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Cashew Apple – An Untapped Tropical Fruit

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SUMMARY

Cashew apple is a juicy fruit that can provide cashew producers with an extra source of income. But due to lack of suitable technologies in handling cashew apple during harvest and post-harvest management about 4-6 tonnes of cashew apple per hectare goes waste without utilization. These cashew apples are a rich source of vitamin C which has an anti-scurvy effect and also possess anti-bacterial properties. In spite of having high nutritional value, neither the fresh cashew apples nor the juice is consumed due to astringency. several technologies developed value-added products of cashew apple which are free from astringency and helpful to get additional income to cashew farmers and create employment opportunities in cashew nut growing areas of the country.

INTRODUCTION

Cashew apple is a tropical fruit which is an important byproduct of the cashew nut processing industry. It can be consumed as fresh fruit, but also possess sensory and nutritional characteristics for food process industrialization, due to its fleshy pulp, soft peel, no seeds and strong exotic flavor. Cashew apple (*Anacardium occidentale* L.) is not a true fruit, but swollen peduncle to which the nut is attached and widely grown in tropical areas. The name Anacardium refers to the shape of the fruit, which looks like an inverted heart (ana means "upwards" and - cardium means "heart"). These fruits are being wasted across various parts of the cashew growing countries due to their short production period and high perishability. The cashew apples are highly perishable not exceeding four days at room temperature. It is a less utilized product because of its astringent and acrid principles. The seasonal nature of the production of the perishable cashew apple, the poor storability and the lack of information on an appropriate processing technology are the reasons hindering the full utilization of the fruit. Numerous quantities of cashew apple are being wasted annually because the focus was on nuts alone.

Value-added products of cashew apple

Cashew apple juice

Cashew apple syrup

Cashew apple squash

Cashew apple wine

Cashew apple feni

Cashew apple RTS

Cashew apple jelly

Cashew apple jam

Cashew apple crisp

As many as 98% of the over 40 lakh tonnes of cashew apples produced in the country reportedly go waste (nuffoodsspectrum). Goa and Kerala are the two states that are using cashew apples for the production of alcoholic beverages such as 'Fenny' and non-alcoholic beverages and other products such as cashew juice, syrup, jam, candy and pickles. Despite being rich in vitamins and minerals and good for health, cashew apple is still not exploited to its full potential by developing new products. There is a need to address these problems by developing a technique which is easily adoptable and cost effective. Also, the processing should not affect the quality of the product. The value-added products from cashew apple is a thrust area of research for food technologists, industrialists and farmers and of course, these products are a definite alternate solution for nutritional source. Processing of cashew apple will turn out to be economic potential for farmers, entrepreneurs and consumers.

Nutritive value of cashew apple

Cashew apple is a juicy fibrous nutritious fruit. It contains sugars, amino acids, tannin, ascorbic acid (Vitamin C) and crude fibre. It is very rich in ascorbic acid (240 mg/100 g) which is almost six times that of citrus fruits (40 mg/100 g), a very rich source of Vitamin C. Besides vitamin C, cashew apple contains free soluble sugars most of which are reducing sugars. Cashew apple is quite rich in crude fibre and on a dry weight basis the crude fibre content varies from 15 to 18 %. Phenols, tannins and flavonols present in cashew apple could serve as natural antioxidants which play a major role in destroying free radicals. Cashew apple is a good source of Vitamin C and fibre. Consumption of cashew apple could help in overcoming Vitamin C deficiency and also constipation (www.nrccashew.org).

Non-alcoholic beverages

Cashew Apple Juice

After harvesting, fruits are sorted to select the best quality ones. The selected fruits are washed by soaking and washing with cold water sprays. The excess water is drained and surface dried and subjected to blanching for 7 min to inactivate the enzymes. The blanched cashew apples are dipped in a brine solution (2%) for 10 min to remove astringency to some extent. The cashew apples are macerated in a pulper and the juice is taken in a measured stainless container. Cassava (tapioca) starch solution is employed for clarifying the cashew apple juice (0.4%) and continued stirring for 10 min and allowed to stand under refrigeration temperature (10°C) for 5 h until a clear filtrate is obtained. Then it is subjected to pasteurization at a temperature of 85°C for 15 min. After pasteurization the juice is allowed to cool, bottled, labeled and subjected to storage at both room and refrigerator temperatures (Sobhana *et al*., 2011).

Cashew syrup

Extraction of juice and removal of astringency are done in the same way as in the pretreatment of juice. Sugar is added at the rate of 1 to 1.25 kg for every litre of juice20-25g citric acid per litre and 0.08% as sodium benzoate is added to the juice and thoroughly mixed for 4-5 hours and clear syrup is cooled and filled in bottles (Sobhana *et al*., 2011).

Cashew apple squash

The procedure for the preparation of juice and squash is similar. But the consistency of squash can be achieved by adding more sugar and citric acid. Freshly harvested cashew apples are washed in running water and

ensured to be free from soil debris or microbial spoilage. The juice extraction can be achieved through a basket press, screw press or hydraulic press. Poly Vinyl Pyrollidone is added at the rate of 10 g per 8 to 10 lit of cashew juice and passed through muslin cloth for clarification. After 20 to 40 min the clear supernatant is added with sugar at the rate of 3 kg per litre of juice and preservatives viz., 6 g of sodium benzoate and 100 g of citric acid. The squash can be diluted with three times water and served (Sobhana *et al*., 2011).

Ready to serve beverage (RTS)

The required amount of water with sugar (200 g sugar / 1 L water) and citric acid (5g) are boiled with continuous stirring. An amount of 200 ml of clarified cashew apple juice and 100 ml of any fruit juice are added after switching off the flame. The content is cooled and packed in an aseptic condition (Sobhana *et al*., 2011).

Cashew apple sauce

Cashew apple sauce is an important byproduct made out of well ripe less firm cashew apples. The cashew apple pulp has been removed for lumps and added with ingredients such as onion powder, garlic powder, red chili powder, salt and vinegar. The ingredients are mixed thoroughly with cashew pulp and cooked till it reached sauce consistency. The consistency can be confirmed with the drop test method (Sobhana *et al*., 2011).

Alcoholic beverages

Cashew wine

Cashew wine is made in many countries throughout Asia and Latin America. It is a light yellow alcoholic drink, with an alcohol content of 6-12 %. Cashew apples are cut into slices and crushed in the juice press. The fruit juice is sterilized in stainless steel pans at a temperature of 85°C in order to eliminate wild yeast. The juice is filtered and treated with either sodium or potassium metabisulphite, to destroy or inhibit the growth of undesirable types of micro-organisms such as acetic acid bacteria, wild yeast and mould. The inoculum is added for fermentation (Sobhana *et al*., 2011).

Cashew feni

Fenny is Goan flavoured liquor made from the juice of the cashew apple. It has got its GI registration as a specialty alcoholic beverage from Goa. Traditionally the cashew apples are manually crushed by a rock and juice is collected in a huge earthen pot, which is buried in the ground. The juice is then distilled in earthen or big copper pots. Juice is extracted from cashew apples and it is fermented till the formation of a film floating over the juice. The time required for fermentation is 65-70 hours. In feni, alcohol content ranges from 40-45 % (Sobhana *et al*., 2011).

Cashew apple vinegar

Cashew apple vinegar preparation consists of two stages a) alcoholic fermentation, b) acidic fermentation. Yeast @ 2.0 g in 20 ml coconut water is added and kept for 12 hours to make a starter solution. To clarify the cashew apple juice, cooked and cooled sago gruel @ 5g is added along with the starter solution into 1 lit of extracted unclarified cashew apple juice. This solution is kept for twelve days for alcoholic fermentation in narrow-mouthed plastic bottles, with cotton plugging. After twelve days, the fermented supernatant juice is separated through filtration (to obtain alcoholic ferment) into a wide mouth glass container or clay pot and added with thrice the quantity of mother vinegar for acidic fermentation. This container is kept tied with a muslin cloth, allowing air passage, for 15 days. The clear juice portion is filtered to a clean stainless steel vessel and pasteurized by keeping it in boiling water for 10 minutes, cooled and bottled on the 16th day to get vinegar with 5 to 6% acidity. For continuous vinegar production, the filtrate can be used as mother vinegar (Sobhana *et al*., 2011).

Osmo-dehydrated products

Cashew apple sweet candy

Whole cashew apples or cashew apple slices are soaked overnight (10-14 hr) in sucrose solution of concentrations ranging from 50-70°Brix, enriched with 2%. Calcium chloride and 0.6% potassium meta bisulphate (KMS) at ambient conditions. The apple slices in solution should be frequently turned upside down manually or through an agitator to ensure complete immersion, which will otherwise lead to microbial infection. The sugar solution concentration can be maintained at 60°Brix for 3-4 days. The cashew apple slices are separated from the sugar solution and spread over a clean dry stainless steel tray for air drying. Dehydration

using a cabinet dryer at 50°C for 3-4 hr is advisable for a rapid dehydration process. When whole apples are used, slits on four sides can be made using bamboo splints to encourage osmosis (Sobhana *et al*., 2011).

Cashew apple spice candy

Whole cashew apples or cashew apple slices are soaked overnight (10-14 hr) in salt mixed with turmeric powder, chilli powder, pepper powder, 2% calcium chloride and 0.6% potassium metabisulphate (KMS) at ambient conditions. The apple slices in solution should be frequently turned upside down manually or through an agitator to ensure complete coating of the spice mixture, which will otherwise lead to microbial infection. The slices should be retained in the spice mixture for at least 2 days. The cashew apple slices are spread over a clean dry stainless steel tray for air drying. Dehydration using a cabinet dryer at 50°C for 3-4 hr is advisable for a rapid dehydration process. Cashew apples slices are preferred for this method over whole apple processing (Sobhana *et al*., 2011).

Cashew apple chew

Well ripened firm and freshly harvested cashew apples were washed and air dried for 5 to 10 min. cashew apples (500 g) are cut into cubes of desirable size and mixed thoroughly with a spice mixture made of cumin, clove, cardomom, cinnamon and sugar (optional). The mixture was spread as a single layer over a clean dry stainless steel tray for dehydration under 28-30°C for 3-4 days for moisture removal. Frequent stirring or turning of sliced cashew apples is essential to avoid microbial infection. The sweet spice mixture acts as an osmolyte and the released aqueous solution from cashew apples are again impregnated into a spice-coated cashew slice to increase the retention of vitamin C. This can be taken as such as a mouth freshener or along with betel leaves (Preethi and Shamsudheen, 2019).

Cashew apple fig

Whole fresh and firm uniform-sized cashew apples are selected and washed with running water. The apple base and distal end are removed by chopping and soaked in a sugar solution of concentrations ranging from 50-70°Brix and 0.6% potassium meta bisulfate (KMS) as a preservative. If the whole apple is used, gentle slits are made on four sides of cashew apple using a bamboo splint or stainless steel knife to encourage osmosis. The sugar solution concentration should be maintained at 60° Brix for at least 3-4 days. The apple slices in the solution should be frequently stirred to ensure complete immersion and to avoid microbial infestation. After 3-4 days, the sugar solution is drained off and the separated cashew apples are dehydrated using a cabinet dryer at 40-45°C temperature for 7-8 hr (Preethi and Shamsudheen, 2019).

Dried cashew fruit

Cashew fruit is not readily consumed in the raw state because of its high content of astringent compounds. Boiling with salt for 5 min removed astringent compounds, which can be converted into a useful dried product. After boiling the fruits are peeled and pressed. Then again boiled with cashew juice and sugar for three hours, then dried in solar driers for three hours. Then these are packed and stored (Sobhana *et al*., 2011).

Cashew apple crisp

Cashew apple crisp is an important extruded product prepared out of cashew apple pomace powder. This is similar to crispy snacks available in the market but enriched with natural fibers, proteins and bio minerals which are beneficial to human health. The methodology for the preparation of cashew apple pomace powder has been standardized by ICAR-DCR, Puttur. Converting the perishable cashew apple pomace to powder form helps in storing the raw material for diversified uses during off-season. Hence, to enrich the product with biominerals, protein and fibre, cashew apple pomace powder (CAPP) was added as one of the ingredients along with commercially available corn flour and rice flour. The optimized quantity of cashew apple pomace powder ranged from 5-25% for the successful exit of extruded products (Preethi and Shamsudheen, 2019).

Cashew Apple Jelly

Under-ripe (have maximum pectin content) and ripe fruits (having good flavor and color) in a ratio 1:1 are selected (1 kg), cut into small pieces along with the peel, and heated with water for 15 min. After cooking, the water is decanted without disturbing the fruit pieces. The fruit extract is subjected for an alcohol test to know about the amount of pectin present in the fruits. The fruit extract is cooked with 3/4th of sugar in small lots along

with pectin (1%). As soon as the scum is collected, it is removed from the surface. Rapid boiling is accomplished for rapid evaporation to avoid strong flavor and darkened color and also to a greater extent to prevent the inversion of sucrose. The doneness of the jelly is confirmed using a sheeting test and reconfirmed with help of a refractometer to read 68°Brix. The citric acid (1%) was added after the jelly is cooked to improve taste, activate the preservative, prevent crystallization by converting to invert sugar, lower the pH and help in gel formation. As soon as the cooking is complete, it is poured into hot, sterilized bottles, labeled and subjected for storage (Sobhana *et al*., 2011).

Cashew apple jam

Cashew apple is thoroughly cleaned by washing with water. The apple is immersed in 3% salt solution for three days to reduce the tannin content, after which the fruits are steamed for 15 to 20 minutes at 0.7 to 1.05 kg steam pressure. Then the apples are crushed and mixed with sugar and boiled. A pinch of citric acid is added towards the end of the cooling process to improve the taste. Finally, it is stored well in sterilized jam bottles (Sobhana *et al*., 2011).

CONCLUSION

Cashew apple processing is one of the prime areas of utilizing the indigenous fruit which opens up wider market possibilities and hence, tremendous scope for commercialization. Cashew apple, which otherwise go as waste can be employed for making diversified products. The crops like cashew can be a boon to the farmers which can sustain with limited inputs and care, still earning higher revenue to the grower. Processing of cashew apple is an economically viable enterprise in cashew growing tracts. Farmers can very well take up this enterprise, thereby effectively contributing to the cause of women's empowerment for the production of value-added foods it can substantially enhance the income from cashew apple processing.

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