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# Message from the Chairperson's Desk

Dear Readers,

Hearty Greetings from Coconut Development Board

As you are all aware, coconut, the tree of life is acclaimed as Kalpavriksha. Even though all parts of this tree can be of use to mankind, we seldom make a complete usage of the same. The profitability of coconut does not always depend on the price of its nut alone and very often we use only the meat of coconut for producing coconut oil while there are innumerable other products of coconut like coconut water, husk, shell etc. In order to make coconut farming profitable, we have to make use of each and every part of coconut as well as the various products that can be produced from it.

Coconut water, virgin coconut oil, desiccated coconut and coconut milk are various other products that can be produced from coconut. Coconut water in particular is a product with immense potential which is being wasted at majority of the occasions in most of the processing units. It is to be noted that this happens at a time when Philippines, Indonesia and Sri Lanka are collecting the coconut water and after further processing and packaging, is exporting the same to the western world. This is a trend to be emulated by India in the wake of the recent reports on the global market studies indicating tremendous growth in the coconut water market.

Another potential product from coconut water is vinegar. While the modern world is after natural products, coconut water based vinegar offers enormous potential in culinary applications especially when the common vinegar available in the market is synthetic based. Nata de Coco is another product which is very popular in South East Asian countries, but yet to establish a dominant market in India. There are very few manufacturers of Nata de Coco in India while in many other countries it is a delicacy.

In a situation where the domestic price of coconut is above the international price, we need to concentrate more on the potential of the domestic market and also the potential of utilizing all parts of coconut. It is to be noted that during the last summer, coconut water was in much demand in North India and was preferred over various other popular soft drinks. Harnessing the potential of coconut through diversification into various products will definitely make coconut farming a profitable venture.

Seasons Greetings and Best Wishes.

G Jayalakshmi IAS
Chairperson

# Farm ponds in coconut gardens for doubling farm income

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Coconut based homesteads are lighthouses of experiential learning and practical innovations of Integrated Farming Systems (IFS). Fish culture, especially in homestead based small backyard ponds, has the potential for higher profit, nutritional benefit and employment opportunities to farmers. The presence of natural habitats in coconut homesteads such as branches of tress, roots of tress, aquatic vegetation are considered as good shelter and sources for production of natural food useful for growth and reproduction of fish. The challenging social process of land fragmentation put forward the low scale of production, lesser marketable surplus and farm income and the lack of mechanism for customized technology packages for small and marginal farmers according to their resource base. Several participatory social experimentations by ICAR CPCRI, proved that clustering of individual interventions can promote social welfare by reducing cost of interventions, accelerating knowledge spread and technology adoption as mobilizing farming community.

## ICAR Farmer FIRST Program (FFP)

ICAR- CPCRI is implementing the 'Farmer FIRST Programme' since November 2016 in Pathiyoor panchayath of Alappuzha district, Kerala state. The Farmer FIRST Programme (FFP) is unique in terms of the five pillars of underlying factors such as Farm, Innovations, Resources, Science and Technology

(FIRST) underscoring the need for paradigm shift in agricultural research and extension. The target of doubling farm income by 2022 requires flexibility in approaches, technology/ knowledge assemblages as well as integration of innovations and experimental learning of farming community, for modest achievements.

Homestead is a challenging beauty of diversity in terms of resources, possibilities and problem based on locations, farmer's knowledge, experiences and livelihood options. In the Farmer FIRST Programme, 1000 farm families are involved in the interventions either individually, clusters or women farmer Self Help Groups (SHG). The farming system is predominantly coconut based with additional components of poultry, livestock (cows), inter/ mixed crops, farm ponds and small scale processing. The interventions are being implemented in six modules of crop, horticulture, integrated farming systems, natural resource management and value addition in the coconut based homestead systems of the 1627 ha of entire panchayath.

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Doubling farmers' income is one of the major goals to achieve by utilizing technologies, attaining social empowerment, skill up gradation and effective resource management. The challenges include income improvement of farmers and ensuring food security for 9.1 billion population by 2050. The role of farm and farm family is of prime importance in whole farm approach. Hence learning the field situation also adds to farming system research and extension approach towards realistic doubling of farm income.

## Farm ponds of coconut based homesteads – A case study

A survey was conducted among 740 coconut farmers for characterizing the farming systems and to delineate the resources. The data indicated that majority of the land holdings are of 25-100 cents 90.1 to 0.4 ha). This reiterates the appropriateness of group/ cluster farming approach in the panchayath. All the farmers surveyed were educated and only 10.01 percent of the total farmers surveyed were young farmers (below 40 years age). Around 25 percent of the land holdings were of size 25-50 cents 90.11 to 0.20 ha) and 20.57 percent with 51 to 100 cents (0.21 to 0.40 ha). Only 8.66 percent of farm holdings were above 0.4 ha. The study showed that 29.2 percent of the coconut based homesteads had farm ponds which served the purpose of irrigation, water collection, conservation and fish culture.

The depth of the ponds also varied from 5 to 20 feet and it was reported that around one third

of the ponds were dry during summer seasons and the rest assured with water availability throughout the year. Besides natural farm ponds, 7 rural youths are maintaining artificial lined ponds for intensive fish culture in the panchayath. A total of 74 farm ponds in coconut gardens were selected in the FFP intervention from the 19 wards of Pathiyoor panchayath based on the willingness to invest in the pond rejuvenation, agreement on adoption of good agricultural practices and to share the information

for larger learning. The farmers were given 4 training programmes with fisheries experts and experienced farmers on pond preparation to fish culture. Based on the preference of participating farmers 65000 fish fingerlings of Nile Tilapaia (*Oreochromis niloticus)* and Koi Anabas (*Anabas testudineus*) were distributed to water area of more than 1 lakh square metre.

Fish culture in farm ponds was included as a major component of in the 'Homestead Farm Plan for doubling farm income'. The critical management points perceived and solved through collective information exchange and innovations were the release and acclimatization of the fingerlings to each of the pond water. The pH level of the water was assessed before the release of fingerlings. They were released to a 'happa' (rectangular shaped light floating structure covered with small sized mesh net leaving upper portion open) in the pond water and appropriate size of feed given and took care up to one month minimum. This practice enabled survival of more than 90 percent of fingerlings and the farmer could monitor the growth and health of them. The pond should be protected from fish predators like tortoises, reptiles and water birds. The feed size to be enhanced with the growth of fishes and chopped greens can be included supplementary feeds. Regular observation of health of fishes and maintaining of oxygen level and required transparency of water is also crucial according to the farmers. The participating farmers already started local marketing of mature fish @ Rs. 250 to 300 per kilogram and the harvest will be completed by January 2020. It was estimated that 10-15 tons of fresh fish worth Rs. 15 to 20 lakhs could be realized in the FFP panchayath. This transformation of farm ponds provides quality protein and fresh fish to consumers and improves the diet diversity of the community.

## Farm ponds as summer solace to coconut palms

With the arrival of summer season the farm ponds should also serve as micro reservoirs for irrigating coconut seedlings and bearing palms in homesteads. For coconut seedlings up to two years old, 45 liters of water is to be given once in four days. Bearing palms need 200 liters of water once in 4 days. Coconut palm basins should be mulched with dried coconut fronds and other organic residues from the homesteads to maintain moisture and protect soil from direct sunlight. Reports indicated that 30-40 percent additional yield of nuts could be obtained by adopting irrigation. Hence revival of farm ponds could transform the coconut gardens to income units and conservation of natural resources. ■

# Modified ground pollination technique for hybridization in coconut

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## Introduction

Root (wilt) is a serious disease of coconut in Kerala State and in certain districts of Tamilnadu State. As the disease cannot be controlled by conventional plant protection measures, development of disease resistant/tolerant variety is the most practical method for the management of this malady. Based on systematic evaluation trials, ICAR-CPCRI Regional Station, Kayamkulam has released one tolerant hybrid (Kalpa Sankara) for the root (wilt) disease prevalent tract. Kalpa Sankara is produced by crossing root (wilt) disease-free Chowghat Green Dwarf as female parent and root (wilt) disease-free West Coast Tall as male parent. Kalpa Sankara gave a ten year cumulative average yield of 84 nuts/palm/year, copra out turn of 2.50 t/ha and oil yield of 1.70 t/ha. Kalpa Sankara is rapidly becoming a popular coconut hybrid in the root (wilt) prevalent tract.

**Modified ground pollination was developed to refine ground pollination technique to suit pollination of dwarf palms from ground level for production of CGD X WCT (Kalpa Sankara) hybrids. The technique developed was attempted on tall palms as well.**

Considering the huge demand for Kalpa Sankara hybrids, efforts are being made for large scale production of the hybrid. The two key components required for production of this hybrid is the availability of Chowghat Green Dwarf mother palms and disease-free West Coast Tall male parental palms. Chowghat Green Dwarf mother palms are available in farmer's plots and such palms can be used for production of D X T hybrids. Since these palms are located in far off places in the root (wilt) disease affected tract and to overcome the shortage of skilled

climbers for undertaking pollination and attempts were made to mechanize artificial pollination.

Devakumar *et al.*, 2018 developed a ground pollination technique for mechanization of pollination on tall palms from ground level. Modified ground pollination was developed to refine ground pollination technique to suit pollination of dwarf palms from ground level for production of CGD X WCT (Kalpa Sankara) hybrids. The technique developed was also attempted on tall palms as well.

## Equipments for modified ground pollination

### ▶ *Pollination equipment*

The equipments for artificial pollination includes pollination bag, pollen applicator for spraying pollen grains, incubator for drying male flowers for collecting pollen and dessicator. The refinements made over the ground pollination technique (Devakumar et al., 2018) include using flexible PVC pipe (6 mm diameter) instead of 8 mm diameter clear PVC tube. The vertical air blower powered by a 12 volt battery used for pumping the pollen-talc mixture was replaced with 5 litre hand pump pressure sprayer. To aid uniform dusting of pollen-talc mixture onto receptive female flowers inside the pollination bag, a 6 mm micro sprinkler attached to 6 mm adapter was fixed onto the top end of the PVC pipe inserted inside the pollination bag.

### ▶ *Operational details*

In the traditional method, female parental palms are selected and emasculation is done 2-3 days prior to initiation of female phase. Emasculation is followed by bagging. As and when the female phase starts, the pollen grains from selected male parental palm is mixed with a suitable diluent like purified talc in 1:6 ratio and filled in the applicator, just before use. Since stigmatic exudation/secretion occurs progressively during the morning hours, 7 am to 11 am is the most preferred time for conducting artificial pollination. On completion of the fertilization process the stigma turns brown and subsequently the pollination bag is removed.

Using the modified ground pollination technique, the climber initially ties the pollen delivery tube on to the top part of the pollination bag. The pollination bag attached with pollen delivery tube is fixed on the emasculated inflorescence. The pollination bag is stitched in such a way that the cloth never comes in contact with the stigmatic surface of buttons. On initiation of female phase, pollen: purified talc mixed in 1: 6 ratio is filled in the pollen tray. One end of the pollen tray is connected to the pollen delivery tube and the other end is attached to the PVC tube of the 5 litre plastic sprayer (after removing the nozzle portion). Pressure build up by manual pumping is released till the pollen-talc spray reaches the emasculated inflorescence. Pollen application is repeated during 7am-11 am on 6-8 consecutive days till the receptivity of all buttons on the emasculated inflorescence get completed.

Studies conducted at different stations of ICAR-CPCRI revealed that modified ground pollination technique in coconut resulted in a fruit setting of 18.5-25.0%, which is comparable to the setting observed under natural pollination. The cost analysis was also worked out to compare the economics of modified ground pollination over manual pollination.

### ▶ *Costing*

The cost for installing one ground pollination unit is approximately Rs. 400 (which includes cost of purchasing 6-8 meter HD flexible PVC tube, cost of pollination bag, fabricating pollen tray and other accessories) and Rs. 600 for purchasing one 5 litre sprayer which can be used for pollinating 25 palms

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(Rs. 600/25 palms = Rs.24/palm). Accordingly, the cost of one ground pollination unit works out to Rs. 424 (Rs. 400 + Rs. 24). This ground pollination unit can be used for pollinating atleast six inflorescences in one year. Hence, the cost per inflorescence works out to Rs. 424/6 ≈ Rs. 70.

Pollen application process which has to be carried out continuously for 3-5 days in the case of tall parental palms or 6-8 days in the case of dwarf parental palms during the receptive female phase can be efficiently carried out without the help of skilled climbers by using this device. Instead of paying Rs. 300 for climbing the coconut palm for consecutive pollen application for 6 days (Rs. 50 for each climbing X 6 times), the cost can be reduced to Rs. 70 for competing pollen application on one inflorescence. Hence, the dependence on skilled climbers can be limited just for emasculation, bagging and bag removal.

## Advantages of modified ground pollination

This technique will reduce the cost incurred in planting material production, especially production of coconut hybrids. Moreover this technique will be beneficial to the health of dwarf parental palms as otherwise there are chances of breakage of fronds/ petioles of dwarf palms due to frequent climbings done for carrying out artificial pollination. In modified ground pollination, climbings can be limited to two times, one for installing the ground pollination unit after emasculation and the second climbing for bag removal. In the traditional method, the skilled climber has to climb atleast eight times for carrying out various operations like emasculation, bagging, pollen application and bag removal. Success of this technique has potential application in undertaking controlled pollination in other palms like oil palm and date palm.

In the concept proposed for National Coconut Challenge 2019, refinements were proposed for making the ground pollination technique more user friendly. The hand pump for pumping pollen-talc mixture on to the top of coconut palms will be replaced by a quick and light weight pressure delivery system and the entire ground pollination components will be made available as a Ground Pollination Kit.

The ground pollination kits will also made available through RAIDCO or KAICO outlets throughout Kerala.

Pollen stored in the central pollen cryo-preservatory at ICAR-CPCRI, Kayamkulam will be made available through deep freezers which are already available with Primary Health Centres of Department of Health & Family Welfare.

The purified talc used for diluting pollen will be enriched with biomolecules with potential for increasing fruit setting upon artificial pollination.

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# Invasion of Rugose Spiralling Whitefly in West Bengal

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## Introduction

Rugose spiralling whitefly, *Aleurodicus rugioperculatus Martin* (*Hemiptera: Aleurodidae*) is an invasive, highly polyphagous pest on coconut reported from Tamil Nadu during August 2016 for the first time in India as well as Oriental region (Selvaraj *et al.*, 2016; Sundararaj and Selvaraj, 2017). Subsequently, the pest was reported from different parts of Kerala, coastal districts of Karnataka, East Godavari, West Godavari, Vizayanaram districts of Andhra Pradesh and Goa during 2017 on coconut, banana, sapota, maize, oil palm, mango, cashew and many other ornamental plants (Selvarajet al., 2017; Selvarajet al., 2018 & 2019). Pest occurrence was confirmed in Kamrup and Nalbari districts of Assam during 2018 (Chandrika Mohan et al., 2018).Recently, its occurrence was noticed in Purba Midnapur and Howrah districts of West Bengal during April 2019 on coconut (*Cocosnucifera*), banana (*Musa spp.*), mango (*Mangiferaindica*), sapota (*Manilkarazapota*), Hibiscus (*Hibiscus rosa-sinensis*), guava (Psidiumguajava), citrus (*Citrus spp.*), water apple (*Syzygiumsamarangense*), jamun (*Syzygiumcumini*), ficus (*Ficusbengalensis*), custard apple (*Annona spp.*), jack fruit (*Artocarpusheterophyllus*), areca nut (*Areca catechu*), betel vine (*Piper betle*), spanish cherry (*Mimusopselengi*), akashmoni (*Acacia auriculiformis*) and areca palm (*Dypsislutescens*). This is the first report of this pest from West Bengal. This paper describes, its distribution, severity, host range, natural enemies and impact on coconut cultivation in India. In India, the pest found to feed on 35 host plants across the field, horticultural, plantation and ornamental plants. The pest is believed to be originated from Central America and could be introduced to India accidentally from Florida, USA through ornamental plants trade from the region.

Two days extensive survey was carried out in affected areas along with Mr. Pradip Mazumdar, Advisor, Agriculture to Chief Minister of West Bengal and officials from department of agriculture. Pest was probably introduced to Purba Midnapurand Howrah district through transport of plant materials from infested areas either from Orissa or South India. Pest could be introduced before three to four months before as its severity reached alarming situation especially on coconut, banana and betelvine and the infestation was up to 60-100% on this crop plant. Due to infestation of this, withering and drying of leaves in coconut and banana, consumer preference and marketing of betel vine was reduced drastically because of the sooty mold on the upper surface of leaves. About 200 ha has been severely affected due to this invasive whitefly in West Bengal. Prevailing hot and humid weather conditions, availability of wide range of suitable plants and absence of natural enemies might have favoured pest multiplication and spread. Survey also revealed the absence of proven potential natural enemies i.eEncasiaguadelouape (*Hymenopetra: Aphelinidae*) which indicates the pest introduced without its natural enemies complex. However, chrysopid, *Dichochrysaastour* (*Neuroptera: Chrysopidae*) only natural enemies was noticed during survey. In South India, natural parasitizatismby *E. guadeloupaerecorded* to the extent of 60 to 82% on coconut and other crops was observed and it was

well established by augmentation by re-distribution and various conservation strategies (Selvaraj *et al.*, 2016).

## Awareness programme

To create awareness about this invasive pest, sensitization cum awareness programme was organized by ICAR-NBAIR in collaboration with department of Agriculture, Government of West Bengal. About 80 department officials and progressive farmers participated in the programme. The technical lecture on Biosuppression of invasive rugose spiralling whitefly was delivered by Dr. K. Selvaraj and suggested were invasion of pest, identification, host plant ranges, distribution and natural enemy's complex. Beside this, special emphasis on biological control by *Encarsia guadeloupae* and its augmentation and conservation strategies for effective management of pest was also discussed. Other suitable management strategies like foliar application of neem oil @ 1% and entomopathogenic fungus, *Isaria fumosorosea* Wize (*Deuteromycotina: Hyphomycetes*) (formerly *Paecilomycesfumosoroseus*) at 1x106 spores/ml were also suggested. Farmers also highlighted successful management of pest in South India in different locations by various stakeholders through various programmes. Extension folder on biological control of invasive rugose spiralling whitefly was distributed among farmers and department officials.

***Distribution of Encarsiaguadeloupae and Isaria fumosorosea***

Nucleus culture of Encarsiaguadelopae and I. fumosorosea was distributed among farmers for the management of the pest. Besides, farmers and department officials demonstrated the identification of *E. guadeloupae* adult population and parasitized nymphs at field level and release technique and conservation strategies including impact of pesticides on this natural enemy.

## Integrated management strategies

1. Avoid transportation of coconut seedling or any other ornamental plants from pest infested areas.

2. Continuous monitoring on pest and natural parasitism in field on different host plants through yellow sticky traps.

3. Conserve /encourage natural buildup of Encarsiaguadeloupae through providing reservoir plants/banker plants which protect them from pesticides and unfavorable weather factors.

4. Re-distribution of *E. guadeloupaeto* affected areas through "Field insectary technique" for augmentation natural enemies. Field collected parasitized materials were strategically placed in, on, or next to infested vegetation.

5. Pesticides holiday may be declared for the pest. Therefore, application of unwarranted insecticides may be avoided to enhance the natural parasitism.

6. Foliar application (Two sprays) of Isariafumosorosea@ 2x 108spores/ml at 15 days intervals.

7. Release of *Chrysoperlazastrowisillemi/* Dichochrysasp. nr. astur@ 1000 eggs/ha at 15 days interval.

8. Under severe outbreak situation and absence of natural parasitism, neem oil 1% may be applied.

9. Awareness programme on the natural buildup of the parasitoid *E. guadeloupaeis* to be conducted in all epidemic zones to sensitize the farming community.

10. Community based approach warranted for the effective management of this invasive pest.

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# Bio-suppression of Coconut Scale Insects - Success Story

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Coconut scale insect (*Aspidiotus destructor Sign.*) is a sporadic pest on coconut. This pest assumes significance in the wake of climate dynamics, which has become all the more realistic in Kerala with extreme weather modulation of scorching summer (>40$^{o}$C), acute winter (<14$^{o}$C), skewed monsoon showers congregating in severe proportions for a few days period (250 mm per day) resulting in landslips. Such varied weather factors and extremities could upset biodiversity, thereafter minor pests turn major in a short time period, for which ecological well-being and understanding of natural enemies are very critical.

**Coconut scale is a cosmopolitan pest recorded from 60 plant families in tropical and subtropical regions of the world. Native to South Asia and described by Signoret in 1869, A. destructor has been a major pest on coconut in Fiji Island in 1920 and for its suppression, classical biological control by importing predators from Java was attempted during those period to a limited success.**

Earlier in August 2012, ICAR-CPCRI had reported an upsurge of coconut scale insect, A. destructor from Chingoli panchayat, near Kayamkulam, Kerala wherein rise in temperature coupled with reduction in precipitation and relative humidity were attributed as reasons for this flare up. Very recently, a similar outbreak of *A. destructor* was observed in Vettiar, near Mavelikara, Kerala during May 2019, where one isolated coconut garden was found seriously infested by the pest. The infestation was restricted mainly on juvenile coconut palms of Dwarf varieties such as Chowghat Green Dwarf, Chowghat Orange Dwarf and the common West Coast Tall.

Coconut scale, *A. destructor* is a cosmopolitan pest recorded from 60 plant families in tropical and subtropical regions of the world. Native to South Asia and described by Signoret in 1869, A. destructor has been a major pest on coconut in Fiji Island in 1920 and for its suppression, classical biological control by importing predators from Java was attempted during those period to a limited success. It is also reported as a pest on banana, avocado, bread fruit, mango, guava, papaya, cocoa, cardamom, black pepper, oil palm, rubber, sugarcane, tea and several ornamental plants.

## Damage symptoms

In the affected coconut garden in Vettiar, the scale insect was confined to the under surface of palm leaflets. The infested palm leaflets were explicit by the characteristic chlorotic lesions on the upper surface. By the sucking feeding habit of the nymphs and injection of toxic saliva, typical yellowing of palm leaflets could be observed at a distance. Under severe conditions, necrotic lesions emerge and random drying of leaflets was recorded. In addition, petioles, inflorescence and buttons were also found infested and in certain extreme cases, the buttons were shrivelled and immature nut drop was realized. In general, juvenile palms of dwarf genotypes were found to be more susceptible.

## Life-stages

On examination of the under surface of palm

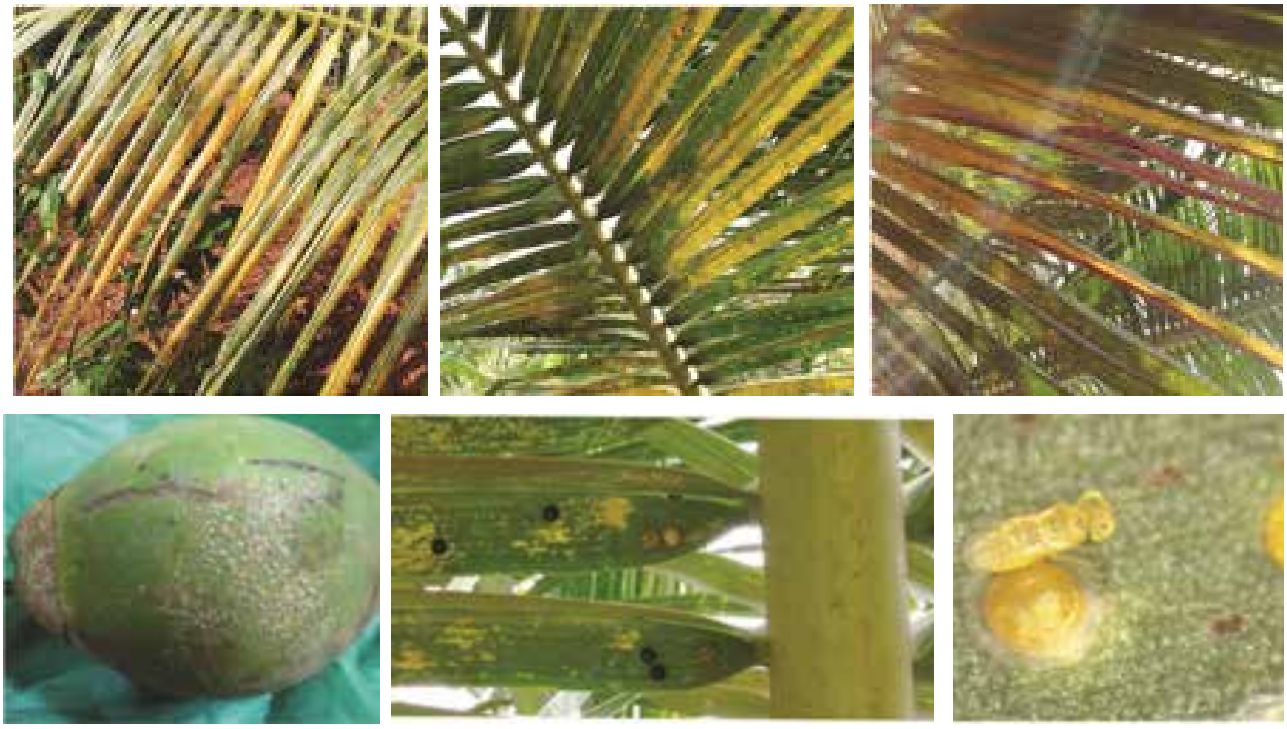

Fig 1 Coconut scale insects and their natural enemies

leaflets, closely packed adult female scale insects with fully covered waxy cover and concentric eggs internally embedded on all directions was observed which are characteristic of the species (*A. destructor*) involved. Eggs are yellow, very small and are laid underneath the scale around the body of the female. After hatching the nymphs crawl out and colonize the plant surfaces. Crawlers of both sexes and adult males are the only mobile stages of the pest. Once settled, the females remain sessile throughout their development; adult males undergo pseudo-pupation, develop a pair of wings and can disperse by flying to find mates. We found innumerable scale insects in all infested leaflets, palms in general were closely planted-about 6 x 6 m spacing and intercropped with banana, creating microclimate congenial for the proliferation of the pest.

## Superfluous natural enemies

A wide array of natural enemies was located and identified on the infested palm leaflets that are abundantly prevalent. More than 50% parasitism was observed by the aphelinid parasitoid, *Aphytis sp.* A good number of the minute wasp was found in all infested leaflets either ovipositing or grooming for mating. This marks a very successful strategy in the bio- control of coconut scale insects.

Three different species of lady beetles were also documented from the infested palm leaflets. The most commonly observed one was the black coloured lady beetle, *Chilocorus nigritus* with the spiny grub feeding on the scale insects. In addition, brown coloured lady beetles, *Sasajiscymnus sp.* were found in less numbers at random. Grubs of *Sasajiscymnus sp.* resemble mealy bugs and are very voracious feeders of the scale insects. An uncommon small black lady beetle with prominent red spots on the elytra, identified as *Pharoscymnus horni* was also located along with its greyish black grubs that were also found devouring the scale insects. Though *P. horni* was known to feed on scale insects, its occurrence on coconut palm infested by scale insects is definitely rare and a first record to be documented. So far *P. horni* was not reported from coconut scale insects from any region but commonly observed from sugarcane scale insects.

This natural guild of defender complex (Fig 1) established very successfully in a period of two months could completely wipe out the entire colony of coconut scale insects by July 2019. The

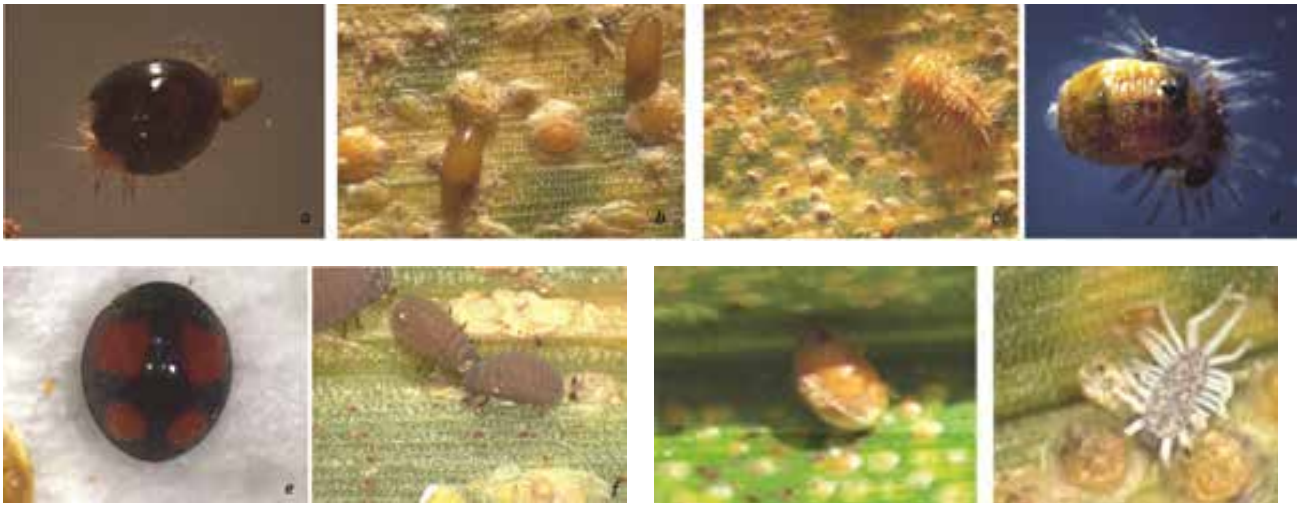

Fig 1 Coconut scale insects and their natural enemies

apprehension expressed by the farmer during May 2019 and his positive feedback after the suppression of the pest is overwhelming. ICAR-CPCRI has advocated pesticide holiday approach because of the prevalence of one effective parasitoid and three species of lady beetles on the palm infested by the pest. This is also another landmark success story in natural suppression of pests encouraged by conservation biological control, where the pest population is bio-suppressed by the natural enemy complex in a period of two months. Dispensation of agrochemicals and organic farming in coconut practiced in the region highlights more on this successful journey of "Conservation Biological Control". ■

***Acknowledgements*****:** *Authors wholeheartedly thank the identification services of natural enemies extended by Dr. J. Poorani, Principal Scientist, ICAR-NRC on Banana, Tiruchirapalli.*

# CDB observes Swachhata Pakhwada

Coconut Development Board is observing Swachhata Pakhwada campaign from 16th to 31st December 2019. A mass shramadaan was conducted at the Headquarters of the Board on 20th December 2019. All employees of the Board actively participated in the cleaning of office premises.

# Status of coconut products export from India

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Coconut, one of the important perennial trees is widely known as "tree of life" because of its multipurpose use. Almost all parts of the tree are useful as food, edible oil, compost, thatch, fuel, fibre, other industry raw material etc. India stands third in world coconut production after Indonesia and Philippines. The three countries together constitute more than 70 per cent of area and production of coconut at the global level.

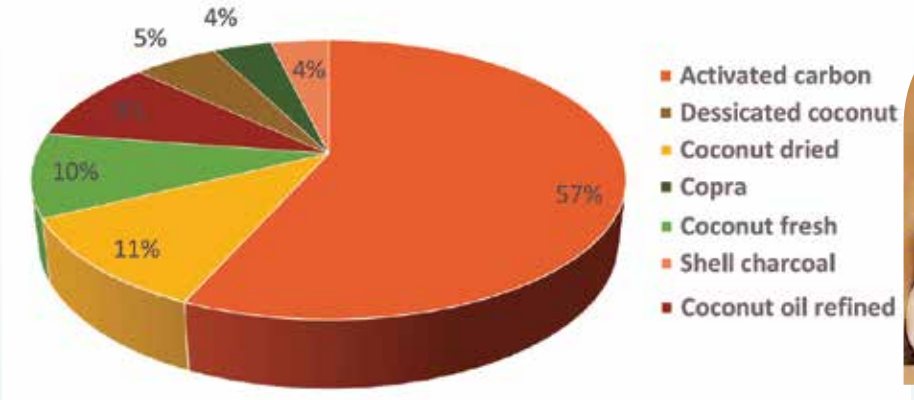
In India, coconut production is largely confined to southern states like Kerala, Karnataka, Tamil Nadu and Andhra Pradesh. Area under coconut cultivation has expanded by around six per cent between 2014-15 to 2017-18. Due to area expansion and increased productivity, coconut production has also increased from 20440 million nuts to 23798 million nuts during this period. During Triennium Ending (TE) 2017-18, Kerala constituted around 37.47 per cent of coconut area under cultivation, followed by Karnataka (24.87 %) (Table 1). Tamil Nadu and Andhra Pradesh also stand in third and fourth position with their respective share of 21.74 per cent and 5.08 per cent. With the highest area under cultivation, Kerala stand first in production of coconut with a share of 33.39 per cent. While Karnataka and Tamil Nadu constitutes 26.02 and 26.85 per cent of total coconut production in the same period. Andhra Pradesh and West Bengal constituted 6.01 per cent and 1.61 per cent of the total coconut production respectively.

Table 1: Major state wise area and production of coconut in TE 2017-18 (share in %)

| States | Area | Production |
|---|---|---|
| Kerala | 37.47 | 33.39 |
| Karnataka | 24.87 | 26.02 |
| Tamil Nadu | 21.74 | 26.85 |
| Andhra Pradesh | 5.08 | 6.01 |
| West Bengal | 1.43 | 1.61 |
| Others | 2.60 | 1.13 |

Source: Horticultural Statistics at a glance, 2018

With expansion of area and production, India had made substantial improvement in the export sector also. Between 2001 to 2018, export earnings from coconut products have risen by more than 20 per cent in real value term. India's export basket of coconut products is dominated by activated carbon with 57 per cent share in export earnings during TE 2017-18 (Figure 1). Dried coconut constitutes 11 per cent followed by fresh coconut (10 %), refined coconut oil (9 %), desiccated coconut (5 %), copra(4%) and shell charcoal(4%). While looking at the trend in export in terms of value, activated carbon has exhibited higher growth compared to all other coconut products

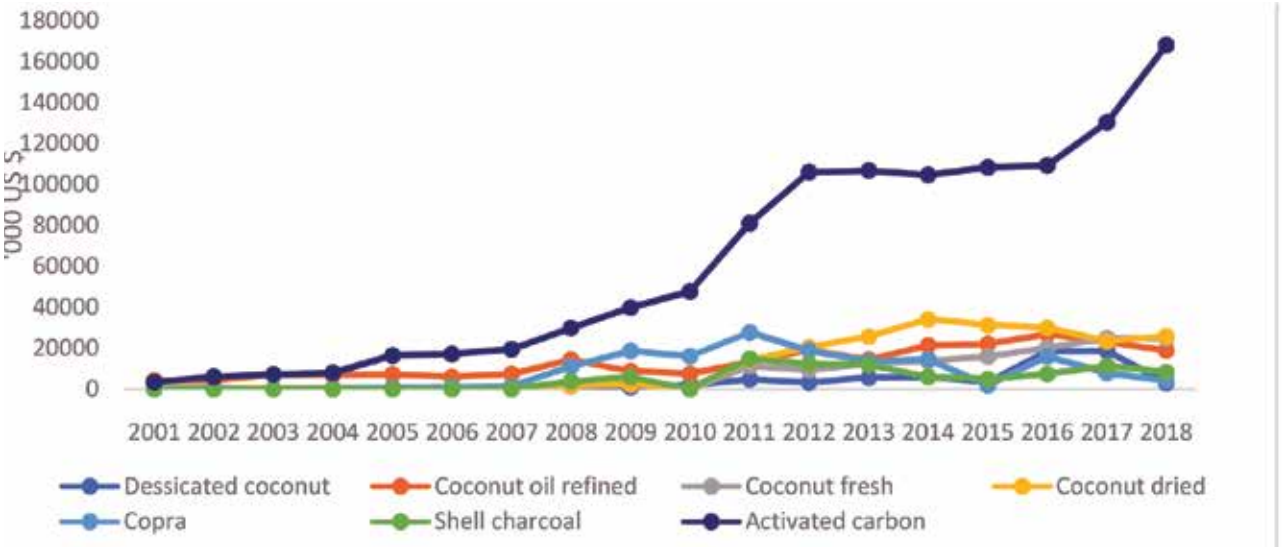



(Figure 2). Activated carbon made from coconut shell charcoal is commercially used in gold extraction from ore, water purification and treatment of industrial waste water, gas purification and air filters. India is the major player in the shell charcoal based activated carbon export in the global market with export destinations spreading to more than 100 countries. USA is the major destination for India's activated carbon.

During the triennium ending 2018, India exported around 25.67 per cent of activated carbon to USA followed by UK, Korea, Sri Lanka and China (Table 2). Sri Lanka which imports both shell charcoal and activated carbon from India is also big player in the international market. Afghanistan and Bangladesh are the major buyers of dried coconut from with a share of 18.59 and 7.92 per cent respectively. Whereas, fresh coconut was mainly exports to gulf countries like UAE (51.45 %), Oman (7.49%), Qatar (5.16%) and Bahrain (4.12%). Around 4 per cent of fresh coconut was exported to UK also. The coconut oil extracted from coconut is used by toiletry, food and pharmaceutical industry have higher demand in foreign markets. The dried copra and kernel contain around 60-65 per cent of oil. Most of India's coconut oil is exported to gulf countries which constitutes 30-35 per cent of India's total export of coconut oil. Top export destinations of Indian refined coconut oil in triennium ending 2018 are UAE (24.03 %) followed by Saudi Arabia (7.12%), Vietnam (5.18%), Qatar (4.22 %) and USA (4.10 %). Even though most of the oil exported to gulf countries, India faces an average tariff of 5 per cent from UAE, Saudi Arabia and Qatar. Besides this, India also faces non- tariff requirement from these countries which is 28 for Saudi Arabia, 21 for UAE and 9 for Qatar in terms of number. This includes requirements which are product specific as well as general agricultural products. The virgin coconut oil which is extracted from coconut milk is becoming popular in overseas market due to its health care applications and USA is the major market for virgin coconut oil.

**With expansion of area and production, India had made substantial improvement in the export sector also. Between 2001 to 2018, export earnings from coconut products have risen by more than 20 per cent in real value term. India's export basket of coconut products is dominated by activated carbon with 57 per cent share in export earnings during TE 2017-18**

In desiccated coconut also, gulf countries like UAE, Saudi Arabia, Qatar, and Kuwait dominate in import from India which together constitute around 42 per cent of India's export. Nepal constitutes 2.81 per cent of the India's desiccated coconut export. Development of the baking industry has an influence in the desiccated coconut market at the global level. Still India has to compete with major desiccated coconut exporting countries like Indonesia, Philippines and Sri Lanka to capture other markets like European Union. Copra finds its major markets in Asian countries like Bangladesh with 57.55 per cent of the export followed by Nepal (20.50 %), Iran (9.61 %), Hong Kong (3.96 %) and Vietnam (3.47 %). Shell charcoal which is a raw material for activated carbon is mainly exported to Sri Lanka (32.78%) followed by Bhutan, Netherlands, Mexico and Korea.




The status of coconut products trade indicates that India still have huge untapped potential for coconut products in the international markets. India has to diversify its markets from Asian countries to other Western countries like European Union. For this, country specific requirements should be studied and followed as they are having higher sanitary and phytosanitary standards for the imported products. ■

**Table 2: Top importers of coconut products from India during Triennium Ending 2018**

| Commodity | Top 5 importers | | | | |
|---|---|---|---|---|---|
| Activated Carbon (HS code 38021000) | USA (25.67%) | UK (5.58 %), | Korea (5.01%) | Sri Lanka (4.94%) | China (4.28%) |
| Dried coconut (HS code 08011920) | Afghanistan (18.59%) | Bangladesh (7.02%) | China (0.34%) | Bahrain (0.21%) | Canada (0.21%) |
| Fresh coconut | UAE (51.45%) | Oman (7.49%) | Qatar (5.16%) | UK (4.19%) | Bahrain(4.12%) |
| Coconut oil refined (HS code 151319) | UAE (24.03%) | Saudi Arabia (7.12%) | | Qatar (4.22%) | USA (4.10%) |
| Desiccated coconut (HS code 080111) | UAE (21.40%) | Saudi Arabia (10.97%) | Qatar (5.08%) | Kuwait (4.69%) | Nepal (2.81%) |
| Copra (HS code 120300) | Bangladesh (57.55%), | Nepal (20.50%) | Iran (9.61%) | Hong Kong (3.96%) | Vietnam (3.47%) |
| Shell charcoal (HS code 44029010) | Sri Lanka (32.78%) | Bhutan (13.02%) | Netherlands (11.91%) | Mexico (5.16%) | Korea (2.60%) |

# Integrated Management of Coconut Pests

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## Introduction

Coconut palm *Cocos nucifera* is being a perennial crop is subjected to attack by an array of insect pests round the year. There are over 750 insect species including the ones that directly feed and those which are only associated with coconut palm. Among them only a few are considered to be of economic importance. All parts of the palm viz., leaves, stem, root, inflorescence and the nuts are subjected to attack by insect pests. Damage when caused to the leaves lead to reduction in photosynthetic efficiency and decrease in value for thatching purpose but when done to inflorescence and nuts leads to direct economic loss. Hence, to tide over it has become imperative to blend cultural, mechanical, physical, chemical and biological method in a harmonious manner which is depicted as integrated pest management in coconut.

### Rhinoceros beetle *(Oryctes rhinoceros L.)* *(Scarabaeidae : Coleoptera)*

Unlike other insect pests, adult are causing damage. Apart from coconut they also infest Palmyra, date palm, wild date, areca, sago palm, pandanus, pine apple, cocasia, banana, oil palm and sugar cane etc. The pest occurs round the year with a peak spike during June to September during which the adults visit the crowns. This ubiquitous and cosmopolitan pest has currently become the greatest impediment in the early establishment of juvenile palms causing more than 20 % damage through collar entry (Ramachandran *et al.*, 1963). The rhicnoceros beetle infestation was reported on banana also (Sivakumar and Mohan, 2013).

#### *Diagnosis*

• Bore holes on furled spindle, petiole and spathe. On unfurling it exhibits a diamond shaped (V shaped) cuts on leaflets.

• Presences of chewed up fresh frass can be seen plugged the hole on the petiole.

• It bores through central shoot of the young seedling and feed on the internal content which eventually cause of bud rot, leaf rot infections RPW infestation.

• Beetles bore into the collar region of the young palms resulting in dead heart, twisted spindle with elephant tusk like symptoms and perverted leaflets

## Biology

Eggs are laid in decaying organic matters, cattle dung and compost pits. They are white / whitish brown with a size ranging from 3 - 4 mm length and 2 - 3 mm width. The fecundity is about 108 eggs / female. The peek oviposition occurs in February - April and September - October. On hatching the yellowish white grub with brown head and grayish blue abdomen remains and feed on decaying organic matter for about six months. It grows up and become stout “C” shaped grub with well developed mandible. It pupate there itself inside the agglomerated matrix of organic matter. Pupal stage lasts for 14 to 29 days. The adult beetle emerging from the breeding grounds rests for 5 - 25 days then fly to crown top for feeding. Longevity for 142 days. Males live for about 140 days. Males live up to 120 days.

**All parts of the palm viz., leaves, stem, root, inflorescence and the nuts are subjected to attack by insect pests. Damage when caused to the leaves lead to reduction in photosynthetic efficiency and decrease in value for thatching purpose but when done to inflorescence and nuts leads to direct economic loss.**

***Integrated Management***

It can be effectively managed by following integrated pest management strategies following Josephrajkumar et al., 2015.

• Field sanitation: Remove dead and decaying organic debris from coconut plantations as they serve as breeding sites for the beetles. Dead planting material which will rot when accumulated must be removed.

• Hooking out of the beetle using GI hooks. After extracting the beetles from infested palms, the wounds may be treated with Bordeaux mixture (1 %) and plug the holes with mixture neem cake powder or naphthalene balls and mud/cement. It is to prevent further entry of pathogens or insect pests

Prophylactic leaf axil filling with either of the following material

a. Naphthalene balls and sand 10.5 g (approx.3 No.s) to be done at 45 days interval (Sadakathulla and Ramachandran, 1990).

b. Neem cake / marotti cake (*Hydnocarpus sp.*) fine sand (1:1 ratio) @ 500g/palm in leaf axils around spindle during May, September and December. Or

c. Mixture of chloranthraniliprole 0.4 % WG (50 g) + 2kg Sand or mixture of chloridust 1.5 % DP (50 g) and sand (2 kg) @ 250 g / palm

d. Placement of two perforated sachets (3g) containing chlorantraniliprole (0. 4 % WG) or fipronil (0.3 % ai) per palm. 100 ml of water may pour to the sachets for subsequent release of molecule.

e. Botanical repellent cake developed by ICAR-CPCRI was found effective during monsoon phase.

f. Covering the cabbage portion of young palms or nursery seedling is very effective mechanical barrier

• Microbial control of biostages of rhinoceros beetle:

Microbial control is an aspect of biological control in which the rational use of pathogen of the pest is included to maintain pest below ETL in agricultural environments. (Nair et al 2002).

**Oryctes rhinoceros nudivirus (OrNV)**

Larval and adult stages are susceptible to OrNV infection (Purrini, 1989). The pathogen has per - os mode of infection through contaminated food. Release of virosed beetles in the field @ 12-15 beetles / ha during dusk, to contaminate the breeding sites and spread the disease to life stages present in the breeding sites. Over a period of 5-6 months considerable reduction in rhinoceros beetle population may be achieved. This technology is highly successful in island where infiltration of natural population is less.

Green muscardine fungus, Metarhizium anisopliae: It is a deutromycets fungus which cause green muscardine disease to grubs and grub die within 10 – 15 days. Infected grub turn into green colour due to production of powdery spores. Treat the breeding sites with green muscardine fungus spores suspension @ 5 x 1011 spores / m3. It is a successful tactics where high humidity and ambient temperature prevail.

**Insect growth regulator:** A weed plant, Clerodendron infortunatum L. harbor insect juvenile hormone analogue which posses growth regulating effect on rhinoceros larvae. It prevents / retards the development of eggs / larvae to a normal adult. Treating the breeding sites with Clerodendron infortunatum @ 1: 10 w/w/ basis results in good control of rhinoceros beetle.

**Mass capturing and destruction by use of aggregation pheromone:** Pheromones are volatiles substance released by insect which induce behavioural changes in receiving conspecific individual. Oryctalure [ethyl 4-methyloctanoate]' is the aggregation pheromone of rhinoceros beetle which is capable of attracting male and female beetles to the trap. Use of PVC trap lured with pheromone impregnated in nanomatrix @1 trap / ha is an innovative method in pest suppression. Avoid installation of traps in gardens with juvenile palms.

**Red Palm Weevil - Rhynchophorus ferrugineus Oliver *(Curculionidae : Scarabaeidae)***

Red palm weevil a fatal enemy and a key pest of coconut palm. Young palms < 20 years succumb to severe damage when infested by this pest. Infection by bud rot, leaf rot disease and

infestation of rhinoceros beetle are predisposing RPW incidence. It is distributed in India, Sri Lanka, Middle East countries, Thailand, New Guinea, Spain and Philippines. Red palm weevil occurs round the year but become serious after monsoon. Alternate hosts are areca, Caryota, Coelococcus, Nypa palms, Palmyrah and oil palm. The adult weevil is ferrugineously brown with long curved and pointed snout. The males are differentiated from females by a tuft of hairs on dorsal side of the snout. The life cycle is completed in four months and the females are short lived than males.

***Diagnosis***

Being an internal feeder it is very difficult to

detect the damage caused by red palm weevil at an early stage.

• Wilting of the central spindle,

• Presence of holes in the trunk with reddish brown fluid oozing out

• presence of chewed fibres, larvae and cocoons, pupal case inside the trunk if it split open.

• Above mentioned symptoms become prominent in advanced stages which the affected

• On severely infested palms, gnawing sound of the grub inside is audible

***Biology***

Female beetle commence oviposition 1- 7 days after mating. Eggs are laid in the wound present in the crown, cracks and crevices in the trunk or in the collar region. Creamy white elongated, oval shaped eggs hatch in 2- 3 days. Fecundity of the female is 276 eggs. Incubation period ranges from 2- 3 days. Larval period ranges from 36 - 78 days, after that it forms a cocoon with the debris and pupal stage last for about 12 to 33 days. The adult weevil is ferrugineously brown with long curved and pointed snout.

The pest incidence can be management by adopting intergrated management programme *(Abraham et al., 1998)*

***Management***

• Maintaining optimum palm density is crucial for harnessing highest benefits of light energy and reducing pest attack

• Crop habitat diversification: Red palm weevil is highly sensitive to kairomonal volatiles emanating from coconut palms. As the intercropped system releases a bouquet of volatiles which makes the beetles difficult to locate the hosts for egg laying

• Clean cultivation: Crown toppled palms which are serving as breeding site for the RPW in a garden should be immediately destroyed so as to avoid lateral spread

• Avoid causing injury to the palms. Mechanical injury if caused may be covered with mud or coal tar. While cutting fronds, a petiole length of 1.2 m may be left behind so that proximity of cut end and crown can be reduced.

• Prophylactic leaf axil filling suggested for the management of rhinoceros beetles and bud rot disease are to be attempted.

• Crown cleaning, regular surveillance and timely diagnosis of the incidence of through close monitoring and vigilant scouting.

• Placement of three filter paper sachets containing 12 - 15 Heterorhabditis indica - infected Galleria mellonella cadavers on the leaf axils after application of 0.002 % imidacloprid.

• Palms showing early stage of infestation may be subjected to curative treatment of stem injection with spinosad 2.5 % SL @ 4 ml / litre or imidacloprid 17.8 % SL @ 0.6 – 1 ml/ litre and plug the hole with cement or mud. If the damage occurs in the crown, damage portion may be removed and insecticide suspension may be poured in. Harvest the nuts after a safe period of 45 days. If infestation is through trunk, a slanting hole is made above the point of infestation and the insecticide solution may be poured with a funnel/ a wash bottle.

• Use of pheromone trap: Aggregation pheromone which attract both the sexes along with host plant volatile is exploited here for entrapping. To a plastic buckets of 5 litre capacity four windows (5 x 1.5 cm) below the rim of the bucket is made and to it the coconut fibre / jute sack is wound over it. The commercially available pheromone lure (Ferrolure) is hung inside on the lid of the bucket. The efficiency of pheromone trap can be enhanced by placing 100 g pine apple / sugarcane / banana, 2 g yeast in one litre of water which works as the kairomone. Do

not keep the trap in young garden. This technology would be successful if taken up in a community basis and prophylactic leaf axil placement of repellent on palms surrounding to pheromone trap.

### Leaf eating caterpillar/Black headed caterpillar Opisina arenosella Walker *(Oecophoridae: Lepidoptera)*

The leaf eating caterpillar / black headed cater pillar causes severe damage to palms in coastal and back water areas in certain pockets of peninsular India. It is a sporadic pest and outbreak occurs during summer months (Feb - May) which lead to severe damage to coconut plantation. In India it occurs in Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Orissa, West Bengal and Gujarat. Apart from coconut they are known to feed on palmyrah, tailpot palm, wild date, ornamental palm and banana are some of the recorded host. (Pushpalatha and Veeresh, 1995)

***Biology***

Eggs are laid distally on the lower surface of the leaflet near the old gallery. Incubation period prolongs for 5 days. The larval period lasts for 42 days with eight instars including the pre pupal stage. Pupation occurs in the gallery and it is brown in colour. Adult emergence occurs after 12 days of pupal period which coincides with 3 – 5 pre monsoon showers in May - June.

***Damage symptoms***

• The older leaves of the palms are reduced to dead brown tissues and only three or four youngest leaves at the centre of the crown remain green.

• The larvae are harbored in the lower leaflets in galleries made of excreta and silken web which appear as saw dust.

• It gregariously feeds on chlorophyll containing parenchymatous cells by reducing the photosynthetic area, leaving upper epidermis intact which appears as papery white patch on leaf blade.

• In case of severe infestation, the whole plantations exhibit a scorched appearance.

Leaf eating caterpillar incidence can be successfully managed by biological approach. Classical biological control programmes have been developed and demonstrated. An array of egg/ larval / pupal parasitoids are present in nature (Pillai and Nair, 1993)

***Management***

• Cut and burn severely infested lower whorl of leaves and four leaves in the next whorl where live biostages can be seen.

• During sporadic outbreaks the pest can be kept under check by spraying dichlorvos 0.2 % or with chloranthraniliprole 18.5 SC @ 1 ml / litre or with malathion 50 EC @ 4 ml / litre on the ventral side of the fronds

• Biological control using egg / larval / prepupal / pupal parasitoids

• Field release of parasitoids may be done as follows: Goniozus nephantidis @ 20 parasitoids / palm, Bracon brevicornis @ 30 parasitoids / palm, the pre - pupal parasitoid, Elasmus nephantidis @49/100 pre-pupae, and the pupal parasitoid Brachymeria nosatoi @ 32 / 100 pupae at the appropriate time was found effective in the sustainable management of the pest. (Pillai and Nair 1993).

### White grubs / Root grubs Leucopholis coneophora Burm., L. burmeisteri Brenk., L. lepidophora Blanch. *(Scarabaeidae: Coleoptera)*

It is a polyphagous subterranean pest of national importance which prevalent in costal belts of peninsular India. L. coneophora burm. is distributed in plains and areas where coastal sandy or sandy loam soils prevails. Coconut grown in parts of Dakshina Kannada districts, L. burmeisteri is present and in hilly tracts where clayey loam soil is prevalent, L. lepidophora is found associated with coconut based cropping systems. Apart from coconut it feeds on arecanut, rhizomatous and tuberous and other intercrops raised in palm garden viz., tapioca, colocasia, dioscoria, sweet potato, elephant foot yam, fodder grass, rubber, cocoa, banana etc.

***Biology***

Adult emergence commence with the onset of summer showers in April after a pause in May it resumes with the setting of south west monsoon in May – June in case of L. coneophora and L. burmeisteri. L. lepidophora adult emergence occurs in the month of August. Eggs are oval in shape and creamy white in colour. Freshly laid eggs measures 5 mm long and 4 mm width. Prior to hatching they turn to dirty white. The larvae are “C” shaped, I has annual life cycle. Whereas, other two species has biennial life cycle. (Abraham, 1983 and Prathibha, 2015).

***Management***

• Collection and destruction on beetles during emergence season. Hand picking and destruction of adult beetles for three weeks starting first day of south west monsoon daily in the evening 6.30 to 7.00 pm (Abraham, 1993; Prathibha et al., 2013).

• Blanket application of bifenthrin @ 2 kg ai / ha (Talstar 10 EC @ 20 litre / ha in 500 L of water) when first instar stage of grubs dominate in the field

• Root zone application of chlorpyriphos 20 EC @ 2kg ai / ha (i.e @ 7 ml / palm after 45 days of first round insecticide application

• Drenching aqua suspension of EPNs Steinernema carpocapsae in the interspaces 5-10 cm depth with 40 - 50 Lakh ijs / 5 litre of water. Repeat application of EPN as and when needed based on the grub population.

• Repeated ploughing to expose the grubs to predators / digging and removal of grubs during October to December

**Eriophyid mite Aceria guerreronis Keifer**
***(Eriophyidae: Prostigmata)***

Coconut eriophyid mite first reported from Guerrero state of Mexico in 1965, later it spread to Carribian islands and Latin American countries and Africa. In India the first report on eriophyid mite infesting coconut was made during later part of 1997 from Ernakulam District of Kerala. Since their dispersal is by wind, their distribution to neighboring states Tamil Nadu, Karnataka, Andhra Pradesh and Pondicherry occurred in relative short span of time. Mite incidence can be seen round the year with a peak in summer months and during prolonged dry spells in the monsoon, with a slight reduction during the rainy season. The continued presence of these mites in the nuts causes a yield loss to the tune of 20 – 30 % in terms of copra yield. Severe infestation leads to button shedding (Rajan *et al*., 2009).

***Damage symptoms***

• Mite feeding cause physical damage to the cell as a result yellowish discolouration which grow downward as elongated triangular patch.

• It turns brown and later appears as longitudinal fissures and warts on the nut as it develops

• Button shedding

***Biology***

Adult mite is wormiform, having 200 - 250 micron length with yellowish white colour. Adults have two pairs of legs at the anterior end of the body. The life cycle completes in 7 days.

***Management***

• By adopting proper agronomic practices viz. integrated nutrient and water management. Under nutritional management, balanced application of NPK fertilizers (500:320:1200), 5 kg neem cake, recycling of organic biomass, raising of suitable green manure crops like cowpea or sunnhemp in coconut. Enhancing nutrient strength of the palm by incorporation of Azospirillum.

• Kalpaharitha (a selection of Kulasekaram Tall) recorded lowest mite incidence in the field and could be a preferred choice in endemic zones.

• Regular crown cleaning and removal of dried spathes, inflorescence parts, fallen nuts and destroying so as to reduce the pest inoculum and consequent infestation.

• Spraying with either of the following eco-friendly materials thrice a year ( during March-April, October - November and December - January) can suppress pest attack

• 2 % neem oil - garlic emulsion ie., Neem oil : garlic : soap (20 ml: 20g: 5g in L of water)

• Spraying of 0.004 % aqua suspension of commercially available neem formulation (azadirachtin 1 % ai) @ 4ml / L of water

• 20 % Palm oil - 0.5 % Sulphur emulsion:- Palm oil : sulphur : soap (200 ml: 5 g: 12g/L of water)

• Root feeding with commercially available neem formulation (azadirachtin 5 % ai) @ 7.5 ml + 7.5 ml water in sandy/ sandy loam soil

• Spraying of acaropathogenic fungus Hirsutella thompsonii @ 20 g talc formulation / L of water containing 1.6 x 108 cfu is also found promising.

Care to be taken to direct the spray fluid on the petiolar end of butter as the mites colonise under the perianth

**Coreid bug Paradasynus rostratus Dist.**
***(Coreidae : Hemiptera)***

It occurs in coastal areas and high ranges in Kerala. Incidence is on higher side on Trivandrum, Wynad and Kasaragod district of Kerala. Apart from coconut it feeds on tamarind, cocoa and guava. The peek population occurs during post monsoon period. The

adults and nymphs feed by desapping the contents on button and developing button below perianth region (Rajan and Nair 2005).

***Damage symptoms***

- Shedding of nuts/ button
- Presence of gummy exudates and cracks on nuts
- Malformation of nuts

***Management***

- Crown cleaning to destroy eggs and immature stages
- Spraying of azadirachtin 300 ppm (Nimbecidene) @ 0.0004% (13 ml / L). Two rounds of azadirachtin spray young coconut bunches of 1-5 months ago, during May-June and September-October
- Spraying lambda cyhalothrin 5 EC @ 1ml/L on the pollinated bunches

**Scale insects *(Aspidiotus destructor Sign., Aonidiella orientalis Mask., Lepidosaphes migregori Banks ) (Diaspididae : Hemiptera)***

Occurrence is sporadic nature and mostly occurs during summer. Apart from coconut they also infest banana, guava, citrus, ginger etc.

***Diagnosis***

- It forms ecrustations over the entire lower lamina resulting in severe yellowing and drying of leaves.
- In addition to leaves they also infest flower, spike and nuts.

***Management***

- Spraying of fish oil rosin soap (2.5 %)
- Two round spraying of malathion at 20 days interval
- Release of predatory coccinellid beetle Chilocorus nigritus

**Mealy bugs *(Palmiculator palmarum Ehrhon, Pseudococcus cocotis Maskal, P. longispinosis Targ. (Pseudococcidae : Hemiptera)***

Mealy bug colonise on all tender plant parts like bases of spear leaf, spadix and inflorescence and beneath the perianth of the coconut. Colonization by the mealy bug on the spindle leaves results in failure of heart leaf development and eventually results in death of the seeding. In case of severe infestation the spadix remains stunted coupled with immature nut fall. Phoretic association of ants is seen with the mealy bugs.

***Management***

- Spraying of 0.05 % dimethoate

**Slug caterpillar *(Macroplectra nararia Moore, Conthyla rotunda Habu, Latoia lepida Cramer (Limacodidae : Lepidoptera)***

It is a sporadic pest on coconut with a peak infestation occurs in post monsoon and summer months. The caterpillar feeds gregariously on entire lamina leaving the mid rib alone. The caterpillar resembles slug with spines all over the body.

***Diagnosis***

- Scorched / burnt appearance of leaves on severe infestation
- Early - instar caterpillars consume the epidermis of leaf leaving the upper surface intact and the grown - up caterpillars feed voraciously on leaf lamina leaving the midrib
- Leaf spot - like black halo marking develops on the feeding areas which later coalesce and form bigger lesions
- Feeding damage promotes the infection of grey leaf blight fungus, Pestalotiopsis palmarum
- On severe infestation, all functional leaves are dried up leaving only the inner leaves thus affecting the photosynthetic efficiency of the palm
- Premature drooping of leaves and shedding of nuts and reduction in nut yield

**Nut borer *(Cyclodes omma Pyralidae: Lepidoptera)***

The caterpillar bore into developing button at perianth portion and cause nut drop.

Hand picking and destroying is the effective management tactic.

**Inflorescence caterpillar / coconut moth : Batrachedra arenosella *(Batrachedridae : Lepidoptera)***

Larvae bore on the female flowers and Rachelle of inflorescence.

***Diagnosis***

- Presence of gummy exudates on inflorescence and male flowers glued together
- Presence of bore holes on female flower and caterpillar inside ■

*Reproduced from Enhancing productivity in coconut- Quality planting material and agro-techniques*

# It is all about
# Coir Fibre Jewellery

**Shameena Beegum*, P.P., Masood, P.****
*ICAR CPCRI Kasargod, **CDB

At a first look, no one would believe that these are made out of coir fibre. Yes, it is! These ornaments were made at the Coir Jewellery working under the Coir cluster unit of Androth Island of Lakshadweep. Lakshadweep islands are bestowed with coconuts. Coconut is in fact very closely associated with the socioeconomic and cultural life of the people of Lakshadweep. Coconut cultivation and production and marketing of copra constitute the major livelihood option in these islands. Coconut husk, one of the by-product of coconut is generally used as fuel in household once after drying besides transporting to coir fibre factories under the Department of Industries for converting it into coir fibre and further processing into value added products such as coir fibre, coir yarn, curled fibre, coir mats etc. As of now, five coir fibre factories, five production demonstration centres and seven fibre curling units are functioning in different islands. The Coir production cum demonstration centre situated in Androtт Island engages around 12 workers; 11 women and one male working with six spinning machines.

As an extension to the coir centre, a coir jewellery has been functioning since 2009 under the supervision of Mr. Sayyed Muhammed. Initially, five women workers were trained in coconut fibre based jewellery and handicrafts making at National Coir Training & Design Centre (NCT&DC) functioning under the Central Coir Research Institute of Coir Board, Kalavoor, Alappuzha district of Kerala. Since then, making of coconut fibre based ornaments and jewellery items were successfully initiated in the island. By 2016, these master trainers started imparting training to selected women from the island. Presently the unit is having 40 trainees in two shifts. The trained women make very attractive ornaments using coir fibre. Earrings, hangings, necklace, finger rings, long chains and bangles are some of the items made by them. The initial step is making coir fibre duct. It will take around 10 min to make one duct. A long chain is made with 200 ducts. Minimum two days are required to finish one product. It needs immense patience and soft skill to make these kinds of products.

## Challenges

Lack of public awareness about coir based jewellery items, Non conducive location of the unit as it is located adjacent to the fish market, lack of proper market, improper unattractive packages, inadequacy of proper schemes by the concerned governmental agencies to support these trained women and Low price for the premium jewellery items.

## Strategies

Interventions are needed for facilitating the formation of women SHG on coconut fibre based jewellery making and handicrafts in the islands along with support for arranging exhibitions and sales of items, especially in islands which are visited by number of tourists. Coir jewellery should get a name and fame like any other traditional jewellery like terracotta or thread based jewellery. There is scope for starting a coir fibre jewellery unit –cum- incubation centre as part of the coir factory for which financial assistance can be made available from related department.

# Buyer Seller Meet


A buyer seller meet and seminar on coconut food products was organized by Coconut Development Board in association with Indian Chamber of Commerce at Guwahati, Assam on 29th November 2019. Shri. Obed L. Director , Coconut Development Board delivered the keynote address wherein he mentioned that coconut from India fetches the highest price compared to other commodities in the international market. But there are no regulated market and processing plants as of now in the North Eastern India. Assam is the lead producer of coconut in the North East. Coconut from Assam is traded in places like Bhutan, Nepal, Bihar and all other North Eastern States. The total value of coconut produced in North East is around 30 crores. Coconut is mostly used in religious and festival purpose in the region. He suggested to have a Marketing Center in Guwahati where coconut can be marketed centrally in an organized manner. Mr Abdul Jalil Asst. Director, Department of Horticulture, Govt. of Assam who spoke during the seminar highlighted the initiatives taken by his department in collaboration with Coconut Development Board in last two years. Dr. Binod Kumar Yadav, Professor and HOD of Indian Institute of Food Processing highlighted on the various value added products especially Nutraceuticals that can be produced from Coconut. Coconut water, a very popular drink in the region can be preserved and can be marketed with higher shelf life. Various products like vinegar, Vitamin B12 etc also can be extracted from coconut with the help of right technology. He offered support in terms of transfer of technology for making value added products from coconut.

Dr P K Mahanta, Director, Department of Horticulture, Govt. of Assam elaborated on the various initiatives taken by Govt. of Assam in coconut production. Assam produces around 10 lakhs of nuts every year with every tree producing around 60 nuts per annum. The production of nuts per tree in other parts of the country is around 75 nuts per annum and he called upon to reach this rate of production with the use of high yielding varieties. Smt. Deepthi Nair S, Deputy Director, Coconut Development Board in her address spoke on the objective of the Buyer Seller Meet of introducing various value added products to the people of North East who have not come across such products. She spoke on the prospects of Neera Sugar which is high in minerals which has numerous benefits for diabetic patients, Alzheimer patients, Thyroid patients etc. There is also a lot of wastage of coconut by products which can fetch high value in the market. She gave an example how eco friendly plates can be manufactured from coconut. Companies in USA like Pepsi and Coco Cola have introduced healthy coconut drinks with global branding. They are also importing this products from countries like Indonesia and Philippines. Virgin coconut oil and capsules which are now mostly produced by some South India based companies helps in boosting the immunity system of the body.

Entrepreneurs, government officials, buyers and sellers took part in the programme.

# Entrepreneurship Development Programme on Organic Cultivation of Coconut and Value Addition

An Entrepreneurship Development Programme (EDP) on organic cultivation of coconut and value addition for Lakshadweep island was conducted at ICAR-Central Plantation Crops Research Institute, Kasaragod during 15th November to 3rd December 2019. The programme was sponsored by National Horticulture Board with an objective to provide necessary skill and knowledge to empower the selected young farmers and entrepreneurs from different Lakshadweep Islands and organize the farmers on cluster basis to initiate agri-business venture for income and employment. Coconut plays a vital role in economic and ecological sustainability of the Island ecosystem of Lakshadweep as more than 80% of the total geographical area of the islands is covered under coconut. The economic benefit from organic cultivation is still not realized by the Lakshadweep coconut farmers. Although per hectare productivity in coconut is very high in Lakshadweep islands, value addition is limited to production and marketing of only copra oil. This is mainly due to unorganized farming sector characterized by fragmented land holdings.In the EDP, thrust was given for empowering the young farmers from Lakshadweep islands to functional clusters and to venture into agri-businessof various value added coconut products targeting domestic and export markets.The newly formed Farmer Producer Companies (FPO's) can make efforts to tap the potential for marketing coconut value added products as 'Lakshadweep organic' brand. As part of the EDP a 15 selected farmers and entrepreneurs from different Lakshadweep islands registered for this second batch of training in the series. The inaugural function of the Programme was held on 16th November at ICAR-CPCRI, Kasaragod and Dr.Anitha Karun, Acting Director, ICAR-CPCRI inaugurated the programme. Dr K. Muralidharan, Head, Social Science Division offered felicitations. Dr. C.Thamban, Principal Scientist and Course Director welcomed the gathering and presented the outline of the Entrepreneurship Development Programme. Dr.M. Sujithra, Scientist and course co-ordinator proposed vote of thanks.

The training module was broadly divided into three components viz. training programme on organic production of coconut and value addition at ICAR-CPCRI, Kasaragod, internship with successful entrepreneurs, formation of Coconut Producers Company and how to make it successful and become competitive. During the training at ICAR-CPCRI, the participants were exposed to various activities such as coconut nursery management, cultivation practices, varieties, pest and disease management and post-harvest products and practices by scientists of CPCRI and external faculties. For internship programme the participants were divided into four groups for hands on training to the successful coconut based value addition units managed by entrepreneurs and were sent to SUBICSHA Coconut Producer Company, Naduvannur, Kozhikode district, Thejaswini Coconut Producer Company, Cherupuzha, Kannur district, St Marry's Defibering unit, Payyanur, Kannur and Dinesh Foods, Kannur. In the third component of the training, interactive sessions on formation of FPOs and group discussion was held at ICAR-CPCRI. The valedictory function was held on 2nd December and Mr. N. Kannan, LDM, Syndicate Bank, Kasaragod was the chief guest of the programme. Dr. C. Thamban, Principal Scientist and Course Director offered felicitations to the trainees and Dr. K. Muralidharan, Director-in-charge, ICAR-CPCRI distributed certificates to the participants. Dr. M. Sujithra, Scientist and course co-ordinator presented report of the training programme and Dr.Krishna Prakash, Scientist and course co-ordinator proposed vote of thanks.

*Report Prepared by Dr. Krishna Prakash, Scientist, CPCRI*

# CDB Invites Excellence in Export Awards

In order to recognize the efforts of exporters, the Coconut Development Board (CDB), which is the Export Promotion Council for Coconut products, has instituted Awards for "Excellence in Export Performance". Export awards are given to top exporters under different categories every year, as detailed below.

| Award Category | No. of Awards |
|---|---|
| Best Manufacturer Exporter Large | 1 |
| Best Manufacturer Exporter Medium | 1 |
| Best Manufacturer Exporter Small | 1 |
| Best Manufacturer Exporter Micro | 1 |
| Best Merchant Exporter Merchant | 1 |
| Best woman Manufacturer Exporter Manufacturer | 1 |
| Best woman Merchant Exporter Merchant | 1 |
| Best innovative Exporter Manufacturer | 1 |
| Best Farmer Producer Organisation Manufacturer | 1 |

## General Conditions

1. The applicant must be a RCMC holder of the Board during the Financial Year 2018-2019 for being eligible for submission of application for Export Excellence Award.
2. The Board shall not entertain/consider "Third Party" Exports for Awards. "Third Party" Exports shall mean exports executed by an Exporter or Manufacturer for and on behalf of another Exporter(s), wherein the "First Party" will not come in the picture, and all the export documents will bear the name, address and other details whereof, of the "Third Party";";
3. The Applicant shall forward the application for Export Awards in the prescribed format.
4. The Applicant is required to submit to the Board a Chartered Accountant's Certificate, duly certifying the value of the individual item exported along with the application (Format given below)
5. All the applications received from aspiring member-exporters will be scrutinized for authenticity/eligibility criteria by the Board. The Board reserves the right to call upon the applicants to produce the original export documents in support of the application(s) made, if necessary;
6. Award for best export performance in the categories shall be considered on the basis of best export performance during the year in all items of coconut and coconut products put together.
7. The winners of award for Export Performance in all categories will be decided on the basis of F.O.B value of export.
8. The total export turnover of coconut products needs to be mentioned in the application form. The application form needs to be certified by a Chartered Accountant.
9. Not More Than One Award will be offered to any Award Applicants.
10. All applicants are required to clearly mention the award(s) applied for in the application form, failing which the applications would be liable to be rejected.

The Award Committee of the Board, constituted from time to time by the Chairman of the Board, would decide on the category of applicants and awards based on documentary evidences available with the award application. The decisions taken by the Award Committee will be final and binding. Duly filled in application form, along with the necessary documents have to be submitted to **The Chairman, Coconut Development Board, Kerabhavan, SRVHS Road, Kochi-682 011 latest by 16th January 2020.**

# Krishithon 2019

Coconut Development Board, State Centre, Thane participated in 14th edition Krishithon exhibition - 2019 from 21st to 25th November -2019 at Nashik, Maharashtra

Shri.B.Radhakrishnan, Collector, Nashik inaugurated the exhibition In the presence of Shri. Harishchandra Chauhan, Ex-Hon'ble Member of Parliament, Lok Sabha Dindori, Nashik District. Shri.Sanjay Nyaharkar, Chairman, Human Service Foundation, Nashik and other officials were present on the occasion. More than 180 exhibitors viz. best companies among manufacturing machines, equipments, input suppliers and semi processed product in the food industry exhibited their products and services in the exhibition.

Coconut Development Board displayed various value added coconut products like packed tender coconut water, coconut oil, coconut milk powder, virgin coconut oil and well informative charts and posters etc. Board publications, leaflets and brochures were also distributed in the stall. VIPs, officials of various National companies and NGOs and business communities visited our CDB Stall.

Coconut Development Board, participated in the exhibition. Shri.Kapish Gupta representative of Keratech (P) Ltd. Kerala, manufacturer of Virgin Coconut Oil, Desiccated Coconut Powder, Virgin plus tablets, Coconut Cream etc, Shri.K.V.Ravindran, Jupitor handicraft manufacturer and Shri. Gaouda, representative of M/s. Madura Agro Process Pvt.Ltd. Coimbatore, Tamil Nadu, manufacture of Coconut Water, Coconut Sugar, Coconut Chips etc. displayed their products in the CDB stall.

## CDB participated in various exhibitions

Otattukara Fest, Alappuzha

Chaithanya Karshikamela, Kottayam

## Retirement

*Smt. Syamala Raveendran, Senior Field Officer retired from the service of Coconut Development Board on 30th November 2019 after rendering around 33 years of service.*

# Farmers Field Day Programmes


Baska, Assam


Bhanjanagar, Odisha


Kendrapara, Orissa


Kozhikode, Kerala

In order to impart knowledge and skill on INM, IPM, IDM etc to the farming community, CDB is conducting Farmers Field Day Programmes atBlock/Gram Panchayat level across the country in all coconut growing areas. Front Line Demonstration in one or more crops and/or allied sector activities will be conducted at farmers field. IntegratedCrop Management including field preparation and seed treatment will be demonstrated as part of the programme. CDB is planning to conduct around 750 farmers field day programmes across India.

# District Level Seminar on Coconut Cultivation Technology

Coconut Development Board, State Centre, Pitapally, Odisha in association with the office of the Deputy Director of Horticulture, Dhenkanal conducted a district level Seminar on Coconut Cultivation Technology on 25th November at Transit Nursery Dhenkanal district, Odisha.

Dr.Jagateswar Behera Assistant Director of Horticulture, Hindol, Dhenkanal welcomed the gathering and discussed with the farmers about the prospects of coconut cultivation in the district. More than 100 farmers were present in the programme Dr. Debabrata Panigrahi, ADR-RRTTS, Mahisapat, Dhenkanal emphasized the necessity of increasing area under coconut and production and productivity of coconut to bring Odisha to a higher position in India. He spoke on scientific coconut cultivation technology like mother palm selection, seed nut selection, nursery management, scientific way of planting, intercultural operations etc.

Dr.Dibya Sundar Kar,Scientist (Horticulture),KVK Dhenkanal spoke on on Integrated Nutrient Management, Integrated Pest Management, and Integrated Disease Management in coconut. Dr.Jagateswar Behera Assistant Director of Horticulture, Hindol,Dhenkanal ,Odisha discussed with the farmers on 'Value addition in Coconut' and explained about various value added products of coconut like VCO, chips, vinegar, desiccated coconut, coconut milk, coir based products, husk based products etc.

Dr.Rajat Kumar Pal, Deputy Director, CDB spoke on CDB schemes and explained the various schemes like, AEP,LODP,OMU,RCN and CPS formation and various trainings implemented by CDB in detail. The importance of CPSs formation in the district for the benefit of coconut farmers was a major discussion point during the technical session.

The district level training programme helped the farmers in gaining knowledge and farmers raised their queries during the interactive session. The resource persons in the training programme cleared the doubts of farmers.

The programme ended with vote of thanks by Dr.Jagateswar Behera, Assistant Director of Horticulture, Hindol, Dhenkanal.

# 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 are 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 hours, resulting in button shedding. Palms subjected

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

Mite damaged nuts

Progression of mite damage

Mite colony

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 completed 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, 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 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.

In the cyclone Gaja affected regions of Tamil Nadu and Titli affected regions of Andhra Pradesh, pest scouting for rhincoeros beetle and red palm weevil should be undertaken and all prophylatic strategies suggested should be undertaken.

## 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. and Subramanian, P., ICAR-CPCRI Kasaragod; Joseph Rajkumar ICAR-CPCRI Regional Station, Kayangulam)

# Market Review – November 2019

## Domestic Price

### Coconut Oil

During the month of November 2019 the price of coconut oil opened at Rs.15925 per quintal at Kochi, Rs.15900 per quintal at Alappuzha market and Rs.17500 per quintal at Kozhikode market. During the month , price of coconut oil at Kochi and Alappuzha markets expressed an upward trend. However the prices expressed a downward trend in Kozhikode market during the month.

The price of coconut oil closed at Rs. 16150 per quintal at Kochi, Rs.16150 per quintal at Alappuzha market and Rs.17300 per quintal at Kozhikode market with a net gain of Rs.225, Rs.250 per quintal at Kochi and Alappuzha market and a net loss of Rs.200 per quintal at Kozhikode market respectively.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.12900 per quintal, expressed a mixed trend during the month and closed at Rs.12800 per quintal with a net loss of Rs. 100 per quintal.

| Weekly price of coconut oil at major markets Rs/Quintal) | | | | |
|---|---|---|---|---|
| | Kochi | Alappuzha | Kozhikode | Kangayam |
| 01-11-2019 | 15925 | 15900 | 17500 | 12900 |
| 02-11-2019 | 15925 | 15900 | 17500 | 13000 |
| 09-11-2019 | 15825 | 15800 | 17200 | 12667 |
| 16-11-2019 | 15950 | 15800 | 17300 | 13000 |
| 23-11-2019 | 16150 | 16150 | 17300 | 13000 |
| 30-11-2019 | 16150 | 16150 | 17300 | 12800 |

### Milling copra

During the month, the price of milling copra opened at Rs.10225 per quintal at Kochi, Rs.10150 per quintal at Alappuzha market and Rs.10300 per quintal at Kozhikode market. The price of Copra at all three markets in Kerala expressed a mixed trend during the month.

The prices closed at Rs.10450 at Kochi, Rs.10400 at Alappuzha market and Rs.10550 at Kozhikode market with a net gain of Rs.225, Rs.250 and Rs.250 per quintal at Kochi, Alappuzha and Kozhikode market respectively.

At Kangayam market in Tamilnadu, the prices opened at Rs. 8900 per quintal and closed at Rs.9000 per quintal with a net gain of Rs.100 per quintal.

| Weekly price of Milling Copra at major markets (Rs/Quintal) | | | | |
|---|---|---|---|---|
| | Kochi | Alappuzha (Rasi Copra) | Kozhikode | Kan-gayam |
| 01-11-2019 | 10225 | 10150 | 10300 | 8900 |
| 02-11-2019 | 10225 | 10150 | 10300 | 8900 |
| 09-11-2019 | 10125 | 10050 | 10150 | 9000 |
| 16-11-2019 | 10250 | 10050 | 10400 | 9000 |
| 23-11-2019 | 10450 | 10400 | 10500 | 9000 |
| 30-11-2019 | 10450 | 10400 | 10550 | 9000 |

### Edible copra

The price of Rajapur copra at Kozhikode market opened at Rs. 13000 per quintal expressed an overall fluctuating trend during the month and closed at Rs.13200 per quintal with a net gain of Rs.200 per quintal.

| Weekly price of edible copra at Kozhikode market (Rs/Quintal) | |
|---|---|
| 01-11-2019 | 13000 |
| 02-11-2019 | 13000 |
| 09-11-2019 | 12800 |
| 16-11-2019 | 13000 |
| 23-11-2019 | 13000 |
| 30-11-2019 | 13200 |

### Ball copra

The price of ball copra at Tiptur market which opened at Rs.12500 per quintal expressed a mixed trend and closed at Rs.11726 per quintal with a net loss of Rs. 774 per quintal.

| Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal) | |
|---|---|
| 01-11-2019 | 12500 |
| 02-11-2019 | 12500 |
| 09-11-2019 | 12200 |
| 16-11-2019 | 12300 |
| 23-11-2019 | 11800 |
| 30-11-2019 | 11726 |

### Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.10150 per quintal expressed a downward trend during the month. The prices closed at Rs.9850 per quintal with a net loss of Rs.300 per quintal.

| Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal) | |
|---|---|
| 01-11-2019 | 10150 |
| 02-11-2019 | 10150 |
| 09-11-2019 | 10150 |
| 16-11-2019 | 10150 |
| 23-11-2019 | 9950 |
| 30-11-2019 | 9850 |

### Coconut

At Nedumangad market the price of partially dehusked coconut opened at Rs.15000 per thousand nuts and closed at Rs.16000 during the month.

At Pollachi market in Tamil Nadu, the price of coconut opened at Rs.12000 per thousand nuts and closed at Rs.13000 during the month. At Bangalore APMC, the price of partially dehusked coconut opened at Rs.23000 and closed at Rs.15000 per thousand nuts during month. At Mangalore market the price of partially dehusked coconut opened at Rs.22000 per thousand nuts and ruled at same price throughout the month.

| Weekly price of coconut at major markets (Rs /1000 coconuts) | | | | |
|---|---|---|---|---|
| | Neduman-gad | Pollachi | Banglore | Mangalore (Grade -1) |
| 01-11-2019 | 15000 | 12000 | 23000 | 22000 |
| 02-11-2019 | 15000 | 12000 | 23000 | 22000 |
| 09-11-2019 | 16000 | 13000 | 23000 | 22000 |
| 16-11-2019 | 16000 | 13000 | 23000 | 22000 |
| 23-11-2019 | 16000 | 13000 | 17000 | 22000 |
| 30-11-2019 | 16000 | 13000 | 15000 | 22000 |

## International price

### Coconut

The domestic price of coconut oil in Philippines, Indonesia, and Sri Lanka expressed an upward trend during the month. In India, the price of coconut oil opened at Rs.1832 MT expressed a downward trend during the month. 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* |
| 02.11.2019 | 116 | 125 | 117 | 394 |
| 09.11.2019 | 116 | 133 | 174 | 408 |
| 16.11.2019 | 116 | 133 | 166 | 408 |
| 23.11.2019 | 118 | 133 | 175 | 423 |
| 30.11.2019 | 118 | 142 | 197 | 416 |
| | | | | *Pollachi market |

### Coconut Oil

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

| Weekly price of coconut oil in major coconut oil producing countries | | | | | |
|---|---|---|---|---|---|
| | International Price(US$/MT) | Domestic Price(US$/MT) | | | |
| | Philippines/ Indonesia (CIF Europe) | Philip-pines | Indone-sia | Sri lanka | India* |
| 02.11.2019 | 745 | 655 | 688 | 1682 | 1832 |
| 09.11.2019 | 754 | 702 | 717 | 1714 | 1785 |
| 16.11.2019 | 778 | 700 | 723 | 1775 | 1832 |
| 23.11.2019 | 880 | 850 | 832 | 1797 | 1832 |
| 30.11.2019 | 895 | 825 | 835 | 1801 | 1804 |
| | | | | | * Kangayam |

### Copra

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

| Weekly International price of copra in major copra producing countries | | | | |
|---|---|---|---|---|
| Date | Domestic Price (US$/MT) | | | |
| | Philippines | Indonesia | Srilanka | India* |
| 02.11.2019 | 399 | 427 | 816 | 1254 |
| 09.11.2019 | 418 | 443 | 818 | 1268 |
| 16.11.2019 | 440 | 447 | 821 | 1268 |
| 23.11.2019 | 480 | 490 | 958 | 1268 |
| 30.11.2019 | 524 | 496 | 953 | 1268 |
| | | | | * Kangayam |