

# SPICES

## NEWS

ICAR-Indian Institute of Spices Research  
Marikunnu (P.O.), Kozhikode, Kerala, India



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### RESEARCH UPDATE

#### Development of isothermal based diagnostic assays for large cardamom chirke virus

Chirke disease of large cardamom caused by large cardamom chirke virus (LCCV) (Genus: Macluravirus; Family: Potyviridae) is an important viral disease of this crop. Large cardamom being a vegetatively propagated crop, development of a diagnostic is important for the identification and propagation of virus-free plants. In view of this, two isothermal molecular assays viz. reverse transcriptase loop-mediated isothermal amplification (RT-LAMP) and reverse transcriptase recombinase amplification (RT-RPA) were developed to detect the LCCV infecting large cardamom. Assays were optimized for parameters like duration, temperature and concentration of magnesium sulfate, and betaine in the case of RT-LAMP and magnesium acetate in the case of RT-RPA.

Detection limits of both assays were determined and compared with conventional RT-PCR and SYBR Green-based real-time RT-PCR. RT-LAMP was found 1000 times additional sensitive than RT-PCR and one-tenth that of real-time RT-PCR. RT-RPA was found 100 times additional sensitive than RT-PCR and one-hundredth that of real-time RT-PCR. Both assays were specific, rapid, and sensitive for detecting LCCV. Compared to real-time RT-PCR, these assays are economical and can be employed in large scale screening of cardamom plants against LCCV for the selection of virus-free plants.

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## Recombinase polymerase amplification assay for *Pythium* spp. and *Ralstoniapseudosolanacearum* detection in ginger

Singleplex and duplex recombinase polymerase amplification (RPA) assays were developed for specific and sensitive detection of *Pythium* spp. and *Ralstonia pseudosolanacearum* from ginger rhizomes. The assays were 10-1000 times more sensitive compared to conventional PCR assays and were highly specific as they did not show any cross amplification with other rhizome-borne pathogens of ginger such as *Fusarium* spp., *Macrophomina phaseolina* and *Sclerotium rolfsii*. In addition, the assays could be performed under isothermal conditions at a temperature ranging from 37-40°C in a heating block. In validation tests, these pathogens could be successfully detected using crude DNA extracted from ginger rhizome samples collected from field, storage and market.

## CVT on farmers varieties of cardamom

In a CVT on farmers varieties of cardamom highest dry yield per plant was recorded in var. Panikulangara (340.67 g/plant) followed by var. Thiruthali (334.78 g/plant).

More number of seeds was recorded in variety Thiruthali (21.27) followed by variety Pappalu (20.73). Highest seed weight of 74.84 % was recorded in variety Panikulangara followed by variety Wonder cardamom (72.41 %). Essential oil content ranged from 8.08 % (Arjun) to 9.72 % (Njallani Green gold).

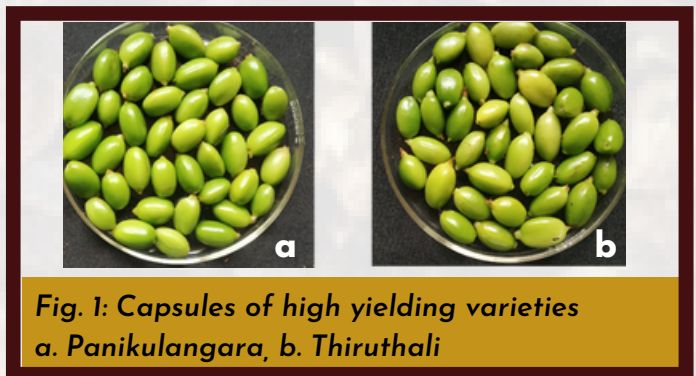


Fig. 1: Capsules of high yielding varieties  
a. Panikulangara, b. Thiruthali

## CVT on hybrids of small cardamom - 2018 Series VII

In the CVT trial consisting of nine hybrids and a national check variety highest dry capsule yield of 841.67 g/plant was recorded in hybrid PH-13 followed by hybrid Bold × IC 547219 (361.33 g/plant). More number of seeds per capsule was recorded in PH 13 (25.10). Essential oil content ranged from 6.88 % (SHC 2) to 9.08 % (Njallani Green gold).



Fig. 2. Specificity analysis of duplex RPA assay  
a). Lane M. 100bp DNA ladder, Lanes 1. *R. pseudosolanacearum*, Lane 2. *Pythium*spp, Lane 3 & 4. *R. pseudosolanacearum*+*Pythium*spp Lane 5. Water control b). Lane M. 100bp DNA ladder; Lanes 1. *Fusarium* spp. Lane 2. *Sclerotium rolfsii* Lane 3. *Macrophomina phaseolina*, Lane 4. *R. pseudosolanacearum*+*Pythium*spp Lane 5: Water control

## NEWS AND EVENTS

Institute Foundation Day celebrations of ICAR-IISR, Kozhikode held on 01-07-2021.

### News from Human Resource Development

- An Online workshop on R for Biologists was organized by ICAR-Indian Institute of Spices Research, Kozhikode from 6-8 October, 2021 for 48 participants including Research Scholars and Project Fellows / JRFs. The sessions were handled by Ms. Sona Charles, Dr. Divya P Syamaladevi, Dr. Santhosh J Eapen from ICAR-IISR and Dr. Sreekumar J from ICAR-CTCRI, Thiruvananthapuram.

### Consultancy Processing Cell

- Dr. C N Biju visited two divisions (Mayfield and Avondale) of Mayfield Estate, Harrison's Malayalam Limited, Gudalur, Nilgiri (District), Tamil Nadu as a consultant for assessing black pepper yield on 19-20.11.2021.

### News from Library

- IISR Library strives towards ensuring excellent academic services through online and offline to the users. Library has a collection of 5653 books and 6010 bound journals.

IISR Library is part of the Consortium of electronic Resources in Agriculture (CeRA) and more than 3500 full text journals on agriculture and allied subject are accessible. Library has subscribed 25 Indian Journals and 8 Foreign Journals during the year in addition to journals accessible under CeRA. Library maintains the Institutional Digital repository software 'DSpice'. Library also provided other academic service like detection of plagiarism in research thesis for Institute users.

### News from AICRPS

The XXXII Annual Group Meeting (AGM) of ICAR-All India Coordinated Research Project on Spices (AICRPS) was conducted during 22-24 September 2021 at ICAR- Indian Institute of Spices Research, Kozhikode through virtual platform. The workshop was inaugurated by Prof. Jeet Singh Sandhu, Hon'ble Vice Chancellor, Sri Karan Narendra Agriculture University (SKNAU), Jobner, Rajasthan on 22 September 2021. Dr. A. K. Singh, Deputy Director General (Horticultural Science), Indian Council of Agricultural Research, New Delhi presided over the function. Dr. Vikramaditya Pandey, Assistant Director General (Horticultural Science), ICAR, New Delhi was the Guest of Honour. He also suggested to identify the yield gap in spice varieties cultivated across different agro-climatic zones

and to develop ecological and cropping system-based technologies to achieve doubling farmer's income. Dr. J. Rema, Project Coordinator, AICRPS welcomed the gathering and presented the achievements AICRP on Spices during 2020-21 with emphasis on various on-going research activities, new initiatives and flagship programmes pertaining to NE regions, SCSP and TSP. During the inaugural session the "Best AICRPS Centre Award 2020-21" was presented to AICRPS centre at Chaudhary Charan Singh Haryana Agricultural University, Hisar. Dr. Homey Cheriyan, Director, DASD, Kozhikode and Dr. S. N. Saxena, Director, ICAR-NRC for Seed Spices, Ajmer offered felicitations. Dr. K. S. Krishnamurthy, Principal Scientist, ICAR- IISR, Kozhikode proposed the vote of thanks.

The workshop was organized in six Technical Sessions viz., Genetic Resources and Crop Improvement, Crop Management, Crop Protection, Variety Release, Technology Transfer and Plenary Session. During the workshop, six varieties (1 coriander, 2 fenugreek, 1 fennel, 1 turmeric and 1 ajwain) viz., Chhattisgarh Raigarh Dhaniya 3 (high yielding, high quality essential oil coriander suitable for both leafy as well as seed purpose developed by IGKV, Raigarh), RF 289 (high yielding, high quality,

moderately tolerant to Ramularia blight by SKNAU, Jobner), HM 273 (high yielding fenugreek variety resistant to downy mildew and tolerant to powdery mildew by CCSHAU, Hisar), Gujarat Methi 3 (high yielding powdery mildew tolerant fenugreek variety by SDAU, Jagudan), Lam Ajwain 3 ((high yielding & high quality ajwain variety) and Chhattisgarh Raigarh Haldi 3 (high yielding, early maturing, bold rhizome with dark yellow colour developed by IGKV, Raigarh) were recommended for release.

Three technologies were also recommended for adoption in XXXII AGM of AICRPS. viz., 1. Management of turmeric foliar diseases like leaf spot (*Colletotrichum capsici*) and leaf blotch (*Taphrinamaculans*) using propiconazole (0.1%) as rhizome treatment and foliar spray developed by TNAU, Coimbatore. 2. Management of coriander powdery mildew (*Erysiphe polygoni*) using new generation fungicides like propiconazole (0.1%) by TNAU, Coimbatore. 3. Control of stem gall disease in coriander by foliar spray @ 219.75 g a.i. ha<sup>-1</sup> at 45, 60 & 75 DAS with ready mixture formulation of Azoxystrobin (11%SC) + Tebuconazole (18.3% SC) by RPCAU, Dholi.

In the Plenary session of the XXXII AGM of AICRPS held on 24 September 2021, Dr. N. K. Krishna Kumar, Former DDG (Horticulture), ICAR, New Delhi

and Dr. K.M. Indires, Hon'ble Vice Chancellor, UHS, Bagalkot were the chair persons. Dr. N. K. Krishna Kumar suggested to facilitate the conduct of training program on statistical analysis of field data to the breeders/scientists involved in the AICRPS trials. He and Dr. Indires K. M., Hon'ble Vice Chancellor, UHS, Bagalkot also suggested to initiate indexing of varieties using weighted parameters and traits of industrial importance such as boldness, luster, unique flavour etc. should be included in the weighted parameters.



RF 289



Chhattisgarh RaigarhDhaniya 3



Gujarat Methi 3



HM 273



Lam Ajwain 3



Chhattisgarh RaigarhHaldi 3

*New spice varieties recommended for release*



*Glimpses of the XXXII Annual Group Meeting of ICAR-AICRPS*

## EXTERNALLY AIDED PROJECTS

Title of project	Investigators	Funding agency	Period	Outlay (Rs. Lakhs)
Development of on-site detection kits for viruses and oomycetes infecting black pepper ( <i>Piper nigrum</i> )	A. I. Bhat and A. Jeevalatha	SERB, Govt. of India	29-12-2021 to 28-12-2024	45.05884

## HINDI NEWS

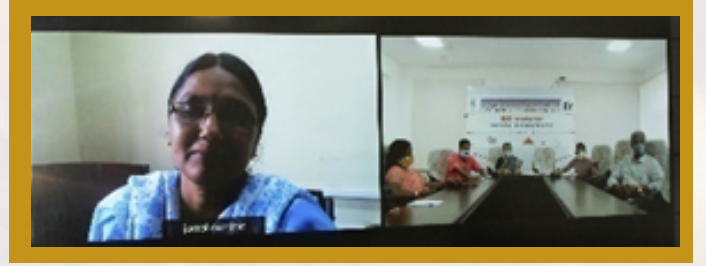
### हिंदी अनुभाग

#### राजभाषा कार्यान्वयन समिति की बैठक

जुलाई-दिसंबर 2021 की अवधि में राजभाषा कार्यान्वयन समिति की दो बैठकें डॉ. जे. रमा, निदेशक की अध्यक्षता में संपन्न हुईं। दिनांक 29 सितंबर 2021 और 28 दिसंबर 2021 को आयोजित बैठकों में समिति ने राजभाषा कार्यान्वयन की गतिविधियों की समीक्षा करके सुधारने के लिए सुझाव दिया गया।

### हिंदी कार्यशाला

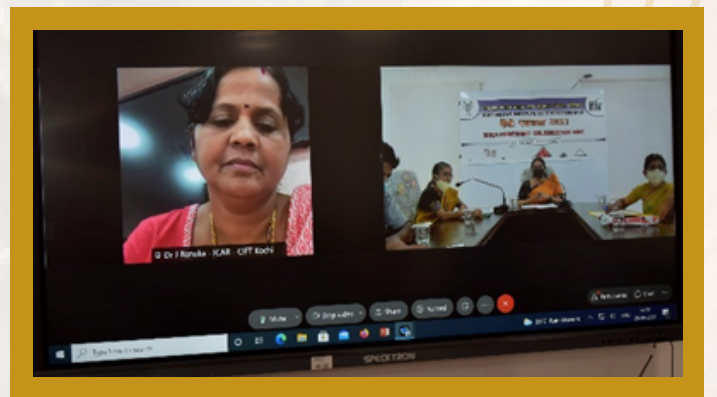
जुलाई-दिसंबर 2021 की अवधि में भाकृअनुप-भारतीय मसाला फसल अनुसंधान संस्थान के अधिकारियों तथा कर्मचारियों के लिए दो कार्यशालाएं आयोजित की गयीं। दिनांक 01.09.2021, 20.12.2021 को आयोजित इन कार्यशालाओं में राजभाषा, पारिभाषिक शब्दावली और बोलचाल की हिंदी तथा हिंदी टिप्पणी एवं पत्र लेखन के बारे में क्रमशः श्रीमती जोमोल, कनिष्ठ हिंदी अनुवादक, भारत संचार निगम लिमिटेड, तिरुवल्ला तथा श्री धर्मेन्द्र कुमार, सहायक निदेशक (राजभाषा), राजभाषा विभाग, हिंदी शिक्षण योजना, कोचिन ने ऑनलाइन व्याख्यान दिया। दिनांक 20.12.2021 को आयोजित कार्यशाला में संस्थान की राजभाषा पत्रिका मसालों की महक 2021 की ई पत्रिका का प्रकाशन किया।



### हिंदी पखवाडा

भाकृअनुप-भारतीय मसाला फसल अनुसंधान संस्थान, कोषिकोड में 14-28 सितम्बर 2021 को हिंदी पखवाडा मनाया। संस्थान के निदेशक डॉ. जे. रमा ने 14 सितंबर को हिंदी पखवाडे का उद्घाटन किया। उद्घाटन समारोह में निदेशक एवं सभी अधिकारियों एवं कर्मचारियों द्वारा राजभाषा प्रतिज्ञा ली गयी। इस अवसर पर संस्थान के अधिकारियों, कर्मचारियों, उनके बच्चों तथा फील्ड कॉन्ट्राक्ट स्टाफ के लिए हिंदी टिप्पणी एवं मसौदा लेखन, निबंध लेखन, भाषण, श्रुत लेखन, अनुच्छेद लेखन, कविता रचना, कहानी लेखन, गीत, रसोई बाग की वीडियो आदि विभिन्न प्रकार की प्रतियोगिताओं का आयोजन किया गया।

हिंदी पखवाडे का समापन समारोह 28 सितंबर 2021 को संपन्न हुआ। समारोह की मुख्य अतिथि डॉ. जे. रेणुका, उपनिदेशक (राजभाषा), भाकृअनुप-केंद्रीय मत्स्य प्रौद्योगिकी संस्थान, कोचिन ने ऑनलाइन रूप में भाग लिया। उन्होंने अपने भाषण में हिंदी भाषा के ही नहीं सभी भारतीय भाषाओं के महत्व पर प्रकाश डाला। इसके अलावा राजभाषा अनुपालन के लिए हिंदी अधिकारियों के कर्तव्य पर जोर दिया।



## हिंदी में वेबिनार

भाकृअनुप-भारतीय मसाला फसल अनुसंधान संस्थान, कोषिककोड द्वारा अखिल भारतीय समन्वित मसाला अनुसंधान परियोजना के सहयोग से 29 नवंबर 2021 को बिहार तथा उत्तर प्रदेश के किसानों के लिए **हल्दी की नवीन उत्पादन प्रौद्योगिकी** पर हिंदी में एक वेबिनार आयोजित किया। इसमें डॉ. ए. के. मिश्रा, वैज्ञानिक, राजेंद्र प्रसाद केंद्रीय कृषि विश्वविद्यालय, बिहार, डॉ. प्रदिप कुमार, वैज्ञानिक, नरेंद्र देव कृषि प्रौद्योगिकी विश्वविद्यालय, उत्तर प्रदेश तथा डॉ. के. अनीस, वैज्ञानिक, भाकृअनुप-भारतीय मसाला असल अनुसंधान संस्थान, कोषिककोड ने क्रमशः हल्दी की उत्पादन तकनीकी, हल्दी का रोग प्रबंधन, हल्दी का प्रसंस्करण एवं व्यावसायिक अवसर आदि विषयों पर व्याख्यान दिया।



## नराकास गतिविधियों में सहभागिता

- डॉ. एन. के. लीला, प्रधान वैज्ञानिक एवं हिंदी अधिकारी तथा सुश्री एन. प्रसन्नकुमारी, वरिष्ठ तकनीकी अधिकारी ने दिनांक 24 सितंबर 2021 को आयोजित नगर राजभाषा कार्यान्वयन समिति की ऑनलाइन बैठक में भाग ली।

- संस्थान के पाच स्टाफ सदस्यों ने नगर राजभाषा कार्यान्वयन समिति द्वारा आयोजित ऑनलाइन टिप्पणी प्रतियोगिता में तथा तीन स्टाफ सदस्यों ने ऑनलाइन राजभाषा प्रश्नोत्तरी प्रतियोगिता और एक स्टाफ सदस्य ने ऑनलाइन अनुशीर्षक लेखन प्रतियोगिता में भाग ली।

## हिंदी प्रशिक्षण

- तीन स्टाफ सदस्यों ने हिंदी शिक्षण योजना द्वारा आयोजित पारंगत पाठ्यक्रम तथा एक स्टाफ सदस्य ने प्रबोध पाठ्यक्रम में भाग लिया।

## हिंदी प्रकाशन

- मसाला समाचार जुलाई-दिसंबर 2018, मसाला समाचार जनवरी-दिसंबर 2019, मसालों की महक 2021, अनुसंधान के मुख्य अंश 2019, संचालन का कलेंडर - काली मिर्च, संचालन का कलेंडर - अदरक, संचालन का कलेंडर - हल्दी, इलायची मोबाइल एप।
- आईआईएसआर राजभाषा गतिविधियां राजभाषा आलोक 2020 में प्रकाशित किया।

## Activities of ITM-BPD Unit

- ITM-BPD unit commercialized eleven technologies from January 2021 to December 2021 (Table 1). An amount of Rs. 6.75 lakhs earned as revenue through technology commercialization.
- ICAR-IISR entered in to a MoA with District Kudumbshree Mission, Kozhikode, on 1st July 2021 for handholding women entrepreneurs through commercial production of spice planting materials, training, capacity building etc., for value added product development.

- Tripartite agreement executed between KeladiShivappa Nayaka University of Agricultural & Horticultural Sciences, Shivamogga, ICAR-IISR and Karnataka State Agricultural Produce Processing and Export Corporation Limited, PMFME scheme as mentoring institute for establishment of Common Incubation Center
- ICAR-IISR celebrated the foundation day on July 1st and during this occasion, M/s RLCO Innovative AgriPvt Ltd, Kozhikode Kerala, startup incubatee of ITM-BPD Unit and licensee of micronutrient technologies was honored with best Startup awards.
- Conducted Online Collaborative Refresher Training Programme (RTP) Promoting Spices Crop cultivation and Business opportunities for Established Agripreneurs under AC&ABC Scheme, MANAGE Hyderabad, at ICAR-Indian Institute of Spices Research (IISR) Kozhikode, Kerala on 16th -18th November 2021. 45 established agripreneurs from across the country participated in the training program. As part of the training, four of the incubatees of BPD unit shared their experience and success story.

**Table 1: Commercialization of Technologies**

Sl.No	Name of Technology/ Know-How	Name of Contracting Party	Revenue Earned (₹)
1.	Turmeric-IISR Alleppey Supreme	Chembakam Joint Liability Group (JLG), Mannampetta, Thrissur, Kerala	50,000
2.	A micronutrient composition for black pepper and a process for its preparation	BHOOMI BIO INDUSTRIES, Magadi Bangalore, Bengaluru Karnataka	3,00,000
3.	A micronutrient composition for cardamom and a process for its preparation	ESAF Swasraya Producers Company Ltd, Thrissur, Kerala	3,00,000
4.	Curry Masala Recipes	Thanima Oil and Flour Mill, Kannur, Kerala	20,000
5.	Noodles Masala	Tasty tribes Pvt Ltd, Pune, Maharashtra	5,000
Total			6,75,000





**Fig.2: MoA execution between ICAR-IISR and Ms. Nisha/ T N, M/s Thanimaoil and Flour Mill, Kannur, Kerala for curry masala recipes on 12th August 2021**



**Fig.3: Technology know-how transfer from ICAR-IISR to M/s Krishi Vikas Sahakari Samiti Ltd, Rajastan on 08-09-2021**



**Fig. 4: M/s RLCO Innovative Agri Pvt Ltd receives the Excellence award from Dr.Beena Philip, Mayor, Kozhikode**



**Fig.5: Dr. J Rema (Director, ICAR- IISR) receives the first batch of products from Mr. Aloak Menon (M/s Spizaar Pvt Ltd, Kozhikode , Kerala)**



**Fig.6: Spice based food products developed by M/s Spizaar Pvt Ltd, Kozhikode, Kerala, Incubatee of BPD Unit**

## PUBLICATIONS

### RESEARCH PAPERS

- AnishaBabu P, NK Leela, J Venkatesh and D. Prasath. 2021. Variability of exotic ginger (*Zingiberofficinale*Rosc.) accessions for quality traits. *Journal of Plantation Crops* 49(2): 111-120.
- Biju, C.N., Jeevalatha, A., Bhat, A.I., Peeran, M.F., Praveena, R., Sarathambal, R., Eapen S.J. 2021. Domestic quarantine: An introspection and future perspectives on biosecurity interventions to contain pathogen spread in vegetatively propagated spices in India. *Journal of Spices and Aromatic Crops*. 30: 142-162.
- C. N. Biju, A. Jeevalatha, M. F. Peeran, R. Suseela Bhai, FadlaBasima, V. A. MuhammedNissar, V. Srinivasan and Lijo Thomas. (2021). Association of *Lasiodiplodiatheobromae* with die-back and decline of nutmeg as revealed through phenotypic, pathogenicity and phylogenetic analyses. *3 Biotech*. DOI: 10.1007/s13205-021-02961-y.
- Sarathambal, C., R. Sivarajan and Rona Viswanathan. 2021. Mechanism of antioxidant and antifungal properties of *Pimentadioica* (L.) leaf essential oil on *Aspergillus flavus*. *Journal of Food Science and Technology*, 58(7) 2497-2506
- Snigdha M and D Prasath (2021) Transcriptomic analysis to reveal the differentially expressed miRNA targets and their miRNAs in response to *Ralston solanacearum* in ginger species. *BMC Plant Biology* 21, 355. <https://doi.org/10.1186/s12870-021-03108-0>.
- Vidya V, Prasath D, Snigdha M, Gobu R, Sona C, Maiti CS. 2021. Development of EST-SSR markers based on transcriptome and its validation in ginger (*Zingiberofficinale*Rosc.). *PLoS ONE* 16(10): e0259146. <https://doi.org/10.1371/journal.pone.0259146>.

### BOOKLETS

- Sharon Aravind, ParshuramSial, Krishnamurthy K S, Rema J, Radha E & John George (Eds.) 2021 Spicing up Tribal's welfare. ICAR-All India Coordinated Research Project on Spices, ICAR-IISR, Kozhikode, Kerala, India 30 p.
- Sharon Aravind, Krishnamurthy K S, Rema J, John George & Radha E (Eds.) 2021 Spicing up NER through ICAR-AICRPS. ICAR-All India Coordinated Research Project on Spices, ICAR-IISR, Kozhikode, Kerala, India 30 p.
- Sawargaonkar S.L., Singh A.K., Bhagat R, Sharma R.N., Rathia G.R., Painkara S.K., S Agrawal, Rama M Savu, D Prasath , Krishnamurthy K.S., Sharon A., J Rema and K NirmalBabu (Eds.) 2021 AICRP on Spices, CARS, Raigarh, IGKV, Chhattisgarh 40 p.

### TECHNICAL REPORTS

- Prasath D and Eapen S J (Eds) (2021) Proceedings-International symposium on spices as flavours, fragrances and functional foods. Indian Society for Spices, Kozhikode, Kerala, India, p. 41.

### POPULAR ARTICLE

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## OTHER PUBLICATIONS

- A.I. Bhat, V. Srinivasan, C. N. Biju and K. S. Krishnamurthy. (2021). Viral disease of black pepper and its management. Extension Folder (2021/06). ICAR-Indian Institute of Spices Research, Kozhikode.
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## PAPERS PRESENTED IN SYMPOSIA/ SEMINARS/ WORKSHOPS /CONFERENCES

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- Aravind S, Gothwal D. K., Chauhan S., Meena R. S., Tehlan S. K., Patel R., Nair R., Mukhim C., Kumar P., Singh D., Shivakumar M. S., Krishnamurthy K. S and Rema J 2021 Evaluation of fennel genotypes under various agro climatic regions of India In. Souvenir & Abstracts International Conference on Saffron and seed spices- Innovative technologies for sustainable development, SKUAST, Srinagar page no. 5
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- Ashutosh Gautam, Leela N K., RayelChhetri, Bora S. S., Deka T. N., Pradip Kumar K., Krishnamurthy K. S., Sharon A. and Rema Shree A. B. 2021. Study on composition of essential oils of large cardamom (*Amomum subulatum* Roxb) and its wild relatives found in Himalayan region, Sikkim In. Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M A, John Jo Varghese, Saju K A, ManojOommen and Thiyagarajan P. (Eds) Book of Abstracts,Coping with the Pandemic and beyond: Research and innovations in the Plantation crops sector, Kochi, page no.13-14.
- Bhagyalakshni P. Arya Surendran A.S., Jayashree E. and Anees K. 2021. Effect of pretreatments for the development of spice enriched finger millet cookies. In: Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M.A, John Jo Varghese, Saju K.A.,ManojOommen, Thiyagarajan P. (Eds.) 2021, Book of Abstracts, Plantation Crops Symposium (PLACROSYM XXIV) - Coping with the pandemic and Beyond: Research and Innovations in the Plantation Crops Sector, at Kochi, Kerala, 14-16 Dec. 2021.pp: 264. (Poster presentation)
- Bhat, A.I. 2021. Conventional and molecular diagnostic assays for proactive management of diseases in the International webinar on Recent Advances in Sustainable Integrated Disease Management in Plantation Crops" 6-8, July 2021, IIOPR, Pedavagi
- Bhat, A.I. 2021.Identification and diagnostic assays for viruses infecting major spice crops. Invited talk at the National Symposium on Sustainable Plant Health Management amidst Covid Pandemic: Challenges and Strategies. Organized by Indian Phytopathological Society (Southern chapter), ICAR-Central Plantation Crops Research Institute, Kasaragod, 1-3 December 2021.

- Karthika C. S., Biju C. N. and Jeevalatha A.. Modified cabin sequestering methods to salvage bacterial contaminated Phytophthora cultures. (POSTER)
- Divya P. Syamaladevi, Karthika Raveendran, T. E. Sheeja, C. N. Biju and Prasath Duraisamy. Ralstonia infected transcriptome of Zingiber officinale. (POSTER)
- Fathimath Zumaila, A. Jeevalatha and C. N. Biju. Evaluation of PCR markers for mating-type determination in Phytophthora spp. infecting black pepper. (ORAL) Papers presented in National Symposium on "Sustainable plant health management amidst COVID pandemic: Challenges and Strategies" (virtual) organized by Indian Phytopathological Society (South Zone Chapter) and ICAR-Central Plantation Crops Research Institute (ICAR-CPCRI), Kasaragod during 1-3 December 2021].
- Jasmine Angel M.J., Abhirami R., Jayashree E. and Anees K. 2021. Optimisation of production of spice based nondairy oats milks and studies on its nutraceutical properties. In: Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M.A, John Jo Varghese, Saju K.A., Manoj Oommen, Thiyagarajan P. (Eds.) 2021, Book of Abstracts, Plantation Crops Symposium (PLACROSYM XXIV) - Coping with the pandemic and Beyond: Research and Innovations in the Plantation Crops Sector, at Kochi, Kerala, 14-16 Dec. 2021. pp: 263. (Poster presentation)
- Jayashree E. Anees K., and Thankamani.C.K. 2021. Nutmeg rind a By-product from nutmeg processing-its value addition and entrepreneurship opportunities. In: Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M.A, John Jo Varghese, Saju K.A., Manoj Oommen, Thiyagarajan P. (Eds.) 2021, Book of Abstracts, Plantation Crops Symposium (PLACROSYM XXIV) - Coping with the pandemic and Beyond: Research and Innovations in the Plantation Crops Sector, at Kochi, Kerala, 14-16 Dec. 2021. pp: 264. (Poster presentation)
- Jayashree E., Anees K., Rajeev P., Radha E. and Thankamani.C.K. 2021. Application of Spice based derivatives for value addition of dairy products. In: Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M.A, John Jo Varghese, Saju K.A., Manoj Oommen, Thiyagarajan P. (Eds.) 2021, Book of Abstracts, Plantation Crops Symposium (PLACROSYM XXIV) - Coping with the pandemic and Beyond: Research and Innovations in the Plantation Crops Sector, at Kochi, Kerala, 14-16 Dec. 2021. pp: 245-246. (Oral Presentation)
- Megha Das, Bhat, A.I. 2021. Association of a novel virus belonging to the family Totiviridae with plant pathogenic Colletotrichum gloeosporioides isolated from cardamom. Poster presentation at the National Symposium on Sustainable Plant Health Management amidst Covid Pandemic: Challenges and Strategies. Organized by Indian Phytopathological Society (Southern chapter), ICAR-Central Plantation Crops Research Institute, Kasaragod, 1-3 December 2021.
- Megha Das, Bhat, A.I. 2021. Association of two novel double-stranded RNA viruses with Fusarium sp isolated from black pepper. Oral presentation at the 24th Plantation Crops Symposium on 'Coping with the pandemic and beyond: Research and innovations in the plantation sector' 14-16 December 2021, Kochi, Kerala.

- Prasath D, Shivakumar MS, Sivaranjani R and Arthi S (2021) Breeding next generation spices for nutraceuticals. In: International Horticulture Conference:Next Generation Horticulture (NEXTGEN-HORT), Tamil Nadu Agricultural University &The Society for Promotion of Horticultural Science and Technology (SoPHoST), September 16-19, 2021, Coimbatore, Tamil Nadu.
- Prasath D, Shivakumar MS, Sivaranjani R and Arthi S (2021) Breeding next generation spices for industrial use and nutraceuticals. In: 9th Indian Horticulture Congress 2021: Horticulture for health, livelihood and economy, November 18-21, 2021, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh.
- Rajeev P., Jayashree E., Anees K., and Thankamani.C.K. 2021.2021. Evaluation of technology commercialization strategy of spice blended dairy products-a case study. In: Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M.A, John Jo Varghese, Saju K.A., ManojOommen, Thiyagarajan P. ( Eds.) 2021, Book of Abstracts, Plantation Crops Symposium (PLACROSYM XXIV) - Coping with the pandemic and Beyond: Research and Innovations in the Plantation Crops Sector, at Kochi, Kerala, 14-16 Dec. 2021.pp: 264. (Poster presentation)
- Rema J, Sharon Aravind and Krishnamurthy K. S 2021. Crop improvement in seed spice: Present scenario & future prospects In. Souvenir & Abstracts International Conference on Saffron and seed spices-Innovative technologies for sustainable development, SKUAST, Srinagar page no.13-14.
- Sarathambal C, R. Sivaranjani, V. Srinivasan, M. Alagupalamuthirsolai and B. Anamika. 2020. Arbuscular mycorrhiza mediated effect on growth, nutrient uptake, physiological and biochemical activities of black pepper cuttings. International E - Conference on "Multidisciplinary approaches for plant disease management in achieving sustainability in agriculture" organized by Department of Plant Pathology, College of Horticulture, Bengaluru during 6-9th October 2020 (Poster presentation) Pp100
- Sharon Aravind, Parshuram Sial, Krishnamurthy K. S. and Rema J. 2021. Spices pave way for tribal welfare In.Dhanpal K., Pradip Kumar K., Shadanaika, Ansar Ali M A, John Jo Varghese, Saju K A, ManojOommen and Thiyagarajan P.(Eds) Book of Abstracts, Coping with the Pandemic and beyond: Research and innovations in the Plantation crops sector, Kochi, page no.296-298.
- Shivakumar M. S., Krishnamurthy K. S., Saji K. V. and Sasikumar P. (2021). "Identifying suitable genotypes for white pepper using seed size, seed to pericarp ratio and quality as determining factor". "Plantation Crops Symposium (PLACROSYM XXIV), Coping with the Pandemic and Beyond: Research and Innovations in the Plantation Crops Sector" organized by Spices board, Kochi on 14 to 16 December 2021 at Bolgatty Palace at Bolgatty Island, Kochi

**PH.D. REGISTRATION**

<b>Sl. No</b>	<b>Name of the student</b>	<b>Guide/Co Guide</b>	<b>Subject</b>	<b>University</b>
1.	Ms.Aiswarya Babu	Dr. Santhosh J. Eapen/ Dr. C. Sellaperumal	Zoology	University of Calicut
2.	Ms. Gayathri Pavithran	Dr. C K Thankamani	Botany	University of Calicut
3.	Ms. Greeshma M	Dr. A Ishwara Bhat	Botany	University of Calicut
4.	Ms. Blessy Peter	Dr. C Sarathambal /Dr TE Sheeja	Biotechnology	University of Calicut
5.	Mr. Silaru Raghuv eer	Dr. D Prasath	Horticulture	YSR Horticulture University
6.	Ms. P. Saleena	Dr. E Jayashree	Food Science and technology	Kerala University of Fisheries and Ocean Studies
7.	Ms. Archana Ravindran	Dr. E Jayashree	Food Science and technology	Kerala University of Fisheries and Ocean Studies
8.	Mr. Shabad M.K.	Dr. Lijo Thomas	Management, Humanities & Social Sciences	Kerala University of Fisheries and Ocean Studies
9.	Mr. Shiyas K.J.	Dr. Lijo Thomas	Management, Humanities & Social Sciences	Kerala University of Fisheries and Ocean Studies

**NEW APPOINTMENT**

<b>Name</b>	<b>Post</b>	<b>Date of joining</b>
<b>Mr. T E Janardhanan</b>	<b>Senior Administrative Officer</b>	<b>25-10-2021</b>

**PROMOTION**

<b>Name</b>	<b>Promoted as</b>	<b>Date</b>
<b>Mr. Faisal K</b>	<b>Personal Assistant</b>	<b>09-09-2021</b>

**TRANSFER**

<b>Name</b>	<b>From IISR, Calicut to</b>	<b>Date of transfer</b>
<b>Mr. T D S Prakash</b>	<b>Senior Fin. &amp; Accounts Officer at ICAR-CTCRI, Trivandrum</b>	<b>13-10-2021</b>
<b>Mr. P Muraleedharan</b>	<b>Administrative Officer at ICAR-NIVEDI, Bengaluru</b>	<b>24-12-2021</b>

**RETIREMENT**

<b>Name</b>	<b>Post</b>	<b>Date</b>
<b>Ms. B M Lalitha</b>	<b>Skilled Support Staff</b>	<b>30-09-2021</b>
<b>Dr. R Ramakrishnan Nair</b>	<b>Principal Scientist</b>	<b>30-11-2021</b>



## PERSONALIA

### Awards/ Honours/ Recognitions

- Best oral presentation award for the research work entitled 'Zoospore-taxis and encystment-based methods for isolating Phytophthora from infested black pepper rhizospheric soil' by Karthika C. S., Biju C. N. and Jeevalatha A. [National Symposium on "Sustainable plant health management amidst COVID pandemic: Challenges and Strategies" (virtual) organized by Indian Phytopathological Society (South Zone Chapter) and ICAR-Central Plantation Crops Research Institute (ICAR-CPCRI), Kasaragod during 1-3 December 2021].
- CHAI- Dr. Kriti Singh Best Paper Award 2021 for the paper entitled Evaluation of different quality planting materials of turmeric (*Curcuma longa* L.) by traditional and PROTT technique by Sawargaonkar S L, Singh A K, Rathia G R, Painkara S K, Tirkeri P, Sharma R N, Sharon A, and Krishnamuthy K. S

### Participation in Symposia/Seminars/ Workshops/Conferences/Meetings

- Dr. A. Ishwara Bhat participated in working group meeting of PLACROSYM XXIV held at ICRI, Myladampura, Kerala on 2nd July 2021.
- Dr. A. Jeevalatha participated in International Webinar "Recent Advances in Sustainable Integrated Disease Management in Plantation Crops" - 6th-8th, July, 2021 organized by ICAR-IIOPR, Pedavegi

- Dr. C. N. Biju acted as panelist in Technical Session III: Molecular approaches for diagnosis and management of diseases in plantation crops during "International webinar on Recent advances in sustainable integrated disease management in plantation crops" organized by ICAR-Indian Institute of Oil Palm Research, Pedavegi, Andhra Pradesh during 06-08 July 2021.
- Dr. A. Ishwara Bhat participated in Research Admission Committee meeting of University of Calicut held at ICAR-IISR, Kozhikode on 15-07-2021
- Dr. A. Ishwara Bhat participated Biannual subcommittee meeting of National Network of Plant Health Experts organized by NIPHM, Hyderabad on 22-07-2021.
- Dr.E. Jayashree participated as expert during the online meeting of KVK Wayanad "Virtual Farmers-Scientist Interface" on 29 July 2021.
- Dr. E. Jayashree participated in the 7th, 8th, 9th and 10th committee meeting to appraise the proposals received from States/UTs for Common Incubation Center establishment under PMFME through video conferencing organized by Indian Institute of Food Processing Technology, Thanjavur on 5 August 2021, 5 October 2021, 2-12-2021 and 22-12-2021, respectively.

- Dr. E. Jayashree participated in the online meeting of MSME under the Chairmanship of Additional Secretary & Development Commissioner, MSME for discussions on Technology Centres to be established under the scheme, "Establishment of Technology Centres/Extension Centres" on 18 Aug 2021.
- Dr. E. Jayashree served as the Chairman of the session II of the Webinar "Challenges faced by the micro food processing enterprises on Spices (Turmeric, Ginger, Chili) Processing and Value Addition organised by Indian Institute of Food Processing Technology under One District One Product (ODOP) of Prime Minister - Formalization of Micro food processing Enterprises (PMFME) Scheme, on 8-9-2021.
- Dr. E. Jayashree participated as member for the first, second, third and fourth online meeting of the Expert Sub Group on 'A plan for value addition and industrial investment in Kerala's post-harvest agriculture ' organised by KAU on behalf of Kerala State Planning Board on 09-09-2021, 17-09-2021, 24-09-2021 and 5-10-2021 respectively.
- Dr. E. Jayashree participated as member for discussion on DPR for Technology Centres in Food Technology in Konkon Region under Ministry of Micro, Small and Medium Enterprises organized by IIFPT on 21-9-2021.
- Dr. E. Jayashree participated in the online Consultation Workshop on GAP and GHP for Black Pepper in Paderu region held on 8th October 2021.
- Dr. E. Jayashree participated in the online meeting organized by SFAC for Technical Evaluation of project proposals and presentation of Business Plan for promoting of Agri Business in Kerala for promoting the scheme 'Promotion of Micro, Small and Medium Agro Processing Units on 1, 2, ad 3 Nov 2021.
- Dr. A. Ishwara Bhat participated XXXII Annual Group Meeting of ICAR-All India Coordinated Research Project on Spices, held at ICAR-IISR, Kozhikode, 22 - 24 September 2021.
- Dr. A. Ishwara Bhat attended Strategy Workshop on Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Diversification, organized by National Academy of Agricultural Sciences, New Delhi on 20-09-2021.
- Dr. A. Ishwara Bhat attended national webinar on Recent Advances in Plant Health Management organized by Professor Jayashankar Telangana State Agricultural University 24-25 September 2021.
- Dr. S. Aarthi, attended International Conference on "Future challenges and prospects in plant breeding" organized by Centre for Plant Breeding and Genetics on 6-7 October 2021 at TNAU, Coimbatore
- Dr. J Rema, Dr. KS Krishnamurthy and Dr. Sharon Aravind International conference on Saffron and seed spices development on 7 -8 November, 2021 at SKUAST, Srinagar

- Dr. A. Ishwara Bhat attended Institute Management Committee meeting of ICAR - Directorate of Cashew Research, Puttur held on 10-11-2021.
- Ms. Sivaranjani and Mr. V. A. Muhammed Nissar attended 2nd Agro Biodiversity Congress (virtual) on 15-18 November 2021 at Rome.
- Dr. D. Prasath attended 9th Indian Horticulture Congress (2021) on 18-21 November, 2021 at CS Azad University of Agriculture and Technology, Kanpur
- Dr. A. Ishwara Bhat attended Assessment Committee meeting at Spices Board, Kochi to consider promotion of scientists under the modified flexible complementing scheme held on 29-11-2021.
- Dr. C. N. Biju attended National Symposium on "Sustainable plant health management amidst COVID pandemic: Challenges and Strategies" (virtual) during 1-3 December 2021.
- Dr.A.I.Bhat, Dr.C.N.Biju, Dr.R.Praveena, Dr.A.Jeevalatha and Dr. M.F.Peeran attended IPS south zone on 1-3 December, 2021 at CPCRI, Kasarkod.
- Dr. Sharon organized the online review meeting of black pepper & tree spices centers of AICRPS on 12 July 2021 to review the performance of AICRPS trials at black pepper & tree spices centers.
- Dr. Sharon organized XXXII AGM of AICRPS on 22-24 September 2021.
- Dr. Sharon participated in International Conference on Saffron and seed spices- Innovative technologies for sustainable development held at SKUAST, Srinagar on 7-8 November 2021.
- Dr. J. Rema, Dr. C.K. Thankamani, Dr. C.N Biju, Dr. N.K. Leela, Dr. S.J. Ankegowda Dr. Sharon Aravind, Dr. Krishnamurthy, Dr. A. Ishwara Bhat ,Dr. K. Anees, Dr.MS Shivakumar , Dr. E. Jayashree, Dr. S. Aarthi, Dr. E. Radha, P.S. Divya and Dr. Akshita HJ attended PLACROSYM XXIV on 4 - 16 December, 2021 at Spices Board Kochi.
- Dr. Sharon attended XXVI Zonal research and extension advisory council meeting of the RARS, (high range zone), KAU on 28 December 2021.

### Lectures Delivered

- Dr.E. Jayashree delivered a lecture on 'Equipments and specifications of machineries in spices processing' online training for Master Trainers on Spices and Plantation Crops Processing organised by ICAR-CPCRI and IIFPT on 24 July 2021.
- Dr.E. Jayashree delivered a lecture on "Processing and Value Addition in Spices" during the inauguration of State level of Pm FME scheme organised by department of Industries and commerce on 12 Aug 2021.
- Dr.E. Jayashree delivered a lecture on 'Value added products from Spices' during the International seminar on "Emerging trends in Agrl. Engineering for Food Safety and Security organised by Acharya N.G Ranga Agricultural University, Bapatla AP on 26 August 2021.

- Dr.E. Jayashree delivered a lecture on "Development of DPR of Spices based value added products and various Business Plans using Spices (below and above 25 lakhs)" organised by KIED-Agro Incubation for Sustainable Entrepreneurship (ARISE) on 8-9-2021.
- Dr.E. Jayashree delivered a special address on "challenges faced by the micro food processing enterprises on Spices (Turmeric, Ginger, Chili) Processing and Value Addition organised by Indian Institute of Food Processing Technology under One District One Product (ODOP) of Prime Minister - Formalization of Micro food processing Enterprises (PMFME) Scheme, on 8-9-2021.
- Dr.E. Jayashree delivered a lecture on 'Post harvest processing of turmeric' during the Master training programme for State horticulture department officials, Govt of Telangana on Turmeric GAP/Integrated pest & disease management practices / Post harvest processing & value addition organised by Spices Board, on 27.9.2021.
- Dr.E. Jayashree delivered a lecture on 'Value addition and Post-Harvest Technologies for Nutmeg' during the online training programme on nutmeg cultivation organised in collaboration with KAU, on 30-10- 2021
- Dr.E. Jayashree delivered a lecture on "Project Identification and scopeful projects in Spices sector" during the online Technology Entrepreneurship Development Programme on Food Professing organised by KITCO on 1-12-2021..
- Dr.E. Jayashree delivered a lecture on 'Spices Processing' during the two days seminar on Food Processing organized by North Malabar Chamber of Commerce, Kannur on 7-12-2021.
- Dr.E. Jayashree delivered a lecture on 'Processing and Value Addition of Ginger and Turmeric' during the programme - Entrepreneurship Development training on "Agril. Food Processing, Packing & Marketing" organized by College of Agricultural Engineering & Technology Odisha University of Agriculture & Technology Bhubaneswar on 20-12-2021.
- Dr. A. Jeevalatha delivered a lecture on "Laboratory Biosafety practices" to students and research fellows of ICAR-IISR, Kozhikode on 4th, Oct, 2021.
- Dr.Akshitha H J delivered a lecture on Varietal wealth of small cardamom in webinar conducted as part of 75th Anniversary of India's Independence on 05.08.2021 by ICAR-IISR RS, Appangala. ( )
- Dr. Akshitha H J delivered a lecture on 'Improved varieties of ginger and turmeric in webinar conducted as part of 75th Anniversary of India's Independence 'on 11.11.2021 by ICAR-IISR RS, Appangala.
- Dr. Shivakumar M. S delivered a lecture on "Spices in agro-forestry" in online farmers training programme organized by Department of social forestry, forest department Madikeri on 12 July 2021.

- Dr. Shivakumar M. S delivered a lecture on “Genetic resources in spices: Diversity, distribution, conservation and utilization” in online training programme on “Conservation, Management and Utilization of Horticultural Genetic Resources for Livelihood and Nutritional Security” from November, 22-26, 2021.
- Dr. A. Ishwara Bhat delivered a lecture on important disease of spice crops and their management. In NAHEP sponsored training organized by CSA University of Agriculture and Technology, Kanpur and Division of Plant Pathology, ICAR-IARI, New Delhi on Identification and management of insects, pests and plant pathogens infecting nutritional crops, 16th December 2021 (through virtual mode).
- Dr.C. N. Bijudelivered a talk on “Integrated pest and disease management in spices” during training programme for ICS staff of Peermade Development Society Organic Spices organized by PDS Organic Spices and ICAR-IISR, Kozhikode at PDS Organic Spices, Peermade, Idukki on 12.08.2021.
- Dr.C. N. Biju delivered a talk on “Plant health management in black pepper, ginger and turmeric” during “Refresher Training Programme (RTP) Promoting Spices Crop cultivation and Business Opportunities-16th to 18th November 2021” for established Agripreneurs under AC&ABC Scheme (hosted by MANAGE) at ICAR-Indian Institute of Spices Research (IISR) Kozhikode on 17.11.2021.

### Training Attended

- Dr. Divya P.S., Dr. Aarthi S, Dr. Honnappa Asangi and Mr. Gobu. R attended training on Plant Genetic Resources Management and Utilization on 19 July to 01 Aug, 2021 conducted by ICAR-NBPGR, New Delhi.
- Dr. E. Jayashree attended training programme on leadership and organization developed for women scientist technologists from 25 to 29, October 2021 Sponsored by the DST, Centre for Organization Development, Beside: Hyderabad House, Madhapur, Hyderabad-500 081.
- Dr. D. Prasath attended DST sponsored online Training Programme on “Managing Technology Value Chains” on 25 -29 October 2021 conducted by Administrative Staff Collage of India (ASCI) Hyderabad.
- Dr. C.M. Senthil Kumar and Dr. A. Jeevalatha attended training on “Transcriptome data analysis” organized by ICAR-IASRI, New Delhi during 28th-30th, September, 2021.
- Dr. A. Jeevalatha attended training on “Protein structure prediction and dynamics” organized by ICAR-IASRI, New Delhi during 27th-29th, Oct, 2021.
- Dr. Akshitha H J attended national Training Programme on “Conservation, management and utilization of Horticultural Genetic resources for livelihood and nutritional security (Virtual mode) conducted by ICAR-IIHR, Bengaluru, 22.11.2021 to 26.11.2021.

- Ms.O. Shajina attended national training programme on Appropriate sampling techniques from 02 to 07 August, 2021 conducted by IARI, New Delhi.
- Mr. C.M. Nikhil and Mr. P. B. Ranjith attended national training programme on Good Agricultural Practice's (GAPs) for Higher Productivity, profitability and resources use 02-16 August 2021 conducted by IARI, New Delhi.
- Mr. Jayaprakash P T attended national training programme on Government e-Marketplace (GeM) training Program cum Interactive session (virtual) on 27th Aug, 2021 conducted by ICAR-IASRI, New Delhi.
- Mr. O.G. Sivadas attended 3 days Online Workshop on "MS-Word (MS-W-08) from 20 to 22 October 2021 conducted by ISTM, New Delhi.
- Dr. Priya George attended national training programme on Experimental data analysis from 20 to 29 October 2021 conducted by ICAR-IASRI, New Delhi.
- Mr. Jayarajan K attended Online Training Programme on Statistical Techniques for Data Analysis in Agriculture from 4 to 13 October 2021 conducted by IASRI, New Delhi
- Mr. Jayarajan K attended Training Programme on E-Governance Application in ICAR for Technical Staff from 6 to 10 September 2021 conducted by IASRI, New Delhi
- Mr. Jayarajan K attended 3 Days Course on ArcGIS Pro: Essential Workflows from 7 to 9 July 2021 conducted by IISR, Kozhikode
- Mr. Jayarajan K attended One Day Generic Online Training In Cyber Security For Central Government Ministries /Department on 29th April 2021 conducted by Ministry of Electronics & Information Technology, Govt. of India
- Mr. Jayarajan K attended Workshop on E-Office from 25 to 26 February 2021 conducted by ISTM, New Delhi
- Ms. Prasanna Kumari attended Training Programme on Motivation, Positive Thinking and Communication Skills for Technical officers (T-5 and above) (Online Mode) from 25 to 30 November 2021 conducted by ICAR-NAARM, Hyderabad
- Mr. R. Bharathan attended Training Programme on Handling Parliamentary Matters from 28 to 29 January 2021 conducted by ISTM, New Delhi
- Ms. M. Seema attended Training Programme on Public Procurement through GeM Portal from 5 to 6, August 2021 conducted by National Productivity Council, New Delhi.
- Mr. P. Sundaran attended Training Programme on Online Training Programme on Assets Management from 06 to 08, October 2021 conducted by IARI, New Delhi.
- Mrs. N. Rebeena attended Training Programme on Online training Programme on Accrual Accounting from 22 to 26 November 2021 conducted by ICAR-NRRI, Cuttack.
- Mr.V.C. Sunil attended Training Programme on Administrative Vigilance: Role of IO/PO from 11 to 15, January 2021 conducted by ISTM, New Delhi.

### Extension activities

- Dr. Sharon organized webinar for farmers (in Hindi) on 'HaldikiNavinUtpadanProydhiki' on 29 November 2021 in which about 50 farmers participated.

# SPICES NEWS



हर कदम, हर डगर

किसानों का हमसफर

भारतीय कृषि अनुसंधान परिषद

*Agri search with a human touch*



## SPICES NEWS

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