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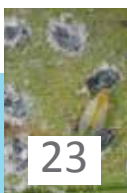
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## **Smt. G Jayalakshmi IAS assumes Charge as Chairman, Coconut Development Board**



Smt. G Jayalakshmi IAS, Director General, National Institute of Plant Health Management (NIPHM) Hyderabad assumed the additional charge of Chairperson, Coconut Development Board. She is a 1995 batch IAS officer of Andhra Pradesh cadre. Presently she is also holding the additional charge of Director General, MANAGE, Hyderabad.

## **Smt. Usha Rani IAS relinquished charge of Chairman, Coconut Development Board**



Smt. Usha Rani IAS relinquished the charge of Chairman, Coconut Development Board. She is repatriated to her parent cadre of Government of Andhra Pradesh.



## Message from the Chairperson's Desk



Dear readers,

Hearty Greetings from Coconut Development Board

It is indeed a matter of great happiness for me to take charge as the Chairperson of Coconut Development Board. At the very outset let me extend my warm greetings to all who are associated with coconut farming and industry in the country.

As the Chairperson of Coconut Development Board, I got the opportunity to take part in the recently held International Conference and Exposition on Coconut organized in Kerala. The Conference was conducted with the objective of sustained development of coconut sector through increase in production and productivity, promotion of processing and product diversification and marketing of coconut. Experts from India and across the globe from major coconut producing countries participated in the event.



The policy papers presented by the speakers from outside India indicated that the challenges faced by the sector is the same across the globe. The prevalence of unproductive palms is a major threat in all major coconut growing countries. The urgent need for replanting and rejuvenation of majority of coconut plantations has been identified as the need of the hour. The necessity of producing quality planting material was a concern shared by all and the participants agreed for mutual cooperation and collaboration in the production of quality coconut planting material, processing and value addition.

The general concern of the international community was that the coconut production statistics indicate a slow down and a sure decline amidst the good news of the sea change and coconut making a come-back economically after half a century of being acclaimed as a dying commodity of a sunset industry.

It was heartening to know that we are also walking in the right path for the sustainable development of the sector and collaboration with other countries especially in planting material production and value addition could help us in progressing further rather than reinventing the wheel.

Let us work together to harness the full potential of this wonder crop. It is my fervent hope that coconut based development will pave the way for the progress and prosperity of the millions of small and marginal coconut farmers who depend on Kalpavriksha for their livelihood.

I solicit the valuable cooperation of the farmers and stakeholders in my way forward.

With best wishes

G Jayalakshmi IAS  
Chairperson



## Coconut sector needs Industry led growth strategy

### International Coconut Conference & Expo 2019

The Government of Kerala in association with Coconut Development Board, Government of India organized a two day International Exposition and Conference on Coconut Development during 2-3 November 2019 at Kozhikode, Kerala.

Shri. Pinarayi Vijayan, Chief Minister, Kerala inaugurated the programme. In his inaugural address he called up for an industry-led growth to establish Kerala as a leader in the coconut sector and a prime position in production and value addition of coconut. A coconut supply chain which has a strong industry linkage should be developed in state to maximize the returns. Charting out the strategy for the State with regard to the coconut sector, the Chief Minister urged the conference to address the developmental and policy issues with respect to coconut sector in order to ensure higher income for farmers and the industry.

The strategy is to put Kerala on an enhanced and sustained growth path in coconut sector through

industry led growth in primary and secondary processing. Pointing out that the sector is facing strong challenges with respect to productivity and price, he said, that it is high time that the state took active steps for increasing income from the sector. This is possible only through industry led growth. The coconut industry has to strengthen the state's economy.

Dwelling on the threats faced by coconut sector in the State, the Chief Minister said that following the Exim policy, which gets revised every year, the country is seeing spree of importing palmolein, which in turn creates glut of copra and coconut oil. Due to heavy import, price of coconut fall day by day and the cultivators find it difficult to market their produce. This affects the sector heavily.

Kerala Government has been taking a number of steps in reviving the State's coconut sector to its past glory. The Government has constituted a Coconut Development Council which aims to expand the area



and increase the productivity of coconut in the State to ensure higher and sustained income to farmers through value addition and other programmes. As part of area expansion programmes, the Council targets to plant 15 lakh good quality seedlings in the state over two years. It also envisages to encourage more startups, enterprises and agro parks for promoting value addition and to strengthen marketing facilities. A coconut supply chain which has a strong industry linkage will be developed in the state to maximize the returns.

Shri. Uron N Salum, Executive Director, International Coconut Community, Indonesia in his key-note address pointed out the need for establishing a strong coconut sector. Across the globe a major change called, Coconut Revolution or Coconut Come back is being observed. He added that value added coconut products are gaining popularity and he called upon the need for the industry to stand united which currently stands fragmented for ensuring fair and steady price to the farmers.

Shri E P Jayarajan, Minister for Industries and Sports, Government of Kerala in his address observed that over the last few years' participation of people particularly that of the youth in coconut industry records to be on a decreasing trend.

Dr. Thomas Isaac, Minister for Coir and Finance, Government of Kerala observed that the sector faces two issues, the reduction in productivity and fall in gross cropped area, and lack of value addition. The share of byproducts of coconut, which was 40 per cent has come down to 10 per cent now. This has to be reversed, he said adding that a periodic revival of byproduct industry should be undertaken through product diversification.

Dr M S Swaminathan, Founder Chairperson M S Swaminathan Research Foundation, in his video message said that the concept of three-dimensional farming or multiple cropping system should efficiently utilized in this sector to take the maximum advantage of soil, water and air.

Dr V K Ramachandran, Vice Chairperson, State Planning Board, Kerala in his address spoke on the need for bringing back the preeminence of coconut and upgrading the value of coconut by reconsidering it as an industrial and agriculture product.

Smt. G Jayalakshmi IAS, Chairperson, Coconut Development Board spoke on the present status of coconut cultivation and processing in the country. She told that in spite of the several adversities faced by the sector, coconut is regaining its lost glory and is



Inaugural address by Shri. Pinarayi Vijayan, Chief Minister, Kerala

being termed globally as a wonder crop and coconut products have attained the status of a super food. She congratulated the Government of Kerala for organizing International Conference and Exposition on Coconut Development aiming at the sustained development of coconut cultivation and industry in the state of Kerala.

She added that the nutritive and healthy attributes of coconut which the coconut consuming world believed based on anecdotal evidences are now being proven through conclusive clinical studies in different parts of the globe. It is the right time for this conference to add to the sustainability of the sector so that we don't run out of coconuts when the global demand is rising.

Coconut is a crop which has much potential for value addition and the involvement of the Industries Department will definitely provide impetus for development of the coconut industry in the state. She further informed that Coconut Development Board facilitates establishment of processing units through technical and financial assistance. She hoped that exploiting the potential of processing and value addition of coconut will definitely result in increased and remunerative prices to the small holder coconut farmers thereby making the country closer to the

## 137<sup>th</sup> meeting of Coconut Development Board held



The 137<sup>th</sup> meeting of Coconut Development Board was held on 8<sup>th</sup> November 2019 in the Board Room of Coconut Development Board, Kochi under the Chairmanship of Smt. Jayalakshmi IAS, Chairperson, Coconut Development Board. Members of the Board Shri P.C. Mohanan Master, Kerala, Shri P.R. Muraleedharan, Kerala, Shri S. Mohan Raj, Tamilnadu, Shri M.R. Shankara Narayan Reddy, Karnataka, Smt. Daksha Rami, Gujarat and Shri Sanjeev Kumar Singh, Bihar, Shri Saradindu Das, Chief Coconut Development Officer and Shri R. Madhu, Secretary, Coconut Development Board, Dr. A. Joseph Rajkumar, Principal Scientist, ICAR-CPCRI, Regional Station, Kayamkulam, representing the Director, CPCRI attended the meeting.

vision of doubling the farmers income by 2022.

Shri V S Sunil Kumar, Minister for Agriculture, Shri M K Raghavan, Member of Parliament, Shri. A Pradeep Kumar, Member of Legislative Assembly and Shri. A Jayathilak IAS, Member Secretary, State Planning Board and Principal Secretary, Department of Planning and Economic Affairs addressed the gathering.

Smt. G Jayalakshmi IAS, Chairperson, Coconut Development Board chaired the session on International Experiences wherein Dr Qiuyu Xia Head, Centre for Product Processing Research, Coconut Research Institute of Chinese Academy of Tropical Agricultural Sciences China presented the Current Coconut Processing Technology and Coconut Products of China. Dr Edna A Anit, Officer in Charge, Crops Research Division, Philippine Council for Agriculture, Aquatic and Natural Resource Research and Development, Philippines spoke on Philippine Coconut Industry Strategic S&T Programme – Reinvigorating the Productivity of the Tree of Life. Mr. Sentoor Kumeran Govindasamy Senior Scientist, Plant Breeding Industrial Crop Program, Crops and Soil Science Research Center, Malaysian Agricultural Research and Development Institute, Malaysia presented the Policies and Programmes for Sustained Development in Coconut Sector in Malaysia and Dr

Normansyah Syahrudin, Deputy Director for Market Development for Estate Crops Products, Directorate General of Estate Crops, Jakarta, Indonesia spoke on the policies and Programmes for Sustained Development in Coconut Sector in Indonesia.

The Conference discussed the most recent technological developments in value-addition, the contemporary trade regime, and institutional arrangements for coconut development from across the globe. Experts from various coconut growing countries shared the policies and programmes followed in their respective countries. Entrepreneurs, farmers, agricultural scientists, extension workers, social scientists, researchers, experts, representatives of mass organizations, NGOs, industry representatives and policy-makers participated in the conference.

An exhibition was conducted which showcased cutting edge technologies for processors, manufacturers, suppliers, fabricators and entrepreneurs. It was also held as a platform for Business-to-Business Meet (B2B) for local buyers and national and international buyers, processors, and suppliers.

The Conference was organized by the State Planning Board in association with the Kerala State Industrial Development Corporation. ■



Excerpts from the keynote address of Uron Salum, Executive Director, International Coconut Community

## Tender coconut water, VCO and Coconut sugar are the emerging products with positive growth rate: Uron Salum

The global importance of the Tree of Life is certified by the growth in volumes and values of Coconut products presently on the global market and domestic consumption in producing countries. Statistics indicate collective export value of Coconut and Coconut products reaching nearly US\$10 billion. In total aggregate value adding domestic consumption and utilization could easily double this amount. Indonesia and India consume up to 80% of products whilst exporting as little as 20% whilst the Philippines is the opposite.

Global export value figures relating to the commercial utilization of the whole nut: Kernel US\$5.6, Water US\$ 2.7, Shell US\$0.87, and Husk US\$0.24.

Emerging high value products of Coconut also indicate increasing annual export values viz desiccated coconut US\$0.86, fresh coconuts US\$0.54, coconut milk US\$0.37, copra US\$0.17, copra meal US\$0.13 and coconut sugar US\$0.16, mostly from Indonesia.

Coconut water, virgin coconut oil and coconut sugar are amongst new emerging products showing positive growth in the last decade.



A 'sea change' in newer and much higher value products are seen in the global markets in both the edible and non-edible categories. Products of coconut are making 'a Come-Back' from the 30 odd products 15 years ago to over 120 different lines and growing year by year.





It is the concern of the international community that coconut production statistics indicate a slow down and a sure decline amidst the good news of the sea change and coconut making a come-back economically after a half century of being acclaimed as a 'dying' commodity of a 'sunset industry'.

Industry participants, especially in the processing segment, have taken bold moves to invest heavily in the upgrade, improvement and increase in capacity at the factories for greater throughput, with two of the largest in Indonesia building capacity to maximize at four million nuts per day process and already running production line of 50% of that capacity.

There is a steady growth and global export volumes in the last few years. A 'sea change' in newer and much higher value products are seen in the global markets in both the edible and non-edible categories. Products of coconut are making 'a Come-Back', from the 30 odd products 15 years ago to over 120 different lines and growing year by year.

Coconut though small player demonstrated and its contribution to the vegetable oils market as last on the list with only 1% alongside olive oil. Yet it still worries the opposing oils as indicated in the recent upsurge in negative claims against the healthy status of coconut oil. What if Coconut grew its quota to 5%? Imagine the 'war' on coconut oil, yet the Community ought to take on this challenge and seriously commence large scale planting because statistics already indicate declining coconut production that would threaten consistent or adequate supply of raw material for the industry going forward.

It is important to understand the manner in which price movements have on the livelihood of coconut farmers. Their role is critical as the major suppliers of 90% of raw material in fresh coconuts, coconut

sap and other parts of coconut. Mostly the CIF price set in Rotterdam is used as the basis to calculate the farm gate price paid to growers for the de-husked mature nut. By using this formula or method it will usually mean paying the lowest price possible. But when fresh nuts are purchased for processing into higher value products such as the VCO, DC, Milk and even White Copra then the baseline used should be higher assuring increased benefit to farmers making farms a lot more viable.

Coconut Oil (CNO) and Palm Kernel Oil (PKO) are the only two Lauric Oils amongst all vegetable oils that contain monolaurin that provides the health properties that are good for human consumption. Choice by consumers between the two oils is guided by the price difference and they would always choose the cheaper therefore if CNO has a high premium in price over PKO the consumers choice would affect market for coconut oils.

An interesting situation exists to the benefit of the industry is the price movement and behaviour for other products including non-edible such as charcoal, activated carbon, charcoal briquette as well as coconut water, DC and at times coconut milk and coco sugar, are not affected by CIF Rotterdam prices.

The Community urges processors and producers of high value products to 'share your success with the suppliers of your raw material to encourage these growers to replant to replace senile palms, plant new coconut lands, improve their farm management practices and remain in the industry to strengthen coconut livelihoods for future generations.

It is therefore pertinent on the industry to review the status of the overall value and supply chain situation to turn it around for the shared benefit of all who are engaged productively in both the food and non-food chains. Only then we are able to ascertain or determine what the true value of one coconut is at any one time. Such transparency in benefits and benefit streams will sustain and grow the industry. ■









INTERNATIONAL  
**COCONUT**  
CONFERENCE & EXPO 2019 KERALA



## The Exhibition





## Kalpa Krunch Ready-To-Eat Snack

R. Pandiselvam, M.R. Manikantan, Shameena Beegum, A.C. Mathew, and S.V. Ramesh  
ICAR-Central Plantation Crops Research Institute, Kasaragod, India

Coconut milk residue (CMR) is a main co-product of coconut processing including coconut milk powder production, virgin coconut oil, flavored coconut milk and coconut milk yogurt based processing industries. It is a rich source of poly phenols and dietary fiber (Trinidad et al., 2007). The proximate composition of coconut milk residue flour is crude fiber (25.51%), dietary fiber (46.50%), crude fat (49.24%) and crude protein (5.29%) respectively (Manikantan, Ambrose, & Alavi, 2015). Nevertheless, CMR is mostly underutilized as animal feed or thrown as waste (Manikantan, Arivalagan, Mathew & Hebbar, 2015). Incorporation of coconut milk residue in our food could go long way in meeting our physiological and nutritional requirements (Manikantan, Ambrose, & Alavi, 2015). Published reports reveal that consumption of high fiber coconut flour products increase the fecal bulk

and lower the serum cholesterol (Gunathilake et al., 2009). It provides numeral health benefits in the prevention of coronary heart diseases, colon cancer, and diabetes (Trinidad et al., 2007). Furthermore, coconut milk residue obtained after milk extraction possess good nutritional properties which could be utilized for value addition of various processed foods.

Most popular junk foods contain very high levels of trans-fats, salts and sugar - which inevitably leads to severe ill health and diseases like obesity and diabetes. Commercially available extrudates are usually developed from cereal flour. They tend to be low in essential amino acid content with a poor biological value and are coated with synthetic flavors and color. Hence, nutritious snacks can be produced by incorporation of coconut milk residue since it is rich in dietary fiber and polyphenols.





Fig 1. Line extrusion unit installed at ICAR-CPCRI for production of Kalpa Krunch

Machineries required for production of Kalpa Krunch (Capacity 5 to 15 kg/h)				
Sl. No	Item	Quantity	Unit price (Rs.)	Total cost (Rs.)
1.	Twin screw extruder	1	2100000	2100000
2.	Ingredient mixer	1	100000	100000
3.	Coating machine	1	200000	200000
4.	Packaging machine (Form fill seal system)	1	300000	300000
5.	Mechanical dryer	2	200000	400000
6.	Pulveriser	1	100000	100000
7.	Miscellaneous items such as stainless steel containers, SS containers with trolley attached and other vessels, weighing balance, moisture meter, etc.,	-	100000	100000
Total cost				33,00,000

## Extrusion

Extrusion technology is a most adaptable and economical method due to continuous nature, short processing time, energy efficiency and absence of effluents to formulate new cereal-based snacks in variety of shapes (Kowalski *et al.*, 2016). Extrusion has been used to produce a variety of foods such as ready-to-eat cereals, textured vegetable protein, and animal foods. In extrusion process, the desirable ingredients are subjected to high mechanical shear, drag, friction, and compression forces (Pandiselvam *et al.*, 2019). Therefore, moistened starchy, fibrous, and protein materials are worked into viscous dough before being forced through the die (Lazou and Krokida, 2010).

## Kalpa Krunch

ICAR-CPCRI has developed a technology for the utilization of coconut milk residue to develop a ready-to-eat extrudates and named as “Kalpa Krunch”. This technology has been commercialized to two entrepreneurs.

## Kalpa Krunch Production Process

The various steps involved in Kalpa Krunch production are mixing the ingredients (coconut milk residue and cereal flours), addition of moisture (14-16%, w.b.), extrusion (co-rotating twin screw extruder), drying, flavour coating and packaging. The process flow is described below,

Kalpa krunch is prepared by using rice flour, corn flour and coconut milk residue. It is coated with natural and healthy flavors. The flavors are formulated from ten different types of spices and vegetables including coriander, garlic, turmeric, clove, cinnamon, chilli, mint, cardamom, tomato and

celery. Kalpa Krunch is rich in dietary fiber, protein, fat and carbohydrate with antioxidant activity. It is crispy and puffy in nature. Hence, Kalpa Krunch is a healthy, nutritious and crunchy snack food for all. Apart from that the underutilized coconut milk residue will fetch a decent market price if it is converted to extrudates, it add to boost the income of the coconut growers and virgin coconut oil manufactures. ■

## Retired



Shri. Supriya Guha retired from the service of Coconut Development Board on 31<sup>st</sup> October 2019. He has served the Board for more than 33 years.



## An ode to the Goodness of coconut: ALOHA SKIN & HAIR CARE PRODUCTS

Vindu N, CDB, Kochi

Dr. Rejitha Nandini is a Consultant Paediatrician with several years of clinical experience. On realizing the various beneficial effects of coconut oil as an excellent medium of moisturizer for both the skin and the hair, Dr. Rejitha has turned into making coconut oil based skin and hair care products under the brand name of Aloha.



The properties of coconut oil help remove dead skin cells and dirt away from the body. The oil also help prevent or reduce acne and helps to firm up skin and helps look younger as coconut oil based products are rich in antioxidants. Under the brand name Aloha, Dr. Rejitha is manufacturing coconut oil based handmade soaps, face packs, gel cream and herbal hair oil Coconut milk based soap, gentle exfoliation scrub soaps and face scrubs are the other coconut based products which are in the pipeline of Aloha.

Excerpts of the interview with  
Dr. Rejitha Nandini

### *1. What attracted you towards making skin and hair care products at home?*

Aloha started as a quest for natural alternative for my daughter's allergy prone dry skin. After researching a lot on handmade soaps I made my first soap and it helped in soothing my kids inflamed skin.

### *2. When did you feel that you should make skin and hair care products commercially?*

After personally realising the various beneficial effects of the products, I started gifting the products





to several of my friends and relatives. The response was really encouraging and even amazing. Those with sensitive skin got immense relief. This made me confident enough to initiate commercial production of the same so that larger section would be benefitted with the quite natural benefits of these products. Licensing procedures are going on for the same.

### ***3. What are the handmade skin and haircare products available under the brand Aloha?***

Currently an array of handmade soaps, face packs, gel cream and herbal hair oil are available under Aloha brand.

### ***4. Is coconut oil a main ingredient in Aloha skin and hair care products?***

In varying proportions coconut oil is used in all Aloha skin and hair care products. Aloha handmade soaps contain 20 to 60 percent of coconut oil, Aloha gel cream has fifty percent coconut oil and Aloha hair oil is medicinal herbs boiled in coconut oil. 'Grameena' or 'Kera' brands of coconut oil is used in Aloha skin and hair care products. Coconut oil procured from Krishimitra, Kottarakkara is also used.

### ***5. What is the advantage of using coconut oil over other oils in Aloha handmade soaps?***

Coconut oil is rich in medium chain fatty acids which are a form

of saturated fat and this is easily absorbed by our skin. It has high percentage of Lauric acid which has antimicrobial effects. Moreover coconut oil suits all skin types. In Aloha handmade soaps it contributes to cleansing effect and hardness of the soap.



### ***6. Does Aloha have special handmade soaps for babies? How beneficial is coconut oil in the skincare routine of babies?***

Yes. Aloha brand manufactures a soap specially made for the soft skin of babies with lots of coconut oil in it. In Kerala babies were traditionally massaged with coconut oil. The medium chain triglycerides in coconut oil are easily absorbed by the delicate skin of the babies. It moisturises the skin thoroughly and keeps the skin hydrated and rash free.

Cradle cap, a common crusting of infant scalp benefits from applying coconut oil to scalp.



Coconut oil is remarkably free from allergens and therefore can be used even for a just born baby safely.

### ***7. Is coconut oil a main ingredient in Aloha Hair oil too? What is the advantage of using coconut oil in hair care?***

Since time immemorial people in the tropics have had long black tresses, thanks to the application of coconut oil in the scalp and hair. Coconut oil penetrates the hair roots and stimulates hair growth and reduces premature greying. Aloha herbal hair oil has proven remarkable results in terms of reducing hair loss, dandruff, arresting greying and promoting hair growth. Coconut oil used in preparing Aloha hair oil helps it to penetrate deep into the hair roots and the hair nourishing nutrients stimulate hair growth. The anti microbial effects help with scalp infection.

### ***8. Which other coconut products are used in Aloha brand?***

Coconut shell charcoal (activated) is used in Aloha anti acne soaps and Aloha anti acne



Dr.Rejitha has taken her MBBS from Medical College, Trivandrum and MD in Paediatrics from Kasturba Medical College, Mangalore. She has worked in both the government and private sectors in Kerala and Dubai. She has also worked as Asst. Professor in Sri Mookambika College of Medical Sciences. She is currently working at Muthoot Medicare, Pathanamthitta.



face pack, Coconut milk powder is used for making Aloha face packs .

**9. How do you use coconut shell charcoal in Aloha charcoal soap?**

Aloha activated charcoal soap is a popular skin care product. It is a deep cleanser which unclogs the skin pores gently and detoxifies the skin. It is natural and harmless cleanser and has very less chance for creating allergies.

**10. Are you planning to use other coconut products in the upcoming Aloha skin/hair care products?**

Aloha coconut milk soap especially for babies will be launched soon. Also Aloha gentle exfoliation scrub soaps and Aloha face scrubs will soon hit the online market with coconut flour as the main ingredient.

**11. There has been lot of negative publicity going on against coconut products in Ones daily diet. As medical practitioner what are your observations?**

Well as a doctor I would definitely recommend coconut products in one's daily diet especially in the diet of growing children. Premature and underweight new born babies are given two drops of coconut oil with each feed for improved weight gain. This is because the medium chain triglycerides in coconut oil are easily digested even by new born babies. Coconut oil can increase HDL cholesterol and also increase the rate of calories burnt. Generations who thrived on coconut oil and other coconut products were remarkably healthy until new food habits got introduced. ■



A casual visit to the face book page of Aloha handcraftedcosmetics and the website [www.alohahandcrafted.com](http://www.alohahandcrafted.com) would leave one amazed with the fantastic array of amazing handmade coconut oil based skin and hair care products.





# Adulteration in Coconut and Virgin Coconut Oil

## Implications and Detection Methods

R. Pandiselvam, M.R. Manikantan, S.V. Ramesh, Shameena Beegum, and A.C. Mathew  
ICAR-Central Plantation Crops Research Institute, Kasaragod, India

Coconut oil is one of the most important vegetable oils in the tropical region. Coconut oil is used extensively for various edible and industrial purposes. The oil is rich in medium-chain fatty acids and exhibits good digestibility (Che Man & Marina, 2006). Of late, coconut oil have been liable to adulteration either accidentally or intentionally (Rohman *et al.*, 2019). Adulteration of food not only decreases its quality but also lead to a number of ill effects on the health. Due to the shortfall in production and consequent high price of oils, adulteration has emerged as a major issue worldwide. In 2018, FSSAI has banned 166 brands of coconut oil in Kerala as they were found to be adulterated. It is essential to have the knowledge on identification of pure and adulterated oil. The available methodologies to detect the adulteration at home level and/or industry scale is discussed in this paper.



**Some of the coconut industries tend to mix the dried testa with copra and utilize the mixture for extracting the oil. The refined and deodorized testa oil is also adulterated along with coconut oil to reduce the cost of production of pure coconut oil.**

## Common adulterants in coconut oil

### ► Palm kernel oil

The physical and chemical characteristics of palm kernel oil are closest to coconut oil and it blends easily with coconut oil. Hence, adulteration detection becomes rather difficult, especially when the adulterant has similar chemical characteristics to that of the original oil (Anklam & Bantaglia, 2001). The price of the palm kernel oil is 60% less than coconut oil. Cochin Oil Merchants Association (COMA) reported that the current price of copra is 92.50/kg. Some of the coconut processing industries are selling coconut oil at Rs. 127/kg. (Business Line., April 30<sup>th</sup> 2019). It is hard to sell coconut oil at Rs. 127/kg. considering the unit operations involved in coconut oil production including labour cost, power, copra extraction, filtration, packaging and transportation costs. Hence, it is highly likely that the coconut oil available at a price below Rs.150/kg could be an adulterated product.

### ► Testa oil

Testa is a brown skin present in the coconut meat and the major by-product from the coconut processing industries including virgin coconut oil, dessicated coconut, coconut chips and flavored coconut milk. It is dried and sold at about 65% of cost



of copra. The fat content in the testa ranges from 34 to 63% (Appaiah *et al.*, 2014). In general, testa oil is used in the process of soap making. Some of the coconut industries tend to mix the dried testa with copra and utilize the mixture for extracting the oil. The refined and deodorized testa oil is also adulterated along with coconut oil to reduce the cost of production of pure coconut oil.

Argemone oil & Cotton seed oil are also used for adulteration of coconut oil.

Table 1. Authentication methods for virgin coconut oil (VCO)

Raw material	Instrumentation	Accuracy	Reference
VCO adulterated with palm kernel olein	FTIR spectroscopy	Successfully measured adulteration to the level of 1%	
VCO adulterated with soybean oil	Differential scanning calorimetry	Detect the samples that where adulteration exceeds 10%	Marina <i>et al.</i> (2009)
VCO adulterated with palm oil	FTIR spectroscopy	Successfully quantified the level of adulterant from 1 to 50%	
	Rohman and Che Man (2009)		
VCO mixed with refined, bleached and deodorized palm kernel olein	Electronic nose	Pure and adulterated samples could be differentiated with 1% detection limit	Marina <i>et al.</i> (2010)
VCO adulterated with corn (CO) and sunflower oil (SFO)	FT-MIR spectroscopy	The error value are relatively low, i.e. 1.68% and 1.32% (v/v), respectively for CO and SFO.	Rohman and Che Man (2011)
VCO adulteration with animal fats (mutton tallow, beef tallow, chicken fat or their mixture)	Two-dimensional gas chromatography (GC × GC–TOF/MS)	Possible to detect animal fats in VCO at a level as little as 0.25%.	Xu <i>et al.</i> (2015)
VCO adulterated with mustard oil	FTIR spectroscopy	Detected the adulterants level of 5% or more	Pandurangan <i>et al.</i> (2017)
VCO adulterated with lard (lard-fat from a pig)	FTIR spectroscopy	The measurement are within ±10% of the expected value for lard in VCO	Lee <i>et al.</i> (2017)
VCO adulterated with grape seed oil (GSO) and soybean oil (SO)	FTIR spectroscopy	It differentiates the pure VCO from that of oil adulterated with GSO and SO with an accuracy level of 100%	Rohman <i>et al.</i> (2019)



such as free fatty acid (FFA) or acid value also may be helpful to find out the adulteration. Lower the acid value better the quality. According to the FSSAI, the permissible limit of acid value is not more than 4.0 for edible oils.

### ► Virgin coconut oil (VCO)

Virgin coconut oil (VCO) is obtained from the flesh of coconut meat by natural or mechanical means. Unlike the commercial coconut oil, VCO remains unrefined and therefore is not processed by deodorizing and bleaching (Xu *et al.*, 2015). In this way, the natural chemical and volatile components in VCO are preserved, including vitamin E, pro-vitamin A, and polyphenols (Dayrit *et al.*, 2011; Manikantan *et al.*, 2018). VCO has received much attention among the consumers due to its antiviral and antimicrobial property (Marina, Che Man, & Ismail, 2009). The market price of VCO is approximately

### ► Second grade oil

Improper handling of coconut while producing copra leads to rotten product and/or fungus infestations. Inferior quality copra is made available at a low price compared to the good quality (white color) copra. Hence, in order to offset the production cost of coconut oil, the inferior quality, rotten copra could be mixed with good quality copra during oil extraction. It causes the rapid spoilage of oil due to its relatively high free fatty acid content.

#### Detection methods

According to the Food Safety and Standards Authority of India (FSSAI), some common adulterants and contaminants can be tested in home itself. The simple method to detect adulterants in coconut oil is to pour the oil in a transparent glass and place it in the refrigerator (do not keep it in the freezer). If it is pure coconut oil, it will solidify; otherwise adulterant forms a distinct layer.

The coconut oil adulterated with other edible oils can be detected by testing the Iodine Value (IV). A higher iodine value represents a higher content of unsaturated fatty acids. Coconut oil contains medium chain saturated fatty acids having an iodine value of about 7 to 10 whereas all other oils have relatively high iodine values. This feature could be used to distinguish other oils from coconut oil. Testa oil generally have an iodine value of about 20, palm kernel oil about 16-19, and for cotton seed oil the value ranges from 100-117 (Thomas, 2000). Hence, coconut oil possessing an iodine value of greater than 10 is an indication of adulteration.

Similarly, estimating other chemical parameters

Table 2: Comparative quality characteristics of VCO by hot and fermentation processes with commercial coconut oil and APCC/ FSSAI \* standard for VCO

Chemical parameters	Hot process VCO	Fermented VCO	Commercial Coconut Oil	APCC/ FSSAI* standard
Tocopherol (µg/g)	15-20	20-30	2-6	-
Polyphenols (µg/g)	500-700	350-500	150-250	-
Antioxidant activity (%)	80-90	65-75	35-45	-
Mono-glycerides (%)	1.5-2.0	2.0-3.0	0.5-1.5	-
Phytosterol (µg/g)	2.5-3.0	2-2.5	0.5-1.0	-
Color (Lovibond)	0.1R+0.5Y	0.1R+0.1Y	0.1R+0.5Y	Water clean
Refractive Index at 40°C	1.4480-1.4490	1.4480-1.4490	1.4480-1.4490	1.4480-1.4492
Saponification value	250-260	250-260	250-260	250-260
Iodine value	7-8.6	7.5-8.4	7.4-8.1	4.1-11.00
Specific gravity at 30°C	0.915-0.920	0.915-0.920	0.915-0.920	0.915-0.920
Moisture (%)	0.09-0.1	0.08-0.1	0.08-0.1	0.1-0.5

\*APCC – Asia Pacific Coconut Community, Jakarta, Indonesia;

\*FSSAI-Food Safety and Standards Authority of India (Source: Manikantan *et al.*, 2016)

5 - 10 times higher than that of common plant oils (Rohman & Man, 2011). Therefore, VCO is extensively adulterated with cheaper plant oils. An analytical technique offering fast and reliable detection of such adulteration has been developed by researchers from different parts of the world (Table 1).

Based on the available quality standards such as Food Safety and Standards Authority of India (FSSAI) and Asian and Pacific Coconut Community (APCC) standards, it is hard to differentiate coconut oil and virgin coconut oil. The main differentiating feature of the coconut oil produced from copra and virgin coconut oil is the variation in tocopherol, polyphenols and antioxidant capacity (Manikantan et al., 2016). The comparative quality profile of VCO produced by different methods and commercial coconut oil (produced from copra) is depicted in Table 2.

Recent advancements have offered many equipments/tools that could be utilized for analysis



and quality control of food products. Analysis of adulteration in oils has been reported using differential scanning calorimetry, spectroscopy, e-nose, gas chromatography and many more. Most of these instruments are expensive, requires manpower expertise and arduous interpretation skills. There is a need for simple and cost effective techniques to check the adulteration in coconut oil and other oil-based food products. ■

#### References

- Appaiah, P., Sunil, L., Prasanth Kumar, P. K., & Gopala Krishna, A. G. (2014). Composition of coconut testa, coconut kernel and its oil. *Journal of the American Oil Chemists' Society*, 91(6), 917-924.
- Che Man, Y. B., & Manaf, M. A. (2006). Medium-chain triacylglycerols. In *Nutraceutical and specialty lipids and their co-products* (pp. 41-70). CRC Press.
- Dayrit, F. M., Dimzon, I. K. D., Valde, M. F., Santos, J. E. R., Garrovillas, M. J. M., & Villarino, B. J. (2011). Quality characteristics of virgin coconut oil: Comparisons with refined coconut oil. *Pure and Applied Chemistry*, 83(9), 1789-1799.
- Manaf, M. A., Man, Y. B. C., Hamid, N. S. A., Ismail, A., & Abidin, S. Z. (2007). Analysis of adulteration of virgin coconut oil by palm kernel olein using Fourier transform infrared spectroscopy. *Journal of Food Lipids*, 14(2), 111-121.
- Manikantan, M.R., A.C.Mathew, K. Madhavan, T.Arumuganathan, M. Arivalagan, Shameena Beegum., & K.B. Hebbar. (2016). Virgin coconut oil hot and fermentation process. *Technical bulletin no-108, ICAR-Central Plantation Crops Research Institute, Kasaragod, Kerala.*
- Manikantan, M. R., Pandiselvam, R., Beegum, S., & Mathew, A. C. (2018). Harvest and Postharvest Technology. In K. U. K. Nampoothiri, V. Krishnakumar, P.K. Thampan, M. Achuthan Nair, (Eds.), *The Coconut Palm (Cocos nucifera L.)-Research and Development Perspectives* (pp. 635-722). Springer, Singapore. [https://doi.org/10.1007/978-981-13-2754-4\\_13](https://doi.org/10.1007/978-981-13-2754-4_13)
- Marina, A. M., Che Man, Y. B., Nazimah, S. A. H., & Amin, I. (2009). Monitoring the adulteration of virgin coconut oil by selected vegetable oils using differential scanning calorimetry. *Journal of Food Lipids*, 16(1), 50-61.
- Marina, A. M., Che Man, Y. B., & Amin, I. (2010). Use of the SAW sensor electronic nose for detecting the adulteration of virgin coconut oil with RBD palm kernel olein. *Journal of the American Oil Chemists' Society*, 87(3), 263-270.
- Pandurangan MK, Murugesan S, N Shettu and Gajivaradhan. (2017). Detection of adulteration of coconut oil using Fourier transform infrared spectroscopy and chemometrics. *International Journal of Statistics and Applied Mathematics* 2017; 2(6): 46-51.
- Rohman, A., & Che Man, Y. B. (2009). Monitoring of virgin coconut oil (VCO) adulteration with palm oil using Fourier transform infrared spectroscopy. *Journal of food lipids*, 16(4), 618-628.
- Rohman, A., & Man, Y. B. C. (2011). The use of Fourier transform mid infrared (FT-MIR) spectroscopy for detection and quantification of adulteration in virgin coconut oil. *Food Chemistry*, 129(2), 583-588.
- Rohman, Che Man, and Eakub Ali. (2019). The authentication of virgin coconut oil from grape seed oil and soybean oil using ftir spectroscopy and chemometrics. *Int J App Pharm*, 11(2), 259-263.
- Rohman, A., & Man, Y. B. C. (2011). The use of Fourier transform mid infrared (FT-MIR) spectroscopy for detection and quantification of adulteration in virgin coconut oil. *Food Chemistry*, 129(2), 583-588.
- Thomas, A. (2000). "Fats and Fatty Oils". *Ullmann's Encyclopedia of Industrial Chemistry*. Weinheim: Wiley-VCH. doi:10.1002/14356007.a10\_173
- Lee, Z.H., Kuek, J.S., & Chua, A.M. (2017). Quantitative Determination of Lard Adulteration by FTIR Spectroscopy with Chemometrics Method - Virgin Coconut Oil. *Halal Authentication Analysis, Application News*. AD-0167.
- Xu, B., Li, P., Ma, F., Wang, X., Matthäus, B., Chen, R., ... & Zhang, Q. (2015). Detection of virgin coconut oil adulteration with animal fats using quantitative cholesterol by GC× GC-TOF/MS analysis. *Food Chemistry*, 178, 128-135.





## Invasion of the Palm infesting Neotropical Whitefly in Coconut

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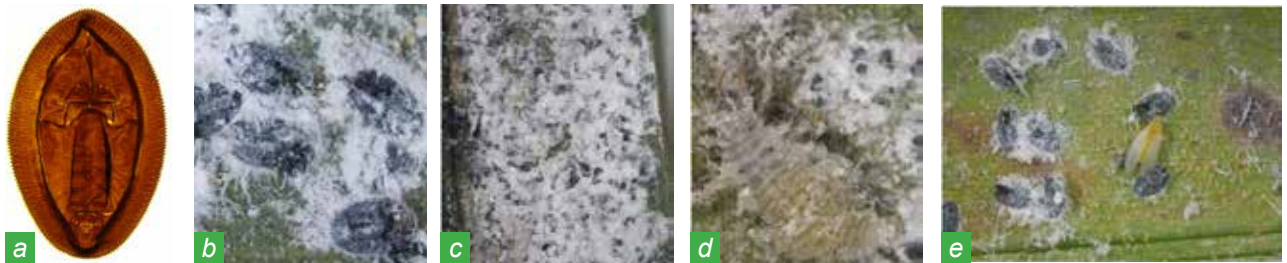
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Increased trade, bioinvasions and travel are the major drivers of bioinvasions and will continue to increase as a by-product of globalization and invasive exotic species move from one region of the world to the other. The enormous increase in the volume, diversity and swiftness of movement of plant products throughout the world has led to a proliferation and dissemination of invasive species, particularly those closely associated with plants, such as scale insects and whiteflies. So far, more than 110 exotic insect species had been reported from India, of which, whiteflies and mealybugs constitute a major part of the invasion. In India, 463 whiteflies species belonging to 68 genera are known to feed on many agricultural, horticultural and forestry crop plants which include four recently invaded species viz., solanum whitefly, *Aleurothrixustrachoides* (Back) on 24 host plants (Sundararaj *et al.*, 2018), rugose

spiralling whitefly, *Aleurodicusrugioeperculatus* Martin on coconut and several horticultural and ornamental plants (Sundararaj and Selvaraj, 2017), Bondar's nesting whitefly, *Paraleyrodesbondari* Peracchi and *P. mineilaccarino* on coconut (ICAR-CPCRI, 2018; Chandrika Mohan *et al.*, 2019). During February 2019, one more palm infesting, highly invasive whitefly species, *Aleurotrachelusatratus* Hempel (Hemiptera: Aleyrodidae) was found colonizing on members of *Arecaceae* viz., coconut, (*Cocos nucifera*) and ornamental areca palm (*Dypsealutescens*) at Mysore and Mandya districts of Karnataka, India.

The genus *Aleurotrachelus* is one of the largest genera of whiteflies and currently containing 74 species worldwide with 12 species known to be well distributed in the Afrotropical region (Evans, 2008). *A. atratus* is a Neotropical whitefly, originally described by Hempel (1922) from Brazil and reported widely in

Fig 1: *Aleurotrachelus atratus*



a) Mounted puparium, b) Pupa, c) Colony structure, d) *Dichochrysa predator*, e) Adult

the tropics and subtropics and colonize on more than 110 plant species belonging to *Areaceae*, *Rutaceae*, *Solanaceae*, *Cycadaceae* and *Lauraceae* (Malumphy and Treseder, 2011). *A. atratus* has spread rapidly in the Neotropical region viz., Antigua, Bahamas, Barbados, Bermuda, Brazil, Colombia, Guyana, Nevis, Puerto Rico, Venezuela and USA, (Florida). It is now also found in Africa, North and South America, Central America and the Caribbean, Europe and Oceania (Borowiec *et al.*, 2010).

Whitefly specimens were collected from infested plants (Coconut & Areca palm) from several locations in Mandya and Mysore districts of Karnataka. The identity of the whitefly is confirmed using best mounted slides as *Aleurotrachelus atratus* Hempel (*Hemiptera: Aleyrodidae*) based on the specific puparial taxonomic characteristics, which includes, Elongate oval puparium with entire dark cuticle (Fig. 1a); marginal teeth separated, with converging subtruncate or rounded apices, each one with serrated margins; absence of first abdominal and mesothoracic setae, metathoracic setae extending beyond 2<sup>nd</sup> abdominal segment, 8<sup>th</sup> abdominal setae longer than the vasiform orifice, caudal setae very long and set on tubercles; submarginal area with rows of flat, elongate granules of subequal size; lingula tip rounded.

Eggs and larvae of *A. atratus* occur on the underside of palm fronds, and when abundant they are highly conspicuous due to the dense flocculent white wax which covers the black pupae. Eggs are stalked, initially creamy white and turn to dark brown before hatching. The first instars have four pairs of wax plumes excreted by glands at the base of dorsal setae (Fig.2c). Puparia are elliptical, black, 1.0-1.1 mm long with a long marginal white wax fringe and dorsal wax filaments that often completely cover the insect (Fig.1b). Adults differ from the recently invaded whiteflies infesting palms; smaller than *Aleurodicus rugioperculatus* but larger

than *P. bondariand P. minei* and without any wavy marking on the wings (Fig 1e). *A. atratus* can be easily diagnosed from its closely related and other recently invaded species *Aleurothrixestrachoides* (Back) by elongate oval puparium, the marginal teeth having crenulations on their sides, the pattern of the tile-like sculpturing on the submargin, and the rounded lingula tip which is not bilobed.

**Symptoms of damage:** Found infesting mainly on the under surface of leaflets in groups ranging from 97 to 186 nymphs per group with 3 to 48 groups per leaflet. In severe cases more than 60% coverage of leaflet by the nymphs resulting in chlorosis or necrosis and loss of vigour with drying of leaflets (Fig.1c). Further indirect damage is caused by the excreted honeydew that serves as a medium for the growth of sooty moulds.

**Natural enemies:** Considering the economic importance of new invasion of *A. atratus* in India, an attempt to find natural enemies revealed no parasitisation but four species of predators such *Dichochrysaastur* (Banks) (=Malladaastur (Banks)) (*Neuroptera: Chrysopidae*) *Jauraviapallidula* (Motschulsky), *Chilocorusnigrita* (Fabricius) (*Coleoptera: Coccinellidae*), *Cybocephalus* spp. (*Coleoptera: Nitidulidae*) were found feeding in the field condition.

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**Impact on coconut:** India being the largest coconut producing country in the world, contributes 31% of global production. Coconut palm provides

food security and livelihood opportunities to more than 12 million people in India, covering 16 states and three Union Territories. Coconut and coconut products are gaining global importance as a contributing factor to the health, nutrition and wellness of human being. India ranks second in terms of productivity (10349 nuts / ha) next to Brazil (11574 nuts / ha), among the major coconut growing countries (Murthy, 2018). With the current report of *A. atratus*, altogether 464 species of whiteflies belonging to 68 genera are known from India in which so far six species viz., *Aleurocanthusarecae* David & Manjunatha, *Aleurodicusdispersus* Russell, *Aleurodicusrugioperculatus* Martin and *P. bondari* and *P. minei* are known to infest coconut palm in India. Among these whiteflies, except *Aleurocanthusarecae*, all others were invasive to India. The present study revealed that rugose spiralling whitefly, *A. rugioperculatus* seems to be slowly getting replaced by *A. atratus* as only few colonies or nil colonies /population (10-15 life stages/leaflet) could be seen in the same infested leaflet as interspecific competition is more common

in Hemiptera and Homoptera because of their life-history traits, such as their aggregated and sedentary lifestyle. Thus danger posed by *A. stratus* is likely to spread to other coconut producing states in India and extent its host ranges on other Arecaceae palms, Solanaceae and Rutaceae plants.

Though, two parasitoids, *Encarsiabasicincta* and *Eretmocerus* *coco is reported* as efficient natural enemies for the suppression of this coconut whitefly population in its native range in Brazil. However, In India, nil natural parasitism either by native or exotic parasitoid could be observed so far thus indicating that pest was introduced probably without natural enemies complex into India. Therefore, it could be a potential threat to coconut cultivation as well as a threat to environmental tourism in India if unchecked. In view of above to develop effective management strategies, intensive surveys for its distribution, host range, intensity and natural may be enemies has been initiated. Red pest alert note issued to all other stakeholders to look out its occurrence on other locations and host plants as soon as they notice this potential pest. ■

### Acknowledgement

We are grateful to the Director, ICAR-NBAIR, Bengaluru for providing facilities to carry out the research and The Chairman, Coconut Development Board, Kochi for financial support through research grant.

### References

- Borowiec, N., Quilici, S., Martin, J., Issimaila, M., Chadhouliati, A., Youssoufa, M.A, Beaudoin-Ollivier, L., Delvare, G. & Reynaud, B. (2010). Increasing distribution and damage to palms by the Neotropical whitefly, *Aleurotrachelus atratus* (Hemiptera: Aleyrodidae). *Journal of Applied Entomology*, 134(6), 498-510. DOI. org/10.1111/j.1439-0418.2009.01450.x
- Chandrika Mohan, Josephraj Kumar, A., Merin Babu, Arya Krishna & Krishnakumar, V. (2019). Occurrence of invasive bondar's nesting whitefly on coconut in Kerala. *Indian Coconut Journal*, 61(4), 17-18.
- Evans, G.A. (2008). *The whiteflies (Hemiptera: Aleyrodidae) of the world and their host plants and natural enemies*. [http://keys.lucidcentral.org/keys/v3/whitefly/PDF\\_PwP%20ETC/world-whitefly-catalog-Evans.pdf](http://keys.lucidcentral.org/keys/v3/whitefly/PDF_PwP%20ETC/world-whitefly-catalog-Evans.pdf) [accessed 19 May, 2019].
- ICAR-CPCRI (2018). Pest alert - A new invasive Bondar's nesting whitefly reported on coconut from Kerala, India. <http://www.cpcri.gov.in/images/images/news/ICAR-CPCRI%20Pest%20Alert%20Paraleyrodes%20bondari1.pdf> (Accessed on 29 March, @019).
- Malumphy, C & Treseder, K. (2011). Palm-infesting whitefly *Aleurotrachelus atratus* (Hempel) (Hemiptera: Aleyrodidae) established in England at a botanical garden. *Entomologist's Monthly Magazine*, 147 (1760-62), 23-31
- Murthy, B.N.S (2018). Country Paper – India, Presented in Global Conference held during 17th-19th April 2018 at Dubai. *Indian Coconut Journal*, 61 (04), 4-10.
- Sundararaj, R. & Selvaraj, K. (2017). Invasion of rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae): a potential threat to coconut in India. *Phytoparasitica*, 45(1): 71-74, DOI 10.1007/s12600-017-0567-0.
- Sundararaj, R., Amuthavalli, T. & Vimala, D. (2018). Invasion and establishment of the solanum whitefly *Aleurothrixustrachoides* (Back) (Hemiptera: Aleyrodidae) in South India. *Current Science*, 115 (1): 29-31.



# Coconut Fibre

## A high Dietary Fibre Source

Coconut is a unique fruit as it contains a number of vitamins and minerals and is a rich source of dietary fibre. Coconut fibre or coco fibre contains more dietary fibre than many other sources. Fibre plays an important role in the digestive process and can meaningfully positively boost human health.

### Health benefits of fibre

Regulates bowel activity

Absorbs carcinogens and other toxic chemicals

Acts as food for beneficial gut bacteria

Aids in filling the stomach and producing a feeling of fullness


Helps regulate blood sugar

Protects against heart attacks and strokes

Fibre plays an important role in digestion, adds bulk to stool and prevents constipation. It also promotes healthy cholesterol levels and is linked to a decreased risk of heart disease.

The fibre content of coconut flour is definitely the highest of all types of flours. A 100-g serving of coconut flour contains almost 39 g of fibre, which is above the fibre content of whole grain, wheat flour or all-purpose flour, which contain 11 g and 3 g of fibre, respectively. Fibre is part of the total carbohydrates, which means that 60 percent of the carbohydrates in coconut flour is fibre. This means that a 1/4 cup of coconut flour provides 12 g of fibre and 1 tbsp. contains about 3 g of fibre.

Coconut dietary fibre is particularly important as it is reported to produce high amount of butyric acid in stomach, which helps in inhibiting tumor formation. Coconut flour incorporated foods show low glycemic index, which is good for proper control and management of diabetes mellitus and in the maintenance of weight. It can reduce total cholesterol, LDL cholesterol and triglycerides in moderately raised serum cholesterol levels of human (Trinidad, 2001). Coconut controls cholesterol and sugar levels in blood and prevent colon cancer. Studies revealed that consumption of high fibre coconut flour increases faecal bulk (Arancon, 2009).



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A study titled Formulation and storage stability of coconut flour and dietary fibre isolate was conducted by Manikandan Arumugam *et al* of Department of Food and Nutrition, RVS College of Arts and Science, Coimbatore, Tamil Nadu, India with the objective of formulating high percentage dietary fibre isolate from coconut flakes, as a functional food. Formulating coconut flour from coconut flakes, determining the proximate composition and microbial analysis of coconut flakes, coconut flour and dietary fibre

isolate and to analyse the storage stability of coconut flour and dietary fibre isolate were the specific objectives of the study. The coconut fibre isolate was prepared by hydrolysis with  $\text{Ca}(\text{OH})_2$  as per the established protocol.

The study found that the dietary fibre content of dietary fibre isolation was 72.25% and further it was found to be 42% and 48% in coconut flakes and coconut flour respectively. With respect to  $\text{CaOH}_2$  to hydrolysis, 0.3M and 0.4M concentrations were found to be very ideal in suppressing the dominant coconut taste. With water holding, retention and swelling capacities, isolate was found to be the best (8.27, 7.42, 21.33 ml water/g samples,). According to BIS (Bureau of Indian Standards), the microbial load and peroxide value were within safe limits in isolate (up to 10 months).

The study concludes coconut fibre isolate is a rich source of dietary fibre, when it was treated with calcium hydroxide hydrolysis and found that coconut flakes lost their coconut taste and produced highest percentage of

dietary fibre (72.5%) than any other cereals. Dietary fibre isolate stored up to 10 months ambient conditions, did not produce any rancid odour and the microbial load was also within the safe limits. Dietary fiber isolate administration substantially brought down the blood glucose level and reduced the lipid parameters. Hence, dietary fiber isolate prepared from coconut flakes renders as a safe, odourless therapeutic functional food. As dietary fiber isolate potentially ameliorates glucose and lipid levels, this may be used as a functional food for human beings. Further, a systematic human study may be carried out using dietary fiber isolate in order to explore its impact in humans.

*Courtesy: International Journal of Pharmacy and Pharmaceutical Sciences. ISSN- 0975-1491 Vol 7, Issue 3, 2015, Formulation and storage stability of coconut flour and dietary fibre isolate: Manikandan Arumugam\*1, Meera Raman1, Kannan Eagappan, Department of Food and Nutrition, RVS college of Arts and Science, Coimbatore, Tamil Nadu, India, 2Department of Clinical Nutrition, PSG college of Arts and Science, Coimbatore, Tamil Nadu, India.*



## CDB celebrated Hindi Fortnight



Coconut Development Board celebrated Hindi fortnight from 13<sup>th</sup> to 27<sup>th</sup> September 2019. The celebration was inaugurated on 13<sup>th</sup> September 2019 by Shri R.Madhu, Secretary, CDB and the Valedictory function was held on 31<sup>st</sup> October 2019. Shri. Saradindu Das, Chief Coconut Development Officer chaired the function. Dr. Indu Velsar, Head, Department of Hindi, Maharajas College, Ernakulam was the chief guest of the function and Shri. P.R Muralidharan, Board Member attended the programme as special guest. Dr.Indu Velsar, in her address emphasized the importance of Official Language. Shri. Saradindu Das, Chief Coconut Development Officer and Shri R.Madhu, Secretary spoke during the occasion.

Shri. Saradindu Das, Chief Coconut Development Officer awarded cash prize and certificates to the winners of the Hindi poetry competition held for the students and Hindi teachers of the schools from Ernakulam District. Chief Guest Dr. Indu Velsar distributed prizes to the winners of the competitions conducted for the officers and staff of the Board. Shri Muralidharan, Board Member, CDB distributed prizes to the children of officers and staff of Board who have scored highest marks in Hindi in the 10<sup>th</sup> and 12<sup>th</sup> standard exams and the winners of the competitions conducted for the children

of officers and staff of the Board. Shri R. Madhu, Secretary CDB distributed the prizes for winners of team competitions and distributed certificates to the officers and staff who participated in the Hindi incentive scheme 2018-19. All the unit offices of CDB also celebrated Hindi Fortnight.

### Exposure Visit



A view of the meeting with farmers and officials from Meghalaya who visited CDB as part of Exposure Visit.

## Vigilance Awareness Week-2019



Shri. Saradindu Das



Shri.R.Madhu



Smt. Deepthi Nair S



Administration of Integrity Pledge by CDB staff

In accordance with the direction of Central Vigilance Commission, Coconut Development Board observed Vigilance Awareness Week 2019 from 28<sup>th</sup> October to 2<sup>nd</sup> November 2019 on the theme Integrity – a way of life. Smt. Deepthi Nair S, Deputy Director & Vigilance Officer-in-Charge, Coconut Development Board administrated the Integrity Pledge in the presence of the officials of the Board on 28<sup>th</sup> October 2019. Administration of Integrity Pledge was organized at all Regional Offices, State Centres and Demonstration cum-Seed Production farms and other unit offices of Coconut Development Board.

Smt. Deepthi Nair S, Deputy Director & Vigilance Officer-in-Charge, CDB presided over the

Valedictory Session on 31<sup>st</sup> October 2019. In her presidential address she advised all employees to maintain integrity and ensure code of ethics during official dealings. She further spoke on the theme “Integrity – A way of life”. Shri. Saradindu Das, Chief Coconut Development Officer, CDB, Kochi during his felicitation called upon the employees of CDB to maintain high standards of integrity, transparency and good governance in all aspects of office activities. He emphasized that every official should be vigilant and remove chances of corruption while in official life. Shri.R.Madhu, Secretary spoke on the need for following laws, rules, regulations and procedures relevant to their work for honest discharge of office duties.

## Krishi Fair 2019



Coconut Development Board, State Centre, Odisha participated in the 10<sup>th</sup> Krishi Fair 2019 held from 21<sup>th</sup> to 25<sup>th</sup> October, 2019 at Puri. The fair was organised by Shree Shrikshetra Soochana, Puri. Shri. Jayanta Kumar Sarangi, Hon'ble Member of Legislative Assembly, Puri inaugurated the programme.

Coconut Development Board displayed coconut seedlings of different varieties, coconut palm climbing machine, different coconut varieties, various value added products like virgin coconut oil, virgin coconut capsule, desiccated coconut, coconut milk, coconut Jam, squash, coconut oil, coconut milk powder, handicraft, items and informative posters

on coconuts and its products, Board's schemes, activities etc. were displayed. Queries on the availability of coconut seedling, CPS formation and coconut processing units were clarified by Board's officials.

Various central and state govt. organisations, Nationalised Banks, NGOs, SHGs, Fertilizer Companies, Agricultural Machinery Manufactures, organic farming related enterprisers & seed companies participated in the fair.

The valedictory session was conducted on 25<sup>th</sup> October, 2019. Shri. Ganeshi Lal Hon'ble Governor of Odisha and Shri. Jayanta Kumar Sarangi, Hon'ble MLAssembly, Puri awarded certificates and mementos to the participating organizations and appreciated the interest of agricultural organizations in disseminating knowledge and new findings through exhibitions and fairs. Puri being a major coconut growing district of Odisha, participation in the five days 'Krislil Fair 2019' helped to create awareness about coconut cultivation technology and activities and schemes of the Board.



## District Level Workshop



With an objective to impart knowledge and skill on scientific coconut cultivation to officials, farming community and extension workers, Coconut Development Board, State Centre, Kolkata organized a District Level Workshop on Scientific Coconut Cultivation Technologies on 14<sup>th</sup> November, 2019 at Purba Medinipur Krishi Vigyan Kendra, West Bengal. Around 200 farmers attended the workshop.

Ms. Sritama Biswas, Technical Officer, CDB SC, Kolkata delivered the welcome address. Dr. Krishna Kishor Goswami, Senior Scientist, Purba Medinipur KVK in his address highlighted the importance of Coconut in West Bengal and stressed upon the need for creating awareness among coconut farmers. Mr. Sayan Sau, Subject Matter Specialist (Horticulture) spoke on scientific coconut cultivation with emphasis on utility of various coconut based

products, varieties, mother palm selection, seed nut selection, methods of planting and nutrient management.

Mr. Depayan De Halder, Technical Officer, CDB, SC, Kolkata spoke on various schemes of the Board being implemented in the state of West Bengal. Shri. Tarun Sarkar, Subject Matter Specialist (Agronomy), briefed on water management and soil conservation including irrigation practices and green manure crops in coconut garden. Shri. Saswata Kamal Roy, Director of Agriculture (Water Management), Govt. of West Bengal spoke on the various schemes of the government of West Bengal for the welfare of the farmers of the state. Mr. Sagar Tamang, Subject Matter Specialist (Plant Protection) briefed on root feeding and spraying of plant protection chemicals using gun sprayer on coconut trees in the KVK farm.

## Regional Agri Fair 2019



Coconut Development Board Regional Office, Assam participated in the CAU Regional Agri Fair 2019 organized by Central Agriculture University, Manipur, at College of Horticulture & Forestry, Pasighat, Arunachal Pradesh held from 11<sup>th</sup> to 13<sup>th</sup> 2019.

Sri Tagi Taki, Honourable Minister of Agriculture, Horticulture, Animal Husbandry and Veterinary, Dairy Development and Fisheries of Arunachal Pradesh inaugurated the Regional Agri Fair-2019.

Coconut Development Board displayed various varieties of nuts, coconut convenience food, value added products from coconut kernel, coconut shell & coconut water, coconut shell/wood based handicrafts and various leaflets, books & publications on coconut and postures on the nutritional and health benefits of coconut and its products.

The Agriculture Minister of Arunachal Pradesh. Prof. M. Premjit Singh, Vice-Chancellor & Patron, Central Agriculture University, Imphal. Manipur, Prof R.K. Saha Director(EE) & Organizing Secretary, Central Agriculture University, Imphal, Manipur and Prof. B.N. Hazarika, Dean & Local Organizing Secretary visited CDB Stall. Board's stall bagged the second prize for its excellent display of various products and services.



## CDB participated in Exhibitions



Friends Fest Season 6, Kochi



Swaraya Bharath, CMFRI, Kochi



Swaraya Bharath, Marine Drive, Kochi



Chaithanya Karshikamela, Kottayam

### Advertisement Tariff of Coconut Journals

Indian Coconut Journal (English monthly), Indian Nalikerla Journal (Malayalam monthly), Bharatiya Nariyal Patrika (Hindi quarterly), Bharatiya Thengu Patrike (Kannada quarterly) and Indhia Thennai Idhazh (Tamil quarterly) are the periodicals of the Coconut Development Board. These journals regularly feature popular articles on scientific cultivation and other aspects of coconut industry. The journals are subscribed by farmers, researchers, policy makers, industrialists, traders, libraries, etc.



Position	Indian Coconut Journal (English monthly) (Rs.)	Indian Nalikerla Journal (Malayalam monthly) (Rs.)	Indhia Thennai Idhazh (Tamil quarterly) (Rs.)	Bharatiya Nariyal Patrika (Marathi Bi-annual) (Rs.)	Bharatiya Kobbari Patrika (Telugu Bi-annual) (Rs.)	Bharatiya Thengu Patrike (Kannada quarterly) (Rs.)	Bharatiya Nariyal Patrika (Hindi quarterly) (Rs.)
Full page - B & W	No B&W pages	No B&W pages	5000	5000	5000	5000	No B&W pages
Full page - Colour	20000	20000	10000	10000	10000	10000	5000
Half page - B & W	No B&W pages	No B&W pages	3000	3000	3000	3000	No B&W pages
Quarter page - B & W	No B&W pages	No B&W pages	1500	1500	1500	1500	No B&W pages
Back inner cover - Colour	25000	25000	10000	10000	10000	10000	8000
Back cover - (Colour)	30000	30000	15000	15000	15000	15000	10000

*Special package : A rebate of 10% will be allowed on advertisements inserted in any two editions of the journal at a time and 12% discount if inserted in three or more editions at a time. 15% discount will be given to bonafide advertising agents.*

# Cultivation practices for coconut December

## Collection and storage of seednuts

From the identified mother palms seed nuts should be carefully harvested and properly stored to prevent drying of nut water. Wherever the ground surface is hard, harvested bunch should be lowered to the ground using a rope.

## Nursery management

Irrigation has to be provided to the seedlings in the nursery. Weeding has to be done wherever necessary. Mulching with coconut leaves or dried grass or live mulch by raising green manure crops can be done in the nursery. If termite infestation is noted in the nursery drenching with chlorpyrifos (2ml chlorpyrifos in one litre of water) should be done. Spraying of water on the lower surface of leaves of seedlings can be done against spiralling white fly attack. Remove five month old ungerminated seed nuts and dead sprouts from the nursery.

## Fertilizer application

- For irrigated coconut palms one fourth of the recommended dose of chemical fertilizers can be given during December.
- Drip fertigation, wherever feasible, may be continued in coconut gardens as per the monthly schedule.
- Apply 100 g of Borax in coconut palm basin wherever Boron deficiency is observed.
- Apply 500 g Magnesium sulphate per palm in the basin wherever yellowing of coconut leaves is observed due to Magnesium deficiency.

## ► Mulching and intercultivation

- Mulching of palm basins can be undertaken if not done earlier. Fallen dried coconut leaves available in coconut gardens can be used for mulching.
- Level down the soil mounds piled up earlier in the coconut garden.

## ► Shading

- Shade has to be provided for the newly planted and young coconut seedlings.



## ► Irrigation

- Regular irrigation can be started in coconut gardens during December.
- Clean the irrigation channels if irrigation water is guided to the palm basin through channels.
- If basin irrigation method is adopted, provide irrigation once in four days @ 200 litres per palm.
- Drip irrigation is the ideal method of irrigation for coconut. The number of dripping points should be six for sandy soils and four for other soil types. Depending on the evaporation rate, quantity of water to be provided through drip irrigation system in different coconut growing tracts can be decided. In Kerala 30-35 litres and in Tamil Nadu and Karnataka 35-45 litres of water is sufficient per palm per day through drip irrigation system.
- Seedlings can be given irrigation either through drip or basin method. If drip method is adopted,



Spear leaf damage



Inflorescence damage

*M anisopliae* infected grubMass multiplication of  
*M anisopliae*

provide irrigation @ 10 litres of water per seedling per day. If other methods like basin method is adopted 60 litres per seedling once in four days is sufficient.

- Irrigation can be started to negate the effect of low temperature in the non-traditional areas like Bihar, Chattisgarh, Madhya Pradesh and North eastern states. Also ensure thick mulch in the palm basin to regulate the soil temperature in such areas.

#### ► Drainage

- Provide adequate drainage in coconut gardens in localities having drainage problems.

### Pest and disease management

The receding phase of North-East monsoon is one of the hallmarks of December month, wherein the weather slowly turns dry and at the same time become cool opening up of winter season. Cool and dry period triggers pest occurrence in the perennial system including coconut plantations.

Wetness coinciding monsoon showers could diminish pest incidence, whereas advent of winter (December) opens up pest prevalence as well as subdues disease causing pathogens, and therefore strict vigilance and sustained scouting should become more focussed for timely pest and disease diagnosis and management. Regarding common and perennial diseases such as leaf rot, stem bleeding and basal stem rot persists during this period for which adequate health restoration is the key for the palms to withstand the pressure incited by them and avoid further deterioration.

The cosmopolitan insect pests viz., rhinoceros beetle and red palm weevil, as well as incidences of slug caterpillar, rugose spiralling whitefly, coreid bug and rodents could emerge and take an upper hand during this period in endemic zones.

#### ► Rhinoceros beetle (*Oryctes rhinoceros*)

In the post-flood fury, Kerala witnessed habitat destruction of breeding grounds of rhinoceros beetle (*Oryctes rhinoceros*) which could suppress the damage potential of the pest in adult palms. Being a ubiquitous cum cosmopolitan pest, incidence of rhinoceros beetle is invariably observed in all seasons and the juvenile palms are extensively damaged. Coconut seedlings planted during May-June should be customarily shielded from pest incursion during this period. More than 0.5% natural incidence of *Oryctes rhinoceros nudivirius* (OrNV) was recorded in Peninsular India and therefore the OrNV-insensitive Coconut Rhinoceros Beetle-Guam (CRB-G) strain is not prevalent in our country, as this strain is taking a great toll in South-East Asian region causing great concern among International community making extensive damage.

#### Management

- Prophylactic treatment of top most three leaf axils with either botanical cake [Neem cake /marotti cake / pongam cake (250 g)] admixed with equal volume of sand or placement of 12 g naphthalene balls covered with sand.
- Routine palm scrutiny during morning hours along with brushing of teeth and hooking out the beetle from the infested site reduces the floating pest population.
- Shielding the spear leaf area of juvenile palms with fish net could effectively entangle alighting rhinoceros beetles and placement of perforated sachets containing 3 g chlorantraniliprole /fipronil on top most three leaf axils evade pest incursion.
- Dairy farmers could treat the manure pits with green muscardine fungus, *Metarhizium anisopliae* @ 5 x 10<sup>11</sup> /m<sup>3</sup> to induce epizootics on the developing grubs of rhinoceros beetle. Area-wide farmer-participatory approach in technology adoption could





Adults weevils



Crown entry



Toppling of palm

reduce the pest incidence very effectively and forms an eco-friendly approach in pest suppression.

- Incorporation of the weed plant, *Clerodendron infortunatum* in to the breeding pits caused hormonal irregularities resulting in morphogenetic transformational aberration in the immature stages of the pest.

► **Red palm weevil (*Rhynchophorus ferrugineus*)**

Reduction in the incidences of rhinoceros beetle, would subsequently suppress the invasive potential of the killer pest, viz., the red palm weevil, which needs an injury for the weevils to orient towards the palm cue and lay eggs. Dwarf genotypes and palms aged between 5-15 years are relatively more susceptible. All life stages of the pest were noticed inside the infested palms. Being a fatal enemy of palms, 1% action threshold has been fixed.

**Management**

- Avoiding palm injury is very critical to disorient the gravid weevils away from the field and therefore leave out at least one metre from palm trunk when petioles are cut.
- Crop geometry and correct spacing is very crucial to reduce pest attack.
- Timely and targeted spot application of imidacloprid 0.002% (1 ml per litre of water) or indoxocarb 0.04% (2.5 ml per litre of water) on infested palms would kill the feeding grubs and induces recovery of palms by putting forth new spear leaf.
- Crop-habitat diversification (Ecological Bio-engineering) through coconut based cropping system strategy inciting defenders and pollinators would diffuse the palm-linked volatile cues and encouraged pest suppression. Diversified cropping system reduced pest incidence than mono-cropping.

► **Slug caterpillars (*Darna nararia*)**

Emergence of slug caterpillar, *Darna nararia* is

East Godavari district, Andhra Pradesh and Tumkur, Karnataka could happen as this period is quite conducive for the population build up especially on coconut palms planted along the river beds and brackish water zones. Several hundreds of caterpillars would congregate and feed from under surface of palm leaflets, causing glistening spots and in synergy with grey leaf blight disease complete scorching of leaflets could be observed. In severe cases, complete defoliation was realized and only midribs will be spared. High temperature and cool weather could be one of the triggering factors.

**Management**

- Complete destruction of affected palm leaflets with caterpillar at early stages of infestation should be made immediately so that the pest build up is suppressed. Care should be taken as the caterpillars cause extreme itching when contacted with human skin due to the presence of poisonous scoli.
- Establishment of light traps and spraying *Bacillus thuringiensis* 5 g/litre was found effective along with inundative biological control using the eulophid larval parasitoid, *Pediobius imbrues*.

► **Rugose Spiralling Whitefly (*Aleurodicus rugioperculatus*)**

This period could also witness the establishment of the invasive rugose spiralling whitefly (*Aleurodicus rugioperculatus*) in new areas as well as re-emergence in already reported areas. Presence of whitefly colonies on the under surface of palm leaflets and appearance of black coloured sooty mould deposits on the upper surface of palm leaflets are characteristic visual symptoms of pest attack. In severe cases, advancement in senescence and drying of old leaflets was observed. Leaflets, petioles and nuts were also attacked by the whitefly pest and a wide array of host plants including banana, bird of paradise, *Heliconia* sp. were also reported.





*Slug caterpillar infested field*



*Mature caterpillars on palm leaflet*

### **Management**

- In juvenile palms, spraying of water with jet speed could dislodge the whitefly and reduce the feeding as well as breeding potential of the pest.
- No insecticide should be used as this causes resurgence of the pest and complete kill of the natural aphelinid parasitoid, *Encarsia guadeloupae*.
- Installation of yellow sticky traps and conservatory biological control using *E. guadeloupae* could reduce the pest incidence by 70% and enhance parasitism by 80%.
- Habitat preservation of the sooty mould scavenger beetle, *Leiochrinus nilgirianus* could eat away all the sooty moulds deposited on palm leaflets and cleanse them reviving the photosynthetic efficiency of palms.

Close monitoring and systematic scrutiny of palms for timely detection of pests are critical to execute the correct approaches in pest suppression and reduce crop loss to double income.

### **Leaf rot disease (*Colletotrichum gloeosporioides*, *Exserohilum rostratum*)**

It is commonly observed on palms affected by root (wilt) disease wherein foliar necrosis of terminal spear leaf and adjacent leaves are registered. The disease prominently noticed in the post-monsoon phase during the month of December. Affected leaves turn necrotic and are not detachable from the palm and remain intact. This disease could be initially observed as minute lesions which later enlarge, coalesce and cause extensive rotting affecting the photosynthetic efficiency of palms. The disease is endemic to root (wilt) affected regions of Southern Kerala

### **Management**

- Need based pruning and destruction of affected spear leaf and other adjacent leaves in the terminal region.
- Spot application of hexaconazole 2 ml in 300 ml water on the affected spear leaf region.

### **Stem bleeding (*Thielaviopsis (Ceratomyces) paradoxa*)**

This disease is mostly confined in the acid soils of Kerala and becomes quite explicit during the period. Conspicuous exudation of reddish-brown gummy fluid is visible on the trunk which turns black on drying. It could be observed initially as small bleeding patch along the longitudinal crack, which later coalesce and form extensive lesion. The tissues underneath show tremendous discoloration and decay subsequently. In advanced stage of infection, outer whorls of leaves turns yellow, dry and shed prematurely affecting the overall health of the palm. Invasion by scolytid beetles such as *Diocalandra* and *Xyleborus* would further weaken the stem.

### **Management**

- Avoid burning of trash and palm residues near the trunk to avoid trunk/root injury
- Adequate irrigation and adoption of soil and water conservation measures is advised.
- Application of 5 kg of neem cake enriched with *Trichoderma harzianum* and soil test based nutrition.
- Application of paste of *Trichoderma harzianum* talc formulation on the bleeding patches on the trunk was also found effective in preventing the spread of stem bleeding.



Colony of rugose spiralling whitefly



Encarsiaguadeloupae



Sooty mould scavenging beetle



Leaf rot disease in juvenile palm



Basal stem rot disease



Bracket fungus

### Basal stem rot disease (*Ganoderma spp.*)

It is a destructive disease observed in all coconut growing regions and found very severe in soils with higher pH and moisture stress condition. The pathogen invades the root system during early stages of infection that are not visibly noticed. Very severe in areas of Thanjavur, Tamil Nadu parts of East Godavari, Andhra Pradesh and Arsikara, Karnataka. The outer whorl of leaves turn yellowish, then gradually become brown and droop from their point of attachment and hang vertically downwards to form a skirt around the trunk apex.

In course of time, the apex of the trunk shows tapering with the advancement of the disease, and bleeding symptoms may appear on the bole region. At the base of the stem a characteristic reddish brown discoloration develops, accompanied by the exudation of a brown viscous gummy substance. These brownish patches may extend up to one metre from ground level and at times bark peeling was also observed. Sometimes fruiting bodies (basidiocarp) of the pathogen develop from the affected trunk.

### Management

- Avoid burning of trash and palm residues near the trunk to avoid trunk/root injury
- Removal of dead palms and palms in advanced stage of the disease as well as destruction of the boles and root bits of the diseased palms to remove disease inoculum.
- Isolation of neighboring healthy palms, by digging isolation trenches (60 cm deep and 30 cm wide) around the affected palm (1.2 m away from the base of the trunk).
- Application of neem cake (5 kg) fortified with *Trichoderma harzianum* (CPTD 28) talc formulation (50 g) per palm per year at six monthly intervals reduced the disease intensity.
- Root feeding of hexaconazole @ 2% (100 ml solution per palm) and soil drenching with 0.2 % hexaconazole or with 40 l of 1% Bordeaux mixture in the coconut basin are recommended

Hence, sustained monitoring and prophylactic treatments would suppress the damage potential of pest and disease and suitable health management strategies need to be adopted at the appropriate time.

(Prepared by: Thamban C, Subramanian P, ICAR-CPCRI, Kasaragod and Joseph Rajkumar, CPCRI Regional Station, Kayamkulam)

# Market Review – October 2019

## Domestic Price

### Coconut Oil

During the month of October 2019 the price of coconut oil opened at Rs.16200 per quintal at Kochi, Rs.16300 per quintal at Alappuzha market and Rs.17350 per quintal at Kozhikode market. The price of coconut oil expressed an overall mixed trend at Kochi and Kozhikode market and downward trend in Alappuzha market during the month.

The price of coconut oil closed at Rs.15925 per quintal at Kochi, Rs.15900 per quintal at Alappuzha market and Rs.16900 per quintal at Kozhikode market with a net loss of Rs.275, Rs.400 and Rs.450 per quintal at Kochi, Alappuzha and Kozhikode market respectively.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.13000 per quintal, expressed a mixed trend during the month and closed at Rs.13000 per quintal.

Weekly price of coconut oil at major markets Rs/Quintal)				
	Kochi	Alappuzha	Kozhikode	Kangayam
01-10-2019	16200	16300	17350	13000
06-10-2019	16200	16200	17250	13000
13-10-2019	15900	16100	16800	12867
20-10-2019	15900	15900	16800	12667
27-10-2019	15900	15900	16900	12900
31-10-2019	15925	15900	16900	13000

### Milling copra

During the month, the price of milling copra opened at Rs.10500 per quintal at Kochi, Alappuzha and Kozhikode market. The price of copra at Kochi and Kozhikode markets in Kerala expressed a mixed trend whereas price of copra in Alappuzha market expressed a downward trend during the month.

The prices closed at Rs.10225 at Kochi, Rs.10100 at Alappuzha market and Rs.10300 at Kozhikode market with a net loss of Rs.275, Rs.400 and Rs.200 per quintal at Kochi, Alappuzha and Kozhikode market respectively.

Weekly price of Milling Copra at major markets (Rs/Quintal)				
	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01-10-2019	10500	10500	10500	9400
06-10-2019	10500	10400	10400	9400
13-10-2019	10200	10100	10000	9300
20-10-2019	10200	10100	10050	8900
27-10-2019	10200	10100	10250	8900
31-10-2019	10225	10100	10300	8900

### Edible copra

The price of Rajapur copra at Kozhikode market opened at Rs. 13500 per quintal expressed an overall fluctuating trend during the month and closed at Rs.12900 per quintal with a net loss of Rs.600 per quintal.

Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01-10-2019	13500
06-10-2019	13300
13-10-2019	13900
20-10-2019	14400
27-10-2019	12900
31-10-2019	12900

### Ball copra

The price of ball copra at Tiptur market which opened at Rs.12500 per quintal expressed a mixed trend and closed at same price during the month.

Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)	
01-10-2019	12500
06-10-2019	12500
13-10-2019	12800
20-10-2019	13000
27-10-2019	12300
31-10-2019	12500



### Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.10900 per quintal expressed a downward trend during the month. The prices closed at Rs.10150 per quintal with a net loss of Rs.750 per quintal.

Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal)	
01-10-2019	10900
06-10-2019	10700
13-10-2019	10500
20-10-2019	10500
27-10-2019	10150
31-10-2019	10150

### Coconut

At Nedumangad market the price of partially dehusked coconut opened at Rs.15000 per thousand nuts and closed at same price during the month. At Pollachi market in Tamil Nadu, the price of coconut opened at Rs.12000 per thousand nuts and ruled at same price during the month. At Bangalore APMC, the price of partially dehusked coconut opened at Rs.19000 and closed at Rs.23000 per thousand nuts during month. At Mangalore market the price of partially dehusked coconut opened at Rs.22000 per thousand nuts and ruled at same price throughout the month.

Weekly price of coconut at major markets (Rs/1000 coconuts)				
	Nedumangad	Pollachi	Banglore	Mangalore (Grade -1)
01-10-2019	15000	12000	19000	22000
06-10-2019	15000	12000	19000	22000
13-10-2019	16000	12000	19000	22000
20-10-2019	16000	12000	18000	22000
27-10-2019	16000	12000	18000	22000
31-10-2019	15000	12000	23000	22000

## International price

### Coconut

The price of coconut quoted at different domestic markets in Philippines, Indonesia, Srilanka and India are given below



Weekly price of dehusked coconut with water				
Date	Domestic Price (US\$/MT)			
	Philippines)	Indonesia	Srilanka	India*
05.10.2019	100	124	127	387
12.10.2019	110	125	142	380
19.10.2019	115	125	161	380
26.10.2019	115	125	186	380

\*Pollachi market

### Coconut Oil

The international price of coconut oil and domestic price of coconut oil in Philippines, Srilanka and India expressed a mixed trend during the month. Whereas the domestic price of coconut oil in Indonesia expressed a slight downward trend. The price of coconut oil quoted at different international/ domestic markets is given below.

Weekly price of coconut oil in major coconut oil producing countries					
	International Price(US\$/MT)	Domestic Price(US\$/MT)			
		Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	Sri Lanka
05.10.2019	705	625	628	1569	1830
12.10.2019	717	650	649	1578	1812
19.10.2019	714	642	650	1552	1783
26.10.2019	725	650	650	1573	1816

\* Kangayam

### Copra

The domestic price of copra at Philippines and Srilanka expressed a mixed trend during the month. The domestic price of copra at Indonesia expressed a slight upward trend whereas, the domestic price of copra in India expressed a downward trend. The price of copra quoted at different domestic markets is given below.

Weekly International price of copra in major copra producing countries				
Date	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
05.10.2019	398	409	766	1323
12.10.2019	391	410	819	1309
19.10.2019	394	414	813	1253
26.10.2019	396	420	817	1253

\* Kangayam