KALPA

CPCRI Newsletter
Volume 39, No. 4, October-December 2020

ICAR-CENTRAL PLANTATION CROPS RESEARCH INSTITUTE
Kasaragod, Kerala - 671 124

From the Director's Desk

Two leaves added to research-history

The biotechnology interventions in plant breeding started with big bang of genetic engineering and development of transgenic plants. But the environmental concerns on possibility of gene flow to the wild varieties that may result in ecological imbalance made to shelf such programmes in many countries including India. Rapid progress made in sequencing technologies in the past two decades has broken this stalemate. Crop improvement strategies now depend more on information from genome, transcriptome, gene expression profiles and epigenetic studies.

At ICAR-CPCRI, we started the work on whole genome sequencing of Chowghat Green Dwarf (CGD) (which is relatively resistant to root (wilt) disease) in 2017 and published the results in December 2020 in the journal *OMICS: A Journal of Integrative Biology (vol. 24)*. A hybrid sequencing technique, using Illumina HiSeq 4000 platform for short genome reads and Pacific Biosciences RSII platform for long genome reads, was utilized to assemble the genome and we achieved 75% coverage (1.93 Gb), which was distributed in 26855 scaffolds.

Annotation of the genome data after stringent filtration resulted in 13,707 genes and which coded for 11,181 proteins. Among these, transcript level evidence was gathered for 6828 predicted genes based on the RNA-Seq data. Number of nucleotide-binding and leucine-rich repeat loci was 112 that are belonging to six classes. The availability of the dwarf coconut genome shall prove invaluable information for deducing the origin of dwarf coconut cultivars, dissection of genes controlling plant habit and fruit color, and accelerated breeding for improved agronomic traits.

The sequencing initiative was undertaken through a collaborative effort involving ICAR-CPCRI, Kasaragod, ICAR-National Research Center on Plant Biotechnology, New Delhi, and Center for Systems Biology and Molecular Medicine, Yenepoya Research Centre, Yenepoya (Deemed to be) University, Mangaluru.

The aforesaid findings add information on coconut genome unveiled from many laboratories across the world. It is a delight to share the work of scientists of University of Philippines and Boyce Thompson Institute, New York on the whole genome sequencing of Catigan Green Dwarf; the paper started with the following sentence: *'Coconut, a diploid (2n = 32) crop, is the only recorded species under the genus Cocos which is a member of the family Arecaceae and sub-family Arecoideae* (Nambiar and Swaminathan 1960; Abraham and Mathew 1963)' (in the journal *G3: Genes, Genomes, Genetis (vol.9)*)

Another important event was the field planting of tissue culture derived plant from immature-inflorescence of coconut at the Regional Station, Kayamkulam by Shri Muralidharan V., Hon'ble Minister of State for Parliamentary and External Affairs, Government of India. In fact it was a dream for nearly four decades! The first success in coconut tissue culture using explants of mature coconut was reported in 1984 from this Institute.

CONTENTS

SPECTRUM

New arecanut germplasm collection

A semi tall and high yielding arecanut germplasm was collected from farmer's plot in Irde, Puttur Taluk in Dakshina Kannada district of Karnataka. Out of 330 arecanut seedlings planted in 1982, one was observed to be semi tall, which is also high yielding and was not affected by fruit rot. Average fresh fruit weight was 60.94g, length and breadth of fruit were 6.22cm and 4.78cm, respectively (Fig. 1a.). Another arecanut germplasm with high yield was collected from farmer's field in Hakathur, Madikeri Taluk, Kodagu district of Karnataka. Length and breadth of fruit are 5.42cm and 3.40cm, respectively (Fig. 1b.).

Fig. 1a. Arecanut fruits of Irde collection

Fig. 1b. The Hakathur collection

N. R. Nagaraja

Absence of plant-parasitic nematodes in coconut leaf and coir pith composts

Freshly produced coconut leaf vermicompost and coir pith compost in controlled conditions were analyzed for presence of nematodes. Microscopic observations revealed total absence of plant-parasitic nematodes in both types of composts. Absence of any plant-parasitic nematodes is encouraging as these composts can be safely used as substrates for soilless cultivation.

Rajkumar, Murali Gopal and Alka Gupta

Cocoa pod husk biochar amendment affects availability of phosphorus in soils

A study was conducted where in fertilized (inorganics with and without organics) and non-fertilized field soils were amended with cocoa pod husk (CPH) biochar, prepared in CIAE developed kiln, @ 0, 5, 10, 20 and 40 g kg^{-1}. The soils (control) and soil biochar mixtures (above two types) were incubated at 50% field capacity at temperature of 25–30°C for 10 days in the dark.

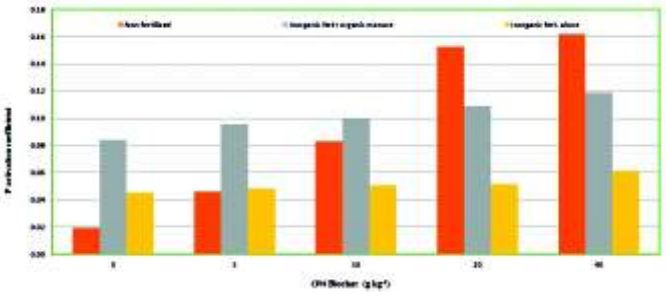

Fig 2a. P activation coefficient with CPH biochar amendment

After incubation, the results showed an increase in available P and the P activation coefficient in all the three types of soils (Fig. 2a and b). On amending with CPH biochar, with P activation coefficient was observed to be increasing manifolds in non-fertilized soil. The increase was also found to be dose-dependent.

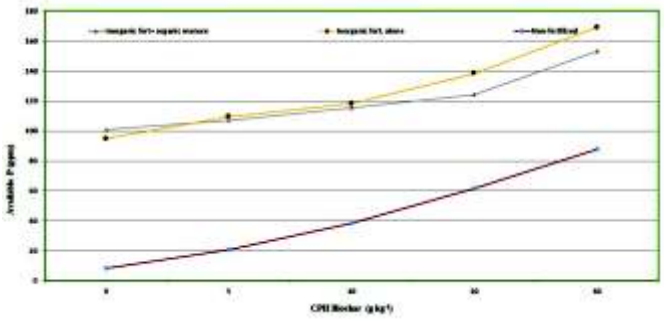

Fig. 2b. Available phosphorus with CPH biochar amendment

Neenu, S., Murali Gopal, Alka Gupta and Elain Apshara, S.

Occurrences of leaf base rot in coconut

Leaf base rot in coconut was observed in two farmer's gardens at Kasaragod district of Kerala. Symptoms were characterized as dark brown color discoloration near the base of the petiole and also in cross sectioned tissue which leads to drying of coconut leaf from base to tip (Fig. 3). The fungal pathogens were consistently isolated and colonies were initially whitish grey in color and later turned to dark grey color with dense aerial mycelium. Recorded oval shaped, hyaline conidia originating from cylindrical shaped conidiogenous cells and later turning to brown color with single septa and longitudinal striations (Fig. 4). The associated fungus was identified as *Lasiodiplodia theobromae* based on morphological characters and by sequencing ITS region. The disease is under check by removal of infected leaves and spraying with 0.2% Hexaconazole 5EC.

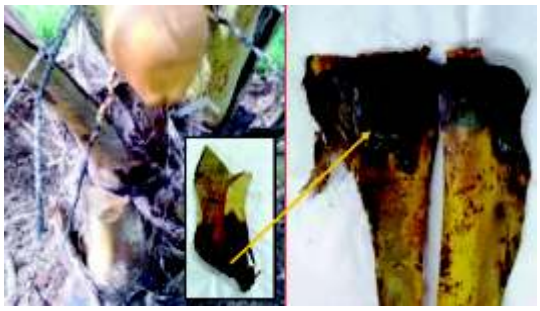

Fig. 3. Symptoms of Leaf base rot (dark brown discoloration is shown in the enlarged portion)

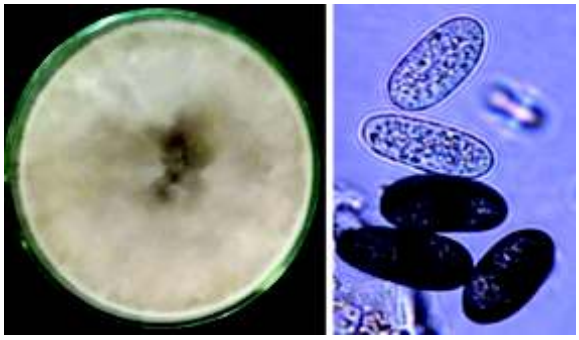

Fig. 4. Colony and conidia of *Lasiodiplodia theobromae*

Prathibha V.H., Daliyamol and Vinayaka Hegde

Screening of combo-fungicides against major fungal pathogens infecting coconut

An *in vitro* screening of selected combination of fungicides (Captan 70%+ Hexaconazole 5% EP) was carried out against *Ganoderma lucidum* and *Theilaviopsis paradoxa*, the pathogens of Thanjavur wilt and stem bleeding of coconut along with other fungicides in different concentrations (0.1%, 0.2% , 0.3% and 0.4%). Hexaconzole 5EC was taken as control treatment. It was observed that combination of Captan 70%+ Hexaconazole 5% EP (Taquat) gave 100 % inhibition of fungal growth in the selected lowest concentration (0.1%). This may be due to the fact that combination fungicides due to presence of more than one active ingredient can disrupt more than one target site thereby increasing the potency of the fungicide.

Daliyamol, Prathibha V.H. and Vinayaka Hegde

Long term preservation of fungal pathogens/bio agents using sodium alginate

Dry mycelial and conidial bead formulations of *Colletotrichum gloeosporioides*, *Lasidiplodia theobromae* and *Trichoderma harzianum* were prepared using sodium alginate. The mycelia and conidial mass of fungal cultures were impregnated in sodium alginate in bead form. The colony forming units (cfu) for the fungal cultures were 11×10^7 cfu/gm for *C. gloeosporioides*, 16×10^7 cfu/gm for *L. theobromae* and 22×10^7 cfu/gm of bead for *T. harzianum* in the initial. Further conidial viability will be calculated at monthly interval for a maximum period until the viability deteriorates.

Daliyamol, Prathibha V.H. and Vinayaka Hegde

Transcriptomic analysis of coconut seedlings having contrasting water-use efficiency

For transcriptomic analysis, two-year-old coconut seedlings {*var*. Kalpasree and Kalpatharu} were subjected to soil water-deficit regimes (25% of available of soil moisture and control). In total, ~7300 differentially expressed genes were identified between the seedlings under water-deficit stress and control. Analysis of transcripts derived from the leaves of stressed and control Kalpasree seedlings revealed that 2388 transcripts are significantly upregulated and 1278 are significantly down regulated whereas in Kalpatharu a significant 2868 transcripts were upregulated and 778 down regulated. Significantly expressed genes (*i.e.* highly up and downregulated genes) are represented in form of heatmap using pheatmap package of R, following hierarchical clustering approach (Fig. 5). Kalpasree leaf transcriptome showed significant upregulation of PHLOEM PROTEIN 2-LIKE A1-like, WRKY transcription factor 40 isoform X1 and downregulation of glycerol-3-phosphate acyltransferase 3 transcripts. On the other hand, upregulation of transcripts encoding polyamine oxidase, arabinose 5-phosphate isomerase among others and downregulation of aquaporin PIP1-2 transcript was documented in Kalpatharu leaves. The transcriptome data would pave way for developing climate-smart coconut crop.

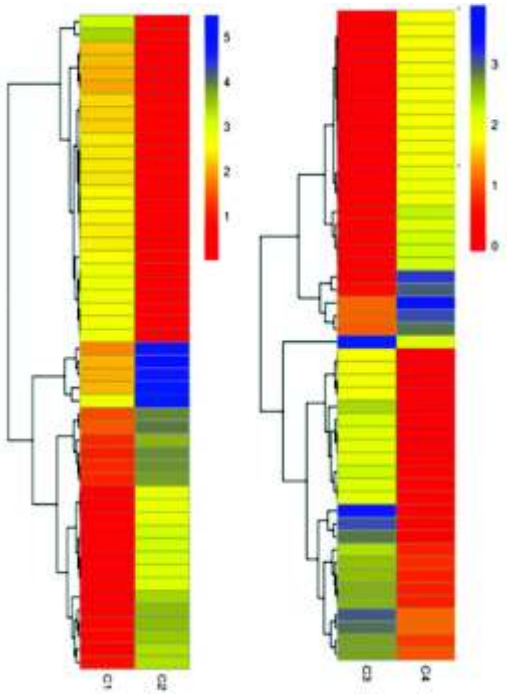

Fig. 5. Unsupervised hierarchical clustering analysis of differentailly expressed transcripts. Heat Map showing clusters of differentially expressed genes in (a) Kalpa Sree (C1:control, C2:stressed) (b) Kalpatharu (KT) (C3:control, C4:stressed). The codes of colour bars are also presented.

Ramesh S.V., Hebbar K.B., Rajesh M.K., Abhin Sukumar P., Gangaraj K.P. and Athul Bobby

Refined framework for revamping the 'neera' sector

A study was conducted to trace the reasons for setbacks experienced in the 'neera' sector and also to provide a refined framework for revamping the sector. The details of licenses granted to the CPFs were sourced from the department of excise, Kerala. The size of the respondents was 95 (including the discontinued ventures). It was observed that the 'neera' value chain is in the evolving stage and the withdrawal of the institutional support of coconut development board had detrimentally affected the confidence of the CPFs. The dearth of technical competence and lack of marketing skills were very much evident in the sector. The availability of 'neera' technicians (tappers) and the high wage rates had evoked concerns on the profitability as well as the assurance of continuous supply of the product. A restructured innovation system of 'neera' with specific roles assigned to the stakeholders through the creation of functional linkages is suggested (Fig. 6).

Fig. 6. Desired sectoral innovation system for neera

Thamban, C., Jayasekhar, S., and Chandran, K.P.

Acoustic sensor-based red palm weevil detector

ICAR-CPCRI in collaboration with M/s Resnova Technologies Pvt. Ltd., Kochi and financial support from the Coconut Development Board, Kochi has developed an acoustic sensor-based detection system for early diagnosis of red palm weevil infestation (*Rhynchophorus ferrugineus*) in coconut palms. The acoustic sensor-based detector records the gnawing sound of the feeding grubs. The detection unit, consisting of a specially designed detector which can be attached to the tree trunk, and upon pressing the scan button, scans the palm for two minutes. The collected signals undergo a series of filtration for removing unwanted noise signals both on the hardware and software sides. The processed signals are then evaluated by the Artificial Intelligence (AI) models to check for patterns pertaining to grub activity. The result is then displayed on the screen of the device. The final embedded hardware is a combination of AI and Signal Processing. The developed hardware was successfully tested on the healthy (un-infested) and red palm weevil infested palms at ICAR-CPCRI, Regional Station, Kayamkulam with detection efficiency of 80%.

Josephrajkumar, A., Chandrika Mohan, Jijo Paul, Jayalekshmi, T., Vinayaka Hegde, Kalavathi, S. and Anitha Karun

Cadaver-based capsule formulation of entomopathogenic nematode

The capsule formulation of entomopathogenic nematode *Steinernema* sp. CPCRIS0804 was developed for the prophylactic application of EPN against red palm weevil infesting coconut. EPN-infected *Galleria mellonella* cadaver is encapsulated with sand as the carrier medium. The dry sand particles used within the capsules arrest the emergence of infective juveniles (IJs), remain within the cadaver inside the capsule and gradually get converted in to an anhydrobiotic condition. When the capsule gets in contact with water, it dissolves slowly and sand particles within the capsule absorb moisture; the anhydrobiotic IJs within the cadaver slowly rehydrates and get out from the capsule and affects the target insect pest.

Anes, K.M., Josephrajkumar, A. and Chandrika Mohan

Coconut water for bacterial cellulose production

Palm sap rich in natural sugars harbour bacteria that can aid in bacterial cellulose production. Three bacterial isolates (Fig. 7a) from coconut palm sap could induce cellulose production in coconut water to varying degrees (Fig. 7b). These indigenously isolated bacteria could prove to be a cost-effective way to convert mature coconut water, which is often a wasted by-product from most of the coconut industrial units, to high value bacterial cellulose.

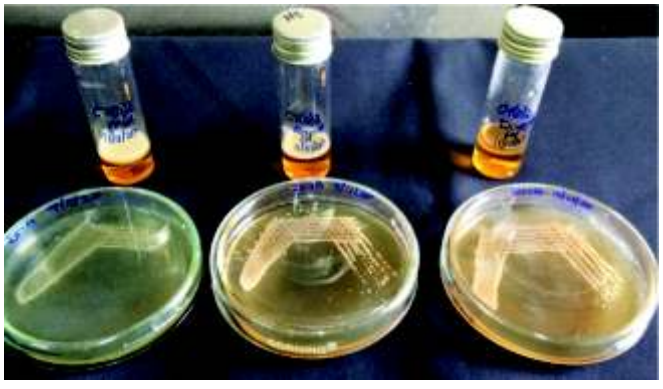

Fig 7a. Bacterial isolates

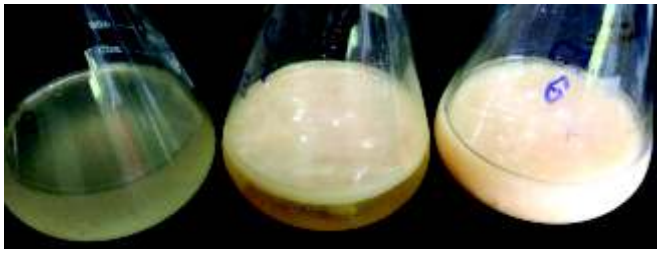

Fig. 7b Coconut water medium (left) converted to cellulose (middle and right) by different bacterial isolates

Indhuja S. and Jissy George

Low-cost artificial diet for mass production of EPN

Selecting a low-cost suitable food ingredient for mass production of nematode is the key to success which greatly affects nematode yield and costs. We attempted to incorporate rice powder as an alternative to maize powder in an artificial diet for the rearing of Greater Wax Moth, *Galleria mellonella* to cut down the cost incurring on mass production of EPNs up to 30 - 40%. Under this method, fully grown larvae attained an average weight of 240 - 255 mg and 4 cm length after 30 - 35 days. Single fully grown larvae produce 2.46 lakh infective juveniles at room temperature during July - September 2020.

Rajkumar and Sujithra, M.

Shelf life extension of tender coconut water dessert

An attempt has been made to extend the shelf life of tender coconut water dessert (pudding). The processing protocol to arrest the enzyme activity as well as microbial load and to extend the shelf life, the trial was conducted to utilize the emerging biopreservatives and FSSAI recommended and commonly used class II chemical preservatives. Based on these studies, it could be possible to optimize the level of each preservative. The efficacy of bio-preservatives (nisin, natamycin, and polylysine) over the chemical preservatives (potassium metabisulphite and sodium benzoate) has been found out from the study.

Shameena Beegum, P.P., Arun Krishnan, A., Paulraj, S., Pandiselvam, R., and Manikantan, M.R.

Development of coconut infused dark chocolates

A value added product, 'Kalpa Bean to Bite' dark chocolate, was unveiled as a part of celebrations on the Institute's foundation day. It is composed of 45% cocoa bean, 30% coconut sugar and 25% cocoa butter. Experiments were conducted to replace the cocoa butter with different concentrations of coconut products such as coconut milk powder, coconut milk residue and VCO cake. It was followed by the evaluation of sensory attributes, textural properties, minerals, antioxidants, phenolics and flavonoid content. Positive effects of coconut milk powder and VCO cake on sensory attributes and biochemical quality have been observed.

Shameena Beegum, P.P., Arifa Nooh, Sugatha, P., Ramesh S.V., Pandiselvam, R., and Manikantan M.R.

COMMERCIALIZATION OF TECHNOLOGY

During the period from October to December, 2020, five technologies were commercialised by the Institute to entrepreneurs through MoA as per the details given below, an amount of Rs. 70,000 have been collected as technology transfer fees.

[...Table. Details of technology commercialization on pg. 16.]

EPN technology MOA signed by Mr. Sandeep Bhat in presence of Director CPCRI, Kasaragod

IMPORTANT EVENTS

Quinquennial Review Team visit

Chairman of the QRT, Dr. B.M.C. Reddy, Former Director, IIHR & Former VC, Dr. YSR Horticulture University and other members (Dr. M.G. Bhat, Former Director, DCR, Puttur, Dr. John Zachariah, Former Head, ICAR-IISR, Kozhikode, Dr. S. Arulraj, Former Director, ICAR-IIOPR, Pedavegi and Dr. H. P. Maheshwarappa, Project Coordinator, AICRP Palms (Member Secretary)) visited ICAR-CPCRI, Kasaragod; Regional Station, Vittal and Research Centre, Kidu during 27-31 December 2020. Prior to that Dr. John Zachariah and Dr. H. P. Maheshwarappa visited Regional Station, Kayamkulam on 21 December 2020. Other two members of the QRT, Dr. H. Hameed Khan, Former PC, AICRP on Palms and Dr. S. Lingaraju, Emeritus Professor, Former Director, Institute of Organic Farming participated in the deliberations through online mode.


QRT field visits at Kasaragod and Kidu

QRT members planting arecanut seedlings at CPCRI, RS, Vittal on 30 December 2020

Task force committee meeting on DUS testing in cocoa

First meeting of the task force committee to finalize distinctness, uniformity and stability (DUS) testing guidelines for Cocoa was conducted on 11th November 2020 online. Dr. V.A. Parthasarathy, Former Director and Emeritus Scientist, ICAR-IISR, Kozhikode chaired the meeting. Dr. Anitha Karun, Director, ICAR-CPCRI, Dr. K.V. Prabhu, Chairperson, PPV & FRA, Dr. D. Balasimha, Former Head, CPCRI, RS, Vittal, Dr. Prasannakumariamma, Former Professor KAU, were present. Dr. Nagarathna, Registrar, Dr. Dipal Roy, Deputy Registrar, PPV & FRA, New Delhi conducted the task force meet. Chairman, briefed the importance of DUS guidelines in horticultural crops specifically fruits/ plantation crops considering their perenniality and cross pollinating nature. Dr. S. Elain Apshara, Principal Scientist (Hort.) & PI of the project presented the draft guidelines before the committee. Based on important inputs, the committee shall be finalising the DUS test guidelines for cocoa.

Task force meeting on DUS guidelines for cocoa

PUBLICATIONS

Research articles

Anes, K.M., Babu, M., Sivadasan, J. and Josephrajkumar, A. 2020. Discovery of a new *Steinernema* sp. (Rhabditida: Steinernematidae) with higher shelf life and better efficacy against red palm weevil under laboratory conditions. *Journal of Plantation Crops*, 48(3): 184-191.

Daliyamol, Merin Babu, A. Josephrajkumar and Vinayaka Hegde. 2020. Identification of *Leptoxyphium sp.* causing sooty mold on coconut. *Indian Phytopathology. h*ttps://doi.org/10.1007/s42360-020-00298-9.

Devakumar, K., Thomas, R.J. and Karun, A. 2020. A durable pollination rain coat for coconut hybridization during monsoon. *Journal of Plantation Crops* 48(3): 269-272 .

Hebbar, K.B., Neethu, P., Sukumar, P.A., Sujithra, M., Santhosh, A., Ramesh, S.V., Niral, V., Hareesh, G.S, Nameer, P.O., Prasad, P.V.V. 2020. Understanding physiology and impacts of high temperature stress on the progamic phase of coconut (*Cocos nucifera* L.). *Plants* 9 (12): 1651. DOI: https://doi.org/10.3390/plants9121651.

Josephrajkumar, A., Mohan, C., Babu, M., Prathibha, P.S., Hegde, V and Krishnakumar A. 2020. Diagnosis of invasive whitefly species co-occurring on coconut. *Current Science,* 119(7): 1101-1105.

Kalavathi, S., Jeena Mathew, Indhuja, S., Merin Babu and Muralidharan, K. 2020. Community-level management of bio-resources for augmenting income from coconut-based farming systems in Kerala State, India. *Journal of Plantation Crops*, 2020, 48(3): 252-258.

Merin Babu, Thangeswari, S., Josephrajkumar, A., Krishnakumar, V., Karthikeyan, A., Selvamani, V., Daliya Mol, Hegde, V., Maheswarappa, H. P. and Anitha Karun. 2020. First report on the association of '*Candidatus* Phytoplasma asteris' with lethal wilt disease of coconut (*Cocos nucifera* L.) in India. *Journal of General Plant Pathology,* 87(1): DOI: 10.1007/s10327-020-00970-y

Rajkumar, Jagadeesh Patil, Pervez Rashid, Subhaharan Kesavan 2019. Management of white grub (*Leucopholis burmesterie*) infesting arecanut through entomopathogenic nematodes under field conditions. *Annals of Plant Protection Sciences (An international Journal of Crop Protection),* 27(1):112-116.

Ramesh, S.V., Pandiselvam, R, Hebbar, K. B., Manikantan, M.R., Shameena Beegum, P.P., Shelly Praveen, Sruthi, N. U. 2020. Antiviral potential of coconut (*Cocos nucifera* L.) oil and COVID-19. *Coronaviruses*. Https://doi.org/10.2174/2666796701999201.

Popular articles

Alka Gupta, G. Panjavarnam, Murali Gopal and H.P. Maheswarappa. 2020. *Thennanthoppel payiridapattu babycorn kaleevukalai manpulu uramaga matruthal*. *Indhia Thennai Idhazh*. 20(1) : 26-30. (Tamil).

Alka Gupta, Murali Gopal, Krishna Prakash and Maheswarappa, H.P. 2020. *Nariyal baag ki antarfasal makke ke bhuse se banayen kenchua khaad*. *Bharatiya Nariyal Patrika*. 31(2): 6-10. (Hindi)

Anithakumari, P., Jithin, S. and Muhammed, I. 2020. Successful experimentation of maize in coconut garden of Pathiyoor. Kerala Karshakan 66(5):58-60.

Anithakumari, P., Jithin, S., Muhammed, I. and Mahima, M. 2020. Finger millet, maize, sesame proved to be successful in coconut gardens. *Indian Naleekera Journal* 11(12): 14-19.

Bharath Mohan, Jefri, J.R., Shareefa, M. and Thomas, R.J. 2020. Convergence model for establishing decentralized coconut nursery: The Kallara Experience. *Indian Coconut Journal* 63 (7): 5-7.

Jeena Mathew and A.Abdul Haris 2020. Balanced fertilizer application-Acritical analysis for ensuring better productivity in coconut. *Indian Coconut Journal*. 63(11): 8-14.

Jissy George. 2020. Processing of fruits along with its cultivation. *Karshakashree.* 26(11): 22-23.

Murali Gopal, Alka Gupta, and Anitha Karun. 2020. Mooting 1 per 1000 policy initiative to rejuvenate coconut soils. *Indian Coconut Journal.* 63(8): 18-20.

Murali Gopal, Alka Gupta, K. Muralidharan, M. Neema and P. Chowdappa. 2020. *Chakirichoril ninnu samrudhi*. *Indian Nalikera Journal.* 11(10): 11-12. (Malayalam)

Murali Gopal, Alka Gupta, P. Subramanian and Anitha Karun. 2020. Coconut Based Farming System: A Gandhian harmony of diverse crops, livestock and soil microorganisms. *Indian Coconut Journal.* 63(6): 28-30.

Murali Gopal, G. Panjavarnam and Alka Gupta. 2020. *Thennai elai manpulu urathilerundu thayarikkapattu 'Kalpa Vermiwash'*. *Indhia Thennai Idhazh*. 20(3) : 35-39 (Tamil).

Murali Gopal, M. Neema and Alka Gupta. 2020. *Urea rahitha chakirichor compost uthpadanam*. *Indian Nalikera Journal.* 11(10): 21-22. (Malayalam)

Murali Gopal, S. Neenu and Alka Gupta. 2020. *Thengavellum upayogichhu jeevanuvallam samvardhanam*. *Indian Nalikera Journal.* 11(11): 11-14 (Malayalam).

Neema M, 2020, Coco de mer palm athava irattathengu, *Indian Coconut Journal*, 11 (11): 15-17.

Nihad K. 2020. Commercial floriculture in coconut garden. *Karshakan* December 2020: 64-66.

Rajeev, G., Shareefa, M. and Thomas, R.J. 2020. Coconut hybrids and its identification. Coconut cultivation questionnaire (Series-3) (*In Malayalam*). *Indian Nalikera Journal* 11 (11): 13-14.

Rajeev, M.S. and Muralidharan, P. 2020. Complete mechanization in Paddy. *Kerala Karshakan* 66(3):19-21.

Sajnanath, K. and Muralidharan, P. 2020. Soil health for human life. *Karshakan* 28(12): 58-59.

Shareefa, M., Sreelekshmi, J.S., Thomas, R.J. and Karun, A. 2020. Propagation techniques in coconut *Indian Coconut Journal* 63 (8): 9-15.

Sivakumar, T. 2020. Fertilizer application in Coconut. *Indian Coconut Journal*. 11(9): 18-19.

Sivakumar, T. and Ranikrishna, K. 2020. Farm field school at Sabarmathi, Vallikunnam. *Indian Coconut Journal*. 11(10): 9-10.

Thamban,C., Samsudeen, K. and Thomas, R.J. 2020. Enhancing planting material production in coconut through decentralized community nurseries. *Indian Coconut Journal* 63 (6): 5-11.

Papers presented in seminar/ symposia/ conference/ workshops

Chandrika Mohan, Josephrajkumar, A. and Anes, K.M. 2020. Advances in red palm weevil IPM in coconut In: *Proc. International webinar 'Advances in Red palm weevil Research and Management'* (Eds: Rajan Shelke and J.R. Faleiro), Don Bosco College of Agriculture, Goa, India. 8th September 2020, pp 14-27.

Daliyamol, Prathibha VH, Mahendran B and Vinayaka Hegde. 2020. Evaluations of fungicides on *Colletotrichum gloeosporioides, Fusarium solani* as incitant of leaf rot disease in coconut under in vitro. *In*: International E-Conference on "Multidisciplinary approaches for plant disease management in achieving sustainability in agriculture" organised by Department of Plant Pathology, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, India 6-9th October, 2020.

Jayasekhar, S., Thamban, C., and Chandran, K.P. 2020. Whether a revamped value chain is inevitable? The case of producer organizations involved in the production and marketing of 'neera' in the coconut sector Agricultural Economics Research Review 2020, 33 (Conference Number), 147.

Nagaraja, N.R., Ranjini, T.N., Neenu, S., Niral, V. and Bhat Ravi.2020. Occurrence and frequency of chlorophyll deficient seedlings in arecanut. International E-Conference on Advances and Future Outlook in Biotechnology and Crop Improvement for Sustainable Productivity.

Rajkumar, Pratibha, V.H., Sujithra, M., Surekha, R. and Vinayaka Hegde. 2020. Effect of *Trichoderma harzianum* and marigold planting on root knot nematode infestation in okra and brinjal in coconut based cropping system. International EConference on "Multidisciplinary approaches for plant disease management in achieving sustainability in agriculture" held from 6-9th October at Department of Plant Pathology, College of Horticulture, Bengaluru (University of Horticultural Sciences, Bagalkot).

Ramesh, S.V.*, Hebbar, K.B. 2020. Untapped nutraceutical potential of *Cocos nucifera* L.- the *kalpavriksha* on earth. *In* National Virtual Conference on 'Current Trends and Challenges in Plant Biochemistry and Biotechnology' held from 20-21 November 2020, organized by Society for Plant Biochemistry and Biotechnology (SPBB), New Delhi and Birla Institute of Technology and Science Pilani, K. K. Birla, Goa Campus.

Ramesh, S.V.*, Hebbar, K.B.*, Rajesh, M.K., Abhin, S.P., Gangaraj, K.P., Athul Bobby 2020. Transcriptome analysis of *Cocos nucifera* L., seedlings having contrasting water use efficiency (WUE) under water-deficit stress: molecular insights and genetic markers for drought tolerance. *Proceedings*. DOI: 10.3390/IECPS2020-08853. *In* Proceedings of International electronic Conference on Plant Science held from 01-15 Dec, 2020.

Shareefa, M., Sreelekshmi, J.S., Thomas, R.J. and Anitha Karun. 2020. *In vitro* flowering in coconut. In: "*Advances and Future Outlook in Biotechnology and Crop Improvement for sustainable productivity*". University of Horticultural Sciences, Bagalkot, Karnataka 24 - 27th November, 2020.

Book chapters

Jayasekhar, S. 2020. Reviving Coconut Sector in Kerala: Problems & Prospects. *In*: Sunil Mani (Ed.) Kerala and World Economy, Centre for Development Studies, Thiruvananthapuram, Kerala. 161-179.

Extension folders

Anithakumari, P., Anju, K., Kalpanamol, K., Steffin, S. and Jithin, S. 2020. Bush pepper for home needs and income. Extension folder in Malayalam (FFP).

Anithakumari, P., Anju, K., Kalpanamol, K., Steffin, S. and Jithin, S. 2020. Scientific cultivation practices of Ginger. Extension folder in Malayalam (FFP).

Anithakumari, P., Anju, K., Kalpanamol, K., Steffin, S. and Jithin, S. 2020. Fodder grass cultivation for quality milk production and income. Extension folder in Malayalam (FFP).

Anithakumari, P., Anju, K., Kalpanamol, K., Steffin, S. and Jithin, S. 2020. Amorphophallus cultivation for health and income. Extension folder in Malayalam (FFP).

Training manuals

Nihad, K., Anes, K.M. and Kalavathi, S. 2020. Agricultural Sciences: Scope and Opportunities, ICAR-CPCRI, Regional Station, Kayamkulam, 68 p.

HUMAN RESOURCES DEVELOPMENT

Trainings attended within India

Name & designation	Title of the programme	Place and date
Dr. A. Joseph Rajkumar, Principal Scientist	ICC online training programme on Good Agricultural Practices, Replanting Program and Integrated Pest Management to Sustain Coconut Development	ICC, Jakarta, 03 November 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Virtual training on Phytosanitary Safety for Transboundary pest prevention"	CGIAR Germplasm Health Unit towards Prevention of Transboundary Pest, 09 November 2020
Mr. Rajeev M S, SMS	e-learning programme on Agri rural startups	BIRDS, Mangalore 10th- 12th November, 2020
Mr. Rajeev M S, SMS	Online training on 'Agri Journalism'	MANAGE, Hyderabad 23rd 27th November, 2020
Dr. T Sivakumar, SMS	Online training on 'ICTs in Agriculture'	MANAGE 23rd to 27th November, 2020
Dr. S. Ravi, SMS	Online training 'CVE- an approach to diagnosis and surgical management of ocular affections in cattle'	12th November 2020
Mrs. G. Lekha, SMS	National level online training on 'Recent advances in entomology- new dimensions to invigorate the insect pest management'	University of Horticulture, Bidar 7th to 18th December, 2020
Dr. Anithakumari P., Principal Scientist	Management Development Programme (MDP)	MANAGE, Hyderabad 15-17 December, 2020.

Awards/ Honours

Prof. T.N. Ananthakrishnan Award for Senior Scientist 2018-2019 (Third position) was awarded to Dr A. Joseph Rajkumar, Principal Scientist, ICAR-CPCRI, Regional Station, Kayamkulam for his outstanding research contributions in the field of coconut entomology. The award carried a citation and an amount of Rs. 10,000/-

NEW PROJECTS

A new project was sanctioned, entitled "Evaluation of stage-specific modulation of specific miRNAs during zygotic and somatic embryogenesis in coconut and their functional validation" under the leadership of Dr. M.K. Rajesh, Principal Scientist (Biotech.). The project has Rs. 15 lakhs funding from DST-SERB. This will be under operation for 3-years at ICAR-CPCRI, Kasaragod.

TRANSFER OF TECHNOLOGY

Trainings

The Institute has launched the Kalpa Graduate Readiness Programme (KGRP), a three months online training programme for final year B.Sc. (Agriculture/Horticulture) students of the agricultural universities across India. Twenty training sessions were conducted on various important topics of palms and cocoa as given below:

SN	Topic/session	Resource Person	Date
1	Coconut nursery: An emerging enterprise	Dr. Samsudeen, K.	22 September 2020
2	Arecanut improvement	Dr. Nagaraja, N.R.	24 September 2020
3	Cocoa improvement	Dr. Elain Apshara, S.	29 September 2020
4	Coconut based cropping system and integrated farming system models	Dr. P. Subramanian	1 October 2020
5	Nutrition management in coconut gardens and soil health management	Dr. Jeena Mthew	06 October 2020
6	Recycling farm wastes	Dr. Murali Gopal	08 October 2020
7	Organic farming	Dr. Ravi Bhat	13 October 2020
8	Irrigation management in coconut	Dr. Abdul Haris A.	15 October 2020
9	Isolation and utilization of bio-inoculants	Dr. Alka Gupta	20 October 2020
10	Soil and water conservation techniques	Dr. A.C.Mathew	22 October 2020
11	Pest management in coconut, arecanut and cocoa	Dr. Chandrika Mohan	27 October 2020
12	Pest management: Part 2	Dr. Joseph Rajkumar	30 October 2020
13	Diagnosis and management of coconut diseases	Dr. Vinayaka Hegde	01 November 2020
14	Disease management in arecanut and cocoa	Dr. R. Thava Prakasa Pandian	06 November 2020
15	'Hotspot' breeding with special reference to root (wilt) disease of coconut	Dr. Regi Jacob Thomas	11 November 2020
16	Statistical techniques in agricultural research- fundamentals	Dr. K.P. Chandran	17 November 2020
17	Statistical techniques in agricultural experiments	Dr. C.T. Jose	19 November 2020
18	Fundamental and conceptual design of coconut processing machineries	Dr. Pandiselvam, R.	24 November 2020
19	Post harvest technology in plantation crops	Dr. Shameena Beegum P.P.	28 November 2020
20	Socio economic aspects of plantation crops	Dr. Jayasekhar S.	4 December 2020

RAWE students training

Due to COVID-19 lockdown, students from Kerala studying in various agricultural colleges from Rahuri, Pune and Coimbatore were oriented for the farm-science and management, technology generation and dissemination as well as societal outreach including visit to experimental plots of the Regional Station, Kayamkulam, during October-November 2020. The students were imparted with the knowledge and practical outreach approaches of farm technologies at farmer's doorsteps.

Training on EPN production technology

Kalpa EPN (CPCRI - SC1) aqua formulation technology was transferred to the arecanut farmer Mr. Sandeep Bhat from Sirsi, Karnataka as he desired to establish EPN production unit at his village Kanchigadde. Three farmers were undergone one day hands on training on production of entomopathogenic nematodes (EPN) and its host insect Galleria mellonella and packaging of nematodes on 05 October, 2020 at ICAR - CPCRI with the objective to produce fresh required quantities of EPN in their arecanut farms for their own use and provide to the needy farmers in villages to promote the environmentally safe and can provide sustainable pest control in plantation ecosystem.

On-campus trainings

Online webinar series on soil health management for crop health and productivity

The online webinar series on the topic 'Soil health management in agricultural crops' was organized at ICAR-CPCRI, Regional Station, Kayamkulam during 20-23 October, 2020. Dr. S. Kalavathi, Acting Head inaugurated the programme. Dr. Jeena Mathew, Scientist, ICAR-CPCRI Regional Station, Kayamkulam; Dr. V. Thulasi, Assistant Professor, RARS, Pattambi; Dr. V. Srinivasan, Principal Scientist, ICAR-IISR, Kozhikkode; and Dr. Susan John K., Principal Scientist, ICAR-CTCRI, Thiruvananthapuram were the resource person. The webinar was streamed live on CPCRI, YouTube channel.

Online training on 'Hybridization techniques and palm health management in coconut'

ICAR-CPCRI, Regional Station, Kayamkulam conducted an online training on 'Hybridization techniques and palm health management in coconut' for participants nominated by Coconut Producers Societies/Federations from Kerala State. Altogether 20 participants from Kerala attended the training conducted during 29-31 December 2020.

Other extension activities

Farmer First Programme

Online training programm on 'Growbag vegetable cultivation' on FB live and Youtube platform was done on 7 December, 2020 and on “Domestic waste management” on 26 December, 2020 for the farmers of FFP locations.

Organized training programs on “Business plan preparation” for 24 FPO promoters and shareholders on 17 October, 2020. Dr. Reshma Ann Mathew, Research Scholar, SYMBIOSIS, Pune handled the session in online mode. Mr. Premkumar, DDM, NABARD, Alappuzha also participated and handled session on promoting business of FPO to be benefit farmers.

The Project Implementation and Monitoring Committee (PIMC) meeting of ICAR-CPCRI Farmer FIRST Project (FFP) initiated 'Odanadu Farmer Producer Company Ltd' on 21 October 2020 at FPO office, Pathiyoor. Mr. Premkumar, DDM, NABARD, Alappuzha reviewed the activities, Dr. P. Anithakumari (PS & PI (FFP), CPCRI, RS, Kayamkulam) and Mr. Steffin.S (CEO) presented the activities.

Odanad Farmer FIRST Agri Mart: A marketing outlet of inputs, farm produces, value added products (coconut oil, sesame oil, ash, coir-pith) planting material of FFP farming community was started Adv. U. Prathibha, Hon'ble MLA, Kayamkulam inaugurated the Agri Mart. on 18 December 2020. Dr. S. Kalavathy Acting Head, ICAR-CPCRI, RS, Kayamkulam and Mr. Premkumar, DDM, NABARD were present.

Dairy farmers in Vallikunnu Panchayat were empowered on area-wide bio-suppression of coconut rhinoceros beetle with the application of *Metarhizium majus* in breeding sites and application of botanical paste on the spear leaf of juvenile palms.

Field Day on Cocoa

'Field Day on Cocoa' was held at Borjhar village, Kamrup (Rural) on 3 November, 2020 with the financial assistance from Directorate of Cashewnut and Cocoa Development, Kochi More than 150 farmers and extension personnel attended the programme. Dr. Alpana Das, Scientist In-charge, inaugurated the programme. Mr. Manoj Das, Managing Director, NERAMAC, Guwahati was the chief guest. Mr. Nagendra Das, a progressive farmer was felicitated. Dr. Anok Uchoi and Dr. L. S. Singh, scientists of the Research Centre were the resource person.

Field day on cocoa at Kahikuchi, Assam

SCSP Activities

Activities under SCSP were conducted in four states viz., Assam (Nalbari), West Bengal (Jaipaiguri), Karnataka (Dakshin Kannada) and Kerala (Kasaragod). A total of 181 families got benefitted. At Assam a programme was organized in Basimaluwa, a flood affected village and distributed the inputs such as animals and planting material. Smt. Purabi Konwar, Deputy Commissioner, Nalbari district was the chief guest. Other officials participated in the meeting are Mrs. Lakkhi Dutta, District Agriculture Officer, and Mr. Krishna Kanta Bora, State Organizing Secretary of Bharatiya Kisan Sangh. Two Industrial training programmes of 26 days duration on coconut value addition were organized at Kasargod.

STC Activities

Bush pepper plants (2000) were transported from ICAR-IISR, Kozhikode to two villages in Paderu, Visakapatnam, Andhra Pradesh (Chintapalle and GKVD) and distributed to 50 families.

Arecanut based multispecies cropping system model

For establishing model demonstration plots on arecanut based multispecies cropping system, tissue cultured banana plantlets, nutmeg grafts, black pepper planting materials and cocoa planting materials were supplied to farmers from Dakshina Kannada, Karnataka. Technical advice on arecanut based cropping system with cocoa, nutmeg, black pepper and banana were provided to beneficiaries.

Planting materials of black pepper, nutmeg, cocoa and banana supplied to beneficiaries

ICAR-Krishi Vigyan Kendra, Kasaragod

Technology outreach

On farm trials were conducted with 24 farmer participants under three main categories and 10 FLDs were conducted in 140 farmer's field. The FLDs initiated during this period are introduction of high yielding rice variety Manu Ratna and mechanization in paddy at Kolavayal, Kanhangad. For mechanization of paddy cultivation, machinery such as rotavator, mat nursery preparation and machine transplantation were demonstrated in the farmers plots.

National Food Security Mission (NFSM) on Pulses: The KVK Kasaragod had initiated the demonstration of green gram in 20 acres fields in Bambrana village in Manjeshwar block as part of NFSM Programme.

Trainings organized: Organized three on campus training programmes with the participation of 120 people (12 men and 108 women) and 13 off campus training programmes with the participation of 231 farmers (201 men and 30 women).

Other extension activities

World Soil Day: The world soil day was celebrated on 5th December at Bambrana village with the participation of 19 farmers. A seminar on soil health was conducted by Dr. Ravi Bhat, Head, Crop Production division and method demonstration on soil sample collection done by Sh. K. Manikandan, SMS during which soil samples were also collected for analysis.

Field day: A field day on high yielding variety of paddy Shreyas was carried out on 30th October 2020 at Bambrana in which 30 farmers participated along with public representatives from the Panchayat.

ICAR-Krishi Vigyan Kendra, Alappuzha

Mahila Kisan Diwas

'Mahila Kissan Diwas' celebration was conducted at Thekkekara on 15th October, 2020 in which 15 women farmers participated. Special talk on 'Importance of nutrition garden in every homestead' was organized for farm women in connection with the programme.

World Soil Day

World Soil Day was celebrated on 5th December, 2020. An interactive session on 'Soil health management practices to keep soil alive' was conducted as part of it.

Swachhata Pakhwada

As per directives of Govt. of India and ICAR, KVK-Alappuzha organized Swachhta Pakhwada from 16th - 31st December, 2020 as on campus and off campus events. A cleaning drive, beautification of premises, awareness creation on personal hygiene and planting of fruit trees were organized.

Field day of the FLD on "High yielding short duration turmeric variety Pragati"

Field day of the Front Line Demonstration on 'High yielding short duration turmeric variety Pragati' was organized at Chettikulangara Krishi Bhavan on 23 December, 2020. Sri K.G. Santhosh Kumar, Member, Alappuzha District Panchayath inaugurated the programme. Dr. P. Muralidharan, PS and Head, detailed about the FLD and briefed the future plans of extending the 'Value Chain in Turmeric' Project to Chettikulangara. Smt. Anajana, Agricultural Officer, Sri. Rajeev M S, SMS, Smt. Thankamony, Agriculture Assistant, Sri Harish Kumar, Convener, A grade Cluster, spoke on the occasion. Sri. Prasannan, Smt Sreeja, and Smt. Lathika, partner farmers, shared their experience of the superiority of *var*. Pragati over the existing traditional varieties with higher yield and short duration. Twenty five partner farmers attended the function.

National Kisan Diwas

On the occasion of the National Farmers' Day, a group meeting of the partner farmers of 'Value Chain in Turmeric' project was organized at Venmony Krishi Bhavan on 23 December, 2020. Dr. P. Muralidharan, PS and Head, Sri Rajeev M.S., SMS, KVK Alappuzha, Sri Subhajith S.S., Agricultural Officer, Venmony reviewed the progress of project activities and discussed the way forward. The 15 partner farmers attended decided to strengthen the group and project activities.

Training programmes

During the period 27 training programmes were organized benefitting a total number of 958 farmers/rural youths. The details of the training programmes were as follows:

Training	No. of Programmes	Participants		
		Men	Women	Total
On campus (online)	18	245	323	568
Off campus	2	5	8	13
Sponsored	7	196	181	377
Total	27	446	512	958

SUCCESS STORY

Local resources for successful technology integration in coconut

Coconut being the base crop in homestead system offers ample scope for cropping / farming systems for effective utilization of available natural resources. The perennial nature, fragmented holdings, low dependency on farm income for livelihood, very less marketable surplus from the homesteads posses challenges and opportunities for participatory social models. In the MGMG program at Bharanikkavu panchayath, the team of scientists implemented a project "Participatory rejuvenation and refinement of coconut based homestead system models for food security and income" with financial support from Bharanikkavu Block panchayath during 2018- 20. The program utilized social resources such as local self governments, department of agriculture and farmers welfare, coconut producers societies (CPS), labour army (Karmasena in each panchayath) and women self help groups (SHG). The major components of this MGMG-Bharanikkavu project (KERANANMA) were scientific selection of WCT coconut mother palms by the team of CPCRI scientists, farmers, agriculture officers and women self help group (SHGs) farmers, selection and collection of seed nuts (QR coded for ensuring genuinity), establishing nurseries at each panchayath by the Karmasena and Women Self Help Groups (SHGs), 64 field visits and 23 training programs to 517 farmers for technology back stopping. The technology integration and dissemination enabled through Focus Group Discussion (FGD), interaction with CPCRI scientists, scaling up the model in panchayath, five poster campaigns and extension literature. The innovative components were, establishment of three 'coconut seedling friendly villages', 6250 bio-primed poly bag seedlings of best mother palms of each locality, adoption of 'Kera Probio', ICAR CPCRI product for bio priming coconut seedlings, demonstration of scientific management of coconut seedlings and integrated root (wilt) disease management practices among 100 coconut farmers' gardens. A total of 270 mother palms were selected from 99 farmers fields and produced 6000 polybag seedlings per year. The root (wilt) management practices were demonstrated in an area of 61.44 ha for 10,568 coconut palms with farmers' participation. The integrated nutrient management of seedlings increased to 72 %, chemical fertilizers only (6.25%) and organic manures only by 18.75%. knowledge level on mother palm selection, seed nut collection, seedling selection, pit size for planting, spacing and nutrient management improved by 58-77% compared to pre project period. 3 decentralized units for AMF multiplication also initiated in the project for the benefit of other farmers.

... Contd from pg. 7. Table. Details of technology commercialization during the period;

Sl. No.	Name of Technology Commercialized	Date of Signing MOU	Value (In INR)	Licensee
	Matured coconut water based value added products	03-11-2020	15000	Secretary, Chemperi Regional Coconut Growers Co-operative Society Ltd. No. C 1901 (CHECOPS), Kannur District, Kerala
	Trichoderma Coir Pith Cake	05-11-2020	5000	Shri Manjunatha K.S., Hadonahalli village, Shivamoga Taluk, Karnataka
	Know-How on utilization of *Metarhizium anisopliae* culture	31-12-2020	5000	Dr. Mallikarjuna B.G., CEO & Scientist, Promagicell Lifetech Raksham (OPC) Private Limited, Agri Solutions, KM Road, Chikmagalur, Karnataka
	Trichoderma harzianum (CPTD 28) culture	31-12-2020	5000	
	Technical knowhow of production of virgin coconut oil	31-12-2020	40000	Shri K. Ramesh Kamath, Proprietor, Sri Vinayaka Virgin Coconut Oil and Other Products Industries, Barkur, Udupi dist, Karnataka
		Total	70000	

CELEBRATIONS

Vigilance awareness Week-2020

Vigilance Awareness Week was observed at this institute and its regional stations and research centres from 27th October to 2nd November 2020. Dr. Anitha Karun, Director inaugurated the Vigilance Awareness Week. Staff members took the 'Integrity Pledge' on the day. Director briefed the gathering the need of transparency in office dealings. Various programmes including competitions were conducted to create awareness among institute staff and students of nearby schools. A special programme was arranged by the institute Farm Section to sensitize the contractual and other temporary staff working within the institute. An Awareness Grama Sabha was also organised at Mogral Puthur Grama Panchayath. The week long programme was concluded with a valedictory function on the 2nd November 2020. Dr. Anitha Karun, Director chaired the function. Dr. V. Balakrishnan, Deputy Superintendent of Police, Vigilance and Anti-Corruption Bureau, Kasaragod was the chief guest. Over exploitation of natural resources like granite, laterite and river sand, especially in Kasaragod District, is a major corruption according to him.

Dr. V. Balakrishnan, DySP (Vigilance) addressing the gathering

Constitution Day-2020

ICAR-CPCRI, Kasaragod observed the celebration of Constitution Day on 26th Nov. 2020. To commemorate the adoption of the Constitution of India, the Constitution Day (Samvidhan Diwas) is celebrated by webcasting of reading of Preamble of Constitution by Hon'ble President of India. It was joined by the Director, Scientists, Officers, Technical, Administrative and Supporting Staff of the Institute.

World Soil Day 2020

As part of the World Soil Day celebrations 2020, a virtual interactive workshop on the theme: Conserving soil biodiversity for sustainable agriculture" was conducted at ICAR-CPCRI, Regional Station, Kayamkulam on 05 December, 2020. The programme was aimed at creating awareness about the necessity of preserving the pristine nature of soil to the graduate and post graduate student community represented from eight colleges. One hundred and twenty students registered for the workshop which was conducted through zoom platform as well as through the YouTube live sessions. Dr. S. Kalavathi, Acting Head, ICAR-CPCRI, RS in her welcome address stressed importance of World Soil Day commemoration, the duties of the younger generation to carry forward the message to protect the soil wealth for the future sustainment in the planet. The workshop was inaugurated by Dr. S. K. Ray, Head, ICAR-NBSSLUP, RS, Jorhat. In the inaugural address, he highlighted the importance of soil organic matter, the different types of soils in India, the role of soil on sustaining plant health and thereby the human health was emphasized. More than 300 BSc and M.Sc. students from 17 colleges were participated the programme through Zoom meeting and YouTube live.

Farmers Day celebrations

A webinar for the farmers in connection with the farmers day celebration was organized on 23 December 2020. The programme was inaugurated by Dr. S. Kalavathi, Acting head, emphasizing the need for ecological balancing of plant, animal, insect and microbial species, conservation of natural resources and recycling of wastes for making farming sustainable. The technical sessions included the topics: (1) Crop habitat diversification for plant health management handled by Dr. A. Joseph Rajkumar and (2) Residue recycling for sustainable crop yield handled by Dr. A. Abdul Haris. In the session on crop habitat diversification, Dr. Joseph Rajkumar, Principal Scientist, Agricultural Entomology emphasized the importance of diversification in farming systems with the inclusion of crops such as medicinal plants, flowering plants, fruit crops, spices along with coconut in a wholistic manner which will reduce the risk of crop loss or price fluctuation in he market. The system should also include, apiary and fisheries component so that the income per unit inch of land can be multiplied. The volatile hues emerging out of these crop components will ward off the pests and thereby the palm health can be sustained. In the session of crop residue recycling for sustainable palm productivity, Dr. A. Abdul Haris, Principal scientist (Agronomy), explained the nutrient components in the palm wastes, the methods for *in situ* recycling of palm residues, the added benefit of palm residue recycling on crop health and productivity. The programme was coordinated by Dr.K.M.Anes, Dr.Jeena Mathew, Dr. A. Abdul Haris and Dr. S. Kalavathi.

'Swachhtha Pakhwada'

Swachhta Pakhwada from was conducted from 16 December, 2020 to 31 December, 2020 under the guidance of Dr.S.Kalavathi, Acting Head. Swachhta pledge was taken by all staff members of ICAR-CPCRI, Regional Station, Kayamkulam on 16 December, 2020, 10 am at the quadrangle of the campus, inculcating the spirit of cleanliness as envisioned by the father of the nation Mahatma Gandhi. The major activities carried out during the period include, stock taking of the files by the administrative section, weeding inside campus garden and replanting with new flowering plants marigold, celosia, portulaca, micky rose, balsams, pandanus etc. A kitchen garden utilizing the organic inputs, crop and weed residues. Seedlings of tomato, chilly, amaranthus, ladies finger and brinjal were planted at the recommended spacing in the area cleared adjacent to the guest house. All the water lines and sewage lines in the guest house, canteen, and institute were checked for any blockages. The weed biomass (approximately 300 kg) collected from the campus are being composted in concrete rings, using cowdung slurry, EM solution, poultry manure and earthworms. Near canteen building the waste pipelines were cleaned and repaired, the tank for collecting waste water was cleaned and protected with lid. Cleaning of public places such as Kerala State Lalitha Kala Academy, Krishnapuram was also undertaken by the staff members. The collected weeds were composted using EM solution and the technique was demonstrated to the staff members of the Academy. *Metarhizium* was applied to the compost pits in the adjoining areas of Krishnapuram panchayath. Online webinars on topics such as 'Aerobic composting' by Dr. D. Girija, Professor (Rtd), Kerala Agricultural University, 'Water quality assessment and management' by Dr. Harikumar, Scientist, CWRDM were also conducted during the period. A webinar for the farmers in connection with the farmers' day celebration was organized on 23 December, 2020 on crop residue recycling and Dr. Abdul Haris A and Dr. A. Joseph Rajkumar delivered lecture on the topic. The valedictory session as marked by a webinar on the topic 'Health and Hygiene', on 31 December, 2020 at 2 PM, which was inaugurated by Dr. S. Kalavathi, Acting Head and the talk was delivered by Dr. R. Ajith, Asst. Surgeon. Government Medical College, Kottayam.

Cleaning activities at Kasaragod

Consolation prize for carrying out cleaning activities at the ICAR-CPCRI Residential Campus, Kasaragod

Swacchata Pakhwada cleaning activities at Kasaragod and Kayamkulam

Dr. Anitha Karun, Director (Acting), planting tissue cultured seedling in the field

Distinguished Visitors

Visit of Hon'ble Lok Ayukta to CPCRI, Kasaragod

Participation in National Conferences/Seminars/ Symposia/Workshops/Webinars

Name and designation	Programme	Place & Date
Dr. Anok Uchoi, and Dr. L. S. Singh, Scientists	International Webinar on Soil Spectroscopy: An emerging technique for rapid soil health assessment	ICAR-Indian Institute of Soil Science, Bhopal and World Agroforestry (ICRAF), Nairobi 1 October, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Dragonflies and Damselflies: Ace acrobats and wafting damsels on stamps	Indian Dragonfly Society 02 October, 2020
Dr. S. Jayasekhar, Principal Scientist	Webinar series on Transforming Indian agriculture-Role of policies and reforms	Department of Agri. Economics, College of Agriculture, Vellayani 5 October 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Biopesticides - Registration and Quality Control Issues-Way forward	ICAR-NBAIR, Bengaluru 06 October, 2020
Dr. Arun Kumar Sit, Principal Scientist	ICAR Regional Committee II Meeting	Organized by ICAR- NRRI, 08 October, 2020
Dr. L. S. Singh, Scientist	International Webinar on Food Insecurity under Mountain Specificities	North-Eastern Hill University, Tura campus 9 October, 2020
Dr. Vinayaka Hegde, AHD, Crop Production	International E - Conference on "Multidisciplinary approaches for plant disease management for achieving sustainability in agriculture"	Dept. of Plant Pathology, College of Horticulture UHS, Bagalakot, 6 - 9 October, 2020
Dr. M.R. Manikantan, Principal Scientist	"National conference on Agricultual Scientific Tamil" (Virtual)	TNAU 9 - 10 October, 2020
Dr. Rajkumar, Scientist (Nematology)	E-Conference on 'Multidisciplinary approaches for plant disease management in achieving sustainability in agriculture	UHS, Bagalkot 6 - 9 October, 2020
Dr. Prathibha V. H., Scientist	E-Conference on "Multidisciplinary approaches for plant disease management for achieving sustainability in agriculture"	College of Horticulture, GKVK, Bengaluru 6 - 9 October, 2020
Dr. R. Pandiselvam, Scientist,	"National conference on Agricultual Scientific Tamil" (Virtual)	TNAU 9 - 10 October, 2020
Dr. Ravi Bhat, Principal Scientist Act. Head, Dr. A. Abdul Haris Principal Scientist and Dr. K. Nihad, Sr. Scientist	Climate-Smart Agriculture: Opportunities and challenges	NIT, Karnataka jointly with Hiroshima University, Japan and Tata Institute of Social Science, Hyderabad 23 - 27 October, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	International Zoobinar on 'Recent Trends in Biodiversity Conservation'	Mary Matha College of Arts & Sciences, Mannathavady 26-28 October, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	International Webinar on on 'Harnessing the Potential of Tropical Tuber Crops under Changing Climate (HPTTC 2020)	ICAR-CTCRI, Thiruvananthapuram 27 October, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Webinar on Agrochemicals sponsored by FICCI	FICCI, New Delhi, 05 November, 2020
Dr. A. Joseph Rajkumar and Dr. Regi J. Thomas, Principal Scientists	Foundation Day lecture by Dr. T. Mohapatra, Director General, ICAR	IAHS, New Delhi 06 November, 2020

Name and designation	Programme	Place & Date
Shobha K., CTO (Library)	Webinar on J-gate@CeRa user orientation programme	ICAR-DKMA 09 November, 2020
Dr. Ramesh S.V., Scientist	National Virtual Conference on 'Current Trends and Challenges in Plant Biochemistry and Biotechnology'	Society for Plant Biochemistry and Biotechnology (SPBB), New Delhi & BITS, Pilani 20-21 November 2020
Dr. S. Elain Apshara Principal Scientist Dr. M. Shareefa, Sr. Scientist (Hort. Science), Dr. N R Nagaraja, Scientist	International E-Conference on “Advances and Future Outlook in Biotechnology and Crop Improvement for Sustainable Productivity”	UHS, Bagalkot 24 - 27, November 2020
Dr. Ramesh S.V., Scientist	International Electronic Conference on Plant Sciences (IECPS-2020)	Multidisciplinary Digital Publishing Institute (MDPI), Basel, Switzerland 01-15 December, 2020
Dr. Shivaji Hausrao Thube, Scientist (Entamology), CPCRI, RS, Vittal	International Virtual conference on “Biodiversity and Ecosystem Services in a Climate Change Perspective (IVCBES)2020	Environmental Management and Policy Research Institute (EMPRI),Bengaluru, 10 - 11, December 2020
Dr. Arun Kumar Sit, Principal Scientist	Buyer Seller Meet for Spices of Sikkim and North Bengal region	Organized by Spice Board, Regional Station, Gangtok 11 December, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Recent Advances in Agricultural Forestry and Medical Entomology in India	ERI, Chennai, 15 December, 2020
Dr. S. Jayasekhar, Sr. Scientist	28th AERA Annual Conference	16-17 December 2020
Dr. Daliyamol, Scientist	National webinar on 'Recent Molecular Approaches for plant disease diagnosis'	Acharya NG Ranga Agricultural University, Andhra Pradesh 17th December 2020
Dr. Alpana Das, Principal Scientist	Webinar on Prospect of Genetic Improvement of Groundnut in the Genomic Era	ICAR-Directorate of Groundnut Research, Gujarat
Dr. A. Joseph Rajkumar, Principal Scientist	Co-chaired the Pest management technical session of AGM-AICRP on cashew	ICAR-DCR, Puttur 19 December, 2020
Dr. S. Indhuja, Scientist	Webinar on 'Arbuscular Mycorrhiza-Nutritional and health benefits in plants'	College of Agriculture, Vellayani 21 December, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	Farmer-interaction meet and distribution of PM-KISAN Samman Nidhi by Hon'ble Prime Minister	New Delhi, 25 December, 2020
Dr. A. Joseph Rajkumar, Principal Scientist	National workshop on 'Modern Interventions in Environmental Management'	ICAR-IIAB, Ranchi, 30 December, 2020

OTHER INFORMATION

Field planting of first tissue culture raised coconut seedling

Shri. V. Muraleedharan, Minister of State for External Affairs, Govt. of India visited ICAR-CPCRI, Regional Station, Kayamkulam on 27 October, 2020. Hon'ble Minister planted the first tissue culture raised coconut seedlings in front of the main building of ICAR-CPCRI in the presence of Dr. S. Kalavathi, Acting Head. Minister also discussed with Dr. M. Shareefa, Sr. Scientist about the advantages of tissue culture coconut seedlings and interacted with other scientist staff about achievements of this Regional Station.

Shri V. Muralidharan, Hon'ble Union Minister planting tissue culture derived coconut seedling at ICAR-CPCRI, RS, Kayamkulam

Infrastructure/ facility developed

Establishment of EPN mass production laboratory

A mass production laboratory unit for entomopathogenic nematode (EPN) and its host insect *Galleria mellonella* at ICAR CPCRI, Kasaragod. About 13,800 units including EPN aqua formulation and nematode infected *Galleria* cadavers were produced and distributed to farmers for eco-friendly management of white grubs and lepidopteron caterpillars in coconut, arecanut and intercrops.

Career orientation programme

Career Oriented Webinar Series on 'Agriculture and Allied Sciences: Challenging Career Options for Students' was organized at ICAR-CPCRI, Regional Station, Kayamkulam during 6-12th October, 2020 for the Higher Secondary students. More than 1000 students from 14 districts of Kerala and Lakshadweep have actively participated in the programme which was conducted online through Zoom platform and simultaneously broadcasted live through ICAR-CPCRI YouTube channel. The programme was inaugurated by Dr. Rajasree M.S., Vice Chancellor, Dr. A.P.J. Abdul Kalam Technological University, Thriruvananthapuram and Mr. P.B. Nooh, IAS, was the guest of honour during the programme. The webinar consisted of a talk and seven technical sessions by eminent speakers including Dr. Anitha Karun (Acting Director, ICAR-CPCRI), Dr. Jiju P. Alex (Director of Extension, KAU), Dr. K. Muralidharan (Acting Head, Division of Social sciences, ICAR-CPCRI), Dr. S. Kalavathi (Acting Head, ICAR-CPCRI, RS, Kayamkulam), Dr. C. George Thomas (former Associate Dean, COH, KAU), Dr. Manoj P. Samuel (Head, Division of Engineering, ICAR-CIFT), Dr. P.J. Cherian (Executive Director, PAMA Research Institute), Dr. Chandrika Mohan (Principa Scientist), Dr. Anithakumari (Principal Scientist), Dr. A. Joseph Rajkumar (Prinicipal Scientist), Mr. Nagesh S.S. (Chief - Agriculture, Kerala state planning board), Dr. Sudheesh Manalil (Honorary Associate Professor, University of Queensland, Australia). The programme was coordinated by Dr. K. Nihad (Senior Scientist), Dr. Anes K.M. (Scientist) and Dr. S. Kalavathi (Acting Head).

'Kalpa' EPN aqua formulation units ready to transport to the field; distribution of EPN formulations to farmers

Contributions to the Covid-19 disaster management fund

In accordance with the appeal made by the District Collector, Kasaragod, staff of ICAR-CPCRI, showing solidarity with the efforts made by the Kerala State Government, contributed collectively from the Centres located in the state. Dr. Anitha Karun, Director (Acting) handed over the collective contributions of ICAR-CPCRI staff to the Chief Mnister's Distress Relief Fund to Shri E. Chandrasekharan, Hon'ble Minister for Revenue and Housing handling the district responsibility of Kasaragod in presence of Dr. Sajith Babu, IAS, District Collector on 3 August 2020.

Dr. Anitha Karun, Director (Acting), contributing the staff collection to Sri E. Chandrasekharan, MLA

PERSONALIA

APPOINTMENTS

Name	Designation	Place	w.e.f.
Shri Kripesh Kumar	Skilled Support Staff	ICAR-CPCRI, Kasaragod	02-11-2020

PROMOTIONS

Name of the staff	From (Designation)	To (Designation)	w.e.f.
Shri B. Anil Kumar	Technical Officer, ICAR-CPCRI, RS, Kayamkulam	Senior Technical Officer, ICAR-CPCRI, RS, Kayamkulam	30-03-2015

TRANSFERS

Name of the staff	From (Place)	To (Place)	w.e.f.
Shri Prakash Burman	Sr. Technician ICAR-CPCRI, RS, Vittal	Sr. Technician, ICAR-CPCRI, RC, Mohitnagar	30-12-2020

RETIREMENTS

Name	Designation	Place	Date
Shri K. Devadas	Asst Chief Technical Officer	ICAR-CPCRI, Kasaragod	31-10-2020
Shri A. Sanjeeva	Technical Asst.	ICAR-CPCRI, Kasaragod	30-11-2020
Shri Vineeth V.S.	Technical Trainee	ICAR-CPCRI, RS, Vittal	13-11-2020 (resignation)
Smt. K. Lolakshi	Skilled Support Officer	ICAR-CPCRI, RC, Kidu	31-12-2020
Shri B. Ananda Gowda	Senior Technical Asst.	ICAR-CPCRI, Vittal	31-12-2020
Dr. Saran Kumar Rizal	Chief Technical Officer	ICAR-CPCRI, Research Centre, Mohitnagar	31-12-2020

Cover Photo: Arecanut dwarfs plantation laid out at ICAR-CPCRI, Regional Station, Vittal, Karnataka

Published by: Dr. Anitha Karun, Director (Actg.)
Compiled and edited by: Dr. Murali Gopal, Dr. K. Muralidharan, Shri H. Muralikrishna and Dr. Anitha Karun
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