

## Kernel Based Coconut Products

Coconut kernel is the inner most part of the coconut which is highly nutritious and rich in the fibre content, vitamins and minerals. Some studies concluded that that the dietary fibres can even resist heart attacks, strokes, digestive disorders and regulate bowel activities. Along with that



fibres can also increase metabolic rate by restoring the functions of thyroid gland. Coconut flour is the residue obtained after extraction of milk from kernel. It is dried, defatted and finely ground into a powder resembling wheat flour. Coconut flour is low in indigestible carbohydrate and high in fibre (61%).

The quality of kernel varies with the variety. Some varieties have more kernel content than others. The property of an oil follows the source from which it is extracted. Coconut kernel contains anti-oxidants which help to flush down the unwanted toxins from the body. This helps in weight reduction and improves the body metabolism. Coconut kernel not only helps in weight reduction, but helps to reduce the cholesterol level in the body. Coconut kernel, especially dried coconut kernel, contains LDH which helps to reduce the cholesterol in body.

### a) Coconut Oil

Coconut oil is the edible oil extracted from the dried kernel which is called copra. Coconut oil has high saturated fat content. So, the oil is slow to oxidize and resist rancidification up to six months at room temperature without



spoiling. It is an oil of natural origin. It is edible in raw form and it is saturated

and stable compared to other similar oils. It has a pleasing flavour, light colour and pleasant aroma. It is a biodegradable oil. The coconut oil shows high resistance to oxidative rancidity and possess a Sharp melting behaviour. It is a skin friendly oil. Effective heat transfer agent in frying makes it a good cooking oil that provides better shelf life for fried product and contributes to palatability. Ideal for deep frying Ideal confectionery fat. It is rich in Omega-6-Fatty acids.

Copra contain about 65-70% oil. Besides its common usage as cooking oil it is also used in soap making industry, surface active agents' production etc. Due to its health benefits it is also used as hair oil. In India, coconut oil is extracted using rotary chucks and also by using expellers.



**Rotary Chuck**



**Oil Expeller**

### **Process:**

Dry the kernel into copra to a moisture content does not exceeds 6% and clean well from foreign matter. Usually sun drying is used for copra drying in village areas. Drying machineries are also using nowadays for quick drying of the kernels. The dried copra is cut into small pieces called copra chips either by using copra cutter or manually. Chips are fed into steam jacketed kettles and cooked mildly in a temperature of 70°C for 30 minutes. Then the cooked material is fed into the expeller continuously and pressed twice. Oil is then collected in a tank.

Oil is filtered by using filter press and fed into mild steel storage tanks. If the oil is to be packed in bulk, it is packed in the tin containers. HDPE containers or polymeric bags are used for small packaging. The oil quality depends on the quality of copra and amount of oil varies with the copra content and varietal quality. Oil cake sediment at bottom of tank which can be effectively used as cattle feed.

## **b) Virgin Coconut Oil**

The fresh coconut milk is processed to obtain virgin coconut oil. Extracted from fresh coconut kernel without any chemical processes, it is the purest form of coconut oil, water white in colour. It also helps in the absorption of fat-soluble vitamins A, D, E and K. The milk is obtained from a mature kernel of 12-month-old from the pollination. Virgin coconut oil is edible in its own form. It is colourless oil and free of sediment which is present in original coconut oil. Virgin coconut oil has natural fresh coconut scent. It is free from rancid odour or taste. Virgin coconut oil consists mainly of medium chain fatty acids mainly lauric acid. It constitutes 48 % of virgin coconut oil. Lauric acid possess powerful antimicrobial properties capable of destroying disease-causing bacteria, fungi, viruses and parasites. VCO has considerable potential for therapeutic uses such as antimicrobial, anti-HIV/AIDS drug, for anti-cancer therapy and for the treatment of Alzheimer's disease.

Virgin coconut oil (VCO) is abundant in vitamins, minerals and antioxidants, thus making it the 'mother of all oils'. VCO was used at VSRC for patients with dry and often microbially colonized psoriasis, acne, atopic, contact dermatitis and rosacea lesion is the best skin care solution for babies. Free from all chemical formulations and assures good protection to the baby skin. Study by Department of Nutrition, University of Indonesia reveals that VCO also helps to

improve blood glucose and lipid profile of type 2 diabetics, due to its readiness to provide energy to body cells.

Always ensure that the nut while fully mature do not have haustorium. This is because the oil content of the kernel and quality of the oil starts declining once the haustorium is formed. Coconut meat/kernel and coconut milk are low acid foods so they are very susceptible to microbial contamination. Because of this, strict sanitation in the plant area, personnel and equipment should be practiced at all the times. Food grade stainless steel is the recommended material of construction for all parts of VCO process equipments that will come in contact with coconut kernel or milk. Water to be used as diluent or rehydrating agent should be of high quality, free from microbial contamination and from too much mineral content.

## **Production Processes**

Virgin Coconut Oil (VCO) is extracted from fresh coconut milk obtained from matured coconut of 12 months old. VCO can be consumed in its natural state without the need for further processing. For making 1 lite of virgin coconut oil, 7 kg (17 nuts) of dehusked coconut is needed.



- a) **Dehusking:** Manual or mechanised husk removal
- b) **Deshelling:** Shell of the coconut is removed without breaking the kernel.
- c) **Paring:** Brown colour out of the kernel is removed using paring machine.
- d) **Pared coconut dipped in hot water for blanching.**
- e) **Draining:** With the help of a vibratory screener excess water is removed from blanched kernels.
- f) **Disintegration:** Pared coconuts are fed into a disintegrator where pared nuts are cut into small pieces and will be ready for extraction.
- g) **Milk extraction:** Milk extractors are normally screw press or hydraulic press extractors. The disintegrated coconuts put in the milk extractors. Coconut milk is separates out. The coconut milk is then filtering and taken for centrifugation. While the residue is used for preparing desiccated coconut.
- h) **Centrifugation:** Coconut milk is the natural oil in water emulsion. After centrifugation, oil and skim milk is separated. Coconut oil is separated from coconut milk.
- i) **Filtration:** Filtration: The oil is passed through the filter and packed in consumer packs. Vacuum dehydration of oils will remove the excess moisture present in oils.
- j) **Packing:** The product is packed in appropriate bottles, packets or containers.

The VCO plant needs machineries like, coconut deshelling machine, blanching tank, primary cutter, disintegrator, centrifuge coconut milk extractor, tubular centrifuge machine, Extra bowl for centrifuge, oil micro filter, overheat tank, defatted coconut powder electrical drier, VCO storage tanks and milk storage tanks. There are other methods of production also available for producing VCO like, fermentation method, Bawalan-Massa process, fresh dry method, wet method etc.

## **CDB Scheme for Promotion of Coconut Industries**

Coconut Development Board under Technology Mission on Coconut extends financial assistance to the limit of 25% of the eligible project cost limited to Rs. 50 lakhs per project. Under this scheme, CDB has supported 44 virgin coconut oil manufacturing units with a processing capacity of 161.85 million nuts.



### **c) Desiccated Coconut**

The coconut meat is dried and dehydrated to form the desiccated coconut which is widely using in these days for confectionaries. It is used as a next best alternative for grated coconut. It is obtained as a by product in VCO production. Different grades of desiccated coconut are available in India. Desiccated Coconut Powder is obtained by drying ground or shredded coconut kernel after the removal of brown Testa. An average processing of 100 coconuts gives around 10 kg of coconut powder.

- a) **Fine** – if size of particle is between 1.40mm and 1.00 mm or if it is retained on 1.00mm IS test sieve.
- b) **Medium**- If size of particle is between 1.70 mm and 1.40 mm or if it is retained on 1.40 mm is sieve.

- c) **Coarse** – If size of particle is more than 1.70 mm or if it passes through 1.70 mm IS test sieve.

Yield of the product is 1 ton from 10,000 coconuts.

### **Production Method**

Production of desiccated coconut involve following steps.

1. De husking of coconuts
2. Deshelling
3. Removal of brown testa
4. Blanching
5. Disintegration
6. Drying
7. Sieving/Grading
8. Packing



#### **d) Coconut Milk and Flavoured Coconut Milk**

The coconut milk is obtained from the processing of kernel. By the processing of coconut milk coconut cream is also prepared. It is used for making flavoured food stuffs. Technology of the coconut milk and cream production developed by RRL, Trivandrum.

##### **Production process of coconut milk and coconut cream:**

Break open dehusked nuts into halves. Kernel is then separated from the shell. Washed kernels then allowed to blanch in hot water of 80°C for 10 minutes. Using a hammer mill kernel is grinded into small gratings. The gratings are subjected to pressing using, continuous screw press to extract the milk. The coconut milk thus obtained is filtered by passing through a vibratory screen. Food additives such as emulsifiers and stabilizers, are to be added to the milk to obtain a stable consistency and texture. For this purpose, permitted emulsifiers and stabilizers are mixed with hot water separately and mixed thoroughly. This is added to the coconut milk and then subjected to emulsification using a mechanical impeller emulsifier. The emulsified milk assumes a creamy consistency. The coconut cream is then pasteurized at 95°C for 10 minutes in a plate heat exchanger. The pasteurized coconut cream is hot filled in cans using a mechanical volumetric filling machine followed by steam exhausting. The cans are seamed using an automatic can seamer. The seamed cans are sterilized in a rotary retort at 15 psi for 20 minutes. The cans are then cooled in running water. Residue left are used for making coconut burfies. Vinegar and Nata de Coco are made by using coconut water as a by-product of this industry. Shell charcoal and shell powder can be manufactured from coconut shells. The utilization of by-products would improve the economic feasibility of the process. A raw material 10,000 ripe green coconuts can yield coconut cream (main product) of 2,500 kg and coconut cream residue of 500 kg.



Coconut flavoured milk is a new venture put forward by Coconut Development Board. Coconut milk extracted from the kernel is an oil water emulsion. Coconut milk is devoid of lactose hence it is low in carbohydrates. It is also a rich source of copper and iron.

Raw material required for the production of 4000 litres is calculated to around 2500kg of coconut. The cost of raw material is assumed to be Rs.20/kg.

### Production process:

9-10-month-old freshly grated coconut is used for this purpose. Extracted milk is clarified to remove suspended solids which are present in the milk. Coconut milk is then mixed with coconut water and diluted by adding purified drinking water until it is appropriate for flavoured coconut milk production. It is then mixed with 10-12% sugar, 2% stabilizers, emulsifiers and flavours. The flavoured coconut milk is then UHT sterilized at 138-140°C for about 15 seconds, which is then packed in sterilized PP bottles. In UHT treatment, milk is exposed to brief, intense heating to temperatures in the range of 138-140°C for about 15



seconds. Most importantly, UHT treatment is a continuous process which takes place in a closed system that prevents the product from being contaminated by airborne micro-organisms. The end result is a product that lasts up to six months without refrigeration or preservatives. The major by products from this Industry will be shell, defatted DC and pairing.

First unit with cooperation of a farmer's producers' company has started in Tirur, Kerala and also a unit is operating in Aluva.

### **e) Coconut skimmed milk**

Skimmed milk is a good source of quality protein suitable for the preparation of many useful food products or as supplemental protein source, especially in regions deficient in animal proteins. Freshly prepared coconut milk from pared kernel is filtered through a 120-mesh vibrating screen and the pH of the filtered milk is raised from 6.3 to 7.0 with the additions of sodium hydroxide. The milk is then pasteurized at about 60°C for one hour and subsequently centrifuged in a cream separator to yield the aqueous phase or the protein rich skimmed milk.

### **f) Spray dried coconut milk**

It is produced by spray drying the coconut milk. By mixing with water it can be used instead of coconut milk.

### **g) Coconut Chips**

Coconut chips preparation is standardized by CPCRI, Kasaragod. It is ready to eat form chips prepared by using kernels.

- a) **Dehusking:** Dehusking is done to remove the husk part of the coconut
- b) **Deshelling:** It is done without breaking the kernel.

- c) **Paring:** It is done to remove the brown skin of the kernel with the help of a machine or manually. Care should be taken to remove the testa alone without affecting the kernel.
- d) **Blanching:** Pared coconuts are dipped in boiling water mixed with 0.05% Potassium Meta bisulphate for 15 minutes in a blanching machine.
- e) **Draining:** It can be done with the help of vibratory screener. This will remove the excess water present in the blanched coconuts.
- f) **Slicing:** It is done to reduce the size of coconut kernel into very thin slices. It can be done with the help of a slicer /peeler.
- g) **Osmotic dehydration:** The coconut chips are then immersed in sugar solution of 50° Brix for 1 hour. Essence of flavours can be added at this time. A little of salt is also added to the sugar solution. Agitation of the sugar solution is required during osmotic dehydration.
- h) **Drain:** The coconut chips are then spread over moisture absorbing paper to remove the excess water.
- i) **Drying:** Drained coconut chips are then dried at a temperature of 70-80°C for 4-5 hours. In order to avoid sticking on the pan, turn the coconut chips after one hour of drying. For toasting purpose increase the temperature up to 90°C and dry until chips get toasted flavour. The product will be golden brown in color after toasting.
- j) **Cooling:** Dried coconut chips are allowed to cool to room temperature.
- k) **Packing:** Since the coconut chips are hygroscopic in nature, packing in metallised poly film or aluminium foil laminated with LDPC film are preferably good to maintain the color and flavour of coconut chips up to six months period without affecting nutritional and biochemical changes. In order to avoid breakage of chips during transportation, nitrogen flushing is usually done in pouches.

Different types of chips can be prepared by adding different types of essences and masalas to increase the varieties.

- ❖ By products: The major by products are husk, shell and vinegar. Yield of the product: 420 kg (1000 nuts) of coconut will give 100kg of coconut chips.

