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GUAVA NECTAR AS A REFRESHING BEVERAGE AN OVERALL REVIEW

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Abstract

An attempt was made to update on review available literature on guava nectar prepared by cooled method is well organoleptic acceptability. With more grid cell due to sedimentation occurs during storage and nectar can be prepared with the combination of 20 per cent fruit pulp and 18^0Brix TSS and 0.3 per cent acidity is best for nectar preparation and its storage. This combination may be varies according to fruits and their blending, where as the above combination showed less physico-chemical changes and also showed higher organoleptic score. guava nectar can be stored better at ambient temperature more than six months. The present investigation entitled . In the experiment alternative sweetener like Equal, Splenda and Stevia were used for the preparation of low calorie guava nectar beverages. Among various recipe tried in this investigation, the nectar prepared from the treatment $\mathbf{T_3}$ (50% Equal + 50% Sugar) recorded highest organoleptic score with respect to colour and appearances aroma, taste and overall acceptability followed by $\mathbf{T_7}$ (50% Stevia + 50% Sugar). Ascorbic acid and non-reducing sugar was recorded maximum under the treatment $\mathbf{T_3}$ (50% Equal + 50% Sugar). Acidity, reducing sugar and total sugar was recorded maximum, $\mathbf{T_9}$ (100% Splenda).

Key word: guava, nectar, organoleptic, aroma

Introduction

Guava (*Psidium guajava* L.) also known as "apple of tropics" is an important tropical fruit belongs to family Myrtaceae. Guava is quite hardy, prolific bearer and highly remunerative even without much care. It is widely grown all over the tropics and sub-tropics of India including Chhattisgarh. Guava is being cultivated in 228,500 hectares, producing 2.71 million tonnes of fruits with a productivity of 12.32 MT/ha in India (Anon., 2012). Post harvest management has become an absolute necessity for effective exploitation of the export potential of fruits and vegetables. Fruits and vegetables losses are estimated at 35-40% due to improper post harvest management. Nectar is one of the refreshing beverages having zero carbonation, relatively few preservatives and excellent source of several important vitamins and minerals and is used as health drink. Therefore, it is necessary to utilize guava for making nutritious processed health food like nectar to increase availability over an extended period and to stabilize the price during the glut season. To utilize the produce at the time of glut and to save it from spoilage, the processing technology for preparation guava nectar is highly required. Today's consumers expect more and more pleasure from food. They want to drink such type of beverages which should be lower in fat and sugar. These facts resulted in development of sugar free as low calorie sweeteners.

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Physico-chemical composition of guava fruits

Ojha *et al.* (1987) observed seasonal variation in the physical characters of guava fruits in two guava cultivars *i.e.*, Sardar and Allahabad Safeda. They reported that the size and weight of fruits were more in winter season crop as compared to rainy season crop. The fruits of cultivar Sardar were superior over Allahabad Safeda with regard to size and weight of fruit during both croppingseason. The rainy season fruits produced more number of seeds per fruit as well as more seed weight per kg of fruit than the fruits harvested during winter season. The cultivar Sardar produced less number of seeds and also less weight of seed per kg of fruit than Allahabad Safeda during both the cropping season.

Singh (2003) evaluated the performance of guava cultivars Seedless, Behat Coconut, Chittidar, Allahabad

Safeda, Lucknow-49 and Red fleshed. The largest fruit (5.87 × 5.84 cm) and heaviest fruit (113.33 g) was recorded in Lucknow-49.

Aulakh (2004) studied the seasonal variation in yield and fruit quality of guava cultivars Allahabad Safeda, Apple Colour, Behat Coconut, Lucknow-49, Pear shaped and Red Fleshed. The maximam fruit weight and fruit size were recorded in Lucknow-49. The maximum total soluble solid content, ascorbic acid content and total sugar content was observed in Lucknow-49.

Jain and Asati (2004) observed that the guava pulp prepared from five cultivars *i.e.*, 'Allahabad Safeda' 'L-49', 'Apple Colour' Chittidar and Red Fleshed analyzed for total soluble solids (TSS), acidity, and ascorbic acid contents initially and after storage of 30 and 60 days at low (6 + or -1^{0}C) temperature. Both chemical composition and organoleptic evaluation indicated that 'Allahabad Safeda' was best cultivar followed by 'L-49.

Patel *et al*. (2005) evaluated fruit quality in eight guava cultivars (Allahabad Safeda, Lucknow-49, Apple Colour, Dharidar, Hafsi, Seedless, Chittidar and Rewa-72), and reported that Allahabad Safeda fruits had the highest TSS (total soluble solids), total sugar (11.80%) and ascorbic acid (250.80 mg/100 g of pulp) contents, as well as the lowest level of acidity (0.25%).

Kaur *et al*. (2011) reported that six cultivars of guava, *viz.*, Allahabad Safeda, Apple Colour, Behat Coconut, Lucknow-49, Pear Shaped and Red Fleshed were evaluated for their physical characteristics and biochemical composition during the winter season. The data on physico–chemical characteristics and biochemical composition revealed that fruit yield (85 kg / tree), fruit weight (95 g), fruit size (6.5 × 5.4 cm) and vitamin-C content (266.0 mg/ 100 g pulp) were found

to be higher in Lucknow-49 when compared to the other cultivars. TSS (11.0 %), total sugars (3.60 %), total protein (0.595 %) contents were higher, while total phenol (580.5 %) content was comparatively less in Allahabad Safeda (580.5 ug/g).

Kocher *et al*. (2011) observed reducing sugars content of 3.40, 3.29, and 3.68% in Punjab Pink, Arka Amulya and Lucknow-49, respectively. The vitamin C content varied widely depending on the cultivars as ascorbic acid content of guava cultivars ranged from 149.0 to 250 mg per 100 g of pulp.

Pooja (2011) reported that in guava cultivars ('Spear Acid', 'Hisar Safeda', 'Lucknow-49', 'Patillo', 'Punjab Pink', 'Arka Amulya') acidity has been found to be in the range of 0.37 to 0.97%.

Standardize recipe for nectar of Guava fruits

Kerure and Kjedkar (1982) reported that guava nectar having composition of 20 per cent pulp, 20 per cent total soluble solids and 0.3 per cent acidity was considered as a good nectar.

Singh and Dhawan (1983) reported that ideal nectar of papaya and guava fruits should contain 20 per cent pulp, 14 per cent total soluble solids and 0.3 per cent acidity.

Choudhary and Dikshit (2006) reported that recipe of 20 per cent pulp, 17 percent total soluble solids and 0.3 per cent acidity for nectar was most ideal for guava beverages prepared from cv. L-49. The acidity, TSS, total and reducing sugar of nectar showed an increasing trend during the progress of storage up to five months under ambient conditions. However, these chemical constituents did not change markedly until five months of storage as compared to fresh nectar atthe time of preparation.

Kumar *et al*. (2012) reported that preparation of value- added nutraceutical products from guava blended with Aloe vera and roselle (at 70:25:05 juices) were done by following standard recipes. Prepared products, nectar were stored for 120 days at ambient temperature to study storage stability and overall acceptability in terms of variation in sugar, pH, acidity, ascorbic acid, calcium and iron contents at an interval of 30 days. A panel of 10 judges evaluated the products at the end of 120 days of storage for their quality attributes like appearance, flavour, taste and overall acceptability. The nectar prepared with 20% juice, 20^{0}Brix TSS and 0.25% acidity were rated as best recipes with highest scores for organoleptic quality.

Kalra and Tandon (1984) screened out the eight samples of guava nectar contains 15 per cent pulp, 12 to 14 per cent TSS and 0.20-0.35 per cent acidity. The nectar were fortified with 100 mg Vitamin-C and stored for 10 month in glass bottles. Organoleptic evaluation indicated that the sample having 14per cent TSS and 0.25 per cent acidity was found to be the best followed by 14 per cent TSS and 0.20 per cent acidity, and 12 per cent TSS and 0.25 per cent acidity. During storage, the TSS and Vitamin-C decreased while titrable acidity was increased by 0.02 to 0.04 per cent.

Singh (1988) reported that 20 per cent juice and 15 per cent total soluble solids with 0.3 per cent acidity was found suitable for making nectar of litchi fruits.

Singh (1990) reported that 20 per cent mango pulp, 20^{0}brix and 0.3 per cent acidity served as an ideal recipe for nectar.

Saravanan *et al*. (2004) reported that papaya nectar

consisting of 23% pulp, 15^{0}Brix (TSS) and 0.3% acidity had the highest acceptability due to better taste and flavour during storage.

Upale *et al.* (2010) reported that the jamun nectar with a recipe containing 25 per cent juice (with sodium benzoate) +0.3 per cent citric acid adjusted to 20 per cent TSS was recorded the maximum organoleptic score for colour and appearance (3.8), whereas nectar with recipe containing 30 per cent juice (with sodium benzoate) + 0.2 per cent citric acid adjusted to 15 per cent TSS recorded the maximum organoleptic scores of 3.0, 3.3 and 4.0 for taste, flavour and overall acceptability respectively. This recipe had lower bacterial, fungal and yeast load

(2.14 × 105 CFU/ml, 0.74 × 103 CFU/ml & 0.81 × 103 CFU/ml, respectively).

Mandal *et al* (2013) standardized different recipes of aonla nectar was to explore the processing potential of Aonla. There were five different possibilities of recipes. The nectar prepared from the recipes with 20% pulp, 13% TSS and 0.30% acidity gave highest organoleptic quality score followed by nectar prepared from 20% pulp, 16% TSS and 0.25% acidity and the consumer acceptability of the ideal nectar was maintained up to five month at ambient temperature.

Shrivastava *et al*. (2013) reported that nectar prepared with the treatment $\mathbf{T_4}$ (20% pulp, 0.3% acidity, 25% TSS) contains highest acidity, TSS, total and reducing sugar with moderate amount of non-reducing sugar and TSS: acid ratio, thus found to be suitable for preparation of Custard apple nectar at commercial scale.

Thakre and Jain (2013) reported that the papaya and banana were blended at the ratio of 50:50. This pulp ratio was used to prepare blended nectar by following standardized recipe 20 per cent pulp, 18 per cent TSS and 0.3 per cent acidity. The prepared nectar was stored under two different storage condition, *viz*. ambient condition and refrigerated condition. The storage life of blended nectar (50:50) was 15 days under ambient condition and 45 days under refrigerated condition. The TSS of blended nectar (50:50) unchanged under ambient condition. Under refrigerated condition, it was increased. There was an increasing trend for total sugar, reducing sugar, pH and TSS: acid ratio. Whereas, the acidity, nonreducing sugar and ascorbic acid were decreased as storage period increased.

Standardization of recipe using alternative sweeteners

Dabbas *et al.* (2012) reported high quality orange nectar by partial replacement of sucrose with an equivalent sweetness from the safe artificial sweetener sucralose. Using different ratios from sucrose and sucralose at concentrations equivalent to sucrose sweetness in the final orange nectar 7.5% sucrose: 0.005% sucralose) nectar were more accepted

Swaroop *et al.* (2012) reported that the experiment was conducted to standardize of the suitable ratio of sugar and stevia for the preparation of quality low calorie guava nectar and observed that 50% stevia+50% sugar was found to be the best on overall sensory score.

Singh and Singh (2014) developed aonla- based low calorie blended nectar from aonla, mango, guava, jamun and jack fruit using stevia for low calorie. A blends containing 25 per cent aonla pulp+75 per cent mango pulp was found better for the preparation of nectar. In the preparation of low calorie nectar, half amount of sugar can be successfully substituted by stevia without impairing the quality of beverage.

Singh *et al.* (2014) carried out an experiment to evaluate the acceptability of aonla-mango low calorie blended beverages during storage and reported that nectar containing the recipe in 25 per cent aonla pulp + 75 per cent mango pulp + 50 per cent sugar + 50 per cent stevia with 15 per cent total soluble solids and 0.25 per cent acidity was found best among all the treatment.

Change in chemical composition of beverages

Ascorbic acid

The demand of fruit beverages is mainly based on their nutritive value, flavour, aroma and colour. The beverages are a good source of vitamins, minerals, carbohydrate, amino acids, flavonoid compounds and probably other unidentified constituents.

Baramanray *et al.* (1995) observed that ascorbic acid content (mg/100 g pulp) in guava nectar decreased significantly ($P < 0.01$) with increasing storage period. During 90 days of storage, it was found to be reduced by 18 per cent amounting to 0.0092 mg per 100 ml per day ($r = 0.991$)

Swaroop *et al.* (2012) reported the suitable ratio of sugar and stevia for the preparation of quality low calorie guava nectar beverage and observed their chemical changes during storage for three months at ambient temperature. Ascorbic acid of nectar did not change upto the entire period of storage .

Dattatreya *et al.* (2012) reported that fresh ripened of Guava were procured from entrepreneur's field and were weighed, sorted, washed, lye peeled before crushing and sieving to get guava pulp for preparation of different products such as RTS, and nectar. Ascorbic acid content

decreased with the product preparation

Bal *et al.* (2014) reported that physico-chemical parameters and ascorbic acid of nectar were evaluated at an interval of 2 months up to 8 months of storage. An overall result of fruit nectar prepared from guava was found better in the treatment P_4B_2 (20% pulp + 15°Brix TSS) which was statistically at par with P_3B_3 (16% pulp + 17°Brix TSS). Results indicated that the minimum physicochemical changes, ascorbic acid (14.7 - 13.82 mg/ 100g), showed decreasing values with duration of storage. Considering above chemical constituents as well as sensory attributes of processed nectar, both the treatments P_4B_2 (20% pulp + 15°Brix TSS) and P_3B_3 (16% pulp + 17°Brix TSS) were found better for nectar preparation. The variety Lalit is commercially used in processing industry due to its attractive pulp colour and could make significant contribution to food industry.

Thakre and jain (2013) reported that the papaya and banana were blended at the ratio of 50:50. The prepared nectar was stored under two different storage condition, *viz*. ambient condition and refrigerated condition. The storage life of blended nectar (50:50) was 15 days under ambient condition and 45 days under refrigerated condition. Whereas, ascorbic acid were decreased as storage period increased. The decrease in ascorbic acid content in nectar during storage might be due to oxidation or irreversible conversion of L ascorbic acid into dehydro ascorbic acid in the presence of enzyme ascorbic acid oxidase (ascorbinase) caused by trapped or residual oxygen in the glass bottles.

Acidity

In general, the acidity of fruit products increased with the duration of storage but when product is cooked to a higher consistency, a decrease in acidity is observed.

Baramanray *et al*. (1995) observed that the titrable acidity in guava nectar increased significantly ($P < 0.01$) with the increase in storage period.

Kalsi and Dhawan (2001) reported that a significant increase in the acidity of guava fruit bar was recorded with all the cultivars during storage. Initially, it was found to be 1.31 per cent which increased to 2.06 per cent after 60 days of storage.

Bons and Dhawan (2003b) observed that the acid content decreased significantly from 3.93 to 0.53 per cent during storage at room temperature in guava juice concentrate under vacuum concentration and open pan concentration.

Swaroop *et al.* (2012) reported the suitable ratio of sugar and stevia for the preparation of quality low calorie guava nectar beverage and observed their chemical changes during storage for three months at ambient temperature. Acidity of nectar did not change upto the entire period of storage.

Bal *et al.* (2014) reported that physico-chemical parameters *viz.*, TSS, acidity, ascorbic acid, non-reducing sugars, total sugars and viscosity as well as organoleptic attributes *viz.*, colour, flavour, taste and overall acceptability of nectar were evaluated at an interval of 2 months up to 8 months of storage. An overall result of fruit nectar prepared from guava was found better in the treatment P_4B_2 (20% pulp + 15°Brix TSS), which was statistically at par with P_3B_3 (16% pulp + 17°Brix TSS). Results indicated that the minimum physico-chemical changes *viz.*, acidity (0.3-0.35%),) showed increasing trend with duration of storage.

Thakre and Jain (2013) reported that the papaya and banana were blended at the ratio of 50:50. The prepared nectar was stored under two different storage condition, *viz*. ambient condition and refrigerated condition. The storage life of blended nectar (50:50) was 15 days under ambient condition and 45 days under refrigerated condition. Whereas, acidity was decreased as storage period increased.

Total soluble solids

Jain and Nema (2007) studied the quality of the leather from five different cultivars (Red Fleshed, Allahabad Safeda, L-49, Chittidar, Apple Colour) of guava and observed the highest TSS (26.67°B) in L-49 followed by Allahabad Safeda (26.53°Brix). This was due to varietal character.

Swaroop *et al.* (2012) reported that the suitable ratio of sugar and stevia for the preparation of quality low calorie guava nectar beverage and observed their chemical changes during storage for three months at ambient temperature. TSS of nectar did not change upto the entire period of storage.

Dubey *et al.* (2011) reported that after 90 days of storage periods, nectar prepared from L-49 has maximum content of TSS (17.01%).

Bal *et al.* (2014) reported that physico-chemical parameters *viz.*, TSS, of nectar were evaluated at an interval of 2 months up to 8 months of storage. An overall result of fruit nectar prepared from guava was found better in the treatment P_4B_2 (20% pulp + 15°Brix TSS) which was statistically at par with P_3B_3 (16% pulp + 17°Brix TSS). Results indicated that the minimum physico-chemical changes *viz.*, TSS (15-15.83°Brix), showed increasing trend with duration of storage.

Sugars

Prasad and Mali (2000) observed that the changes occurred during storage were faster at room temperature (25 – 40^{0}C) than at low temperature (4-5^{0}C). For a longer storage (1-year) pomegranate squash, low temperature storage was better. The low temperature storage did not have much change on the total sugar, while the level of reducing sugars increased but non-reducing sugars decreased during 6 months of storage.

Kalsi *et al*. (2002) observed that the total sugar and reducing sugar contents were maximum in vacuum concentration than open pan concentration method of guava juice concentrate.

Bons and Dhawan (2003b) reported non- significant increase in total sugar in guava juice concentrate initially and thereafter, a significant increase in sugars was noticed during 30 to 90 days of storage.

Choudhary (2004) reported that there was an increasing trend of total and reducing sugar in guava nectar and RTS with increasing period of storage under ambient condition.

Jain *et al*. (2007) found that reducing sugar and total sugar of Chakaiya aonla nectar increased during storage. The significant changes were observed almost every month in reducing and total sugar. However, the changes in TSS and acidity were slow. An increase in TSS in storage may be due to conversation of polysaccharides into sugars, while the reason for rise in reducing sugar might be ascribed to the conversion of non- reducing sugars through the process of hydrolysis, similarly the increase in total sugars might be due to partial hydrolysis of complex carbohydrates which may be accelerated by high temperature

Swaroop *et al*. (2012) reported that among the different sugar stevia ratios, guava nectar prepared by using 50% stevia + 50 % sugar is the best overall. There were no changes in total soluble solids, acidity, ascorbic acid content and nonenzymatic browning of nectar upto the entire period of storage whereas, organoleptic score slightly decreased after two month of storage

Rustagi and Kumar (2013) reported that the value of acidity, reducing sugar and TSS increased while the value for the pH and ascorbic acid decreased during the two month storage with different preservatives at different temperatures. The preservatives increased the acidity, and decreased the pH. It is observed that with freeze temperature, less Vitamin C oxidized and more acidic conditions are maintained. The control show more number of microorganisms than with preservatives. The highest inhibitory effects on bacterial growth in R.T.S were exerted by PMS alone followed by combination of PMS and SB each. With two different temperatures more microorganism are found at room temperature than at freeze temperature. The drink stored at refrigeration temperature (4-6^{0}C) was ranked the best for colour, flavor, taste, texture, appearance and overall acceptability as compared to the others stored at room temperature (30^{0}C)

Organoleptic score

The demand of fruit beverage is largely based on their nutritive values, flavour, aroma and colour. These beverages are good source of vitamins, minerals, carbohydrates, amino acid, flavonoid compounds and many other constituents. Sulphur di- oxide also improved the quality of fruit slices during storage.

Kalsi and Dhawan (2001) observed that the organoleptic rating of guava fruit bar obtained highest score by cv. Allahabad Safeda (32.50) and minimum by hybrid H-25-25 (26.83). During storage, a significant reduction in organoleptic rating was also observed.

Choudhary (2004) reported that the nectar and RTS prepared from the cultivar L-49 and Allahabad Safeda recorded highest organoleptic score.

Upale *et al*. (2010) observed that the jamun nectar with a recipe containing 25 per cent juice (with sodium benzoate) + 0.3 per cent citric acid adjusted to 20 per cent TSS was recorded the maximum organoleptic score for colour and appearance (3.8), whereas nectar with recipe containing 30 per cent juice (with sodium benzoate) + 0.2 per cent citric acid adjusted to 15 per cent TSS recorded the maximum organoleptic scores of 3.3 and 4.0 for flavor and overall acceptability respectively.

Sarvanthi *et al.* (2014) reported that custard apple products like squash andnectar were initially evaluated organoleptically and microbial count was performed for their appearance, color, flavor, taste and overall acceptability. The score for each attributes was highest on the day of preparation which decreased with passage of time for taste, flavor and overall acceptability during storage. Organoleptice valuation of processed products remained more acceptable for products stored at low temperature compared to room temperature. Retention of colour, taste, flavor and appearance were better in all the products stored at low temperature indicating that low temperature storage conditions are better in improving the shelf life stability of the products.

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