium sized; soft seeds; pinkish flesh and juice with agreeable taste. Generally these fruits are used for table purpose; however they are also processed into varieties of products like juice, squash, syrup, wine, anar-rub and anardana (La Rae, 1969). The special structure of fruit is one of main factors which limit its industrial processing. The fruits can be preserved and processed into different products like juice, squash, syrup, jelly, wine, anardana and canned beverages. The juice from fresh pomegranate fruit is an excellent cooling beverage for alleviating thirst in cases of fever and sickness. It acts on liver, heart and kidneys and tones up their functions. It supplies the required minerals and helps the liver to preserve the vitamin from the food. It also increases the body resistance against infections. The juice is an excellent cooling beverage for alleviating thirst in cases of fevers and sickness. It also increases the body resistance against infections (Seeram *et al.*, 2008). The juice particularly tannin fraction, reduces lipid peroxidation, cellular cholesterol, accumulation and development of atherosclerosis (Esmailzadeh *et al.*, 2004). Commercialization of process technology and pomegranates products in market is very important to improve economy. Knowing the importance of health benefits of pomegranate and all related aspects, the present investigation entitled "Studies on effect of different extraction methods on the quality of pomegranate juice and preparation of spiced pomegranate juice" was carried out to standardize the recipe for preparation of spiced pomegranate juice by using selected processing techniques and explore the prepared product for commercial use. Further efforts were made to evaluate the chemical quality of prepared pomegranate juice enriched with spices for their nutritional and organoleptic quality. Techno-economic feasibility of spiced pomegranate juice was also assessed.

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MATERIALS AND METHODS

Pomegranate fruits of cultivars Ganesh and Arakta were selected from local market. The fruits of uniform size, colour and maturity were selected by visual observation and used as experimental material. Spices like cardamom, clove, fennel and other material required for preparation of spiced pomegranate juice were procured from local market.

- Proximate Analysis of spiced pomegranate juice: Prepared pomegranate juice and spiced pomegranate juice were analyzed for its chemical quality by standard methods (AOAC, 1990).
- Sensorial Analysis: Sensory analysis of prepared products was performed by using standard method (Amerine *et al.*, 1987).
- Statistical analysis: The analysis of variance of the data obtained was done by using Completely Randomized Design (CRD) for different treatments as per the methods given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of $P < 0.05$ level, S.E. and C.D. at 5 % level is mentioned wherever required.

Extraction of juice

Hand Press Method (M₁): Pomegranate juice arils were separated manually from fruit. The juice was extracted by crushing the arils followed by pressing through two to three layers of muslin cloth

Domestic Mixer Method (M₂): Pomegranate juice arils were separated manually from fruit. The separated arils were crushed in domestic mixer. The juice obtained is strained by using muslin cloth.

Clarification of juice

The filtered pomegranate juice was used for clarification using commercially available fining agent gelatin and bentonite. Firstly

juice was filtered through muslin cloth. To this juice bentonite at 0.5% of juice was added and juice was held for 4 hrs. Then the treated juice was filtered through muslin cloth. This juice was pasteurized at 82°C for 15 min. to get clarified juice.

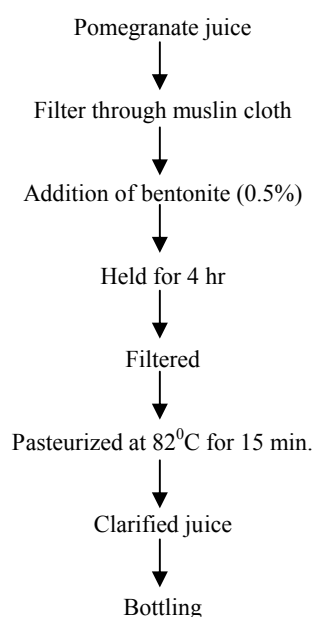


Figure 1. Clarification of Pomegranate Juice

Clarification of juice

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Storage Studies of Pomegranate Juice and spiced Pomegranate juice

Pomegranate spiced juice was analyzed for various attributes on every 15th, 30th, 45th, 60th day and shelf life studies were carried out for a period of 2 months. The pomegranate juice samples were stored at ambient temperature (27-28°C) and at refrigerated temperature (4-5°C).

Assessment of Energy Value of value added products

Theoretical energy value of the spiced juice was calculated on the basis of proximate chemical composition.

Assessment of Techno-Economical Feasibility

The production cost of spiced juice prepared from pomegranate was calculated by considering the cost of raw material, processing and packaging cost.

RESULTS AND DISCUSSION

It is observed from Table 1 that on the basis of whole fruit, percent juice yield by hand press method (M1) and domestic mixer method (M2) in Ganesh cultivar was 50.25 and 55.50 percent while in Arakta cultivar 50.20 and 55.00 percent respectively. It was noted that higher juice yield was obtained for both cultivars using mixer due to crushing of whole seeds. The juice obtained by using mixer had higher turbidity and increases the load of clarification of juice. Comeroglu *et al.* (1992) showed that juice yield of pomegranate was 50 percent of its whole fruit and 60 percent of arils.

Table 1. Effect of extraction method on yield of pomegranate juice

Variety	Juice Yield (%)	
	On basis of whole fruit	On basis of weight of arils
Ganesh M1	50.25	65.80
Arakta M1	50.20	66.50
Ganesh M2	55.50	70.50
Arakta M2	55.00	72.00
S.E.	0.335	0.422
C.D.	1.093	1.375

M1: Hand Press Method1 M2: domestic Mixer Method2

Effect of different extraction methods on chemical parameters of Pomegranate juice

The TSS, acidity, pH, total sugar, reducing sugar and non-reducing sugar in juice extracted by method M1 for Ganesh cultivar were 15⁰Bx, 0.3 percent, 3.2, 13.00 percent, 12.30 percent and 1.7 percent. Whereas juice extracted by method M2 showed values were 15.50⁰Bx, 0.32 percent, 3.1, 13.50 percent, 12.00 percent and 1.5 percent respectively. It was observed that there was slight increase in TSS in method M2 due to crushing of seeds. In case of Arakta cultivar there is slight change in values of chemical parameters like Ganesh variety. Miguel *et al.* (2004) reported that there is no significant difference in content of sugars, acidity in juices obtained through application of different extraction methods.

Table 2. Effect of different extraction methods on chemical parameters of Pomegranate juice

Juice extraction method	Parameter					
	TSS (⁰ Bx)	Acidity (%)	pH	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)
GM1	15	0.3	3.2	13	12.30	1.70
AM1	14	0.32	3.2	13.50	12.30	1.20
GM2	15.5	0.32	3.1	13.50	12	1.50
AM2	14.5	0.35	3.2	14.0	12.80	1.20
S.E.	0.381	0.013	0.057	0.354	0.287	0.115
C.D.	1.243	0.044	0.187	1.555	0.935	0.375

Each value is mean of triplicate determinations M1: Hand Press Method1 M2: domestic Mixer Method2 G: Ganesh variety A: Arakta variety

Table 3. Effect of Extraction Methods on Antioxidant Properties of Pomegranate Juice

Juice extraction method	Parameter	
	Anthocyanin (mg/100ml)	Ascorbic Acid (mg/100g)
GM1	4.50	8.5
AM1	16.0	18.20
GM2	7.25	9.0
AM2	18.20	9.5
S.E.	0.1666	0.24
C.D.	0.542	0.786

Each value is mean of triplicate determinations M1: Hand Press Method1 M2: domestic Mixer Method2 G: Ganesh variety A: Arakta variety

Polyphenols are most prominent antioxidants in our diet. Among polyphenols, anthocyanins are predominant group of polyphenol with high colouring potential (Wrolostad *et al.* 2005). Ascorbic acid is also well known for its antioxidant properties. It was found that the concentration of extracted anthocyanins and ascorbic acid were found to be more by domestic mixer extraction method. Anthocyanin content in Arakta cultivar was higher 16-18.20 mg/100ml juice than anthocyanin content in Ganesh cultivar 4.50-7.25 mg/100ml juice. The results reported in Table 3 showed the lower total anthocyanins values than the results reported by Cam *et al.*, (2009). Ascorbic acid content in Ganesh cultivar was 8.5-9 mg/100g and in Arakta cultivar 9.2-9.5mg/100g. The values obtained in the current study are in agreement with the results reported by Kulkarni and Aradhya (2005). It is observed from Table 4 that there was not much variation in

Table 4. Effect of Extraction Methods on Mineral Content of Pomegranate Juice

.Juice extraction method	Mineral (mg/100g)						
	Calcium	Phosphorus	Potassium	Iron	Zinc	Copper	Manganese
GM1	5	60	132	1.30	0.80	0.30	0.70
AM1	6	55	130	1.40	0.79	0.32	0.75
GM2	6	65	133	1.35	0.82	0.32	0.72
AM2	7	50	132	1.45	0.80	0.34	0.77
S.E.	0.377	0.421	0.484	0.154	0.019	0.025	0.022
C.D.	1.229	1.404	1.578	0.501	0.063	0.081	0.073

Each value is mean of triplicate determinations M1: Hand Press Method1 M2: domestic Mixer Method2 G: Ganesh variety A: Arakta variety

Table 5. Sensory evaluation of spiced pomegranate juice

Sample Code	Sensory Attributes				
	Colour	Appearance	Flavor	Taste	Overall Acceptability
A	7	7	7	8	7
A1	8.5	8.5	8.5	8.5	8.5
G	8	8	7	7	7.5
G1	7	8	8	8	7.8
S.E.	0.381	0.456	0.381	0.44	0.483
C.D.	1.243	1.486	1.243	1.435	1.572

A= Pomegranate juice Cv. Arakta A1= Spiced pomegranate juice of Cv. Arakta G= Pomegranate juice Cv. Ganesh G1= Spiced pomegranate juice of Cv. Ganesh

Table 6. Effect of storage temperature on quality of juice

Storage Period	Parameter						
	TSS (^o Bx)	Acidity (%)	pH	Ascorbic acid (mg/100g)	Total sugars (%)	Reducing sugars (%)	
0 days(fresh)	15	0.4	3.1	8.5	13.0	12.50	1.2
After 60 days at Ambient temp.	15.5	0.32	3.3	6.5	14.30	12.90	1.4
After 60 days at Refrigeration temp.	16.0	0.35	3.2	6.8	14.25	12.80	1.45
	0.288	0.017	0.81	0.173	0.106	0.111	0.036
C.D.	0.997	0.05	0.282	0.598	0.368	0.386	0.124

Table 7. Energy value of prepared products

Energy value of 200ml spiced pomegranate juice	128.4 Kcal.
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Table 8. Cost of spiced pomegranate juice
The production cost of pomegranate spiced pomegranate juice is worked out in Table 7.

Sr.No.	Particular	Quantity	Price Per Unit (Rs.)	Cost (Rs.)
1.	Pomegranate	2 kg	40/kg	80/-
2.	Cardamom	20 g	15/10g	30/-
3.	Clove	10 g	15/10g	15/-
4.	Fennel	20 g	20/100g	5/-
5.	Total raw material cost			130/-
6.	Processing and Packaging cost @ 15% of raw material cost			20/-
7.	Production cost for 1 liter of flavored juice			150/-
8.	Production cost of 200 ml of flavored juice			30/-

Production cost of 200ml of flavored pomegranate juice = Rs. 30/-

mineral content in both the cultivars as well as for different extraction methods. The results obtained were similar with results reported by Chavan *et al* (1995). It is observed from Table 5 that sample A1 scored highest score for overall acceptability was 8.5 than A, G and G1 7, 7.5 and 8 respectively. The sample A1 scored higher 8.5 for overall acceptability among other samples may be due to colour of Arakta Cultivar compared to Ganesh cultivar and addition of spice extract than control i.e. without addition of spices. Flavored spicy pomegranate juice remarkably improved organoleptic quality.

Effect of storage temperature on quality of juice

It is observed from values in Table 6 that values of TSS, Total sugars, reducing sugars and non-reducing sugar of pomegranate juice increased during storage. It was noted that TSS of juice was initially 15^oBx and after 60 days it was 15.5^oBx at ambient temperature and 16^oBx at refrigeration temperature. Increase in TSS was found to be associated with increase in sugars. These results were in agreement

with those reported by Palaniswamy and Muthukrishnan (1974). It was found that total sugar, reducing sugars and non-reducing sugar content was increased during storage at both room and refrigeration temperature. The pH of juice showed not much change during storage. Acidity and ascorbic acid content of juice showed decreasing trend during storage period. This decrease in acidity could be due to chemical interactions between organic constituents of the juice particularly organic acids and anthocyanins Palaniswamy and Muthukrishnan (1974). Similar results were reported by Khurdiya and Anand (1981). At room temperature juice when stored for two months decrease in ascorbic acid from 8.5mg/100g to 6.5mg/100g was observed. While at refrigeration temperature ascorbic acid was found to be reduced upto 6.8 mg/100g.

Conclusion

It can be concluded that a good quality spiced pomegranate juice can be prepared from pomegranate fruits. In case of extraction methods

for juice extraction, the domestic mixer method was found in relation to yield and other quality characteristics like TSS. Pomegranate cultivar Arakta is suitable for preparation of highly nutritive and palatable spiced pomogranate juice with its attractive colour Hence this product could be recommended for commercial exploitation.. Nevertheless, the pomegranate has commercial potential for production of health related food products. But the systematic and organized approach should be followed with other sophisticated methods for retention of other bio-active components, storage life, clinical studies and packaging requirements.

REFERENCES

- AOAC (1990) Official methods of analysis of the association of official analytical chemists (15th edition), Washington D.C.:992-995.
- Amerine M A, Pangborn R M and Roessler E V (1987) Principles of Sensory Evaluation of Food. Academic Press, New York. PP: 349-397.
- Cam M, Durmaz G, Hisil Y (2009) Classification of eight pomegranate juices based on antioxidant capacity measured by four methods. Food Chem. 112:721-726.
- Chavan U D, Adsule R N and Kadam S S (1995) Physico-chemical properties of pomegranate (*Punica granatum L.*) rind powder. Beverage Food World. 22(1):36.
- Comeroglu B, Artik N and Erbas S (1992) Gewinnung von granatapfel saft and seine zusammensetzung. Fillissiques. Obst. 59:335-340
- Esmailzadeh A, Tahbaz F, Gaieni I, Alavi-Majd H and Azadbakht L (2004) Concentrated pomegranate juice improves lipid profiles in diabetic patients with hyperlipidemia. J. Medic. Food. 7(3):305-308.
- Khurdiya D S and Anand J C (1981) Effect of extraction method, container and storage temperature of Phalsa fruit juice. Indian Food Packer. 35(6):68-71.
- Kulkarni A P and Aradhya S M (2005) Chemical changes and antioxidant activity in pomegranate arils during fruit development. Food Chem. 93:319-324.
- La Rae R H (1969) Agric. Expt. Station. University of California. Leaflet. 305-313.
- Miguel G, Dandlen S, Antunes D, Neves A and Martins D (2004) The effect of two different methods of pomegranate (*Punica granatum L.*) juice extraction on quality during storage at 4°C. J. Biomed. Biotech., 5:332-337.
- Palaniswamy K P and Muthukrishnan C R (1974) Studies on the physico-chemical characters of lemon juice and squash during storage. Indian Food Packer. 28(4):37-41.
- Panse V.S. and Sukhatme P.V. (1967). Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research. New Delhi, pp70-72.
- Seeram NP, Aviram M, Zhang Y, Henning SM, Feng L, Dreher M and Herber D (2008) Comparison of antioxidant potency of commonly consumed polyphenol-rich beverages in the United States. J. Agric Food Chem. 56(4):1415-1422.
- Wrolstad R E, Durst R W and Lee J (2005) Tracking colour and pigment changes in anthocyanin. Trends in Food Sci. Tech. 16:423-428.
