

Evaluation of Sensorial Attributes of Pomegranate Syrup based RTS with the Fusion of chia Seeds and Sensorial Attributes

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ABSTRACT: Pomegranate is a commercially/economically extensive fruit crop grown all around the world. Pomegranate juice is delectable one which is immensely invigorating and recommended for patients suffering from gastrointestinal in convenience due to its medicinal value. Chia seeds are known as super food as it contains high potent of essential fatty acids, dietary fibres, vitamins and antioxidants. From the health point of view, omega-3 fatty acids are of thoughtfulness because they are influential element in the membranes of brain cells, cardiomyocytes and the rods and cones of the retina. Chia could also be a good source of gel. The melioration of product has become an evoking interest tool in modern fruit beverage processing industry, in the developing of new beverages of superior grade having sensory and nourishing properties. Enrichment of the product not solely boost the attribute and nutrition but also leads to the emergence of new product advancement. In this investigate, nutritious pomegranate juice and immersed chia seeds were exploit at various combinations (100:0, 90:10, 85:15 and 80:20) using both sucrose and fructose for preparation of pomegranate RTS by incorporation of chia seeds. The study disclosed that RTS prepared with 90 per cent pomegranate juice and 10 per cent chia seeds scored maximum for almost all sensorial attributes.

Keywords: Pomegranate juice, chia seeds, fructose, sucrose, sensory characteristics.

INTRODUCTION

Pure fruit extracts are also coming in the category of RTS beverages. Nowadays a lot of heterogeneity soft drinks are manufactured in the country such as sweetened carbonated (aerated) soft drinks, still beverages containing fruit juice/pulp and soda water falling under the category of RTS (ready-to-serve) beverage. Among these the share of fruit juice-based beverages is very small compared to synthetic carbonated drinks/soda waters. Nevertheless, the drift is steadily changing for the apparent advantages of nutritious fruit juice-based beverage over the synthetic and carbonated drinks. Fruit and fruit products together can be a significant appendage to the individual

sustenance as they contribute almost all the essential integral vitals for systematic growth and development of the individual paramounting to the healthful body and insight. Refinement of fruit juice is accustomed to tame the elevated are of several outlandish fruit juices, dearth or seasonal availability, reimbursing of strong flavours, high acidity, astringency or bitterness, improving total soluble solids, bland flavour, improving and stabilizing colour. Phytonutrient properties can be ameliorated by blending which propound to modify brix/acid ratios and remunerate disagreeable juice consistency.

The consumable part of the fruit (arils-pulp bearing seeds) contains appreciable proportions of acids, sugars, vitamins, polysaccharides, polyphenols and important

minerals (Vardin and Fenercioglu 2003). Pomegranate fruit has been employed as a folk medicine for thousands of years. More recently, it has been upgraded as a “Superfood” that can mitigate symptoms of numerous diseases. Pomegranate (*Punica granatum*) is regarded as a wholesome food as it possesses a wide range of phytochemicals and bioactive compounds (Mena *et al.*, 2013; Vegara *et al.*, 2013; Vardinet *et al.*, 2013). The pomegranate can be refined into various products like minimally processed fresh arils, juice, squash, beverage, molasses, juice concentrates, frozen seeds, jam, jelly, marmalades, grenadine, wine, seeds in syrup, pomegranate spirits, pomegranate powder, pomegranate rind powder, anardana, confectionery, pomegranate seed oil etc. (Yadav *et al.*, 2006).

Chia seeds known to have a good proportion of vital amino acids, so the body can make use of the proteins in them (Sandoval- Oliveros and Paredes-Lopez 2013). Chia seeds contain high fiber and can able to imbibe up to 10-12 times their mass in water, fetching gel-like formation and enlarging in the abdomen therefore it makes chia a low friendly food (Alfredo *et al.*, 2009). Chia gel is a polysaccharide-based gel mainly comprise of crude fiber and carbohydrate. Extricated gel has a great prospective of food formulations as thickening agent, emulsifying agent and as a stabilizer. Chia seeds are having an affluent quality protein much higher than the several plant foods. Protein is that the foremost weight reduction congenial sustenance and exceedingly lower appetite and cravings. Experiments revealed that chia seeds (specially milled) can escalate haemoglobin levels of ALA (α -linolenic acid) and EPA (eicosapentaenoic acid), but not DHA (docosahexaenoic acid) which is a drawback (Nieman *et al.*, 2012; Jin *et al.*, 2012).

Fruit-based beverages are already gaining significant attention due to their expanding commercial potential. Not only are these drinks delightful, but they are also very nourishing. They might be especially helpful in areas where malnutrition is a problem and can result in disorders related to nutritional deficiencies. Thus, the current study was conducted to create a tasty and nourishing beverage from the combinations of fruit juice and chia seeds in order to make the most of pomegranate fruit juice and chia seeds.

MATERIAL AND METHODS

Pomegranate fruits that were fresh and free of illness were completely cleaned under running water and partially cut with a sharp stainless-steel knife. To extract juice, fruits were put in a manually operated pomegranate juice extractor and pressed. After extraction, juice was allowed to settle down and subsequently strained through clean muslin cloth to obtain clear juice extract. To this extract according to the treatment formulations chia seeds (10- 20%) were added by replacing pomegranate juice at different percentages (except T₁ and T₅). To this juice sucrose and fructose were added to maintain 65 °Brix and 45°Brix, respectively. Formulation details were as given below.

A. Formulation of treatments

The assessment was organized and carried out to achieve the stated objectives proposed. The design of the experiment was CRD with three replications. After the formulation the pomegranate beverages were stored at 4°C temperature and used for further study. The details of treatments are as follows.

Treatments	Pomegranate juice %	Chia seeds %	Sucrose ° Brix
T ₁	100	-	65
T ₂	90	10	65
T ₃	85	15	65
T ₄	80	20	65
	Pomegranate juice %	Chia seeds %	Fructose ° Brix
T ₅	100	-	45
T ₆	90	10	45
T ₇	85	15	45
T ₈	80	20	45

B. Sensory evaluation

For organoleptic testing, the fresh beverage samples made with different proportions of pomegranate juice and chia seeds were served cold. Ten judges who had received some training served as the panel for the sensory examination. The panel assessed the beverage's acceptability in terms of colour, flavour, and general acceptability. For this, a 9-point hedonic scale was employed.

Sensory evaluation plays a significant role while developing a beverage to visualize the impact of individual fruit juice as well as incorporation of chia seeds on the sensorial properties of the product. While ranking a group of similar food samples, the overall sensory perception of the product is crucial to reach any decision. The quality rating test is one of the techniques

which includes assessment and rating of some preselected sensory attributes on a predefined scale to get the overall impression about the product (Beeren, 2010). The assessors may be a consumer or a skilled person; however, the reproducibility of the sensory data is the primary concern (Sinija and Mishra 2011). Being untrained, the scores or ratings given by a consumer are frequently correlated with restricted reproducibility. However, while a trained panellists or expert does the same, the response becomes precise (Shrivastava and Chakraborty 2018).

C. Statistical analysis

The data generated in the experimentation were noted and subjected to statistical analysis using standard procedure. The standard errors (SE) and critical differences (CD) at 1 per cent level of significance were

calculated for comparison of treatments and presented in the respective tables.

RESULTS AND DISCUSSION

The physicochemical properties of pomegranate fruit were mentioned in Table 1 and proximate composition of chia seeds were mentioned in Table 2. The statistics on organoleptic evaluation of RTS is presented in Table 3.

A. Colour and appearance

The outcome of colour and appearance values (Fig. 1a) were affected by the incorporation of chia seeds in pomegranate RTS showed notable difference. The range value for colour and appearance varies from 6.47 to 8.37. Appreciably utmost outcome for colour and appearance was noticed in T₅ (8.37) which was equate with T₁ (8.13) and T₆ (8.03). The minimum score was recorded in T₄ (6.47). Here the control sample got maximum score due to its natural colour. In the present experimentation chia seeds were added after soaking in water which forms a mucilage or gel, when it was added to pomegranate juice gradually lost its original red colour. As the concentration of chia seeds increased simultaneously the colour reduced and it was slightly unacceptable by the panelists. Comparable outcomes were illustrated in sensory analysis of sports drink based on chia seeds (Bhardwaj and Saraswat 2019).

B. Consistency

Remarkable variance was noted for consistency of RTS among the different treatments. The uppermost score was noticed in T₆ (8.00) which was correlate with T₁ (7.90) and T₅ (7.70). The minimum sensory aggregate was reported in T₄ (7.03) (Fig. 1b).

It may be because of addition of soaked chia seeds in the form of mucilage or gel which changes the consistency of the RTS which was least acceptable by the panel lists. As the accumulation of chia seeds increased the viscosity of the treatments increased. The results acquired by the sensory estimators of RTS which enriched with 10, 15 and 20 per cent chia seeds proved to be a nutri enriched drink. The treatment T₆ with 10 percent chia seeds was good and scored highly in sensory analysis compared to other treatments. Similar outcomes were reported in sensory analysis of sports drink based on chia seeds along with control sample (Bhardwaj and Saraswat 2019) and it is also supported by the earlier study that, as chia seed gel level increased, the scores for consistency of ice cream get decreased (Chavan *et al.*, 2017).

C. Taste

Prominent deviation was noticed for the observation of taste (Fig. 1c) among the different treatments. The sensory value for the taste of treatments ranged from 6.93 to 7.80. Treatment T₇ possessed highest sensory score (7.80) for taste which was similar with all other treatments except T₄ (6.93) and T₈ (6.97) which are having lowest score.

Taste of the RTS was fairly accepted which were enriched with chia seeds. Lowest sensory outcome for chia seed added samples may be due to decline in sweet taste of the treatments when compared to control. Taste

was fairly accepted in treatments which were supplemented with chia seeds. It looks similar incase of ice cream whereas the chia seed gel increases the taste decrease (Chavan *et al.*, 2017).

D. Flavour

Remarkable lowest result was reported in T₈ (7.17) for the flavor (Fig. 1d) of RTS enriched with chia seeds. The highest outcome was noticed in T₆ (7.93) which was on par with T₁ (7.80) and all other treatments except T₃ (7.27) and T₄ (7.40).

The outcomes showed that elevated concentration of chia seeds gave slightly undesirable flavour in the RTS that was least liked by the panel lists. Just in case of taste addition of soaked chia seeds affect the flavour also. This may be due to leaching of some soluble components of cellular structure of chia mucilage into the pomegranate syrup. Similar results were noticed in sensory analysis of sports drink based on chia seeds along with control sample (Bhardwaj and Saraswat 2019).

E. Over all acceptability

T₆ (90 % Pomegranate juice + Fructose 45° Brix + 10 % chia seeds) recorded a significantly maximum sensory score (7.87) for overall acceptability (Fig. 1e) which was equate with control II T₅ (100 % Pomegranate juice + Fructose 45° Brix: 7.77) and control I T₁ (100 % Pomegranate juice + Sugar 65° Brix: 7.67) and all other treatments except T₃ (85% Pomegranate juice + Sugar 65° Brix + 15 % chia seeds: 7.10) and T₄(80% Pomegranate juice + Sugar 65° Brix + 20 % Chia seeds: 7.07). The minimum sensory score (7.07) for overall acceptability (Fig 1e) was noted in T₄ (80% Pomegranate juice + Sugar 65° Brix + 20 % chia seeds). This may be because of highest score for taste, consistency and flavour in comparison with the other treatments. In contrast, the study conducted by Corey *et al.* (2012) opined that the chia chips are liked just as much as the commercial brand chip in terms of appearance, colour, flavour and overall acceptability by the panel members.

Table 1: Physico-chemical properties of pomegranate fruit.

Sr. No.	Physico-chemical composition	Juice
1.	Yield of juice (%)	48.56
2.	Waste index (%)	51.43
3.	Total soluble solids	13.00
4.	Acidity	0.32
5.	pH	2.7

Table 2: Proximate composition of chia seeds.

Sr. No.	Component	Chia seeds
1.	Moisture (%)	7.86
2.	Ash (%)	3.63
3.	Protein (%)	21.52
4.	Carbohydrate (%)	45.30
5.	Fiber (%)	21.14

Table 3: Sensory evaluation of pomegranate RTS enriched with chia seeds.

Treatments	Colour and appearance	Consistency	Taste	Flavour	Overall acceptability
T ₁	8.13	7.90	7.60	7.80	7.67
T ₂	7.23	7.50	7.50	7.47	7.50
T ₃	6.70	7.37	7.37	7.27	7.10
T ₄	6.47	7.03	6.93	7.40	7.07
T ₅	8.37	7.70	7.67	7.63	7.77
T ₆	8.03	8.00	7.73	7.93	7.87
T ₇	7.47	7.53	7.80	7.73	7.67
T ₈	7.00	7.47	6.97	7.17	7.23
Mean	7.42	7.56	7.45	7.57	7.48
S. Em±	0.16	0.06	0.14	0.12	0.13
CD @ 1%	0.65	0.33	0.54	0.48	0.57

T₁: 100 % Pomegranatejuice + Sugar (65° Brix Control I)

T₂: 90 % Pomegranate juice + Sugar (65° Brix) + 10 % chia seeds

T₃: 85% Pomegranate juice + Sugar (65° Brix) + 15 % chia seeds

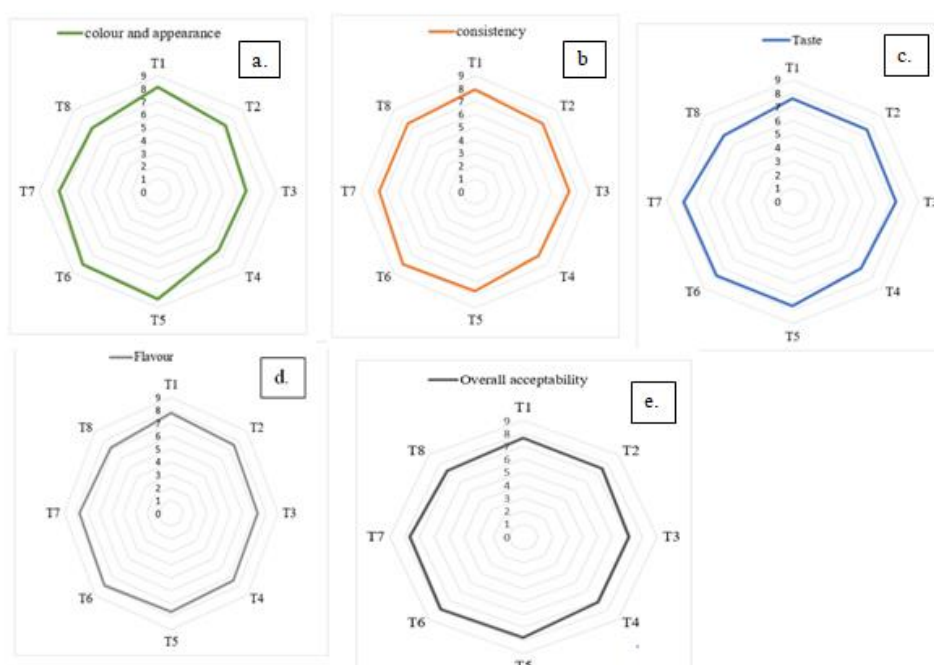
T₄: 80% Pomegranate juice + Sugar (65° Brix) + 20 % chia seeds

T₅: 100 % Pomegranatejuice + Fructose (45° Brix Control II)

T₆: 90 % Pomegranate juice + Fructose (45° Brix) + 10 % chia seeds

T₇: 85% Pomegranate juice + Fructose (45° Brix) + 15 % chia seeds

T₈: 80% Pomegranate juice + Fructose (45° Brix) + 20 % chia seeds



T ₁ : 100 % Pomegranate juice + Sugar (65° Brix Control I)
T ₂ : 90 % Pomegranate juice + Sugar (65° Brix) + 10 % chia seeds
T ₃ : 85% Pomegranate juice + Sugar (65° Brix) + 15 % chia seeds
T ₄ : 80% Pomegranate juice + Sugar (65° Brix) + 20 % chia seeds
T ₅ : 100 % Pomegranate juice + Fructose (45° Brix Control II)
T ₆ : 90 % Pomegranate juice + Fructose (45° Brix) + 10 % chia seeds
T ₇ : 85% Pomegranate juice + Fructose (45° Brix) + 15 % chia seeds
T ₈ : 80% Pomegranate juice + Fructose (45° Brix) + 20 % chia seeds

Fig. 1. Sensory evaluation of pomegranate syrup based RTS with the incorporation of chia seeds (a) Colour and appearance (b) Consistency (c) Taste (d) Flavour and (e) Overall acceptability

CONCLUSIONS

Chia seeds incorporated pomegranate syrup with combination of 90 per cent Pomegranate juice + 10 per cent Chia seeds + Fructose (45° Brix) had a better acceptability by the panellists.

FUTURE SCOPE

Further scope for experiment is need to concentrate on optimization of recipe for value added products from chia seeds such as fruit jam, biscuits, fruit jelly etc

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Conflict of Interest. None.

REFERENCES

- Alfredo, V. O., Gabriel, R. R., Luis, C. G. and David, B. A. (2009). Physicochemical properties of a fibrous fraction from chia (*Salvia hispanica* L.). *LWT - Food Sci. Tech.*, 42(1), 168–173.
- Beeren, C. J. M. (2010). Establishing product sensory specifications. In *Sensory analysis for food and beverage quality control* (75-96). Woodhead Publishing.
- Bhardwaj, S. and Saraswat, S. (2019). Product development, nutrient and sensory analysis of sports drink based on chia seeds (*Salvia hispanica* L.). *Int. J. Physiol. Nutri. Phys. Educ.*, 4(2), 187-190.
- Chavan, V., Gadhe, K., Dipak, S. and Hingade, S. (2017). Studies on extraction and utilization of chia seed gel in ice cream as a stabilizer. *J. Pharma. Phytochem.*, 6(5), 1367-1370.
- Coorey, R., Grant, A. and Jayasena, V. (2012). Effect of chia flour incorporation on the nutritive quality and consumer acceptance of chips. *J. Food Res.*, 1, 85-95.
- Jin, F., Nieman, D. C., Sha, W., Xie, G., Qiu, Y. and Jia, W. (2012). Supplementation of milled chia seeds increases plasma ALA and EPA in postmenopausal women. *Plant Foods Hum Nutr.*, 67, 105–110.
- Mena, P., Vegara, S., Martí, N., García-Viguera, C., Saura, D. and Valero, M. (2013). Changes on indigenous microbiota, colour, bioactive compounds and antioxidant activity of pasteurised pomegranate juice. *Food Chem*, 141(3), 2122-2129.
- Nieman, D. C., Gillitt, N., Jin, F., Henson, D. A., Kennerly, K., Shanely, R. A., Ore, B., Su, M. and Schwartz, S. (2012). Chia seed supplementation and disease risk factors in overweight women: a metabolomics investigation. *J Altern Complement Med.*, 18(7), 700-708.
- Sandoval-Oliveros, M. R. and Paredes-Lopez O. (2013). Isolation and Characterization of Proteins from Chia Seeds (*Salvia hispanica* L.). *J. Agric. Food Chem.*, 61(1), 193–201.
- Sinija, V. R. and Mishra, H. N. (2011). Fuzzy analysis of sensory data for quality evaluation and ranking of instant green tea powder and granules. *Food Bioproc. Tech.*, 4(3), 408-416.
- Shrivastava, C. and Chakraborty, S. (2018). Bread from wheat flour partially replaced by fermented chickpea flour: Optimizing the formulation and fuzzy analysis of sensory data. *LWT*, 90, 215-223.
- Vardin, H. and Fenercioglu, H. (2003). Study on the development of pomegranate juice processing technology: clarification of pomegranate juice, *Nahrung*, 42, 300-303.
- Vegara, S., Martí, N., Mena, P., Saura, D. and Valero, M. (2013). Effect of pasteurization process and storage on color and shelf-life of pomegranate juices. *LWT- Food Sci. Technol*, 54(2), 592-596.
- Yadav, K., Sarkar, B. C. and Kumar, P. (2006). Pomegranate: recent developments in harvesting, processing and utilization. *Indian Food Ind.*, 25(2), 56-63.

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