




association to protect the interests of cashew growers. Growers from Karnataka, Maharashtra, Andhra Pradesh and Kerala were present during the occasion. The meeting was chaired by Mr. S.R. Sathischandra, the President of CAMPCO. The formation of a national level association was endorsed by the growers gathered during the occasion.

The All India Cashew Growers Association thus formed has the objectives of enhancing communication among the cashew farmers, giving voice to cashew growers at central and state government levels, communication between various organizations and departments, delivering scientific cashew farming and processing information to



farmers, promoting farmer producer companies and holding cashew melas and fairs.

It is hoped that this association will work towards fulfilling the aspirations of cashew growers throughout the country. Further, it is also expected to increase the utility of research carried out at the Directorate in terms of catering to the needs of growers besides strengthening the institute's effort in promoting formation of FPOs in cashew.


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FOCUS ON RESEARCH

Cashew Apple Products and Cashew Sprout Preethi, P. and M. Shamsudheen

The cashewnut got considerable commercial attention because of its delicious and nutritive kernels. However, the cashew apple and cashew sprouts did not receive much attention with respect to their commercial utilisation. Nearly 90% of cashew apples are thrown in the plantation after collection of cashewnuts. The cashewnuts left behind during harvest or those are hidden in between weeds and dried leaves of cashew start germinating with the onset of monsoon. In cashew plantations, it is common to observe people go in search of sprouted cotyledons which are relished by the

coastal inhabitants of Karnataka and Kerala. In view of this, research on utilization of cashew apple and improving the nutritional status of cashew nuts through sprouting were taken up at this directorate. Cashew apples cannot be stored for long time even under refrigerated condition because of complex physiological nature and thin skin and hence, processing is essential. Dehydration and drying are the most common practices of preservation followed by human since many decades. The following products are developed using either one of these techniques.

CASHEW APPLE CHEW

Fresh and firm cashew apples are selected and washed with running water for removal of debris and adhesives and wiped off the excess moisture. Cashew apples are



cut into 0.5 cm cubes and mixed thoroughly with the prepared sweet spices powder (cloves – 4 nos, cardamom – 5 nos, cinnamom – 1 cm², cumin – 40 g, sugar – 50 g, for 500 g cashew apple), spread as single layer over a clean dry stainless steel tray for dehydration using cabinet dryer at 40-45°C for 6-7 h. 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 apple is again impregnated into spice coated cashew slices to enhance the retention of vitamin-C. This can be taken as such like a mouth freshener or along with betel leaves.

CASHEW APPLE FIG

Whole fresh and firm uniform sized cashew apples are selected and washed with running water. The apple base and distal ends are removed by chopping and soaked



in sugar solution of concentrations ranging from 50-70°Brix and 0.6% potassium metabisulphite (KMS) as preservative. To encourage osmosis, gentle slits are made on four sides of cashew apples using bamboo splint or stainless steel knife. The sugar solution concentration should be maintained at 60°Brix for at least 3-4 days. The apple slices in solution should be frequently stirred to ensure complete immersion, to avoid microbial infestation. After 3-4 days, the sugar solution is drained off and the separated cashew apples are dehydrated using cabinet dryer at 40-45°C temperature for 7-8 h.

The vitamin C, protein, starch and total phenol content of cashew apple chew and cashew apple fig prepared at ICAR-DCR are furnished in Table. 1.

Table 1. Biochemical characters of cashew apple chew and cashew apple fig

	Ascorbic acid (mg/100 g)	Protein (%)	Total phenols (% catechol equivalents)
Cashew apple chew	35.32	2.73	0.69
Cashew apple fig	15.83	2.33	1.20

CASHEW APPLE CRISP

Cashew apple crisp is an important extruded product prepared out of cashew apple pomace powder. The methodology for preparation of cashew apple pomace powder (CAPP) has been standardised by ICAR-DCR, Puttur. By converting the perishable cashew apple in to powder form, the raw material can be stored for diversified uses during off season. Corn flour (CF) and rice flour (RF) are the major ingredients in extruded product preparation. These ingredients are predominantly poor in minerals,

proteins and fibre. Hence, to enrich the product with bio minerals, protein and fibre, CAPP is added as one of the ingredients along with commercially available corn flour and rice flour. The optimised quantity of cashew apple pomace powder ranged from 5-25% (Fig.1) for successful exit of extruded products. Effect of addition of cashew apple pomace powder on physical and biochemical parameters of the final products are furnished in Table 2. The research work was carried out in agro processing complex, ICAR-CPCRI, Kasaragod.



75% RF + 25% CF



5% CAPP+75% RF + 25% CF



10% CAPP+65% RF + 25% CF



15% CAPP+60% RF + 25% CF



20% CAPP+55% RF + 25% CF



25% CAPP+50% RF + 25% CF

Fig.1 Cashew apple crisp prepared using different proportions of cashew apple pomace powder (CAPP), rice flour (RF) and corn flour (CF)

Table 2. Physical and biochemical characters of cashew apple crisp

Treatments	Physical parameters					Biochemical parameters	
	Expansion ratio	Specific length (mm/g)	Bulk density (g/mL)	Water absorption index (%)	Water solubility index (%)	Ash (%)	Protein (%)
75% RF + 25% CF	3.86 ^a	32.74 ^d	0.24 ^a	13.94	5.47 ^d	0.93	3.97 ^d
5% CAPP+70% RF + 25% CF	3.16 ^b	52.14 ^c	0.17 ^b	13.62	10.24 ^c	0.93	4.47 ^c
10% CAPP+65% RF + 25% CF	2.98 ^{bc}	56.39 ^b	0.15 ^{bc}	12.29	11.28 ^c	0.93	4.66 ^{bc}
15% CAPP+60% RF + 25% CF	2.87 ^c	56.70 ^b	0.14 ^{bc}	12.03	12.14 ^c	0.94	4.72 ^{bc}
20% CAPP+55% RF + 25% CF	2.59 ^d	56.89 ^b	0.13 ^{bc}	9.98	17.23 ^b	0.94	4.93 ^{ab}
25% CAPP+50% RF + 25% CF	2.34 ^e	59.91 ^a	0.12 ^c	8.18	22.89 ^a	0.96	5.31 ^a
CD (0.01)	0.25	3.68	0.06	NS	5.78	NS	0.64

[RF: Rice flour, CF: Corn flour; CAPP: Cashew Apple Pomace Powder]

CASHEW SPROUTS

Cashewnut is preferred as snack in the form of roasted or salted or both. Cashew being rich in monosaturated fatty acid (40-48%) and protein (18-20%), supports the tissue build up and strengthens the immune system. Phytic acid is a natural anti-nutritional substance believed to cause digestive issues and cashew contains considerable amount of phytic acid. In general, germination, soaking in water, steaming, frying, fermentation are the methods followed in many leguminous and cereals for reduction of phytic acid. Germination is the best effective method and is reported to reduce the phytic acid even up to 80% and consequently increasing the bioavailability of nutrients. At ICAR-DCR, Puttur,

the nutritional factors and biochemical quality parameters of cashew sprouts raised under etiolated conditions were studied. In the process of germination, the fat content was drastically reduced to 19-22% from 42-48% compared to the cashew kernel. Two fold increase in total phenol content (the representative of antioxidant property) was recorded in cashew sprouts compared with the cashew kernel. Germination exerts significant increase in minerals such as calcium, iron, manganese, zinc and copper (Table 3).



Table 3. Bio-chemical and nutritive status of cashew sprouts and cashew kernel

Parameters	Cashew sprout	Cashew kernel
Fat content	19-22%	42-48%
Fibre content	4.3%	3.3%
Total sugars	2%	8%
Total Phenols	472 mg/100 g	210 mg/100 g
Free Amino acids	1.06%	0.48%
Essential minerals	Potassium – 0.85% Calcium – 0.58% Magnesium – 0.14% Iron – 336.94 ppm Manganese – 10.1 ppm Zinc – 60.62 ppm Copper – 9.80 ppm	Potassium - 0.85% Calcium – 0.03% Magnesium – 0.03% Iron – 30.4 ppm Manganese – 2.32 ppm Zinc – 9.1 ppm Copper - 0.66 ppm

In addition to the existing products of cashew apples such as jam, jelly, RTS beverages, cider, these new products developed at this Directorate open up different ways of utilizing cashew apples. This is expected to enhance the income of cashew farmers and livelihood options for self help groups.

PROGRAMMES ORGANIZED

ANNUAL CASHEW DAY - 2018

Annual cashew day of ICAR-DCR, Puttur was organized on 22 January 2019. The programme was inaugurated by Smt. J. Mercykutty Amma, Hon'ble Minister for Fisheries, Harbour Engineering and Cashew Industry, Government of Kerala. On the occasion, first cashew hybrid of ICAR-DCR, H-130 was released by distributing it to Horticultural department officials from Karnataka and Kerala. In the program, a website serving as