

# PRODUCE AND PRODUCTS OF PLANTATION CROPS

V. Rajagopal

## INTRODUCTION

India is endowed by Mother Earth with a wide range of plantation crops, which serve as the source for diversified products of commercial importance. The crops that come under plantation category represent oil yielders (coconut, oil palm), condiments and spices (cashewnuts, pepper, cardamom, ginger, turmeric, cinnamon), beverages (cocoa, coffee, tea), masticatory (arecanut) and of industrial nature (rubber). As foreign exchange earners most of these crops have great potential at the international market and India ranks first in some of the products in the world trade. Biodiversity of plantation crops are evident in view of the varied agroecological conditions under which they grow in this country. While the area, production and productivity of some of the crops increased over the last five decades, there was late realization of the utilization of products obtained from these crops. With the emphasis being given now in the Indian Agriculture on value added products, the role of post-harvest technology has gained utmost significance.

It has been estimated that there is considerable loss in many of the agricultural products after harvest. This is either because the post-harvest technology has not been developed to the desired extent in some crops or the problems in marketing of produce or both. In the present context, the stress is more not only on the development of techniques to preserve the harvested products but also on

identifying and refining the techniques to add value to the products. The objective, therefore, is to enhance the consumer acceptability of the products through improved technologies.

## COCONUT

Coconut plays a pivotal role in the socio-economic scenario of Kerala, as it provides employment potential with many industries based on various products. Almost all parts of coconut are useful both for domestic purposes and in industrial units. Thus, the crop is often referred as Kalpa vrikshat. From the utilization point of view coconut products can be grouped under three categories: (1) Food products, (2) Non - food products and (3) Miscellaneous products.

### (1) Food products

a) **Wet meat or kernel** : The kernel of 7 to 8 month old nuts is consumed either as such or along with sweet tender nut water. At this stage the kernel will be very soft, rich in protein and sugars. In riped kernels of 11 to 12 month old nuts, the chemical constituents show marked changes. In the households, fresh kernel is used in the grated form and in the form of milk or cream obtained by squeezing the gratings with or without addition of water. Processed forms of kernel and milk find applications in the food industry.

(i) **Coconut milk (CM)** : It is an emulsion of oil in water into which some of the soluble components of the meat has passed. Apart

from culinary uses, CM is used as a substitute of dairy cream in beverage type milk, as evaporated and condensed milk in the preservation of soft white cheese, yoghurt and many other food stuffs. Preserved forms of milk such as canned cream milk (40% fat) or whole milk (12.5% fat) are available in markets with high consumer acceptability.

**(ii) Coconut jam (CJ) and coconut syrup (CS) :** CJ and CS are essentially prepared using whole coconut milk, with different extraction and mixing procedures. The CS with 44.5% soluble solids, which gives a delicious instant milk white drink, is an excellent bread spread and can be used for confectionery purposes.

**(iii) Coconut skim milk (CSM) :** It is a good source of quality soluble protein for the preparation of many useful allied food products or as supplemental protein source in places where animal protein is deficient.

**(iv) Coconut flour (CF) :** During the processing of coconut cream and other related products, the fibrous residue obtained after expelling the milk is dried and powdered to obtain CF. Nutritionally CF compares favourably with most of the common seed flours.

**(v) Desiccated coconut (DC) :** DC is the white kernel comminuted and desiccated to a moisture content of less than 3%. The common grades of DC have particle size of less than 5mm. It is an important commercial product with world wide demand in the confectionery and other industries, as one of the main subsidiary ingredient of filling for chocolates, candies and liquorice.

**b) Coconut water :** Water from 6 to 7 month old nut is a refreshing drink, effective in cases

of gastro enteritis etc. It is a rich source of B vitamins, minerals, sugars etc. Though less nutritious, mature coconut water is the main source for products like Nata de coco, a gelatinous substance, soft drink, coconut vinegar, food yeast, edible mushroom etc. In addition, coconut water can also be used as rubber coagulant to obtain good quality rubber.

**c) Coconut toddy :** Toddy is obtained by tapping the unopened spadix of coconut palm. Fresh toddy obtained on tapping is rich in sugar and vitamins, while on fermentation the composition differs. Unfermented toddy is a good source of coconut jaggery with high percentage of sugar (88.3 %), whereas fermented toddy is used extensively to produce coconut vinegar and treacle. Arrack is obtained by distilling fermented toddy, while double distillation of toddy gives coconut feni.

**d) Dry kernel or copra :** The dried coconut endosperm is called copra, with the richest source of fat (65 to 70 %). Two types of copra are: edible copra and milling copra. Edible copra is available as ball copra (fully matured whole unsplit nuts) and as cup copra (matured split copra). The quality of milling copra ultimately determines the quality of oil and the residual cake.

**(i) Coconut oil :** It is extracted from copra with appropriate devices. The oil is referred as lauric oil in the world market for oil seeds, oils and fats because of its high lauric acid content. Coconut oil is rich in saturated fatty acids, mainly lauric and myristic acids. When compared with other leading vegetable oils, coconut oil is low in unsaturated and polyunsaturated acids, particularly linoleic acid. The quality of the oil depends not only

on the quality of copra, but also on storage conditions of copra before milling, as well as storage of oil after extraction.

(ii) **Coconut cake** : The cake left after extraction of coconut oil from copra is a valuable cattle feed rich in fat.

## 2) **Non - food products**

Among the non - food products of coconut, coir or coconut fibre, coconut pith and shell assume commercial importance, other parts being wood and leaves.

(i) **Coconut husk (CH)** : The husk usually forms 25 to 45 % of the weight of whole ripe nut. When the nuts mature, the quantity of the fibre does not decrease but it is the moisture in the fibrous mass of the husk which disappears. The thickness of husk varies from 2.5 to 3 cm in thin husked nuts to 4 to 5 cm in thick husked nuts. Coir fibre and coir pith are the products derived from coconut husk.

The husk of an average coconut weighs about 0.4 kg, of which 30% constitutes coir fibre and the balance 70% is pith and outer skin. Two types of fibres are white and brown. Lignin and cellulose are the major constituents of pure fibre. Coir pith is a waste product of coconut industry. It can be used for conservation of soil moisture, as a manure and also as a source of furfural, oxalic acid and gypsum. Pith can be added as a substitute in biogas generation and also power gas in industrial engines. Many commercial products like hard boards, insulators, expansion joint fittings can be prepared from coir pith.

(ii) **Coconut shell (CS)** : It is the endocarp of coconut with major use as a fuel. It is also

used to make various domestic utensils, curios, fancy items etc. The commercial importance of CS lies mainly in the production of shell charcoal, activated carbon and shell flour. Activated carbon is extensively used as agents for purifying, refining and bleaching of volatile oils and chemical solution. It is also in demand as an adsorbant of gases. Coconut shell flour is used in the production of glues in plywood industry and as a substitute for bunker oil in boiler operations.

## 3) **Miscellaneous products**

Coconut wood is currently a substitute for conventional wood. Extensive processing is involved in making the wood durable for construction purposes. The plaited and unplaited leaves of coconut are used for thatching, fencing and making baskets.

## **OIL PALM**

In oil palm, the main produce is the fresh fruit bunch varying in shape and weight. The products of commercial value are kernel oil and mesocarp oil, differing in chemical composition. Chemical composition of palm kernel oil is similar to coconut oil and is grouped under lauric acid oils. Unprocessed palm oil is rich in carotenes, vitamin E, sterols, etc., while in refined palm oil carotenoids are absent. Because of the presence of vitamin E it is a nutritionally important oil.

## **ARECANUT**

In arecanut, the major produces are green nut and dry nut which differ in their composition. The nuts are mainly used for masticating purposes, besides religious and social occasions. The products of arecanut have alternate uses with the potential for establishing small scale industries.

(i) **Arecolin, tannins and fats** : Among the alkaloids present in arecanut, arecolin ( $C_7H_{13}O_2N$ ) is the main active compound, other minor alkaloids being arecaidine, guvacoline and guvacine. Tannins in arecanut are used for dyeing clothes, ropes, etc. These are byproducts obtained from the process of preparing immature nuts for masticatory purposes. Areca fat (8 to 12 %) has comparable characteristics with hydrogenated coconut oil. Arecanut fat is used for certain confectionery purposes, along with cocoa butter.

(ii) **Arecanut husk** : It is used as a cheap fuel and mulch. In Indonesia and Philippines arecanut is used for tooth brushes. It can also be used for the manufacture of thick boards fluffy cushions and non - woven fabrics. Insulation and hardboards of satisfactory quality are also prepared from areca husk. Activated charcoal and xylose can also be produced from areca husk. Other uses of areca husk are fibre and plastic boards, soft cushion pads, etc. Possibilities also exist to use areca husk as manure.

(iii) **Leaf sheath** : Leaf sheath with its high cellulose content and crude fibre makes a flexible and pliable material for heat moulding. From leaf sheath, domestic items like cups, plates and head caps are prepared. It is also used in manufacturing plyboards, veneer boards, picture mounts, decorative panels, tea poys, file boards, bags, etc.

(iv) **Stem and leaf** : Due to its hardness the areca stem is used as building material, poles, rulers, shelves, nails, etc. Hollow stem can be used as drainage and irrigation pipes. Areca leaves are a good source of organic manure. They are mostly used for thatching purposes.

## CASHEWNUT

The hard kidney shaped nut of cashew fruit is the raw material for cashewnut. The cashew kernel is a nutritious dry nut rich in unsaturated fat (47%), protein (21%), and carbohydrates (22%). The important byproducts of cashewnut are cashewnut shell liquid and cashew apple.

(i) **Cashewnut shell liquid (CNSL)** : It has wide application in many industries. Anacardic acid (90%) and carol (10%) are the constituents useful as industrial raw material for manufacture of lacquer and varnishes, CNSL and its derivatives are used in the preparation of antioxidants and lubricants. The cashewnut shell gum can be used as thickening agent for ice cream, binder for tablets in pharmaceuticals and as a drilling mud in mining industry.

(ii) **Cashew apple** : Cashew apple is a juicy fruit rich in carbohydrates, vitamin C, etc. It contains astringent and acrid principles. Conversion of fruits to value added edible products has been undertaken by industries. The products are clarified and cloudy apple juice, blended juice beverages, cashew apple juice concentrate, candy, jam, pickles, chutney etc. The areas of commercial importance are blended juices, mixed jam and feni.

## SPICES

(i) **Pepper** : Pepper is generally referred as the king of spices. The significant quality aspects of pepper are the pungency attributed to the piperine and aroma to pepper oil. There is a wide range of value added products in pepper, which are in great demand in international market. The products are dehydrated green pepper, freeze dried green pepper, frozen green pepper, white pepper,

green pepper in brine, pepper oil, pepper oleoresin, organic pepper, sterile pepper and canned tender green pepper.

(ii) **Cardamom** : There are two types of cardamom generally referred as small cardamom and large cardamom. Like pepper, this also is a spice crop of commercial importance and export potential. Green cardamom, cardamom oil and cardamom oleoresin are the products of this crop.

(iii) **Ginger** : It is a crop with medicinal value. The fresh produce has culinary importance, while multipurpose uses exist for the value added products. The products include ginger oil, oleoresin, candy, plain and vitaminized effervescent ginger powder, starch from spent ginger, ginger brandy, wine, beer, medicinal beverages, encapsulated ginger oil and dehydrated ginger.

(iv) **Turmeric**: Like ginger, turmeric also has medicinal value. Byproducts of importance are dehydrated turmeric powder, oil, oleoresin, and curcuminoids.

## **COFFEE**

Coffee is the most widely exchanged commodity in the international trade scenario. Coffee berries and coffee seeds are the produce from the crop. For attaining aroma and taste many processes are involved in coffee industry. The important products are roasted coffee powder, soluble coffee, coffee brew concentrate, decaffeine coffee, monsoon

coffee, carbonated coffee, flavoured coffee, coffee-chicory mix. The refined process technology adds much value to these products and attract consumer acceptability.

## **TEA**

Internationally acclaimed to be of the best quality, tea in India has well established estates and processing industries with quality control. Green leaf is the main produce, whereas the products of fermentation processing are black tea and oolong tea. The former is fully fermented and the latter is produced as a result of partial fermentation. The most popular value added product is instant tea, a water soluble product of black tea.

## **COCOA**

It is an intercrop in coconut and arecanut gardens. The crop produces pods with cocoa beans as the main economic component. The major products from the beans are cocoa powder, cocoa butter and chocolate. (i) Cocoa powder: This is obtained by milling and sieving the cake, which is a resultant product after pressing the beans through various processes. (ii) Cocoa butter: It is another byproduct of beans after the processes of roasting and grinding and subjecting the liquor to hydraulic press. (iii) Plain chocolate: This is obtained by mixing the mass with sugar and grinding and coating.