

RESEARCH PAPER

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Sensory attributes of the squash made from bael and pineapple

■ S.B. PALVE*, N.G. DEVSHETE AND T.S. KULKARNI

Department of Food Engineering, K.K. Wagh College of Food Technology, NASHIK (M.S.) INDIA

Email : sbpalve@kkwagh.edu.in; ngdevshte@kkwagh.edu.in and kulkarnit63@yahoo.in

*Author for Correspondence

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SUMMARY :

Sensory attributes of the squash prepared from bael (*Aegles marmelos*) and pineapple (*Ananas comusus*) fruit juices was evaluated. Fruit juices of ripe bael and pineapple fruits were incorporated for the preparation of the squash at different levels where T₀ (100% bael juice), T₁ (75% bael and 25% pineapple juice), T₂ (70% bael and 30% pineapple juice), T₃ (60% bael and 40% pineapple juice) and T₄ (50% bael and 50% pineapple juice). Good quality squash can be prepared by blending 70 per cent bael and 30 per cent pineapple fruit juice (T₂). Bael and pineapple fruits have good medicinal and nutritional properties like improvement of digestive system, anti-diabetic, pyretic, laxative, anti-oxidant, etc. It is seen that the organoleptic score of the squash prepared by blending 70 per cent bael and 30 per cent pineapple fruit juice was highest, i.e 7.82, followed by the treatment T₁, T₃, T₀ and T₄.

KEY WORDS : Bael, Pineapple, Squash, Sensory

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Squash is easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to mainly synthetic and aerated drinks (Sidappa, 1986). Processing of fruits and vegetables to the juice and other valuable products are ways abundant fruits and vegetables can be utilized to reduce the wastage and bring economic return to the farmer. Fruits generally used for making squash are oranges, grapes, apples, lemons, mangoes and pineapples.

Many of the tropical fruits and some other fruits have not been utilized in area of fruit juices like bael fruit. *Aegle marmelos* is commonly called as bael, or bel or Bengal quince or wood apple.

Bael (*Aegles marmelos*) is a tree of Indian Origin and is known from prehistoric time. It has a great mythological significance for Hindus. Utilization of bael in day to day life has great nutritional, environmental as well as commercial importance but it is not fully utilized. Bael tree has its origin from Eastern Ghats and Central India and is most commonly found in growing along foothills of Himalayas, Uttar Pradesh, Bihar, Chhattisgarh, Uttaranchal, Madhya Pradesh and East Coast (Singh, 2000 and Purohit and Vyas, 2004). It is incumbent upon all Hindus to cultivate and cherish this tree and it is sacrilege to cut it down (Dhiman, 2003). Bael plant acts as a 'Absorbent' for chemical pollutant as it absorbs

poisonous gases from atmosphere and make them neutral, thus, reducing its harmful effects on the environment (Sharma *et al.*, 2007).

Systemic classification	
Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub-class	Rosidae
Order	Sapnidales
Family	Rutaceae
Genus	<i>Aegle</i>
Species	marmelos

The tree is slow growing and may reach a height of 40-50 feet. Tree has a short trunk and the bark is thick, soft and flaking. When wounded, the branches give out a clear gummy sap which hangs down like strands but eventually solidifies. The tree bears alternate leaves that are in 2's and 3's. The branches sometime bear spines and the fruit is often drooping. The inflorescence of contains a bunch of fragrant flowers that vary from 4 to 7 in number (Chakraborty *et al.*, 2012).

In India, the plant is widely cultivated in Uttar Pradesh and Bihar. So far around twelve distinct cultivars, viz., Basti No. 1, Kagzi Gonda, Gonda No. 1, Gonda No.

Nutritional value of bael fruit (% per 100g)	
Components	Value (%)
Moisture	64.2
Protein	1.8
Fat	0.2
Mineral	1.5
Fibre	2.2
Carbohydrate	30.6
Calcium	0.09
Phosphorus	0.05
Potassium	0.6
Iron	0.3
Vitamin A (IU)	186
Vitamin B ₁	0.01
Nicotonic acid	0.9
Riboflavin	1.2
Vitamin C	0.01
Calorific value	129

(Shankar and Garg, 1967 and Paricha, 2004)

2, Gonda No. 3, Kagzi Etawah, Sewan Large, Mirzapuri and Deoria large have been found to be superior and excellent in taste and other qualities (Jauhari and Singh, 1971).

Bael plant is mostly prized for its fruit. The fruit is a pyriform, may vary from oval to round, and size varies from 10-20 cm in diameter. The fruit has a hard, woody exocarp and inside it is a thick, fleshy and aromatic, slightly sweet pulp. The colour of the pulp may vary from bright orange to sunset yellow and the pulp contains seeds that are present in grooves and is surrounded by thick, clear mucilage. Both ripe and unripe fruits are used for their medicinal values. The peel of the fruit which is a very hard shell and green to brown in colour depends on ripening stage. The appearance of yellow or orange edible pulp is like a boiled pumpkin, possesses a slightly sweet taste and a characteristic floral, terpene like aroma, very fragrant and pleasantly flavoured. The ripe fruit of bael is sweet aromatic, nutritious and very palatable being highly esteemed and eaten by all classes of people (Charoensiddhi and Anprung, 2008).



Bael fruit

Chemical constituents of bael fruit :

Coumarins :

The coumarins present in bael fruit includes marmelosin, marmesin, imperatorin, marmin, alloimperatorin, methyl ether, xanthotoxol, scoparone, scopoletin, umbeliferone, marmelide and marmenol (Sharma *et al.*, 2007).

Alkaloids :

Aegelin, aegelinine, fragine, o-methylhalfordinine, o-isopentanylhalfordinol, N-2-[4-(3',3'-dimethylallyloxy)phenyl]ethyl cinnamide, o-(3,3-dimethylallyl) halofodinol, Ethyl cinnamide (Sharma *et al.*, 2007).

Phenylpropanoids :

Hydroxycoumarins, phenylpropenes, lignans (Chakraborty *et al.*, 2012).

Polysaccharides :

Galactose, arabinose, uronic acid, L- rhamanose (Sharma *et al.*, 2007).

Seed oils :

Palmitic acid, stearic acid, oleic acid, linoleic acid and linolenic acid (Sharma *et al.*, 2007).

Tannins :

Highest percentage of tannins recorded in bael fruit is 9 per cent and was recorded (Chakraborty *et al.*, 2012).

Carotenoids :

Imparts colour to the fruit pulp (Sharma *et al.*, 2007).

Minor constituents :

Ascorbic acid, sitosterol, crude fibres, α -amyirin, crude proteins (Farooq, 2005).

It acts as a brain and heart tonic. The plant contains hypoglycemic, hypolipidemic and blood pressure lowering factor (Lambole *et al.*, 2010). The pulp is laxative in nature and thus, helps in curing gastrointestinal related problems such as diarrhea, dysentery and diabetes. In case of constipation, administration of ripe fruits cleans and tones up the intestines. Its regular use for 2-3 months has been effective in removal of even old and accumulated fecal matter from bowels.

Bael has anti-fungal and anti- bacterial properties. Bael is known to have anti- cancer activity, pyretic and analgesic and also provide relief in constipation (Sharma *et al.*, 2007). Bael extract, when administered at a dose of 250 mg/kg of body weight, shows better result than glycenamide (antidiabetic drug). This antidiabetic effect may be due to the coumarins present in the fruit which induce the beta cells of islet of Langerhans to produce insulin. Aqueous extract of bael seeds reduces blood glucose level in case of severe diabetic patients (Maity *et al.*, 2009; Kamalakkanan *et al.*, 2005).

A firm jelly is made from the pulp alone or combined with guava to modify the astringent flavour. The pulp is also pickled (Reuther *et al.*, 1967). The fruits are richest source of Vitamin-B2 as it contains 1191 mg/100g riboflavin. The processing of the ripe and unripe bael fruits

into many quality value added products like preserve (Singh *et al.*, 2014), candy, powder and beverages is only solution for its proper consumption (Chand *et al.*, 2007) because fruit is not popular as desert due to its mucilage content which makes fruit difficult to consume fresh without proper preservation. Nutritional point of view bael is rich source of carbohydrate, protein, vitamin A, riboflavin and minerals.

Pineapple is favorite for the lovers of fruit in its fresh form as well as in the preserved form like jam, jelly and squashes. It is of the most important commercial fruit in the world. It is known as the queen of the fruits due to its excellent flavour and taste. This fruit contains 14 per cent sugar, protein digesting enzyme Bromelain and good amount of citric acid, malic acid, vitamin A and vitamin B complex. Pineapple contains calcium, potassium, magnesium, fibre and vitamin C. It is low in fat and cholesterol. Bromelain which is useful for digestion is popular among athletes for treating all sorts of physical aches and injuries. Pineapple is a good source of manganese which thus makes it a good choice for boosting fertility by improving sperm quality. Pineapple also have an anti- inflammatory property, good property for healing of tissue injuries, joint and muscle pain, corn's and dry skins, strengthen bones, good for colds and coughs (Debnath *et al.*, 2012).

It is an excellent source of antioxidant, vitamin C which is required for the collagen synthesis in the body. It contains micronutrients and it protects against cancer and this micro-nutrient break up blood clots is beneficial to the heart (Tochi *et al.*, 2008).

Bael fruit is extensively meant for its medicinal values but is unutilized due to difficulty in processing and bitterness due to mucilage and seeds. To make it acceptable the pure extract of the bael was blended with pineapple juice and squash was prepared which made it highly acceptable.

EXPERIMENTAL METHODS

The bael and pineapple fruits required for the study were obtained from the local market of Nashik, Maharashtra. Fully ripened bael and pineapple fruits were used for the preparation of the squash in different levels viz., T₀ (100% bael juice), T₁ (75% bael and 25% pineapple juice), T₂ (70% bael and 30% pineapple juice), T₃ (60% bael and 40% pineapple juice) and T₄ (50% bael and 50% pineapple juice).

Collect fresh ripe bael fruits
 É
 (Free from infection)
 É
 Washing with fresh water
 É
 Removal of shell
 É
 Addition of water to the pulp in 1:1 ratio
 É
 Mixing properly
 É
 Removal of seeds and fibres
 É
 Heating at 82°C for 1 min
 (Inactivation of enzyme)
 É
 Extract through pulper
 É
 Strain through muslin cloth
 É
 Collect the fresh pulp
 É
 Centrifuge at 4000 rpm for 5 minutes
 É
 Collect the supernatant

Extraction of the bael juice (Singh *et al.*, 2014)

Blending of bael and pineapple juice at various levels like
 T₀, T₁, T₂, T₃, and T₄

É
 Make sugar syrup
 (84 g sugar in 64.6 ml water and 1 g citric acid)
 É
 Add 75ml sugar syrup to the blend
 É
 Bottling
 É
 Pasteurization (82°C for 2 min)
 É
 Cooling
 É
 Storage

Preparation of the squash (Fruit product order, 1955)

Selection of ripe pineapples
 É
 Removal of stem and crown portion
 É
 Washing of fruits with water
 É
 Peeling and removal of eyes
 É
 Slicing and juice extraction
 É
 Filtration of juice
 É
 Centrifugation at 3000 rpm for 4 minutes
 É
 Collect the supernatant
Extraction of pineapple juice

EXPERIMENTAL FINDINGS AND ANALYSIS

The experiment was replicated 3 times and total 15 samples of squash were prepared and served to panel of expert to judge the product. Sensory evaluation of the squashes were judged for colour, taste, clarity, consistency, aroma and overall acceptability on a nine point hedonic scale, varying from “dislike extremely” (score 1) to “like extremely” (score 9) (Stone and Sidel, 1992).

The organoleptic score for colour ranged from 5.5 to 7.5. Highest score for T₂ was found 7.5 which was superior over all remaining treatments, *i.e.* T₀, T₁, T₃ and T₄.

The organoleptic score for clarity ranged from 6.53 to 7.47. Highest score for T₁ was found 7.47 which was superior over all remaining treatments, *i.e.* T₀, T₂, T₃ and T₄.

The organoleptic score for aroma ranged from 6.0 to 7.5. Highest score for T₁ and T₂ was found 7.5 which was superior over all remaining treatments, *i.e.* T₀, T₃ and T₄.

The organoleptic score for consistency ranged from 7.0 to 7.85. Highest score for T₂ was found 7.85 which was superior over all remaining treatments, *i.e.* T₀, T₁,

Table 1 : Replication 1

	Colour	Clarity	Aroma	Consistency	Taste	Overall acceptability
T ₀	5.1	6.8	5.8	7.0	4	6
T ₁	6.45	7.50	7.3	7.9	7.4	7.7
T ₂	7.3	7.4	7.25	7.86	7.6	7.56
T ₃	6.5	7.2	7	7.0	7.35	7.76
T ₄	5.8	6.5	6.7	7	6.7	6.0

T₃ and T₄.

The organoleptic score for taste ranged from 5 to 8.0. Highest score for T₂ was found 8 which was superior over all remaining treatments, i.e. T₀, T₁, T₃ and T₄.

The organoleptic score for overall acceptability ranged from 6 to 7.82. Highest score for T₂ was found 7.82 which was superior over all remaining treatments, i.e. T₀, T₁, T₃ and T₄ (Table 1 to 4 and Fig. 1).

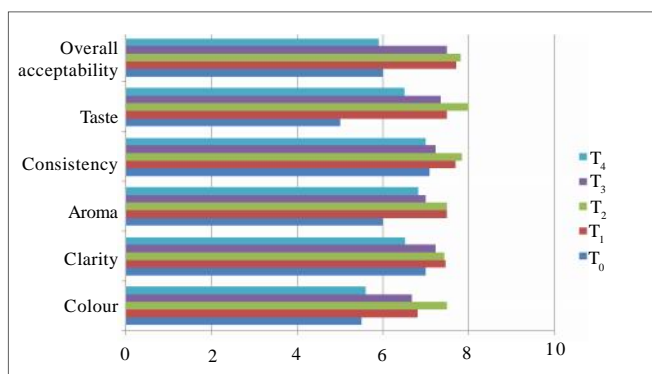


Fig. 1 : Organoleptic score

Sindhumathi and Premalatha (2015) recorded sensory attributes for development and storage studies of naturally flavored papaya- Pineapple blended RTS beverages.

Tiwari and Deen (2014) recorded the observation on preparation and storage of blended RTS beverage from bael and aloe vera.

Conclusion :

From the result of present investigation, squash developed from blend of bael and pineapple fruit was having appealing colour and pleasing flavour. It may be concluded that good quality squash can be prepared by blending 70 per cent bael and 30 per cent pineapple fruit juice. Treatment T₂ scored the highest points (7.82) followed by T₁, T₃, T₀ and T₄. A 50:50 proportion did not show good result in terms of sensory attributes. The good quality squash is acceptable and thus, it helps in utilization of the bael fruit. Indian food technologist should consider scope for expanded bael fruit processing as highly

Table 2 : Replication II

	Colour	Clarity	Aroma	Consistency	Taste	Overall acceptability
T ₀	5.4	6.9	6.2	7.4	5	6
T ₁	7.5	7.2	7.6	7.50	7.47	7.6
T ₂	7.45	7.5	7.75	7.95	8.2	7.78
T ₃	6.81	7.4	6.9	7.2	7.35	7.44
T ₄	5.5	6.4	7.0	7.2	6.6	5.85

Table 3 : Replication III

	Colour	Clarity	Aroma	Consistency	Taste	Overall acceptability
T ₀	6	7.3	6	6.9	6	6
T ₁	6.52	7.7	7.6	7.69	7.61	7.88
T ₂	7.75	7.4	7.5	8.04	8.2	8.12
T ₃	6.7	7.1	7.1	7.5	7.35	7.3
T ₄	5.5	6.7	6.8	6.8	6.2	5.9

Table 4 : Mean table

	Colour	Clarity	Aroma	Consistency	Taste	Overall acceptability
T ₀	5.5	7.0	6	7.1	5	6
T ₁	6.82	7.47	7.5	7.69	7.49	7.72
T ₂	7.5	7.43	7.5	7.85	8	7.82
T ₃	6.67	7.23	7.0	7.23	7.35	7.5
T ₄	5.6	6.53	6.83	7	6.5	5.9

promising. These drinks are consumed less as a food or refreshment than for their medicinal effects.

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