ORIGINAL RESEARCH

Organoleptic Evaluation of Product Developed from Pomegranate Flower for Liver Disease

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Abstract

Pomegranate biologically known as *Punica Granatum* L. It is grown throughout dry Mediterranean regions like hot, dry summers. It is a small shrub in which flowering occurs on 1-year-old spurs or short branches appearing as solitary, pairs, or clusters. It shows the antioxidative property, anti-inflammatory property and hepatoprotective property due to the presence of two anthocyanins- pelargonidin 3, 5-diglucoside and pelargonidin 3-glucoside in its purified form. The study was conducted to develop a value-added product from dry pomegranate flower powder for liver disease patients. It involves procurement of flowers from Delhi, NCR and dried at room temperature to convert them into dry powder. The product, shrikhand was developed in different concentrations, i.e., 12.5 g, 18 g, 25 g of pomegranate flower powder. Sensory evaluation was done using a composite scale and the data was statistically analyzed by using Statistical package for Social Sciences (SPSS) version 21. It revealed that the product with a concentration of 12.5 g of pomegranate powder was highly acceptable in all parameters -color, taste, texture, aroma, an appearance by composite scale. The shelf life of the product developed with 12.5g of pomegranate flower powder was done.

Keywords: Liver disease, Sensory evaluation, Pomegranate flower, Proximal analysis, Shelf life.

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Introduction

The liver is an important organ of the human body that regulates metabolism, storage, and secretion functions in the body. Oxidative injuries are caused by an imbalance between oxidative forces and antioxidant defense systems which hence lead to many diseases like liver cirrhosis, atherosclerotic, cancer, etc. According to the World Health Organization (WHO), around 46% of global diseases and almost 39 million deaths in the world are because of chronic liver diseases. In this study, we aimed to develop a value-added product from pomegranate flower powder, rich in anthocyanins (Zhang L *et al.* 2011) which aims to prevent hepatotoxicity and reduces oxidative stress. Pomegranate is a fruit on a small shrub which grows up to 5m only. Flowering in the tree occurs on 1-year-old spurs which are odorless but very colorful (Kumar, DB 2010). Various studies show health properties of pomegranate flower due to the presence of anthocyanins like antioxidative property (Li Y *et al.* 2008), anti-inflammatory property (Xu J *et al.* 2017) and hepatoprotective property. These health properties lead to many health benefits like it ensures liver health, helps in arthritis prevention (Fosang A, 2005) and also reduced cisplatin chemotherapy-induced nephrotoxicity (Motamedi F and Nematbakhsh M, 2014). Two anthocyanins-pelargonidin 3, 5-diglucoside and pelargonidin 3-glucoside in its purified form showed strong radical scavenging activities. Ferric nitrilotriacetate (Fe-NTA) reduces hepatotoxicity by reducing oxidative stress and liver injury (Kaur G *et al.* 2006). The extract of pomegranate flower allows up to 60% protection from hepatic lipid peroxidation and safes glutathione (GSH) levels. Considering all these properties, the present study was done to develop an anthocyanin-rich product and to assess its acceptability and shelf life of the most acceptable product.

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Methodology

Fresh pomegranate flowers are procured from different areas of Delhi, NCR and dried at room temperature for about 1-month. Dried flowers were then converted into powder through the process of grinding. Value-added product "Shrikhand" was developed with the incorporation of pomegranate flower powder in varying concentrations of 12.5 g, 18 g, and 25 g. One standard shrikhand (without pomegranate flower) was also developed for sensory evaluation which includes 408gm of hung curd, 40 gm of strawberry puree, 20gm dates paste and 10gm of honey. All the ingredients are mixed together, and a paste type product is developed which is called Shrikhand. Sensory evaluation of the developed product for color, texture, taste, appearance, aroma, and overall acceptability was done by 50 subjects using composite scoring test. Shelf life and microbiological analysis of the most acceptable product (incorporated with 12.5g of pomegranate flower) was done.

One-way ANOVA and post-hoc test was applied using SPSS version 21 for statistical analysis.

Result and discussion

The developed products with varying concentrations (12.5 g, 18 g, and 25 g) of pomegranate flower were analyzed for their color, texture, taste, appearance, and aroma by using composite score tests. Table 1 depicts the mean acceptability score of the attribute between the samples: Shrikhand by composite scoring. In color, there was a statistically significant difference between the sample as determined by one way ANOVA, i.e. (p <0.05). Sample standard had the highest mean value, i.e., 9.02 ± 0.84, whereas T_1 sample had highest mean value, i.e., 8.12 ± 1.04 in all developed products with different concentrations and the differences, were statistically significant (p <0.05). Application of post hoc test stated the same. The result revealed that sample T_1 was most acceptable regarding color as compared to other samples.

Sample standard had the highest mean value for taste, i.e., 16.52 ± 3.28 whereas sample T2 had highest mean value, i.e., 15.24 ± 3.41 among products of different concentration of pomegranate flower but differences were not statistically significant among samples (p = 0.118). The result revealed that sample T2 was most acceptable regarding taste as compared to other samples. Regarding texture, the highest mean value was of standard, i.e., 8.70 ± 0.76 and among developed products, the highest mean value was of sample T1, i.e., 7.96 ± 0.90. However, the differences are statistically significant, i.e. (p <0.05), which means that sample T_1 was most acceptable regarding texture as compared to other products. For appearance, there was no statistically significant difference between the sample as determined by one way ANOVA (p = 0.327). Standard had the highest mean value, i.e., 16.26 ± 3.60, whereas in products of different concentration the highest mean value was of sample T1, i.e., 15.28 ± 3.59. The results revealed that the most acceptable product, according to appearance was sample T_1. In aroma, the standard is having the highest mean value, i.e., 8.36 ± 1.24 whereas among developed samples of different concentration sample T1 is having the highest mean value, i.e., 7.78 ± 1.25 and sample T3 is having least mean value, i.e., 7.62 ± 1.15. The differences are statistically significant, i.e. (p <0.05), which shows that T1 is the most acceptable sample regarding aroma as compared to other samples. Standard had the highest mean value for, i.e., 8.06 ± 1.33 whereas sample T1 is on highest among other samples of different concentration with mean value, i.e., 7.48 ± 1.29. The differences were statistically significant among samples, i.e. (p <0.05). The Result determined that T1 was most acceptable regarding mouthfeel as compared to other samples. The overall acceptability was highest for standard with the mean value, i.e., 16 ± 3.36, however among the developed products of different concentration, the mean value is highest for sample T_1 i.e. 15.40 ± 3.56 and it was lowest for sample T_3 with the

Mean value of 15.08 ± 3.93. The difference was not statistically significant i.e. (p = 0.269). The results depict the sample T_1 (12.5 g pomegranate flower powder) was more acceptable regarding all the attributes as well as had the highest overall acceptability as compared to other products.

Table 2 shows the nutritional properties per 100gm of powder developed from dry pomegranate flowers. The powder has 285.6 kcal of energy, 9.4 g of protein, 10.84 g of total carbohydrate, 2.35g of total fat, 14.84g of dietary fibre and 44.8g of anthocyanins, RDA by NHANES (National Health and Nutrition Examination Survey) 2007–2008 stated as 11.6 g per day for people below 20 years and women above 20 years has to take 12.6g/day whereas for men the recommendation is 10.6 g/day.

Table 3 shows the Physical analyses of product developed with the incorporation of 12.5g of pomegranate flower and Result analysis was as shown: Total colonies of TPC = 126.5 cfu Total colonies of coli form = nil. Total colonies of Yeast and mold = 51 cfu. Entire colonies of *Enterobacteriaceae* = nil. Hence, the

Table 1: Mean acceptability score of attributes between the samples: Shrikhand by composite scoring

Parameter	*Standard Mean ± SD*	*Sample T1 Mean ± SD*	*Sample T2 Mean ± SD*	*Sample T3 Mean ± SD*	*ANOVA p value*
Color	9.02 ± 0.84	8.12 ± 1.04^{ab}	7.80 ± 0.92^{ac}	7.66 ± 1.22^{ad}	0.000
Taste	16.52 ± 3.28	15.14 ± 3.48	15.24 ± 3.41	15.12 ± 3.44	0.118
Texture	8.70 ± 0.76	7.96 ± 0.90^{ab}	7.42 ±1.14^{acb}	7.48 ± 1.05^{ad}	0.000
Appearance	16.26 ± 3.60	15.28 ± 3.59	15.16 ± 3.69	14.98 ± 4.15	0.327
Aroma	8.36 ± 1.24	7.78 ± 1.25	7.64 ± 1.12^{ac}	7.62 ± 1.15^{ad}	0.006
Mouthfeel	8.06 ± 1.33	7.48 ± 1.29	7.22 ± 1.18^{ac}	7.30 ± 1.44^{ad}	0.007
Overall	16.38 ± 3.36	15.40 ± 3.56	15.22 ± 3.59	15.08 ± 3.93	0.269

Standard: Normal Shrikhand Sample T1: Shrikhand incorporated with 12.5g of pomegranate flower powder Sample T2: Shrikhand incorporated with 18 g of pomegranate flower powder Sample T3: Shrikhand incorporated with 25g of pomegranate flower powder. ANOVA (p <0.05) mean value with the same superscripts were significantly different as tested by ANOVA post hoc test

Table 2: Proximate analysis of dry pomegranate flower powder

S. No	Parameter	Results
1	Energy (Kcal)	285.6
2	Protein (gm)	9.4
3	Total Fat (gm)	2.35
4	Total carbohydrate (gm)	10.84
5	Dietary fibre (gm)	14.84
6	Anthocyanins (mg)	448.8
7	Ash content (%)	2.53
8	Moisture content (%)	11.8

Table 3: Physical analyses of shelf life of developed product were

S. no	Parameter	Test results
1	Appearance	Solid
2	Odor & flavor	Good
3	Taste	Sweet
4	Moisture	50.4%
5	Ash Content	0.85%
6	Acid-insoluble ash	0.33%
7	pH	6.92
8	The acidity of extracted fat	0.53%
9	Rancidity	No rancid odour detected

Table 4: Microbiological analysis of the product developed (sample analyzed for 2 days)

Name of microorganisms	Incubation time	Tempera-ture	No. of colonies	Tempera-ture	No of colonies	Max limit	Total average colony	Total colonies
TPC	72 hr max	28–30°C	115 cfu	35°C	138 cfu	10000 cfu/gm	253 / 2	126.5 cfu/gm
Coli form	24 hr max	30°C	Absent	35°C	Absent	Absent/gm	Absent	Absent/ gm
Yeast and mold	120 hr max	22–24°C	34	28°C	68	50 cfu / gm	102 / 2	51 cfu/ gm
Entero-bacteriaeea	48 hr max	22–24°C	Absent	28°C	Absent	Absent / 0.1 gm	Absent	Absent/ 0.1g

Shelf life of The product developed with the incorporation of 12.5g of pomegranate flower powder was analyzed, and results revealed that product is best before two days from date of manufacture.

Table 4 depicts the microbiological analysis of the developed product from pomegranate flower for hepatic patients. The table shows the incubation time, Temperature, and a number of colonies formed by the microorganisms like coli form, yeast and mold, and *Enterobacteriaceae*.

Conclusion

The study concludes that the product developed with a concentration of 12.5 g of pomegranate flower powder was highly acceptable by the composite scoring test. The Shelf life of highly acceptable product was of two days from the date of manufacture. Further, the study can be regarding the intervention of developed product for human Trials with the dosage of 100gm of shrikhand in a day.

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