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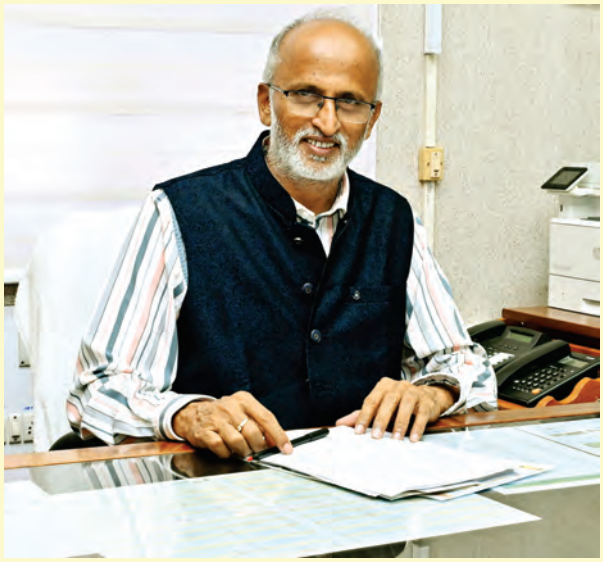

DIRECTOR'S DESK

Plantation crops for a sustainable environment

Climate-smart agriculture is gaining more importance than ever before. This year, the country has experienced harsh moisture stress coupled with high temperatures. It has come to the notice that those farmers who have adopted rainwater harvesting techniques, farm ponds, micro-irrigation and water conservation technologies and integrated nutrient management practices could tide over the situation and save their crops.

Carbon budgeting is an important criterion in precision farming techniques, indicating the importance of plantation crops in agriculture. These not only maintain evergreen habitats with high carbon sequestration potential but also have a high B:C ratio, allowing the farmers to grow very high value intercrops.

Various coconut producer companies are coming up with models of integrated farming systems and the utilisation of spices processing units for continuous sustainable income. These examples from Kerala and Karnataka are the torchbearers for the other coconut-growing communities in similar agro-climatic conditions from different regions as well.

Both the plantation crops, coconut and arecanut, can accommodate unique niches for the different stories of intercrop with not only the required sunlight but also a conducive microclimate. Properly enriched soils with organics boost the rhizosphere environment, which is comparable with virgin rainforests.

Reiterating the claims from a farmer's perspective, a high-density cropping system model of coconut or arecanut generates a handsome income. It also maintains a sustainable livelihood, cushioned with income from intercrops. System diversity without competition for natural resources is a boon for tropical farmers, who can diversify to satisfy their needs.

A well-managed plantation, on the one hand, gives unlimited opportunities for the farmers to diversify their farming as well as income. It also provides various avenues for intensive agriculture throughout the year. Environmental balance in such perennial cropping systems helps in maintaining climate resilience thereby providing a better hope for future generations with a slowdown for climate change.

K. Balachandra Hebbar

CONTENTS

TECHNOLOGY HIGHLIGHTS

Discovery of *Aleuroclava canangae* whitefly on ornamental *Coleus* in coconut system

Aleuroclava canangae (Corbett, 1935) was discovered on an ornamental *Coleus* species in coconut system which represents the first occurrence of this species in India on this plant host. *Aleuroclava canangae* can be distinguished from other species in the canangae species group through lateral margin differentiated at the opening of the thoracic tracheal furrow as a cleft; submedian area of the dorsum of the cephalothorax with three pairs of enlarged tubercles; and the entire dorsum with microtubercles. Results of the DNA analysis indicated that A. *canangae* forms a clade with *Aleuroclava indica* (Singh, 1932) which also has two pairs of very elongate, tuberculate setae which appear two-jointed because they have a wider basal part separated from a long slender apical part by a fine suture.

Tea mosquito bug management in cocoa

A new pod bioassay method was developed to evaluate the efficacy of newer insecticide molecules to control tea mosquito bug (*Helopeltis theivora*) in cocoa. Eight novel insecticide molecules were tested against tea mosquito bug with fipronil and lambda cyhalothrin showing significantly higher efficacy and the highest mortality rates. A laboratory protocol was established for rearing tea mosquito bug on cocoa. Further, biocontrol potential of *Cordyceps javonica* against tea mosquito bug was also evaluated.

Performance of dwarf jackfruit varieties in juvenile coconut plantation

Performance of four varieties of dwarf jack (Sindhoora Varikka, Thailand Red, Thailand Pink and Gumless Jack) is taken up during 2021-2024 in the interspaces of juvenile coconut palms *var*. Kalpa Sankara planted at 9m x 9m spacing. The first fruiting was recorded at 9 months after planting (June-July, 2023) in *var*. Thailand Pink and flowering was 100% during the second (Dec. 2023 - Jan. 2024) and third (June –July 2024) fruiting season. It produced fruits with an average weight of 4.25 kg and 123 fruit lets/fruit. The average weight of a fruit let is 35g with a seed weight of 10g.The leaf area index (LAI) was recorded the highest in Thailand Red variety (7.18) followed by Thailand Pink (5.98). The coconut palms in the system recorded an average height (m) and number of leaves during 1st year (2.3, 8.3), 2nd year (5.6, 12.3) and 3rd year (6.2, 20.6), respectively. There was no visible competition for light, water and nutrients in the system.

Functional biomolecules of arecanut

Phytochemical profiling for arecoline content was performed on diverse arecanut genotypes (Mohitnagar, Shatamangala, Swarnamangala, South Kanara Local, and Mangala) at different maturity stages (6-10 months post-anthesis and at full maturity). HPLC-based quantification revealed that at 7 months post-anthesis, arecoline content ranged from 3.75 mg/g to 21.46 mg/g across different genotypes. As the nuts matured, the arecoline content declined, with concentrations ranging from 3.21 mg/g to 8.02 mg/g.

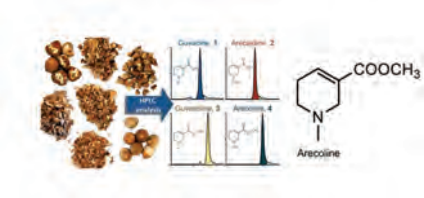

Fig. 1. Arecoline profiling at various stages of maturity of arecanut

Gum arabic as a novel edible coating for storage of haustorium

An edible coating of coconut haustorium with 15% gum arabic effectively preserved its biochemical attributes for up to 20 days under refrigerated conditions (Fig. 2a and 2b). This coating maintained a comprehensive acid value (CAV) of 6.1±0.5 mg NaOH/g, significantly lower than the 18.6±1.57 mg NaOH/g in untreated control. After 20 days,

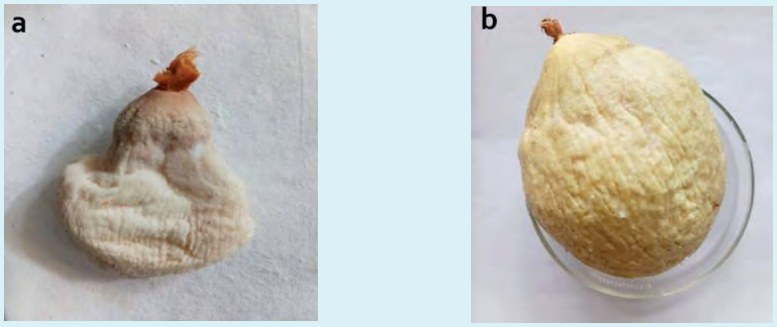

Fig. 2. Coconut haustoria without and with shelf life coating

the treated haustorium contained gallic acid (183.43 µg/g), chlorogenic acid (8.13 µg/g), caffeic acid (65.23 µg/g), vanillic acid (72.69 µg/g), traces of p-coumaric acid, sinapic acid (1.59 µg/g), 2,4-DHBA (2.49 µg/g), and ferulic acid (1.19 µg/g) comparable to that of freshly collected untreated haustorium. Thus, the gum arabic-based coating effectively delayed quality changes and extended the haustorium's shelf life under refrigerated conditions (4-10 °C).

Performance of orchids under arecanut plantation

Dendrobium nobili, *Epidendrum* and *Zygopetalam* were tied with coconut husk on arecanut stem for initial establishment during December 2021. Among the three orchid types, the performance of *Dendrobium nobili* was better than the other two Epidendrum species and *Zygopetalum*. Initial growth of *Dendrobium* was better than the other two. All the plants of *Dendrobium nobili* and *Epidendrum* flowered after 27 months, while only 25% of *Zygopetalum* flowered in the same period. The highest number of shoot/clump (15), number of florets/spike (12-24) and maximum flower duration (22-25 days) were recorded in *Dendrobium nobili.*

Fig. 3. Flowers of *Zygopetalum*

Fig. 4. *Dendrobium nobili* planted on arecanut stem

Fig. 5. Flowers of *Dendrobium Nobili*

Increased shelf life of *Metarhizium anisopliae* (CPCRI – Ma 18) by pelleting with neem cake

Entomopathogenic fungus, *Metarhizium anisopliae* var. *majus* (CPCRI – Ma 18) is an effective bio control agent which kills different stages of *Oryctes rhinoceros* grubs within 7 - 14 days. It is currently available in rice grain and talc based formulations with limited shelf life. The studies conducted at ICAR-CPCRI have shown that infusing the fungal strain with neem cake and converting them into pellets retained higher cfu / g (colony forming units/g) with extended shelf life of more than ten months.

Fig. 6. *M. anisopliae* pellets

Fig. 7. Infected grubs

SPOTLIGHT

Flowering of tissue culture coconut palm

The first tissue cultured coconut seedling raised from immature inflorescence through direct organogenesis flowered after three years and three months (Figure 1). The first inflorescence opened on April 2024 with eleven buttons and the pollen germination was 62%. Subsequent bunches emerged at 25-28 days interval. The seedling was planted in front of ICAR-CPCRI, Regional Station, Kayamkulam by Sri V. Muralidhran, then Hon'ble Union Minister for External Affairs, on 21st November 2020.

Fig. 8. Flowering in tissue cultured coconut juvenile palm at Kayamkulam

Flavoured coconut milk

Defatted coconut flour (DCF) obtained while processing virgin coconut oil was utilized for the extraction of low-fat coconut milk for developing ready to drink coconut milk. The optimum level of pH, fat content, sweetness, emulsifier, skimmed milk powder, colour, and flavor in the milk was standardized. The second extract of coconut flour with 4% fat with Almond (Badam) flavor was standardized with 82.45% moisture, 4.17% fat, 9.62% carbohydrate, 2.85% protein and 0.92% ash contributing 94 kcal. Thus pasteurized flavoured milk would stay fresh up to 6 days under refrigerated condition and further increase in shelf life is possible through retort processing.

Fig. 9. Flavoured coconut milk as health drink

Sweet kernel of 'Mohachao Narel' for ice cream preparation

The kernel of the 'Mohachao Narel' variety of coconut, established at ICAR-CPCRI has sweeter kernel compared to normal coconut kernel. Substantial difference was observed with respect to total solids (56.14±10.74% and 49.72±5.98%), total soluble solids (20.23±4.35°Brix, and 15.43±5.41°Brix), total sugar (12.85±5.83% and 7.66±2.34%) and reducing sugar content (1.184±0.23% and 1.03±0.42%) in the endosperm milk extract of sweet and non-sweet kernel respectively.

Fig. 10. Mohacho coconut ice cream

Two frozen delicacies were successfully prepared with sweet kernel extract without sugar *i.e.,* 0% sugar, and with 8% refined sugar and compared with the commercial coconut frozen delicacy (with 16% sugar). The prepared delicacies had an overrun of more than 50%. the delicacy with 8% sugar was observed to be the best, with respect to appearance, flavor, mouthfeel, fat feel, taste and overall acceptability, demonstrating the usefulness of sweet kernel in coconut milk based frozen delicacy/ ice cream preparation. Panel also found the sugar-free version has a reasonable acceptance.

GLOBAL ISSUES

Global cocoa crisis

The global cocoa production is predominantly centred on Ivory Coast and Ghana, rendering the market exceedingly susceptible to the conditions affecting the harvests in these countries. In the period of 2023-24, adverse weather conditions, diseases, and the ageing of cocoa trees had a detrimental impact on the production in Ivory Coast and Ghana, which together account for 60% of global cocoa production. As a result, there was a significant global scarcity of cocoa, leading to a surge in the price of cocoa to USD12,000 per tonne in the international market.

Upon further analysis, it is apparent that the current price increase was precipitated by the interconnected effects of climate change and El Nino. These factors resulted in the proliferation of cocoa pests and diseases, including black pod disease and cocoa swollen shoot virus disease in cocoa-growing regions, as well as erratic rainfall and elevated temperatures. Together, these climate-induced disruptions have significantly diminished yields.

The proliferating supply shortage is evident in the fact that the Ivory Coast shipped only 1.5 million tonnes of cocoa to overseas locations from October 2023 to May 2024, a 30% decrease from the same period last year. According to the International Cocoa Organisation (ICCO), there will be a deficit of 374,000 metric tonnes in cocoa production compared to demand in the 2024 season. This will be the third consecutive year of insufficient supply.

Another source of scarce supply is structural issues, such as the ageing of trees in the main cocoa growing tracts. In general, producers provide minimal long-term investment for cocoa trees. Due to the low-income predicament that cocoa farmers are in, there is minimal replanting in major cocoa-growing regions. As a matter of fact, cocoa farmers receive only a small portion of the high value commodity chain of cocoa-based products.

In India, the impact of surging cocoa prices was very much reflected in the domestic prices, wherein in the month of June 2024, the domestic prices were hovered around Rs 600.kg of dry beans, and Rs 190 per kg of wet beans. India's consumer tastes have been changing at the same time as the ongoing cocoa crisis.

The country's cocoa production is small compared to the rest of the world, but it has been slowly growing. Nevertheless, it is still not enough to meet domestic demand, which makes the imports inevitable. In response to the challenging situation regarding cocoa prices, prominent Indian chocolate makers have introduced moderate price hikes up to 9% to partially counterbalance the escalating expenses. Significantly, their primary focus lies on enhancing internal operations by enhancing the efficiency in the domestic cocoa value chain. Notwithstanding these difficulties, there is a prudent sense of hopefulness towards the future. From October 2024 onwards, it is anticipated that favourable weather conditions in Africa will enhance the supply of cocoa, thereby alleviating pricing pressures.

TIPS AND GUIDANCES

Cocoa clone standard (Indian Minimum Seed Certification Standards Part II):

S. No.	Characters	Standards
1	Method	Soft wood grafting
2	Type of root stock	Bulk Forastero, Trinitario and hybrid seedlings
3	Root stock raising	Poly bag nursery
4	Size of polythene bag	6" x 9" size and 250 gauge thickness
5	Potting mixture	2: 1: 1 Soil: Sand: FYM
6	Age of root stock	4- 5 months
7	Root stock size	Height 50 cm, 3.5 cm girth with 7 pairs of leaves
8	Scion size	Thickness same as root stock, soft woods of 12- 15 cm length with 2- 3 buds, defoliated
9	Graft union	20 cm above soil, about 2 cm thickness, should be covered with polythene pouch to avoid drying
10	Grafted plant	Height 60 cm, 7 pairs of healthy leaves, stem straight without jorquetting
11	Root	Tap root with well spread young roots
12	Precautions	Remove the polythene pouch after 15-20 days. Polythene stripe tied over graft joint should be removed after 2 months. Graft joint should be above ground while planting. Emerging shoots from root stock should be nipped off. Free from nursery diseases, pests, deficiencies, pot bound condition and breakage at graft joint.

For part 1 refer Kalpa Newsletter 43(1) Jan-March 2024

TECHNOLOGY COMMERCIALIZATION

Fig. 11. Technology licensing to entrepreneurs

During the period from April to June, 2024, 10 technologies were commercialized by the Institute to entrepreneurs through 12 different MoAs as per the details given below, an amount of Rs. 2.30 lakhs have been collected as technology transfer fees.

PUBLICATIONS

Research articles

Chaithra, M., Prameeladevi, T., Prasad, L., Kundu, A., Bhagyasree, S. N. and Kamil, D. 2024. Metabolomic profiling of virulent and non-virulent *Beauveria bassiana* strains: insights into the pathogenicity of *Tetranychus truncatus*. *Archives of Microbiology*, 206(7): 311. (NAAS Rating: 8.80)

Hebbar, K.B., Abhin Sukumar, P, Sanjo Jose, V., Ramesh, S.V. and Bhat, R. 2024. Predicting current and future climate suitability for arecanut (*Areca catechu* L.) in India using ensemble model. *Heliyon*, 10(4). https://doi.org/10.1016/j.heliyon.2024.e26382(NAAS Rating: 10)

Josephrajkumar, A., Gregory Evans, Merin Babu, Anes, K. M., Jilu V. Sajan and Vinayaka Hegde 2024. Discovery of *Aleuroclava canangae* (Corbett) (Hemiptera: Aleyrodidae) on Coleus in India and the establishment and review of the *Aleuroclava canangae* species group. *Journal of Natural History* 58 (17-20): 603-623, http://dx.doi.org/10.1080/00222933.2024.2347602. (NAAS Rating: 6.80)

Kumar, R.S., Ramesh, S.V, Sun, Z., Thankappan, S., Nulu, N.P.C., Binodh, A.K., Kalaipandian, S. and Srinivasan, R. 2024. *Capsicum chinense* Jacq.-derived glutaredoxin (CcGRXS12) alters redox status of the cells to confer resistance against pepper mild mottle virus (PMMoV-I). *Plant Cell Reports*, 43(4), p.108. https://doi.org/10.1007/s00299- 024-03174-2 (NAAS Rating: 12.20)

Nagesh, C. R., Prashat, G, R., Goswami, S., Bharadwaj, C., Praveen, S., Ramesh, S.V. and Vinutha, T., 2024. Sulfate transport and metabolism: strategies to improve the seed protein quality. *Molecular Biology Reports*, 51(1), p.242. https://doi.org/10.1007/s11033- 023-09166-x (NAAS Rating: 8.80)

Pandiselvam, R., Davison, S., Manikantan, M. R., Jeevarathinam, G., Jacob, A., Ramesh, S. V. and Shameena Beegum, P.P. 2024. Infrared-aided hot-air drying of coconut: Impact on drying kinetics and quality metrics. *Journal of Food Process Engineering*, 47(6), p.e14668. https://dx.doi.org/10.1111/jfpe.14668 (NAAS Rating: 9.00)

Prathibha, V.H., Balanagouda Patil, Rajesh, M.K., Sunil, S. Gangurde., Maruthi, M. N., Gangaraj, K. P., Thava Prakasa Pandian, R., Daliyamol, Chaithra, M., Rajkumar and Vinayaka Hegde 2024. Insights into the population dynamics of *Phytophthora* species associated with arecanut fruit rot disease. *Physiological and Molecular Plant Pathology*, 133: 102334. https://doi.org/10.1016/j.pmpp.2024.102334. (NAAS Rating: 8.70)

Rachana, K. E., Gangaraj, K. P., Muralikrishna, K. S., Antony, G., Prathibha, V. H. and Rajesh, M. K. 2024. Resistance gene analogs (RGAs) of coconut respond differentially to *Phytophthora palmivora* and exogenous salicylic acid and methyl jasmonate. *Plant Physiology Reports*, 29: 421–437. (NAAS Rating: 7.70)

Rajesh, M. K., Nagaraja, N. R., Sabana, A. A. and Muralikrishna, K. S. 2024. Inter-specific hybrids in *Areca* spp.: Verification using SCoT markers. *Indian Journal of Genetics and Plant Breeding*, 84(2): 308-310. (NAAS Rating: 7.00)

Ramesh S. V., Rajesh, M. K., Das, A. and Hebbar, K. B. 2024. CRISPR/Cas9–based genome editing to expedite the genetic improvement of palms: challenges and prospects. *Frontiers in Plant Science*, 15, p.1385037. https://doi.org/10.3389/fpls.2024.1385037 (NAAS Rating: 11.60)

Sabana, A. A., Antony, G., Gangaraj, K. P., Tony Grace and Rajesh, M. K. 2024. Regulation of coconut somatic embryogenesis: decoding the role of long non-coding RNAs. *Plant Biotechnology Reports*, 18: 33–44. https://doi.org/10.1007/s11816-023-00884-z(NAAS Rating: 8.40)

Shameena Beegum, P. P., Ramesh, S. V., Pandiselvam, R., Neema, M., Daliyamol, Manikantan, M. R., Hebbar, K. B. 2024. Perspectives on the cardioprotective, neuroprotective and anti-obesity functions of coconut (*Cocos nucifera* L.). *Food Bioscience*, p.103756. https://doi.org/10.1016/j.fbio.2024.103756 (NAAS Rating: 11.20)

Tenguri, P., Chander, S., Ellur, R., Patil, E., Sundaran, A., Yele, Y., Thube, S., Naik, V., and Nagaraju, M. 2024. Effect of silicon application on rice plant defence against brown planthopper feeding under climate change conditions. *Animal Biology*, 74(2), 163-179. https://doi.org/10.1163/15707563-bja10132 (NAAS Rating: 7.20)

Thube, S.H., Thava Prakasa Pandian, R., Rajkumar, M., Merin Babu, Josephrajkumar, A., Santhoshkumar, P., Nirmalkumar, B. J., Vinayaka Hegde, Balanagauda Patil,

Rajashekara, H., Prabhulinga, T., Babasaheb Fand, Shailesh Gawande, Dipak Nagrale, Devindrappa, M. and Rajesh, M. K. 2024. *Euwallacea fornicatus* (Eichhoff, 1868) and associated novel fungal symbiont, *Fusarium* sp.: A potential cause of wilting in cocoa, *Theobroma cacao* in India, *Crop Protection*, 106754. https://doi.org/10.1016/j.cropro.2024.106754. (NAAS Rating: 8.80)

Popular articles

Abdul Haris A., Nihad K., Jeena Mathew., Indhuja S. and Regi Jacob Thomas. 2024. Climate smart coconut farming for higher productivity and sustainability. *Indian Coconut Journal,* 66 (12) pp.8-12.

Anithakumari, P. and Vishnu, K. S. 2024. Thirsty palms and parching soil (In Malayalam). *Indian Nalikera Journal*, 16 (95): 5-9.

Haris, A. A, Nihad, K., Jeena Mathew., Indhuja, S., Regi Jacob Thomas. 2024. Climate Smart coconut farming for higher productivity and sustainability. *Indian Coconut Journal*, 66 (12) 8-12.

Jeena Mathew, Abdul Haris, A., Josephrajkumar, A. and Subramanian, P. 2024. Management of acidity in tropical soils for higher palm productivity. *Indian Coconut Journal,* 66 (12) 20-22.

Josephrajkumar, A., Anes, K. M., Mayalekshmi, Shareefa, M., Merin Babu and Jilu V. Sajan 2024. Coconut-An ecological Service Provider (In Malayalam). *Indian Nalikeera Journal* 16(6): 5-10.

Madhu, T. N., Saneera, E. K., Chaithra, M., Bhavishya, A., Thava Prakasa Pandian, R. and Nagaraja, N.R. 2024. Adike beleyalli ambrosia jeerundeya samagra nirvahane (Kannada). *Krushibimba Patrike*. 21(2): 19-20.

Nihad, K., Abdul Haris, A., Jeena Mathew, Indhuja, S., Neenu, S. and Subramanian, P. 2024. Inter-cropping fodder grass in coconut based system using minimum external inputs. *Indian Coconut Journal*, 66(12) pp.23-25.

Ravi, S. and Muralidharan, P. 2024. Kadakknath Poultry. *Karshakan*. 32(5):59-60.

Book Chapters

Bhat Ravi, Sujatha, S., Bhavishya, Priya, U. K., Gupta Alka and Uchoi Anok. 2024. Arecanut (*Areca catechu* L.). In: Soil Health Management for Plantation Crops: Recent Advances and New Paradigms. (Eds. George V Thomas and V. Krishnakumar). pp. 177-206. Springer Nature Singapore Pte Ltd. P. 533.

Bhat Ravi, Bhavishya, and Sujatha, S. 2024. Cocoa (*Theobroma cacao* L.). In: Soil Health Management for Plantation Crops: Recent Advances and New Paradigms. (Eds. George V Thomas and V. Krishnakumar). pp. 309-336. Springer Nature Singapore Pte Ltd. P. 533.

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Hebbar, K. B., Ramesh, S.V., Kalaipandian, S. and Adkins, S.W., 2024. Coconut Production under a Changing Climate. In *The Coconut: Botany, Production and Uses* (pp. 46-57). GB: CABI. https://doi.org/10.1079/9781789249736.0004

Jeena Mathew., Haris, A. A. and Nihad, K. 2024. Nutrition for sustaining palm health and productivity. In Science Journey of Coconut root (wilt) disease. Kalpa Granth.pp.123-148.

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Subramanian, P., Alka Gupta, Murali Gopal, Selvamani, V., Jeena Mathew., Surekha and Induja, S. 2024. Coconut (Cocos nucifera L.) In: Soil Health Management for Plantation Crops: Recent Advances and New Paradigms. (Eds. George V Thomas and V. Krishnakumar). pp.37 Springer Nature Singapore Pte Ltd. P. 533.

Books

Josephrajkumar, A., Prabhat Kumar, Hanumanthe Gowda, B., Regi, J. Thomas., Anithakumari, P., Abdul Haris, A. and Hebbar, K. B. 2024. Science Journey of Coconut Root (wilt) Disease, Kalpa Granth, ICAR-CPCRI, Regional Station, Kayamkulam, Kerala, India, 340p.

Technical Bulletin

Anithakumari, P. and Hebbar. K. B. 2024. Innovations for inclusive sustainable rural livelihoods through the Farmer FIRST Program: Output, Outcome, Impact. Published by Director, ICAR CPCRI, Kasaragod and Director, ICAR-ATARI, Bengaluru. Pp. 32.

Extension folders

Shameena Beegum, P. P., Pandiselvam, R., Manikantan, M. R., Mathew, A. C., Thamban, C. 2024. Virgin Coconut Oil (*Virgin Velichenna*). ICAR-CPCRI Extension Folder No.331 (*Malayalam*).

Shameena Beegum, P. P., Arivalagan, M., Ramesh, S. V., Pandiselvam, S., Maniknatan, M. R., Dineshkumar, N., Thamban, C., Hebbar, K. B. 2024. Kalparasa (*neera*), ICAR-CPCRI Extension Folder No. 330 (*Malayalam*).

Shameena Beegum, P. P., Pandiselvam, R., Manikantan, M. R. 2024. Coconut Chips (*Nalikera Chips*). ICAR-CPCRI Extension Folder No. 329 (*Malayalam*).

IMPORTANT EVENTS

World Intellectual Property Day

ICAR-CPCRI, Kasaragod organised a seminar on IP Management on 29th April 2024 as part of the celebration of World Intellectual Property Day. Dr K Balachandra Hebbar, Director, ICAR-CPCRI while welcoming and introducing the dignitaries articulated the blooming of India's agricultural sector with innovation and technology.

Dr. S.N. Jha, DDG (Agricultural Engineering), ICAR, New Delhi delivered the inaugural address. He dwelt upon various aspects of IP management and shared his experiences in managing the IP in his career.

Dr. B.D. Prasanna, Associate Dean, National Institute of Technology Karnataka (NITK), Surathkal, Mangalore delivered an expert talk on IP creation and management and answered the queries raised by the participants. Around 150 participants attended the programme by online and offline mode.

Fig. 12. Director addressing the gathering

International Yoga Day

'International Yoga Day' was celebrated on 21st June 2024 at ICAR-CPCRI, Regional Station, Vittal. Shri Sajeev K.N., LDC, was the yoga instructor. The Head of the Station, Dr. M.K. Rajesh, in his address, highlighted that the 'International Yoga Day' was a day dedicated to embracing the timeless practice of yoga, which has transcended borders and united people across the globe. It is a holistic approach to life that promotes harmony between the mind, body, and spirit. A total of 21 staff performed different yoga asanas.

Fig. 13. Yoga performance at KVK Kasaragod

An awareness programme on 'Yogic Food' for Self and society was conducted at KVK Kasaragod. Also marking with aim of empowering women through yoga and demonstration on basic yoga asanas was demonstrated by faculties of KVK. Around 25 participants attended the programme.

Research Advisory Committee meeting

The 26th Research Advisory Committee meeting was held at ICAR-CPCRI, Kasaragod on 4th April 2024 in hybrid mode. Dr. V.A. Parthasarathy, chairman, Former Director ICAR-IISR, Calicut, chaired the meeting. Dr. George V. Thomas, Former Director, ICAR-CPCRI (Member), Dr Nirmal Babu, Former Director, ICAR-IISR Calicut (Member), Dr. Vishwa Bandhu Patel, ADG (Fruits and Plantation Crops), ICAR-New Delhi (Member), Dr. R.N. Padaria, Joint Director (Extension), ICAR-IARI, New Delhi (Member), Dr C.A Jayaprakas, Former Principal Scientist and Head, Div. of Crop Protection, ICAR-CTCRI (Non-Official Member), Dr. Tejaswi G. Gowda Ph.D (Agril. Entomology) Mudigere (Non-official member), Dr. K. Balachandra Hebbar, Director, ICAR-CPCRI, Kasaragod (Member), Dr. Vinayaka Hegde, Head Division of Crop Protection (Member Secretary) were present in the meeting.

Dr H.B. Singh, Former Professor and Head (Plant Pathology), Banaras Hindu University, and Dr Pradeep

Fig. 14. A glimpse of RAC meeting at CPCRI

Fig. 15. ADG visit to Vittal cocoa nursery

Fig. 16. Planting of cocoa sapling by RAC member R. N. Padaria at Vittal

Singh Negi, Chief Scientist, CSIR-CFTRI, Mysore, attended the meeting online.

Dr. K.B. Hebbar, Director, welcomed all the participants and made a brief presentation on recent research achievements of the Institute during 2023-24.

Later research achievements under the eight mega-projects were presented by respective mega project leaders. After the deliberations the following recommendations were given by the RAC.

- The efficacy of bio-control agents developed by ICAR-CPCRI, should be compared with commercially available formulations before registration with CIB&RC.
- The precision farming model for coconut shall be initiated with already available data.
- The reasons for declining coconut productivity in India need to be analyzed.
- Data on nano fertilizers should be generated, for plantation crops.
- The *in vitro* glycemic index (GI) of plantation products should be determined for better comprehension of their health promotional properties.

Institute Research Committee Meeting

The 52nd IRC meeting was held at ICAR-CPCRI, Kasaragod, from 13th to 17th May, 2024, under the chairmanship of Dr. K.B. Hebbar (Director). All the scientists from ICAR-CPCRI, Kasaragod, Regional Stations and Research Centres, KVK Kasaragod, and KVK Alappuzha participated in the meeting.

Presentations of 7 sessions under the five divisions were made by Principal Investigators and co-investigators. The presentations were continued for four days. The Plenary Session was held on 17th May 2024. In the plenary session, farmers, personnel from developmental agencies from different organisations including cooperative and banking institutions attended and they suggested relevant activities to be included in the technical programme of the coming year. The following invitees participated in the meeting:

Dr. D. Chandrashekhara Chowta, (Progressive Farmer), Dr Tejaswi G. Gowda Ph.D (Agril. Entomology) Mudigere (Non-official member, RAC), Dr C.A Jayaprakas, Former Principal Scientist and Head, Div. of Crop Protection, ICAR-CTCRI (Non-Official Member, RAC), Mr. Krishna, Exec. Officer Agriculture, CAMPCO, Mr. Roopak Bhat, Mondelez, Dr. K.M. Sreekumar, College of Agriculture,

Fig. 17. Dr. K. Balachandra Hebbar, Chairman, IRC, addressing the delegates

Fig. 18. Dr. K. Balachandra Hebbar along with Scientists

Padannakkad, Shairon (ADM, NABARD, Kasaragod), Dr. Hanumanthe Gowda, CCDO, CDB, Sri Babulal Meena, Deputy Director, DASD, Dr. Dadasaheb Desai, Deputy Director, DCCD, Dr. Rashmi R., Sci. Horti. KVK Dakshina Kannada, Sri Mahesh H.S., Vice President, MAMCOS, Srikanth Baruve, Mangaing Director, MAMCOS, Dr. V. Srinivasan, Head, Crop Production and PHT, IISR kozhikode, Mrs. Ajitha C., Production Manager, Dinesh Foods and Dr. T.N. Ravi Prasad, Principal Scientist, DCR, Puttur.

Some of the suggetions from the progressive farmers and other agencies include the following:

- Indigenous tender nut varieties like COD and recently released Kalpa Suvarna variety may be mass multiplied and supplied.

- Research on wild animal management and bean quality aspects in cocoa may be initiated.

- Research on storage pests management and ideal conditions for storing cocoa may be carried out.

- Work on waste to wealth may be expanded to bioenergy and biofuel production.

- Coconut products developed from private companies may be checked for quality assessment.

- 3 Cocoa varieties including 2 hybrids,VTLCC1, VTLCH3, VTLCH4 respectively were recommended for release.

It was decided to update the Package of Practices and Organic farming in coconut with latest findings. New trials were approved for nutrient management of Palmyrahs. New projects sensor based smart farming in coconut approved.

During the meeting, ongoing projects, including 35 externally funded projects, were discussed, and the technical programme for the years 2024–25 was also finalized.

World Environmental Day

World Environmental Day was celebrated at ICAR CPCRI, Kasaragod on 5th June 2024 on the theme 'Land restoration, desertification and drought resilience'. The programme was organised under the chairmanship of Dr. K. Balachandra Hebbar, Director, ICAR-CPCRI. Shri Ananth Hegde Ashisara, former chairman of the Western Ghats Task Force, was the chief guest of the programme. He delivered a speech

regarding various kinds of ecosystems as a part of the Western Ghats, including the coastal ecosystem, river valley, wetland, deemed forests and plantations, and tradition, culture, and gestures of gifting tree seedlings during important occasions to promote biodiversity conservation.

Shri Prakash Mesta, Marine Ecologist, was also present in the programme. He spoke on the importance of documentation of traditional forms of agriculture, that itself is a resource documentation with more than 4000 years history to learn by the younger generations in the country.

A tree-planting programme was held as a part of the celebration in the main office campus. Fruit tree saplings were also distributed from the ICAR-KVK, CPCRI. An MoU on

Fig. 19. Shri Anamth Hegde Ashishara, former chairman of Western Ghats Task Force addressing the meeting

Fig. 20. Shri Anamth Hegde Ashishara planting evergreen saplings

'Kalpa organic gold-Coconut leaf vermicomposting' was signed between Prathik Solanki and ICAR-CPCRI during the occasion.

Fig. 21. Fruit tree sapling distrubution to women farmers

Painting competition for school children from Kendriya Vidyalaya No.1, ICAR-CPCRI, Kasargod was also held as a part of the programme. Chief Guest distributed prizes to the winners of the competition.

An awareness programme was conducted under the slogan "Our land, Our future" wherein 350 fruit and forest plant seedlings procured through Social Forestry Department and vegetable seed kits was distributed to 40 farmer participants by ICAR-KVK, Kasaragod.

National Seminar organized

Fig. 22. Dr. K. B. Hebbar, Director CPCRI inaugurating the seminar

Fig. 23. Dr. S. K. Singh addressing the seminar

Fig. 24. Releasing of publication during the seminar

ICAR-CPCRI, Regional Station, Kayamkulam organised a national seminar on 'Climate smart agriculture for sustatinable soil and plant health in plantation crops' during 13-14, June 2024. About 100 delegates, including scientists, faculty, students and researchers from different parts of the country as well as from abroad participated the event.

TRANSER OF TECHNOLOGY

Training on modified ground pollination technique in coconut

A three days training programme on 'Modified ground pollination technique in coconut' was conducted during 17th-19th April 2024 at ICAR-CPCRI, Regional Station, Kayamkulam for the staff of Jain Irrigation Pvt. Ltd., Udumalpet, Tamilnadu. As part of the training programme, officials were trained on artificial pollination in coconut including ground pollination technique, pollen processing, pollen

Fig. 25. Training on modified ground pollination

germination and viability testing, management of pests and diseases, nursery management and special emphasis on hands-on-training on assembling and setting of ground pollination units (Figure 2).

Capacity building of coconut farmers

During April to June 2024, 358 farmers (175 women farmers) and 24 officials from Kerala and Tamil Nadu were trained at ICAR-CPCRI on scientific coconut cultivation and value addition with the duration ranging between 1 and 3 days. Most of them have been sponsored under ATMA scheme and considerable number of them represented Farmers Producers Companies.

A training for staff of Jain Irrigation Systems was organised as a part of licensing of modified ground pollination from 17th April 2024 to 19th April 2024 at KVK, Alappuzha.

A training session for the 6 Board of Directors of M/s. Farm Fine FPOs Ottappalam, Ambalappara, Palakkad conducted on 12th June 2024 under ITMU project.

Orientation trainings

An orientation training was conducted for the newly joined technical staff (T-1) from 10th May 2024 to 18th June 2024 at ICAR-CPCRI, Kasaragod.

Orientation Training Programme on 'Good Agricultural Practices (GAPs) in Arecanut and Cocoa' was organized for the 8 newly joined Technical Staff of ICAR-CPCRI at ICAR-CPCRI, Regional Station, Vittal during 28th to 29th May 2024. Dr. Nagaraja, N.R., Senior Scientist (Plant Breeding) Coordinated the training.

Training programme on 'Cultivation and processing in arecanut and cocoa' was organized for the progressive farmer (Mr. Parun Meetei) of Manipur during 20th-23rd June 2024 at ICAR-CPCRI, Regional Station, Vittal.

Organised training on scientific turmeric cultivation and supplied 800 Kg turmeric planting material to tribal farmers at Idappana tribal settlements on 2nd April 2024 at ICAR-CPCRI, Regional Station, Kayamkulam.

Organised training on scientific arecanut cultivation and distributed more than 2500 arecanut seedlings to the tribal farmers of Kocharippa, Kollam district on 03rd May 2024 at ICAR-CPCRI, Regional Station, Kayamkulam..

Organised workshop on Biofuels at ICAR-CPCRI, Regional Station, Kayamkulam on 13th June, 2024. The workshop was attended by eminent scientists and students.

ICAR-CPCRI, Regional Station, Kayamkulam organised one day post seminar panel discussion on 'Climate Change in Plantation Sector - Issues and Way Forward' on 15th June 2024.

Collaborative meeting

ICAR-CPCRI, Kasaragod and Bharatheya Kisan Sangh conducted a collaborative meeting with 16 National Level farmers on 09th April 2024.

Women group visit

Two women groups from Jnana Vana Dharmasthala Mandir visited ICAR-CPCRI, Kasaragod on 19th June 2024 and 27th June 2024 with 85 members.

Skill development training activities under SCSPs

Under the Scheduled Caste Sub Plan (SCSP) component, a 'Selection of Beneficiaries Drive' was organized for Scheduled Caste candidates to undergo three different eight-month duration skill development training programs, namely:

1. Basic computer applications, Office automation, E-office management skills
2. Laboratory Techniques
3. Coconut agro-techniques, cropping system models, and planting material production

23 candidates were selected to participate in the training program from July 1, 2024, to February 28, 2025.

HUMAN RESOURCES DEVELOPMENT

Awards/ Recognitions

Dr. M.R. Manikantan was conferred with Fellow of National Academy of Agricultural Sciences (NAAS) on June 5, 2024.

Best Oral Presentation Award

Best Oral Presentation Award (Second Prize) was awarded to Thanuja, G., Nagaraja, N.R., Ravi Bhat, Vishnuvardhana, Bhavishya, Neenu, S., Nayana. H. for the research paper entitled "Varietal variation in arecanut (*Areca catechu* L.) for zinc absorption, zinc translocation and zinc use efficiency" in the National Seminar on Climate Smart Agriculture for Sustainable Soil and Plant Health in Plantation Crops organized by ICAR-CPCRI,, Regional Station, Kayamkulam, Kerala during June 13 to 14, 2024.

Fig. 26. Dr. M. R. Manikantan recognized as the fellow of National Academy of Agricultural Sciences (NAAS)

KRISHI VIGYAN KENDRAS

KVK, Kasaragod

Promotion of Jackfruit Value addition technologies under ODOP

Two training programmes was conducted for 4 days from June 18th to 21st to Extension functionaries of Kutumbashree. The significance of Jackfruit seed and bulb powder as functional food and technologies pertaining to value added products from jackfruit seed powder, mature jackfruit bulb powder and brining of raw jackfruit was highlighted for feasibility of marketing with minimal processing and wider dissemination through the 29 women representative members belonging to various panchayaths. Also, the trained women entrepreneurs of KVK have been successfully engaged in production of dehydrated value added products from jackfruit such as seed and bulb powder and pappad using Bio fuel dryers which has been adopted successfully through the Front Line Demonstration Programme of KVK.

Fig. 27. Women involved in jackfruit value addition at Kasaragod

Fig. 29. Training programme to extension functionaries under ODOP

Fig. 28. Dehydration of jackfruit bulbs and seed in bio fuel dryer

Fig. 30. Dehydrated jackfruit bulb-Pulary food products

Celebration of World Bee Day

Under the SCSP programme of KVK around 11 farmers/ youths have been trained in Apiculture and provided with bee boxes with colonies and tool kits. With this successful intervention they have been able to reap the first harvest of honey. Commemorating the day the potential beekeepers were given a platform to sell the first harvest of honey at KVK. Shri Vishwanath of Karadka village sold around 11 Kgs of Honey. An awareness programme was organized on marking the day highlighting the theme "Bee engaged with youth". Vegetable kits and seedlings of papaya and drumstick was provided to foster diverse agricultural systems like vegetable cultivation with reliance to organic farming practices to facilitate increased pollination. Significance of bees for improving food quality and quantity to benefit both human population and ecosystem was focus of World Bee Day.

Fig. 31. Bee keeping training for youth at Badiadka

Fig. 32. Planting fruit crop saplings at KVK premises

Fig. 33. Shri Vishwanatha N. B. of Karadka village selling honey at KVK

Fig. 34. Distribution of seedlings and vegetable seed kits to KVK beneficiaries

NATIONAL/INTERNATIONAL SEMINAR SYMPOSIA ATTENDED

Name and Designation	Title	Place and Date
Dr. Vinayak Hegde, Principal Scientist & Head, Crop Protection	International webinar organised by the 'ASEAN FAW Action Plan' on 'Palm pests and diseases'.	April 23, 2024 (online)
Dr. Ravi Bhat, Principal Scientist, Dr. Muralidharan K., Principal Scientist, Dr. Subramanian P., Principal Scientist and Head, Crop Production and Dr. Vinayaka Hedge, Principal Scientist & Head, Crop Protection	National Workshop on Dynamics of Coconut Production and utilization and Strategies for addressing the challenges in Amrit Kaal organized by the ASM Foundation in collaboration with Junagadh Agricultural University (JAU)	May 29, 2024 at JAU, Junagadh, Gujarat
Dr. B. A. Jerard, PC (Palms), Dr. Vinayaka Hegde, Head, Crop Protection, Dr. P. Subramanian, Head, Crop Production, Dr. Niral V. Head, Crop Improvement, Dr. Murali Gopal, Head, PB &PHT, Dr. K. Ponnusamy, Head, Social Sciences, Dr. M. K. Rajesh, Head, ICAR-CPCRI,, RS, Vittal, Dr. Regi Jacob Thomas, Head, ICAR-CPCRI,, RS, Kayamkulam, Dr. Anithakumari, Pr. Scientist, Dr. A. Abdul Haris, Pr. Scientist, Dr. K. Muralidharan, Pr. Scientist, Dr. Ravi Bhat, Pr. Scientist & SIC, PME, Dr. C. Thamban, Pr. Scientist, Dr. K. Samsudeen, Pr. Scientist, Dr. P. Muralidharan, Pr. Scientist & Head, KVK Alappuzha, Dr. S. Elain Apshara, Pr. Scientist, Dr. M.R. Manikantan, Pr. Scientist, Dr. S. Neenu, Sr. Scientist, Dr. Prathibha P.S. Sr. Scientist, Dr. Shareefa M., Sr. Scientist, Dr. K. Nihad, Sr. Scientist, Dr. Jeena Mathew, Sr. Scientist, Dr. Merin Babu, Sr. Scientist, Dr. Anes K.M., Sr. Scientist, Dr. Shameena Beegum. Scientist, Dr. Y. Diwakar, Scientist, Dr. Indhuja S., Scientist, Dr. Jilu V. Sajan, Scientist	National Seminar on "Climate Smart Agriculture for Sustainable Soil and Plant Health in Plantation Crops"	June 13-14, 2024 at ICAR-CPCRI,, Regional Station, Kayamkulam.
Joseph Rajkumar, Principal Scientist	International Seminar on Spices	June 05, 2024 at College of Agriculture,Vellayani, Thiruvananthapuram
Joseph Rajkumar, Principal Scientist	AICRP on Biological Control -Annual Group Meeting	June 13-14, 2024 at Dr YS Parmar University of Horticulture and Forestry, Solan

NEW PROJECTS INITIATED

A new project on 'Technology based entrepreneurship for integrated development of coconut farmers' in Muthukulam block panchayath (Rs. 25.00 lakhs), with Anithakumari P., Principal Scientist as project leader.

A project on 'Integration of beekeeping and mushroom cultivation to increase the income of farmers under plantation based cropping system in coastal regions of Karnataka' under RKVY-RAFTAAR (Rs 34.00 Lakhs), with Dr. Madhu T. N., Scientist as project leader.

FACILITIES CREATED

'Vertical Garden' demonstration unit established in the KVK farm Alappuzha

A 'Vertical Garden' demonstration unit is established at KVK farm to educate the visitors on effective and efficient use of the natural resources viz., land, solar energy and water and to replicate at their homesteads. The unit was officially inaugurated by Dr. K. B. Hebbar, Director, ICAR-CPCRI,, Kasaragod in the presence of Dr. D.V.S. Reddy, PS, ICAR-ATARI, Bengaluru.

Fig. 35. Vertical garden inauguration by Director, ICAR-CPCRI, Kasaragod

OTHER INFORMATION

Women farmers as master trainers in coconut intercropping promoting area wide adoption

Intercropping of groundnut (Var: Kadiri Lepakshi of APAU) in coconut gardens were adopted by 37 women Self Help Groups (SHG) comprising of 329 farm women during the period in 50 acres of 4 panchayaths of ICAR-CPCRI, FFP. The variety was rated as suitable to the locations, yield obtained @ 750 kg /ha, but affected by untimely rains in terms of quality of final harvested product in 3 locations.

Farmer participatory assessment of Sweet potato varieties (Sreee Arun, Sree Bhadra, Sree Varun, Bhu Krishna) released by ICAR CTCRI was conducted for suitability in Arattupuzha panchayath with the involvement of women farmers (12 groups).

PERSONALIA

APPOINTMENTS

Name of the staff	Designation	Place	w.e.f.
Mr. Vishnu Pooniya	Technician (T-1)	ICAR-CPCRI, Kasaragod	02.05.2024
Mr. Pavan Kumar	Technician (T-1)	ICAR-CPCRI, Kasaragod	06.05.2024
Mr. Pradipta Mondal	Technician (T-1)	ICAR-CPCRI, RC, Kahikuchi	06.05.2024
Mr. Rahul Meena	Technician (T-1)	ICAR-CPCRI, Kasaragod	08.05.2024
Mr. Anjesh Kumar	Technician (T-1)	ICAR-CPCRI, RS, Kidu	08.05.2024
Mr. Avadhesha Maurya	Technician (T-1)	ICAR-CPCRI, Kasaragod	09.05.2024
Mr. Vishal Singh	Technician (T-1)	ICAR-CPCRI, Kasaragod	09.05.2024
Mr. Roshan Sharma	Technician (T-1)	ICAR-CPCRI, RC, Kidu	09.05.2024
Mr. Priy Ranjan Bharti	Technician (T-1)	ICAR-CPCRI, RS, Vittal	09.05.2024
Mr . Vikas Joon	STO (T-6)	ICAR-CPCRI, Kasaragod	14.06.2024
Mr. Dinesh Kumar Yadav	SMS (T-6)	ICAR-KVK ICAR-CPCRI, Kasaragod	19.06.2024

TRANSFERS

Name of the staff	Designation	To (Place)	w.e.f.
Dr. Pandiselvam R.	Scientist	ICAR-CIRCOT, Mumbai	04.04.2024
Shri Jayarajan V.V.	LDC (on deputation)	ICAR-DCR, Puttur	21.05.2024

PROMOTIONS

Name of the staff	From (designation)	To (designation)	w.e.f.
Dr. V. Selvamani	Senior Scientist	Principal Scientist	08.01.2023

RETIREMENTS

Name of the staff	Designation	Place	w.e.f.
Sri B. Ramachadra	SSS	ICAR-CPCRI, Kasaragod	30.04.2024
Sri T.K. Gangadharan	UDC	ICAR-CPCRI, Kasaragod	30.04.2024
Smt K. Valsala	SSS	ICAR-CPCRI, RS Kayamgulam	30.04.2024
Sri Chaniya Naik P.A.	SSS	KVK ICAR-CPCRI, Kasaragod	30.04.2024
Sri V.T. Rameshan	Technician (T-1)	ICAR-CPCRI, Kasaragod	30.04.2024
Sri B. Choma	LDC	ICAR-CPCRI, RS, Vittal	30.04.2024
Smt. N.V. Sasikala	SSS	ICAR-CPCRI, Kasaragod	31.05.2024
Sri Jayaprakash K.	SSS	ICAR-CPCRI, Kasaragod	31.05.2024
Sri K. Haridasan	Assistant	ICAR-CPCRI, RS, Kayamkulam	31.05.2024
Sri K Ravi	SSS	ICAR-CPCRI, RS,Kayamgulam	31.05.2024
Sri C. Sukumaran	SSS	ICAR-CPCRI, RS, Kayamkulam	31.05.2024
Sri Padmayya Gowda	SSS	ICAR-CPCRI, RC, Kidu	31.05.2024
Sri S Regappa	SSS	ICAR-CPCRI, RC, Kidu	31.05.2024
Smt . N. Bhavani	SSS	ICAR-CPCRI, RC, Kidu	31.05.2024
Sri Panduranga K	Sr. Technical Assistant	ICAR-CPCRI, Kasaragod	30.06.2024
Sri Laxmana Naika	SSS	ICAR-CPCRI, Kasaragod	30.06.2024

OBITUARY

The Director and staff mourn the sudden and untimely passing away of Sri Sanjeeva Patali B., SSS, ICAR-CPCRI,, Kasaragod on 03.04.2024. We pray that the bereaved soul may rest in peace and tranquility.

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