Development and Nutritional Assessment of Herb Fortified Pomegranate Beverage

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Abstract

The herbs such as ashwagandha (*Withania somnifera*) and tulsi (*Ocimum sanctum*) are rich in phenols, minerals and strong free radical scavenger activity. The extract of selected herbs was fortified in pomegenate juice to improve the health and nutritional requirements. The different levels of a tulsi extract (3%, 4%, 5%, and 6%) and ashwagandha extract at (0.6 %) were fortified in pomegenate juice to prepare ready to serve beverage. Each sample was subjected to sensory evaluation by a panel of semi-trained individuals. The results of sensory evaluation show highest acceptability (overall acceptability 7.8) for sample with 0.6 % ashwagandha and 4% tulsi extract. The same sample was analysed for mineral, antioxidant and total phenol content which recorded potassium 121.32, magnesium 9.87, sodium 59.7, copper 0.3, DPPH scavenging activity 52% and 8.4 (GAE/100g) respectively.

Keywords: pomegranate juice, basil extract, ashwagandha, sensory evaluation, physicochemical evaluation, antioxidant, phenol, storage.

Introduction

The pomegranate (*Punica granatum*) is fruit well identify for its nutritional benefits. The ratio of fruit such as peel: arils: seeds is approximately 50:40:10. The fruit arils contain 85% water, 10% total sugar (fructose and glucose), 1.5% pectin, organic acids (such as citric acid, ascorbic acid, and malic acid), as well as bioactive compounds like phenolic and flavonoids. Pomegranate fruit offers a significant health advantage by combating oxidative stress and reducing levels of inflammatory mediators (Panth *et al*., 2017). Juice from pomegranates contains a lot of polyphenolic components. The main groups are tannins and flavonoids, which suggest the pomegranate's medicinal potential due to its high antioxidant and preservation properties.(Zarfeshany *et al*., 2014). Pomegranate juice is a reliable source of vitamin B5 (panthotenic acid), polyphenols (tannins, flavonoids), minerals (potassium, sodium, iron, copper), ascorbic acid (Heyn,1990).

The roots of Ashwagandha primary compounds known as withanolides (steroidal compound) which deliver extraordinary medicinal properties for the disease (Verma and Kumar, 2011).In Ayurveda medicine Ashwagandha is called a Rasayana herb (*Withania somnifera*) is a medicinal plant that extends over a large area. The botanical liquid extract of the herb can be used in effective beverages to help improve the health (Mishra *et al.*, 2000). Indian Basil (Tulsi) comes with loads of health benefit as it is a rich source of vitamin C, β carotene. Basil is useful in treatment of fever, common cold, antispasmodic, appetizer, carminative, and anti-inflammatory properties (Sethi, 2020). A mixture of herbal extracts will be used in the current research for development of novel pomegranate juice based beverage

Basil (*Ocimum sanctum Linn.*) is well known medicinal plant in traditional medicine from back several 1000 years. Tulsi or Holy Basil from the family *Lamiaceae* is known as the “Queen of plants” and the “mother medicine of nature” for presence medicinal qualities. Tulsi present in different forms like fresh extract from leaves or dried powder in herbal teas or mixture with other herbs like in to honey enhance the medicinal value. Extract from Tulsi leaves is claimed for numerous useful properties such as expectorant, anti-asthmatic, and anti-inflammation, hypoglycemic, hypolipidemic (Yamani *et al*., 2016). Therefore, the ashwagandha and basil extract where used for developed herb fortified pomegranate beverage. The developed was assessed for chemical and nutritional properties.

2. Materials and methods

2.1 Raw materials

Raw materials such as fruits (Pomegranate- variety *Arakta*), sugar, Ashwagandha extract, Tulsi (holy basil) leaves were purchased from the local market Loni Kalbhor, Pune.Other raw material like sugar, pectin, preservative was also procured from the local market pune.

2.2 Methods

2.2.1 Extraction of pomegranate juice

The fruits were washed, peeled and arils were separated. The pomegranate juice was extracted in food processor and the seeds were added as a part of waste with peel.

2.2.2 Preparation of extract

The Tulsi leaves were washed, cut and steam blanched in laboratory steamer at 100ºC for 2 minutes. The Tulsi juice was filtered through muslin cloth to remove the fibres and sediments. The method for tulsi extract preparation was as per (Hingne *et a*l., 2020) with slight modification.

2.2.3 Development of pomegranate herb fortified beverage

The Ashwagandha extract and prepared Tulsi extract were mixed in the pomegranate juice 0.6% and 4% respectively as per the formulation depicted in table 1. All the ingredients were properly blended and the finished beverage was undergone pasteurization at 90° C for 15 sec. The hot filling process was carried out at 75° C in sterile PET and glass bottles. The beverage was then allowed to cool at ambient temperature before being kept chilled at 8 to 12 C for additional storage research.

2.2.4 Formulation of herbal pomegranate beverage

Table 1: Standardized formulation of herb fortified beverage

Sr. No.	Ingredient	T0	T1	T2	T3	T4
1	Pomegranate juice (%)	25	25	25	25	25
2	sugar (%)	10.8	10.8	10.8	10.8	10.8
3	Citric acid (%)	0.25	0.25	0.25	0.25	0.25
4	Ashwagandha (%)	-	0.6	0.6	0.6	0.6
5	Tulsi extract (%)	-	3	4	5	6
6	Pectin (%)	-	0.7	0.7	0.7	0.7
7	water (%)	63.95	59.35	58.35	57.35	56.35

2.3.1 Sensory evaluation of herb fortified beverage

The MIT School of Food Tech loni used a semi-trained panel to assess the new beverage's sensory quality. Twelve semi-trained members used a nine point hedonic scale to evaluate the qualitative aspects of color, flavor, taste, consistency, mouthfeel, and overall acceptability. (Amerine *et al*., 1965).

2.4 Chemical analysis

2.4.1 pH

The pH of juice was measure by using perkin-Elmer meter.

2.4.2 Acidity

The acidity of juice were measured by using titration method with 0.01N sodium hydroxide (Ranganna, 1986).

2.4.3 Total soluble solid

Total soluble solid (TSS) was measured by using Erma hand refractometer. Take a drop of a juice on the prism and hold the refractometer into the light, then look through the eyepiece to get reading.

2.5 Nutritional composition

2.5.1Minerals estimation

Minerals content *viz.*, potassium, magnesium, sodium, copper was analysed by as per standard method Ranganna, (1986).

2.5.2 Antioxidant and radical scavenging assay

The level of antioxidant activity was assessed using DPPH (1, 1 diphenyl 1-2 picrylhydrazyl) radical scavenging assay.

2.5.3 Total phenolic content

Using the folin-Ciocalteu reagent in triplicate and an absorbance measurement at 650 nm, the total phenolic content was ascertained.

2.5.4 Estimation of Vitamin C

Vitamin C estimated as per the method prescribed by Ojukwu and Nwobi, (2017).

3. Statistical analysis:

Triplicates of each experiment were run. Data were statistically analysed using one-way ANOVA. Package to evaluate the significance at $p<0.05$.

4. Result and Discussion

4.1 sensory analysis

The sensory evaluation of pomegranate herbal beverage at different concentrations of Ashwagandha and Tulsi extract was carried out in comparison to control (pomegranate beverage without herbal extracts) beverage. The rubric for sensory evaluation comprised of colour, taste, flavour, mouth feel, consistency and overall acceptability parameters. The semi-trained panel set-up at MIT School of Food Technology was used to assess the quality parameters of developed test samples (S_0, S_1, S_2, S_3 and S_4) on Hedonic scale of a 9-point .

The herbal extract fortified beverage samples recorded significant improvement in sensory scores compared to control beverage sample. The sample S_2 (0.6g Ashwagandha + 4g Basil extract per 100g beverage) was found to have the highest significant difference ($p<0.05$) scores for colour (8.1), taste (7.9), flavour (7.2) consistency (7.5), mouth feel (7.8) and overall acceptability (7.8) compared to control sample with overall acceptability (7.6). The improved sensory score because of fortification of herbal extracts such as basil was notified by (Lall *et al.*, 2019; Hingne *et al.*, 2020) Goat milk based herbal beverage and in herbal milk fortified with basil and aloe Vera. And ashwagandha extract by Dhumal *et al.*, (2006) in beverage it contains Ashwagandha extract.

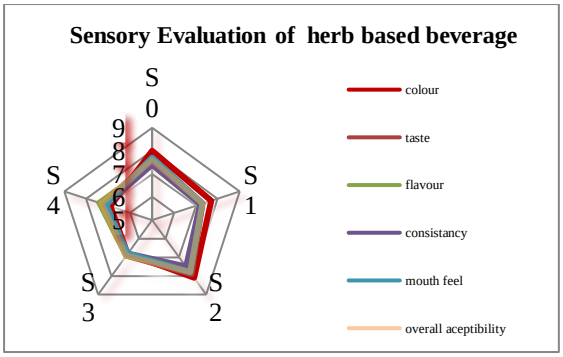

Fig 1: sensory evaluation of herb based beverage

4.2 Physicochemical analysis

The herb fortified and control beverage was prepared according to the formulation. The physicochemical properties were analysed and are tabulated in table 2. Which revealed that TSS of pomegranate herb fortified beverage is 15 ℃Bx, acidity 0.33, pH 3.3 and vitamin C is 5 as it during the preparation of beverage.(Sandhan *et al.,* 2009)**;** (puranik *et al.,* 2013).

Table 2: Physicochemical analysis of beverage

Sample	TSS (℃Bx)	% Acidity	pH	Vitamin C (mg/100g)
control	13	0.31	3.0	3
S2 (0.6g Ashwagandha + 4g Basil extract per 100g pomegranate beverage)	15	0.33	3.3	5

4.3 Nutritional composition

4.3.1 Mineral estimation

The selected mineral profile (sodium, potassium, magnesium, and copper) of control and S_2 beverage sample is calculated. The significant difference observed in mineral content of control and fortified beverage values. An increasing trend for potassium from 95.7 to 121.32 (mg/100g), magnesium from 5.31 to 9.87(mg/100g), sodium 54.0 to 59.7(mg/100g) and copper from 0.05 to 0.3 (mg/100g) was observed in present investigation due to fortification of herbal extracts. The similar result was recorded by (Maiman and Ahmad, 2002); (Akhtar *et al.,* 2013). The rise in mineral content of S_2 sample could be due to the inherent mineral richness of tulsi and Ashwagandha which after fortification improved the mineral profile of pomegranate beverage.(Vidhani *et al.,* 2016);(Gulati *et al*., 2017).

Table no 3: minerals content in herb fortified beverage

Sr. no	Sample	Potassium (mg /100g)	Magnesium (mg /100g)	Sodium (mg /100g)	Copper (mg /100g)
1	Control pomegranate beverage	95.7	5.31	54.00	0.05
2	S2(0.6gAshwagandha + 3g Basil extract per 100g pomegranate beverage)	121.32	9.87	59.7	0.3
3	SE ±	0.47	0.41	0.42	0.03
4	CD@5%	1.85	1.62	1.65	0.12

4.4 Antioxidant and radical scavenging assay and total phenolic content

The total phenolic content and % DPPH inhibition of control and fortified pomegranate beverage. The significant difference was observed in total phenolic content and DPPH scavenging activity of control and fortified beverage. The values for total phenolic content increased from 2.06 to 8.4 (GAE/100g) and %DPPH from 25.27 to 52% for control and fortified beverage respectively. The results % DPPH scavenging activity and total phenolic content are in agreement with Gil *et al., (*2000); Puranik *et al*., (2013).The significant increase in %DPPH scavenging activity could be due to increased total phenolic content. The positive correlation between a for mentioned components was notified by Soha *et al.,* 2015; Gaur *et al*., (2019).

Table no 4: nutritional composition in herb fortified beverage

Sr. No.	Samples	Total phenolic content (GAE/100g)	% DPPH Scavenging activity
1	Control pomegranate beverage	2.06	25.27
2	S2 (0.6g Ashwagandha + 4g Basil extract per 100g pomegranate beverage)	8.4	52
3	SE±	0.07	0.44
4	CD @5%	0.28	1.73

5 Conclusions

The evaluation showed clear preference for selected sample (25% of pomegranate juice + 4% tulsi leave extract + 0.6% ashwagandha root extract) sample which was found to have the highest scores for colour (8.1), taste (7.9), flavour (7.2) consistency (7.5), mouth feel (7.8) and overall acceptability (7.8),So selected sample formulation was highest acceptability than other sample. The developed pomegranate herbal beverage having nutritional composition (total phenolic content 2.06 to 8.4 (GAE/100g) and %DPPH from 25.27 to 52%)

and requires health benefits for commercial exploration with technological and economic feasibility.

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