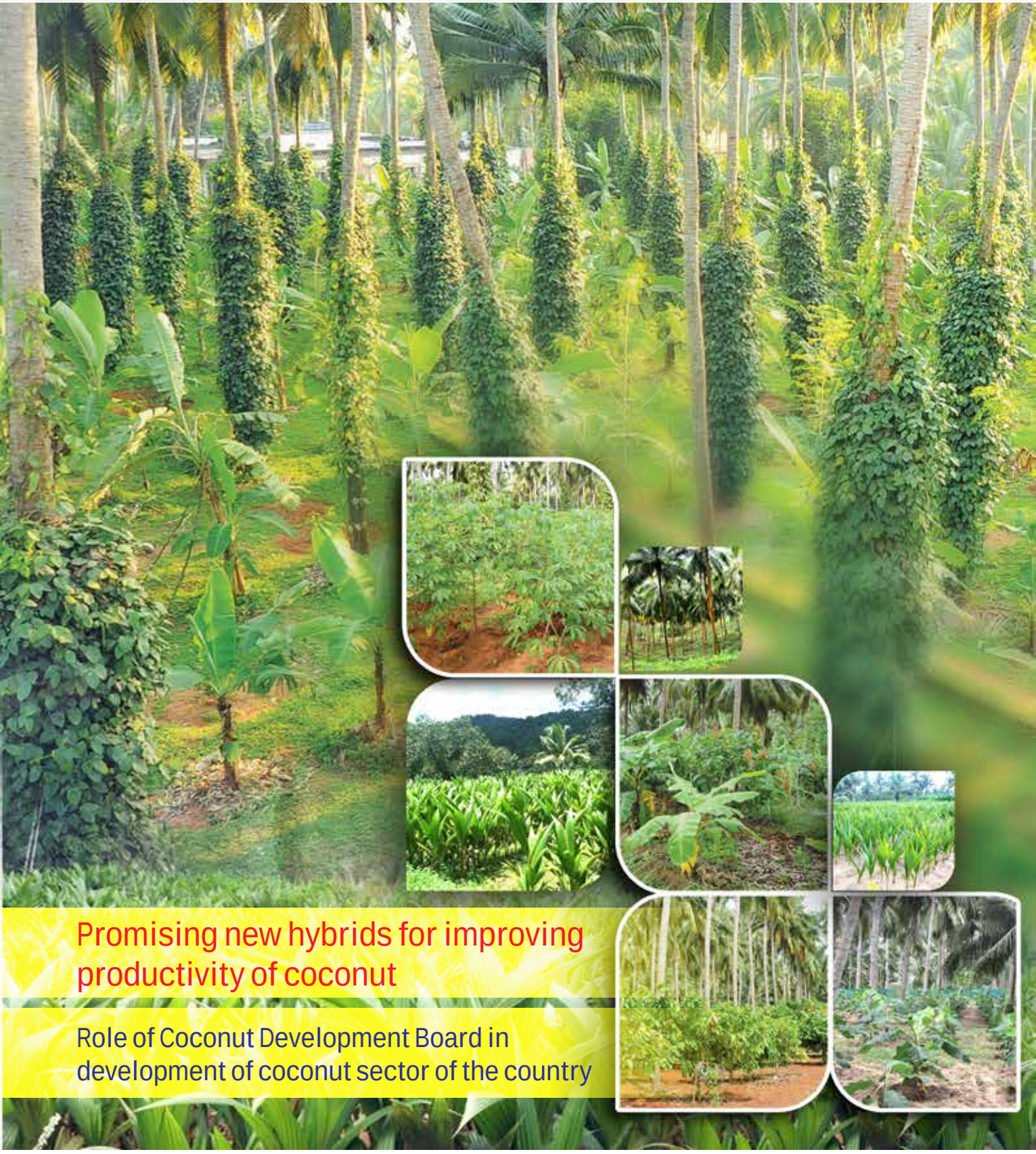
Vol.LXIV No.6 December - 2021 Pages-40 Price: Rs.6

Indian Coconut Journal



Promising new hybrids for improving productivity of coconut

Role of Coconut Development Board in development of coconut sector of the country

INDIAN
COCONUT
JOURNAL

Vol. LXIV No.6
December - 2021
Kochi - 11

Publisher
COCONUT DEVELOPMENT BOARD
Ministry of Agriculture and Farmer's Welfare,
Department of Agriculture and Co-operation,
Government of India
Kera Bhavan, Kochi - 682 011, India

Phone : 0484- 2377266, 2377267, 2376553, 2375266, 2376265
Fax : 91 - 0484-2377902,
Grams : KERABOARD
E-mail : kochi.cdb@gov.in
cdbkochi@gmail.com
Website : www.coconutboard.gov.in

SUBSCRIPTION

Annual	Rs. 60.00
Single Copy	Rs. 6.00
Institutes / Libraries	
Annual	Rs. 200.00
Single Copy	Rs. 20.00

Articles, research papers and letters on different aspects of coconut cultivation and industry are invited for publication in this Journal. All accepted material will be paid for. The Board does not accept responsibility for views expressed by contributors in this Journal. All remittances and correspondence should be addressed to the Chairman, Coconut Development Board, Kochi - 682 011.

Coconut Development Board

The Coconut Development Board is a statutory body established by the Government of India for the integrated development of coconut cultivation and industry in the country. The Board which came into existence on 12th January, 1981, functions under the administrative control of the Ministry of Agriculture and Farmers Welfare, Government of India, with its headquarters at Kochi in Kerala State and Regional Offices at Bangalore, Chennai, Guwahati and Patna. There are five State Centres situated in the states of Orissa, West Bengal, Maharashtra and Andhra Pradesh and in the Union Territory of Andaman & Nicobar Islands. DSP Farms are located at Neriyamangalam (Kerala), Vegiwada (Andhra Pradesh), Kondagaon (Chhattisgarh), Madehpura (Bihar), Abhayapuri (Assam), Pitapalli (Orissa), Mandya (Karnataka), Palghar (Maharashtra), Dhali (Tamil Nadu), South Hichachara (Tripura) and Fulia (West Bengal) besides a Market Development cum Information Centre at Delhi. The Board has set up a Technology Development Centre at Vazhakulam near Aluva in Kerala.

Functions

❒ Adopting measures for the development of coconut industry. ❒ Recommending measures for improving marketing of coconut and its products. ❒ Imparting technical advice to those engaged in coconut cultivation and industry. ❒ Providing financial and other assistance for expansion of area under coconut. ❒ Encouraging adoption of modern technologies for processing of coconut and its products. ❒ Adopting measures to get incentive prices for coconut and its products. ❒ Recommending measures for regulating imports and exports of coconut and its products. ❒ Fixing grades, specifications and standards for coconut and its products. ❒ Financing suitable schemes to increase the production of coconut and to improve the quality and yield of coconut.

❒ Assisting, encouraging, promoting and financing agricultural, technological, industrial or economic research on coconut and its products. ❒ Financing suitable schemes where coconut is grown on large scale so as to increase the production of coconut and to improve its quality and yield and for this purpose evolving schemes for award of prizes or grant of incentives to growers of coconut and the manufacturers of its products and for providing marketing facilities for coconut and its products. ❒ Collecting statistics on production, processing and marketing of coconut and its products and publishing them. ❒ Undertaking publicity activities and publishing books and periodicals on coconut and its products.

The development programmes implemented by the Board under the project Integrated Development of Coconut Industry in India are- production and distribution of planting material, expansion of area under coconut, integrated farming for productivity improvement, technology demonstration, market promotion and Information and Information Technology. Under the Technology Mission on Coconut, the programmes implemented by the Board are development, demonstration and adoption of technologies for management of insect pest and disease affected coconut gardens, development and adoption of technologies for processing and product diversification and market research and promotion.

Index

Message from the Chairman's desk

Dear Readers,

The year 2021 is on the way out and we have been living in the new normal created by the pandemic for nearly two years now. The agriculture sector has emerged successful in dealing with the pandemic and the supply chains are slowly being restored. Export of coconut products has picked up during the year with an export of 1469 crores as on September 2021, recording almost 37% increase over the previous year (Rs. 1076 crores). In the domestic market also, demand for tender coconut water and desiccated coconut from major consuming areas in North and North West India has revived creating enthusiasm among the coconut entrepreneurs. Virgin Coconut Oil has emerged as a health supplement and enhancer of immunity in the post pandemic period.

The priority for healthy food has increased and the consumers now look forward to foods that not only enhance immunity and possess nutritional and medicinal attributes, but also those foods that are produced ensuring sustainability of the environment and providing remunerative price to the farmers through fair trade practices. Farmers too are motivated to move towards a multi-pronged approach that has started with the shift from a single crop to a bouquet of crops for reducing the risk of crop failure or price crash. Coconut is a crop that is suited for today's sustainable agriculture with enormous prospects for crop diversification coupled with the nutritional and medicinal attributes. Clinical Studies undertaken during the pandemic in countries like Philippines and Indonesia have scientifically showed the efficacy of Virgin Coconut Oil in improving immunity; this is all the more relevant now, when world over, we are facing the post covid health issues.

The congenial climatic situations experienced in the major coconut growing regions in the country offer prospects for a good harvest season in the forthcoming months. With increasing demand for coconut products, quality production should also go hand in hand for the sector to develop sustainably. The quality standards for food products are getting stringent day by day. Factors like pesticide residues, heavy metal content, presence of allergens etc are mostly intrinsic factors from the field itself. Coconut being a product with numerous health attributes, it should be supplemented with Good Agricultural Practices in crop husbandry which will escalate the quality of the final product manifold. Coconut cultivation and industry should complement each other and be mutually benefitting.

As we approach the new year, let us pledge ourselves to work together to rejuvenate the coconut sector by making the soil and earth alive, bringing more life through increased microbial activity and provide more nutrients back into the soil through the biomass generated thereby contributing to enhanced production of quality products, increased carbon sequestration and sustained development of the sector.

Rajbir Singh IFS

Chairman

CDB farm, Neriamangalam – catering to the demand for quality coconut seedlings in Kerala

George Peter, Senior Field Officer, Shaji C.S, Field Officer &
Resmi D.S, Assistant Director, CDB DSP Farm, Neriamangalam

Introduction

Considering the need for demonstrating scientific coconut cultivation and to ensure supply of quality coconut seedlings to farmers in Kerala, the Demonstration cum Seed production (DSP) Farm of Coconut Development Board (CDB) was established in Neriamangalam during the year 1991 which is about 70 kms from Kochi, Kerala. The farm is positioned in a beautiful valley, which marks the beginning of high range tract enroute Munnar, a tourist destination in Kerala.The farm area is located in the 20 ha. of land which is leased out to Coconut Development Board by Government of Kerala in 1991. Out of this land area, 14.95 ha. is fully developed into farm area and the remaining 5 ha. is rocky forest area. The farm is planted with different coconut cultivars and other suitable annual and perennial crops. The farm also produces quality seedlings of various varieties for supply to farmers and other agencies at reasonable rates.

The present palm population of the farm is 1542 coconut palms with 752 tall, 593 dwarf and 157 hybrid palms. Blocks two and five are in replanting phase after the removal of the aged palms. 1158 palms are in the bearing stage and 334 palms are mother palms for hybridization purpose.

Soil & Climate

Being a tropical palm, coconut palm thrives well in the climatic conditions in Kerala. The farm area is having favourable sandy loam, lateritic and red soil. Neriamangalam gets one of the highest average rainfall in the state of Kerala. So this place is aptly hailed as 'The Cherrapunjee of Kerala. Even though Neriamangalam was considered a high rainfall area, number of heavy rainfall days shows a significant decreasing trend in Ernakulam district. (IMD Study -Observed Rainfall Variability and Changes over Kerala State). The soil ph ranges between 5 and 6 on an average, rain falls for 256.6 days in an year and collects up to 1696 mm (66.77") of precipitation. The temperature ranges between 20°C and 32.8°C.

Table 1 COCONUT PLANT POPULATION (September 2021)						
Block No.	Variety	Year of Planting	System of Planting	Area (Ha.)	Spacing	No. of Bearing Palms
I	D x T (CGD x WCT)	2017	Square	0.926	8m x 8m	75
IA	C O D	1994	Square	0.200	7m x 7m	15
	D X T	1994	Square	0.005	7m x 7m	2
	W C T	Old		0.001		2
II				0.400		Replanting in progress
III	C D G	1994	Square	1.200	7m x 7m	192
IV	L O & D X T	1994		0.005		7
V				0.930		Replanting in progress
VII	Exotic	1993	Square	0.900	8m x 8m	121
	L. Micro	1993	Square	0.080	8m x 8m	10
	T T	1993	Square	0.250	8m x 8m	34
	E C T	1993	Square	0.200	8m x 8m	29
VIII	W C T	1993	Double Plantation	0.900	15m x 15m	56
IX	W C T	1994	Rectangular	0.650	9m x 8m	27
X	W C T	1999	Rectangular	0.610	9m x 8m	66
	C O D	1999	Rectangular	0.400	9m x 8m	45
XA	M G D	2008	Rectangular	0.500	9m x 8m	30
XI	W C T	1999	Rectangular	0.600	9m x 8m	68
	C D G	1999	Rectangular	0.300	9m x 8m	20
XII	W C T	1997	Round	1.250		33
	CDG	1997	Round	0.025		6
	D X T	1997	Round	0.010		4
XIII	C D G	1997	Square	0.500	7m x 7m	71
XIV	W C T	1997	Triangular	1.500	7.6m x7.6m	186
XV	Ganga Bondam	2014	Rectangular	0.610	8m x 7m	39
				12.952		1138

The details of cultivars planted in the farm are shown in Table 1.

Details of Plantation

The farm is at present divided into 15 blocks which has been developed over the years with different coconut varieties in different planting systems, depending on the land topography of the land in Neriamangalam. The major varieties planted are West Coast Tall, Chowghat Green Dwarf (CGD), Chowghat Orange Dwarf (COD), Exotic varieties and Hybrids. As per recommendations of CPCRI committee visit on October, 2016, the 1st block is replanted with 150 superior Hybrid seedlings –"Kalpasankara" (CGD X WCT), which is reported to be tolerant to Root wilt disease. The hybrid block has started bearing in 2019.

Coconut production and productivity

In Kerala, Coconut is generally grown all over the state, mostly as a homestead crop. As per statistics reported by Department of Economics and Statistics, Kerala State; area, production and productivity of coconut is showing a decreasing trend. This trend is being reflected in the production and productivity of palms in Ernakulam district also.

Table 2 Coconut production and productivity of the Farm

Year	Production of coconuts in million nuts	Yield rate of coconut in Nos/ha
2018-19	5299	6964
2019-20	4814	6328

Source: Department of Agri. Statistics and Economics

The present bearing palm population of Neriamangalam farm is 1158. The farm is getting an average yield of 53100 per year with an average productivity of 47 nuts per palm. The dwarf palms planted during 1992-93 period is completing 30 years and is showing a drastic decline in yield and hence replanting is taken up in phased manner in the farm.

CGD Palm

COD Palm

The details of coconut harvested in the farm in last 5 years is shown in Table 3

Table 3: coconuts harvested in DSP Farm, Neriamnagalam in last 5 years

Year	Tall	Dwarf	Hybrids	Hybridized nuts	Total harvested nuts
2016-17	34929	17634	558	10309	63430
2017-18	26695	10041	1369	11187	49292
2018-19	38089	18666	2315	4814	63884
2019-20	31736	18468	1929	-	52133
2020-21	28745	8582	2537	3462	39864

Cultivation practices adopted

This farm is mainly following the package of practices recommended by Kerala Agricultural University. As the farm is located in the banks of river Periyar, there is no scarcity of water and during severe summer months irrigation for seedlings is done by sprinkler irrigation. Every year coconut palms are applied with 50kg FYM and the recommended dose of chemical fertilizers. Micro nutrient mixture @ 100 gm is also applied to palms every year. In addition to this, for promoting the health of palms application of coconut tonic, Trichoderma, Bacillus sp. are also being undertaken on need basis.

Mulching basins with coconut husk

Depending upon the climatic conditions, prophylactic measures are also taken up for preventing major pests and diseases as part of demonstration to farmers. Introduction of mechanical trap – by using fish nets for Rhinoceros beetles was found to be very successful in managing the pest to a higher extent in the farm

Mulching basins with coconut husk

Commercial Nursery and supply of coconut seedlings

As the major mandate of DSP farm is production of good quality coconut seedlings, CDB- DSP Farm, Neriamangalam takes stringent efforts to maintain the quality of the certified seedlings for distribution to the farmers of Kerala. As the production is solely for supply in Kerala, the entire certified seedlings are being distributed to farmers under various schemes of Government of Kerala 'Model demonstration plots' and Janakeeyasoothranam schemes of different Panchayaths throughout Kerala.

In order to contain the root wilt disease of coconut in Kerala, CDB had implemented the massive replanting and rejuvenation programme and this farm has also taken a lead role in the supply of seedlings to farmers in Kerala under this scheme

The details of seed nuts sown in last 5 years is shown in Table 5

Table 5. Seed nuts sown in DSP Farm, Neriamangalam

Year	Own seed nuts	Seed nuts procured from outside sources	Total sown nuts
2016-17	38946	37007	75953
2017-18	29371	60000	89371
2018-19	38531	88150	126681
2019-20	19793	64000	83793
2020-21	19678	106000	125678
Total	146319	355157	501476

The details of seedlings produced from this farm in last 5 years are given in Table 6.

Table 6: Seedling production from DSP Farm, Neriamangalam 2016-2021

Year	No. of seedlings produced
2016-17	162082
2017-18	51516
2018-19	30738
2019-20	47054
2020-21	96889
Total	388279

The farm has been instrumental in supplying coconut seedlings under the flag ship programme "Coconut council" of Agriculture Department, Government of Kerala in five major districts in Kerala namely Ernakulam, Kottayam, Pathanamthitta, Idukki and Alappuzha in 2019-2020 and 46, 853 seedlings were supplied under the scheme.

Table 4. Variety wise coconut harvest 2018 - 2020

Year	Existing palms	Bearing palms	2018-19		2019-20 *		2020-21 **	
			Production (No. of nuts)	Per palm productivity	Production (No. of nuts)	Per palm productivity	Production (No. of nuts)	Per palm productivity
Tall	752	634	38089	60	31736	50	28745	45.37
Dwarf	595	306	18666	61	18468	60	8282	28.00
Hybrid	162	80	2315	29	1929	24	2537	32.00
Hybridized nuts	218	218	4814	23			39864	0
Total	1727	1238	63884	52	52133	42.60	43326	32.00

** Hybridization discontinued during 2018-19 due to 2018 flood ** Dwarf palms were removed from plot no. II & V for replanting*

Coconut Nursery in block no. I

Table 6. Seedling supplied in 2020-2021 – Coconut council programme

Sl No	District	Variety supplied	No. of seedlings lifted
1	Kottayam	WCT	17140
2	Pathanamthitta	WCT	16290
3	Ernakulam	WCT	623
		DWARF	4800
4	Idukki	WCT	3250
5	Alappuzha	WCT	4750
	Total		46853

During the current financial year, this farm has committed supply of 50,000 seedlings of which 38,362 seedlings are already supplied .

Recycling of farm waste and organic manure production

The farm is maintaining vermicompost production units with a capacity to produce 60 tonnes of vermicompost per year. Crop residue of banana, chopped pseudostem pieces and coconut leaf are effectively recycled in the production of vermicompost

Further, coir pith composting is also done as per the suggestions given by Technical committee visit in 2018-19. Application of vermicompost and organic manures in addition to cow dung has improved the general health of the palms and has imparted more resistance to diseases in the field.

Intercropping

As part of demonstration of cropping system, this farm is practicing intercropping in coconut plantations. One of the major advantages of intercropping is that it provides additional income to the farm and better utilization of the available land and other natural resources including land, water and sunlight. Annual intercrops such as banana and elephant foot yam are being cultivated in the farm. Perennial intercrops such as pepper, cashew, nutmeg, cocoa, arecanut and rambutan also are planted in various blocks along with coconut palms. The intercrops have helped the farm to generate additional revenue ranging from Rs. 1.0 to Rs. 5 lakhs per year.

Rambutan as intercrop

Hybridization programme

Considering the huge demand for the hybrid seedlings in the state, farm is conducting hybridization program especially production of D X T seedlings. Around 218 mother palms are selected in the farm and trained labourers are being utilised for the same. During this year, the farm has started trials using the ground pollination device in consultation with CPCRI, Kayamkulam

OJT for VHSE Agri students

FoCT Training

Table 7. Trainings Conducted in DSP Farm, Neriamangalam

Sl. No.	Name of Training	Period of training (no. of days)	No. of Trainings	No. of Trainees
2016-17				
1	OJT-VHSE	1	12	437
2	ATMA-One dayFarmers visit	1	3	54
	2017-18			
1	OJT-VHSE	1	9	307
2	OJT-VHSE	2	1	26
3	OJT-VHSE	3	1	45
4	OJT-VHSE	4	1	45
5	One day training for farmers "Integrated pest and disease management"	1	1	40
6	Farmers Visit- ATMA	1	1	30
2018-19				
1	ATMA (Integrated Crop Management- Inter State Training Programme)	1	2	40
2	OJT-VHSE, Muvattupuzha	1	1	59
3	OJT-VHSE, Pallarimangalam	1	2	48
4	OJT-VHSE-Valakom	1	1	25
5	OJT-GVHSS-Kadavoor	1	2	41
6	ATMA cell, Karur, Tamilnadu	1	1	21
7	OJT-GVHSS-East Marady	1	1	20
8	OJT-GVHSS-Neriamangalam	2	2	90
9	VHSE-Nedukkandam	1	1	23
10	Farmers training- KB, Karimkunnam	1	1	10
2019-2020				
1	OJT-VHSE- Thodupuzha	1	2	60
2	OJT-VHSS-Valakom			24
3	Exposure visit of farmers and officials from Manipur	1	1	10
4	OJT-VHSE, Muvattupuzha	1	1	28
5	OJT-VHSE, Kadavoor/Pallarimangalam/ Kolenchery	1	1	111
6	ATMA-Madathikulam/Nagapattinam / Thiruvarur -TN	1	3	70
7	JNV,Neriamangalam	1	1	6
8	One day farmers seminar-	1	2	60
9	FOCT- Friends of coconut tree training	6	1	20

Elephant Foot yam intercropped in Block 1

Extension activities

The farm is having a training centre which is utilised for conducting training and various awareness programmes to farmers, Friends of coconut tree trainings and other extension activities. The farm also caters to the requests from various vocational higher secondary schools for conducting On Job Training (OJT) programmes to VHSE agri. students.

Area expansion programme

Neriamangalam farm has facilitated the implementation of Area expansion scheme in Kerala by distributing 19,505 seedlings to 586 farmers in 2018-19 and 2019-2020.

Conclusion

DSP farm, Neriamangalam plays a pivotal role in the supply of quality seedlings to farmers in Kerala and it is devoted in dovetailing all the resources needed for improving and strengthening the farm, which will definitely benefit the coconut sector in the state. ■

Coconut Testa – a Valuable by-product of Coconut Oil Industry

Prakruthi Appaiah[1], L.Sunil[2], P.K.Prasanth Kumar[3], G.Suresh Kumar,[4] and [5]*A.G.Gopala Krishna

[1]Formerly Senior Research Fellow, Department of Food Safety & Analytical Quality Control Laboratory,
[2]Research Associate, Department of Plant Cell Biotechnology,
[3]Formerly Senior Research Fellow, Department of Lipid Science & Traditional Foods,
[4]Senior Scientist, Department of Biochemistry
[5]*Formerly Chief Scientist, Department of Traditional Food & Sensory Science and Head, Department of Lipid Science & Traditional Foods, CSIR-Central Food Technological Research Institute(CSIR-CFTRI), Mysuru-570020,

Introduction

The brown skin covering the coconut kernel is testa, mainly a by-product obtained from coconut processing industries. During the preparation of desiccated coconut, coconut milk, and virgin coconut oil, the testa is removed by paring the dry/wet coconut as it imparts a brown color to the oil and a dull appearance to other products. As the coconut matures, the thickness of the testa increases and gives brown color to the bottom layer of the kernel. Testa earlier was usually used as animal feed, and raw material for the production of bio-diesel. In contrast, nowadays, it is used in bakery products as a substitute for wheat flour and feed. It is found that coconut testa flour substitution of up to 30 % was acceptable without affecting the overall quality of cookies. The use of 5 % coconut testa in fish feed showed that the growth rate of the red tilapia breed was effective.

*Corresponding author Email: gopkag11@gmail.com

The potential of coconut testa, oil and cake in India

Currently, over 150 desiccated coconut powder production units are present in India, of which the total production capacity of all the production units would come around one lakh metric tones. India is one of the largest exporters of desiccated coconut powder globally, next only to the Philippines. Coconut testa constitutes about 18% of the total dry weight of kernel. About 23.7 thousand tonnes of testa is produced annually in Hainan Island, Sri Lanka. In India, about 88,884 tons of testa is available to produce oil and other value-added products. Worldwide, the production of testa waste is still more and hence needs alternative ways to reuse it as valuable products. Table 1 shows data on the potential availability of testa (88,884 tonnes), testa oil (44,442 tonnes), and testa cake(44,442 tonnes) valued at Rs.1200 crores per annum.

Proximate composition of testa

Proximate composition of dry and wet coconut and dry and wet coconut kernel and the dry and wet coconut testa has been reported in various studies. A study by Prakruthi Appaiah et al. 2014) was based on laboratory scale dry and wet coconut testa and the dry and wet coconut kernel, and the starting whole dry and wet coconut. The proximate composition of dry coconut (copra) whole, copra testa, and testa removed coconut (copra) kernel had moisture 3.6-4.3%; fat 59.0 – 63.6%; protein 8.1 – 10.2%; carbohydrates 22.4 – 26.3%; ash 1.4 – 2.1%; and potassium was the major mineral present at 120.3 – 124.1 mg%. The proximate composition of wet coconut whole, wet coconut testa, and testa removed wet coconut kernel. 'had moisture 32.9 – 43.5%; fat 34.7 – 38.8%; protein 6.2 – 7.5%; carbohydrates 10.6 – 24.6%; crude fibre 11.7 – 17.2%; ash 0.7 – 1.0%; and potassium was the major mineral present at 107.8 – 123.8 mg%. The coconut testa contained other minerals like sodium, calcium, iron, and zinc. The samples had fat as a major component ranging from 34.7 to 63.6 %. Dry coconut testa yields more oil than wet coconut testa, and wet coconut kernels and dry coconut kernels yield almost the same amount of oil expressed on a dry basis. But the amount of oil present in the testa is found to be lower than in the kernel. Marasinghe et al., 2019 investigated the proximate composition of four local cultivars, namely San Raman, Gon Thambili, Ran Thambili, and Tall x Tall, and compared with the commercial hybrid grown in Sri Lanka. These had moisture content of 2.27 -4.27 %, crude fat content 7.93 – 23.49 %, crude protein 23.83 – 32.22 %, ash content 3.7 - 5.3 %, and total carbohydrate content by difference 42.55 – -4.27 %, crude fat content 7.93 – 23.49 %, crude protein 23.83 – 32.22 %, ash content 3.7 - 5.3 %,

and total carbohydrate content by difference 42.55 – 59.24% respectively. Compared to Indian coconut these had a higher protein content probably due to varietal differences.

Physico-chemical characteristics of coconut testa oil/coconut pairing oil

Some of the physico-chemical characteristics of commercial coconut oil and laboratory solvent extracted coconut testa oil from India and the commercial coconut oil and commercial coconut testa oil(coconut pairing oil) from Sri Lanka are given in Table 2. Only fatty acid composition and iodine value are available for commercial Sri Lankan coconut pairing oils compared to normal commercial coconut oil. Coconut pairing oil is allowed as an edible oil in Sri Lanka. The data is not available for the Indian coconut pairing oils, probably because the pairing oil is not allowed as an edible oil in India. However, the data provided by Prakruthi Appaiah et al. (2014) for the laboratory solvent extracted testa oil shows the variation in fatty acid composition and iodine value among the testa oil, coconut whole, and kernel oils.

TABLE 1. The potential availability of coconut testa, testa oil, and testa cake in India

Production of coconuts	Dry coconut whole (copra)	Dry coconut testa (18% of copra) ***
India*,**	2469 million nuts	444.42 million nuts equivalent
Potential in tones		444.42 million nuts x 200g/nut = 88,884 tones (4% moisture basis) valued at Rs.60/kg = INR 533.3 crores
Potential of oil (50% basis)	-	44,442 tones valued at Rs.1111.1Crores (Rs.250/kg oil)
Potential of cake (50% basis)	-	44,442 tones valued at Rs. 88.9 Crores (Rs.20/kg)
Total value (oil +cake)	-	INR 1200 crores

*Jnanadevan R. Coconut sector experiencing an all-time high price. Indian Coconut Journal. February 2018, pages 8-11.
**Current coconut production reported is 21,206.74 million nuts during 2019-20, internet data from CDB website 11th October 2021).
*** Marikkar and Madhrapperuma, 2012

TABLE 2. Some physico-chemical characteristics of commercial coconut pairing (testa) oil and coconut oil in comparison to Indian commercial Coconut oil and lab prepared coconut testa oil

Parameters	*Sri Lankan commercial Coconut (copra) oil	*SriLankan coconut(copra)testa oil (also known as coconut pairing oil)	***Indian commercial Coconut (copra) oil*	****Indian coconut testa oil (laboratory prepared-testa solvent extracted)
Moisture	na	na	na	na
Colour (Lovibond unit)	na	na	2.4	na
Peroxide value meq O2/kg	na	na	2.67	na
Free fatty acid value (as % lauric)	na	na	0.32	na
Iodine value Wij's cgI2/g	4.75	17.46	5.3	na***** (20.60)
Saponification value mg KOH/g	na	na	255.1	na
Fatty acid composition (relative area %)	**Sri Lankan coconut oil (CNO-3)	**Sri Lankan testa oil (CPO-3)	***Indian coconut oil MYS-1	****Indian coconut (copra) testa oil
C8:0	5.06	3.23	8.06	3.9
C10:0	4.45	3.17	5.78	3.8
C12:0	48.47	36.78	51.66	40.9
C14:0	21.15	22.49	21.05	20.9
C16:0	9.08	13.32	8.64	11.3
C18:0	2.75	0.42	0.28	1.6
C18:1	6.57	17.88	4.01	12.2
C18:2	2.63	2.62	0.53	5.3
SFA	90.96	79.5	95.47	82.5
MUFA	6.57	17.88	4.01	12.2
PUFA	2.63	2.62	0.53	5.3
MCFA	57.98	43.18	65.5	48.6
Iodine value Wij's	4.75	17.46	5.3	-

*J.M.N.Marikkar and A.R.Nasyrah. Distinguishing Coconut Oil from Coconut Paring Oil using Principle Component Analysis of Fatty Acid Data, Cord 2012, 28(1) 9;

**Sri Lankan specification for coconut oil SLS 32: 2002 amended in 2009 of 2009-03-30. AMD 387. AMENDMENT NO: 1 APPROVED ON 2009-03-30 TO SLS 32: 2002. AMENDMENT NO: 1 TO SLS 32: 2002. SPECIFICATION FOR COCONUT OIL. (SECOND REVISION).

*** PK Prasanth Kumar and AG Gopala Krishna (2015) Physico chemical characteristics of commercial coconut oils produced in India. Grasas Y Aceites, 66(1) Jan.-Mar. 2015 e062.

**** Prakruthi Appaiah, Sunil L., Prasanth Kumar PK, and Gopala Krishna AG. 2014, Composition of coconut testa, coconut kernel and its oil. J.Amer. Oil Chem. Soc., 91, 917-924.

*****Calculated from fatty acid composition refer to Table 4footnote, na = not available

Similarly, testa oil differed in fatty acid composition and iodine value with commercial coconut oil. A lower lauric acid content for testa oil was observed, and a higher oleic and linoleic acid content was observed. The data shows that the testa oil has lesser saturated fatty acid content and a slightly higher MUFA and PUFA content than the normal coconut oil. However, the fatty acid composition of coconut/ testa/ kernel oils from both countries was almost similar.

Chemical composition of coconut testa oil

Till now, testa oil has not been allowed in India for edible purposes, although a few proprietory products are available commercially. Prakruthi Appaiah et al.

TYable 3: Fatty acid composition of oils from dry and wet coconut (whole, testa, testa removed kernel) (Prakruthi Appaiah et al. 2014)

Fatty acid (%)	Dry coconut (copra) whole	Dry Coconut (copra) testa	Dry Coconut (copra testa removed) kernel	Wet coconut whole	Wet Coconut testa	Wet Coconut (testa removed) kernel
Caprylic	9.6	3.9	6.7	8.1	1.6	5.6
Capric	6.4	3.8	6.2	7.8	2.2	5.8
Lauric	51.5	40.9	52.6	50.5	32.4	52.8
Myristic	19.1	20.9	18.9	16.1	20.2	19.2
Palmitic	6.9	11.3	7.4	6.8	14.1	7.4
Stearic	1.1	1.6	1.9	2.3	1.2	1.9
Oleic	4.3	12.2	4.8	5.6	17.8	5.5
Linoleic	1.1	5.3	1.6	1.8	10.6	1.0
SFA	94.6	82.5	93.7	92.6	71.6	92.7
MUFA	4.3	12.2	4.8	5.6	17.8	5.5
PUFA	1.1	5.3	1.6	1.8	10.6	1.0
MCFA	67.5	48.3	65.5	66.3	36.2	64.2

Calculated iodine value from fatty acid composition: IV= 0.9007x%oleic +1.8143x%linoleic+2.7410 x %linolenic acid; IV =.5.87, 20.60, and 7.23 for dry copra whole oil, testa oil, and testa removed kernel oil, respectively; IV =13.35, 35.26, and 6.77 for wet coconut whole oil, testa oil, and testa removed kernel oil, respectively.

(2014) studied the chemical composition of testa oil in detail to make use of it as an edible oil similar to coconut oil. Table 3 shows the fatty acid composition of oil from dry coconut (copra) testa. The oil has a fatty acid composition similar to that of normal coconut oil. However, the content of fatty acids viz., lauric acid, palmitic acid, oleic acid, and linoleic acid show a low to high trend for the testa oil. Lauric acid showed a low value of 40.9 % compared to 51.5 – 52.6% for the kernel oils. Table 3 shows the fatty acid composition of wet coconut testa oil and the coconut whole and kernel oils. A still lower lauric acid content of 32.6% and a still higher amount of oleic and linoleic acids, 17.8% and 10.6%, were observed for the wet coconut testa oil than the dry coconut(copra) testa oil of 40.9%, 12.2%, and 5.3% respectively. The testa oil has a lower amount of SFA, MCFA, and higher amount of MUFA, PUFA, and hence a higher iodine value for the testa oils, which is normally provided for specifications for coconut oil. Marikkar and Nasyrah (2012) have shown that coconut pairing oil could be differentiated from normal coconut oil based on their fatty acid composition and iodine values considering the pairing oil and coconut oil produced in Sri Lanka. The SFA (SFA+MCFA) contents were lesser than about 90-92%, which is generally attributed to normal coconut oil (Prasanth Kumar and Gopala Krishna 2015)

The triacylglycerols content of dry testa oil and wet testa oil were almost similar, and that of dry coconut whole and kernel oil was slightly lower than that of the wet coconut whole and kernel oils . The oils from CT and WCT contained 94.1 % and 96.4 % TAG, 5.3 % and 3.2 % of DAG, and 0.6 % and 0.4 % of MAG, respectively. CT and WCT oils contained slightly higher DAG content than testa removed kernel oils. The triacylglycerol composition of dry coconut (copra) testa oil and coconut whole and kernel oils shows variation in the composition for the dry coconut testa oil with regard to the content of trilaurin, LaMM, which was true for the wet testa oil .A lower amount of trilaurin is found in testa oils (wet. 12.34% and dry 15.9%), and a moderate amount of LaMM (wet 4.91% and dry 14.3%)is found

Copra testa

for both wet and dry testa oils. The oil from WCT had a slightly higher triolein content of 3.35% than other coconut oil samples of 0.15%. For normal commercial coconut oils, the trilaurin content of 20.67% and LaMM of 9.7%, have been observed. In general, the MUFA and PUFA (oleic and linoleic acids) of testa oils are distributed more in the triacylglycerols. In contrast,the SFA (SFA+MCFA)are distributed more in the triacylglycerols of normal coconut oils.

An analysis of tocopherol and tocotrienol composition for dry and wet coconut testa oils and the dry and wet coconut whole and kernel oils show that both dry and wet coconut testa oils contained higher amounts of tocopherols and tocotrienols of 22.3 mg% and 100.14 mg% than the respective coconut whole and kernel oils of 2.9 – 6.7 mg% for dry and 2.5- 4.4 mg% for wet whole and kernel oils. Dry and wet testa oils contained 42.52mg %, 50.97mg% of phytosterols, 22.3mg%, 100.1mg% of tocopherols+tocotrienols, 1.9mg%, 0.5mg% of phenolics, 313.9µg%, 389 µg% of phenolic acids respectively. The normal commercial coconut oils have a phytosterol, tocopherol, and phenolics content of 74.5mg%, 1.2mg%, and 8.2mg%,respectively. These studies indicated that the oil from coconut testa (wet and dry) contained more natural antioxidants and probably conferred better health benefits than normal coconut oil. A study by Arivalagan et al., 2018 has reported that phenolics composition of coconut testa oils and a total of 28 phenolics were reported, of which 16 were phenolic acids and 12 were flavonoids. The primary phenolic acids found were protocatechuic acid, p-coumaric acid, and ferulic acid, whereas the principal flavonoids found were catechin, apigenin, and kaempferol.

Phytochemical composition of testa extract

The analysis of phytochemical composition and antioxidant activity of extracts from commercial wet and dry coconut, testa, and cakes found that the Copra Testa Extract (CTE) and wet Coconut Testa Extract (WCTE) contained carbohydrates, amino acids, glycosides, triterpenes, tannins, flavonoids, phenolics, and saponins. The extracts were rich in phenolics, flavonoids, tocopherols,and tocotrienols, confirmed by HPLC. These contained high amounts of total phenolics 1.3g%; 6.3g%, total flavonoids content 2.3g%, 12.6g%; and phenolic acids 100.7mg%, 195.2mg% , tocopherols+tocotrienols content 18.7 mg%, 49.2 mg%; for dry and wet coconut testa extracts respectively compared to coconut whole and kernel extracts. A very low IC50 value of 0.06 mg/ml was observed for wet coconut testa extract. This study showed that the WCTE had high antioxidant properties and many phytochemicals compared to other coconut testa extracts. The extracts from coconut testa and seed coats of four different varieties of beans were investigated for total phenolic content, antioxidative and antidiabetic properties (Adekola et al., 2017) The study showed that the coconut testa and red kidney bean were found to have better antioxidant activity when compared to other seed coats. The study also showed that the coconut testa had strong α-glucosidase inhibition, an effective anti-diabetic agent. Ojha et al. (2019) showed that coconut testa extracts contain various polyphenolic and non-phenolic natural antioxidants, anti-inflammatory and antimicrobial compounds. The studies showed that coconut testa is a natural source of multiple phenolics, phenolic acids, and flavonoids with potent antioxidant capacity and may be used as a natural source of antioxidants.

Coconut testa oil, extracts and its probable health benefits in experimental animals:

Extraction, physicochemical properties, and fatty acid composition analysis of coconut testa oil (CTO), antioxidant activity, and the protective effect on oxidative damage to human serum albumin (HSA) of coconut testa oil extract(CTOE) were investigated (Zhang et al., 2016) Results showed that the optimal extract condition of CTO was B3 A2 C2(temperature of 60°C, material-to-solvent of 1:4g mL-1 and extraction time of 3h) with the maximum oil yield (76.83%). The obtained CTO was non-drying oil with an iodine value of 14.69 g per 100 g, and lauric acid was the main component of 42.28%. Hydrogen peroxide scavenging activity of CTOE can reach 49.81% at 2.5mgmL-1,while antioxidant activity(AA) on the oxidation of linoleic acid dropped from 56.82% to 31.70% during the first 80 min. CTOE could prevent HSA from oxidative damage induced by hydrogen peroxide by inhibiting the formation of protein carbonyl and increasing hydroperoxides

content effectively. Total phenolic content was 68 mg g-1, and the epicatechin and catechin were2.74 and 2.26 mg g-1 in their phenolic compositions. These all-suggested CTO and CTOE might be new worthy exploiting functional sources.

Defatted coconut testa extracts showed high amounts of phytonutrients such as phenolics, flavonoids, and tocopherols and have been shown to possess antioxidant and hypolipidemic effects in experimental animals. Geetha et al.(2016) carried out rat feeding studies on the impact of ethanolic extracts from defatted coconut testa in experimental animals(C57BL/6). Feeding of testa extract at 50 and 100mg/kg body weight showed increased body weight in high fat-fed animals when compared to starch fed control (SFD) group. Treatment with a ethanolic extract of coconut testa reduced their body weight dose-dependently. Lipid profiles like triglycerides, cholesterol, and LDL levels were significantly decreased, whereas HDL levels were increased, indicating its health beneficial effect (antiobesity effect). Catalase, SOD, GPx, TBARS in tissues, analysis of OGTT, serum insulin levels, advanced glycation, and atherogenic protection were augmented at different levels in the treated groups.

Analysis of serum showed increased HDL-C in the testa extract treated group and, therefore, higher protection against atherogenesis than the high-fat diet-fed group. Lesser fecal fat content and a higher level of liver cholesterol were observed in the high fat-fed group, and treatments with testa extract(rich in phenolics) ameliorated significantly. Fat content in the organs (liver, heart, kidney & adipose) of the HFD group was high. Furthermore, certain fatty acids observed in the tissues were 14:0, 16:0, 18:0, 18:1, 18:2, 20:0, 20:3, and 20:4, among which 14:0, 16:0 & 18:0 are the major saturated fatty acids that increased significantly in HFD when compared with the SFD group and ameliorated with testa extract(rich in phenolics) dose-dependently. Hence, coconut testa, a by-product of the coconut processing industries rich in natural phytonutrients, could be exploited to treat human diabetes and obesity conditions.

The utilization of coconut testa defatted flour in bakery products.

Sanjita Marasinghe et al. (2019) reported a study on the utilization of coconut testa defatted flour in place of wheat flour to prepare bakery products. For this purpose, coconut testa flour of four local cultivars, namely san raman (SR), gonthembili (GT), ran thembili (RT), TallxTall (TxT) against the commercial hybrid (COM) grown in Sri Lanka were used in the study. A hundred grams of coconut testa flour produced from partially defatted coconut pairings was extracted with a 70% ethanol-water mixture. The TPC and FRAP assays were conducted using a 96 well microplate reader. Percentage yield (%) of crude extracts of SR, RT, GT, TXT, and COM were 8.26, 6.87, 7.66, 8.06, and 11.17, respectively. The maximum TPC content was observed in TXT(62.58±5.99mgGAE/gofextract),while the minimum TPC content was recorded for GT (27.53 ± 4.54 mg GAE/g of extract). The lowest FRAP value was observed for SR (0.26 ± 0.02 mmol FeSO4/g of extract), while the highest FRAP value was observed for COM (0.67 ± 0.00 mmol FeSO4/g of extract) variety. In conclusion, coconut testa flour is a rich source of phenolics and antioxidants.

The presence of these bioactives (from testa) in bakery products would make the testa a potential functional ingredient in the food processing industry.

Coconut testa in feed formulation.

A study by Nuha et al., 2019 aims to determine the coconut testa in the most effective feed formulation for red tilapia growth to provide a high survival rate. The treatment used was feed containing coconut testa A(0%), B(5%), C(10%), D(15%),and E(20%). The results showed that using 5% coconut testa in feed was effective for a growth rate of red tilapia because the response to feed was relatively faster, the highest survival rate was 92%, and the growth rate was 6,19g. The feed can fulfill the energy needs and help the growth of red tilapia because the range of nutrient content of pellets is in accordance with the fish needs.

Coconut testa with banana peels for organic waste management

Organic waste produced by economic activities may create health, aesthetic, and economic problems. One of the approaches applied to solve this problem is the utilization of decomposer macro fauna to decompose the waste. One of the decomposers with great potential is Black Soldier Fly larvae (Hermetiaillucens), which can consume various types of organic manure and convert it in to biomass with high protein and lipid content. In this study, banana peels and coconut testa had been fed to the larvae at 200mg/larvae/day as the objects

that represented organic wastes with low fiber content and high fiber content, respectively(Putra et al. 2020). This study aimed to observe the growth and efficiency of BSF larvae in decomposing those wastes. The analysis was conducted on some parameters such as the growth and consumption rate, the efficiency of conversion of digested (ECD), waste reduction index, and mortality rate. The results showed that BSF larvae that consumed banana peel had a higher final weight(58.24mg), growth rate, and consumption rate, while the mortality rate was lower than BSF larvae that consumed coconut testa. The ECD of the larvae group that consumed banana peel was higher than the larvae group that consumed coconut testa. The waste reduction index of banana peel was higher than coconut testa (1.5and1.4, respectively). The larvae that consumed coconut testa had a longer pupation period(9±1,75days) than the larvae consumed banana peel. Based on this result, it can be concluded that the fiber content of organic waste affected the decomposition rate and growth of BSF larvae.

Coconut testa for preparation of value-added products

Solid-state fermentation(SSF) is an alternative low-cost useful process that has many vital applications in the field of biotechnology (Jamaluddin et al. (2016). In this study, SSF has been employed as a process for the production of value-added agricultural by-products using coconut testa(CT), rice bran(RB),and the combination of both substrates(CT-RB). The effect of SSF by Monascus purpureus on total phenolic content(TPC), antioxidant, anti-tyrosinase, and anti-elastase of the substrates were studied and compared with its non-fermented counter parts. The results showed that the SSF had improved the TPC up to three-fold higher in the studied substrates. Antioxidant potential evaluated using FRAP analysis also exhibited an enhancement in fermented substrates with the values ranging from 23.70 to 63.15mg AAE/g sample. On the other hand, the radical scavenging activity evaluated using DPPH assay showed a different trend than the TPC and FRAP analyses. In other studies, tyrosinase and elastase inhibition activities were enhanced in most substrates upon the fermentation. The free phenolic acid content changes(p-coumaric, caffeic, ferulic, sinapic, vanillic, protocatechuic, gallic, and 4-hydroxy benzoic syringic acid) of the substrates after fungal fermentation was also examined through high-performance liquid chromatography(HPLC) analysis. In summary, SSF offers a tool further to increase the bioactive potential of the studied substrate.

Other Uses of Coconut testa

The testa is currently being used in industry for the production of value-added products like biodiesel, edible oil, cosmetics, hair oil, pharmaceutics and other allied industries.

Conclusion

Coconut testa is a by-product of the coconut oil/ virgin coconut oil industry. About 18% of the coconut (copra and the wet coconut) equivalent to about 88,884tones are removed as testa during pairing of coconut. The testa has about 50-68% oil which may be used for edible purposes and may add about 44,442 tonnes of coconut pairing/testa oil to the edible oil pool. Already a number of brands of testa oil viz. sadhya, GFO coco kera Tripthi, Kaveri, Keratreat, Navaruchi, Kera Mudra, etc., are commercially available under specific product approval. The full potential of the testa is to be explored and the oil and cake to be put to edible use for maximum benefits in terms of commerce and health.

The cake contains residual oil and health-beneficial compounds. Wet coconut testa has more tocopherols, tocotrienols, phenolics than dry coconut/copra testa. The oil may be included under the specification of coconut oil with suitable levels of iodine value, color, and fatty acid composition. As testa oils have higher amounts of unsaturated fatty acids and health-promoting compounds than normal coconut oil, the testa oil may provide more health benefits to consumers than normal coconut oil. The de-fatted testa and its extract may find application in preparing healthy foods, especially for diabetes and obesity-related population. More research on the antioxidant, antiviral, antimicrobial, and antidiabetic effects of testa oil and testa extracts, as well as related health benefits in humans, is needed so that the defatted testa can be used more effectively for health improvement, resulting in an increase in its commercial value.

Acknowledgements

The authors thank the Director, CSIR-CFTRI, Mysuru, for infrastructural facilities and Chairman, The Coconut Development Board (CDB), Kochi, for funding various projects on coconut at CSIR-CFTRI, Mysuru. ■

References

1. Parmar PT, Singh AK, Borad SG (2020). Coconut (Cocos nucifera). Oilseeds: Health Attributes and Food Applications, 163-189.

2. Prakruthi Appaiah, Sunil L, Prasanth Kumar PK and Gopala Krishna AG (2014). Composition of coconut testa, coconut kernel and its oil. Journal of the American Oil Chemists Society, 91: 917-924. DOI 10.1007/s11746-014-2447-9.

3. Swaroop C, Jose TK and Ramesh A (2016).Property testing of biodiesel derived from coconut testa oil and its property comparison with standard values. International Journal of Advances in Production and Mechanical Engineering, 2: 37-41.

4. Nuha RSB, Haetami K, Lili W, Herman RG (2019). Effect use of coconut testa in feed on growth rate of red tilapia (Oreo chromisniloticus). Global Scientific Journals, 7 (12): 1323-1330.

5. Marasinghe SSK, Marikkar JMN, Yelagama C, Wimalasiri S, Seneviratne G, Weerasooriya R and Liyanage R (2019). Comparison of inter-varietal differences in chemical composition and nutritional properties of coconut testa flour. J. Natn. Sci. Foundation Sri Lanka 47 (3): 351-358.

6. Marasinghe S, Marikkar N, Wimalasiri S, Jaysinghe L and Liyanage R (2020). Comparison of antioxidant properties of coconut testa flour of selected local coconut cultivars of Sri Lanka. Proceedings, 36: 124. doi:10.3390/ proceedings2019036124.

7. Marikkar JMN, Nargaraja R, Somawathie KMS, Hewapathirana HPTD, Yalegama C, Littardi P and Chiavaro E (2020). Effect of coconut testa flour on cookie characteristics. Italian Journal of Food Science, 32: 209-221.

8. Sebastian KS (2017). Desiccated coconut powder export. Indian Coconut Journal, 5-38.

9. Marikkar JMN and Madhrapperuma WS (2012). Chapter 9. Coconut. In: Siddiq, M., Ed., Tropical and Subtropical Fruits: Postharvest Physiology, Processing and Packaging, John-Wiley Publishing Co., Ames, Iowa, USA, 159-177. https://doi.org/10.1002/9781118324097.ch9.

10. Marikkar J.M.N. and Nasyrah. A.R. (2012) Distinguishing Coconut Oil from Coconut Paring Oil using Principle Component Analysis of Fatty Acid Data, Cord 2012, 28(1) 9

11. Prasanth Kumar PK and Gopala Krishna AG (2015) Physico chemical characteristics of commercial coconut oils produced in India. Grasas Y Aceites, 66(1) Jan.-Mar. 2015 e062.

12. Arivalagan M, Roy TK, Yasmeen AM, Pavithra KC, Jwala PN, Shivasankara KS, Maniantan MR, Hebbar KB and Kanade SR (2018). Extraction of phenolic compounds with antioxidant potential from coconut (Cocos nucifera L.) testa and identification of phenolic acids and flavonoids using UPLC coupled with TQD-MS/MS. LWT - Food Science and Technology, 92: 116-126.

13. Prakruthi Appaiah, Sunil L, Gopala Krishna AG and Suresh Kumar G (2016). Phytochemicals and antioxidant activity of testa extracts of commercial, wet and dry coconuts and cakes. International Research Journal of Pharmacy, 7 (9): 9-13.

14. Adekola KA, Salleh AB, Zaidan UH, Azlan A, Chiavaro E, Paciulli M and Marikkar JMN (2017). Total phenolic content, antioxidative and antidiabetic properties of coconut (Cocos nucifera L.) testa and selected bean seed coats. Italian Journal of Food Science, 29: 741-753.

15. Ojha SB, Roy S, Das S and Dhangadamajhi G (2019). Phytochemicals screening, phenolic estimation, and evaluation for antioxidant, anti-inflammatory and anti-microbial activities of sequentially soxhlet extracted coconut testa. Food and Nutrition Sciences, 10: 900-922.

16. Zhang Y, Zheng Y, Duan K and Gui Q (2016). Preparation, antioxidant activity and protective effect of coconut testa oil extraction on oxidative damage to human serum albumin. International Journal of Food Science and Technology, 51: 946–953.

17. Geetha V., Mohan Kumar A.S., Chetana R., Gopala Krishna A.G., and Suresh Kumar G.(2016). Effect of Shelf Stable Concentrates of Tender Coconut Water and Testa Phenolics on Lipid Profile and Liver Antioxidant Enzymes in High Fat Fed Rats. Global Journal of Biology, Agriculture and Health Sciences, 5(2), 25-30.

18. Sanjita Marasinghe, Nazrin Marikkar, Swarna Wimalasiri, Lalith Jayasinghe and Ruvini Liyanage. (2019), Comparison of Antioxidant properties of coconut testa flour of selected local coconut cultivars of Sri Lanka, Proceedings MDPJ, Presented at the Third International Tropical Agriculture Conference (TROPAE-2019), Brisbane, Australia, 11-13, November 2019.

19. Putra R.E., Margareta A., Kinasih I., (2020). The digestibility of Banana Peel and Testa coconut and its effects on the growth and mortality of black soldier Fly Larvae. Biosfen Journal Tadris Biologi., 11(1), pp.66-67 (2020).

20. Jamaluddin A., Razak D.L.A., Rashid NYA, Sharifuddin S.A., Kahar A.A., Saad A.Z.M., and Kamariah Long., (2016). Effects of solid-state fermentation by Monascus Purpureus on phenolic content and biological activities of coconut testa and rice bran. J. Teknologi. 78: 11-2(2016). 23-28.

21. Sadhya coconut testa oil website: munduvayalil.com/blog1.php

Promising new hybrids for improving productivity of coconut

B.V.K. Bhagavan, A. Kireeti* and N.B.V. Chalapathi Rao

AICRP on Palms, Horticultural Research Station, Ambajipeta,
East Godavari, Andhra Pradesh, 533214

Coconut (Cocos nucifera L.) is one of the most useful palms in the world which provides food, shelter and a number of industrial products from each and every part of the palm useful in the everyday life of human beings, so eulogised as "Kalpavriksha". Coconut is grown in over 93 countries in an area of 12.568 million ha, producing 67698 million nuts with a productivity 5387 nuts/ha (APCC Statistical Year Book 2019) In India, it is cultivated in 2.17 million ha. with production of 20,308 million nuts with an average productivity of 9,345 nuts/ha during 2019-2020.

In India coconut sector is facing the problem of low productivity as $^{1}/_{3}^{rd}$ of total area is under cultivation

Coconut productivity can be increased by cultivation of improved varieties and by adopting nutrient management, water management, pest and diseases management.Enhancing productivity through cultivation of improved varieties is more remunerative in coconut.

Vasista Ganga

Corresponding Mail-id: itsmekireeti@gmail.com

Performance of Coconut Hybrids/Vareites						
Parameters	Abhaya Ganga	Vynatheya Ganga	Vasista Ganga	Gouthami Ganga	ECT (Local Check)	Godavari Ganga (Hybrid Check)
Number of nuts produced /palm /year	135.80	118	125	85.73	88.13	115
Copra content (g/nut)	170.0	190.50	185.25	156.7	124.1	150
Copra output/ palm/ year (kg)	22.47	22.47	21.86	13.32	10.25	18.44
Copra output/ ha/ year (t)	3.70	3.37	3.82	2.3	1.54	2.79
Oil content (%)	72	65.8	69	68.5	64.0	68.0
Oil yield/palm/year (kg)	15.50	14.7	15.11	9.70	6.56	12.53
Oil yield/ha/year (t)	2.80	2.20	2.64	1.7	1.0	1.88
Tender nut water content (ml)	346	327	395	447	291	306
TSS of tender nut water (0B)	5.00	7.00	6.20	7	5.00	6.75

with old and senile palms and planting of local varieties from unknown mother palms chowdappa et al. 2015). The productivity can be increased in one way by cultivation of improved varieties and in another way by adopting nutrient management, water management, pest and diseases management. Enhancing productivity through cultivation of improved varieties is more remunerative in coconut. Only after 15 or 20 years, the grower will be in a position to reap the reward of his investment. As coconut is a perennial crop having long juvenile phase (7-10 years) which takes another five years or more to come to full bearing stage, the farmers have to wait for 15-20 years for attaining economic return from coconut (Regi et al., 2021). Traditional plant breeding methods like introduction, selection and hybridisation, with necessary modifications have been successfully employed for yield improvement in coconut. In India, hybridization programme was initiated in the year 1932, at the Coconut Research Station, Nileshwar, and milestone in the hybridization of coconut on hybrid vigour in the progeny with parentages West Coast Tall and Chowghat Green Dwarf was reported by Patel, (1937). Later, in the

Gouthami Ganga

course of time, other coconut growing countries like Philippines, Indonesia, Sri Lanka, Cote d'Ivoire and Jamaica started hybridization. Despite the many problems that is unique to hybridization in coconut like long vegetative phase, low multiplication rate, and ineffective clonal propagation, requirement of climber to make crosses and large area required for planting field evaluation trials and slow multiplication rate, many selections and hybrids have been developed in coconut *(Samsudeen et al., 2017).*

The Horticultural Research Station, Ambajipeta started hybridization work in coconut in early 1960's. In the year 1993, Godavari Ganga, a Tall x Dwarf hybrid was released and gained much attention among coconut farmers which was having high yielding potential of 120-140 nuts/palm/year. (Maheswarappa, et al. 2016) and with precocity in bearing of four years after planting. The collection and maintenance of coconut germplasm during 1960's and 1970's at HRS, Ambajipeta and hybridization of various elite accessions led to the development of various new hybrids in coconut. The crop improvement in coconut confined to the exploitation of basic breeding approaches like mass selection and hybridization. Attempts were made to study various cross combinations like Tall x Tall, Dwarf x Tall and Tall x Dwarf, of varieties in various field experiments. Utilization of available genetic resources and selection of superior lines from germplasm/hybrids developed by evaluating at various locations in India has resulted in the development of following improved coconut varieties/hybrids. The best performing cross combinations, which were proved/ realized to be suitable for cultivation by various scientists and breeders were explained in detail about the growth and yield attributing characters.

The hybrids Abhaya Ganga, Vynatheya Ganga and Vasista Ganga were developed for improved nut quality and yield. The variety Gouthami Ganga is particularly for tendernut purpose. Ramanandam et al. (2017) reported that hybrid developed from crossing the parents Gangabondam as female parent and Laccadive Ordinary Tall as male parent is a semi tall type with circular crown with trunk girth of 107.7 cm comprising of 38.3 leaves per palm. It comes to bearing in four years (38-42 months) after planting. The average mean nut yield of 135.8 nuts/palm/year was recorded at Ambajipeta. It contains good quantity of tender nut water (on an average 346 ml/nut) with TSS-5.6 0Brix. The average copra content from each nut is 170 gm and oil percentage is 72%.

Abhaya Ganga

The average copra output is 3.70 t/ha/year with 32.62 % increase and 3.37 % increase over local check and hybrid check and oil output is 2.80 t/ha/year which recorded 48.94 % increase and 2.2 % increase over local check and hybrid check (Godavari Ganaga) respectively. This hybrid is moderately resistant to bud rot disease and is having potential for more oil yield. The hybrid is named as Abhaya Ganga and recommended for cultivation in Andhra Pradesh.

A Tall x Dwarf hybrid, Philippines ordinary Tall x Gangabondam is found with semi tall growing habit, circular crown with trunk girth of 92.90 cm comprising 40.25 leaves per palm. It comes to bearing in 4-5 year (48 months) after planting . The average mean nut yield of 118 nuts/palm/year was recorded at Ambajipeta. It contains good quantity of tender nut water (326.58 ml/nut) with TSS-7.0 0Brix. The average copra content from each nut is 190.50 gm and oil percentage is 65.8 %. The average copra output is 3.37 t/ha/year, with improved yield over 20.79 % and 3.82 % compared to local and hybrid existing cultivars. Oil output is 2.20 t/ha/year was also recorded with 17.02 % more yield compared to local cultivar (ECT). This hybrid is moderately resistant to ganoderma, bud rot and stem bleeding diseases and is recommended for cultivation in Andhra Pradesh as Vynatheya Ganga.

Ramanandam et al. (2017) evlauated that a semi tall (Dwarf x Tall) hybrid using Gangabondam as female parent and Philippines ordinary Tall as male parent is with circular crown with trunk girth of 117.10 cm. It comprises of 35.64 functional leaves per palm at the age of 28 years. It comes to bearing in around four years (40 months) after planting. Average nut yield under normal conditions is 125


Vasista ganga Bunch


Vynatheya Ganga

nuts/palm/year. Good quantity and quality of tender nut water (395 ml) with TSS of 6.20 0Brix is recorded. The average copra output is 3.82 t/ha/year and oil output is 2.64 t/ha/year with more yield (36.92 % and 40.43 % respectively) compared to local cultivar (ECT). The variety is moderately resistant to bud rot disease and mild to medium scale incidence of eriophyid mite. The cross combination is named as Vasista Ganga and is recommended for cultivation in Andhra Pradesh and Karnataka.

A dwarf variety selection from Gangabondam with semi circular crown, thin trunk 59.50 cm comprising 30.2 functional leaves per palm was also developed. It is a precocious bearer which comes to flowering in 31/2 to 4 years (36 months) after planting. The average mean yield of 85-93 nuts/palm/year was recorded at Ambajipeta. The variety contains high quantity of tender nut water (on an average of 450 ml/nut) with TSS-7.0 0Brix. This variety is very much suitable for tender nut purpose. The average copra content from each nut is 156.7 gm and oil percentage is 68.5 %. The average copra output is 2.3 t/ha/year and oil output is 1.7 t/ha/year. Dwarf variety is named as Gauthami Ganga and recommended for cultivation in AndhraPradesh.

As per the Government of India, Gazette notification1369 dt. 7th April 2021 by Ministry of Agriculture and Farmers welfare, India, the above hybrids and varieties are recommended for release on commercial cultivation in the east coastal region of India especially, Andhra Pradesh. The hybrids Abhaya Ganga, Vynatheya Ganga and Vasista Ganga were developed for improved nut quality and yield. The variety Gouthami Ganga was released especially for tendernut purpose.

References

Coconut Development Authority (CDA 2017). World market Information and Statistics.

https://www.cda.gov.lk/web/images/pdf/world_market_prices/2017/WORLDPRODUCTIONOFCOCONUTS.pdf

Coconut Development Board (CDB. 2021). CDB home page [online]. CDB - Statistics (coconutboard.gov.in)

Chowdappa, P., Krishnakumar, V. and Jayasekhar, S. (2015) Coconut Research and Development in Kerala . Achievements and Aspirations. Souvenir Article, Prof. M S Swaminathan Felicitation Programme 2015: 109-118

Patel, J. S. (1937). Coconut Breeding. Proceedings of Association of Economic Biologists, 5: 1-16.

Ramanandam, G., Ravindra Kumar, K., Padma, E., kalpana, M., and Maheswarappa, H.P., (2017) Potential coconut (Cocos nucifera) hybrids for yield and quality for coastal region of Andhra Pradesh (India). Indian Journal of Agricultural Sciences, 87 (8): 89-92.

Regi, J. T., Shareefa, M. and Ajith, A. (2021), Quick Response (QR) code labeling as a quality assurance mechanism for coconut seedlings. Indian Coconut Journal. 63:17-19.

Samsudeen, K. Thamban, C. Niral, V. Chowdappa, P. (2017). Ensuring quality planting material for sustainable coconut production. Indian Horticulture, 2017, 62(1): 10-14.

Maheswarappa, H.P., Sumitha, S.B., Augustine Jerard, Niral, V., (2016). Coconut varietal improvement efforts of AICRP on Palms. Technical Bulletin No. 104, ICAR- CPCRI, Kasaragod, Kerala. pp.1-22. ■

Role of Coconut Development Board in development of coconut sector of the country

Deepthi Nair S., Deputy Director and Pramod P Kurian, Assistant Director,
Coconut Development Board, Kochi -11

Coconut is eulogized as the 'Kalpavriksha', the 'Tree of life', due to its multifarious utilization as food, fuel, medicine, timber and other utility purposes of different parts from root to leaves, from tender nut water to outer husk, etc. Coconut offers scope for sustaining the livelihood of growers, farm communities and industries in major coconut growing countries of the world. The crop is intricately woven into the socio-economic and cultural backdrop of the Indian subcontinent. As per 2019 statistics of the International Coconut Community, India is the largest coconut producing country in the world, with 31.45 % share of global production of 67,698 million nuts. The three leading coconut growing countries viz., India, Indonesia and Philippines contribute 73.33 % of area under coconut and 74.15 % of production. India ranks second in terms of productivity (9,897 nuts per ha) next to Vietnam (10,547 nuts per ha) who top in productivity among the major coconut growing countries.

As per the All India estimate (second advance) for the year 2020-21, the area and production of coconut in the country is 2.19 million hectares and 21,206.74 million nuts, respectively. The corresponding figures for the year 2019-20 were 2.17 million hectares and 20,308.70 million nuts. In comparison to the previous year, the area under coconut cultivation increased by 0.73%. The crop contributes around Rs 307,498 million (US$ 4,142.50 M) to the country's GDP (2020-21) and earns export revenue of around Rs. 60737.90 million (US$ 818.24 M). Due to its nutraceutical and health benefits, the crop is gaining importance in various parts of the world, which is realized by the increased domestic and international trade of coconut and coconut products.

In India, coconut is cultivated in 16 States and 4 Union Territories located in different parts of the country in varied agro-climatic zones. However, about 89.12 % of the area and 90.03% of production fall in the south peninsular region covering 4 States of Tamil Nadu, Kerala, Karnataka and Andhra Pradesh. Out of the total geographical area of 328.73 million hectares of India, the total agricultural land is 140.13 million hectare. About 2.19 million ha is covered under coconut which is about 1.56 % of the total agricultural area.

Annexure 1. World Area, Production and Productivity of Coconut (2019)						
Sl. No.	**Country**	**Area ('000 ha)**	**% Share**	**Production (Million Nuts)**	**% Share**	**Productivity (Nuts/ha)**
1	Philippines	3,652	29.06	14,765	21.81	4,043
2	Indonesia	3,413	27.16	14,140	20.89	4,143
3	India	2,150	17.11	21,288	31.45	9,897
4	Sri Lanka	444	3.53	3,086	4.56	6,950
5	Papua New Guinea	221	1.76	1,483	2.19	6,710
6	Vietnam	159	1.27	1,677	2.48	10,547
7	Thailand	124	0.99	645	0.95	5,202
8	Samoa	99	0.79	260	0.38	2,626
9	Vanuatu	90	0.72	303	0.45	3,367
10	Malaysia	86	0.68	537	0.79	6,244
11	Others	2131	16.96	9514	14.05	4465
	Total	12,568	100.00	67,698	100.00	5,387
Source: APCC (Currently ICC) Statistical Year Book- 2019						
Annexure 2. Area, Production and Productivity of Coconut in India (2020-21 second advance estimate)						

It may be noted that Indian agriculture is the home of small and marginal farmers (85%). Coconut is predominantly a smallholders' crop in India. About 12 million people, i.e. 0.99 % of the Indian population are dependent on coconut in the country and very meager portion of them are big farmers.

Export & Import of coconut products

During the year 2020-21, export of coconut products (excluding coir) was valued at Rs. 2294.81 crores against Rs. 1,762.17 crores over the corresponding period previous year. Coconut exports have increased by 30.23 % in terms of value. Major items exported are Activated Carbon, Coconut Oil and Fresh Coconut in terms of value. USA is the largest importer of coconut shell based Activated Carbon followed by Sri Lanka and Germany in terms of value whereas UAE is the largest importer of Coconut Oil followed by Saudi Arabia and USA. UAE, Oman and Qatar are the major importers of Fresh coconut from India. Contribution of Activated Carbon alone to the total export is 65.99% whereas Coconut Oil contributed 11.15%, in terms of value. Over the last five years, value of export of coconut products showed an increasing trend from Rs. 2,061.70 crores in 2016-17, to Rs. 2294.81 crores in 2020-21. Also, the trade balance for last 5 years is positive.

During the year 2020-21, import of coconut products (excluding coir items) was valued at Rs 744.25 crores .The major items of import are Oil Cake followed by Copra and Desiccated Coconut in terms of value. Copra Oil cake alone recorded 67.38% and Copra recorded 12.88 % of the total coconut products imported during the year in terms of value. Increase in import of Oil Cake is mainly attributed to the difference in price compared to the domestic market price and is mainly used for manufacturing cattle feed. Indonesia is the largest supplier of copra expeller cake. Copra import was under advance authorization scheme, whereby the imported products are exported after value addition.

Role of Coconut Development Board in the development of coconut sector in India

Coconut Development Board is a statutory body established by an act of Parliament called the Coconut Development Board Act, 1979 for the integrated development of coconut production and utilization in the country with focus on productivity increase and product diversification. The main thrust of the Board is adopting measures for the development of coconut industry, particularly small and marginal farmers comprising majority of coconut holdings.

The coconut palm indeed is a traditional plantation crop grown in India over the past 3000 years with longest mythological and historical record. In spite of the great antiquity attached to coconut crop in the country, organized efforts to develop the crop

2020-21 second estimate						
Sl No:	STATES	Area	% Share in Area ("000" ha)	Production (Million nuts)	% Share in Production	Productivity (nuts /ha)
1	Kerala	760.70	34.75	6974.50	32.89	9169
2	Karnataka	633.74	28.95	5409.01	25.51	8535
3	Tamil Nadu	442.32	20.21	5432.36	25.62	12282
4	Andhra Pradesh	114.31	5.22	1276.35	6.02	11166
5	Odisha	52.00	2.38	359.20	1.69	6908
6	West Bengal	31.71	1.45	394.59	1.86	12443
7	Maharashtra	29.95	1.37	523.66	2.47	17485
8	Gujarat	24.90	1.14	240.71	1.14	9667
9	Assam	20.82	0.95	184.60	0.87	8867
10	Bihar	12.16	0.56	78.39	0.37	6444
11	Tripura	4.62	0.21	18.45	0.09	3996
12	Chhattisgarh	1.56	0.07	0.96	0.00	617
13	Nagaland	1.06	0.05	9.02	0.04	8478
14	Telangana	0.79	0.04	8.68	0.04	11044
15	Mizoram	0.03	0.00	0.15	0.00	4350
16	Others	58.47	2.67	296.10	1.40	5064
		2189.14	100.00	21206.74	100.00	9687

Source : Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi

were made only about a century back and actual systematic efforts for development of coconut palm as a commercial crop begun in 1940s. The enquiry commission set up by the Government of India in 1943 recommended establishment of a statutory body at central level. Since then, Indian Central Coconut Committee was formed in February, 1945, later created Directorate of Coconut Development in 1966. In 1981, the Directorate of Coconut Development was abolished to pave the way for establishment of Coconut Development Board.

Four decades of CDB can be delineated into two stages considering the shift in strategy in its approach. The first two and half decades i.e. the first stage, the production aspects were concentrated and for the last one and half decade, being the second stage, value addition, marketing and exports are also focussed.

At the time of setting up of Coconut Development Board in 1980-81, the area and production of coconut in the country remained at 1.08 million ha and 5942 million nuts. However, in 202-21 coconut area has increased to 2.19 million ha producing 21207 million nuts with a national average productivity of 9687 nuts per ha per annum, the production and productivity being the highest in the world.

Focused efforts on area expansion have resulted in a quantum jump in the area and production of coconut in the States especially in Tamil Nadu, Karnataka, West Bengal, Assam and Tripura and introduction of coconut cultivation in new areas. The productivity has also enhanced to about 80 % during the last 40 years.

The CDB has played a pivotal role for diversification from the copra-coconut oil centered industry and tremendous progress is achieved in the field of product diversification and by-product utilization of coconut. Under Technology Mission on Coconut (TMoC) many technologies were developed in association with premier Research Institutions in the country. Technologies developed for the manufacture of various products like; coconut cream, spray dried coconut milk powder, packed and preserved tender coconut water, virgin coconut oil, preserved and packed neera and its downstream products, and by-products like; coconut water based vinegar, nata-de-coco, industrial utilization of wood for the manufacture of particle boards etc. are the important achievements of the Board.

In India, during 2001, 2.6 % of total coconut production was being utilized for industrial purpose other than copra and coconut oil, which

has increased to 16 % during the last 2 decades with the TMoC interventions coupled with market promotion, extension & publicity activities including international exposure.

In the last decade, CDB focused the formation of three tier Farmers' Collectives with the objective of collective purchase of inputs, undertaking plant protection measures, planned harvesting, produce aggregation, marketing, etc. by Coconut Producers' Societies (CPS) at bottom level; and Primary processing, marketing, production of quality planting material, etc. by Coconut Producer Federations (CPF) at middle level. The main role of the apex level Coconut Producer Company (CPC) is setting up of processing unit for production of value added products from coconut procured from the member farmers and its marketing.

From 2002-03 to 2020-21, the Board had assisted establishment of 534 coconut processing units in different parts of the country, manufacturing varied coconut products. The annual processing capacity of these units is around 3600 million nuts.

Coconut and coconut products have very good market potential within as well as outside the country. For expanding the market for Indian coconut products across the globe, the Board is extending support to the industry through the programmes viz., 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, Organizing workshops/ seminars for entrepreneurs and exporters. Products of all countries are now available in all potential markets and good quality coconut products of India are being made available to international markets. 'Niche' markets for pharmaceutical, nutraceutical and cosmecuetical products from coconut are emerging, giving further boost to Indian opportunities.

The export of coconut products from India (other than coir products) has observed a progressive increase after the inception of the Technology Mission on Coconut during 2001-02, from Rs. 25.30 cr. to Rs. 179.81 cr. during 2008-09. CDB was notified as Export Promotion Council during the year 2009. The present export earnings from coconut and coconut products (excluding coir products) is Rs. 2294.81 cr.

Establishment of CDB opened up new vistas in the history of coconut cultivation and industry in the country. The focused approach yielded rewards in the coconut sector and it emerged as a viable plantation crop with a profitable processing sector to absorb the production. ■

Source: Souvenir, PLACROSYM XXIV 14-16 December 2021, Kochi, Kerala

Online Payment System for Coconut Journal Subscription

Coconut Development Board has introduced the online payment system for subscription for Coconut Journals. Both the new subscribers as well as the existing subscribers can make the payment and start or renew their subscription through the online mode.

For more details visit *www.coconutboard.gov.in*. or *https://www.coconutboard.in/journalsubscription/home.aspx*. The payment can be remitted through Board's Account: State Bank of India, Iyyattil Jn., Ernakulam Branch: Account No.- 61124170321,IFSC: SBIN0031449 through Demand Draft/ NEFT / BHIM / Phone Pe /Google Pay or PayTm.

Subscription payable (inclusive of Tax):		
	Annual Subscription	Life time subscription*
Individual Subscribers		
Indian Nalikera Journal	Rs. 40/-	Rs. 1000/-
Indian Coconut Journal	Rs. 60/-	Rs. 1600/-
Bharatiya Nariyal patrika**	Rs. 40/-	Rs. 1000/-
Institutes/ Libraries		
Indian Coconut Journal	Rs. 200/-	Rs. 5000/-
** 30 years., **Quarterly*		

Barn owl project - A new hope to the Coconut Farmers of Lakshadweep

A.M. Muneera Beegum,
Agri. Demonstrator, Department of Agriculture, Union Territory of Lakshadweep

Lakshadweep is the tiniest UT of India, both in area wise and population wise. It is an island group located 220 - 440 km off the Malabar cost in South Western Arabian Sea. It is a uni – district Union territory, and comprises of 5 submerged sand banks and 11 inhabited islands. The island is having a total geographical area of 3220 Ha- land. The Capital island is Kavarathi and it is also the principal town of the UT. The temperature remains moderate all through the year ranging between 32 and 34^{O}c and annual rainfall ranges between 1500 and 1850 mm.

Coconut is the only commercially grown crop in this territory which is organic by default. Agriculture was the only livelihood activity till early 1970s in all islands and now coconut husbandry is the second important contributor to the economy next to tuna fishery with Rs. 105 crores /year that gives livelihood support to about 14000 households of this territory directly or indirectly. The average annual income from coconut per household is estimated at Rs. 75000/- per year. Annual production of coconut in Lakshadweep is 107 MT nuts / year & the productivity of coconut in Lakshadweep islands is high compared to the national average.

There are many challenges faced by the coconut farmers of Lakshadweep, which include incidence of pest and diseases to the crop, rodent attack etc. out of which the main problem is rodent attack as per the survey conducted, during, 2019. It is estimated that coconut production loss due to rodent damage in the island is about 40 – 50% and annual income loss due is Rs. 6.04 crores. From this data it is clear that almost half of the production was wasted due to rat menance. Inadequate spacing, unsystematic way of cultivation, inappropriate crown. Cleaning delayed harvest of coconut and absence of natural predators like snake, owl etc are the main factors which favour rat population.

The entire UT of Lakshadweep is declared as organic and hence the chemical methods of rat control cannot be adopted here. The only possible way to reduce rat menace is the adoption of biological control measures. In this background, the Department of Agriculture, Lakshadweep started a pilot project for the biological control of rodent using Barn owl (Tyto alba).

The pilot project was launched during 2019 – 20 at Kavaratti Island in collaboration with Krishi Vigyan Kendra Kavarathi. For the purpose, three pairs of barn owl were transported from Thiruvananthapuram zoo. The birds were transported in specially designed transportation cage. Since these birds being listed in schedule IV of wild life (protection) Act 1972, before the introduction necessary preparations were made by the department for the protection of

Barn owl. Also aviary was built by the department of agriculture with the help of PWD Department under the guidance of Krishi Vigyan Kendra for the purpose of acclimalization and nesting. After 82 days of acclimatization the birds were released to the island.

As of now the barn owl population in Kavarathi has increased to 25 (+) from three pairs which was successfully translocated from Kerala. It is a good sign showing that this translocated birds has been very successfully acclimatized to this island condition. It is added that in wild condition average of egg laying/ hatching of barn owl is generally two per laying. But in island condition it is very high & is five hatching in most of the egg layings. It positively shows the adaptation to island climate, feeding habitat, abandoning of rat population etc. Under this ratio of multiolication in a geometric progression rate, it can be estimated that the bird population of Kavarathi will be near 200 by April 2022.

As per the recent data collected by the Krishi Vigyan Kendra, Kavarathi from selected coconut gardens, the rat population has been declined considerably. Though 25 birds cannot bring a notable change in rat population as its hunting rat is 4-6 rat / night. The difference will be apparent by next one year, when the population reaches 200 and the daily hunting will be 1000 rats.

Considering the successful outcome of the project, Department of Agriculture has extended the project to Andrott & Minicoy islands. In this regard, construction of quarantine and nesting cage for the barn owl has completed in last financial year with the help of KVK .This project has created a new hope among the public of Lakshadweep to manage the rodent menace effectively. From the successline of the project, the Department is now planning to replicate the barn owl project in the remaining islands.

However the chances of inbreeding depression is high among the existing barn owl population of Lakshadweep because the existing bird population is proliferated only from the two (or three) pair of parents, inbreeding depression will inversely affect the vigour and feeding habit of these birds. As such the purpose for which the birds have been translocated may not serve in an effective manner. So as to bring about the efficiency of biological control of rodent pests, the inbreeding vigour of the upcoming generations has to be reinstated. Therefore new pairs of birds has to be introduced to the existing generation from the available resources. ■

PLACROSYM XXIV

The 24th Plantation Crops Symposium on the focal theme 'Coping with the pandemic and Beyond: Research and Innovations in Plantation Crops Sector' was held in Kochi from 14th to 16th December 2021. The programme was organized as part of 'Azadi ka Amrut Mahotsav' to commemorate the 75th year of Indian Independence.

Dr. R. Chandra Babu, Hon'ble Vice Chancellor, Kearla Agricultural University, inaugurated the programme. Shri AG Thankappan, Chairman, Spices Board of India, Shri APM Mohammaad Hanish IAS, Principal Secretary, Department of Industry, Commerce and Plantation, Govt. of Kerala; Shri KS Srinivas IAS, Chairman, MPEDA, Kochi; Dr. KN Raghavan IRS, Executive Director, Rubber Board; Shri D Sathiyan IFS, Secretary, Spices Board of India; Shri SSV Swami IAS, Development Commissioner, Cochin Special Economics Zone, Kochi; Dr. Poonam Pande, Advisor-Global Project on Private Business, Action for Biodiversity, GIZ, Germany and other delegates spoke during the occasion. The delegates spoke on various opportunities, issues and other prospects of plantation crops sector and requested the participants to effectively utilize the platform for exchange of scientific ideas, technologies come up with progress in resolving the issues and develop strategies for the overall development of the plantation sector and for the prosperity of the farmers.

Technical sessions on plantation and spice crops with lead papers, oral presentations and poster presentations by experts, scientists and academic persons covering climate change, genetics & genomics, sustainable production system, plant health management, value addition, mechanization, post harvest technology, transfer of technology, business and policy making were made during the occasion. Scientists from various research Institutes, teaching professionals from academic institutions, officers from State and Central government organizations and private sector, entrepreneurs and farmers from across the country participated in the symposium.

Coconut Development Board was one of the co-organizers of the programme. Shri. Pramod P Kurian, Assistant Director and Shri. Kumaravel S, Development Officer represented the Board in the symposium. In the special session held on 14th December 2021, Shri. Pramod P Kurian, Assistant Director, CDB briefed about the Research Innovation Activities undertaken by the Board and also put forth few topics like effective management practices for root wilt affected coconut gardens, measures for containing the spread of root wilt disease in Districts of Tamil Nadu adjoining Kerala, especially Coimbatore and Tiruppur Districts, standardisation of mass multiplication techniques for planting material production, farmer friendly low cost/ cost effective management measures for white flies, reduction of cost of production etc in which research and development support in coconut sector need to be focused. The Board exhibited various value added products and publications in the exhibition pavilion arranged as part of the Symposium. The visitors were enlightened about the products and activities of the Board.

The symposium was hosted by Spices Board of India and Indian Society of Plantation Crops (ISPC) The programme was co-organized by Coconut Development Board, Coffee Board, ICAR-Central Plantation Crops Research Institute (CPCRI), ICAR-Directorate of Cashew Research, ICAR- Indian Institute for Oil palm Research (IIOPR), ICAR-Indian Institute for Spices Research (IISR), Rubber Board, Tocklai Tea Research Institute, United Planters' Association of India (UPASI) and Society for Promotion of Oil Palm Research & Development (SOPOPRAD).

National Official Language Webinar

A National Official Language webinar was organized in the Board on 14th December 2021 on the theme "Official Language and Information Technology". All the officials from the Headquarters and Unit Offices attended the webinar. Dr.S.N.Mahesh, Sr.Translation Officer, Centre for Artificial Intelligence and Robotics, DRDO, Bengaluru was the resource person and he spoke on the latest technologies available for the use of Hindi in computer and also answered the queries raised by the participants during the webinar. Smt. S.Beena, Assistant Director(OL) welcomed the gathering and Smt. Sangeetha T.S., Senior Translation Officer proposed vote of thanks.

Coconut Based convenience Food Training

Coconut Development Board, Regional office, Guwahati, Assam, conducted Coconut based convenience Food Training from 6th to 9th December 2021 at CDB, Regional office, Guwahati. 10 participants from Kamrup, Assam attended the programme. Dr. Jyotsna Baruah, Retd Professor, Directorate of Extension Education, Guwahati and Dr. Sanjib Dutta, Retd. SADO, Agriculture department, Assam attended the programme as Resource Persons.

Friends of Coconut Tree (FoCT)

Coconut Development Board,Field Office, Thiruvananthapuram in association with KVK, Vellanad, Thiruvananthapuram conducted Friends of Coconut Tree (FoCT) Skill Development Training programme from 6th to 11th December 2021 .

KVK, Lakshadweep, ICAR-CMFRI, Kavarati conducted Friends of Coconut Tree (FoCT) Skill Development Training programme from 22nd to 27th November 2021. Shri. Abdul Kader, Chairperson, Village Dweep Panchayat of Lakshadweep Island inaugurated the programme. Dr.P.N.Ananth, Senior Scientist and Head, KVK-Lakshadweep, Dr.Mohammed Koya Scientist, ICAR-CMFRI and Shri.Shareef, District Agriculture Officer were present during the occasion.

Farmers Field Day Programme

A Farmers Field Day programme was conducted for coconut farmers from Federations of Alapuzha district on 23rd November 2021.A field visit to the coconut based gardens of two prospective farmers were made as part of the programme. The participant farmers could get first hand knowledge on fruit plants based mixed farming system including pisciculture and floriculture along with vegetables and fruit plants in the interspace of coconuts. Participants appreciated the scientific way of cultivating a variety of fruit plants by Mr. Kochumon, farmer and the wide collection of ornamental plants maintained by Adv. T.M.Mathunny, farmer. The technical session was handled by Dr. Abdul Haris, Principal Scientist, CPCRI, Regional Station, Kayamkulam wherein coconut cultivation with focus on Integrated Nutrient Management as well as Integrated Pest Management and Integrated Disease Management was briefed to the participants.

Block Level Seminar

Coconut Development Board, Regional office, Guwahati, Assam in association with District Agriculture Office,Hojai organized a Block Level Seminar on 10th December 2021 at Hojai District, Assam.

CDB, RO,Guwahati, Assam in association with District Agriculture Office, Morigaon Organized a Block Level Seminar on 7th December 2021 at Resource Centre for Sustainable Development Campus, Sanubari, Morigaon District, Assam.

CDB Kochi organised a Regional Awareness Campaign on Advance in Coconut Cultivation in Kiltan, Lakshadweep Islands on 28th November 2021 at Thanal campus, Kiltan through KVK - Lakshadweep,ICAR-CMFRI. Shri Kungi Koya, Block Development Officer, Kitan Island inaugurated the programme. Shri Abdul Hameed, Chairman Thanal Charitable Organisation, Dr.P.N.Ananth, Senior Scientist and Head, KVK were present and spoke on Organic inputs to increase the production of coconut in the island.

CDB RO, Chennai conducted a block level Seminar on 9th December 2021 at KVK,ICAR-SCAD, Vagaikulam, Thoothukudi, Tamil Nadu

Cultivation Practices for Coconut - January

Collection and storage of seed nuts

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

Nursery management

Irrigation has to be continued for the seedlings in the nursery. Weeding has to be done wherever necessary. If termite infestation is noted in the nursery drenching with chlorpyriphos (2ml chlorpyriphos in one litre of water) should be done. Spraying of water on the lower surface of leaves of seedlings can be done against spiralling white fly attack.

Shading

Shade has to be provided for the newly planted seedlings, if not already provided.

Irrigation

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

Removal of senile and unproductive coconut palms

Cut and remove senile and unproductive palms in the coconut garden and dispose them properly to maintain the field hygiene.

Management of pests and diseases

January month is the critical winter month with cool night and hot day. The humidity comes down and the Tamil calendar celebrates Pongal, with farmer's festival. Bountiful harvests in all crops are accomplished. Pest vigilance in this period should be strengthened as this period opens out dry day time with cool night favouring population build up of sucking pests and dry pathogens. Breeding pits of coconut rhinoceros beetle get dried favouring egg laying and development of grubs. The establishment

Pest-infested field

Black headed caterpillar

Goniozus nephantidis

of moth pests, viz., black headed caterpillar and slug caterpillar is aptly virulent and successful in this month in all endemic zones of Kerala, Tamil Nadu, Andhra Pradesh and Karnataka.

▶ *Black headed caterpillar, Opisina arenosella*

The coconut black headed caterpillar, Opisina arenosella, is a major pest distributed in almost all coconut growing tracts across the country especially along the water bodies during winter.The infested portions get dried and form conspicuous grey patches on the upper surface of the lower fronds. Severe pest damage results in complete drying of middle to inner whorl of fronds leaving a burnt appearance. Presence of black headed caterpillars, webbing of leaflets and occurrence of dried faecal matter on the leaflets are the characteristic features of pest incidence. In the absence of natural enemies in the new area of emergence, the outbreak becomes faster and expands at high speed. Damage results in tremendous reduction in photosynthetic area, decline in rate of production of spikes, increased premature nut fall and retarded growth. Extensive feeding of caterpillars causes a crop loss of 45.4% in terms of nut yield in addition to rendering the fronds unsuitable for thatching and other purposes. Farmers need not panic and this is one of the classical examples of successful augmentative biological control suppressed by natural enemies.

Management

a) Regular monitoring of palm fronds for pest occurrence in endemic zones.

b) Removal and destruction of 2-3 older and dried leaves harbouring various stages of the pest. The leaflets could be burnt to reduce the caterpillar/ pupal population.

c) Domestic quarantine should be strengthened by not transporting coconut fronds from pest-infested zone to pest free zone.

d) Augmentative release of the larval parasitoids viz., Goniozus nephantidis (20 parasitoids per palm) and Bracon brevicornis(30 parasitoids per palm) if the pest stages is at third-instar larvae and above. The pre-pupal parasitoid (Elasmus nephantidis) and pupal parasitoid (Brachymeria nosatoi) are equally effective in pest suppression and are released at the rates of 49% and 32%, respectively for every 100 pre-pupae and pupae estimated.

e) Before releasing, the parasitoids need to be adequately fed with honey and exposed to host odours (gallery volatiles) for enhancing host searching ability.

f) Ensure adequate irrigation and recommended application of nutrients for improvement of palm health.

▶ *Nut borer, Cyclodes omma*

Incidence of nut boroer was observed in certain coconut gardens in Pollachi (Tamil Nadu). This is a sporadic pest normally found in dwarf genotypes and also in hybrids. Succulency due to excessive nutrition by nitrogenous fertilizers is also one of the factors responsible for pest outbreak. Caterpillars bore into buttons after pollination as well as immature nuts and feed on the internal contents during night

1. Nut boring caterpillar
2. Damaged buttons
3. Adult noctuid moth


Mite damaged nuts


Progression of mite damage


Mite colony

hours, resulting in button shedding. Palms subjected to assisted pollination are more susceptible to pest attack. The pupal stages are observed on the debris of palm crown.

Management

a) Crown cleaning and removal of immature stages of the pest

b) Judicious and need based application of nitrogenous fertilizers to avoid succulency

c) Application of the entomopathogen, Bacillus thuringiensis @ 20 g per litre or neem oil 0.5% (5 ml per litre with 10 g soap powder) using hand sprayers would reduce pest incidence.

▶ *Cocout eriophyid mite, Aceria guerreronis*

Coconut eriophyid mite is the invasive pest reported from our country during 1998 and has been on the rise during post-winter season. It belongs to the spider family with two pairs of legs, sub-microscopic (200-250 microns size), lays about 100-150 eggs and the life cycle complete in 7-10 days. Mites infests the developng nuts immediately after pollination and are confined within the floral bracts (tepals) and feeds on the meristematic tissues beneath the perianth. Appearance of elongated white streak below the perianth is the first visible symptom. Within few days, yellow halo appears round the perianth, which turns as warts and finally develops as cracks, cuts and gummosis. Shedding of buttons, immature nuts and malformation of nuts are other indications of mite damage.

Management

a) Removal and destruction of dried spathes, inflorescence parts and fallen nuts to subdue the pest population

b) Spraying 2% neem-garlic emulsion or azadirachtin 10000 ppm @0.004% or root feeding with neem formulation containing azadirachtin 10000 ppm at 10 ml with equal volume of water three times during March-April, October-November and December – January is recommended. Prophylactic application before the increase in summer temperature should be resorted to.

c) Application of talc-based preparation of acaropathogen, Hirsutella thompsonii@ 20 g / litre/ palm containing 1.6 x 108cfu three times in synergy with neem formulation.

d) Kalpaharitha (a selection from Kulasekharam Tall) was found field tolerant to mite damage.

e) Application of recommended dose of fertilizers, recycling of biomass, raising of green manure crops in palm basin and incorporation during flowering, summer irrigation including soil and water conservation measures improve the palm health and reduce the pest attack.

Disease

▶ *Leaf blight of coconut (Lasiodiplodia theobromae)*

Leaf blight is an emerging disease in Coimbatore, Erode, Dindigul, Tirunelveli and Kanyakumari districts of Tamil Nadu. The pathogen causes damage in leaf and nuts. Affected leaflets start drying from the tip downwards and exhibit a charred or burnt appearance. The leaves in lower 3 to 4 whorls are affected. Leaf blight causes apical necrosis of lower leaves with an inverted “V” shape, and symptoms similar to those induced by drought (water deficit) and other stresses. The leaflets have extensive necrotic lesions with defined edges and without transition areas between the necrotic and healthy tissues. The pathogen can internally colonize the rachis, inducing internal necrosis that moves upward towards the stem (systemic invasion). The necrotic tissues develop exposed cracks that release gums under the leaf rachis and at petiole insertion. On coconuts, small black sunken region appear near the perianth of immature nuts.When nearly mature /mature nuts were infected, the infection spread internally into mesocarp without any external

symptoms. The affected nuts are desiccated, shrunk, deformed and drop prematurely causing 10% to 25 % loss in nut yield.

Management

a) Improving the palm health by application of 5 kg of neem cake enriched with Trichoderma harzianum and soil test based nutrition.

b) Adequate irrigation and adoption of soil and water conservation measures is advised.

c) Root feeding of hexaconazole @ 2% (100 ml solution per palm) thrice a year.

Root (wilt) disease

Root (wilt) disease (RWD) is prevalent in a contiguous manner in all the 8 southern districts of Kerala starting from Thiruvananthapuram to Thrissur and in isolated patches in the remaining 6 northern districts of the state. The disease is also prevalent in Coimbatore, Theni, Senkottai and Kanyakumari districts of Tamil Nadu. The presence of the disease has been recorded from Dakshina Kannada district of Karnataka and Goa as well.

The most obvious and diagnostic symptom of the disease is the abnormal inward bending of the leaflets termed ribbing or flaccidity. Yellowing and marginal necrosis of leaflets are the other characteristic foliar symptoms associated with the disease. Rotting of roots, shedding of immature nuts, drying up of spathes and necrosis of spikelets in unopened inflorescence is noticed in certain cases. The husk, kernel and oil of the nuts of the disease affected palms are of poor quality. Palms of all age groups are affected. The disease is non lethal, but debilitating. However, palms contracting the disease in the pre bearing age may not come to flowering and bearing. The disease also causes several internal changes in the palm.

A phloem bound mollicute – phytoplasma belonging to 16SrRNA group XI has been identified as the pathogen. The insect vectors transmitting the disease have been identified as lace bug (Stephanitis typica) and plant hopper (Proutista moesta). The coconut RWD has been found to occur on all soil types of Kerala under varying ecological conditions ranging from the high ranges of the Western Ghats to the coastal plains.

Management

One of the significant features of the disease is that it is not lethal but a debilitating malady which responds to ideal management practices. Two strategies, one for the heavily diseased contiguous area, and another for the mildly affected area have been formulated.

a. Strategy for heavily diseased tracts

In the heavily diseased area, the yield of palms can be sustained or even improved through adoption of integrated management practices:

- Removal of disease advanced and juvenile palms.
- Management of leaf rot disease.
- Balanced fertilizer application.
- Addition of organic manures.
- Raising of green manure crops in the basins and incorporation.
- Irrigation during summer months.
- Management of pests.
- Adopting inter and mixed cropping.
- Mixed farming in the diseased gardens involving raising of fodder crops in the inter spaces, maintaining milch cows and recycling of organic waste.

b. Strategy for mildly affected area

Removing all the diseased palms: The spread of the disease can be arrested by systematic surveillance and rouging of diseased palms as and when identified. Accurate and timely diagnosis of plant diseases is an essential component of integrated disease control. ELISA test has been developed at CPCRI for the early diagnosis of this disease. The disease affected palms can be detected even 24 months before the expression of symptoms and they can be removed to avoid further spread.

Replanting with disease free healthy seedlings: Replanting with quality seedlings has to be undertaken only in gardens with sufficient space. As RWD is not amenable to conventional plant

protection measures, cultivation of resistant varieties is the most ideal method for management. The resistant/tolerant varieties Kalparaksha (selection from Malayan Green Dwarf), Kalpasree (selection from Chowghat Green Dwarf) and the hybrid Kalpasankara (Chowghat Green Dwarf X West Coast Tall) released from Central Plantation Crops Research Institute (CPCRI) are suitable for cultivation in RWD endemic tracts.

The dynamics of insect pests and diseases in coconut system vis-à-vis weather change pattern is so critical in population build up. Timely prophylactic measures to safeguard palms and enhancing palm health through need-based nutrition is very essential to withstand the pressure exerted by pests and diseases in outbreak situation. ■

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

Market Review – November 2021

Domestic Price

Coconut Oil

During the month of November 2021 the price of coconut oil opened at Rs. 16900 per quintal at Kochi and Alappuzha market and Rs. 17300 per quintal at Kozhikode market. The price closed with a net gain of Rs. 100 at Kochi and Alappuzha market and Rs. 200 per quintal at Kozhikode market.

The price of coconut oil closed at Rs. 17000 per quintal at Kochi and Alappuzha market and Rs. 17500 per quintal at Kozhikode market.

During the month, the price of coconut oil at Kangayam market opened at Rs. 14267 per quintal and closed at Rs. 14733 per quintal with a net gain of Rs. 466 per quintal.

Weekly price of coconut oil at major markets Rs/Quintal)				
	Kochi	Alappuzha	Kozhikode	Kangayam
01.11.2021	16900	16900	17300	14267
06.11.2021	17000	17000	17300	14533
13.11.2021	17000	17000	17500	14667
20.11.2021	17000	17000	17500	14600
27.11.2021	17000	17000	17500	14667
30.11.2021	17000	17000	17500	14733

Milling copra

During the month, the price of milling copra opened at Rs.10200 per quintal at Kochi and Alappuzha market and Rs. 10450 per quintal at Kozhikode market.

The prices of milling copra closed at Rs. 10250 per quintal at Kochi and Alappuzha market and Rs. 10750 per quintal at Kozhikode market with a net gain of Rs.50 at Kochi and Alappuzha market and Rs. 300 per quintal at Kozhikode market.

**NR-Not reported*

During the month the price of milling copra at Kangayam market opened at Rs. 9700 per quintal and closed at Rs.9900 per quintal.

Weekly price of Milling Copra at major markets (Rs/Quintal)				
	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kan-gayam
01.11.2021	10200	10200	10450	9700
06.11.2021	10250	10250	10650	9900
13.11.2021	10250	10250	10800	10000
20.11.2021	10250	10250	10750	9900
27.11.2021	10250	10250	10750	9900
30.11.2021	10250	10250	10750	9900

Edible copra

During the month the price of Rajpur copra at Kozhikode market opened and closed at Rs. 19000 per quintal.

Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01.11.2021	19000
06.11.2021	19150
13.11.2021	19750
20.11.2021	19750
27.11.2021	19500
30.11.2021	19000

Ball copra

The price of ball copra at Tiptur market opened at Rs. 16300 per quintal and closed at Rs. 17200 per quintal with a net gain of Rs.900 per quintal.

Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal) (Sorce: Krishimarata vahini)	
01.11.2021	16300
06.11.2021	17200
13.11.2021	17000
20.11.2021	16900
27.11.2021	17200
30.11.2021	NR

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.15550 per quintal and closed at Rs.15350 per quintal with a net loss of Rs.200 per quintal.

Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal)	
01.11.2021	15550
06.11.2021	15550
13.11.2021	15350
20.11.2021	15350
27.11.2021	15350
30.11.2021	15350

Coconut

At Nedumangad market in Kerala, the price of coconut opened and closed at Rs. 16000 per thousand nuts during the month.

At Pollachi market in Tamilnadu, the price of coconut opened Rs. 29000 per ton and closed at Rs.30000 per tonne during the month with a net gain of Rs. 1000 per tonne.

At Bangalore market in Karnataka, the price of coconut opened at Rs. 22500 per thousand nuts and closed at Rs. 20000 per thousand nuts with a net loss of Rs. 2500 per thousand nuts.

The price of coconut was not reported from Mangalore market during the first three weeks of the month. During the last week of the month the price of coconut at Mangalore market was Rs.32000 per ton.

Weekly price of coconut at major markets				
	Nedumangad (Rs./1000 coconuts)*	Pollachi (Rs./ MT) **	Bangalore Grade-1 coconut,(Rs./ 1000 coconuts) ***	Mangalore Black coconut (1 ton) ****
01.11.2021	16000	29000	22500	NR
06.11.2021	16000	29000	22500	NR
13.11.2021	16000	29000	22500	NR
20.11.2021	16000	29000	20000	33000
27.11.2021	16000	29000	20000	32000
30.11.2021	16000	30000	20000	32000
30.11.2021	16000	30000	20000	32000

International price

Coconut

International price and domestic price of coconut oil at different international/ domestic markets are given below.

The price of coconut oil quoted at different international/ domestic markets are given below.

Weekly price of dehusked coconut with water				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
06.11.2021	213	245	311	381
13.11.2021	214	246	305	381
20.11.2021	213	246	306	381
27.11.2021	NR	237	NR	381
				*Pollachi market

Coconut Oil

International price and domestic price of coconut oil at different international/ domestic markets are given below.

Weekly price of coconut oil in major coconut oil producing countries					
	International Price(US$/MT)	Domestic Price(US$/MT)			
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	Sri lanka	India*
06.11.2021	2052	NR	1581	3073	1911
13.11.2021	1836	NR	1542	3007	1928
20.11.2021	1958	NR	1617	3017	1920
27.11.2021	NR	NR	1639	NR	1928
					*Kangayam

Copra

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

Weekly International price of copra in major copra producing countries				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India* * Kangayam
06.11.2021	1014	954	1562	1275
13.11.2021	994	946	1584	1315
20.11.2021	1006	984	1589	1302
27.11.2021	NR	988	NR	1302
				* Kangayam

*(Source: Epaper,Kerala Kaumudi), **(Source: Star market bulletin)
*** (Source: Star market bulletin) **** (Source: Star market bulletin)

Coconut Development Board

Shri. Rajbir Singh IFS
Chairman : 0484-2375216

Shri. Rajeev Bhushan Prasad
Chief Coconut Development Officer (i/c) : 0484-2375999

Shri. R. Madhu
Secretary : 0484-2377737

Government of India,
Ministry of Agriculture and Farmer's Welfare
P.B. No.1012, Kera Bhavan, SRV Road,
Kochi – 682 011, Kerala, India.
Email : kochi.cdb@gov.in, cdbkochi@gmail.com,
Website: http://www.coconutboard.gov.in
Office:0484-2376265, 2377267,
PABX : 2377266, 2376553, Fax:91 484-2377902

Regional Offices

KARNATAKA
Director, Regional Office, Coconut Development Board, Hulimavu, Bannerghatta Road (Beside Horticulture Farm, Govt. of Karnataka), Bangalore South Taluk, Bangalore - 560 076 Karnataka. Ph: (080) 26593750, 26593743 Fax: 080-26594768 E-mail: ro-bnglr@coconutboard.gov.in, cdbroblr@gmail.com.

ASSAM
Director, Regional Office, Coconut Development Board, Housefed Complex (Sixth Floor), Wireless Basistha Road, Last Gate, Dispur, Guwahati - 781 006. Assam. Ph: (0361) 2220632 Fax: (0361) 2229794 E-mail: ro-guwahati@coconutboard.gov.in, cdbassam@gmail.com

TAMILNADU
Director, Regional Office, Coconut Development Board. No. 47, F1, Dr. Ramasami Salai K.K.Nagar, Chennai - 600 078 Ph: 044-23662684, 23663685 E-mail: ro-chennai@coconutboard.gov.in, cdbroc@gmail.com

BIHAR
Director, Regional Office, Phulwari Road, Jagdev path, Phulwari Road, Patna - 800 014, Bihar Phone: 0612-29720200 Email- ro-patna@coconutboard.gov.in, cdbpatna@gmail.com

State Centres

ANDAMAN & NICOBAR ISLANDS
Dy. Director, State Centre, Coconut Development Board, House MB No.54, Gurudwara Lane, Near Head Post Office, Opp. BSNL Quarters, Port Blair - 744 101, South Andaman. Ph: (03192) 233918 E-mail: sc-andaman@coconutboard.gov.in, cdban@rediffmail.com

ANDHRA PRADESH
Dy. Director, State Centre, Coconut Development Board, D.No.4-123, Rajula Bazar Ramavarappadu PO, New Zilla Parishad High School, Vijayawada - 521108, Krishna District, Andhra Pradesh Telefax: 0866 2972723 E-mail: sc-vijayawada@coconutboard.gov.in, cdbvijap@gmail.com

MAHARASHTRA
Dy. Director, State Centre, Coconut Development Board,Flat No. 203, 2nd Floor, Eucalyptus Building, Ghodbundar, Thane West - 400 610. Maharashtra. Ph: 022-65100106 E-mail: sc-thane@coconutboard.gov.in, cdbthane@gmail.com

ODISHA
Dy. Director, State Centre, Coconut Development Board, Pitapally, Kumarbasta PO, District Khurda - 752 055 Odisha. Ph: 8280067723, E-mail: sc-pitapalli@coconutboard.gov.in, cdborissa@gmail.com

WEST BENGAL
Dy. Director, State Centre, Coconut Development Board, DA-94 - Sector - I, Salt Lake City, Kolkata - 700 064. West Bengal, Ph: (033) 23599674 Fax: (033) 23599674 E-mail: sc-kolkata@coconutboard.gov.in, cdbkolkata@gmail.com

Market Development cum Information Centre
Asst. Director, Market Development cum Information Centre, Coconut Development Board, 120, Hargobind Enclave, New Delhi - 110 092. Ph: (011) 22377805 Fax: (011) 22377806 E-mail:mdic-delhi@coconutboard.gov.in, cdbmdic@gmail .com

CDB Institute of Technology (CIT), Technology Development Centre and Quality Testing Laboratory,
Dy. Director, Technology Development Centre, Quality Testing Laboratory and CIT, Coconut Development Board, Keenpuram, South Vazhakkulam, Aluva, Ernakulam District. Pin - 683 105. Kerala Ph: (0484) 2679680 Email: cit-aluva@coconutboard.gov.in, citaluva@gmail.com

Field Office Thiruvananthapuram
Coconut Development Board, Agricultural Urban Wholesale Market (World Market), Anayara PO, Thiruvananthapuram. Pin 695 029 Kerala Ph: 0471 2741006 E-mail: fo-tvprm@coconutboard.gov.in, cdbtvm@yahoo.in

Demonstration-cum-Seed Production (DSP) Farms

ANDHRA PRADESH, Asst. Director, DSP Farm, Coconut Development Board, Vegivada (Village) P.O, Tadikalapudi (Via), W. Godavari (Dist.) Andhra Pradesh - 534 452. Ph: 8331869886, E-mail: f-vegiwada@coconutboard.gov.in, dspfmvgda@gmail.com

ASSAM- Farm Manager, DSP Farm, Coconut Development Board, Abhayapuri, Bongaigoan, Assam - 783 384. Ph: 9957694242 Email: f-abhayapuri@coconutboard.gov.in, cdbdspabhayapuri@gmail.com

KARNATAKA - Farm Manager, DSP Farm, Coconut Development Board, Loksara P.O., Mandya District, Karnataka - 571 478 Ph: 08232 298015 E-mail: f-mandya@coconutboard.gov.in, dspfarmmandya@gmail.com

KERALA - Asst. Director, DSP Farm, Coconut Development Board, Neriamangalam, Kerala Pin-686 693. Ph: (0485) 2554240 E-mail: f-neriamangalam@coconutboard.gov.in, cdbnrlm@gmail.com

ODISHA - Farm Manager, DSP Farm, Coconut Development Board, At Pitapally, Post Kumarbasta,District Khurda - 752 055, Odisha. Ph:8280067723, E-mail: f-pitapalli@coconutboard.gov.in, cdbdspfarmodisha@gmail.com

BIHAR - Farm Manager, DSP Farm, Coconut Development Board, P.O. Singheshwar - 852 128, Madhepura District, Bihar. Ph: (06476) 283015 E-mail: f-madhepura@coconutboard.gov.in, dspfms@gmail.com

CHATTISGARH - Asst. Director, DSP Farm, Coconut Development Board, Kondagaon - 494 226, Bastar District, Chhattisgarh. Ph: (07786) 242443 Fax: (07786) 242443 E-mail: f-kondagaon@coconutboard.gov.in, cdbkgn1987@ gmail.com

MAHARASHTRA - Farm Manager DSP Farm, Coconut Development Board, Dapoli Village, Satpati PO, Palghar District, Pin - 401405, Maharashtra. Ph: (02525) 256090 Mob:07767948448 & 7776940774 E-mail: f-palghar@coconutboard.gov.in, dspfarmpalghar@gmail.com

TAMIL NADU - Farm Manager DSP Farm, Coconut Development Board, Dhali, Thirumoorthy Nagar PO, Udumalpet, Tamil Nadu 642 112 Ph: (04252) 265430 Email: f-dhali@coconutboard.gov.in, dspfarmdhali@gmail.com

TRIPURA - Farm Manager, DSP Farm, Coconut Development Board, Hichachera, Sakbari PO, Via: Jolaibari, Sabroom, SouthTripura, Tripura Pin:799141 Ph: 03823263059 Email: f-hitchachara@coconutboard.gov.in, dspfarmhichacharatripura@gmail.com

WEST BENGAL -Farm Manager, DSP Farm, Coconut Development Board, Fulia,1st Floor, Near SBI Bank, Fulia Branch, NH-34, PO Belemath, Fulia, Nadia, West Bengal, 741402. Phone: 03473-234002, E-mail- f-fulia@coconutboard.gov.in, dspfarmfulia@gmail.com

December 2021
Vol. LXIV No.6
Price: Rs.6

Registered No.KL/EKM/721/2021-23
Licence No. KL/CR/EKM/WPP-18/2021-23
Licensed to Post Without Prepayment
RNI No. 3032/1957

INDIAN COCONUT JOURNAL
Date of Publication - 28/12/2021

ENROLL UNDER KERA SURAKSHA INSURANCE SCHEME by CDB

Coconut Development Board

An initiative by Coconut Development Board in association with M/s Oriental Insurance Company Limited.

Accidental insurance coverage for coconut tree climbers/Harvesters.

SUM ASSURED
Rs. 5 Lakhs
for a nominal
annual premium of
Rs. 99/-

Coverage for
- Death
- Disability
- Unemployment due to accidents

Who can Enroll???

Anyone who does coconut tree climbing /harvesting /Neera Technicians as occupation.

Age 18-65

Forms available in CDB Website

https://www.coconutboard.gov.in/docs/Appl-Kerasuraksha.pdf

Plan Ahead..
Be Secure & Safe
For More Details..
Contact:
0484 2377266 Extn 255
www.coconutboard.gov.in

Coconut Development Board, Kochi

Printed and Published by Mini Mathew on behalf of Coconut Development Board, Printed at M/s KBPS, Kakkanad, Kochi-30 and Published at Coconut Development Board, Govt. of India,
Ministry of Agriculture and Farmer's Welfare, Kera Bhavan, Kochi-11, Editor: Deepthi Nair S