

Study of Development of Pomo-Lime Nectar Fortified with Sweet Lime Peel Powder

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Abstract: Nectar is ready to drink type of beverage, which is prepared from mango, litchi, guava, papaya, citrus fruits and pineapple. As per FSSAI specification nectar should contain TSS not less than 15^o brix, not less than 20% fruit content, and acidity not less than 1.5%. Citrus limetta is popular indigenous citrus fruit relished for its cooling and therapeutic effect. It contains high amount of Vit.C which increases the resistance of individuals to several diseases. Citrus limetta peels are considered to be one of the potential sources for the screening of anticancer, antimicrobial, antioxidant, and free radical scavenging agents. Pomegranate juice is a rich source of Ellagic acid, polyphenols, tannins, anthocyanins, including vitamin C, vitamin E, coenzyme Q10, and lipoic acid. Pomegranate fruit juice, seeds, and seed oil act in prostate, breast, skin, colon, lung, oral and leukaemia cancers, through antioxidant antiproliferation, antiangiogenesis and anti-inflammatory mechanism of action.

Keyword: Nectar, Anticancer, Antioxidant, Vit C, Citrus limetta peels

1. Introduction

Nectar is a non fermented beverage, formulated using the juice or pulp of one or more fruits, water in certain concentration resulting in the product of ready to drink product [1]. It is prepared from the tropical fruits pulp such as mango, litchi, guava, papaya, citrus fruits and pineapple by adding sugar, acid and other ingredients. As per FSSAI specification nectar should contain TSS not less than 15^o brix and not less than 20% fruit content, except for pineapple and citrus fruits where fruit content should not be less than 40%. The acidity of nectar should be up to 1.5%. Nectar is not diluted before serving[2]

Sweet lime is known as Mousambi in India, and its scientific name is *Citrus limetta*. Its skin is greenish orange in color and its flesh is pale yellow in color. *Citrus limetta* belongs to genus citrus (*Rutaceae*) especially comprises of trees, shrubs, and herbs of various sizes and uses [3]. It is popular indigenous citrus fruit relished for its cooling and therapeutic effect. In the traditional indigenous medicinal system sweet lime juice is valued for curing fever, malaria and jaundice [4]. The vitamin C as a primary component of the lime juice increases the resistance of individuals to several diseases, helps in wound healing and increases the health of eyes, improves the maintenance of good dentition and keeps away toothache, dental caries, and swollen gums, fragility of bones and bleeding of the gums. It also contains citric acid, sugar, certain minerals like calcium and phosphorus. The acidic juice of lime facilitates the lipid and alcohol absorption and neutralizes excessive bile produced by the liver. The juice reduces gastric acidity, therefore useful in treatment of peptic ulcers. Lime juice acts as curative for tonsillitis, provides relief from burning sensation, stops bleeding in cystitis, treatment of gastric disorder like indigestion, constipation and peptic ulcer [5]. Sweet lime has been traditionally used for several medicinal purposes. In Mexico the fruit is used for its Antihyperglycemic and Antihypertensive activity [6]. The fruit has shown anti-inflammatory and antithrombotic action [7]. There are various compounds

present in *Citrus limetta* peels are considered to be one of the potential sources for the screening of anticancer, antimicrobial, antioxidant, and free radical scavenging agents[8]. In the Mediterranean region the peel is chewed to sweeten the breath. It is used to treat partial paralysis and the juice extracted from the peel is effective against snake bite. The ash of peel is good against leprosy and skin diseases [9].

Pomegranate (*Punicagranatum*) is an ancient fruit-bearing deciduous shrub. It is a native of the Himalayas in northern India, but it has been cultivated and naturalized throughout the Middle East, the entire European Mediterranean region, the drier parts of Southeast Asia, northern and tropical Africa, and to some extent the United States, especially California and Arizona [10]. The fruit can be divided into three parts: the seeds and the juice, which represent about 3 and 30% of the fruit weight, respectively, and the peels [11]. Pomegranate has been consumed and used as a medicinal food in the Middle East for thousands of years [12]. The edible part of the fruits contains acids, sugars, vitamins, polysaccharide polyphenols and minerals, however several factors may contribute to the chemical changes, including cultivars, environmental conditions, ripening storage and postharvest treatments, which may affect fruit quality and health beneficial compounds[13]. Pomegranate juice may be fruitful as a therapy for prostate cancer, particularly recurrent type of cells. Pomegranate juice was also reported effective in hypertension by decreasing Angiotensin Converting Enzymes (ACE) activity; reducing myocardial ischemia and improving myocardial perfusion; in diabetes through a significant effect on atherogenesis through reduced oxidative stress [14].

Pomegranate consists of Ellagic acid, ellagitannins (including punicalagins), punicic acid, flavonoids, anthocyanidins, anthocyanins, estrogenic flavonols and flavones appear to be the most therapeutically beneficially pomegranate components[15]. Especially ellagitannins, which release ellagic acid when hydrolyzed. Pomegranate juice is a rich source of polyphenols, tannins, anthocyanins, including

vitamin C, vitamin E, coenzyme Q10, and lipoic acid [16]. Its main antioxidative compounds are anthocyanins and ellagic acid derivatives, which are the main constituent of the juice, giving the fruit its color [17]. The health effect of pomegranate can vary due to geographical region, harvesting and season, which can alter the fruit composition [18]. Ellagic acid, which present both antioxidant [19] and anticarcinogenic [20], properties is thought to be the main compound responsible for pomegranate health beneficial effect, recent studies suggest that the synergistic action of several pomegranate constituent is superior to ellagic acid alone in suppression of prostate cancer [21, 22]. Pomegranate provides insulin resistance and prevents obesity [23].

Pomegranate fruit juice, seeds and seed oil act in prostate, breast, skin, colon, lung, oral and leukaemia cancers, through antioxidant, antiproliferation, antiangiogenesis and anti-inflammatory mechanism of action [24]. Pomegranate juice had the greatest antioxidant potency composite index among beverages like black cherry juice, cranberry juice, grape juice, apple juice, orange juice, red wines, blueberry juice and iced tea; and the antioxidant activity was at least 20% superior to any of other beverage tested [25].

2. Materials and Methods

2.1 Materials procurement

Pomegranate, Sweet lime, Sorbic acid and sugar were procured from the local market at Nashik Maharashtra. Fresh pomegranate and Sweet lime subjected to cleaning, sorting and grading operations and were further utilized for further processing.

2.2 Preparation of Pomegranate and Sweet lime juice

Collect, cleaned and graded pomegranate. Then remove rind and separate the arils. Extract the juice by pressing and separate the seeds. Filter the juice by using muslin cloth. Also take fresh Sweet lime, remove peels and extract juice. Filter the juice using muslin cloth.

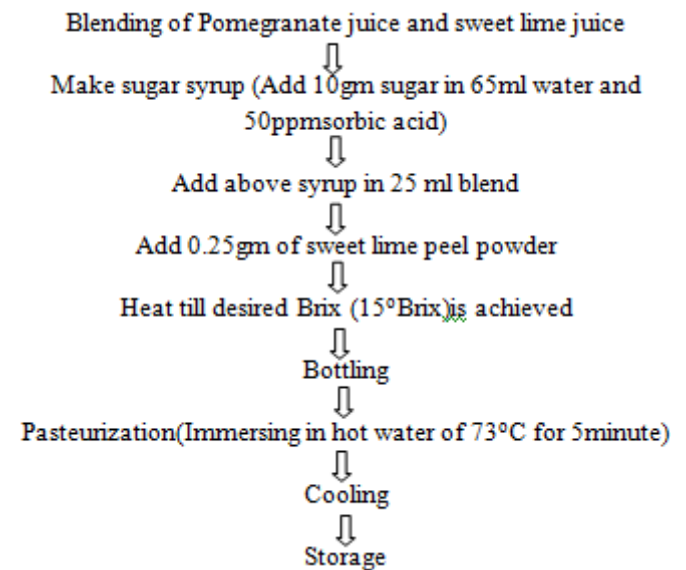
2.3 Preparation of Sweet lime peel powder

Collect Sweet lime peels and wash by using water. Make small pieces of peels and dry in vacuum drier. After complete removal of moisture grinding and sieving was done.

2.4 Preparation of Pomo-lime nectar

Pomegranate and sweet lime was first procured from local market and graded. Wash and remove the peels of both fruits, and extract the juice. Then filter the juice to get clear extract. Make a blend of 3 parts of pomegranate juice and 1 parts of sweet lime juice. Make sugar syrup (10°Brix) and add blended juice in it, add a sorbic acid (50ppm) as a preservative. Add (0.25%) sweet lime peels powder. Heating is done until 15-17° brix is obtained. Hot filled in sterilized bottles, seal and keep it at room temperature.

2.5 Basic Procedure



3. Variations in Pomo-lime Nectar formulation

Three variations in formulations were carried out which mainly varied in Pomegranate and Sweet lime juice concentration.

Table 1: Variation of the prototype

Ingredients	Sample A	Sample B	Sample C
Pomegranate juice	75ml	50ml	25ml
Sweet lime juice	25ml	50ml	75ml
Citrus peel powder	0.25gm	0.25gm	0.25gm

3.1 Sensory analysis protocol

9 point hedonic scale was used for analyzing different sensory attributes like appearance, color, flavor and overall acceptability by a panel of 10 trained members having experience in sensory evaluation of fruits and vegetable products. Average scores were calculated accordingly.

4. Result and Discussion

4.1 Sensory Evaluation

The hedonic scale was used and average scores were obtained accordingly. It was observed that Sample B and Sample C had same average scores but was lower than Sample A which had an average color score of 8, similar trend was seen in other attributes like flavour. Although there was a marked difference in the scores of the taste attributes, highest score was obtained by sample A. Overall; all the sensory attributes indicated higher average score of A. So sample A was selected for further formulation.

Table 2: Average scores of sensory analysis

Sample	Sensory Attributes				Overall Acceptability
	Colour	Appearance	Flavour	Taste	
A	8	8.5	7.9	8.8	8.3
B	7.5	7	6.7	7	7.2
C	7.5	6.8	6.6	6.8	6.8

After conducting sensory analysis by prescribed number of panelist using hedonic scale rating it was decided that sample "A" was satisfactorily accepted.

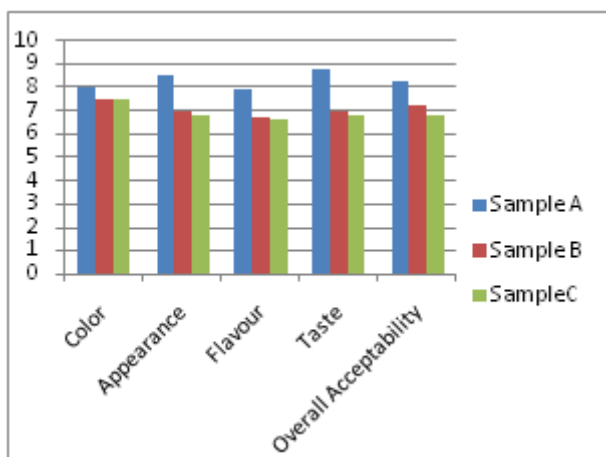


Figure 1: Graph of sensory evaluation of pomo-lime nectar:

Table 3: Sensory score for Colour of Nectar

Sample	Colour
A	8
B	7.5
C	7.5

Table 4: Sensory Score for Appearance of Nectar

Sample	Appearance
A	8.5
B	7
C	6.8

Table 5: Sensory score for Flavour of Nectar

Sample	Flavour
A	7.9
B	6.7
C	6.6

Table 6: Sensory score for Taste of Nectar

Sample	Taste
A	8.8
B	7
C	6.8

4.2 Discussion

While making the Pomo-lime nectar extra addition of Sweet lime peels powder gives bitter taste in final product so to overcome this problem we reduce the proportion of sweet lime peels powder i.e. (0.25% added). At room temperature Pomo-lime Nectar get spoiled within four to five days, but at Refrigeration temperature (2 to 4°C) the shelf life of the product increases up to one month.

5. Conclusion

Pomegranate and Sweet lime are the fruits which have good therapeutic and nutritional value. Pomegranate juice is a rich source of polyphenols, tannins, anthocyanins, including vitamin C, vitamin E, coenzyme Q10, and lipoic acid and Sweet lime is a rich source of Vit C. Formulation of Pomolime Nectar (A) which can be mocktail type beverage,

scored highest in sensory evaluation with overall acceptability score of 8.3 out of 9. Use of sweet lime peel powder not utilizes peel by-product but enriches nutritional properties of developed pomo-lime nectar.

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