

PRODUCT DEVELOPMENT FROM POMEGRANATE FLOWER FOR ATHEROSCLEROTIC DISEASE PATIENTS

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Abstract: Pomegranate flower is a part of shrub which grows as a small tree up to 5m only and comes from the family of Punicaceae. It shows the property of Peroxisome proliferator-activated receptor (PPAR) – alpha/-gamma activator which act as transcription factors from family of nuclear receptors. Pomegranate flower also have anti oxidative property due to presence of good amount of anthocyanins. The study focus on development of value added product from pomegranate flower for atherosclerotic patients. The pomegranate flower was dried at room temperature to develop powder. The product, shrikhand was developed in different concentrations i.e. 12.5g, 18g, 25g from pomegranate flower powder. Sensory evaluation was done using 9 point Hedonic scale. Data was statistically analysed by using SPSS Version 21. The result revealed that the product with concentration of 12.5g of pomegranate powder was liked very much (8 point) in all parameters by 9 point Hedonic scale. Proximal analysis for the product developed with 12.5g of pomegranate flower powder was done.

Key words: Pomegranate flower, Atherosclerotic disease, Sensory evaluation, and proximal analysis.

Introduction: Pomegranate flower is a part of pomegranate tree which is a small shrub comes from the family of Punicaceae, which is a monogenetic family of two species i.e. Punica Granatum L. and P. Protopunica. Pomegranate tree only grows up to 5m ^[1]. Flowering in pomegranate tree occurs very early as on one year old spurs. Pomegranate flowers are odourless but very colourful. They are 5-9cm in length and cylindrical in shape. Flower is chemically composed of phenol compounds like Gallic acid, protocatechuic acid, chlorogenic acid, caffeic acid, ferulic acid, and quercetin etc. Pomegranate flower is usually considered as a by-product of pomegranate cultivation as all flowers do not developed as pomegranate. It is having tremendous nutritional value and health benefits. Various properties shown by flower are: Peroxisome proliferator-activated receptor (PPAR) – alpha/-gamma activator property according to which PPAR – alpha helps in fatty acid uptake and oxidation, inflammation and vascular function whereas PPAR – gamma helps in fatty acid uptake and storage, glucose homeostasis and inflammation. Hence PPARs are major regulators for lipid and glucose metabolism ^[2]. Ant oxidative property as presence of two anthocyanins- pelargonidin 3, 5-diglucoside and pelargonidin 3-glucoside in its purified form showed strong radical scavenging activities ^[3] ^[4]. Anti – inflammatory property ^[5] and hepatoprotective property ^[6]. Health benefits of pomegranate flower are: helps to regulate blood glucose, ensures heart health, prevents arthritis ^[7] and also reduce cisplatin chemotherapy induced nephrotoxicity ^[8]. Instead of being treated as an agriculture waste pomegranate flower can be utilized as an ingredient in food product formulation. Although India produces a large amount of pomegranate but the nutritional properties and health benefits are less focused by researchers. Considering all these factors the present study was done to analyze the acceptability of developed food product from pomegranate flower.

Materials and Methods: Fresh pomegranate flowers are procured from different areas of Delhi, NCR and dried at room temperature for about 1 month. Dried flowers are then converted into powder through the process of grinding. Value added product “Shrikhand” is developed with incorporation of pomegranate flower powder in varied concentrations of 12.5g, 18g and 25g. One standard shrikhand (without pomegranate flower) is also developed for sensory evaluation. Sensory evaluation of developed product for

colour, texture, taste, appearance, aroma and overall acceptability was done by 50 subjects using 9-point hedonic scale. Proximal analysis was done for energy, protein, total fat, carbohydrates, fibre content, ash, moisture and anthocyanins content. Chi- square test was applied using SPSS version 21 for statistical analysis.

Result and Discussion: The developed products with varied concentrations (12.5g, 18g, and 25g) of pomegranate flower were analyzed for their colour, texture, taste, appearance and aroma by using 9-point hedonic scale. The obtained data reveals results as:

Table 1 – Colour acceptability percentage of developed products by 9-point hedonic rating scale:

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	(P value)
Like extremely(9)	34(66.7)	7(13.7)	5(9.8)	5(9.8)	0.000
Like very much(8)	13(25.5)	30(58.8)	25(49.0)	15(29.4)	
Like moderately(7)	3(5.9)	10(19.6)	14(27.5)	21(41.2)	
Like slightly(6)	1(2)	3(5.9)	4(7.8)	8(15.7)	
Neither like nor dislike(5)	0(0)	1(2.0)	2(3.9)	1(2.0)	
Dislike slightly(4)	0(0)	0(0)	1(2.0)	1(2.0)	
Dislike moderately(3)	0(0)	0(0)	0(0)	0(0)	
Dislike very much(2)	0(0)	0(0)	0(0)	0(0)	
Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)	

Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 1 depict the percentage acceptability of colour of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding colour was of standard (66.7 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 58.8% of subject found T1 sample(Shrikhand incorporated with 12.5g of pomegranate flower powder) highly acceptability (8 - like very much) regarding colour as compared to T2 and T3, 49.0% and 29.4% respectively. The differences were statistically significant ($P < 0.05$)

Table 2 – Taste acceptability percentage of developed products by 9-point hedonic rating scale:

S.No.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	(P value)
Like extremely(9)	17(33.3)	18(35.3)	3(5.9)	5(9.8)	0.000
Like very much(8)	20(39.2)	20(39.2)	19(37.3)	9(17.6)	
Like moderately(7)	11(21.6)	9(17.6)	20(39.2)	20(39.2)	
Like slightly(6)	2(3.9)	3(5.9)	8(15.7)	14(27.5)	
Neither like nor dislike(5)	1(2.0)	0(0)	1(2.0)	1(2.0)	
Dislike slightly(4)	0(0)	0(0)	0(0)	2(3.9)	
Dislike moderately(3)	0(0)	0(0)	0(0)	0(0)	
Dislike very much(2)	0(0)	1(2.0)	0(0)	0(0)	

Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)	
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Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 2 depict the percentage acceptability of taste of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding taste was of sample T1 (35.3 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 39.2% of subject found T1 sample (Shrikhand incorporated with 12.5g of pomegranate flower powder) highly acceptability (8 - Like very much) regarding taste as compared to T2 and T3 37.3% and 17.6% respectively. The differences were statistically significant ($P < 0.05$)

Table 3 – Texture acceptability percentage of developed products by 9-point hedonic rating scale:

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	(P value)
Like extremely(9)	20(39.2)	8(15.7)	6(11.8)	3(5.9)	0.04
Like very much(8)	16(31.4)	21(41.2)	18(35.3)	13(25.5)	
Like moderately(7)	11(21.6)	19(37.3)	20(39.2)	23(45.1)	
Like slightly(6)	2(3.9)	1(2.0)	4(7.8)	8(15.7)	
Neither like nor dislike(5)	2(3.9)	1(2.0)	3(5.9)	2(3.9)	
Dislike slightly(4)	0(0)	1(2.0)	0(0)	1(2.0)	
Dislike moderately(3)	0(0)	0(0)	0(0)	1(2.0)	
Dislike very much(2)	0(0)	0(0)	0(0)	0(0)	
Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)	

Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 3 depict the percentage acceptability of texture of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding texture was of standard (39.2 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 41.2% of subject found T1 sample (Shrikhand incorporated with 12.5g of pomegranate flower powder) highly acceptability (8 - like very much) regarding taste as compared to T2 and T3 35.3% and 25.5% respectively. The differences were statistically significant ($P < 0.05$)

Table 4 – Aroma acceptability percentage of developed products by 9-point hedonic rating scale

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	(P value)
Like extremely(9)	20(39.2)	11(21.6)	5(9.8)	3(5.9)	0.17
Like very much(8)	15(29.4)	17(33.3)	16(31.4)	16(31.4)	

Like moderately(7)	9(17.6)	15(29.4)	16(31.4)	17(33.3)
Like slightly(6)	4(7.8)	4(7.8)	9(17.6)	12(23.5)
Neither like nor dislike(5)	1(2.0)	4(7.8)	3(5.9)	3(5.9)
Dislike slightly(4)	1(2.0)	0(0)	1(2.0)	0(0)
Dislike moderately(3)	1(2.0)	0(0)	1(2.0)	0(0)
Dislike very much(2)	0(0)	0(0)	0(0)	0(0)
Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)

Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 4 depict the percentage acceptability of aroma of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding aroma was of standard (39.2 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 33.3% of subject found T1 sample (Shrikhand incorporated with 12.5g of pomegranate flower powder) highly acceptability (8 - like very much) regarding taste as compared to T2 and T3 31.4% and 31.4% respectively. The differences were not statistically significant ($P>0.05$)

Table 5 – Appearance acceptability percentage of developed products by 9-point hedonic rating scale:

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	(P value)
Like extremely(9)	26(51.0)	11(21.6)	3(5.9)	1(2.0)	0.000
Like very much(8)	16(31.4)	18(35.3)	18(35.3)	14(27.5)	
Like moderately(7)	9(17.6)	18(35.3)	21(41.2)	26(51.0)	
Like slightly(6)	0(0)	4(7.8)	6(11.8)	8(15.7)	
Neither like nor dislike(5)	0(0)	0(0)	3(5.9)	2(3.9)	
Dislike slightly(4)	0(0)	0(0)	0(0)	0(0)	
Dislike moderately(3)	0(0)	0(0)	0(0)	0(0)	
Dislike very much(2)	0(0)	0(0)	0(0)	0(0)	
Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)	

Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 5 depict the percentage acceptability of appearance of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding appearance was of standard (51 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 35.3% of subject found T1 sample and T2 sample (Shrikhand incorporated with 12.5g and 18g respectively of pomegranate flower powder) highly acceptability (8 - like very much) regarding taste as compared to T3 27.5% . The differences were statistically significant ($P<0.05$)

Table 6 – Overall acceptability percentage of developed products by 9-point hedonic rating scale:

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
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	No. (%)	No. (%)	No. (%)	No. (%)	0.000
Like extremely(9)	40(78.4)	28(55)	16(31.3)	8(15)	
Like very much(8)	8(15.6)	17(33.3)	24(47)	32(63)	
Like moderately(7)	2(4)	5(9.8)	9(18)	9(18)	
Like slightly(6)	1(2)	1(2)	2(4)	2(4)	
Neither like nor dislike(5)	0(0)	0(0)	0(0)	0(0)	
Dislike slightly(4)	0(0)	0(0)	0(0)	0(0)	
Dislike moderately(3)	0(0)	0(0)	0(0)	0(0)	
Dislike very much(2)	0(0)	0(0)	0(0)	0(0)	
Dislike extremely(1)	0(0)	0(0)	0(0)	0(0)	

Standard: Normal Shrikhand

Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder

Sample T2: Shrikhand incorporated with 18g of pomegranate flower powder

Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder

Table 6 depict the overall percentage acceptability of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Shrikhand regarding appearance was of standard (78.4 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 55% of subject found T1 sample (Shrikhand incorporated with 12.5g of pomegranate flower powder) highly acceptability (9 - like extremely) as compared to T2 and T3 31.3% and 15% respectively . The differences were statistically significant ($P < 0.05$)

Table 7 – Proximate Analysis of Shrikhand developed with incorporation of 12.5gm of pomegranate flower powder:

S. No.	Parameter(as per100gm)	Values
1	Energy (Kcal)	242
2	Protein (g)	3.2
3	Total Fat (g)	2.95
4	Total Carbohydrate (g)	38.5
5	Dietary Fibre (g)	<0.1
6	Anthocyanins (mg)	132.5
7	Ash Content (%)	0.85
8	Moisture Content (%)	50.6

Table 7 shows that the most acceptable product (with incorporation of 12.5g of pomegranate flower) was having very good nutritional properties per 100gm. The product has 242 kcal of energy, 3.2g of protein, 38.5g of total carbohydrate and 13.2g of anthocyanins, RDA stated as 11.6g per day for people below 20yrs and women above 20yrs has to take 12.6g/day whereas for men the recommendation is 10.6g/day by NHANES (National Health and Nutrition Examination Survey) 2007-2008 ^[9].

Conclusion – The study conclude that the product developed with concentration of 12.5g of pomegranate flower powder was highly acceptable by 9- point hedonic rating scale. The content of anthocyanins in highly acceptable product was 13.2gm/100gm which is as equal to the daily body requirement of male and female. Further the study can be regarding the intervention of developed product for human trials.

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