Quality Virgin Coconut Oil
Doing the right thing at the right time

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Virgin Coconut Oil has emerged as the most promising coconut product of the current times with world demand increasing rapidly at geometric progressions. The nutraceutical benefits and its properties as a functional food have primarily led to this increased demand. The immense application of virgin coconut oil in the health and beauty care segments has also added to the demand. The advantage of VCO is that it could be produced at house hold, micro or village scale levels too which makes it possible for the micro, small and medium scale enterprises. But the major concern related to VCO is that it should be produced as per good manufacturing practices under well managed hygienic conditions to ensure quality as a food product suited for human consumption.

There are different processes for producing VCO but irrespective of the process, there are certain critical control points in VCO processing which will influence the quality of the final product. The common commercial methods of production of VCO include the fresh dry process which is the desiccated coconut route followed by the high pressure expeller method and the fresh wet process which is the coconut milk route followed by the centrifuge method.

Critical Control Points in VCO production

Nut selection

The selection of nuts hold great importance and play a major role in the quality of the final product. Fully mature nuts of 12-13 months maturity are most suited for VCO production since they have the highest oil content and the lowest moisture content. The nuts have to be thoroughly inspected to segregate and reject all immature, germinated or spoiled nuts. Nuts with cracks or a damaged soft eye should be discarded. It is to be ensured that the fully mature nut does not have a haustorium. With onset of haustorium development, the oil content of the kernel starts to decline and as the haustorium grows bigger, the quality deteriorates. The husk colour should have turned from green to brown.

Care should be taken to ensure that the nuts do not break during unloading. Also nuts should not be exposed to sunlight. This is because exposure of dehusked nuts to sunlight during weighing, unloading or delivery could lead to cracking of the shell that will cause spoilage. Studies have shown that there is possibility of nut cracking if the dehusked remain

in sun for more than an hour. Cracking of nuts will directly lead to initiation of spoilage.

It is always ideal to place the coconut processing facility within the production areas to ensure adequate supply of fresh nuts and reduce costs of logistics. The dehusked coconuts should be used for processing within a period of seven days from harvest.

Storage of nuts

Storage of nuts also holds much importance. As mentioned earlier dehusked nuts should not be exposed to sun and should be stored in clean storage areas with adequate ventilation. The storage pile should not be kept directly on the cement floor, but in elevated platform to facilitate flow of coconut water, in case breakages occur. Also store in such a way that the first in it is used for processing first. The maximum height of the storage pile for fresh nuts should not exceed 1.8 metres. Never store nuts in plastic sacks since lack of air circulation inside the sack would lead to moisture accumulation inside which can cause deterioration of the nuts.

Disposal of coconut water

Coconut water is an important by-product of VCO processing. It is extremely susceptible to fermentation and spoilage once opened. Coconut water is to be collected before deshelling if it is to be processed for production of packed coconut water or other value added products. If not it could be removed later after paring. Other options for the utilization of coconut water are production of value added products like coconut vinegar, nata de coco, electrolyte drinks etc. Large quantities of coconut water should not be disposed directly into drains or a sewage system or a river or sea without proper treatment. Coconut water is considered a major pollutant because of its high biochemical oxygen demand(BOD5) or biological oxygen demand.

In VCO processing, care should be taken to ensure that coconut water is not left on the floor since it will attract flies and will become a source of contamination. Since it easily gets fermented, it generates a foul smell. Undiluted coconut water becomes very acidic and could destroy the cement surface of the floors, if not properly tiled.

Selection of coconut kernel for processing

After splitting of nuts, quality control of fresh coconut kernel should be done to ensure that only fresh unspoiled coconut flesh is processed. The kernel should be firm in texture and white/opaque in colour. Coconut kernel with a soft texture, slimy surface or discoloration should be segregated and discarded. Also kernel from nuts with big haustorium or germination growth is soft and thin and has a rancid smell. Hence it must be discarded as it will destroy the quality of the whole batch.

Drying of coconut meat

In the fresh dry method through the desiccated coconut route, drying of coconut meat should be done within four hours of opening of the nut since delay in drying will cause bacterial contamination of the fresh meat which will in turn cause an unacceptable yellow oil. Quality VCO will be water clear. Maintenance of drying temperatures is also important. High temperature and improper drying techniques would result in unacceptable pale yellow with a burnt

Required characteristics and type of coconut oil for specific applications

Specific Application	Required characteristics	Type of coconut oil
Nutraceutical and functional food	100% pure and processed under strict sanitary conditions; High Quality with FFA content of 0.1% and below and peroxide value of 1 and below.; does not have oily after taste when ingested	VCO from Fresh Wet Centrifuge process; Properly aged VCO from natural fermentation process
Base oil for hypoallergenic cosmetics	100% pure and processed under strict sanitary conditions; High Quality with FFA content of 0.1% and below	VCO from all types of production processes
Cold pressed bath soap	High Quality with FFA content of 0.1% and below	RBD coconut oil; VCO from all types of production processes
Moisturising body oil	High Quality with FFA content of 0.1% and below; no greasy feel (non-viscous) and easily absorbed by the skin; mild coconut scent	VCO from Fresh Wet Centrifuge process; VCO from coconut milk residue
Moisturising body butter and jelly	High Quality with FFA content of 0.1% and below	VCO from all types of production processes; RBD coconut oil
Hair conditioning oil, butter and wax	High Quality with FFA content of 0.1% and below	VCO from all types of production processes; RBD coconut oil
Aromatherapy and massage oils	High Quality with FFA content of 0.1% and below; no greasy feel (non-viscous) and easily absorbed by the skin; mild coconut scent	VCO from Fresh Wet Centrifuge process; VCO from coconut milk residue

(Source : Paper presented by Mrs. Divina Bawalan at 1st International Conference on Coconut Oil, March 2015, Bangkok, Thailand).

odour. If the drying temperature is too low, bacterial contamination may occur resulting in unacceptable yellow coloured oil. Overloading the dryer can also result in yellow coloured oil due to deterioration of the kernel that is not reached by the heat.

Moisture in virgin coconut oil

Moisture content in VCO is one of the most crucial factors that affect the shelf life of the product. Removal of residual moisture is very critical in the wet extraction process. In the case of commercial production, vacuum drying is the most effective way though investment cost is high.

General sanitation in the plant

The hygiene and sanitation maintained in the plant is very crucial in the quality of the product. Strict adherence to the sanitary procedure will mean zero or fewer rejection/retention/complaints. Fresh coconut meat and coconut milk are low in acid, high in moisture and nutrients and hence highly susceptible to microbial contamination. Continuous cleaning and washing down of the processing area followed by end of the shift cleaning followed by regular disinfection will reduce the risk of VCO not meeting quality standards. All standard operating procedures for maintenance of sanitation should be strictly followed.

Removal of by-products

Coconut shells should be regularly removed to prevent contamination and foul odours. When VCO is produced from coconut milk, the residue generated after milk extraction should be transferred to the area where it is further processed.

Essential Composition and Quality Factors of Virgin Coconut Oil

Parameter	Specification
Moisture (%)	Max 0.1
Volatile Matters at 120°C	Max 0.2
Free Fatty Acid (%)	Max 0.2
Peroxide Value meq/kg	Max 3
Relative Density	0.915-0.920
Refractive Index at 40°C	1.4480-1.4492
Insoluble impurities per cent by mass	Max 0.05
Saponification Value (Mg KOH/g oil)	250-260 min
Iodine Value (Wijs)	4.1-11
Unsaponifiable matter % by mass, max	0.2-0.5
Specific gravity at 30°C	0.915-0.920
Polenske Value	Min 13
Total Plate Count	<0.5
Colour	Clear Water
Odour and Taste	Natural Fresh co-conut scent, free of sediment, free from rancid odour and taste
(Source: APCC Quality Standards)	

VCO has a multitude of applications in nutraceutical, functional food and health and beauty care segments. The end market for the VCO should be in accordance with the quality of the VCO produced. And every stage of processing has a stamp on the final quality of the product. Hence at each stage, the right thing should be done at the right time

Wet coconut milk residue left unattended for more than four hours itself is a source of foul odours and microbial contamination. As indicated earlier, immediate flushing away of the coconut water is necessary whenever it is spilled on the floor.

Quality of VCO depends on the adoption of good practices during the preprocessing, processing and packaging stages. VCO has a multitude of applications in nutraceutical, functional food and health and beauty care segments. The end market for the VCO should be in accordance with the quality of the VCO produced. And every stage of processing has a stamp on the final quality of the product. Hence at each stage, the right thing should be done at the right time. ■