Different Processing Technologies and Products of Guava

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ABSTRACT

Guava can be consumed as fresh or processed in the form of juice, jam, jelly, nectar, pulp, canned guava, puree, preserve, fruit leather, RTS beverage, dehydrated guava powder, candy, cakes as well as additive in different fruit juices. Several processing technologies of guava are used to produce new food products that include powder production, jams and jelly preparation etc. Such products and approaches will be proved highly beneficial to avoid the post-harvest loss of fresh fruit. It was concluded that several technologies are used during guava processing, which aids in the enhancement and improvement of the fruit value as well as allow its availability all throughout the year. In this current review the production of different guava products including some processing technologies will be discussed.

Introduction

Guava (Psidium guajava L.) belongs to the family Myrtaceae. It is of higher nutritional value and is considered as “Apple of poor” less cost and easily available in the market makes it more common. Its cultivation is liked by many fruit growers because of its wider adaptableness and advanced returns (Hassan et al., 2012). Guava fruits consist of two shapes i.e., oval rounded and rough surface. It is a climacteric fruit means it can ripens even after harvest and is perishable in nature with a shelf-life period changing from 2-3 days (Bassetto et al., 2005). Yield is supposed to be 150-300 fruits per tree (Approximately) and is widely cultivated due to its delicious taste (Panhwar, 2005). Due to the considerable nutritional value, guava is frequently sold in market. Depending on the variety fruits are of varying size, shape and flavor. The best varieties are of sweet taste while others are of astringent taste (Yan et al., 2006). The fresh fruits cannot be stored for longer period due to short shelf life or used in off season but same is possible by the use of different processing technologies. Hence these processing methods are of highly demanded in the markets. The fruits of guava have a distinct flavor which decreases when processing is done. The weight of individual guava fruit varies from 150 to 250 g (Ayub et al., 2005). The tree bears twice per year but best quality fruits are obtained in winter season (Bal and Dhaliwal, 2004). The fruit is roundish in shape with a diameter of 3-10 cm and yellow featured peel during maturity (Lee et al., 2010). Fruits stored under cold conditions leads to chilling injury and the symptoms appear in the form of surface pitting and browning of flesh. Under subtropics, guava bears two times, one in and other in winter season that is why fruit remains available in the market for 8-9 months (Samson, 1986). The fruit pulp can be used as a base in order to prepare these products (Kadam et al., 2012).
Purpose of using such technologies—

- The efficiency of solid waste management system is improved.
- Useful materials can be recovered in better way.
- Conversion of products and energy is recovered much efficiently.

DIFFERENT PROCESSING TECHNOLOGIES

Dehydrated products

The process of dehydration is dependent on removal of water present inside the fruits to a minimum point that will be sufficient and for the preservation for extended duration. It is one of the excellent alternative approach in storing the perishable fruits, and retardation activity of water is linked to the reduction of enzymatic as well as chemical functions that are liable in the deterioration of fruits. Osorio and Carriazo (2011) artificially prepared powder from guava by means of different procedures and conducted thermal and structural study. By means of lyophilisation and hot air drying method on guava fruits, two kinds of food products/powders were obtained. These powders were considered for their sensory and scanning electron microscopy, thermal analysis, infrared spectroscopy and X-ray diffraction. The X-ray diffraction showed the partly-crystalline shape of the powder. Instant drink-powder of guava are to be obtained by using different drying techniques which result in preparation of dehydrating the concentrated juice of guava. The removal of water from this guava juice and conversion to powdered form provides a significant decline of the quantity and it is one of the efficient methods to prolong shelf life of fruits.

By means of tunnel drying, spray and freeze drying methods converts guava in powder form and the effects of drying on fruit powders and their quality characteristics were studied by various workers. Mahendran (2010) also conducted the consumer preference test in order to evaluate sensory characteristics of the guava juice plus its comparison with the final produce and also with the products obtainable in the marketplace. His results verified that freeze dried guava powder/product have exceptional nutritional and sensory parameters; while the dried guava powder obtained by spray drying is more stable and highly economical in the preparation of guava powder with better stability and having free flowing property. Sweetened dehydrated candy made from guava slices of lower calories with medium moisture and is ready made food excellent meant for people conscious on their diet of all age groups and especially for the patients who are diabetic.

Ayub et al. (2005) obtained dehydrated guava slices with lower calorie sweeteners with the use of sweeteners that are non-nutritive and conducted an experiment to know the impact of different concentrations of the above sweeteners that are non-nutritive independently or in combination with that of the preservatives that are chemical driven such as potassium sorbate (PS) & potassium metabisulphite (PMS) and antioxidants such as ascorbic acid (AA) & citric acid (CA) on the dehydrated guava slices to evaluate the growth of microbes and sensory parameters of the product during a storage period of 85-90 day. The samples mixed with chemical preservatives resulted in slow growth of microorganisms throughout the period of storage. It was reported that non-nutritive sweeteners treatment on guava slices had severe loss of moisture and resulted in leathery appearance. The slices that are treated with the chemical preservatives such as potassium metabisulphite and ascorbic acid were found to have more overall acceptability.
Guava pulp:
It is prepared by blending guava pulp in pulp of other fruits, where it can be used as the base for the preparation of different foodstuffs. Different guava cultivars are evaluated for the preparation of guava pulp. Guava pulp can be prepared from some of the guava cultivars like Lucknow-49, Apple color, chittidar, Allahabad Safeda and Red Fleshed. Pulp was then analyzed for different parameters like acidity, vitamin C and total soluble solids (TSS) and after the storage of period about 35 & 60 days of pause at low temperature. Both organoleptic and chemical composition assessment disclosed that cv. Allahabad Safeda was the best next trailed by the cv. Lucknow-49.
Jain et al. (2011) assessed the quality of guava fruit pulp during storage period. They analyzed the organoleptic parameters like feel, taste, color, taste, and overall acceptability of the product and other qualitative parameters like pH, acidity, TSS, ascorbic acid of guava pulp and mixed with the fresh fruit. They recorded that with extended storage duration, decline the overall satisfactoriness of the pulp was resultant. Blending the pulp in different ratios was influenced by both organoleptic and qualitative characters.

Juice, Puree and Nectar:
Preparation of nectar, juice and puree are the most important fruit processing techniques. The conservation of quality attributes like color, flavor, nutrients as well as flavor increased shelf-life and easy management of the produce. Ordinary juice processing plants are used for the processing of guava puree and then cooled it at freezing temperature until transported to food industry and can be used for manufacturing of various juice blend products.
While the puree of guava is pasteurized and it undergoes deterioration at frozen temperatures throughout the storage period, the development of off flavors and results in declined sensory quality of the guava juice. These results revealed that the traditional processing techniques cannot avoid the fluctuations in flavor and the quality of juice (Yen and Lin, 1999).
Santos and Riascos (2010) reported the influence of processing and length of storage period on the lycopene contents and vitamin-C content of pink guava nectar. Nectar production obtained from fresh guava decreased the content of lycopene, titratable acidity, and vitamin C content whereas there is a rise in pH value and total soluble solids value (TSS). Studies resulted in the retention of vitamin C content of 46% for about 120 days in the guava nectar stored at 10°C.

Jam, jelly and preserve:
Hossen et al. (2009) reported that there are different stages of extraction of guava juice for the processing of jelly. He also studied the sensory and storage attributes of the produce. Guava jelly is sweet semisolid and an elastic in nature or the spread made to a thick consistent, prepared from fruit juice along with sugar boiled together.
Based on the of sensory evaluation of jelly made from guava by special extraction methods of the juice taking into consideration the color, taste, smell, consistency and overall adequacy of jelly prepared mixture of both during first step and then juice extractions was more appropriate. After processing, the preserves must be packed properly and are stored under advantageous conditions. Color features of the product (guava jam or jelly) should be of varying color from yellowish red to brownish red, odor and typical flavor of guava and a jellylike appearance, suitable for consumption.
Menezes et al. (2011) reported that the involvement of different packing materials etc. like polypropylene and potassium sorbate on the fruit quality preserves in storage by various features like physical, microbiological and physiochemical. The results revealed that various types of packaging materials did not influence the stability of the guava preserves. However it was concluded that the use of potassium sorbate resulted in the increase in levels of soluble solid and retarded the activity of water.

**Guava leathers:**

It is prepared by removal of water from the fruit puree. These leathers can be generated either by mixing or cooking, to give it a consistency like sauce. The guava and papaya leathers and studied for both organoleptic and chemical properties of the guava leathers. It was found that the guava leather consists of large amounts of protein and fat. It was also reported that the content of ash in papaya leather is 2.6% in addition to that of guava leather (2.8%). Ashaye et al. (2005) studies revealed that guava fruit leather is considerably better in the overall acceptability, improved compositional attributes and smell.

**Canned slices:**

A canned slice is a processed product prepared by retaining the original appearance and shape of the fruit in which guava is mixed along with sugar syrup. This process requires soaking the fruit in sugar syrup for a limited period under high temperatures. The reduction in the water content results in increased product shelf-life, due to the higher sugar concentration in the syrup. Sato et al. (2006) reported the impact of various temperatures and the concentration of Ca of the cooking syrup of the guava. Most of these parameters of the processed guava are then compared with that of the fresh fruit and those of commercial samples for assessment the effects of various processing methods on the quality of product. Higher temperature during the processing affects the color of the final produce. Though, higher Ca content in the cooking syrup yields samples (canned slices) that are lighter, with the color of fruit closer to those of the fresh fruit. Generally, the addition of calcium resulted in the improved texture of product.

**Alcoholic beverages**

In addition to increasing economic status of Indian farmers, guava wine is proved to be one of the quality wines with alcohol or a stimulant and consists of higher amount of phenols and ascorbic acid which acts as an antioxidant especially during the period of surplus production. Kocher (2011) explained the production of wine from the guava fruits. Guava juice involves the addition of calcium carbonate to neutralize sugars and incline alcoholic strength so in order to adjust its TSS and produce a perfect wine out of this fruit. The juice is then is enriched by the addition of CaCO₃ to neutralize the acid and in order to increase the alcoholic strength of the wine. This improved juice need be treated with the enzyme like pectinase or in combination with other enzymes and then fermented at a temperature range of nearly 23 to 30°C with an inoculums size of 7 to 11% with traditional yeasts. The organoleptic along with sensory characteristics of wine can be improved by ageing and racking of guava wine.
Guava fruits are taken and are washed under running tap water

Juice is extracted from these fruits

This juice is taken @ 0.50 mg/100ml and then treated with the pectinase enzyme at a temperature of 450c for 6 hours.

Inoculum size of 9% (v/v) of *S. cerevisiae* strain 35 and 0.3% DAHP (w/v) is optimized for the fermentation conditions

It is later decanted and then stored

Guava wine

**Minimal processing**

Minimal processing is a technique in which there is elimination of the parts of fruits that are not edible, like the rinds, stems, seed and pulp next by processing operations such as

The fruits are washed thoroughly under running tap water

Then the fruits are then cut into pieces

Sanitization

Centrifugation

The fruits are then packed

And are then stored
It possibly includes the lower levels of irradiation and preparing them ready-to-eat devoid of the loss of their novelty, degree of sanitization with the good quality produce. It was observed that purification resulted in increased quality of the minimally processed guava fruit. Next to this, the cultivar of guava was sent through two types of sanitization procedures dried out by means of sodium dichloroisocyanurate compound, at a concentration of 50 ppm, sanitization before and after being cut, exclusion of surplus amount of water; packaging materials like PET and PS-PVC during storage at a temperature of 3±1°C are used for conditioning.

a) Physio-chemical analysis:
- pH
- Vitamin C
- Total soluble solids (TSS)
- Acidity
- Total sugars

b) Microbiological, sensorial and textural analyses:
These analyses are used to observe the quality of the product, consumer preferences. The guavas are cut into pieces along with the pulp and packed in polyethylene terephthalate (PET) packaging. This type of packaging material increases the water vapor condensation on the inner side of the lid, improving the form and appearance of the product. There are two types of sanitization techniques with the packaging methods will not considerably affect the acidity, pH, TSS, texture and ascorbic acid values. Both the sanitization methods were found efficient in controlling the growth of aerobic bacteria and sanitization resulted to be the most important method in order to control of microbes (aerobic).

Conclusion
Guava fruit is an important source of several vitamins and minerals and also a good source of antioxidants. For efficient and economic utilization of this commodity, it is very important to preserve guava fruits. Different fruits including guava cannot be stored for an extended period because of its perishable character. During post-harvest some fruits remains unsold and is wasted. Hence these products are not marketable. Approximately 20-25% of the fruit spoilage is increased due to improper handling, transport and processing. These losses can be reduced by the use of these fruits in processing and preserving the fruit into many products like guava preserve, cheese and nectar etc. To avoid the spoilage and enhance the production of guava the processing technology should be increased. This will help in increasing the net income of the grower and the consumer can taste the guava in off season too.
References