

## Country Paper – India

B.N.S Murthy

04

## Philippines - reigning the global coconut market

Deepthi Nair S

11

## Research efforts on coconut improvement at Regional Agricultural Research Station, Pilicode

T. Vanaja, P.R.Suresh and M.Esakkimuthu

16

## Non food uses of nata de coco, a microbial cellulose

Kumaravel S

19

## Pest and disease free coconut

P. Chowdappa, Vinayaka Hedge, Chandrika Mohan, A. Josephraj Kumar, Merin Babu

24

## Fake new alert: The American Heart Association proclaims coconut oil unhealthy

Bruce Fife

26

## News

32

## Monthly Operations

34

## Market Review

36



# Country Paper – India

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## Introduction

Coconut is one of the most useful crops to mankind. Because of its multifaceted uses of its products; it is called the Kalpavriksha or Tree of abundance. It is an important food crop of economic importance to many of the Asian and Pacific countries in the world. The crop provides livelihood security and employment opportunities to a major segment of the rural mass of these countries. India being the largest coconut producing country in the world, occupies 31% of global production. Coconut palm provides food security and livelihood opportunities to more than 12 million people in India. It is also a fiber-yielding crop. More than 15,000 coir based industries provide employment to nearly six lakhs workers of which 80 per cent are women folk. The crop contributes around

Rs.2,50,000 million (US\$ 3788 M) to the country's GDP and earns export revenue of around Rs.43,654 million (US\$ 661 M). Coconut and coconut products are gaining global importance as a contributing factor to the health, nutrition and wellness of human beings. This is due to its multiple medicinal and nutraceutical properties which are being revealed day by day. This new development in health sector has brought in an unprecedented increase in the demand of coconut products in domestic and international markets. It is estimated that there are five million coconut holdings and 12 million farmers in the country, covering 16 states and three Union Territories. This country paper mainly encompasses the major developments in Indian coconut sector along with other salient outcomes.



In India, coconut is predominantly a small holders crop where about 98% coconut holdings are owned by small and marginal farmers. As per the All India estimate for the year 2016-17, the area and production of coconut in the country is 2.096 million hectares and 22237.97 million nuts respectively. In comparison to the figures of the previous year, the area under coconut cultivation and coconut production increased by 0.38 per cent and 0.32 per cent, respectively.

India, the largest producer of coconut in the world is having sufficient raw material surplus, good reputation in global markets and access to good technologies in the production of virgin coconut oil, packed tender nut water, minimally processed tender coconuts, activated carbon etc. The presence of dominant ethnic population in the Gulf, UK and US are the strengths of India. India is having good network of organizations for conducting research in coconut. Central Plantation Crops Research Institute (CPCRI) was established in 1970 as one of the agricultural research institutes under the Indian Council of Agricultural Research (ICAR) and an International Coconut Gene Bank for South Asia (ICG-SA) was established at Kidu, Karnataka in 2013. The Research Centre at Kidu helps to cater to the needs of the farmers by supplying elite planting materials of the mandate crops, in addition to serving as the International Coconut Gene Bank for South Asia.

The All India Coordinated Research Project on Palms, started in the year 1972, is coordinating research in coconut, oil palm and palmyra under different agro-climatic regions for the identification of location specific technologies. The project provides adaptive research support for coconut through collection, conservation, cataloguing and evaluation of germplasm, evaluation of new hybrids and high yielding varieties of coconut, standardization of agro-techniques for various agro-climatic regions including development of appropriate farming systems and development of efficient pest and disease management strategies.

## Coconut Production - 2015 -17 and forecast for 2018

As per the statistics of APCC for the year 2015, India tops world production of coconut with 20440 million nuts. As per the latest data of the Government of India, 22237.97 million coconuts (2965 MT of copra equivalent) are produced in the country. Over the period from 2012-13 to 2016-17 coconut production in the country decreased by 1.95% from 22,680.03

million nuts to 22,237.97 million nuts. Droughts due to the insufficient monsoon in major coconut growing states coupled with natural calamities like cyclonic storms and effect of pests and diseases are mainly attributed to this decreasing trend in coconut production.

The four southern states, Kerala, Tamil Nadu, Karnataka and Andhra Pradesh accounted for 88.87 percent of the coconut area and 90.81 percent of the coconut production in the country. Kerala, with the largest area under coconut cultivation and production accounted for 36.86 percent of the area under coconut and 33.57 percent of production at national level.

The productivity of coconut at national level for 2016-17 is 10,611 nuts per hectare. The highest yield is reported from Chhattisgarh at 16508 nuts per hectare followed by Andhra Pradesh (13759 nuts/ ha) and Tamil Nadu (13423 nuts/ ha). Andhra Pradesh and Tamil Nadu out perform to about 40 % over the other two major coconut growing states of Karnataka (9744 nuts/ ha) and Kerala (9663 nuts/ ha).

As per 2015 statistics, India contributes 30.49% of world coconut production and enjoys the first position in terms of production. 75.60 % of area under coconut and 74.55 % of production are contributed by three leading coconut growing countries viz., India, Indonesia and Philippines. India ranks second in terms of productivity (10349 nuts per ha) next to Brazil (11574 nuts per ha), among the major coconut growing countries.

During the period from 2012-13 to 2016-17, the area under cultivation of coconut decreased from 21.37 lakh hectares to 20.96 lakh hectares. The decrease in area is mainly because of the rapid urbanization taken place especially in Kerala coupled with the effects of back to back cyclone hit coastal Andhra, Tamil Nadu and Odisha.

Coconut is a traditional crop in the major coconut growing states of the country, which is cultivated over centuries. As coconut is grown as a homestead plant and cultivation is mainly taken up by the small and marginal farmers, the major part of the palms are retained even after their economic life. Hence about 20% of the palm population in India is estimated to be senile and unproductive. A massive Replanting & Rejuvenation programme is being taken up in the country after the successful implementation of the pilot projects in few areas of the country. The seedlings of new and improved varieties are being planted under the area expansion programme assisted by the Central and State Governments in

India. It is estimated that about 10 % of the palms in India are still in the juvenile phase.

Non-availability of sufficient quantity planting materials of new and improved high yielding varieties is one of the major obstacles faced by the farmers who are interested in coconut cultivation. Coconut is a smallholders' crop and the homestead/fragmented nature of coconut cultivation makes it difficult to adopt modern scientific technologies and farm mechanization for higher income and reduced production cost. Dearth of skilled labourers for farm operations including harvesting, plant protection measures, crown cleaning, etc. are the reasons for lesser productivity. The natural calamities like droughts due to deficit monsoons, cyclones and climate change affect the coconut production and productivity. The incidence of pests and diseases in coconut is increasing due to the constraint that most of the plant protection operations are to be carried out on the crown. This makes the process tiresome. The old/ senile and uncared palms due to absentee landlordism are breeding sites for the insects and pathogens. The wild fluctuation in coconut prices due to its seasonal nature and too many middlemen in the supply chain also are the reasons for reduced interests in coconut cultivation by the farmers which ultimately leads to reduced production and productivity.

### **Policies to Promote Farm Productivity and increase Farmer's Income:**

In India, development programmes and policies in coconut are mainly carried out by Coconut Development Board under the Ministry of Agriculture and Farmers Welfare. Production and distribution of quality planting materials, expansion of area under coconut especially in non-traditional states, promotion of adoption of integrated nutrient management, pest management and coconut based farming systems by establishing farmer participatory demonstration plots, replanting and rejuvenation of old and senile coconut gardens, Technology Mission on Coconut for promoting value addition, facilitating formation and handholding farmer producer organizations for promoting production, processing and marketing of coconut are the major policies adopted in India for promoting coconut sector. Formation of farmers' collectives in coconut sector is encouraged by the government for aggregation, farm level processing, collective plant protection measures and production of value added coconut products.

The development programmes in coconut is undertaken by the Board for replanting, new planting,

rehabilitation for enhancing coconut production and productivity are listed below:

### **Replanting/new planting, rehabilitation and farm productivity programmes**

India started Replanting and Rejuvenation (R&R) of traditional coconut gardens in the country. To begin with, the programme was introduced in Kerala, the state with the longest history of coconut cultivation where 1/3<sup>rd</sup> of palm population was old, senile and disease advanced. Apart from the longest recorded history of coconut cultivation, the state is under the grip of a lethal disease called root wilt. Cutting and removing the disease advanced trees and giving management care to the existing palm population is the only strategy to manage the gardens. Therefore the R&R programme was implemented in the state from 2009 and is still continuing. The main objective of the scheme is to enhance the productivity and production of coconut by removal of disease advanced, old and senile palms, replanting with quality seedlings and rejuvenating the remaining palms by giving compensation to farmers for cutting and removal, replanting and rejuvenation. The scheme is extended to other traditional coconut growing states from 2016-17 onwards. So far more than 3.5 million palms have been cut and removed under the scheme and nearly 3.05 lakh ha. is rejuvenated.





## Production and distribution of planting material

Establishment of Demonstration cum Seed Production (DSP) Farms in different parts of the country for creating infrastructure facilities for production of quality planting materials besides demonstrating and educating the scientific coconut cultivation and processing to various stake holders in those regions, establishment of regional coconut nurseries for extending support to various participating states for strengthening the seedling production programme, distribution of hybrids/dwarf seedlings in government sector and establishment of nucleus coconut seed gardens and coconut nurseries in private sector are taken up under this programme. Last year nearly 7.20 lakhs seedlings were produced and distributed under this scheme. 10 DSP farms have so far been established in different parts of the country.

## Expansion of Area under Coconut

This programme is for extending adequate technical and financial support to the farmers to take up coconut cultivation on scientific lines in potential areas to attain a significant achievement in the future production potential. Financial and technical assistance is extended under the scheme for taking up new planting of coconut in potential areas.

## Integrated Farming for Productivity Improvement programmes

The objective of the programme is to improve production and productivity of the coconut holdings through an integrated approach and thereby increasing the net income from unit holdings with the component programmes under Laying out of Demonstration Plots and establishing Organic Manure Units by providing incentives. Scientific integrated management practices including coconut based farming systems are promoted under the scheme by establishing farmer participatory demonstration plots in farmer's field.

## Publicity and Extension activities

The Board is disseminating information on various aspects of coconut cultivation and industry through various media and publications besides organizing awareness training programmes for farmers, stakeholders and training programmes for imparting skills and knowledge to farmers, unemployed youths and rural women in various fields related to coconut. Board also regularly participates in exhibitions and fairs across the country and abroad.



## Coconut Palm Insurance Scheme (CPIS)

The Coconut Palm Insurance Scheme intends to provide insurance coverage to coconut crop. Under the scheme all healthy bearing palms in the age group from 4 to 60 years are eligible to get insurance coverage against natural perils leading to death or becoming unproductive. 50% of the insurance premium is borne by the Board and the balance is shared between the state government and farmers @ 25% each.



## Technology Mission on Coconut

The Technology Mission on Coconut programme gives emphasis on the development of technologies for the management of insect pest and disease affected gardens and product diversification besides demonstration and promotion of these technologies for adoption. Under the Mission, research projects and clinical studies are sponsored through reputed institutions in the area of technology development and also for establishing the medicinal and nutraceutical properties of coconut products especially coconut oil. Technical and financial support is given to establish 479 processing units with processing capacity of 2785 million nuts per year.

## Performance of the Coconut Processing Industry

During the financial year 2016-17 export of coconut products (excluding coir items) was valued at Rs.20776.50 Million (US\$ 314.77 M) against Rs.14502.40 Million (US\$ 220 M) during the previous year, recording an increase of 43.26% in terms of value. Activated Carbon was the single largest item of export both in terms of quantity and value of export. Significant increase was recorded in the export of desiccated coconut, activated carbon and coconut oil. Activated carbon accounted for 39.23% of the total export of coconut products from India during 2016-17. Major coconut products such as coconut oil, desiccated coconut, copra, and coconut shell charcoal registered significant growth in exports during the year 2015-16. The export details in 2017-18 (till January 2018) is presented in Table 1.

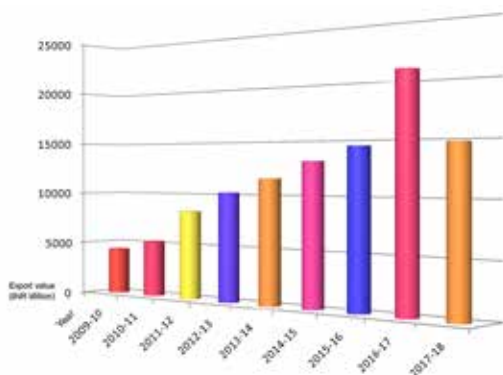
The export earnings are picking up with the surge in growth of industries like virgin coconut oil, activated

carbon, shell charcoal etc. Indian products are moving to US, UK, Germany, Japan, France, Middle East, and African Countries. Advancement in technology development and the technical and financial support extended by India through the Coconut Development Board under the Technology Mission programme for starting coconut based industries have been instrumental for this success. Added to these, the Board has been designated as Export Promotion Council (EPC) for various products other than coir based products from 1<sup>st</sup> April 2009 which also has contributed to a perceptible improvement in export.

Table - 1: Export of coconut products (2009-18)

Year	Export value	
	(In INR Million)	(In USD Million)
2009-10	4323.84	91.71
2010-11	5256.50	115.61
2011-12	8386.47	174.60
2012-13	10225.33	187.92
2013-14	11561.19	190.24
2014-15	13123.85	214.20
2015-16	14502.44	221.07
2016-17	20837.4	311.01
2017-18	14748.7	228.97

(till January 2018)



In the capacity of EPC, Board has so far given registration to 3273 exporters of coconut products. This has enabled the Board to monitor the export scenario more closely.

Average price of Major Products per MT in USD (2018)	
Activated Carbon	1944.89
Coconut oil	2888.88
Fresh Coconut	580.77
Desiccated coconut	3000.00

## Consumption pattern

### *Coconut Processing Plants and their Capacities*

During the year 2015-16, 61 coconut processing units were assisted by the Coconut Development Board for producing copra, coconut oil, flavoured coconut juice, virgin coconut oil, packaged tender coconut water, neera and neera based products, shell charcoal, activated carbon, etc. Around 30 units were assisted during 2016-17. Board has sanctioned the establishment of 22 processing units in the country during 2017-18. The coconut shell based activated carbon units are run with about 80 % of the installed capacity to produce 9300 MT activated carbon.

### *Update of Recently Adopted National Quality Standards of Coconut Products*

CDB Institute of Technology is engaged in the development and demonstration of technologies for product diversification and by-product utilization of coconut. The centre is devoted to product development, microbial analysis of coconut based products, apart from skill development programmes to interested entrepreneurs and self help groups for acquiring technologies on post harvest coconut processing and process demonstration. The Institute received the recognition of NABL. Many value added and novel products were developed by the institute during the last year and the institute has now been designated as CDB Institute of Technology (CIT).

## Marketing and Product Promotion

### *Major Market Destinations of Traditional Coconut Products*

The UAE, China, Iran, Oman and Saudi Arabia are the major markets for fresh coconuts. Copra attracts good demand from countries like Bangladesh, Nepal, Iran, Vietnam and Hong Kong. Coconut is having a good market in Indonesia, Malaysia, Sri Lanka,

Ireland and Mauritius. USA, Korea, US, Russia and Netherlands are the major buyers of activated carbon.

### *Major Market Destinations of Non-Traditional Coconut Products*

As far as the non-traditional coconut products are concerned, VCO has good demand in Brazil, France, USA, UAE, Oman, Mexico, Qatar and the United Kingdom. Countries like UAE, Kuwait, Oman, USA, Saudi Arabia, Qatar, Canada and UK have good markets for products like coconut water and coconut milk powder.

### *Government Policies Related to Coconut Trade and Market*

The Government of India implemented Goods and Services Tax (GST) on 1<sup>st</sup> July 2017 with the aim to improve ease of doing business in the country. GST was implemented by amalgamating large number of Central and State taxes into a single tax which would mitigate cascading or double taxation in a major way which paves way for a common national market. GST, being a simple tax regime, is expected to reduce the complications in doing business and improve trade. The GST applied on various coconut products ranges from 0 to 28%.

Coconut and coconut products have very good market potential within as well as outside the country. Towards expanding the market for Indian coconut products across the globe, the Board is extending support for sales outlets/ kiosks for value added coconut products, facilitating participation in domestic exhibitions/ trade fairs and buyer-seller meets in metropolitan cities within the country, encouraging coconut product exporters with award for export excellence, overseas and domestic industrial exposure visits to prosperous manufacturers, organising workshops/ seminars for entrepreneurs and exporters etc.

## Coconut Research and Development

India was lagging behind in technology development for product diversification till the last two decades. Introduction of Technology Mission has given momentum to this area and now India possesses many technologies in value addition. Acceleration to the activities of CDB Institute of Technology, further quickened coconut product development. In the world, for the first time, technology for processing and packing of neera and various downstream products like neera sugar, jaggery, honey etc have been developed. Food products like sweet/spicy chips, sweet chunks, chocolate, cookies, burfi, lemonade,





flavoured juice, ice cream and milk spread are also the other new additions of CIT's contribution in the product basket.

### Three tier Farmer Producer Organization (FPO) in coconut sector.

CDB started a novel extension approach to organize farmers by formation of three tier Farmer Producer Organization (FPO) with Coconut Producers Societies (CPS) at the primary level, Coconut Producers Federation (CPF) at the intermediate level and Coconut Producer Company (CPC) at the apex level. The CPCs are engaged in the production of value added products from coconuts procured from the member farmers. So far 9582 CPSs, 735 CPFs and 67 CPCs are formed and functioning in the country.

### Skill Development Training Programmes- Friends of Coconut tree (FoCT)

Acute shortage of palm climbers to harvest and adopt plant protection measures is one of the



problems faced by coconut growers. With a view to tackle this problem, the Board is conducting skill development programme from 2011-12 onwards, to train unemployed youths in developing special skills and confidence in coconut climbing and plant protection activities for the benefit of coconut farming community. The skill fetches the youth handsome income for their decent living and help to make available sufficient manpower in coconut harvesting and other plant protection activities.

### Other Issues/Problems/ Recommendations

Indian coconut sector has to improve in many areas in spite of the unprecedented progress achieved in selected sectors. There are many issues to be addressed and solutions to be arrived at. Inadequate availability of quality planting material in tune with the increasing demand, low pace of value addition, low level of productivity than the potential, low pace of expansion of crop and low level of Replanting and Rejuvenation of old plantations, non availability of disease tolerant and short statured high yielding varieties are issues that still need solution. Against the annual requirement of 10 million seedlings, the present supply is only 3.5 million seedlings. Considerable area suitable for coconut is available in traditional and non-traditional areas in the country which need to be utilized for expanding the crop. Through convergence of various programmes and bridging the gap in existing schemes, India will try to make coconut a more remunerative crop by enlarging the scale and size of operations and reducing production costs giving more thrust on irrigation, drought management and soil and moisture conservation. Restructuring of planting population giving more stress on hybrids and dwarf and more diversion of production to value addition, improvement in quality standards matching with international standards, adoption of new marketing strategy for tapping domestic and international markets and widening the skill development in all essential areas of production and processing will be other areas of priority. Indian Coconut sector is striving hard to grow further for the benefit of millions of farming community. The country is aiming at sustaining the premier status enjoyed at global level in production and productivity and also in the process of gaining the prime position in export front.

\*Country Paper - India - Dubai Global Conference 17<sup>th</sup>-19<sup>th</sup> April 2018. ■



# Philippines - reigning the global coconut market

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Philippines leads in the production and export of diversified value added products from coconut. The Philippines is the leading exporter of coconut products in the global market and stands second in area under coconut behind Indonesia and third in production. The present status of Philippines with respect to various traditional and non-traditional coconut products is presented below.

## Traditional Coconut Products of Philippines

### *Copra and Coconut Oil*

As primary material, crude coconut oil itself is marketable overseas. Locally, major consumers of this oil are the coconut oil refineries, unless a refinery has integrated operation, that is, from copra crushing to refining. Other oil millers (effectively considered also as refiners) produce only semi-refined oil mainly for export. Called cochin oil, it is semi-refined oil in that the processes involved are only refining (chemical and/or physical) and bleaching. The coconut aroma may still be present as no deodorization was done. RBD coconut oil is refined, bleached and deodorized coconut oil or fully refined coconut oil.

The US and Europe are the major importers of Philippine coconut oil with combined market share of

85%. Disaggregating according to coconut oil types, imports of Europe comprise mainly crude coconut oil, while the US is top buyer of cochin oil. On the other hand, RBD coconut oil has the most diverse market with Asia & Pacific, notably China and Japan, as key markets until 2012. Since 2013 the US took over as market leader.

### *Copra meal*

The copra meal by-product is exported exclusively to Asian countries. Previously, almost the entire production of copra meal was shipped to Europe for use in feed compounding for cattle but the Philippines lost the market eventually due to strict limits on aflatoxin contamination. The last shipment to Europe was made in 2007. Meanwhile, copra meal found new markets in South Korea and Vietnam for the countries' growing livestock industries. The local market likewise has substantial share of the copra



meal market. Lately, India has become an aggressive buyer of copra meal and has overtaken Japan in the number three slot in the importers' list since 2014.

### ***Oleochemicals***

Philippine oleochemicals derived from coconut oil are for the most part intermediate chemicals: coconut fatty alcohol, fatty acid, methyl ester, and the by-product glycerin. Major market for these oleochemicals is in Asia & Pacific, primarily coco fatty acid. Europe is a much smaller market accounting for 21% as opposed to 78% of Asia & Pacific as a group. Export to Europe is mostly methyl ester. US ceased to be a market since 2013, it was importing coco fatty alcohol in 2012 and coco fatty acid in 2013. The main market of glycerine is in Asia & Pacific, accounting for 94.2% of which Japan dominates followed by China and Korea.

Oleochemical are further processed into amides, surface active agents, soap chips, soap noodles, biodiesel, aviation fuel, MCT oil and other fractions. Alkanolamide also has Asia & Pacific as its primary market. Within the region, Thailand, Australia and Vietnam were consistent buyers during the five-year period to 2015 with Thailand dominating followed by Australia and Vietnam. Shampoo is shipped mostly to Asia & Pacific.

## **Non Traditional Coconut products**

### ***Coconut shell charcoal and activated carbon***

Coconut shell charcoal and activated carbon are traditional coconut shell products which are exported regularly. Apart from export, demand for coconut shell charcoal comes from local activated carbon manufacturers too. Asia has been coconut shell

charcoal's export market where Japan takes the leading position and China takes the second spot. In contrast, trade of activated carbon is global in scope with Europe as top export market followed by Japan, US and Korea. The demand is on the rise over the years both for coconut shell charcoal and activated carbon from cited key importing countries.



### ***Coconut water***

Coconut water, the clear to slightly turbid liquid found inside the coconut kernel, apart from being a beverage, is raw material for the production of nata de coco, coconut vinegar, and coconut wine. It is also a sought after sports drink as more and more sports enthusiasts appreciate its many health attributes. The coconut water drink comes from coconuts between six and nine months old. Athletes and individuals value the coconut water for its being a natural beverage that is biologically pure, tasty, no sugar added, and high in nutritional value, among others. A comparison of the components of coconut water drink and typical sports drinks show coconut water has the edge because it is low in sodium and sugars and high in potassium, making it an ideal sports drink. Distribution of coconut water in consumer packs took some time to take off





because of the difficulty in packing coconut water and preventing it from fermentation. New packaging methods developed nowadays make the product accessible to the consumers in Tetra Pak, aluminum can, glass or PET bottle. In coconut growing countries like the Philippines, however, people still prefer taking coconut water straight from the coconut, particularly in the countryside, to ensure freshness apart from price consideration. Coconut water is also exported in concentrate form although still in limited volume compared to the regular coconut water or termed as single pass.

Export of coconut water saw a phenomenal rise in 2011 and 2012 but suffered a setback in 2013 owing to reduced purchases from the US. Export of coconut water was merely less than 1 million liters until 2010 when it first exceeded the 1 million-mark. Volume thereafter hit more than 10 million liters. The last two years saw a huge spike in export from 35.848 million liters to 71.735 million liters (+100%). The US has been a top buyer of coconut water. The European market saw radical increase in uptake from 6.3 million liters in 2014 to 30.0 million liters the following year, for a 376% increase. In Europe, the top consumers are United Kingdom and Netherlands. Interestingly, export prices virtually followed a rising path even with increasing volume traded, suggesting rising demand for the product.

Other products from coconut water are coconut wine, vinegar and nata de coco. There is limited data on coconut wine while figures on vinegar and nata de coco do not disaggregate the raw material used to produce these products. Nevertheless, a good part of vinegar produced comes from coconut water and as to nata de coco, from coconut milk. Export of vinegar is largely to the US. Vinegar is an important condiment and cooking ingredient for Filipinos, which explains for the significant market share of the US where many Filipinos reside permanently or otherwise. In 2013, there were huge purchases by the Middle East,

notably Saudi Arabia. Like the US, there are many Filipinos working in Saudi Arabia as well.

### **Coconut meat**

The Philippines, world's biggest supplier of desiccated coconut, presently has 13 desiccated coconut plants. The other exporters are Sri Lanka, Indonesia, and Vietnam. DC remains the second biggest export earner in the coconut industry next to coconut oil. The US is the single biggest market for Philippine desiccated coconut followed by the European market, the key importers being the Netherlands, Belgium, United Kingdom and Germany. In the Asia & Pacific region, Australia is the market leader in the region followed by China, Singapore, Japan and Korea.



### **Coconut milk liquid**

The domestic market for liquid coconut milk remains limited and concentrated in urban centers. Consumers still prefer manually doing the extraction of coconut milk from fresh coconuts because it is cheaper and easy to do and the assurance that the milk product is fresh. The US is a major market followed by the European market, mainly the United Kingdom and Germany. Japan is the third biggest market. The market for liquid coconut milk is more diversified compared to the powder form. It was shipped to around 40 countries in the last five years of which eight regularly take orders from each year.





## Coconut milk powder

The local market for coconut milk powder, like liquid coconut milk, is limited to institutional users like hotels and restaurants. In the export side, coconut milk powder counts about 35 country markets led by Japan, the US, Netherlands and France. The combined market share of EU comes to 29%. Out of the 35 importing countries, only Japan, the US, Korea and Australia had annual purchases during the five-year period.

## Coconut flour

The US was principal destination cornering nearly one-third (32.6%) of total sales trailed by Korea, Australia and Europe. Its important use in nutrition makes it a highly priced product.

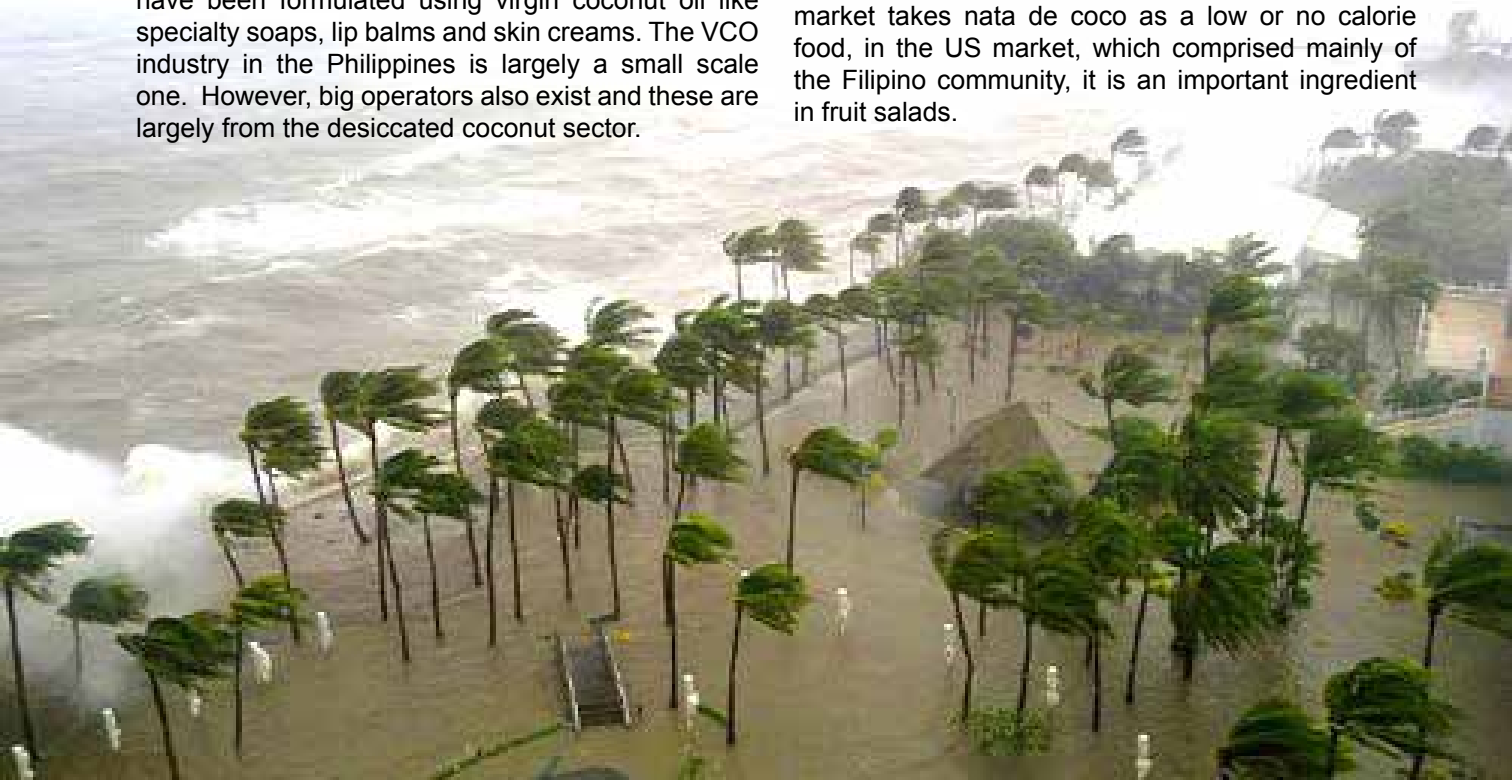
## Virgin coconut oil (VCO)

VCO has risen to prominence for its anti-bacterial, anti-viral, anti-microbial, anti-protozoal properties that is has become well-known as a special premium product from coconut, even in countries which do not grow coconuts like United States and European countries. VCO still retains its tocopherols, which has been cited as an advantage over traditional coconut oil. Since VCO is solid most of the time at room temperature in importing countries like the US and Europe or when refrigerated, it can be used as a butter or margarine substitute for spreads or for baking. Most recipes calling for butter, margarine, or any other oil can be substituted with virgin coconut oil. For non-food applications, it has always been used as hair and scalp conditioner, as massage oil, body lotion, body scrub, among others. Other products have been formulated using virgin coconut oil like specialty soaps, lip balms and skin creams. The VCO industry in the Philippines is largely a small scale one. However, big operators also exist and these are largely from the desiccated coconut sector.



Record in the past five years show volume and value uninterrupted growing by over six folds. US remained the market leader. Decade ago, the US monopolized the VCO market, cornering about 95% of total Philippine export. However, since the entry of Canada into the market in 2006, the US market share started to dwindle and continued on with market expansions into Europe and Asia & Pacific. In Europe, the major players are Germany, the Netherlands, United Kingdom and Belgium while in Asia & Pacific are Japan, China, Australia and Malaysia.

Nata de coco is basically for the Japanese market with Japan cornering more than 80% (81.4%) of nata de coco market. The second biggest market is the US which accounts for around 7%. While the Japanese market takes nata de coco as a low or no calorie food, in the US market, which comprised mainly of the Filipino community, it is an important ingredient in fruit salads.



## Strength of the Philippine processing sector

Apart from the concerted activities of PCA for the sustained development of the coconut sector, Philippines also has an organized processing sector of coconut. The United Coconut Associations of the Philippines, Inc. (UCAP) is a confederation of associations/organizations involved in the various activities of the coconut industry. The objectives of UCAP are to unite all elements of the coconut industry and work for their common good. UCAP promotes harmonious coordination among the various sectors of the industry for the common benefit of the producing, trading, processing and consuming public; inculcate and preserve high standards of honor and integrity among its members and promote just and equitable principles and practices of trade. It also serves as a center of information about the coconut and related subjects; and provide a forum for the discussion of problems, issues affecting the coconut industry and/or any of its sectors, inter alia. UCAP serves as a forum for discussion on various issues involving the coconut industry and/or any of its sectors and members. UCAP published UCAP Monthly Review, Monthly Export Statistics, Coconut Statistics, Directory of Coconut Establishments in the Philippines are to name a few.

The major associations or organizations in the coconut sector in the Philippines include Philippines Coconut Producers Federation Inc (COCOFED), Coconut Oil Refiners Association (CORA), Association of Philippine Coconut Desiccators (APCD), Organic Coconut Association of the Philippines (OCAP), Association of Coconut Brokers Inc (ACBI), Philippines Activated Carbon Manufacturers Association Inc (PACMA), Philippine Coconut Oil Producers Association (PCOPA), Virgin Coconut Oil Producers and Traders Association of the Philippines Inc (VCOP) etc. UCAP is organizing the 1<sup>st</sup> World Coconut Congress during 14-16 August 2018 in the Philippines.

## US Roadshow

Coconut being a major export commodity, Philippines Government addresses any challenge or threat to the industry with utmost concern and urgency. In the year 2017, the same old issue of saturated fats as the chief culprit for cardiovascular disease was again revived by the American Heart Association (AHA). Coconut oil has been singled out by AHA, as it did in the late 1980s. The Philippines has

taken the initiative to rally the Asian and Pacific Coconut Community

(APCC) and the private sector in opposing this smear campaign against coconut oil, pointing out that it is based on flawed research which endangers the economies of the major coconut producing countries as well as the

livelihoods of millions of coconut farmers throughout the world. In partnership with the Department of Trade and Industry (DTI), a Coconut Road show and Outbound Business Matching Mission was sent to the US in September 2017 to conduct a press relation, market intelligence and promotion campaign for coconut oil and other coconut products.

## Challenges faced

Climate change is the major challenge faced by the country. Philippines has been ranked second only to Bangladesh among the countries in Asia to be most at risk from the changing temperatures and weather systems. The country has been ravaged by numerous disasters, both by climatic and tectonic forces. The Philippines is exposed to various hazards because of its geographic location. Being situated in the Pacific rim of fire, the country is no stranger to earthquakes. This is further compounded by the fact that the Philippines is in the path of Pacific typhoons averaging 20 per year. The names Ondoy, Pepeng, Pablo, and Yolanda have been etched in the memories of Filipinos because of the destruction these typhoons have brought upon the country. Yolanda-hit areas are coconut producing regions leaving many coconut farmers economically marginalized. As per PCA reports, around 33 million trees in seven provinces were damaged in varying degrees. It will take three to five years to rehabilitate the coconut farms using fast-growing varieties. Apart from the decreased production due to varying climatic factors and the climatic risks and threats, there is also the Coconut Scale Insect (CSI) invasion which caused massive destruction in coconut areas. Increasing population of senile coconut trees and the prevalence of low-yielding varieties of coconut trees around the country are other major challenges to be addressed. ■





## Research efforts on coconut improvement at Regional Agricultural Research Station, Pilicode

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### Introduction

Coconut research in India was started as early as in 1916 with the establishment of research stations at Kasaragod, Nileshevar-I (Pilicode), Nileshevar II & III. These stations were located on the west coast of the erstwhile Madras State, representing the three major soil types on which coconuts are generally grown. Later, these stations were taken over by the Indian Central Coconut Committee in 1947. With the formation of Kerala State in 1956, three stations of Pilicode & Nileshevar came under the Department of Agriculture. The Kasaragod station was taken over by ICAR in 1970 and is functioning as CPCRI, Kasaragod. The Stations at Nileshevar II and Pilicode were taken over by the Kerala Agricultural University in 1972. During implementation of National Agricultural

Research Project (NARP), these stations were pooled together and elevated as Regional Agricultural Research Station with an objective of strengthening agricultural research in the Northern regions of Kerala, comprising the Districts of Kasaragod, Kannur, Kozhikode and Malappuram with effect from June 1st 1980.

The Regional Agricultural Research Station, Pilicode is located in Pilicode Village of Hosdurg Taluk in Kasaragod District and is geographically located at 13°N latitude and 75°E longitude at an elevation of 15m above MSL. It is about 55 km North of Kannur town by the side of NH-66. The Station is 130km South of Mangalore Air port and 3 km East of Cheruvathur Railway Station. Nileshevar station is situated in Nileshevar village of Hosdurg Taluk in Kasaragod District and is about 65 Km North of Kannur



town lying on either sides of NH-17 and is about 1.6 km South West of Nileshtar Railway Station. The extent of area of RARS, Pilicode is 57.87 ha and that of Nileshtar is 17.25 ha. The Station receives 3379 mm of average annual rainfall. The mean maximum and minimum temperature of the location is 33°C and 23°C respectively.

The thrust area of research is to perform as the lead centre for research on coconut and coconut based farming system. Hybrid vigour in coconut was first reported from this station. The first ever hybrid T x D (WCT x CDG) was developed and planted at Nileshtar campus during 1936 which still exists at this campus. Later under the crop improvement programme this station had released the high yielding coconut varieties namely, Lakshaganga (Laccadive Ordinary X Gangabondam), Keraganga (West Coast Tall X Gangabondam), Ananthaganga (Andaman Ordinary and Gangabondam), Kerasree (West Coast Tall X Malayan Yellow Dwarf), Kerasowbhagya (West Coast Tall X Straight Settlement Apricot), Kerasagara (Pedigree is Seychelles of South East Asia) and Keramadhura (Pedigree selection from Malayan Green Dwarf). Of these Keramadhura is a variety suited for tender nuts. It has good copra yield compared to dwarf palms. Most of the package of practice recommendations of coconut for management and crop protection were developed from this station.

The station maintains a unique collection of coconut germplasm consisting of 35 exotic and 40 indigenous types. Philippines Ordinary, Lakshadweep Ordinary, Cochin China, Java, New Guinea and Spicata were found to be highly suitable for cultivation in the northern zone under rainfed conditions. Philippines Ordinary and Lakshadweep Ordinary ranked first in yield of copra and number of nuts, respectively. Under All India co-ordinated programme of Palms two programmes are being conducted namely, collection, conservation and evaluation of local germplasm of

coconut and performance of Dwarf x Dwarf hybrids of coconut in different agro-climatic regions. Third generation inbred plantation is another unique programme of this station.

The details of varieties released from Regional Agricultural Research Station, Pilicode are given below.

### Lakshaganga

This variety was developed through hybridisation method. Parentage is Laccadive Ordinary X Gangabondam. It was released in 1988. The features of this variety are early bearer, suitable for rainfed system, drought tolerance, copra weight 195 gm, and 70 % oil content. Key characteristics are tall tree with nut weight of 677 gm, weight of husked nut is 380gm. Annual productivity is 108 nuts/tree. It can be recommend for cultivation at any part of Kerala.

### Keraganga

This variety is developed through hybridisation method. Parentage is West Coast Tall X Gangabondam. It was released in 1989. This variety takes five years for flowering, 75% more copra yield (201 gm) than WCT, 69 % oil content. Key characteristics are tall tree with nut having 20.20 cm polar diameter, 16.45 cm equatorial diameter and 1182 gm weight. Weight of husked nut is 760 gm and Kernel thickness is 1.20 cm. Annual productivity is 100 nuts/tree. It can be recommend for cultivation in rainfed, coastal and mid-land regions.

### Ananthaganga

This variety was developed through hybridisation between Andaman Ordinary and Gangabondam. It was released in 1989. The features of this variety are it takes six years for first harvest. Copra yield (216 gm)- 77%, which is more than WCT, drought tolerant, oil content of 68%. Key characteristics are tall tree



Lakshaganga



Keraganga



Ananthaganga



Kerasree



Kerasowbhagya



Keramadhura

with nut having 22.6 cm polar diameter, 16.85 cm equatorial diameter and 1100 gm weight. Weight of husked nut is 795 gm and kernel thickness is 1.29 cm. Annual productivity is 95 nuts/tree. It can be recommend for cultivation in rainfed, coastal and mid-land regions.

### Kerasree

This variety is developed through hybridisation method. Parentage is West Coast Tall X Malayan Yellow Dwarf. Released in 1992. it takes six years for first harvest. Suitable for all types of soil under rainfed system and the copra yield is (216 gm). The oil content is 66%. Key characteristics are tall tree, light green nut with 17.02 cm polar diameter, 16.52 cm equatorial diameter and 1011 gm weight. Weight of husked nut is 524.65 gm and Kernel thickness is 1.13 cm. Annual productivity is 140 nuts/tree. It can be recommend for cultivation in rainfed, coastal and mid-land regions.

### Kerasowbhagya

This variety is a hybrid between West Coast Tall X Straight Settlement Apricot. It was released in 1993. The features of this variety are suitable for moderate management conditions and is drought tolerant. Copra content is 196 gm and the oil content is 68%. Key characteristics are tall tree, light orange nut with 21.08 cm polar diameter, 17.07 cm equatorial diameter and 1019 gm nut weight. Weight of husked nut is 694 gm and the kernel thickness is 1.3 cm. Annual productivity is 130 nuts/tree. It can be recommended for cultivation in coastal regions.

### Kerasagara

This variety is developed through selection method of crop improvement. Parentage is Seychelles (South East Asia). (Was released in 2006.) The features of this variety are, it takes eight years for flowering and

gives 75 % more copra yield (203.4 gm) than WCT and oil content 68 %. Key characteristics are tall tree, light green nut with 27 cm polar diameter, 1.05 cm equatorial diameter and 1300 gm nut weight. Weight of husked nut is 575 gm and kernel thickness is 1.5 cm. Annual productivity is 99 nuts/tree. It can be recommended for cultivation throughout Kerala.

### Keramadhura

This variety is developed through selection from Malayan Green Dwarf. It was released in 2013 as a dual purpose variety suited for tender coconut and copra products. It is a superior genotype suitable for dual purpose with excellent quality as tender nuts. The copra yield is (196 gm/nut). Key characteristics are semi-tall tree, oval nut, crown and nuts green in colour, thickness of kernel is 1.27 cm. Annual productivity is 119 nuts/tree. It can be recommend for rainfed and irrigated conditions.

### Conclusion

Under crop production programme, the station has been producing and supplying hybrid seedlings of the above varieties. These varieties are preferred throughout the state and in many places of southern India. Distribution of seedlings starts from June and completes by August through farmers registration. A network programme on centre of excellence in value addition of agricultural crops is being operated at this station. Technologies for commercial level production of various value added products from coconut have been standardised at this centre. This includes Virgin Coconut Oil (hot & cold processed), Danthapala oil, coconut water syrup, coconut water vinegar, coconut water wine, coconut chutney powder, coconut chips, coconut pickle, coconut curry paste, coconut laddu and face cream. The training has conducted training programmes on value addition in coconut based products for the farmers of North Kerala. ■



# Non food uses of nata de coco a microbial cellulose

**Kumaravel S**, Development Officer, Coconut Development Board, Kochi

**C**ellulose is the most abundant organic polymer on earth. It is an important structural component of the primary cell wall of plants, many algae and Oomycetes. Paper and paper boards are mainly produced from lignocellulosic material (plant origin). The derivatives like cellophane and rayon are also made in smaller quantities. Wood pulp and cotton are the main sources of cellulose for industrial use.

However, plant materials are not the only source of this valuable polymer. Microbial cellulose is a form of cellulose that is produced by bacteria. Some bacteria from the genera *Aerobacter*, *Acetobacter*, *Achromobacter*, *Agrobacterium*, *Alcaligenes*, *Azotobacter*, *Pseudomonas*, *Rhizobium* and *Sarcina* can synthesize cellulose when they are cultivated under adequate conditions. Of the above, *Acetobacter xylinum*, now known as *Gluconacetobacter xylinus* is

Nata de coco is a chewy, translucent, jelly-like food produced by the fermentation of coconut water which gets converted into cellulose through the microbial action of *Acetobacter xylinum*. Originating in the Philippines, nata de coco is most commonly used as a candy or dessert, and can garnish a variety of foods, including pickles, drinks, ice cream, puddings and fruit cocktails



most preferred for commercial production due to its behaviour for producing enough cellulose. *G. xylinus* extrudes glucan chains from pores into the growth medium. These aggregate into microfibrils which forms into a three-dimensional coherent network of pure cellulose nanofibers or microbial cellulose ribbons. The production occurs mostly at the interface of liquid and air.

The bacterial cellulose is finer and more intricate in structure, the fibres are longer and stronger and has more absorbent per unit volume compared to the plant cellulose. The quality of the pellicle is determined by the strain of *G. xylinus* and media used. It has higher purity, crystallinity and degree of polymerization. It can be produced on a variety of substrates, can be grown to any shape virtually. No *hemicellulose* or *lignin* need to be removed as done in plant cellulose production. Bacterial cellulose is kept pure and handled carefully during subsequent manufacturing. It remains hydrated during other processes like pasteurization and infusion with ingredients based on the need. Conversely, wood pulp or cotton fibers are heavily processed and chemically treated.

Various kinds of sugars are used as substrate for production of bacterial cellulose. Coconut water is also one of the substrate from which microbial cellulose called Nata de coco is widely produced and mainly marketed as a dessert food. It is also used as an ingredient in other food products, such as ice creams, fruit cocktails, etc. Nata de Coco is low in calories, has no cholesterol and is high in dietary fiber which is good for digestive system.

Bacterial cellulose is an interesting, renewable and biodegradable material with extended commercial application due to its high purity, dietary fibre content and special physico-chemical characteristics. Apart from food sector, the bacterial or microbial cellulose is widely used in the paper industry, electronics, cosmetics and tissue engineering considering its remarkable mechanical properties, conformability and porosity.

## Medical nonfood uses of bacterial cellulose

Bacterial cellulose is biocompatible and non-toxic and hence it is a suitable material for medical applications. The use of bacterial cellulose gels for the fabrication of biomedical products has advantages over the use of other types of cellulose and polymers. These advantages include the fact that the three dimensional shape and the fiber network architecture can be controlled.

## Wound dressing

The dried, translucent, semi-opaque, biosynthetic cellulose membrane are widely used for wound dressing. The commercial products claim that the fluid balance is improved and the mechanical cellular matrix bridges the wound bed, thus promotes distribution and concentration of growth factors and nutrients needed for healing, while protecting the wound from environmental contamination. Studies have shown that the bacterial cellulose accelerates the process of healing of the skin in comparison with conventional wound dressings. It was further reported that these coverings reduce wound pain, accelerate re-epithelization and reduce wound infection rates and scarring.



## Tissue engineering

Microbial cellulose has been used as a scaffold for tissue engineering application due to its biocompatibility. The scaffolds should have interconnecting pores of appropriate scale to favor tissue integration and vascularization, appropriate surface chemistry to favor cellular attachment, differentiation and proliferation, adequate mechanical properties and should be made from materials with



controlled biodegradability so that tissue will eventually replace the scaffold. Most of these requirements are met by the microbial cellulose, except biodegradability due to its high degree of crystallinity and a compact structure. However, researchers have overcome this by an *in vitro* chemical treatment which kept the original network structure intact and made a bacterial cellulose based scaffold that it could degrade in water, phosphate buffered saline and the simulated body fluid.

The investigations are on to create artificial blood vessels using bacterial cellulose as it is strong enough to cope with blood pressure and works well with the body's own tissue. It is claimed that the material also carries a lower risk of blood clots than the synthetic materials currently in use. The laboratory trials have positive response on the use of bacterial cellulose modified for addressing the issue of blood clotting, as real blood vessels have an internal coating of cells that ensure that the blood does not clot.

### Other uses

Other less-documented biomedical applications include the use of bacterial cellulose for the production of contact lenses, electro conductive composite hydrogels biosensors, membranes for topical delivery of lidocaine, synthetic dura mater, bladder neck suspension, implantable soft tissue replacement, etc.

### Non medical applications of microbial cellulose:

#### Use in acoustics

Traditionally, membrane of cone loudspeakers are made of paper (cone paper), formed with cellulose fibers. The biocellulose cone is normally made from kenaf (*Hibiscus cannabinus*), also called Deccan hemp and Java jute. Considering the good mechanical properties of bacterial cellulose

made from nata de coco, several very thin layers of biocellulose membranes fused together by a special process to produce the biocellulose diaphragm.



The loudspeakers with biocellulose membranes were found to exhibit acoustic response in a wider frequency range and of higher effectivity and high sound quality in comparison with that produced from a plant cellulose diaphragm. Improvement of the mechanical properties can be achieved by treating the biocellulose with alkali or oxidant solutions. It means that the replacement of cone paper loudspeaker with a cone biocellulose is prospective. The nata de coco diaphragms are already in use in high-end earphones/headphones of popular brands.

#### Use in cosmetics

Not all cellulose is the same. Most of the facial masks in the market use paper, technically made of cellulose from wood or cotton fiber. There is a tremendous difference. Biocellulose is hydrophilic, which has the ability to both absorb or donate moisture to the surface it is in contact with. Bacterial cellulose's inclination to reach moisture equilibrium makes it more helpful as it moisturizes dry skin and normalizes oily skin simultaneously. Cosmeceutical ingredients are even added for the facial masks.





As the fibers are stronger, the bacterial cellulose masks are more durable. These can be applied, removed, and re-applied if necessary. The super hydration also helps it cling tightly to the skin which aids in gentle opening of pores during use.

#### Other uses

Researches are ongoing to evaluate a possible role for bacterial cellulose in the following applications of matrix for electronic paper; high strength paper; substrates for OLEDs; gloss surface finish in magazines, etc.

With some fusion of science and creativity, fashion designers manage to create non-woven, eco-friendly dress materials from bacterial cellulose.

It is reported that nata de coco hydrogel, synthesised using radical polymerization from nata de coco, finds application as nano reactors for preparation of iron nano particles from ferrocenium reduction. The nanoscale iron particles are widely used in medical and laboratory applications. Researches have found that nanoscale iron particles can be effectively used to treat industrial sites contaminated with chlorinated organic compounds. However, these are not commonly used due to lesser production and higher price.

#### Disadvantages of bacterial biocellulose

Though the microbial cellulose produced from various substrates, including coconut water, have several advantages, large scale commercialization is prevented as the price is much higher than plant

cellulose. This is due to the low volumetric yields, high priced sugar substrates and lack of large scale production. Since it is a cultured material which takes minimum ten days to manufacture and because the entire organic process must be done cleanly and avoid harsh chemicals it is more expensive to create.

#### Future thrust

Microbial cellulose is biocompatible and non-toxic. The research is to be geared up to evaluate a possible role for bacterial cellulose in the several new applications, making the product cheaper by improvement in production process to enhance the yield. Development of new strain of *G. persimmonis* for producing substantial amounts of bacterial cellulose both under stationary and submerged agitated conditions has also been reported. Cellulose production using laboratory fermentor has substantially reduced the duration from 12-14 days (stationary cultivation) to 5-7 days (agitated conditions). The effects of different parameters like strain, agitation, dissolved oxygen levels, media rheology, etc. on bacterial cellulose production are to be investigated and standardized.

Popularizing the products for dessert, dietary, medical and other uses may attract more entrepreneurs in the fields. India is the world leader in coconut production. Several industries in the country are manufacturing value added products like desiccated coconut powder, virgin coconut oil, coconut oil, coconut milk and milk based products, where the coconut water is wasted except for making some vinegar. For appropriate largescale production, a specific knowledge about these byproducts and a proper standardization of them are required. This may yield additional income to the existing entrepreneurs or may help in flourishing small entrepreneurs.

The Government of India through Coconut Development Board extends financial assistance as back ended credit linked subsidy at different levels for development of technologies; demonstration of technologies; adoption of technologies; market research and promotion under the Technology Mission on Coconut programme.. Interested government institutions, societies, research organizations, cooperative societies, NGOs, individuals and other organizations are eligible for submission of projects under TMoC for availing financial assistance. ■

**Source** • Handbook of natural fibres: Types, properties and factors affecting breeding and cultivation, RM Kozłowski - 2012  
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# Pest and disease free coconut

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## Introduction

Integrated Pest and Disease Management (IPDM) in coconut is a holistic concept wherein all components of management strategies are integrated in as compatible manner as possible so as to prevent the insect population/ diseases attaining action threshold. While ensuring the pest and disease incidence under tolerant level, IPDM maintains a quality environment for the use by next generation. Adoption of IPDM practices enable sustainability of ecosystem which is extremely important in economic productivity in agriculture. It considers whole production system and always leaves a pest residue for the natural enemies to sustain.

Coconut is affected by a wide array of insects, mites, rodents and lethal / debilitating diseases. The IPDM tools for a united convergence for sustainable pest/ disease management tactics will be discussed hereunder. With the formation of Coconut Producer's Society and Federation throughout the coconut growing tracts of the country, community-mode in extension outreach of pest/ disease management options are wide open and many a time is successfully accomplished through farmer-participatory approach.

## Approaches in Pest and Disease Management

**Cultural Approaches:** Simple adoption of good agricultural and agronomic practices will be handy for pest avoidance as prevention is always better than cure. Planting coconut seedlings with correct spacing and fully exposed to sun light *ad libidum* are the best agronomic practices to avoid infestation by rhinoceros beetle, red palm weevil and rodents. Shallow planting leads to heavy incidence by red palm weevil and pits of size 1 m<sup>3</sup> are recommended for seedling planting. Coconut seedlings planted in shallow pits show exposed bole region and proliferating roots that invite bole entry of red palm weevil. Never mulch seedlings with coconut leaves during the early stage of establishment. Poorly-drained soil is unsuitable for coconut planting and seedlings in water logged condition would invite skipper butterfly attack and root



grub incidence. Timely crown cleaning reduces the damage caused by coreid bug and coconut eriophyid mite. Destruction of red palm weevil infested palms, beyond recovery reduces the floating weevil population quite considerably. Avoiding injuries to palm and cutting petiole beyond 1.2 m from trunk is advised to ward off red palm weevil attack. Avoid succulence by excess application of nutrients. Farm hygiene and removal of breeding grounds of rhinoceros beetle is the foremost option in the management of rhinoceros beetle. Soil-test based nutrient application along with dolomite and *in situ* biomass recycling through its raising cow pea in palm basin and incorporation during flowering are sound techniques to improve the palm health after invasion by coconut eriophyid mite and leaf eating caterpillars. Removal and destruction of heavily infested leaves are sound options in the management of black headed caterpillar and slug caterpillars. Summer ploughing exposes the white grubs for avian predators. Mulching of palm residues around the basin, raising green manure crops as well as providing summer irrigation improves the health of the palm significantly.

For a perennial crop like coconut, cultural practices form an important component of integrated disease management (IDM). Phytosanitation plays a vital role in the management of crown diseases viz., bud rot, leaf rot and grey leaf spot of coconut. Removal of the



infected tissues eliminates or reduces the amount of inoculum facilitating the effective management of the disease by biological/ chemical means. Moreover, rotten/fermented tissues in palms with leaf rot and bud rot diseases produce a spectrum of odorants that elicit stronger attraction in red palm weevil.

The attracted weevils lay eggs on the moist rotten tissues in the disease affected portions of the palm. These diseased tissues serve as the point of entry/ breeding site of the pest. In bud rot endemic areas, priority has to be given to the removal and destruction of severely affected or dead palms as they may serve as inoculum reservoirs of the pathogen. Removal of inoculum/ infected tissues help to bring down the possibility of recurrent infection and prevent greater losses incurred from the spread of the disease. Providing proper irrigation and drainage in the field plays a critical role in the incidence and spread of bud rot, stem bleeding and basal stem rot diseases.

Since wounds on the trunks predispose the palms to infection by stem bleeding pathogen, care should be taken not to injure the stem base while ploughing and avoid trash burning near the base of the palm. Isolation of diseased palms from healthy ones by digging a trench (60 cm deep and 30 cm wide) around the affected palm (1.2 m away from the base of the trunk) and avoiding flood irrigation or ploughing reduce/ check the spread of the basal stem rot disease. Application of farm yard manure, neem cake, recommended dose of nutrients and moisture conservation by coconut husk burial enhances the health of the palm and reduce the severity of disease in root (wilt) disease (RWD) affected palms.



### Use of Mechanical Tools

Use of mechanical devices and direct involvement of mankind are grouped under this category which is quite compatible with all techniques. Collection of emerging adult beetle of white grubs during June-July and use of light traps in monitoring the pest reduces the incidence of white grub. Mechanical hooking of rhinoceros beetle is perhaps the best method of management that a marginal farmer can adopt. Banding the palm trunks using polythene sheets or metal bands avoids climbing of rodents to the crown. Tying fertilizer gunny bags on the crown as well as baiting with traps are sound techniques in rodent management. Establishment of light traps could help both in monitoring and reducing the population of the slug caterpillar moths in endemic tracts of Andhra Pradesh and Kerala.

### Biological Suppression

Biological pest suppression is the most ecologically sound and environmental - friendly approach that acts slowly with long-term effect. Some of the classical examples in coconut pest management come under this category. Application of an entomopathogenic green muscardine fungus, *Metarhizium anisopliae* on the breeding pits @ 5 x 10<sup>11</sup> spores / m<sup>3</sup> is an effective low cost farmer friendly technology in the sustainable management of rhinoceros beetle.

This has been successfully implemented through farmer participatory mode by the Institute. *Oryctes rhinoceros nudivir* is utilized for bio-suppression of rhinoceros beetle. Release of 10 -12 viroseed beetles/ha reduced rhinoceros beetle incidence. Placement of three filter paper sachets containing 12-15 *Heterorhabditis indica*-infected *Galleria mellonella* cadavers on the leaf axils after application of 0.002% imidacloprid sup- Rhinoceros Beetle, Rhinoceros-affected Coconut Leaves, and Rhinoceros traps pressed the grubs of red palm weevil. Augmentative release of stage-specific parasitoids viz., the larval parasitoids *Goniozus nephantidis* (Bethyidae) @ 20 parasitoids/palm, *Bracon brevicornis* (Braconidae) @ 30 parasitoids/ palm, the prepupal parasitoid, *Elasmus nephantidis* (Elasmidae) @49%/100 prepupae, and the pupal parasitoid *Brachymeria nosatoi* (Chalcididae) @32%/100 pupae at the appropriate time was found effective in the sustainable management of black headed caterpillar. This technology also has been validated in large area demonstrations by ICAR CPCRI.

Application of talc based preparation of *Hirsutiellathompsonii* @ 20g/1/palm containing





1.6 x 10<sup>8</sup>cfu with a frequency of three sprayings per year significantly reduced eriophyid mite population on coconut. Drenching aqua suspension of EPNs *Steinernema carpocapsae* in the interspaces of palms at 5-10 cm depth with a dosage of 40 - 50 lakh infective juveniles/5 liter of water suppressed white grub incidence. The application of EPN shall be repeated as and when needed based on the grub population. *Coccinellid* beetles, *Chilocorus nigritus*, *Cryptognatha nodiceps*, *Pseudoscymnus anomalus*, *Pseudoscymnus dwipakalpa*, *Scymnus luteus*, *Rhyzobius* spp. and *Telsimianitida* suppress the scales and mealy bug population by predation. Hence, chemical pesticides in management of these sucking pests have to be judiciously used.

Management of disease using bioagents is an ecofriendly and sustainable component of IDM in coconut. Use of antagonistic microbes with biocontrol potential has been proved to be an effective tool in the management of leaf rot, stem bleeding and basal stem rot diseases. Application of 10% solution of talc based formulation of *Pseudomonas fluorescens* *Bacillus subtilis*/consortium of these microbes (50 g talc based formulation in 500 ml water) to the spindle leaf axils twice in a year can be adopted as a prophylactic measure during April- May and October-November in leaf rot disease endemic areas. Placement of *Trichoderma* coir pith cakes (2 nos.) in the inner most leaf axils protects the palms from bud rot. For stem bleeding affected palms, smearing of a paste of talc based formulation of *Trichoderma harzianum* (CPCRI TD 28) on bleeding patches along with the basin application of neem cake (5 kg) enriched with *T. harzianum* per palm during September- October effectively manages the disease. Basin application of neem cake (5 kg) fortified with *T. harzianum* (CPCRI TD 28) manages basal stem rot disease.

**Use of Botanicals:** Botanicals constitute yet another biorational approach in coconut

pest management. Since time immemorial, use of botanicals has been leading from the front in sustainable pest management in coconut. Incorporation of the common weed plant, *Clerodendron infortunatum* on the manure pits to induce larval-pupal abnormalities in feeding grubs is an easily adoptable practice against rhinoceros beetle. Filling up top most leaf axils with 250 g neem cake/ maroti cake/ pongamia cake along with equal volume of sand in palms reduced rhinoceros

beetle attack. Spraying 2% neem oil garlic mixture or azadirachtin 10,000 ppm @ 0.004% or root feeding with neem formulations containing azadirachtin 50,000 ppm at 7.5 ml or azadirachtin 10,000 ppm at 10 ml with equal volume of water three times during March-April, October- November and December-January is recommended for the management of the coconut eriophyid mite. Placement of tablet-mode botanical cake on the leaf axils was found effective in the management of rhinoceros beetle. Spraying of azadirachtin 300 ppm (Nimbecidene) @ 0.0004% (13 ml / 1) reduced the coreid bug incidence at the highest level. Two rounds of azadirachtin spray on young 1-5 months old coconut bunches during May-June and September-October are quite essential for satisfactory control of coreid bug in the field.

**Host plant resistance:** The most effective, at the same-time a very difficult and time consuming approach in perennial crop system, is the development of tolerant cultivars against biotic stresses. Kalpaharitha (a selection of Kulasekaram Tall) recorded the lowest mite incidence in the field and could be a preferred choice in endemic zones. Dwarf genotypes such as CGD, MGD and Gangabondam are relatively more susceptible to red palm weevil attack than Tall genotypes. Disease resistant/tolerant varieties are the cheapest and effective means of disease management especially in a perennial crop which remains in the field for many years. Use of a resistant genotype reduces the cost involved in plant protection and is of utmost importance in the management of phytoplasmal diseases which are not cured by any known chemical/ biocontrol measures. Use of disease free quality seedling is recommended for planting in disease endemic areas as this will help in the better initial establishment. ICAR-CPCRI has released two resistant/tolerant varieties viz., Kalparaksha (selection from Malayan Green Dwarf),

Kalpasree (selection from Chowghat Green Dwarf) and a hybrid Kalpasankara (Chowghat Green Dwarf X West Coast Tall) for RWD endemic tracts.

**Behaviour modulation tactics:** Volatile chemistry is the buzz word in innovative pest management approach and uses of semiochemicals has been very successful in monitoring as well as trap and kill strategy. Use of PVC pheromone traps 'Oryctalure [ethyl 4 methyloctonoate]' and field delivery using nanomatrix @1 trap / ha is an innovative method in pest suppression. Avoid installation of traps in gardens with juvenile palms. Installation of pheromone traps with ferrugineol embedded on nanoporous matrix @ 1 trap / ha was found effective in mass trapping of weevils. Impregnation of kairomonal blends containing host-induced volatiles enhanced the weevil catches substantially. Timely servicing of traps with fresh food baits once in 6 days and avoiding placement of traps in gardens with juvenile palms or palms intercropped with tall intercrops (banana) are essential in successful adoption of the technology. A farmer-participatory community approach would be the key factor in successful field realization. Pheromone lures to attract *Opisina arenosella* moths are available in the market. It is dispensed in the field in sticky traps and a trap density of 40 traps/ ha is recommended along with parasitoid release for pest management. Olfactory conditioning of parasitoids using the volatiles from larval frass enhanced the host searching ability and swift recognition of the host, *arenosella* by the parasitoid.

**Agro-ecosystem based approach:** The stimulo deterrent approach rather pushpull strategy is emerging as an important pest management component in perennial cropping system. ICAR-CPCRI has developed a crop habitat diversification strategy in the management of rhinoceros beetle and red palm weevil through volatile confusion and disorientation of pest through diverse cropping techniques. Habitat manipulation with crop diversity (nutmeg, rambutan, papaya, banana, glyricidia, curry leaf, coral vine, and sunflower) along with coconut subdued disease management needs in rhinoceros beetle attack to 53.2%. Disease management needs in inter/mixed cropping system differ from those in pure stands. With the increase in crop diversity due to multi-species cultivation, the incidence and intensity of diseases may increase or decrease. The intercrop should not serve as an alternate/ collateral host of the pathogens affecting coconut. Growing non host crops helps to check the spread of soil borne diseases like basal



**Chemical control:** This is the most powerful technique that needs to be judiciously used only on a need based manner. Residual toxicity need to be studied before recommendation of a chemical pesticide. Application of imidacloprid 18.5 SL 0.02% (1 ml per 1 of water) or spinosad 2.5 SC 0.013% (5 ml per 1 of water) or indoxacarb 14.5 EC 0.04% (2.5 ml per 1 of water) along with other crop management components for a cost effective productivity of the crop is essential in making the farmer more competitive to face the challenges of the changing agricultural scenario. Drenching the root zone with chlorpyrifos 20EC @ 2.5ml/lit or imidacloprid @ 240 g ai /ha or bifenthrin @ 4.0 kg ai/ha during May-June and September- October is recommended for management of white grubs. Spraying lambda cyhalothrin @ 1ml/1 on the pollinated bunches was found effective in the management of coreid bug. In coconut, application of 10 g Bromadiolone (0.005%) blocks two times at an interval of 12 days on the crown of one palm out of every five palms is recommended for effective control of rat. This method is highly cost-effective. If the damage is restricted to certain palms, only such palms require baiting.

Use of plant protection chemicals in disease management gained momentum with the discovery and development of Bordeaux mixture by PA Millardet. The introduction of fungicides revolutionized the entire concept of disease management and became the most widely adopted and accepted component of IDM. Crown application of 300 ml of fungicidal solution containing 2 ml of hexaconazole 5 EC in the cavity around the base of the spindle is recommended as prophylactic (April- May and October-November) and



curative treatment in disease endemic areas. Crown cleaning and application of Bordeaux mixture (1%) to palms in disease endemic areas before the onset of monsoon preferably during the first week of June protect the palm from bud rot disease. Bordeaux paste (10%) is recommended for the curative treatment of bud rot affected palms. Root feeding of hexaconazole SEC 2% (100 ml solution per palm) and soil drenching with hexaconazole 5EC @ 0.2% or Bordeaux mixture @ 1% (40 l solution per palm) at quarterly intervals are recommended for the management of basal stem rot disease.

**Legislative mode:** The most needed one but the least emphasized tool in pest and disease management is the legislative component. Sustained surveillance, scouting and sensitization programme have already been made in the look out of the invasive pest, coconut leaf beetle, *Brontispaalonissima* which has not so far entered our country due to strict quarantine programme. However, this needs to be further strengthened with the formation of an incursion management team for tackling the disaster

upon accidental entry. The diseases prevalent in other countries viz., cadangcadang, lethal yellowing and foliar decay virus are the major biosecurity threats to coconut sector in India. Domestic quarantine stations with diagnostic labs have to be equipped to prevent the spread of RWD to non endemic areas. The upsurge in the report of new diseases

on coconut in recent years from other coconut growing countries warrants the strengthening of the disease surveillance, diagnostics and management techniques.

## Conclusion

Judicious integration of all aforesaid techniques in a need based manner with sustained scouting and surveillance are key factors accomplishing plant health management for enhancing productivity in coconut. A social outreach programme through these tools would be realistic for the sustainable coconut production which has redefined its position through product diversification and creating demand among public. Integration of IPDM practices along with other crop management components for a cost effective productivity of the crop is essential in making the farmer more competitive to face the challenges of the changing agricultural scenario. ■

(Reproduced from: *Cocoinfo International* Vol. 2; 2012)

## Coconut Development Board participated in Organic Farm Fest

Coconut Development Board participated in Organic Farm Fest organized by Kerala Organic Charitable Trust held at Kochi from 10<sup>th</sup> to 15<sup>th</sup> April 2018. Farmers seminar, organic farmers meet, training programme and exhibition was held as part of the programme. Coconut Development Board displayed coconut based value added products including neera products, handicraft items and publications of the Board in the CDB stall. Around 35 stalls displaying various organic products participated in the programme.





## Tender coconut with Black Pepper Sauce

### Ingredients

Tender coconut 350 g [cut into pieces]  
Celery 50 g [cut into strips]  
Carrot (s) 50 g [cut into strips]  
Green onion(s) 2 pcs [sectioned]  
Crushed Black Pepper 3 tbsp  
Water 2 tbsp

### Marinade

Crushed Black Pepper 2 tbsp  
Corn starch 1 tbsp

### Method of Preparation

Mix tender coconut with marinade.

Blanch carrot and celery in boiling water for a short while and then drain. Sauté green onions in two tbsp oil. Add tender coconut and stir-fry until done. Stir in carrot, celery, water and black Pepper sauce. Stir well until heated thoroughly.



## Tender Coconut Mango Panna Cotta

### Ingredients

#### Mango Puree

- 4 medium mangos peeled and pitted
- 1 cup mango juice
- 1 tsp unflavored gelatin or agar

250 ml Mango juice

1. Tender Coconut

(coconut flesh with 50 ml coconut water blended)

#### Panna Cotta

- 1 1/2 cups whole milk
- 1/3 cup sugar
- 2 tsp powdered gelatin
- 1/2 tsp salt
- 1 1/2 cups fresh cream
- 1/4 tsp vanilla extract



### Method of Preparation

#### Mango Puree

In a small bowl, add mango juice and sprinkle gelatin on top. Wait for five minutes for gelatin to soften and then mix well. Microwave on high for one minute and stir again. Keep the mixture in a wine glass. Mix well the mango puree and mango juice. Pour into glasses to a half inch below the brim and chill for two hours to set.

#### Panna Cotta

In a medium sized saucepan, add milk and powdered gelatin and wait for ten minutes cook in medium flame. Add sugar and stir several minutes to dissolve. Remove saucepan from heat and stir in the cream, coconut cream and salt. Once the mixture is at room temperature, pour into the glasses. Make sure that the mango is covered well. Chill for 1-2 hours until it is set. Well. Decorate with raspberries and diced mango. Serve and enjoy!

Recipe prepared by Royjoseph Pothan,  
Executive chef, Flora Airport Hotel, Kochi



# Coconut water and coconut milk

## healthy products from the tree of life

Coconut milk and coconut water are completely different products, both in terms of flavor and in terms of nutritional value.

• One cup of coconut water has much more potassium than one whole banana

• Coconut milk is one of the healthiest alternatives for fat

• Eight ounces of coconut water contains 45 calories

Just because coconut milk and coconut water share the same source, doesn't mean that they are the same thing. These two beverages are completely different, both in terms of flavor and in terms of nutritional value. Coconut water is the fluid found in the center of a young, green coconut. Coconut milk, on the other hand, is obtained from the white flesh of a mature coconut.



### What is coconut milk?

This beverage, unlike coconut water, is not harvested directly from the coconut. It is obtained from the flesh of coconut. It is shredded and simmered in plain water or coconut water and allowed to soak. When the flavor is absorbed by the water, it is strained and the coconut and white are separated. It is left as an opaque, white fluid. This one is higher in terms of calories and fat content. These calories are obtained from saturated fat. However, it can be used as a plant-based substitute for dairy in cereals and coffee. It is one of the healthiest alternatives for fat and it gives food a distinct, nutty flavor.

Besides this, it promotes weight maintenance in people who are looking for a way to gain weight or maintain a healthy Body Mass Index (BMI). It is also known for its ability to increase good cholesterol levels which lowers blood pressure. In terms of calorie content, one cup of coconut milk contains 445 calories and 48 grams of fat which is much more than the calorie content of coconut water.

### What is coconut water?

Coconut water is found in a young coconut. This drink is synonymous with hydration. This beverage is sweet and is low in terms of calories. It is one of the best beverages for people who are on a weight-loss spree.

In terms of nutrition, one cup of coconut water has much more potassium than one whole banana. It is also rich in sodium. It is recommended for the gym-goers who are looking for a way to replace the electrolyte loss they go through when they sweat. Besides this, it contains traces of calcium, zinc, and magnesium. Eight ounces of coconut water contains 45 calories. So it is a great way to give your taste buds a sweet treat and your body a dose of nutrition. Add it to your smoothies or supplement it with fruit juices to maximize its benefits.



### Coconut water VS coconut milk

For those who are trying to lose weight, coconut water is healthier and those who wish to maintain their weight, coconut milk is healthier. Coconut milk is a healthier alternative to other sources of fat and coconut water is the drink of hydration. So it is the purpose and not its properties which make either of these two the healthier option.

Source: <https://doctor.ndtv.com/living-healthy/whats-healthier-coconut-water-or-coconut-milk-1835376>



# Fake new alert: The American Heart Association proclaims coconut oil unhealthy

Bruce Fife\*

Today saw it as a way to stir up controversy by attacking the wholesome image of coconut oil with the attention grabbing headline, "Coconut Oil Isn't Healthy, It's Never Been Healthy."

Coconut oil has been gaining ground as one of the premier healthy fats. The editors of USA Today knew that a widely perceived healthy fat that was now being labeled as unhealthy by the AHA would generate huge interest, and sell a lot of papers. And they were right! Immediately following publication of the article, other publications quickly jumped on the bandwagon and started producing their own shocking stories with headlines such as: "Coconut Oil As Unhealthy As Beef Fat" and "Coconut Oil May Not Be As Healthy As You think?"

These articles stirred up a swarm of confusion. Over the past few years numerous new studies, articles and books have sung the praises of coconut oil and many people, including doctors and nutritionists have recommend it as one of the good fats. Now, all of a sudden, according to the media, the AHA is declaring it unfit for human consumption. What is going on here? What is the truth?

These articles are examples of fake news perpetuated by editors solely to attract attention to their publications. Did you know that 50 percent of the media headlines about medical studies are deceptively wrong? And that these headlines don't accurately match the content or conclusions of the medical journal articles on which they are based. This fact is from a review published in the New England Journal of Medicine. Today editors are often interested more in sensationalism than in reporting the facts and, consequently, we get a lot of fake health news misleading the public. This is the case with the attack on coconut oil. The AHA article was not specifically about coconut oil, it was

In June 2017 the journal Circulation published an online article prepared by the American Heart Association (AHA) titled "Dietary Fats and Cardiovascular Disease." The focus of the article was to reiterate the AHA's long standing position against the use of saturated fats, recommending that we replace them with polyunsaturated fats, which they stated, are as effective as cholesterol-lowering statins in reducing the risk of heart disease.

This article was not the result of any new study but simply a statement of position by the AHA, supported by select (cherry picked) studies. The article demonized all saturated fats as bad because they increase LDL cholesterol—the so-called bad cholesterol; which in turn, supposedly increases the risk of heart disease. Only half of one page, out of the 24 page article, addresses coconut oil specifically, along with discussions on dairy fats, trans fats, and others. The article was not about coconut oil, it was about saturated fats. However, the editors at USA



a statement of their position on saturated fats. The AHA has always maintained the stand that saturated fats are bad and increase cholesterol levels, which they claim increases the risk of heart disease. They argue that all saturated fats raise total cholesterol and LDL cholesterol and, therefore, increase the risk of heart disease. What they conveniently fail to mention is that total cholesterol is not an accurate indicator of heart disease risk. They also don't mention that saturated fats, including coconut oil, increase HDL cholesterol—the good cholesterol that reduces the risk of heart disease.

Another fact they tend to downplay is that there are actually two types of LDL cholesterol: one, that is small and dense, and another, that is large and buoyant. The large buoyant LDL cholesterol is also a form of good cholesterol. It is the type of cholesterol that is used to make bile, hormones, and vitamin D; it is essential not only for good health, but for life itself. The small dense LDL, on the other hand, is the type of cholesterol that becomes oxidized, and all oxidized lipids are unhealthy, and can contribute to heart disease. Coconut oil increases HDL, large LDL, and reduces small dense LDL. The overall effect is that coconut oil reduces the cholesterol ratio, thus lowering the risk of heart disease. The cholesterol ratio is recognized as being a far more accurate indicator of heart disease risk than total cholesterol. Coconut oil may increase total cholesterol in some people, but it does so by increasing good LDL and HDL, not the bad LDL. Blood triglycerides is another independent risk factor for heart disease. In fact, it seems to have a greater influence on heart disease risk than cholesterol. Sugar and refined carbohydrates increase triglycerides, while coconut oil reduces triglycerides, thus again lowering risk of heart disease. Did the AHA report mention this? No, the authors seem to have forgotten to say anything about this important point. In fact, the AHA article seemed to leave out a lot of important information such as the fact that polyunsaturated vegetable oils increase the small, bad LDL cholesterol and increase the risk of cancer, neurological disorders (including muscular degeneration), and autoimmune disease, or that coconut oil can prevent, and possibly even reverse these conditions.

The report also failed to mention that populations that use coconut oil as their primary source of fat have the lowest rates of heart disease in the world. The report failed to mention a lot of important facts, including the financial associations of the authors. I examined the original article and could find no

financial disclosure that generally accompanies scholarly articles. Which strongly suggests that the authors may have financial ties with the vegetable oil or pharmaceutical industries. Indeed, Dr Barbara Roberts, a cardiologist, discusses the financial connection of the authors in her article here : <http://www.thedailybeast.com/theheart-associations-junk-sciencediet>.

The AHA should not be allowed to profit off their own dietary advice, but apparently they do which makes their recommendations questionable. The article entitled "Controversial Pharma CEO To Chair AHA Charity Ball" by Larry Husten, March 24, 2017 ([www.cardiobrief.org](http://www.cardiobrief.org)) also explains about the financial relationship between the AHA and the pharmaceutical industry. This is just one example of the conflict of interest with the AHA. It's no wonder why the AHA is so much against coconut oil and other health promoting saturated fats.

I am not alone in saying the AHA is misguided on this issue. The following links go to several others who have come out with statements regarding coconut oil and heart disease.

Dr. Anthony Pearson, a cardiologist at St. Luke's Hospital in St. Louis in his article "Beware of More Misinformation from the American Heart Association on Coconut Oil and Saturated Fats" (<https://theskepticalcardiologist.com/2017/06/18/beware-of-more-misinformation-from-the-american-heart-association-on-coconut-oil-and-saturated-fats/>), provides an excellent rebuttal to the AHA article. Bestselling author of Eat Fat, Get Thin, Mark Hyman, MD, weighs in on the controversy. (<http://drhyman.com/blog/2016/04/06/is-coconut-oil-bad-for-your-cholesterol/>) Diana Rogers, RD, explains why coconut oil won't kill you, but listening to the American Heart Association might! (<http://sustainabledish.com/coconut-oil-wont-kill-listening-american-heart-association-might/>) Mary Newport, MD, who used coconut oil to successfully treat her Alzheimer's affected husband, comments. (<https://www.facebook.com/CoconutOilandAlzheimers/posts/898200733651342>) Gary Taubes, an investigative science and health journalist and bestselling author, gives a detailed analysis. (<http://garytaubes.com/vegetable-oils-francis-bacon-bing-crosby-and-the-american-heart-association/>)

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# State Agriculture Fair



Coconut Development Board , Regional Office, Patna participated in State Agriculture Fair 2018 held in Champaran, Bihar from 13<sup>th</sup> to 15<sup>th</sup> April 2018. Shri. Radha Mohan Singh, Hon'ble Agriculture Minister, Government of India inaugurated the fair. Shri. Pramod Kumar, Minister of Bihar State Tourism Development Corporation, Dr. AK Singh, DDG, ICAR, Dr. Ramesh Kumar Srivasthav, Vice Chancellor, Dr. Rajendra Prasad Central Agricultural University, Dr B P Bhat, Director , ICAR, Patna, Dr. Anjani Kumar, Director, ATARI, Patna and other dignitaries were present during the occasion. Various government and non government organizations took part in the programme. Coconut Development Board, Regional Office, Patna displayed different variety coconut bunches, coconut based value added products, handicraft items and informative charts, posters and publications on coconut. Shri. Radha Mohan Singh, Hon'ble Agriculture Minister visited the Board's stall.

## Shri. R Madhu appointed Secretary, CDB



Shri. R Madhu took charge as the Secretary of CDB on 27<sup>th</sup> March 2018. Prior to this appointment, he was working as Accounts Officer at Rubber Board. Shri. Madhu has earlier worked as Audit Officer at CDB.





## Monthly operations in coconut gardens - May

### Andaman & Nicobar Islands:

Plant the seedlings in the previously prepared pit after half filling the pit with a mixture of wood ash, sand and surface soil in a small hole dug in the centre of the pit. Provide bunds along the edge of the pit to prevent water stagnation in the pit. Clean the crown of all the bearing palms and fill the leaf axil with sand and naphthalene ball mixture to prevent the attack of rhinoceros beetles

**Andhra Pradesh:** Prepare nursery beds. Sow seed nuts in the beds. If coconut husk is available bury it in trenches taken 3m away from the trunk between rows of palms or in circular trenches taken around the palm at a distance of 2m from the trunk. The husk is to be placed in layers with concave surface facing upwards and buried. The husk helps in the retention of moisture and supplies nutrients especially potash. The beneficial effect of husk burial will last for 5 to 7 years. Apply the first dose of fertilizers i.e. 400 g urea, 700 g single superphosphate and 750g muriate of potash to adult palms in the basin. Apply green leaf manure@ two headloads per tree and then finally cover with soil and irrigate the basins. If cattle manure is available, apply 25 kg along with the above manures. Apply ¼ cartload of tank silt depending on its availability. Plant one year old seedlings in the main field. If the attack of blackheaded caterpillar is noticed, cut down and burn the affected leaves to arrest the spread of the pest. Spray the affected

palms with 0.02 per cent dichlorvos or 0.05 per cent Malathion.

Liberate specific parasites on older palms according to the stage of the pest. In a multi-stage condition of the pest, combined release of all the parasitoids is required. When an initial insecticide treatment is given the parasitoids may be released after three weeks of spraying.

If there is termite problem in the area, raise the nursery in sandy soil or apply thick layers of river sand on the bed or drench the nursery with 0.05 per cent chlorpyrifos twice at 20 to 25 days interval. If the attack of mite is noticed, spray neem oil formulation containing 0.004 per cent Azadirachtin/ Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth year old bunches.

**Assam:** Continue transplanting of seedlings in the mainfield. Drain out regularly accumulated rain water from the pits of newly transplanted seedlings. Clean the crowns of the palms and tie or prop up bunches to prevent buckling. Take preventive measures against diseases. If termite attack is noticed, adopt soil drenching of the nursery beds and basins of newly transplanted seedlings with 0.05 per cent chlorpyrifos twice at 20 to 25 days interval. Against leaf rot disease, pour contaf 5EC @ 2ml/300 ml of water per palm around the base of the spindle leaf after cutting and removing the rotten portion.



**Bihar / Madhya Pradesh/ Chhattisgarh:**

Increase the frequency of irrigation. Search for the incidence of termite attack/fungal disease and adopt recommended control measures. Start planting seedlings in the field by taking pit size of 1.2m x 1.2m x 1.2m in laterite soil and 1m x 1m x 1m in sandy loam soil.

**Karnataka:** Clean the water channels and repair the bunds. Continue irrigation, if the monsoon has not set in. Sow the seednuts before the onset of monsoon rains and irrigate them if necessary. Give a prophylactic spray with, 1 per cent bordeaux mixture or any other copper fungicide against fungal diseases. Fresh planting may be done in previously prepared pits half filled with wood ash, cattle manure and surface soil. Irrigate the seedlings if dry spell prevails. Apply the first dose of fertilizers, organic manure (FYM) @ 50 kg and neem cake @ 5 kg per palm per year. If the attack of mite is noticed, spray neem oil formulation containing 0.004 per cent Azadirachtin/Neemazal@ 4 ml/ litre of water.

**Kerala/Lakshadweep:** Search for leaf eating caterpillars and destroy them by cutting and burning the leaves infested by them. When an initial insecticide treatment is given, the parasitoids may be released after three weeks of spraying. Search for rhinoceros beetle and red palm weevil in the affected trees. The black beetle should be hooked out and destroyed. Inject the red palm weevil attacked palms with carbaryl 1 per cent using a funnel. Search for bud rot infection. If infection is found, treat with bordeaux paste and spray the neighbouring palms with one per cent bordeaux mixture as a prophylactic measure. Take basins around the palm at 2m radius and sow green manure crop in it if it has not been sown in the main field. Husk burial can be done to conserve soil moisture. Application of sufficient quantities of organic manures and balanced doses of inorganic fertilizers is recommended to improve the nutrient status of palms. Apply organic manure (FYM) @ 50 kg and neem cake @ 5 kg per palm per year. If the attack of mite is noticed, spray neem oil formulation containing 0.004 per cent Azadirachtin/Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth year old bunches.

**Maharashtra/Goa/Gujarat:**

Plough the land once or twice and remove the grasses. Sow green manure crop such as wild sunnhemp, dhaincha, sesbania or kolinji @ 28 to 34 kg per hectare. Apply fertilizers if not given earlier.

**Orissa:** Dig basins around the palms. Apply green leaf and cattle manure at the beginning of the

southwest monsoon. First apply the green leaf and then cattle manure and cover with soil. Apply the first dose of fertilizers @ 250g urea, 300 g single super phosphate and 400 g muriate of potash per palm.  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  of the above doses of fertilizers may be given to 1<sup>st</sup> year, 2<sup>nd</sup> year and 3<sup>rd</sup> year old palms respectively. Start planting seedlings in the main field by taking pit size of 1.2m x 1.2m x 1.2m in laterite soil and 1m x 1m x 1m in sandy loam soil.

**Tamil Nadu/Puducherry:**

Continue irrigation in the garden. Apply 80 litres of water / day / palm in drip irrigated gardens or apply 500 litres of water / palm through basin irrigation once in 6 days in the western region and once in 5 days in eastern region. Search for black headed caterpillar. If infestation is observed, cut and burn the infested leaves or portion of leaves. If the attack of black headed caterpillar is noticed spray the affected palms with 0.02 percent dichlorvos or malathion and release larval or pupal parasites 3 weeks after spraying. Repeat the spraying with copper oxychloride @ 0.25 per cent / carbendazim 0.1 per cent or root feed with 2 g carbendazim in 100 ml water if grey/lethal leaf blight is observed. Forty-five days interval should be maintained between root feeding and next harvest of nuts. Start sowing of seed nuts in the nursery and sowing of green manure crops like sunnhemp and daincha in the palm basins.

**Tripura:** Weed the garden and improve the drainage facilities. Transplanting should be taken up during this month. Spray one per cent bordeaux mixture if bud rot is prevalent in the garden. To protect the palms from rhinoceros beetle and red palm weevil fill the top 3-4 leaf axils of the palm with a mixture of 25g sevidol 8G with 250g fine sand. Prepare nursery beds for sowing seednuts. In areas of poor drainage make raised beds. The seed beds are to be treated with 0.05per cent chlorpyrifos twice at 20 to 25 days interval to protect the nuts from the attack of termite.

**West Bengal:** Prepare bunds and clean the water channels. Continue irrigation if the monsoon has not set in. Sow seednuts before the onset of monsoon and irrigate them if necessary. Dig out pits for new planting if it is not yet done. Give palms a prophylactic spray with 1per cent bordeaux mixture (Dissolve 10 g of copper sulphate and 10 g quick lime separately in 500 ml water. Pour the copper sulphate solution into the lime solution to get one litre bordeaux mixture. Check the acidity by dipping a knife or blade in the solution. If rusting is seen add more lime solution) to prevent bud rot and other fungal diseases. Apply the first dose of fertilizer if not done.

# Market review – March 2018

## Domestic price

### Coconut Oil

During March 2018 the price of coconut oil opened at Rs.19600 per quintal at Kochi market, Rs.19800 per quintal at Alappuzha market and Rs.20900 per quintal at Kozhikode market. During the first fortnight the price of coconut oil in all three markets expressed a declining trend and thereafter expressed an upward trend.

The price of coconut oil closed at Rs.19200 per quintal at Kochi and Alappuzha market and Rs.20000 per quintal at Kozhikode market with a net loss of Rs.400 at Kochi market and Rs.600 at Alappuzha market and Rs.900 per quintal at Kozhikode market.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.17333 per quintal, expressed a mixed trend and closed at Rs.17667 per quintal with a net gain of Rs.334 per quintal.

	Kochi	Alappuzha	Kozhikode	Kangayam
01.03.2018	19600	19800	20900	17333
04.03.2018	19000	19300	20400	16000
11.03.2018	18600	18600	19500	16667
18.03.2018	18700	18800	19400	17333
25.03.2018	18700	18700	19400	17667
31.03.2018	19200	19200	20000	17667



### Milling copra

During the month, the price of milling copra opened at Rs.12850 per quintal at Kochi, Rs.12900 per quintal at Alappuzha market and Rs.13050 per quintal at Kozhikode market. During the first fortnight the price of copra in all three markets expressed a declining trend and thereafter expressed an upward trend.

The prices closed at Rs.12650 at Kochi and Rs.12350 at Alappuzha market and Rs.13200 at Kozhikode markets with a net loss of Rs.200 per quintal at Kochi and Rs. 550 per quintal at Alappuzha market and net gain of Rs.150 per quintal at Kozhikode market.

At Kangayam market in Tamilnadu, the prices opened at Rs. 12500 per quintal and closed at Rs.12100 per quintal with a net loss of Rs.400 per quintal.

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01.03.2018	12850	12900	13050	12500
04.03.2018	12450	12550	12800	11500
11.03.2018	12100	11850	12150	11000
18.03.2018	12200	11950	12300	11400
25.03.2018	12200	11900	12700	11800
31.03.2018	12650	12350	13200	12100

### Edible copra

The price of Rajapur copra at Kozhikode market which opened at Rs.14000 per quintal expressed an overall upward trend during the month and closed at Rs.16200 per quintal with a net gain of Rs.2200 per quintal.

Table 3 : Weekly price of edible copra at Kozhikode market (Rs/Quintal)

01.03.2018	14000
04.03.2018	13000
11.03.2018	13700
18.03.2018	14000
25.03.2018	15300
31.03.2018	16200

### Ball copra

The price of ball copra at Tiptur market which opened at Rs.12500 per quintal expressed a mixed trend during the month and closed at Rs.13000 per quintal with a gain of Rs.500 per quintal.



Table 4 : Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)

	Tiptur
01.03.2018	12500
04.03.2018	12100
11.03.2018	11500
18.03.2018	12500
25.03.2018	13000
31.03.2018	13000

### Dry coconut

At Kozhikode market, the price of dry coconut opened and closed at Rs.9550 per quintal. The price expressed a mixed trend during the month.



Table 5 : Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal)

01.03.2018	9550
04.03.2018	9350
11.03.2018	9350
18.03.2018	9650
25.03.2018	9550
31.03.2018	9550

### Coconut

At Nedumangad market the price of partially dehusked coconut opened and closed at Rs. 21000 per thousand nuts. At Pollachi market in Tamil Nadu, the price of coconut opened at Rs. 18000 and closed at Rs.16000 per thousand nuts with a net loss of Rs.2000 per thousand nuts. At Bangalore APMC, the price of partially dehusked coconut opened at Rs. 25000 and closed at Rs. 27500 with a gain of Rs.2500 per thousand nuts during the month. At Mangalore APMC market the price of partially dehusked coconut of grade-I quality opened at Rs.25000 per thousand nuts and closed at Rs.23000 per thousand nuts with a net loss of Rs.2000.



Table 6: Weekly price of coconut at major markets (Rs /1000 coconuts)

	Neduman-gad	Pollachi	Banglore	Mangalore (Grade-1)
01.03.2018	21000	18000	25000	25000
04.03.2018	21000	17000	27500	25000
11.03.2018	21000	17000	27500	23000
18.03.2018	21000	17000	27500	23000
25.03.2018	21000	17000	27500	23000
31.03.2018	21000	16000	27500	23000



## International price

### Coconut oil

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

Table 8: 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	India*
03.03.2018	1183	1120	1110	2459
10.03.2018	1098	1080	1070	2562
17.03.2018	1126	1077	1070	2664
24.03.2018	1139	1100	1110	2716
31.03.2018	1143	1098	1100	2716
* Kangayam				



### Coconut

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

Table 11: Weekly price of dehusked coconut with water				
Date	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
03.03.2018	189	182	447	600
10.03.2018	190	182	445	584
17.03.2018	180	175	445	584
24.03.2018	178	175	370	584
31.03.2018	166	167	370	569
*Pollachi market				



### Copra

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

Table 9: Weekly price of copra in major copra producing countries				
	Domestic Price(US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
03.03.2018	714	639	1531	1768
10.03.2018	654	619	1535	1691
17.03.2018	612	591	1535	1752
24.03.2018	614	589	1525	1814
31.03.2018	617	589	1535	1860
* Kangayam				

