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FROM THE DIRECTOR'S DESK

COP26 and its resonance in the plantation sector

COP26, the 26th United Nations Climate Change Conference, known as Conference of the Parties, held in Glasgow, UK, from 31 October to 13 November 2021, was a critical moment in the world's mission to keep the hope of limiting global temperature rise to well below 2 °C (preferably 1.5 °C) as it falls on the fifth year cycle for every country to update the nationally determined contributions (NDCs) on reducing emissions as per the Paris Agreement (COP21 held in 2015). Sri Bhupendar Yadav, Hon'ble Minister of Environment, Forest and Climate Change, led the Indian delegation to Glasgow. India's declarations on carbon emission reductions in COP26 are considered path-breaking and ambitious.

Amongst the five commitments made by India, the plantation sector may play a significant role in the following two commitments: (i) reduction of carbon emission by one billion tonnes between now and 2030; and (ii) achieving net-zero emissions by 2070.

Coconut, arecanut and cocoa have a significantly high carbon sequestration potential and sequester carbon for longer periods (>30 years). It is estimated that coconut can sequester as high as 15t CO_2/ha/year; it is 7t in arecanut and 1t in cocoa. With every one lakh ha area brought under coconut, arecanut and cocoa, 23 lakh tonnes CO_2 would be sequestered annually. This will only be 0.23% of the country's commitment, but quite significant achieved from a relatively small area. Sequestration could be doubled from the same area by adopting the high-density multiple cropping systems.

One major component of achieving net-zero emissions by 2070 is increasing forest or tree coverage. In this regard, the relevance of plantation crops needs no mention as they provide the much needed employment generation, income, and food, especially when established in smallholder systems where local people have control over overproduction. These crops also provide scope for adopting high-density multispecies cropping systems and may help mitigate the effects of climate change to some extent.

However, the aforesaid positive benefits are possible only when CO_2 emission is reduced, and global warming is contained below 1.5°C. The temperature would rise by 2.1 and 3.3 °C in many coconut and arecanut growing regions with the overall carbon emission level. An analysis of crop suitability based on the MaxEnt model suggested productivity enhancement in coconut all along the west coast but limited set back in the south interior of Karnataka and Tamil Nadu. In the Eastern region, it may become less suitable. In the case of arecanut, Karnataka, which is contributing more than 60% of the production, may become more vulnerable.

In south interior regions with low rainfall, the temperature-induced rise in evapotranspiration might subject the crops to drought if not adequately irrigated. In other words, more attention is required for soil moisture management in these areas for which technologies are made available. Such technologies include water conservation in the basin by half circle bunds across the slope and coconut husk burial; providing trenches filled with coconut husk in the interspaces; providing contour bunds; cover cropping; construction of rainwater harvesting structures; and adopting drip irrigation. It is pertinent that the Institute is a pioneer in moisture stress tolerance studies based on physiological and biochemical characters. With the availability of whole-genome sequencing data and results from various 'omics' studies, it would be certainly possible to arrive at molecular markers in the near future.

Dr. Anitha Karun

Inside...

SPECTRUM

Kalpa Raja Coconut Variety

Kalpa Raja is a tall variety of coconut developed by hybridization (WCT x WCT) specifically for the root (wilt) disease prevalent tract. The high yielding, root (wilt) disease-free parental palms for crossing were selected during the period 1993-94 from the disease 'hotspots' after serological testing. The crossings for developing different lines of WCT x WCT cross combinations were carried out during 1994-96. The progenies of WCT x WCT planted during 1996-98 are superior in terms of higher yield and have recorded less root (wilt) disease incidence compared to WCT (OP) and WCT (Self) progenies. The four years average yield of WCT x WCT progenies was 80.1 nuts/palm/year. The healthy palms gave on an average 158 nuts and the diseased palms gave an average yield of 65 nuts. Performance evaluation trials at CDB Farm, Neriamangalam revealed that the four years average yield (2015-19) of WCT x WCT was 91.3 nuts/palm compared to WCT (OP) which yielded 69.4 nuts/palm. It is recommended for release as 'Kalpa Raja', a tall variety suitable for cultivation in root (wilt) disease prevalent tract.

Regi J. Thomas, M. Shareefa, Merin Babu, S. Kalavathi, and Anitha Karun

Effects of drought on anatomical leaf characteristics

The effects of drought on anatomical leaf characteristics were investigated in eight hybrids and a control variety in order to reveal the origin of the variability in drought resistance/tolerance among these cultivars. Unique anatomical characteristics were associated with drought stress tolerance. Thickness of epidermis was associated with drought tolerance, genotypes with higher epidermal thickness had lower water loss rates and thinner upper epidermis widths had higher water loss rates. Among the hybrids, higher thickness of upper and lower epidermis was observed in COD x LCT (46.02 μm and 30.86 μm respectively) followed by WCT (30.59 μm and 27.55 μm respectively). Drought tolerance was also associated with thick palisade mesophyll layers. Among the hybrids, the thickness of the palisade and spongy mesophyll tissues was more in COD x LCT (223.30 μm and 88.04 μm respectively). Greater xylem area is also associated with the ability to maintain functional conductance under stress, ensuring better water potential and stay-greenness. Among the hybrids, the diameter of the xylem is more in COD x LCT (44.41 μm) followed by COD x WAT (34.31 μm). Stomatal characteristics such as less number of stomata per unit area is associated with drought resistance, as number of stomata reduced, the resistance for drought increased. Among the genotypes, MYD x WCT (3.3 μm) recorded reduced number of stomata per microscopic field.

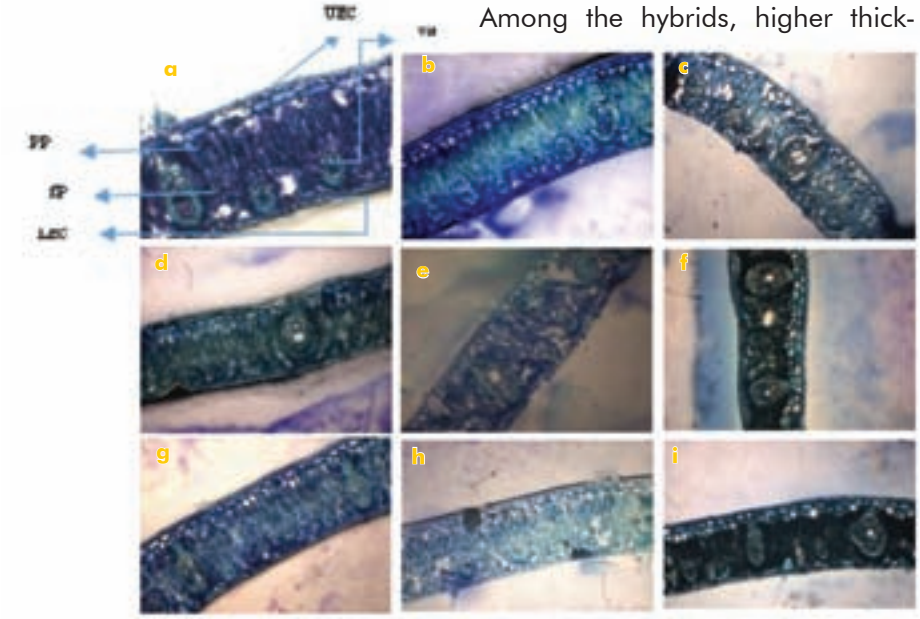


Fig 1. Leaf anatomy of coconut hybrids and WCT. Leaf cross-sections showing the upper epidermis cell (UEC), lower epidermis cell (LEC), palisade parenchyma (PP), spongy parenchyma (SP) and vascular bundles (VB) under a light microscope. a) CODxWAT, b) CODxLCT, c) CODxWCT, d) CODxADOT, e) MYDxWCT, f) MYDxWAT, g) MYDxLCT, h) MYDxADOT and, i) WCT

Sudha, R., Niral, V., Samsudeen, K. and Neema, M.

Characterization of pink husked Tall x Tall hybrid

Tender nut characters in the normal and pink husked hybrids of PHOT x FJT were studied. Volume of tender nut water (625 mL) and husk thickness (2.35 cm) was high in pink husked nuts when compared to normal husked nuts (495.6 ml and 2.08 cm respectively). Weight of the tender nut, length and breadth of the tendernut, polar and equatorial circumference of the tendernut, polar and equatorial circumference of the cavity was higher in normal hybrid nuts than pink husked hybrid nuts. Biochemical characteristics of tender nut revealed protein (314.5 mg/100mL), amino acid (40.39 mg/100mL), sodium (2737.5 ppm)

Fig. 2. Pink husked nuts of PHOTxFJT hybrid

and potassium content (1412.5 ppm) of pink husked nuts recorded higher values than normal nuts. Total sugar (4.84 g/100mL) and reducing sugar content (2.39 g/100mL) of the pink husked tender nut water are on par with normal tender nut water.

Niral, V., Sudha, R. and Samsudeen, K.

Ecological and economic benefits of conservation biological control of rugose spiralling whitefly on coconut

Pesticide holiday approach, conservation biological control using the aphelinid parasitoid, *Encarsia guadeloupae* Viggiani and *in situ* habitat preservation of the sooty mould scavenger beetle, *Leiochrinus nilgirianus* Kaszab and other defenders are found effective in the bio-suppression of the exotic rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin on coconut. The monetary gain by non-spraying of insecticides for at least 300 million palms, natural production of *E. guadeloupae* @ 500 nymphs or pupae of RSW / palm by 40% parasitism, timely emergence of *L. nilgirianus* in coconut system, preservation of pollinators (Bees, ants, weevils *etc.*) and ecosystem services in synergy with environmental health @ 10% of the value of defenders /pollinators was approximately accrued to about 17.958 billion rupees. Besides conservation of environmental health, the wellness and human health have been safeguarded through conservation biological control auguring a concept of one-health approach in intelligent pest management solutions on transboundary pests.

Josephrajkumar, A., Anes, K.M. and Merin Babu

Nutrient exhaustion by *Setaria* weed grass in coconut garden

Setaria sp. is a noxious grassy weed profusely infesting the coconut gardens. It is propagated through slips and seeds like other grasses. On average, the weed was observed at a density of 2-4 clumps per m^2. To quantify the magnitude of nutrients taken by the weeds, the nutrient composition of these weeds, dry matter content, root and top uptake and total uptake of nutrients were computed. It was found that the concentration of phosphorus, potassium calcium, magnesium in the above ground biomass was 0.24%, 3.38%, 0.60% and 0.18% respectively. In the root biomass, the nutrient concentration was 0.1%, 2.36%, 1.15% and 0.13% respectively. Considering the dry matter content of root and shoot in an infested garden, the total uptake of nutrients phosphorus, potassium, calcium and magnesium in kg ha^{-1} were 8.18, 71.55, 19.36, 3.78 respectively. The total uptake of micronutrients such as iron, manganese, copper and zinc in mg ha^{-1} were 1372, 202, 67 and 160. The nutrient profile of Setaria grass opens up the possibility for its composting for recycling the nutrients back to the soil from plants available in non-cropped land and boundary areas. At the same time, control measures are to be taken to reduce the nutrient loss by weed uptake from the cropped garden.

Jeena Mathew and Abdul Haris, A.

By product utilization in cocoa - Cocoa Juice

Cocoa beans have an outer white sweet mucilaginous pulp, which contains 84% water, 10% glucose and fructose and inorganic acids. These wet beans undergo biochemical reactions during the week-long fermentation process, but on the first day, a considerable quantity of pulp is being drained and wasted as sweatings from the fermentation mass. Hence, utilization of this pulp as cocoa juice is explored. Fifty eight Forastero type pods with a wet bean weight of 5.63 kg were used for the extraction of 2.5 litres of fresh juice during the second harvest season in October. TSS of mucilage ranged from 12-14°Brix, after dilution with water it was 7°Brix. Around 150 mL of bottled juice were added with sugar, cane sugar, salt, honey and lemon+salt+sugar mix individually and the TSS recorded was 15.4, 14, 8, 18.4 and 12°Brix respectively. Organoleptic evaluation was done with scores on taste and palatability with a panel of 10 tasters. Cocoa juice flavoured with lemon+sugar+salt mix was the most preferred one followed by juice with honey.

Fig. 3. Cocoa juice extraction from wet beans

Fig. 4. Cocoa juice with different combinations

Elain Apshara, S.

Biochar particle size affects soil nutrient availability

Biochar, prepared from dried cocoa pod husks, was partitioned into three particle sizes, *viz*. 0.5-1.0 mm (small), 1-2 mm (medium) and 2-4.75 mm (large), using appropriate sieves. These were mixed with soil @ 1% and incubated at 50% field capacity in the dark. Analysis was done at regular intervals to study the nutrient release dynamics. The results revealed that the particle size of the biochar had an inverse relation to the release of the nutrients. The concentration of available nutrients especially for phosphorus, potassium, calcium, magnesium, sulphur, zinc and copper was more in the smallest biochar size. At the same time, micronutrients like iron showed a declining trend, as the incubation period progressed, irrespective of the particle size, to the point of dropping below 'control' levels. Soil pH did not show any significant variation with the change in particle size of the biochar.

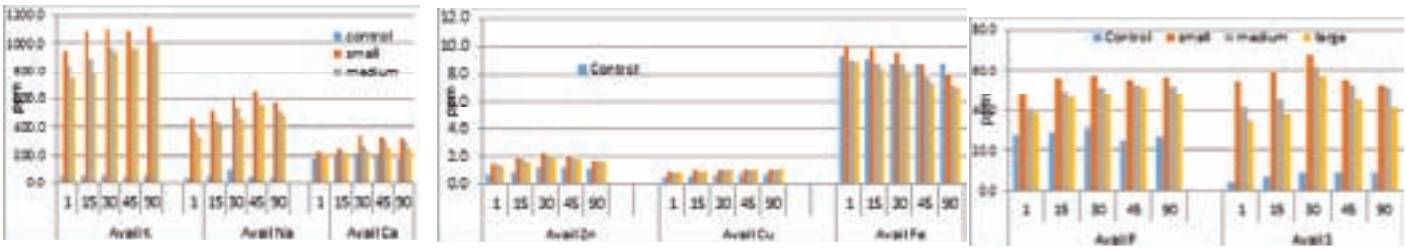


Fig. 5. Nutrient release dynamics of different micronutrients from biochar

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

Management of YLD in arecanut

Field trial on the management of YLD was initiated in two farmer's gardens in Sringeri and three gardens in Sullia taluk in 2015 and 2016, respectively, to demonstrate YLD management strategies for arecanut in farmer's field. Plastic mulching during monsoon (June-October) was found to reduce the disease index in all three management trial plots in Sullia during the experimental period (2017-2021) compared to the pre-experimental data (2016). The disease index during 2021 was 1.7 – 3.0%, whereas, it was 2.9-5.8% in 2016 in different plots. Importantly, the yield was 1184 – 2525 kg ha^{-1} in mulched plots, which was 2-14% higher than non-mulched plot. It was observed that plastic mulching during monsoon could delay the symptom expression and increase the yield in YLD affected gardens (especially when the initial disease index is low).

Fig. 6. Plastic mulching in YLD affected garden

Bhavishya, Priya, U.K. and Ravi Bhat

Development of a diagnostic assay for the species specific detection of *Fusarium falciforme*, infecting arecanut

To develop the species-level detection of *Fusarium* associated with arecanut root decay disease, universal primers targeting housekeeping genes were attempted. A Polymerase Chain Reaction (PCR)-based diagnostic assay targeting three housekeeping genes *viz*., translation elongation factor 1α (tef1α) using tef1αF (5'-GACTCACCTTAACGTCGTCG-3')/ tef1αR (5'-GATGAAATCAC GGTGACCGG-3'), RNA polymerase III large subunit (RPB1) using RPB1F (5'-GAAC GGTGTCCAGCAAGTTGTG-3')/ RPB1R (5'-GACTG MGCAGCCAGAACACCA-3') and RNA polymerase II second large subunit (RPB2) using RPB2F (5'-CACATTTGCGACGAACCAACAC-3')/ RPB2R (5'-CCTGGTTGTGAT CGGGGAAAGG-3'), identified the fungal pathogen as *Fusarium falciforme*, a member of *Fusarium solani species complex* (FSSC). Species-specific primers developed under the present investigations were validated using various isolates of *Fusarium falciforme*.

Thava Prakasa Pandian R. and Shivaji Hausrao Thube

Association of *Ganoderma ryvardenii* causing arecanut basal stem rot disease in dry arecanut growing tracts of Karnataka

During regular pest and disease surveillance program, significant incidence (>90%) of basal stem rot disease was documented from Kadur taluk of Chikkamangaluru district, Karnataka. Diseased samples were collected and isolation of causal organisms was carried out at CPCRI, RS Vittal. A whitish fungus

was constantly isolated from the infected materials. Cultural and molecular characterization using partial ribosomal DNA amplification with universal primers (ITS1 and ITS4) revealed the association of new *Ganoderma* species i.e., *G. ryvardenii* with the diseased samples (GenBank accession No. OM169346). This is the first report on the association of *Ganoderma ryvardenii* with arecanut basal stem rot disease prevalent in dry tracts of Kadur taluk, Chikkamangaluru district, Karnataka.

Fig. 7. a) & b) – Basal stem rot symptoms on arecanut; c) – Pure culture of *Ganoderma ryvardenii* on PDA plates

Thava Prakasa Pandian, R., Shivaji Hausrao Thube, Bhavishya, Chaithra, M. and Vinayaka Hegde

Unravelling the conundrum of stem rot disease caused by *Marasmiellus* sp. in arecanut

During post-monsoon season of 2020, severe rotting of arecanut stems were reported from younger plantations located at Dharmasthala, Belthangady Tq., Karnataka. The disease incidence varied from 90-100%. Rotting was observed on the stem near the soil region and extended up to 6 feet height of the palm. Severely infected palms rotten and collapsed at the later stage of infection. Diseased samples were collected and kept for pathogen isolation by following standard isolation procedures. A whitish coloured fungus was constantly isolated from the infected tissues and subjected to molecular characterization using ITS amplification. Gene sequence results identified this fungus as *Marasmiellus* species. Pathogenicity was established by inoculation of the pathogen on healthy arecanut stem and re-isolation was completed successfully. The amplified gene sequence was submitted in the NCBI database (GenBank accession No. OM212645). Ambrosia beetle (*Xyleborus perforans*) was also found in the infected stem and the role of these beetles have to be elucidated further. This is the first report on the association of *Marasmiellus* sp. with arecanut stem rot disease in India.

Fig. 8. a) -d) - Different stages of arecanut stem rot symptoms; e) Proving pathogenicity on a healthy arecanut stem f) - g) – Pure culture of *Marasmiellus* sp. on Potato dextrose agar (PDA) plates

Thava Prakasa Pandian, R., Shivaji Hausrao Thube, Bhavishya, Chaithra, M. and Vinayaka Hegde

Identification of an effective bacterial isolate against major fungal pathogens of palms and cocoa

Four bacterial isolates*viz.*, *Bacillus licheniformis* strainPALEB3, *Bacillus megaterium* strain SHIS10, *Bacillus* sp. strain SHIS11 and *Rhizobium* spp. strain S8 were screened following dual plate assay against major fungal pathogens, *Fusarium solani*, *Ganoderma lucidum* and *Colletotrichum gloeosporioides* commonly infecting palms and cocoa. Among the tested bacterial isolates, *Bacillus licheniformis* strainPALEB3 recorded maximum inhibition (59.25%)as compared to others. This isolate could be employed in the development of eco-friendly management measures against the above fungal pathogens under the study.

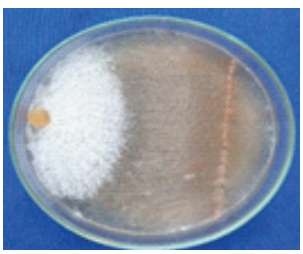


Fig. 9. *F. solani* + *B. licheniformis* PALEB3

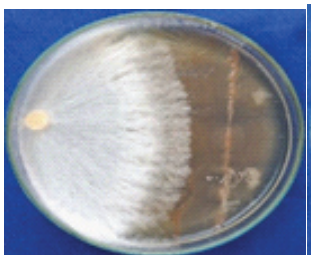


Fig. 10. *G. lucidum* + *B. licheniformis* PALEB3

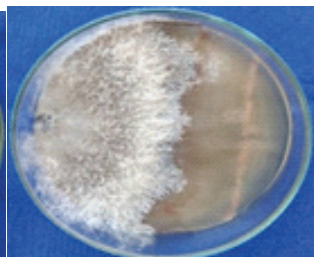


Fig. 11. *C. gloeosporioides* + *B. licheniformis* PALEB3

Chaithra, M., Thava Prakasa Pandian, R., Elain Apshara, S., Shivaji Hausrao Thube, and Priya, U.K.

Fungal micro-flora associated with storage spoilage of cocoa

Moulds/fungi are ubiquitous in cocoa storage which causes loss in weight of cocoa beans. In the present investigation, seed samples were collected from different geographical locations *viz.*, 1. ICAR-CPCRI, RS, Vittal, 2. Farmers field, Vittal, 3. Karadykan estate, Balehonnur and 4. Badra Estates, Balehonnur and subjected to agar plate technique to find out the associated seed-borne mycoflora of cocoa. A total of fifteen morphologically different isolates were isolated and characterized. Morphological and molecular characterization using ITS specific primers revealed different fungal genera *viz.*, *Aspergillus* spp., *Talaromyces* spp., *Lasiodiplodia* spp., *Fusarium* spp.,., *Lichtheimia* spp., *Scopulariopsis* spp. and *Syncephalastrum* spp. were associated with the cocoa seed storage spoilage.

Fig. 12. Seed-borne mycoflora of cocoa isolated and cultured in the laboratory

Chaithra, M., Thava Prakasa Pandian, R., Elain Apshara, S., Shivaji Hausrao Thube, and Priya, U.K.

Screening of arecanut germplasms against spindle bug, *Mircarvalhoia arecae*

Six arecanut varieties and one hybrid were evaluated for their resistance against spindle bug infestation. One year old seedlings of arecanut with spindle leaf are subjected for choice test to know the preference of feeding by nymphs and adults of spindle bug (35 nymphs + 35 Adults). Feeding preference of spindle bug was analyzed based on number of feeding lesions (pos-inoculation), total area of infestation and percentage of spindle leaf infested per treatment.

Arecanut Hybrid (VTLAH-1) was recorded as highly susceptible (>140 feeding lesions and 50.73 cm^2 area of infestation) followed by Shatamangala (>128.5 feeding lesions and 50.31 cm^2 area of infestation). Mangala was found to be the least preferred variety of arecanut by spindle bug *i.e.* 49.50 mean feeding lesions and 21.78 cm^2 area of infestation. This *in-vitro* study results will certainly help in formulating the breeding programmes for spindle bug resistance in arecanut.

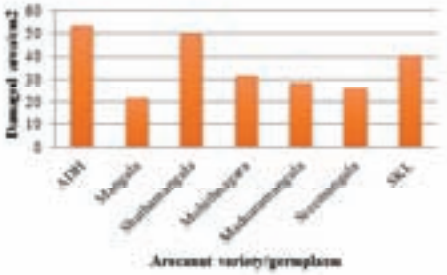


Fig. 13. Spindle bug damage to seedlings of different areca varieties

Shivaji H. Thube, Nagaraja N.R and R.T.P. Pandian

Novel cost-effective prototype to trap ambrosia beetle complex in plantation based ecosystem

In recent times, various species of the ambrosia beetles have emerged as a major threat to the plantation-based ecosystem in India. A symbiotic association of specific fungal species is reported from different species of ambrosia beetles. Adult females bore galleries into the plant xylem and started inoculating the mutualistic fungi, which serve as a food source for the developing broods. Recently, we have encountered the infestation of various species of ambrosia beetle *viz.*, *Xylosandrus crassiuscuslus*, *Euwallacea fornicatus* and *Euplatypus parallelus* from arecanut and cocoa. Incidence of ambrosia beetle is also recorded from other plantation crops like cashew nut, coconut and coffee. In the climate change scenario, these ambrosia beetle complex pose a serious threat to plantation crops.

In view of studying the diversity and management of these beetle complex in Indian condition, we designed a cost-effective and re-usable trapping device under the present investigation. Alcohol based solvent is used as an attractant for adult beetles. Four various concentrations were evaluated including control (only water) to find out the initial trapping efficiency of the developed device. A total of 100 ml attractant was used per trap. The number of beetles trapped per device was counted at 24 h interval. Likewise, the observations were collected till evaporation of the attractant (varied

Fig. 14. Prototype of Ambrosia beetle trap

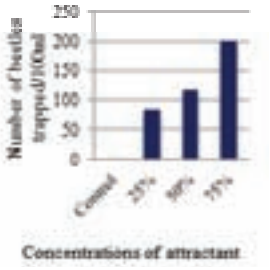


Fig. 15. Relationship of concentration of attractant to number of trapped beetles

between 8-14 days). The maximum trapping efficiency was recorded in the device containing 75% concentration of the attractant with 200 beetles/trap (Recorded up to 7 days of installation). No single beetle was trapped in the control device. A total of five different ambrosia beetle species were collected during this study.

Shivaji H. Thube, Pandian, R.T.P., Enrico, R., Josephrajkumar, A. and Bhavishya

RNA-Seq reveals molecular response of cocoa genotypes to water-deficit stress

The total RNA extracted from the leaves of both the control and treated (water-deficit stress) cocoa genotypes *viz*., VTLC22 and VTLC15 were sequenced using NGS platform. The clean reads after processing the raw transcriptome sequences were mapped to the Cacao Genome Database (CGD), which harbours 43,653 transcripts for genome assembly and annotation of one of most cultivated cacao type Matina 1-6 cultivar. Analysis of differentially expressed transcripts revealed that 486 cocoa water-deficit stress responsive transcripts are specific to VTLC15 whereas 505 water-deficit stress responsive transcripts belonged to VTLC22. Among this 303 transcripts were shared by both the genotypes. The differential gene expression pattern in the cocoa genotypes was further corroborated by the variations in the enrichment of KEGG metabolic pathways suggesting differential molecular responses of the genotypes to water deficit stress. Water-deficit stress activates multiple metabolic pathways involved in chalcone synthase, genes involved in cell number regulator, aspartate amino transferases, MYB-related protein among others when compared to the transcriptome of control seedlings suggesting the molecular interplay of diverse metabolic pathways.

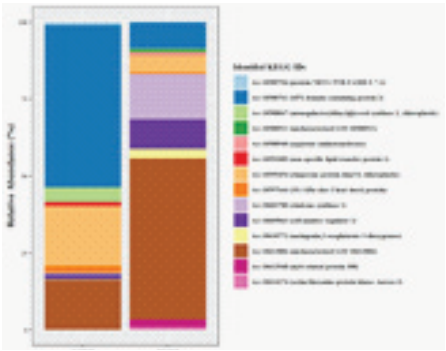


Fig. 16. Response of cocoa genotypes to water-deficit stress

Ramesh S.V., Rajesh M.K., Elain Apshara, Sandip Shil and Hebbar K.B.

Phenolic acids of coconut testa oil

The phenolic acids of coconut testa oil (extracted with 80% methanol) were characterized using LC-MS/MS (Waters UPLC H class system fitted with TQD MS/MS system) by resolving eluents on an analytical column BEH-C18 (2.1x 50 mm, 1.7 µm) (Waters) protected by a Vanguard BEH C-18 (Waters, USA) with the gradient flow of organic and aqueous phase in the flow rate of 0.1mL/min. The eluted phenolic acids were monitored by a PDA detector and the eluted metabolites were pumped directly without any split into the TQD-MS/MS (Waters, USA) system optimized for the analysis of the phenolic acid. LC-MS analysis revealed the presence of 18 phenolic acids such as p-coumaric acid (67.40 ± 4.8 $\mu g\ g^{-1}$), caffeic acid (15.14 ± 0.24 $\mu g\ g^{-1}$), vanillic acid (5.32 ± 0.09 $\mu g\ g^{-1}$), ferulic acid (5.05 ± 2.10 $\mu g\ g^{-1}$),trans cinnamic acid (3.75 ± 0.83 $\mu g\ g^{-1}$), gallic acid (3.10 ± 0.59 $\mu g\ g^{-1}$), o-coumaric acid (2.26 ± 0.34 $\mu g\ g^{-1}$), p-hydroxy benzoic acid (1.83 ± 0.12 $\mu g\ g^{-1}$), among others. Phenolic acids such as benzoic acid, syringic acid protocatechuic acid and chorogenic acid, salicylic acid, 3-hydroxy benzoic acid, 2,4-dihydroxybenzoic acid, sinapic acid and ellagic acid are found in minimal quantities (<1 $\mu g\ g^{-1}$).

Ramesh S.V., Hebbar K.B., Lokesha A. and Shivashankara K.S.

Coconut testa-based food colourant and phytochemical attributes

Defatted coconut testa powder was used as substrate to extract colourant using various organic solvents (HCL acidified acetone, ethanol and phosphoric acid acidified ethanol) in direct and ultrasonication assisted extraction (UAE) procedures. The phytochemical composition of the testa colourant, based on standard qualitative tests, revealed the presence of flavonoids, tannins and anthocyanins whereas anthraquinones, steroids, saponins and terpenoids are conspicuously absent. Also analysis of monomeric anthocyanin content of testa-colourant following the pH-differential method divulged that

the treatment of 0.3 M HCl acidified ethanol for 60 min at 70 °C yielded highest level of anthocyanin of 23.71 ± 2.19 mg/ Kg Cy-3-glc equivalents, whereas the lowest anthocyanin was obtained with the same treatment at 60 °C (4.07 ± 1.26 mg/ Kg Cy-3-glc equivalents). Among the extracts that were obtained from ultrasonication process, acidified ethanol treated for 120 min at 60 °C yielded anthocyanin content of 18.20 ± 2.09 mg/ Kg Cy-3-glc equivalents. Hence, to improve the functional components in the testa colourant use of acidified ethanol either in a water bath or UAE methodology is suggested.

Fig. 17. Coconut testa-based food colourants

Ramesh, S.V., Shameena Beegum P.P., Pandiselvam R., Sugatha P., Manikantan M.R.and Hebbar, K.B.

Acrylamide formation in coconut chips produced by hot air drying, frying and baking method

Coconut chips is a popular and nutritious ready-to eat healthy snack. Currently, convective hot air drying method is followed for the production of chips which takes long time for the production of crispy snacks. However, frying and baking methods of chips production are not preferred owing to the possibility of formation of acrylamide. Therefore a study was initiated to optimize the temperature-time combinations for the production of coconut chips following frying (Fried at 150 °C for 3 min;150 °C for 6 min; 160°C for 3 min; 160 °C for 6 min; 170 °C for 3 min; 170 °C for 6 min) and baking (Baked at 120 °C for 55 min; 150 °C for 45 min; 180 °C for 28 min; 210 °C for 22 min; 240 °C for 15 min. and 270 °C for 7 min) methods. The quality (proximate composition, mineral contents, and sensory evaluation) of the chips prepared by both the methods were analyzed and compared with hot-air drying method. The results indicated that the level of acrylamide is higher in fried samples than the baked chips. The samples baked at 120 °C for 55 min and 150°C for 45 min have comparatively low acrylamide content than others.

Pandiselvam, R. Manikantan, M.R., Ramesh, S.V., Shameena Beegum, P.P., Sugatha, P. and Hebbar, K.B.

Coconut infused dark chocolates

Kalpa bean to bite dark chocolate comprises 45% cocoa nibs, 30% coconut sugar and 25% cocoa butter. To reduce the cost, an effort was made for partial substitution of cocoa butter with different levels of coconut products and by-products such as desiccated coconut, coconut milk powder, coconut milk residue and VCO cake (25 and 50% replacement respectively). The resultant chocolates made was compared with two control chocolates (Kalpa bean bite and a commercial dark chocolate with 70% nibs and 30% coconut sugar) with respect to sensory attributes and nutritional quality in terms of functional and mineral contents. The raw materials such as raw, roasted beans, nibs showed maximum phenolic and antioxidant potential. Among the butter substitutes, chocolate made with 50% of butter replacement with desiccated coconut (703.25 mg GAE/ 100g) showed the maximum phenolic content followed by 50% coconut milk residue (619.56mg GAE/ 100g). Reduction in flavonoids occurs while roasting was visible from the data. Dark chocolate made with 70% nibs and 30% coconut sugar showed higher flavonoids comparable with that of raw beans. Cocoa butter replaced with 25 and 50% coconut milk residue was comparable with that of dark chocolate made with the control followed by 50% desiccated coconut. With regard to antioxidant activity, treatment consist of 50% butter replacement with coconut milk residue showed antioxidant potential (FRAP) higher than that of the control chocolate (542.03mg TE /100g against 446.82mg per 100g in control chocolate sample. With regard to the macro nutrients (P, K, Na, Mg, Ca and S), and micro nutrients (Fe, Mn, Zn and Cu), raw beans and roasted beans showed maximum concentration followed by chocolate made with 50% butter replacement with VCO cake. Result obtained for sensory evaluation revealed that the treatment with VCO cake was statistically significant. However, there were no significant difference among the chocolate samples in the scores obtained for appearance, colour and mouthfeel ($P>0.05$).

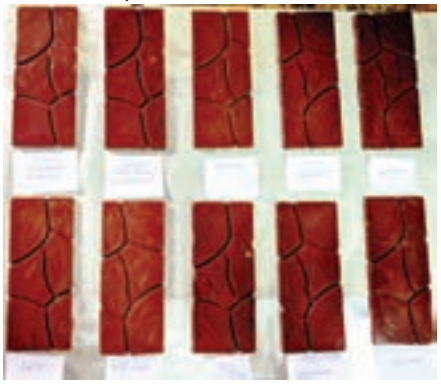


Fig. 18. Dark chocolate with different ingredient combinations

Shameena Beegum, P.P., Sugatha P., Ramesh S.V., Neenu, S., R. Pandiselvam., Manikantan, M.R. & Hebbar, K.B.

Microbial changes in coconut milk on storage

Freshly extracted coconut milk (freshly harvested WCT variety), when stored at 30°C, showed an increase in microbial population with an increase in holding time. There was no appreciable change in the microbial population in coconut milk within 1-2 hours of keeping; thereafter, it started fermenting and the population increased exponentially with an increase in keeping time. There was ≥250-fold increase in microbial population after 7 h of keeping the coconut milk at 30°C. The microflora consisted of both bacteria and yeasts. Conversely, no filamentous fungi were detected in coconut milk at any point of holding period. Though the total microbial colony forming units increased, there was a reduction in the number of colony morphotypes as the fermentation of coconut milk progressed.

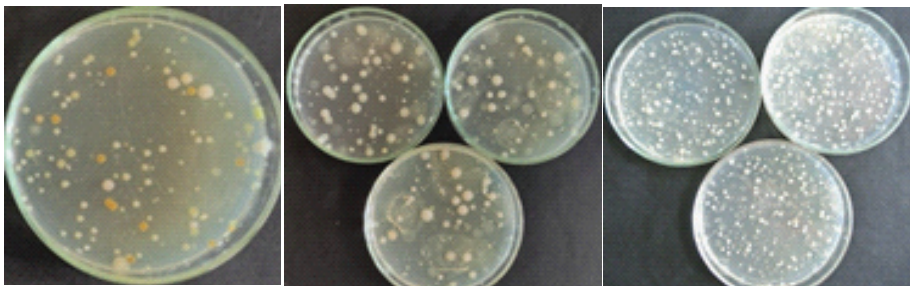


Fig. 19. Microflora in coconut milk at increasing time intervals

Alka Gupta, Shameena Beegum, P.P., R. Pandiselvam and M.R. Manikantan

SUCCESS STORY

Modified ground pollination technique in coconut

The ground pollination technique developed by Deva Kumar *et al.*, 2018 was modified to perform artificial pollination on parental palms of coconut. The refinements include using flexible PVC pipe instead of PVC tube. The battery operated vertical air blower used for pumping the pollen-talc mixture was replaced with hand pump pressure sprayer. To aid uniform dusting of pollen-talc mixture onto receptive female flowers inside the pollination bag, a micro sprinkler was fixed onto the top end of the PVC pipe inserted inside the pollination bag. Pollination using modified ground pollination technique was carried out during 2020 on 40 dwarf and 56 tall mother palms at three centres of ICAR-CPCRI (Kasaragod, Kayamkulam and Kidu) and two AICRP centres (Aliyarnagar and Ratnagiri). The modified ground pollination technique gave a fruit set of 22.0-30.9% (D X T) and 24.7-26.0% (T X D) which was comparable with fruit set obtained with manual pollination.

Demo of modified ground pollination technique to Sri A.M. Arif, Hon'ble MP

To initiate a large-scale demonstration of this technique, offline training on 'Hybridization techniques in coconut with special emphasis on modified ground pollination technique' was conducted at Chavakkad (Thrissur) for officials of the Department of Agriculture Development & Farmers Welfare during 8-11th November 2021. Dr. Regi J. Thomas, Principal Scientist along with H. Mohammed and Anandha Narayanan (Project Fellows) conducted the training for 140 participants (in two batches of 70 each) including supervisory staff and skilled pollinators from Thrissur (Coconut Hybridization Unit, Chavakkad, Ayyanthole, Nattika, DAF-Chelakkara) and Malappuram (CHU-Perumbadappu). Smt. Jayasree, ADA (Seed Development Unit, Chavakkad) coordinated the training with the support of Mrs. P. Jashi, (Deputy Director of Agriculture- Thrissur), and Mrs. Nimba Franko (ADA-Seeds, Thrissur). The theory sessions of the training was conducted at Vyapari Vyavasayi Auditorium, Chavakkad during 8-9th November 2021 and the field training at the plot of Mr. Job David, Elavally, Pavaratti, Thrissur during 10-11th November 2021. All aspects like different components, fabrication, installation, servicing of modified ground pollination kit were covered during the training programme. The participants had an opportunity for hands-on-experience on pollinating tall and dwarf mother palms using the modified ground pollination kit. Currently, 5000 parental palms are used for pollination in Thrissur and it is planned to carry out pollination at least on 200 mother palms using the modified ground pollination kit.

Impact of Heliconia as intercrop in coconut gardens

Promising heliconia variety 'Iris' which has potential for good growth and flowering in shaded coconut plantations was distributed to 56 farmers (50-2500 rhizomes each) from different districts of Kerala. The impact analysis was conducted among twelve progressive farmers who had collected more than 250 rhizomes each of *Heliconia stricta* 'Iris' since 2011 for starting its commercial cultivation in the coconut garden. The 'Iris' variety proved to be a potential intercrop in coconut plantations with more than 60% shade with production of inflorescences of all the preferred inflorescence characteristics (more

than one meter length, 9cm inflorescence girth and unique characteristics of bracts)throughout the year. In addition, documented the success story as a video film titled *Heliconia 'Iris'- a potential intercrop in shaded plantations*. The outcomes of the study depict heliconias accepted as suitable intercrops by medium and large farmers. It is suitable as a component crop in farming system with up to 60% shad with a potential of by product utilisation as forage. Among the growers of this variety Sri Saju Ignatius, Naduvilekoot, Kadanadu, Kottayam District received 'Vibrant Gujarat-2013' award for cut-flower production considering his outstanding contributions in sale and promotion of 'Iris' heliconia inflorescences in Delhi, Bangalore, Mumbai and Hyderabad.

Sri Saju Ignatius, Heliconia grower

Trichoderma production for local supply of biocontrol agents

Mrs. Sreelatha, an ex-school teacher of Kasaragod approached ICAR-CPCRI and discussed with pathologists on the scope and marketing of biocontrol agents and its formulation. Kasaragod, delcared as an organic district would be a great platform to start the venture, according to Mrs. Sreelatha. After a thorough discussion with the scientists' group, she signed the MoU and purchased the technology of 'Trichoderma talc and coirpith formulation'. The compatibility of their native fish amino acid based product - 'Plant growth booster' with '*Trichoderma harzianum* CPTD 28' was tested *in vitro* by ICAR-CPCRI. This Trichoderma- fish amino acid based growth promotor is of high performance especially in cardamom, coffee, banana and many vegetable gardens. She took hands on training for the same during 20-22 April 2021. Subsequently, she started an enterprise, 'Sreekrishna Agrofert' in Industrial area of Ananthapuram, Kasaragod on 20th October 2021. The product is marketed by All Kerala Southern Phosphates and Minerals Pvt. Ltd in and around Kerala, Tamil Nadu and Karnataka. So far they had marketed around 1000 liters of the product. This unit gives employment to 6 women.

Fig. 20. MoU signing with CPCRI

Fig. 21. Trichoderma enriched growth booster for crop plants

Management of Yellow Leaf Disease of Arecanut

The 5-years (2016-2021) management-cum-demonstration trial in Sullia taluk of Karnataka indicated that plastic mulching the YLD affected garden during monsoon season could prolong the symptom expression and increase the yield. In this regard, a scientist-farmer interaction meeting on YLD was organized in YLD management-cum-demonstration trial plots at Markanja and Kalmakaru villages of Sullia taluk. It was attended by the Director and Heads of Division, ICAR-CPCRI, Kasaragod and local farmers. The farmers opinioned that, there was no further spread of the disease in plastic mulched plots and yield was higher than non-mulched plots.

Fig. 22. Scientist-farmer field level interaction on yellow leaf disease of arecanut

Management of inflorescence die back in arecanut

Inflorescence die-back (IDB) and button shedding caused by *Colletotrichum gloeosporioides* is increasingly noticed in many farmer's gardens. One among them, Mr. Vishnu Bhat of Kodapadavu village experienced a severe incidence of IDB in his young garden and could get only <1kg dry kernel yield per palm. After following the CPCRI recommendations *i.e.*, removal of dried infloresces, spraying Propiconazole 25EC (0.3%) and soil test based macro and micro nutrient application, he could get higher yield of >2.5kg dry kernel yield per palm. Another farmer Mr. Charan Kumar was spraying Mancozeb but had little success. However, after Propiconazole for last two years, the disease had reduced and he could get 40% more yield. A woman farmer from Markanja, Mrs. Pavithra Gundi was getting poor yield due to this disease. Balanced nutrition and spraying Propiconazole as per the suggestions of ICAR-CPCRI which could improve the palms. "It is very effective and we got good yield". she admits.

Fig. 23. Follow-up visit by the scientists of ICAR-CPCRI, Vittal

CPCRI tech to help farmers save arecanut crop

Fig. 24. English daily covering the success of CPCRI technology in combating the disease

Fig. 25. Yield improvement in the arecanut garden of Mr. Vishnu Bhat

Management of red palm weevil in arecanut

Incidence of red palm weevil (RPW) was noticed in many arecanut gardens, especially in young palms. Severe damage was observed in 10% of young Mangala and Mohitnagar palms beloning to Mr. Vishwanatha Bhat, Koila, Kadaba taluk. Many palms died due to this pest. However, after following the recommendation of CPCRI, *i.e.,* removal of severely infested palms and dead arecanut and coconut palms, spot application of Imidacloprid 18.7SL (0.1%) and periodic monitoring of the palm, he could save the palms. No fresh incidence of the RPW was observed.

Fig. 26. Arecanut palms damaged by red palm weevil

Management of Ambrosia beetle in arecanut

Fig. 27. Ambrosia beetle infestation in arecanut

Ambrosia beetle *(Euplatypus parallelus)* is a new pest infesting arecanut. Incidence of ambrosia beetle was observed in many arecanut plantations in different parts of Karnataka. About 6% of young arecanut palms were infested by this pest in the arecanut garden of Mr. Sripada Rao in Moodabidri. Removal and destruction of severely affected palms, removal of resinous exudation/frass and the injection of Chlorophyriphos 20EC @5ml/ litre into the bored holes and proper nutrition was suggested. It was followed by the farmer and no further spread of the pest was observed. Moreover, about 66% of the affected palms were recovered.

IMPORTANT EVENTS

Inauguration of Agro-Processing Training cum Incubation Centre (APTIC) and Training hall cum laboratory building

Inauguration of the Agro-Processing Training cum Incubation Centre (APTIC) established at the KVK, Alappuzha with funding from the Kerala State Dept. of Agricultural Development and Farmers Welfare was done by Sri P. Prasad, Hon. Minister of Agriculture, Govt. of Kerala on 18 November 2021. On the occasion, the newly built Training hall cum laboratory building of the KVK funded by ICAR-ATARI was inaugurated by Adv. A. M. Arif, Hon. M. P., Alappuzha. Adv. U. Prathibha, Hon. MLA of Kayamkulam presided over the function in the presence of Dr. V. Venkatasubramanian, Director, ICAR-ATARI, Bengaluru; Dr.Anitha Karun, Director, ICAR-CPCRI; Dr. S. Kalavathi, Acting Head, CPCRI, RS, Kayamkulam and Dr. P. Muralidharan, Head, KVK-Alappuzha. About 100 participants including entrepreneurs attended the programme. An interface of the entrepreneurs with the Minister along with the display of their products of Coconut, Jackfruit, Banana, Rice, Papaya, Spices, Millets and fruits also was arranged on this occasion.

Sri P. Prasad, Hon. Minister of Agriculture, Govt. of Kerala inaugurating the APTIC and Training hall

Adv. A. M. Arif, Hon. M. P., Alappuzha, inaugurating the training hall cum laboratory building

XXX Annual Group Meet of AICRP on Palms

The 30th Annual Group Meeting of All India Co-ordinated Research Project on Palms was organized by ICAR-CPCRI, Kasaragod through virtual mode on November 22, 2021. Dr. B. K. Pandey, Assistant Director General (Horticultural Sciences-II), ICAR, New Delhi was the Chief Guest of the event. Dr. R. K. Mathur, Director, ICAR-IIOPR, Pedavegi and Dr. Eaknath B. Chakurkar, Director, ICAR-CIARI, Port Blair participated in the Inaugural Session. Dr. Anitha Karun, Director and Project Co-ordinator (Acting), CPCRI, Kasaragod welcomed the gathering and presented the report of the AICRP (Palms) for the year 2020-2021. The action taken report of the recommendations of the AGM held on 10th – 11th August 2020 was presented by Dr Ravi Bhat, Acting Head (Crop Production) and Scientist In charge, PC Cell.

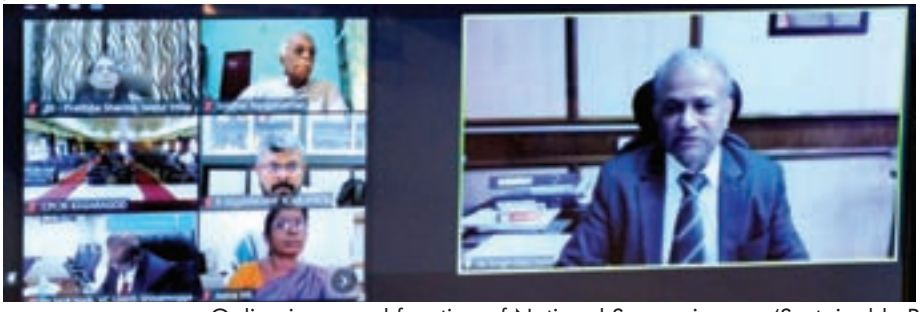
The Assistant Director General (Horticultural Sciences) in his inaugural address suggested bringing out a publication on "Fifty Years of AICRP (Palms)" on the eve of Golden Jubilee Celebrations of the AICRP (Palms). He envisaged the need for the collection, conservation and evaluation of trait specific germplasms devoid of duplicates, enhancing input use efficiency with special reference to micronutrients, identification of alternatives for red labelled chemicals towards hassle free plant protection and demonstration of cutting edge research technologies to the farm front through KVKs of the states and digitization of data for easy reference by the scientists. About 72 participants from different AICRP centres and ICAR-CPCRI were connected through virtual mode.

Plenary session of the XXX Annual Group Meeting of the All India Coordinated Research Project on Palms was held in the afternoon on 24 November 2021 under the chairmanship of Dr. A.K. Singh, DDG (Hort. Sci.). He made special mention on the need to develop technology for intercropping in oil palm gardens to enhance the income of farmers and keeping in view of the increasing demand for cocoa, he stressed upon intensifying the work on growing cocoa as an intercrop under palms in different regions.

Online AGM of AICRP (Palms)

National Symposium on "Sustainable Plant Health Management amidst Covid Pandemic: Challenges and Strategies"

ICAR-CPCRI in collaboration with Indian Phytopathological Society (IPS) South Zone chapter organized a National Symposium on "Sustainable Plant Health Management amidst Covid Pandemic: Challenges and Strategies" during 1-3 December 2021 in virtual mode. Dr. Anitha Karun, Director, ICAR-CPCRI gave the welcome address. Dr. Trilochan Mohapatra in his inaugural address appreciated the efforts of ICAR-CPCRI in conducting the virtual symposium and also emphasized the importance of the study of population dynamics and early diagnostics. He also pointed out the use of advanced gene editing technology for developing disease resistance, diagnostics etc. Dr. A.K.Singh, DDG (Hort.Sci.) presided over the function and opined about the need to develop surveillance, disease diagnosis and mechanized spraying system using UAV or Drone and AI technologies. The inaugural session witnessed release of four e-publications from the institute including e-book of abstracts. This was followed by keynote lectures chaired by Dr.P. Chowdappa, VC, BESTIU, Andhra Pradesh wherein Dr. M.K. Naik, Dr. V.G.Malathi, Dr. Sudisha J and Dr. Vinayaka Hegde delivered keynote lectures on different topics. There were five technical sessions during the symposium *viz.*, Epidemiology and population biology of plant pathogens, Emerging diseases and plant quarantine, Advances in plant disease diagnostics, Recent advances in diagnostics and management of Phytoplasmal diseases and Disease management, host plant resistance, chemical and biological control. During each session, there were lead lectures followed by two invited lectures and later oral presentations. On 2nd day of the symposium, a special plenary lecture was held wherein Dr. Lava Kumar, IITA, Nigeria gave a lecture on use of digital tools in plant disease management. During the three day symposium, more than 130 research papers were presented by scientists, students and researchers from ICAR institutes and Agricultural/Horticultural Universities from Kerala, Karnataka and Tamil Nadu states. On 3rd December, the valedictory session was held wherein Dr. Prathibha Sharma, President, IPS, New Delhi was the chief guest.



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HUMAN RESOURCES DEVELOPMENT

Training Programmes within India

Name & Designation	Title of programme	Date & Place
Dr. T. Sivakumar Mrs. Lekha G., SMSs	Online training on 'Advances in IPM strategies for important crops of Karnataka, Kerala and Lakshadweep'	Organized by ICAR-ATARI& ICAR-NCIPM during 21-23, October 2021
Dr. M K Rajesh, Principal Scientist (Ag. Biotechnology)	Online training on Protein Structure Modeling and Dynamics	Organized by ICAR-IASRI during 27-29 October 2021
Dr. S. Elain Apshara, Principal Scientist (Hort.) and Dr. Shareefa M., Sr. Scientist (Horticulture)	Online training programme on Conservation, Management and Utilization of Horticultural Genetic Resources for Livelihood and Nutritional Security".	Organized by ICAR - Indian Institute of Horticultural Research, Bengaluru during 22-26, November 2021
Dr. Jeena Mathew, Senior Scientist	Online training programme on "Advances in Agricultural Water Management through integrated approach under changing climate".	Organized by KSCSTE-CWRDM, Kozhikode during 15-25 November, 2021
Mr. M.S.Rajeev Dr. T. Sivakumar Mrs. Lekha G. , SMSs	Online training programme on "ICAR-IIHR Technologies for dissemination through KVKs"	Organized by ICAR-IIHR during 17-18 December 2021
Dr. Mayalekshmi, Dr. Muralikrishna K.S., Santhoshkumar P., Sr. Technical Assistants Mr. Bisun Bhasakar, Technical Asst.	Online training programme on 'Statistical Techniques for Data Analysis in Agriculture'	Organized by CAR - IASRI, New Delhi during 04-13 October, 2021
Dr. Avrajyoti Ghosh, ACTO	Online training programme on ' Experimental Data Analysis"	Organized by ICAR - IASRI, New Delhi during 20-29 October, 2021
Mr. Arunji G, Technical Asstt. (Library)	National Level Capacity Building Workshop for Agricultural LIS Professionals" of SAU and ICAR Institutes	Organized by Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad during 22-27 November, 2021
Mr. Neil Vincer A, AAO, Mr. Paulson Sam George, Assistant	Online Training Programme on "Accrual Accounting"	Organized by ICAR-NRRI, Cuttack during 22-26 November, 2021

Awards

Dr. R. Pandiselvam, Scientist AS&PE, was conferred NAAS Young Scientist Award on the occasion of XV Agricultural Science Congress held at Banaras Hindu University, Varanasi during 13-16 November, 2021. He was selected as NAAS Associate in the category of Agricultural Engineering & Technology.

Best oral presentation award for the paper by Bhavishya, Priya, U.K., Najeeb, N., Thube, S.H., Pandian, R.T.P., Jose, C.T. and Ravi Bhat. 2021on'Effect of plastic mulching on disease index and yield of yellow leaf disease affected arecanut (*Areca catechu*)' was conferred during the national seminar on Sustainable plant health management amidst pandemic challenges and strategies, held during 1-3 December 2021at ICAR-Central Plantation Crops Research Institute, Kasaragod, Kerala, India".

Best oral presentation award for the paper by R. T. P. Pandian, S. H. Thube, Merin Babu, V. H. Prathibha, Rajkumar, Priyank, H. M., and Vinayaka Hegde. 2021. First report of *Fusarium falciforme* (FSSC 3+4) causing root decay of arecanut (*Areca catechu*)was conferred during the national

Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR conferring the award to Dr. Pandiselvam

symposium on "Sustainable Plant Health Management amidst Covid Pandemic: Challenges and Strategies" organized by South Zone Chapter of Indian Phytopathological Society (IPS) at ICAR-CPCRI, Kasaragod during 1st-3rd December 2021.

Best oral presentation award for the paperby Paulraj,S., Ravi Bhat, M. K. Rajesh, S. V. Ramesh, U. K. Priya, R. Thava Prakasa Pandian, Vinayaka Hegde, and P. Chowdappa. 2021. Rhizosphere microbiome-mediated nutrient transformations underlie Yellow Leaf Disease of arecanutwas conferred during the international conference on Global Perspectives in Crop Protection for Food Security (GPCP -2021) conducted at TNAU, Coimbatore during 8th – 10th December, 2021.

Best oral presentation award for the paper by R. Pandiselvam, M.R. Manikantan, A.C. Mathew, and P.P. Shameena Beegum 2021. Design, Development and Evaluation of Tender Coconut Trimming Machine was conferred during the International Symposium on "Emerging Trends in Agricultural Engineering Education, Research and Extension" held at Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar during 23-25th, November, 2021.

Recognitions

Dr. Nagaraja, N. R., Scientist (Plant Breeding) has been recognized as 'PG Teacher/ Research Guide' in the discipline of 'Genetics and Plant Breeding' by the University of Agricultural Sciences (UAS), Bangalore, Karnataka.

Ph. D. award

Mr. Ravindran P., Asst. CTO has been awarded with Ph.D. by the Mangalore University for his thesis entitled 'Exploring the potential of botanicals in management of rhinoceros beetle, *Oryctes rhinoceros* Linn. (Coleoptera: Scarabaeidae)' under the guidance of Dr. K. Subaharan, Principal Scientist (Entomology), ICAR-NBAIR, Bengaluru.

COMMERCIALIZATION OF TECHNOLOGY

Name of Technology Commercialized	Date of Signing MOU	Value (In INR)	To Whom Commercialized
Preservation protocol for trimmed tender coconut	25-10-2021	15,000	Mr. Shajil K.M., C/o Lifeleaf, Sithara complex, 2nd Floor, 4/4361, P.T. Usha Road, Calicut – 673032, Kerala.
Technical knowhow of production of virgin coconut oil	12-11-2021	40,000	Yogananda M.P., M.P. Estate, Gowthampura, Anandapuram hobli, Sagar Tq, Shimoga Dist., Karnataka – 577404.
Technical knowhow of production of virgin coconut oil	01-12-2021	40,000	Mr. Shahul Hameed C, Chalil house, Perambra P.O., Calicut – 673525, Kerala.
Snowball Tender Nut Machine	10-12-2021	2,500	M/s. Easy Tender, Vattapparamba, Chaliyam P.O., Kozhikode – 673301, Kerala.
Technical knowhow of production of virgin coconut oil	17-12-2021	40,000	Miss. Chrysolite, M/s NIVAH, 3/432-A, Near Tekke Kanattu, Parambath Temple, Makkada Post, Badirur, Kozhikode – 673611, Kerala.
Linear actuator based tender coconut cutting machine	21-12-2021	10,000	M/s Stonehat Technologies, No.62C-1, Siruvani Main Road (East), Vadavalli, Coimbatore – 41, Tamil Nadu.
Continuous coconut testa removing machine	21-12-2021	10,000	M/s Stonehat Technologies, No.62C-1, Siruvani Main Road (East), Vadavalli, Coimbatore – 41, Tamil Nadu.
	Total Rs.	**1,57,500**	

TRANSFER OF TECHNOLOGY

Training programmes

Training programmes for farmers on 'Coconut Production Technology' were organised on 8 December 2021 in collaboration with Maruthonkara Krishi Bhavan on 18 December 2021 in collaboration with ATMA Wayanad and on 24 December 2021 in collaboration with ATMA Kannur.

Participants of the training programme on coconut production technology at ICAR-CPCRI, Kasaragod

Conservation and utilization of coconut genetic diversity in farmers' field-Initiative to promote 'Bedakam Coconut', a superior local ecotype of coconut

Promoting conservation of local coconut ecotype at Bedadka, Kasaragod

'Bedakam coconut' is a local ecotype of coconut which is tall growing and yield satisfactorily even under rainfed situations and water scarce areas. As a part project to conserve and popularise 'Bedakam Coconut', a meeting was conducted on 17th November 2021 at Bedadka as a part of the formation of Farmers' Society for the promotion of Bedakam Coconut. Dr. Ravi Bhat, Head Division of Crop Production, ICAR-CPCRI inaugurated the meeting. Dr. Thamban. C, Principal Scientist, CPCRI Kasaragod presented the outline of activities envisaged under the project. The meeting was chaired by Sri Madhavan, Vice President of Bedadka grama panchayat. As part of the meeting a field visit was also conducted to selected coconut gardens of farmers cultivating 'Bedakam Coconut' ecotype.

Interface programmes

An interface programme on 'Effective use of technologies for coconut prosperity - Role of Farmer Producer Organizations' was organised by ICAR-CPCRI at ICAR-IISR, Kozhikode on 21st October 2021. The programme was inaugurated by Dr. Anitha Karun, Acting Director,ICAR-CPCRI. Apart from scientists of CPCRI and IISR, Mr. Subashbabu. K, former General Manager, KERAFED and Deputy Director of Agriculture (retd.) and representatives of coconut FPOs participated in the interface programme.

Interface programme at ICAR-IISR, Kozhikode

Off-Campus Training

Training programme on 'Advances in management of pest and diseases in Arecanut'

Organized a training programme on "Advances in management of pest and diseases in Arecanut" on 7 October 2021 at Enmakaje, Kasaragod district under the DASD project on "Demonstration of arecanut fruit rot disease management using Mandipropamid fungicide". The programme was inaugurated by Sri Somashekara J.S., President, Enmakaje panchayath, Kasaragod. Dr. Ravi Bhat, Head, Crop Production, ICAR-CPCRI delivered introductory remarks and a lecture on arecanut cultivation practices. Dr. Prathibha V.H. and Dr. Rajkumar coordinated the programme and handled sessions on advances in the management of pests and diseases in arecanut with special emphasis on fruit rot disease of arecanut.

Farmers trainig at Enmakaje, Kasaragod

Training programme on 'Friends of Coconut'

A training on 'Friends of Coconut' for farmers from Alappuzha and Pathanamthitta District was conducted during 25-27th October

2021. The training was coordinated by Dr. K. M. Anes, Scientist and Dr. M. Shareefa, Senior Scientist with the support of Farmers Training Centre, Pandalam.

Awareness programme on Zero Budget Natural Farming

An awareness programme on zero budget natural farming was organized at ICAR-CPCRI, RS, Vittal on 16 December 2021 on the occasion of Prime Minister's virtual speech on zero budget natural farming at 'National Conclave on Natural farming', Anand, Gujarat. It was attended by 40 farmers and staff of ICAR-CPCRI, RS, Vittal. Dr. C.T. Jose, Acting Head of ICAR-CPCRI, RS, Vittal emphasised the need for sustaining the soil health without harming the native soil micro-organisms which are the soul of soil. Mr. Bhavishya, Scientist, ICAR-CPCRI, RS, Vittal explained the concept of natural farming and its advantages.

Farmers awareness programme on ZBNF at ICAR-CPCRI, RS, Vittal

On Farm Training

Two on farm training cum Field Day on 'Entomopathogenic nematodes (EPN) for management of root grubs in arecanut'were organized on 26th October 2022 and 12th November 2021 at Ishwarmangala village of Dakshina Kannada district and Averse village of Udupi district of Karnataka respectively under the project sponsored by DASD, Calicut. Visit to EPN demonstration plots, sessions on production and protection technologies of arecanut and discussions on the role of entomopathogenic nematodes (Kalpa EPN) & its utilization in root grub and other pests management programmes in palm based cropping system were conducted as part of the field day. More than 182 coconut and arecanut growers, District Horticultural Officers (Dr. Hemanthkumar and Smt. Rekha) and people's representatives, progressive farmers, private bio-pesticide companies' representative and President of Bharthiya Kisan Sangh of the districts have participated in the programme.

View of Field day on EPN conducted at Udupi district of Karnataka

On Farm Trials

In collaboration with KVK Kasaragod, on farm trial (OFT) efficacy of citriodora oil impregnated calcium alginate beads as prophylactic repellent against red palm weevil *Rhynchophorus ferrugineus* Olivier on coconut palms is taken up at Panayal Village in Ajanur panchayat Kasaragod. Farm units having 3-8 years old coconut palm prone to red palm weevil attack were identified. In each farm units palms were subjected to prophylactic leaf axil placement of citriodora oil impregnated calcium alginate beads @ 5g/ palms. It provided complete protection against red palm weevil for a period of 3 months.

Control of red palm weevil attack on coconut palms

Farmer First Programme (FFP)

Organized training programme on 'Scientific Mushroom Cultivation' during the Annual General Body Meeting of Odanadu Farmer Producer Company Limited (OFPC) for 32 FFP farmers on 21 October 2021 at Pathiyoor. Another training programme and distribution of BSF larvae production bins for supplementary poultry feed were organized for FFP farmers on 12 November 2021 at Kareelakulangara for 20 farmers. World Fisheries Day meeting was organized at Fish farmers' demonstration units on 22 November 2021. In the meeting, three model fish farmers, Mrs. Resmi Sreekumar (Ward-2), Mr. Sivaprasad (Ward-16) and Asokan Thandasseril (Ward-16) of FFP were felicitated. The programme was attended by 43 farmers.

Field demonstrations cum farmers' - scientists' interface

Field demonstration on the use of entomopathogenic fungus, *Simplicillium longisoniveum* for the management of invasive whitefly complex (*Aleurodicus rugioperculatus*, *Paraleyrodes bondari* & *P. minei*) in coconut was conducted at Nirchal Village, Badiadka Panchayath, Kasaragod on 20 October 2021 followed by demonstration on foliar applications of *S. longisoniveum* (Talc and rice grain based formulations) in the farmer's coconut gardens. About 62 progressive farmers were participated in the programme.

Farmers interface and demonstration of whitefly control at Nirchal village of Kasaragod, Kerala

Frontline demonstrations

Inputs and plant protection items like neem cake, rock phosphate,

copper sulphate and lime were supplied to beneficiary farmers for establishing demonstration plots on arecanut based multispecies cropping systems, *i.e.*, arecanut + cocoa + black pepper + banana as well as arecanut + nutmeg + black pepper + banana. Planting materials were distributed and technical advices were delivered to the participants.

Diploma in Agricultural Extension Services for Input Dealers (DAESI)

ICAR-CPCRI, Regional Station, Kayamkulam as the Nodal Training Institute, started the second batch of one year Diploma in Agricultural Extension Services for Input Dealers (DAESI) of Alappuzha District in collaboration with ATMA, Alappuzha, SAMETI, Kerala and MANAGE, Hyderabad. Sri P. Prasad, Hon'ble Minister for Agriculture Development and Farmers Welfare, Govt. of Kerala inaugurated the programme on 18 November 2021. Adv. U. Prathibha, Hon'ble MLA, Kayamkulam presided over the session. Dr. Anitha Karun, Acting Director, ICAR-CPCRI delivered the Key note address. Dr. V. Venkatasubramanian, Director, ATARI, Bengaluru released the 'Compendium of Lecture Notes' for the DAESI participants. Dr. S. Kalavathi was the Course Director.

Sri P. Prasad, Hon'ble Agricultural Minister inagurating the programme

Adv. U. Prathibha MLA, Kayamkulam addressing the participants

RAWE Programme

Research Station Attachment Phase of RAWE Programme-2021-22 for the B.Sc. (Agri) students of Sharadchandraji Pawar College of Agriculture, Dapoli and College of Agriculture, Padannakkad were conducted at CPCRI Kasaragod during the period from 29 September 2021 to 6 October 2021 and 22 to 27 November 2021, respectively.

Students of RAWE with experts at ICAR-CPCRI, Kasaragod

SCSP/ TSP Programmes

During October and November 2021 training the SC/ ST stakeholders on 'Honeybee hives management' was held through a total of 15 training programmes in which 80 SC/ST participants of Vorkady, Paivalike Kasaragod participated in two batches. A total of 224 Honeybee colonies were distributed to the participants.

Handing over beehives to beneficiaries

An entreprenurial development programme on 'Production of VCO based herbal soap' was conducted benefitting 24 SC/ST participants in two batches during 9-23 December 2021.

Diagnostic field visit

A diagnostic field visit toseverely leaf blight disease affected arecanut garden (55-60%) atKonnakkada, Parappa of Kasaragod district was conducted. Observations revealed that the leaf spot was caused by *Colletotrichum gloeosporioides*. The farmer were adviced to immedietely clear andburn the dead seedlings and severely affected leaves to check the inoculam load. Spraying of Hexaconzole @ 2ml/liter was recommneded on the affected palms.

Exposure Visits

Farmer's group (FTC, Pandalam on 27 October 2021; WSD farmers on 6 December 2021; Paippadu, Changanassery on 17 December 2021 visited the Regional Station, Kayamkulam experimental plots and acquainted on scientific advancements.

Organized training cum exposure visit for 4 farmers from Pollachi, Coimbatore, Tamil Nadu on 4 December 2021 to ICAR-CPCRI, Regional Station, Vittal.

Radio talks/ TV programme broadcast

'Kamukillode karuthilekku' - Radio series on arecanut

Broadcasting of a radio series, on aecanut farming entitled 'Kamukiloode Karuthilekku, a collaborative initiative of AIR Kannur and ICAR-CPCRI Kasaragod got underway through All India Radio, Kannur. The radio programme broadcast under 'Kisan Vani' has

been streamlined on every Saturday at 6.50 pm from 21st August, 2021 to 16th October 2021 to create awareness among stakeholders on various aspects of scientific arecanut farming.

Dr. Thamban C, Principal Scientist (Agrl. Extension) presented the following radio programmes.

1. Radio talk on 'Kera samrudhi veendedukkam' in Malayalam broadcast through All India Radio Kannur on 2 September 2021.
2. Radio talk on 'Kavungin thoppile jalasechanam' in Malayalam broadcast through All India Radio Kannur on 4 September 2021.
3. Radio talk on 'Kavunginte samagra sasyaposhanam' in Malayalam broadcast through All India Radio Kannur on 4 September 2021.

Dr. S. Kalavathi, Acting Head, ICAR-CPCRI RS, Kayamkulam delivered a radio Talk on *'Ithu Thenginte Pradhana Paricharana Samayam'* on 14 October 2021 at AIR, Thiruvananthapuram.

Dr. Nagaraja, N. R., Scientist-SS (Plant Breeding) delivered a talk on 'Cocoa as an ideal mixed crop with arecanut' in the Kisanvani programme of All India Radio, Mangaluru, which was broadcasted on 5th October 2021 at 6:50PM.

Cocoa nursery techniques and processing of beans telecasted by Shramajeevi Farm TV on 30th December 2021.

Sl.No	Name and designation of officer	Topic	Station and Date
1	Dr. P. Muralidharan, Principal Scientist and Head	World Food Day	All India Radio, Thiruvananthapuram on 16th October, 2021
2	Dr. P. Muralidharan, Principal Scientist and Head	Formation and Functioning of Farmer producer Organizations	All India Radio, Thiruvananthapuram on 20.10.2021
3	Smt. Jissy George SMS (Home Science)	Banana-a suitable crop for value added products	All India Radio, Kannur on 13.11.2021

Mera Gaon - Mera Gaurav

Farmers' - Scientist interface meeting on 'Coconut production technologies and practices in collaboration with Krishi Bhavan agricultural officers of Kasaragod was organized at ICAR - CPCRI, Kasaragod on 25 November 2021. More than 95 coconut and arecanut growers participated.

Interactive meeting with farmers at Kasaragod

A training programme on 'Quality Planting Material Production in Coconut with Special Emphasis on Local Ecotypes' for selected representatives of FPOs and labour collectives from Bedadka grama panchayat was conducted during 2-3 December 2021 under MGMG in collaboration with Bedadka Krishi Bhavan.

Scientists from ICAR-CPCRI, RS, Vittal have visited MGMG Villages *viz.*, Palthady, Balpa and Kokkada, collected soil samples from farmers' gardens for issuing soil health cards. Created awareness among farmers about importance of soil health and soil test based nutrients management. Demonstrated soil sampling method in arecanut gardens to farmers.

Participants of farmers training programme at Bedadka, Kasaragod

Training programmes and awareness interactions were held highlighting the importance of cultivation of fruits and vegetables in plantation ecosystem as a part of celebration of International Year of Fruits and Vegetables under MGMG at various locations. 50 Vegetable seed kits were distributed to farmers belonging to scheduled caste communities of various villages under Scheduled caste sub plan (SCSP) scheme as given here below.

Distribution of vegetable seed kit to farmers under SCSP scheme at Puthige

Participants of farmers training programme at Puthige, Kasaragod

Date	Place
8-12-2021	Puthige, Kasaragod
14-12-2021	Kandalloor, Alappuzha
20-12-2021	Pallikkara, Kasaragod
21-12-2021	Madikai, Kasaragod
23-12-2021	Kattanam, Alappuzha
31-12-2021	Manchi, Dakshina Kannada

Vegetables seed distribution at Kandaloor, Alappuzha, Kerala

Dr. Ravi Bhat, Head of Plant Production Division distributing seeds kit

Vegetables seed distribution at Manchi, D.K., Karnataka

ICAR - Krishi Vigyan Kendra, Kasaragod

On Farm Trials

On farm trials on, 'Assessment of Indigenous Functional foods in addressing Anaemia among children', 'Assessment of black pepper varieties' and 'Formulation of functional food supplements for differently abled children', were carried out.

Frontline Demonstrations

Demonstrations of 'Banana prop rings', 'Pepper special – micronutrient mixture for pepper', 'Introduction of high yielding rice variety- Manuvarna', 'Yard long bean variety Manjary in upland', 'Small scale cashew nut processing technology' and 'Promotion of Value added products from mussels' were carried out.

Training Programmes

Details of capacity development training programmes conducted

Category	No. of courses	No of participants		Total
		Men	Women	
On campus	12	101	88	189
Off campus	9	46	115	161
Total	**21**	**147**	**203**	**350**

ICAR - Krishi Vigyan Kendra, Alappuzha

Webcasting of Prime Minister's address to farmers

Hon. Prime Minister's address on 'Natural farming' was webcasted to farmers assembled in the KVK on 16 December 2021. Interface of the farmers with KVK scientists also was done on the occasion. A total of 61 participants including farmers, staff and students attended the programme.

Rural Agricultural Work Experience (RAWE)

KVK module of the RAWE programme for final year B. Sc. (Agri.) students from Kerala Agricultural University was conducted at KVK in three batches during the period.

Sl. No.	Institution	Partici-pants	Period	Activities undergone
1.	College of Agriculture, Vellayani	17	04thto 07th October 2021	Oriented to the functioning and various on and off campus activities of KVK; Facilitated to organize farmers' training online
2.	College of Agriculture, Padannakkad	14	22nd– 27th November, 2021	
3.	College of Agriculture, Vellanikkara	14	04th– 08th December 2021	

Training programmes

During the period 56 training programmes were organized benefitting a total number of 1167farmers/rural youths. The details of the training programmes were as follows:

Training	No. of Pro-grammes	Participants		
		Men	Women	Total
On campus (online)	25	97	290	387
On campus	11	139	136	275
Off campus	18	177	285	462
Extension Officials	2	17	26	43
Total	**56**	**430**	**737**	**1167**

RAWE studenst on KVK farm visit

Participation in national seminars/ symposia/ conferences/ workshops/webinars

Name and designation	Title	Place and date
Dr. Regi Jacob Thomas, Principal Scientist, Dr. N.R. Nagaraja, Scientist	Awareness programme on 'Germplasm registration in Horticultural Crops'	ICAR-IIHR, Bengaluru 1 October 2021
Dr. A. Joseph Rajkumar, Principal Scientist	*Mera Gaon Mera Gaurav* –Review meeting	ICAR-CPCRI, Kasaragod 7 October 2021
Dr. Shameena Beegum, P.P. , Scientist	International conference on Global Trends in Food Processing and food safty (Food Xplore, 2021)	TNAU, Coimbatore 12 October 2021
Dr. Jeena Mathew, Scientist	International Conference on Challenges, Opportunities and Innovation in Agriculture, Plantations and Allied (APA) Domains Posed by the Pandemic"	Indian Institute of Plantation Management, Bengaluru, 21 October, 2021
Dr. Rajkumar, Scientist	Online seminar on the 'Facets of innovation and Development of plant Nematology	Nematological Society of India held at IARI New Delhi, 29 - 30 October 2021
Dr. A. Joseph Rajkumar, Principal Scientist	International Webinar on Management of Basal Stem Rot in Oil palm and other forest species -present status and future strategies	ICAR-IIOPR, Pedavegi 9-11 November, 2021.
Dr. Regi Jacob Thomas, Principal Scientist	2nd International Agro Biodiversity Congress	Rome, Italy 15-18th November 2021
Dr. S. Elain Apshara, Principal Scientist (Hort.)	9th Indian Horticulture Congress from organized by Indian Academy of Horticultural Sciences (IAHS) (online)	Chandra Shekhar Azad University of Agri. & Tech. Kanpur, Uttar Pradesh, 18-21 November 2021.
Dr. Anitha Karun, Acting Director, Dr. Ravi Bhat, Dr. Vinayaka Hegde, Dr. K.B. Hebbar and Dr. K. Muralidharan, Heads, Dr. S. Kalavathi, and Dr. CT Jose, Heads of Stations, Dr. V. Niral, Dr. Regi Jacob Thomas, Dr. P. Subramanian, Dr. Elain Apshara, Dr. Joseph Rajkumar, Pr. Scientist (Agronomy), Dr. C. Thamban, Dr. Murali Gopal, Pr. Scientists, Dr. Merin Babu, Dr. Rajkumar, Dr. Sujitra M., Dr. P S Prathibha, Dr. R Sudha, Dr. VH Prathibha, and Dr. Daliya Mol, Dr. Nagaraja, Dr. Shivaji Hausrao Thube, Dr. Thava Prakasa pandian and Dr. S Sumitha, Scientists	XXX Annual Group Meet of AICRP on Palms	ICAR-CPCRI, Kasaragod (online) 22- 24 November 2021
Dr. M. Shareefa, Sr. Scientist	Conservation, Management and Utilization of Horticultural Genetic Resources	ICAR-IIHR, Bengaluru 22-26th November 2021
Dr. M R Manikantan, Principal Scientist Dr. R. Pandiselvam, Scientist	55th Annual Convention of Indian Society of Agricultural Engineers and International Symposium	Dr Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, 23-25 November 2021
Dr. A. Joseph Rajkumar, Principal Scientist Dr. Merin Babu, Dr. Paulraj S, Senior Scientist Dr. Rajkumar, Dr. Prathibha V H, Dr. Daliyamol, Dr. K. M. Anes, Sri Bhavishya, Dr. R. Thava Prakasa Pandian,Dr. Jilu V Sajan, Scientists	IPS National symposium on 'Sustainable Plant Health Management Amidst Covid-19 Pandemic: Challenges and Strategies'	ICAR-CPCRI, Kasaragod 1-3rd December, 2021

Dr. K B Hebbar, Dr. C Thamban, Dr. V. Niral, Dr. S. Elain Apshara, Dr. A. Joseph Rajkumar, Dr. Rajesh M K, Dr. Chandran K P, Dr. S. Jayasekhar Principal Scientists, Dr. Paulraj S, Sr. Scientist Dr. K.S. Muralikrishna, Senior Technical Assistant	PLACROSYM- 24 'Coping with the Pandemic and Beyond-Research and Innovations in Plantation Crops Sector'	Bolgatty Palace, Kochi 14-16th December, 2021
Dr. S. Elain Apshara, Principal Scientist (Hort.)	International webinar on "Exchange on Biochemical and Molecular Technoques (BMT) guidelines and implementation of BMT in DUS"	PPV & FRA, New Delhi, 16 - 17 December, 2021

NEW PROJECTS SANCTIONED

A new project entitled 'Establishment of FLDs on effective and eco-friendly management of white grub using entomopathogenic nematodes (EPNs) in arecanut' has been sanctioned with a budget of Rs. 14.22 lakhs funding from 'Directorate of Arecanut and spices development (DASD), Kozhikode' for a period of three years from October 2021. Dr. Rajkumar, Scientist (Nematology) is the Principle investigator of the project.

Externally funded (DASD, Calicut) project on 'Demonstration of integrated management of inflorescence die-back disease in arecanut' with Dr. R. Thava Prakasa Pandian, ICAR-CPCRI, Regional Station, Vittal as Principal Investigator, with an outlay of Rs. 12.75 lakhs has been sanctioned.

Another project on 'Establishment of advanced facilities for measuring physiological processes' with Dr. K. Nihad, Senior Scientist, ICAR-CPCRI, Regional Station, Kayamkulam as Principal Investigator, with an outlay of Rs. 54.4 lakhs from RKVY, Kerala has been sanctioned.

DISTINGUISHED VISITORS

Shri P. Prasad, Hon'ble Minister for Agriculture Development and Farmers Welfare, Govt. of Kerala, Adv. A.M. Arif, Hon'ble M.P., Alappuzha and Adv. U. Prathibha, Hon'ble MLA, Kayamkulam, visited ICAR-CPCRI, Regional Station, Kayamkulam on 18 November 2021 and interacted with the scientists.

Adv. A.M.Arif, MP, Alappuzha getting updates on RPW detector

CELEBRATIONS

Mahatma Gandhi Jayanti

To commemorate the 152nd birth anniversary of Mahatma Gandhi, and 117th birth anniversary of former Prime Minister, Lal Bahadur Shastri, celebrations at ICAR-CPCRI, Regional Station, Kayamkulam, Swachhta Pledge was administered by Dr. S. Kalavathi to the staff on 2 October 2021. Swachh Bharat campaign and online session on 'Health and hygiene in the wake of COVID 19 pandemic' were organized. Dr. B. Padmakumar, Head, Internal Medicine, TD Medical College, Alappuzha delivered an online message on cleanliness and sanitation.

Staff of ICAR-CPCRI, RS, Kayamkulam on Cleanliness Week activities as a part of Mahatma Gandhi Jayanti

Mahila Kisan Diwas

Mahila Kisan Diwas was celebrated at ICAR-CPCRI, Kasaragod on 15 October 2021. A seminar on Bank Micro Credits was organised in virtual mode with ICAR-KVK, Kasaragod. Dr. Anitha Karun, Director, ICAR-CPCRI presided over the function. Smt. Divya, DDM, NABARD delivered a lecture on bank micro credits for women. Farm women and entrepreneurs attended the programme along with the staff members of ICAR-CPCRI and KVK. A seminar on "Empowering daughters of India in Agriculture" was also organized jointly with DCR-Puttur as a part of Mahila Kisan Diwas celebration. Ms. Suvarna Bhat, CEO, Bhoomiputri, NGO delivered a special lecture on role of women in Agriculture. ICAR-KVK, Alappuzha celebrated Mahila Kisan Diwas in collaboration with Santhwanam Cultural and Charitable Trust, Krishnapuram on 15 October 2021. Krishnapuram Grama Panchayath President, Mr. Shani Kurumpolil inaugurated the programme.

World Food Day

World food day was celebrated at ICAR-CPCRI on 16 October 2021. A seminar on Plantation Crops Enterprises for Doubling Farmers' Income was organised in virtual mode and Dr. R. T. Patil, Former Director, ICAR-CIPHET, Ludhiana delivered a lecture. A webinar was organized by KVK, Kasaragod inaugurated by Dr. Anitha Karun, Acting Director. The lead talk was given by renowned Kannada journalist and social activist Shree Padre, who is now created a revolution regarding raw banana utilization and diversification all over India, delivered a talk on 'Banana, jackfruit, kokum: Farm to table'. The webinar was attended by 44 participants.

Orientation programme on "Prospects of value addition of homestead fruits" was conducted on the occasion to 23 women from Krishnapuram Panchayath at the KVK Alappuzha.

Vigilance Awareness Week

Inaugural function of the Vigilance Awareness week at ICAR-CPCRI Kasaragod was held on the 26 October 2021 at 11 AM under the chairmanship of Dr. Anitha Karun, Acting Director. About hundred staff members were present. Dr. Niral V, Principal Scientist and Vigilance Officer briefed the gathering about the importance of the programme. Dr. Anitha Karun, Acting Director administered the Integrity Pledge in English to the staff members, while Mrs Sreelatha, ACTO(OL) administered the oath in Hindi. Two 'Grama sabha' programme were organized as part of the vigilance awareness week of 2021 on 2 November 2021 at Mogral Puttur Gram panchyath. More than 45 people participated in the programme.

Various competitions like essay writing, and quiz programme were conducted for staff members as well as school children. To spread awareness about 'Complaints under PIDPI (Public Information Disclosure and protection of Informers'), two posters were displayed in institute premises as well public places viz., Chowki in Kasaragod and

Participants attending vigilance awareness 'Gram Sabaha'

Daily wage workers attending vigilance awareness programme

Krishnapuram Gram panchayat Office. The valedictory function of the Vigilance Awareness Week was held on 2 November 2021 with Mr. K. V. Venugopal, DySP (Vigilance & Anti Corruption Bureau), Kasaragod as the Chief Guest.

At ICAR-CPCRI, Regional Station Kayamkulam the integrity pledge was administered by Dr. S. Kalavathi, Acting Head.

Rashtriya Ekta Diwas

As part of the National Unity Day celebrations a Rangoli competition was organised at CPCRI, Kasaragod Beach on 31 October, 2021. A 'Run for Unity' was organised at Kayamkulam. The valedictory function was held on 1 November 2021 under the chairmanship of Mr. Shani Kurumbolil, Krishnapuram Grama Panchayat. Mr. Sunilkumar, A.U., Addl. Superintendent of Police, Alappuzha inaugurated the valedictory function.

Constitution Day

Constitution Day was celebrated at ICAR-CPCRI, Kasaragod on 26 November 2021. Dr. Anitha Karun, Director, CPCRI read the Preamble of the Constitution followed by the staff.

World Soil Day

World Soil Day was celebrated at ICAR-CPCRI, Kasaragod. Dr. Anitha Karun, Director, CPCRI inaugurated the programme. A webinar on the theme 'Halt soil salinization and boost soil productivity' was organised by KVK, Kasaragod on 5 December 2021. Dr. V.V. Prakash, Assistant Director, Soil Conservation Department, Kannur, Kerala delivered a lead lecture. Around 33

Inauguration of 'World Soil Day' programme at Kayamkulam

participants including farmers/farm women attended the webinar.

A training programme on 'Soil health management in Palms and Cocoa' was organized at ICAR-CPCRI Regional Station, Vittal. It was attended by 78 participants. An interactive workshop on 'Halt soil salinisation-boost soil productivity' was also conducted on 6 December 2021. The keynote address was delivered by Dr. Thomas Mathew, Professor and Head (Retd.), Kerala Agricultural University. Soil health cards were distributed to the farmers.

KVK, Alappuzha conducted the programme at Edathua Grama panchayath. Smt. Mariyamma George, President of the Grama Panchayath inaugurated the programme and distributed soil health cards to 30 farmers. A seminar on 'Enhancing farmer's income through boosting soil productivity" was conducted. A total of 85 farmers and 15 students attended the programmes.

Participants attending 'World Soil Day' programme at Vittal

Pre Vibrant Gujarat Summit 2021

Live streaming of Hon'ble Prime Minister's address during the valedictory function of Pre Vibrant Gujarat summit was arranged at the Institute on 16 December, 2021.

National Farmers Day

National Farmers Day was celebrated as an online workshop on 23 December 2021 at ICAR-CPCRI, RS, Kayamkulam.

Swachh Bharat Campaign

Special Swachhta Campaign organized by the ICAR-KVK, Alappuzha on 6 October, 2021 in association with Department of Agricultural Development and Farmers' Welfare at Puliyur grama panchayath. Another outreach campaign on 'Fortification of farm residue and pest management in coconut' was conducted for dairy farmers of Vallikunam panchayat, Alappuza, sensitizing on the potential use of the green muscardine fungus, *Metarhizium majus* in the management of coconut rhinoceros beetle on 12 October 2021 at ICAR-CPCRI, RS, Kayamkulam. About 25 farmers attended the programme.

The Swachtha Pakhwada 2021 was celebrated at ICAR-CPCRI, RS Kayamkulam during 16-31 December 2021 involving sanitation drive within campus and the premises of RVVLP School, Krishnapuram. A session on organic waste recycling through effective microbes was handled by Dr. N. Chithra, Assistant Professor, College of Agriculture, Vellayani, during valedictory session conducted on 31 December 2021.

PERSONALIA

Deputation: Dr. H.P. Maheswarappa, Project Coordinator (Palms) & Principal Scientist has been on deputation as Director of Research, University of Horticultural Science, Bagalkot w.e.f. 26 September 2021. Dr. Anitha Karun, Director (Acting) has taken over the additional charge of Project Coordinator (Palms).

PROMOTIONS

Name of the staff	From (Designation)	To (Designation)	w.e.f.
Smt. U. Sarojini	Skilled Support Staff	Technician, CPCRI, Kasaragod	24.12.2021
Smt. V.A. Leela	Skilled Support Staff	Technician, CPCRI, Kasaragod	24.12.2021
Smt. Chithralekha K.	Skilled Support Staff	Technician, CPCRI, Kasaragod	24.12.2021
Shri Vinod K.	Skilled Support Staff	Technician, CPCRI, RS, Vittal	24.12.2021
Shri V. Chennappa	Skilled Support Staff	Technician, RC, Kidu	24.12.2021
Shri B. Sundara	Skilled Support Staff	Technician, CPCRI, Kasaragod	24.12.2021
Shri B. Chandrahasa	Skilled Support Staff	Technician, CPCRI, Kasaragod	24.12.2021
Shri V.T. Rameshan	Skilled Support Staff	Technician, CPCRI, Kasaragod	29.12.2021

TRANSFERS

Name of the staff	From (Designation & Place)	To (Designation & Place)	w.e.f.
Shri T.E. Janardhanan	AO, CPCRI, Kasaragod	SAO, ICAR-IISR, Kozhikode	23.10.2021
Smt. Jessymol Antony	AF&AO, ICARI-CTCRI, Thiruvanthapuram	FAO, ICAR-CPCRI, Kasaragod	06.11.2021
Smt. Jenny C.M.	AAO, ICAR-CMFRI, Kochi	Administrative Officer, ICAR-CPCRI, Kasaragod	15.11.2021
Shri Premjith Antony	Technician, ICAR-CPCRI, Kasaragod	Technician, ICAR-CPCRI, RS, Kayamkulam	30.11.2021
Shri P. Krishna Kumar	AAO, ICAR-CIFT, Kochi,	Administrative Officer, ICAR-CPCRI, Kasaragod	30.12.2021

RETIREMENTS

Name	Designation	Place	Date
Shri. Adolphus Francis Mascarenhas	Technical Officer (Electrical Engg.)	ICAR-CPCRI, RS, Vittal	31.10.2021
Smt Sreelatha K.	Asst. Chief Technical Officer	ICAR- CPCRI, Kasaragod	31.10.2021

Agresearch with a human touch

Cover Photo: Crown of high yielding Kalpa Raja variety of coconut from root (wilt) prevalent tract.

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