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S Jesupriya PoornakalaAssistant Professor, Krishi
Vigyan Kendra, Vamban,
Pudukkottai, Tamil Nadu, India**VM Indumathi**Assistant Professor, Krishi
Vigyan Kendra, Vamban,
Pudukkottai, Tamil Nadu, India**K Shanthi**Associate Professor, Community
Science College and Research
Institute, Madurai, Tamil Nadu,
India

Value addition in cashew apple: A review

S Jesupriya Poornakala, VM Indumathi and K Shanthi

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Abstract

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. These fruits are being wasted across various parts of the cashew growing countries due to its short production period and high perishability. It is a less utilized product because of its astringent and acrid principles. Numerous quantities of cashew apple are being wasted annually because the focus was on nuts alone. 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. Cashew apple and their products have a potential market in the domestic and international forum. Though there are some limitations, certain physical and chemical processing steps are to be followed to bring out quality and palatable cashew apple products with significant nutritive qualities. 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. In this present review, we discussed about the feasibility of production of various value added cashew apple processed foods.

Keywords: Cashew apple, detanning, value addition, cashew apple processing.

Introduction

The cashew apple is the fleshy part of the cashew fruit that is attached to the cashew nut. It is a rich source of ascorbic acid, polyphenols, minerals, vitamins and sugars. Its phytochemical profile reveals a complex source of natural antioxidants as phenolic compounds and carotenoids what makes this pseudo fruit an excellent source of antioxidants that can scavenge free radical or reactive oxygen species, inhibit free radical formation, and prevent damage of cellular components, as well as cellular death (Melo-Cavalcante *et al.*, 2008) ^[1].

Cashew apple extract gave the widest zone of inhibition against one of the five test organisms at the concentration of 1 mg/disk. However, *Salmonella typhimurium* was more sensitive to the extract. The phytochemical screening indicated the presence of total phenolic content (405.54 ± 27.50 mg/g), total flavonoids (2.378 ± 0.38 mg/g), and tannins (33.17 ± 3.96 mg/g) in the cashew apple extract which confirm its inhibitory activities against the test organisms. This therefore, supports the traditional medicinal use of *Anacardium occidentale* L in the treatment of bacterial infections (Bhagirathi and Asna, 2018) ^[2].

The cashew apples are highly perishable not exceeding four days at room temperature. Its availability is seasonal and even when in season, a large quantity of these fruits are wasted due to lack of adequate storage facilities (Oduwole *et al.*, 2001) ^[3]. 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 utilisation of the fruit (Bidaisee and Badrie, 2001) ^[4]. After removing the cashew nut, the fruit is often neglected due to its high perishability.

High losses of the cashew apples could be prevented by processing them into a shelf-stable product. A number of processes have already been developed for converting cashew apples into value added products such as juice, jam, powder, candy and distilled products (Das *et al.*, 2017) ^[5]. The use of cashew apple as a source of high value-added sugars may represent an economic alternative (Azevedo and Rodrigues, 2000) ^[6]. The therapeutic and nutritional virtues of the cashew apple show that this agro-resource can be used as an interesting food (Pascal, 2018) ^[7].

Corresponding Author:**S Jesupriya Poornakala**
Assistant Professor, Krishi
Vigyan Kendra, Vamban,
Pudukkottai, Tamil Nadu, India

The valorization of cashew apples in developing countries by the improvement of the process of cashew apples available in these countries can contribute to cover the nutritional needs of the populations (Dedehou *et al.*, 2016) ^[8].

Cashew apple is subjected to several processes after the harvest which influences its physicochemical characteristics and quality attributes. There are many traditional and industrial ways of removing the astringency of cashew apple juice, while clarifying the juice. Due to lack of awareness about the nutritional values of cashew apples and suitable technology for preservation, thousands of tons of cashew apples are wasted every year. Improved shelf life of cashew apple juice minimises wastage of these fruits and would derive benefits even during off-season. Juice preservation also has the potential for developing a village level cottage industry thereby generating income to the rural and tribal areas people (Runjala and Kella, 2017) ^[9].

Detanning

Tannins are a group of phenolic compounds that can form strong complexes with proteins and other macromolecules. The cashew apple contains about 0.6 mg tannins/100 g juice (Rocha *et al.*, 2007) ^[10]. The tannins can form complexes with salivary protein and glycoprotein, resulting in astringency (Fontoin *et al.*, 2008) ^[11]. Ingested tannin could inhibit digestive enzymes and affect the utilization of nutrients. Cashew apple is not consumed because of its astringency due to the presence of tannins. Indeed, in addition to the water content (86%), the cashew apple has a high tannin content which limits its conservation for useful purposes (Vijayakumar *et al.*, 1991) ^[12].

The clarification of cashew apple juice by removing astringency is an important step in cashew apple processing. In the optimal conditions, cassava and rice starch preparation, are an efficient clarifying agent for cashew apple juice (Dedehou *et al.*, 2015) ^[13]. The juice is astringent and somewhat acid due to 35% tannin content and 3% of an oily substance, the fruit is pressure-steamed for 5 to 15 minutes before candying or making into jam or chutney or extracting the juice for carbonated beverages, syrup or wine (Ahaotu *et al.*, 2019) ^[14].

The juice extracted from cashew apples contains tannins that must be reduced due to their astringency and anti-nutritional properties. Prommajak (2018) ^[15] investigated reducing the tannins in cashew apple juice by mixing gelatin at 0.0 to 1.0% (w/v) with the juice for 5 to 15 min. Increasing the gelatin concentration decreased tannins and juice turbidity. Optimal conditions for minimum concentration of tannins and turbidity were obtained by adding gelatin at 0.67% (w/v) for 15 min. Cashew apple juice with the tannins reduced could be used in the subsequent production of wine and bioethanol.

Cashew apple juice

Cashew apple juice contains 219 mg of vitamin C per portion of 100 ml, which is 5 times that of an orange and 12 times that of a pineapple. This juice also contains more magnesium (260 mg) than oranges, bananas or pineapples. Its potassium content (565 mg) is twice that of an orange, 4 times that of a mango and 5 times that of a pineapple (USDA, 2002) ^[16].

Juice from the cashew apple offers potential alternative uses, including fermenting into wine, probiotic beverages, and bioethanol (Prommajak *et al.*, 2014) ^[17].

Thermal processing has a negative effect on the sensory and nutritional characteristics of the juice as the compounds

responsible for aroma and flavor are volatile and some vitamins are thermo sensitive (Polydera *et al.*, 2003) ^[18].

Cashew apple (*Anacardium occidentale* L.) juice was produced and pasteurized at 80°C for 15 min. It can conveniently be produced and stored in green and brown bottles for up to four months in the refrigeration temperature to retain its vitamin C content and pH value which is an indication of good quality product. It could also be stored in polyethylene sachet but not more than two months while the fruits are in season to serve as a cheap source of fresh drink, vitamin C and to reduce the 90% wastage of cashew-apples in the orchard (Emelike *et al.*, 2015) ^[19].

Vechalapu (2012) ^[20] reported that combination of sodium benzoate and sodium metabisulphite at 0.1 g/L each, sodium benzoate and citric acid at 0.1 g/L each and sodium metabisulphite and potassium metabisulphite at 0.05 g/L each, prolonged shelf life of cashew apple juice upto 20 days. Vitamin C and total sugars of the preserved samples were found to be almost stable. Sensory attributes also revealed good overall acceptability of the juice. Thus, cashew apple juice could be preserved using optimized chemical preservatives at household level.

Marc (2019) ^[21] found that the pasteurization rate of 75°C/5 min and the storage time for 5 days can be retained for a better preservation of the physicochemical characteristics of cashew apple juice. Thermal treatment, notwithstanding the degradation caused by vitamin C, appears to be an effective way of preserving cashew apple juice. Tamuno and Onyedikachi (2015) ^[22] studied the sensory qualities of pasteurized cashew apple juice which stored various packaging materials at 28°C and 4°C for a period of four months.

Talasila (2011) ^[23] confirmed that combination of clarification, sterile filtration and chemical preservation is suitable for preservation of cashew apple juice upto three months under refrigeration. This method was efficient in decreasing astringency, microbial count and in retaining nutrient quality of the juice, since soluble solids, total sugar content and vitamin C were not affected significantly. The juice was also acceptable in terms of sensory attributes. Further, the method described is simple, rapid, inexpensive and convenient for industrial use in the processing and preservation of cashew apple juice.

Cashew apple ready to serve beverage

The cashew apple juice extracted from the fruits was blended with the fruit juices of mango, pineapple and sapota at different percentages. The organoleptic score for RTS prepared from 25% cashew apple juice + 75% mango juice blend followed by 50% cashew apple juice + 50% mango juice blend, 25% cashew apple juice + 75% pineapple juice blend and 50% cashew apple juice + 50% pineapple juice blend were found high for their qualities *viz.*, colour, taste and overall acceptability up to 60 days of storage (Roy, 2016) ^[24].

Mirdha *et al.* (2019) ^[25] prepared ready to serve beverage from fifteen diverse cashew genotypes. The genotypes recorded scoring values between 3.50- 5.00 for colour, 3.00- 5.00 for appearance, 2.00- 4.80 for flavour, 2.00-4.00 for taste, 2.00-4.50 sweetness and 2.00-4.25 for overall acceptability on 5 point hedonic scale.

Nectar

Mixed nectar based on cashew apple (*Anacardium occidentale* L.), mango (*Mangifera indica* L.) and acerola (*Malpighia emarginata* D.C.) pulps was developed. The

formulations with higher contents of acerola and cashew apple pulps showed higher levels of vitamin C and total extractable polyphenols (Silva *et al.*, 2017) ^[26]. Sousa *et al.* (2010) ^[27] developed a nectar mixture using cashew apple, mango and acerola. The proportions of each pulp were as follows: 21% mango pulp, 12.25% of cashew apple pulp and 1.75% of acerola pulp.

Cashew juice blended beverages

Lakshmana *et al.*, (2018) ^[28] indicated that the overall opinion with respect to cashew blended beverages, the beverage obtained from treatment (Cashew+ Neera+ Tender coconut) was found to be better. Therefore, by adding these combinations can be effectively utilized for the preparation of the beverages which may help to increase the income of the farmers.

Marc *et al.* (2017) ^[29] carried out sensory analysis of blend juice from cashew apple juice (*Anacardium Occidentale* L.) and passion juice (*Paciflora Edulis*). Of the three proportions of mixture (v/v), the mixture C (90/10) seems best appreciated by the panelists. The study showed that cashew apple can be valued in juice with better acceptance if mixed with exotic fruit juices such as passion fruit. Mixtures with a variable proportion of passion fruit juice and cashew juice have improved the attributes of the resulting juices. The association of passion juice with cashew juice is therefore a good alternative for the valorization of cashew apple.

Sousa *et al.* (2010) ^[30] has developed the fruit blended beverage with 35% juice blend. It included 14.0% cashew apple, 5.7% papaya, 5.7% guava, 5.7% acerola, and 3.9% passion fruit with 10 percent sugar, added with 100 mg/L of caffeine and preservatives, packed in pasteurized bottles and second pasteurized at 90°C for 30 s stored at room temperature (25°C). It was concluded that the caffeine added fruit mixed beverages was well accepted by the panelists at the initial period, the hedonic scores for appearance, colour, flavour and overall acceptance were 7.2, 7.2, 6.9 and 7.1 which had reduced at the end of storage period on 180 days at 25°C, the scores were 6.3, 5.9, 5.7 and 5.9 respectively. However, the overall acceptance decreased with time, which may be attributed to colour changes, because the colour acceptance also diminished.

Carbonated beverage

The extracted cashew juice was clarified using sago @ 5g/lit. and stored by adding KMS @ 2.5 g/lit. and citric acid @ 5g/lit. of juice. Cashew apple soda was prepared from cashew apple syrup. For making cashew apple syrup, one lit. of clarified juice, two kilograms of sugar and 15 g citric acid were used. Various quantities of the syrup were taken and chilled carbonated water was added to the syrup at different gas pressure. Organoleptic scoring revealed that the sample with 100 psi carbonation in 160 ml chilled water, added to 40 ml cashew apple syrup, thus constituting a total quantity of 200 ml cashew apple soda, was the most acceptable one. This is being filled and sold in 200 ml glass bottles. The carbonated drink has good acceptance among all the consumer segments and large scale production can generate substantial opportunities for income generation (Sobhana and Mathew, 2014) ^[31].

Bio-fortified cashew apple juice

Cashew apple is highly nutritious, blending with other fruit juice improves its palatability. Cashew apple juice can be

blended with the sap of fruits depending on the seasonal availability.

CashLime is a cashew apple and lemon juice blend RTS/Nectar prepared using cashew apple pulp. The nutrient rich drink can be stored under refrigerated conditions for maximum of five months with maximum retention of nutrients and biochemical quality parameters whereas the samples stored at room temperature began to lose its quality after two months of storage (Preethi *et al.*, 2019) ^[32].

Cashew apple syrup

Simple boiling of cashew apple juice above boiling point of water can yield good quality cashew syrup. The juice obtained from the cashew apple can be cooked under brisk stirring with or without any additive until it turns to syrup. Preliminary investigation carried out in the National Centre for Agricultural Mechanization showed that cashew juice can be prepared into syrup without any additive or osmotically active agents, and can stand ambient storage for over six months. Syrup produced during this preliminary investigation was stored under ambient condition. The proximate composition and microbial load analysis showed that no significant difference has occurred for six months. Cashew apple syrup usually had a sharp sweet taste and good aroma (Nwosu *et al.*, 2016) ^[33].

Cashew apple jam

Cashew 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 (Suganya and Dharshini, 2011) ^[34].

Pre – frozen whole cashew apples were soaked in varying osmotic solution concentrations (50, 60 and 70°Bx) at different soaking times (3,4 and 5 h) before conversion into jam. Jam made from 60°Bx for 3 and 4 h were most preferred by the panelists (Oyeyinka *et al.*, 2011) ^[35].

Cashew apple jelly and cake

Cashew apple extract was prepared by boiling 250 g cashew apple pieces in 500 ml water for 30 minutes. Jelly was prepared using the cashew apple extract, sugar, gelatin, guava fruit extract and china grass along with pineapple, mango pulp, ginger drops and cardamom powder in different combinations. Sensory scoring of the samples revealed that the jelly prepared with cashew apple extract, sugar, gelatin and cardamom powder showed maximum acceptability. Cashew apples were washed and detanned using common salt @ 5% and made into small pieces, then dried and powdered. This powder was used for making cake after mixing with sugar, maida, egg, butter, milk, baking powder in different combinations. The sample prepared by using 30g maida, 20 g cashew apple powder, 75 g butter, 200 g condensed milk and a pinch of baking powder showed maximum acceptability in the organoleptic scoring of the samples (Sobhana and Mathew, 2015) ^[36].

The potential of cashew apple fiber in enriching wheat flour for production of acceptable cake was attempted. Wheat and cashew apple fiber composite flours were produced by substituting wheat flour with 5–30% cashew apple fiber while 100% wheat flour was used as control. Physicochemical properties of the composite flours and sensory acceptability of the cakes produced were examined. Sensory acceptability of

cakes produced from wheat flour substituted with 5–10% cashew apple fiber compared favorably with wheat flour cake (Adegunwa *et al.*, 2020) [37].

Cashew apple candy

Bidaisee and Badrie (2001) [38] found that a more acceptable candied cashew apple could be produced. The pre-treatments consisted of soaking the fruits in 5% NaCl solution, 10% NaCl solution or without NaCl solution. Subsequently osmotic dehydration of the fruits was accomplished in 30° Brix sucrose syrup, increased by 10° Brix daily to 70° Brix, followed by convection drying at 60°C for 48 h. The effect of brining pre-treatment was significant on texture with resultant firmer textured candied products. Panelists rated the candied products from all treatments as slightly astringent to not astringent. Colour changed from dark red for cashew apples to light yellow for candied products. Pre-treatment without brine had significantly higher sensory scores for texture and was rated highest for acceptability.

Production of banana-cashew apple fruit bar

The cashew and banana fruit pulp were sliced separately into thin pieces with clean stainless steel knife and then blended separately in a blender to obtain smooth purees. Six fruit bar samples were prepared with blends of banana and cashew apple purees in the ratios of 100: 0, 90:10, 80:20, 70:30, 60:40, 50: 50% (Banana puree : Cashew apple puree). Sugar (70g), ground dates powder (50g), citric acid (5g) and sodium meta-bisulphite (2g) were added into 1000g of each sample puree and mixed thoroughly. The mixed purees were heated to 95°C for 5 minutes to concentrate the mixture, inactivate enzymes and inhibit microbial actions. The purees were poured into 25 x 25 cm aluminium trays covered with aluminium foil that were smeared with glycerine which aided the easy peeling off of the fruit leather after drying. The fruit purees were then oven dried at 90°C for 9 hours. The dried fruit bars were manually cut into equal shapes and packaged in airtight jars. From this study, it has shown that the utilization of cashew apple and its incorporation into already existing fruit bar like banana bar improved the nutritional and organoleptic qualities of the fruit bars. The addition of cashew apple improved the vitamin C content of the formulated fruit bars. It is concluded that 10 – 50 % of cashew apple pulp could be used to produce fruit bars without having any negative impact on the consumer acceptability (Arinzechukwu and Nkama, 2019) [39].

Marmalade

The fruit was divided into quarters and 500 g of fresh fruit, 400 g of sugar and 600 g of water were mixed, using citric acid as a preservative, and the marmalade was obtained using an artisanal method as follows: 3 g of the white skin of a lemon was added to 50 mL of water, followed by heating in a microwave oven for one minute (0.17 % citric acid). This hot citric acid mixture was used in the marmalade. The previous preparation of water, citric acid and fruit was heated at 50 °C until 65 °Bx was obtained. After cooling 50 g samples in jars, each underwent pasteurization (100°C for 30 min) to obtain a shelf life of 45 days stored under refrigeration conditions (Figueroa-Valencia *et al.*, 2019) [40].

Osmo-dehydrated cashew apple

Osmo-dehydrated cashew apple could be developed by osmotic treatment of 10 mm thick slices of blanched cashew apples in 60° brix honey at 50° C for 24 hours followed by

drying at 50°C till 15-20% moisture. The product could be stored for six months in vacuum pack with nitrogen in laminated pouch without affecting major chemical quality parameters. Currently available technology for the development of value added cashew apple products utilizes sugar as the raw material, where as sugar has been completely replaced with honey in preparation of this product, hence having medicinal property with no side effect of sugar. This is a 'ready to eat' high quality snack food with extended shelf life, preserving natural qualities of cashew apple. By developing this value added products, it is possible to make the seasonal fruit available to the consumers throughout the year (Mini and Archana, 2016) [41].

Cashew apple was processed into value added product with improved consumer acceptability by osmo-dehydration of them in a 50% sucrose solution (fruit: syrup ratio 1:4) fortified with 2% CaCl₂ for 12 hrs at 30°C and drying in a hot air dryer for 48 hrs below 60°C. The dried product packed under vacuum in a nylon packaging, showed shelf life of 6 and 10 months at 30°C±2 and 4°C respectively. The estimated medians for color, taste, aroma, crispness and overall acceptability above 6 in 7 point hedonic scale. To obtain self stable product, osmo-dehydrated products were further dried by two methods, freeze drying and hot air drying for 48 hrs. Hot air dryer temperature ~ 60°C speed of the fan inside the dryer is ~1200rpm. Osmo-dehydration in 50% sucrose containing 2% CaCl₂ and subsequent hot air drying can be improved overall acceptance and self stability of cashew apple. Samples packed under vacuum found to possess higher self stability than the samples packed under nitrogen. Freeze dried samples, packed under vacuum retained nearly 4 month shelf life. Product obtained from hot air drying can be preserved up to 6- 10 months depending on the packaging material and storage condition. The hot air dried product packed under vacuum in a nylon packaging, showed shelf life of 6 and 10 months at 30 °C±2 and 4 °C respectively (Kaushalya and Weerasooriya, 2017) [42].

The slices of cashew apple were placed in 600 mL beakers containing the osmotic solutions. A fruit / solution ratio of 1:10 was used. The samples were placed in an incubator, maintained

at 34°C and agitation at 80 r.p.m. After 165 min of experiment, samples were taken out from the osmotic medium, lightly rinsed to remove any excess of sugar solution, drained and then placed on a preweighed drying tray in order to proceed to the drying process. Drying experiments were carried out in a continuous flow fixed bed dryer at constant air velocity of 2.1 m s⁻¹ and at three air temperatures (50, 60 and 70°C). Products pretreated in sucrose solution had the highest test scores, except for aroma. The samples pretreated in corn syrup had test scores closer to the untreated samples (Azoubel *et al.*, 2009) [43].

Matured ripe cashew apples were transversely cut into 10 mm, 15 mm and 20 mm slices and immersed in sugar solutions of 52°Brix, 60°Brix and 68°Brix, for 10 h. The osmotic temperature was maintained at 27 °C in a water bath. Osmosed samples were subsequently dried in either an air-oven (50 °C) or a vacuum-drier (50 °C), both for 6 h. The instantaneous moisture content of osmosed cashew apples decreased with increasing immersion time and osmotic solution concentration, but also increased with increasing slice thickness. The water loss, solids gain and percentage weight reduction increased with increasing osmotic solution concentration and immersion time, but decreased with increasing slice thickness. Osmotically dried samples received

high acceptability. Sample pre-osmosed in 60°Brix and 68°Brix solutions were significantly better than those pre-osmosed in a 51°Brix solution (Falade *et al.*, 2003) [44].

Cashew apple Powder

Cashew apple powder could be prepared by solar drying the apple for 5 days (8 h/day) followed by drying in a hot air cabinet dryer for 2 days at 70°C. This yielded a free flowing cashew apple

powder. Alternatively cashew apple powder could be prepared by autoclaving at 16 lbs for 10 min followed by drying at 70°C for 2 days in a hot air cabinet dryer. Pretreatment of cashew apple with sodium chloride at 2 to 10% concentration over a period of 5 days (concentration of sodium chloride to be increased by 2% daily upto 10%) before autoclaving and drying resulted in cashew apple powder with lower tannin content. Cashew apple powder could be blended upto 20% with cereal flours (rice, finger millet and wheat) to get fibre and antioxidants rich flour blends. Cashew apple powder / pomace has a shelf life of 12 months at ambient temperature (27- 30°C). Antioxidant activity in cashew apple powder, however, decreased beyond 4 months of storage at ambient temperature. Antioxidant activity in cashew apple powder is associated with tannin, phenols, amino acids and sugars and ascorbic acid (Bhat, 2008) [45].

Cashew apple juice powder can be prepared by using maltodextrin and tricalcium phosphate. Maltodextrin levels exhibited a significant variation with respect to physical parameters of juice powder such as recovery per cent, bulk density, colour and chemical parameters TSS, acidity, ascorbic acid, reducing and total sugars of the cashew apple juice powder. All the quality parameters decreased with increase in maltodextrin levels except recovery and pH. Sensory evaluation for RTS of cashew apple juice powder showed decreasing results with increasing maltodextrin levels. Based on the overall acceptability, the addition of maltodextrin @ 10 or 20 per cent is useful for the preparation of high quality spray dried cashew apple juice powder (Khanvilkar, 2016) [46].

Cashew apple powder was prepared by drying the fruits. This dehydrated powder was used in the preparation of wheat laddu, sponge cake, chocolate, soup and sweet kadabu recipes at the rate of 10 per cent substitution. Similarly, cashew apple juice blended with skimmed milk in the ratio of 15:85 was subjected to spray drying, thus obtained powder was also used in the preparation of halwa and lassi (Shivaleela and Vaidehi, 1995) [47]. Cashew fruit powder can be blended in regular traditional recipes as high fiber, light flavored dishes. Hence, the wastage of cashew apples can be used and variety and enhancement of nutritional quality of traditional foods could be achieved. Dried cashew apple powder with good sensory properties could be used in the development of value-added products such as cookies, bread spread, wheat-based confectionaries, chocolates, sponge cakes (Ray, 2010) [48].

Cashew apple and guava residues from fruit juice industry were prepared as dehydrated fruit powders and used at different levels of wheat flour substitution for cookies formulations. The effects of guava and cashew apple fruit powders supplementation on physicochemical and sensorial characteristics of the cookies were evaluated. The pH, fibre and protein content were significantly affected. Biscuits with 15 g and 20 g/100g cashew apple and guava fruit powders showed the highest scores for sensorial attributes, respectively. The supplementation seems to be suited for

wheat flour substitution and it is possible to obtain cookies with value-added food ingredient within the standards (Uchoa *et al.*, 2009) [49].

Conclusion

Numerous studies have reported the health benefits of consuming fruits and vegetables that contain bioactive components. In order to preserve these fruits and to avoid subsequent losses and make the fruits available throughout the year, fruits need to be processed and preserved into various products. The present review is a compilation of studies on value addition in cashew apple. Cashew apple fruits are highly perishable and susceptible to spoilage. But effective exploitation of cashew apple through formulating value added food products would improve sensory qualities of the final product and create a stable market for farmers and food processors, thereby improving the utilization of cashew apple and economy of the country. These cashew apple products are highly acceptable since they are natural products and consumers are becoming more and more health conscious. Some major problems of cashew apples are their astringent and acrid nature. Therefore, in cashew apple processing into functional foods and products, tannins are reduced to tolerable and acceptable level that would be safe for human consumption.

Research reports surveyed, in this review, revealed that 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. Various methods have been developed to improve the shelf life and sensory properties of whole cashew apple and its products. A wide variety of methods ranging from chemical preservatives to high pressure processing have been evaluated for the improvement of shelf life. Physical, chemical and bioprocessing methods have also been used to improve sensory qualities of the products. 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 empowerment for production of value added foods it can substantially enhance the income from cashew apple processing.

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