



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

RESEARCH UPDATE

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Small cardamom breeding trial

23 inter-varietal F1 hybrids were evaluated for morphological and yield characters. Among the hybrids, Green Gold x Appangala 1 recorded highest plant height (260.33 cm), whereas the hybrid PV 2 x IISR Vijetha registered more number of tillers (25.53), leaves (285.53) and capsules with fresh and dry weight. Leaf blight and rhizome rot disease incidence ranged between 13.33–40.00% and 13.33–33.33%, respectively in these hybrids. Out of the 23 hybrids screened against leaf blight for a period of eight months, 11 hybrids (Mudigere 1 x IISR Avinash, Mudigere 1 x IISR Vijetha, Mudigere 1 x Appangala 1, Mudigere 2 x Appangala 1, ICRI 5 x IISR Avinash, PV 2 x IISR Avinash, PV 2 x IISR Vijetha, PV 2 x Appangala 1, GG x Appangala 1 and GG x MB 5) were found to be resistant to the disease.

Portable Black Pepper

Generally black pepper vine is trailed on live or dead standards. A stationary vine lacks horizontal mobility. This is a limitation one face during exhibitions and outreach programmes. A portable vine is the answer to this issue and is a novelty. Portable black pepper can be raised in big containers with PVC pipe or Bamboo as standards compacted with coir rope. Portable vine can be easily shifted from one place to another. It serves a purpose of display and adds aesthetic values in exhibitions and best suited for urban horticulture. Orthotropic shoots are the ideal material to raise portable vines as it will have a uniform canopy from the base to the top.

RAC team with portable black pepper



Identification of bioactive compounds from *Streptomyces* sp.

A total of 58 bioactive compounds were identified from ethyl acetate and butanol extracts of IISRBPAc1 and IISRBPAc25, the potential *Streptomyces* strains isolated from black pepper rhizosphere. The compounds were identified based on molecular mass, retention time and peak area percentage. The major antibiotics identified are Brefeldin A, Dermadin, Fusaric Acid, Salfredin B11, Brevianamide F, Enniatin B, Harzianopyridone 1, Harzianopyridone 2, Isonitrinic acid E, Natamycin, Trichodermin and Zeanol. Brefeldin A is an antiviral antibiotic. Harzianopyridone 1 is an antifungal metabolite reported to be produced by *Trichoderma harzianum*.

PERSONALIA

Awards/ Honours/ Recognitions

Aiswariya K K

Expert, Interview for recruiting Block Technology Managers in ATMA, Kozhikode, 02 June 2017.

Alagu Palamuthir Solai M

Evaluator, M.Sc. (Crop Physiology) Thesis, TNAU, Coimbatore. Training Coordinator, 'Horticulture based industries' placement of final year students of College of Horticulture, Mudigere from 22 May to 17 June 2017.

Ankegowda S J

Chaired session on coffee and black pepper in National Conference on Horticultural Crops of Humid Tropics-Diversification for Sustainability, Madikeri, 20-21 May 2017.

Member, Accreditation Committee of Spices Nursery in Karnataka by Directorate of Spices and Arecanut Development, Kozhikode.

Manoj P S

Expert, Evaluation of SHM projects, PAO Office, Kozhikode, 22 May 2017.6

Ratha Krishnan P

Expert, Policy Workshop on Urban Forestry, FC&RI, Mettupalayam, 28 April 2017.

Suseela Bhai R

External Examiner, Ph.D. Thesis Viva, MG University, Kottayam, 16 June 2017.

Reviewer, Scientia Horticulturae (Elsevier).

Participation in Symposia/Seminars/ Workshops/Conferences/Meetings

Aiswarya K K & Manoj P S

Students-Scientist interaction meet, Planetarium, Kozhikode, 08 May 2017.

All Scientists

First Dr. Y. R. Sarma Memorial Lecture, ICAR-IISR, Kozhikode, 28 June 2017.

Ankegowda S J

National Conference on Horticultural Crops of Humid Tropics - Diversification for Sustainability, CHES ICAR-IIHR, Bengaluru, 20-21 May 2017.

Jayashree E

Interaction meeting as part of WTO- The Standards and Trade Development Facility, on Capacity Building in Sanitary and Phytosanitary (SPS) measures in nutmeg and mace, Spices Board, Kochi, 01 June 2017.

John Zachariah T

ICAR Review Committee, NIAP, New Delhi, 20 April 2017.

Debriefing of different Codex Committee meeting, FSSAI, New Delhi, 24 May 2017.

Nirmal Babu K

Viva-voce exam of Ms. Anu Cyriac, Ph.D. Student, Mangalore, 04 April 2017.

IRC Plenary Session, Kasaragod, 07 April 2017.

Meeting of all the stakeholders involved in spices research development, value addition and trade, New Delhi, 13 April 2017.

Viva-voce of Ms. Surabhi, Ph.D. Student, Mangalore, 16-17 April 2017.

RAC Meeting, ICAR-IISR, Kozhikode, 19-20 May 2017.

Parliamentary Standing Committee Meeting on Commerce, New Delhi, 25 May 2017.

23rd meeting of the ICAR Regional Committee -Zone III, Imphal, Manipur, 30-31 May 2017.

Project Validation Workshop under WTO, New Delhi, 08 June 2017.

25th Meeting of Central Sub-committee on Crop Standards, Notification and Release of Varieties for Horticultural Crops, Udaipur, 30 June- 01 July 2017.

Nirmal Babu K & John Zachariah T

ICAR-CIFT Diamond Jubilee Foundation Day Celebration, Kochi, 29 April 2017.

Nirmal Babu K & Kandiannan K

National Conference on Technological Changes and Innovations in Agriculture for Enhancing Farmers Income, JAU, Junagadh, Gujarat, 28-31 May 2017.

Nirmal Babu K & Prasannakumari N

59th Half yearly meeting of TOLIC, IIM, Kunnammangalam, 28 June 2017.

Nirmal Babu K & Sasikumar B

Parliamentary Standing Committee Meeting, Appangala, 27-28 April 2017

Pradeep B

Awareness Programme on Government Schemes for Benefit of Coconut Farmers, Chelannur Service Cooperative Bank, 28 April 2017.

Prasannakumari N

TOLIC Sub Committee Meeting, SBI, Kozhikode, 24 May 2017.

Praveena R

Scientist-Farmers Interface Meeting, Naduvannur, 25 April 2017.

Monthly ATMA Meeting, ICAR-IISR, Kozhikode, 25 May 2017.

Ratha Krishnan P

Annual Workshop of KVKS- Zone VIII, ICAR-CCARI, Goa, 04-06 May 2017.

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Sasikumar B

NIRMAN 2016 Meeting, RSC, Kozhikode, 19 April 2017.

Meeting on Doubling Farmer's Income, Secretariat Annex-II, Thiruvananthapuram, 21 April 2017.

Annual General Body Meeting, Harithamitram Karshakasamithi, Thamarassery, 23 May 2017.

SHM Review Meeting, Secretariat Annexe-II, Thiruvananthapuram, 21 June 2017.

TRAINING ATTENDED

Hareesh B T & Rasmish A R

Training on Good agricultural practices, NIPHM, Hyderabad, 24-28 April 2017.

Pradeep B

Training on Aquaponics, KAU, Vellanikkara, 13-15 June 2017.

RADIO TALK

Deepthi A

Mango products, AIR, Kozhikode, 14 April 2017.

EXTENSION ACTIVITIES

Biju C N

Visited The Seed Garden Complex, Munderi, Malappuram (30 May 2017) to ascertain the health status of black pepper in nurseries and to provide technical advice.

Suseela Bhai R

Demonstrations on bacterial wilt management was taken up in two fields in Wayanad and one at Karnataka.

NEWS AND EVENTS

In-plant Training Programme

An in-plant training programme for Agricultural Engineering students was conducted in two batches from 11- 20 April 2017 and 22 April to 2 May 2017 at ICAR-IISR Experimental Farm, Peruvannamuzhi. 24 B.Tech. (Agrl. Eng.) students from Kelappaji College of Agrl. Engg. & Technology, KAU, Tavanur participated in the programme. Dr. E. Jayashree, Principal. Scientist acted as the Convener for the programme.



Participants of the In-plant training programme

Summer Internship Programme

A one month summer Internship programme on Biochemistry, Biotechnology and Microbiology was held at ICAR-IISR for college students from 8 May to 6 June 2017. Ten students representing various colleges across the country participated in the month long programme. The programme was inaugurated by Dr. K. Nirmal Babu, Director of the Institute. Various lectures covering basic and applied aspects in the disciplines

of Biochemistry, Biotechnology and Microbiology were covered by different scientists. A special lecture was given by Dr. Murali Gopal, Principal Scientist, ICAR-CPCRI, Kasaragod. The training included 58 sessions (28 theory sessions and 30 Practical sessions). The students were given hands on training in all practical sessions. As a part of the training programme, a practical manual and an e-manual were prepared and distributed to students. Dr. C. M. Senthil Kumar, Dr. M.S. Shivakumar and Ms. R. Sivaranjani coordinated the course.



Participants of the internship programme

Swachhta Pakhwara – 2017

At ICAR-IISR headquarters, the cleanliness fortnight celebration (16-31 May 2017) was inaugurated by Dr. K. Nirmal Babu, Director during which, the Swachhta pledge was administered to all the staff members. Dr. C.K. Thankamani, Nodal Officer, briefed about the programmes. At ICAR-IISR Experimental Farm, ICAR-Krishi Vigyan Kendra, Peruvannamuzhi and ICAR-IISR Regional Station, Appangala respective heads administered Swachhta pledge to the staff.

On the occasion of Swachhta fortnight, International Day for Biological Diversity was also observed. Dr. B. Sasikumar, Principal Scientist and Head, Division of Crop Improvement and Biotechnology, ICAR-IISR, Kozhikode delivered a talk on the importance of biodiversity and its conservation. Mr. K. P. Velayudan, District Coordinator (Kozhikode), Suchitwa Mission, Kerala, briefed the initiatives undertaken by Government of Kerala through Suchitwa Mission.

In order to spread the message of clean and green environment, programmes including planting of bush pepper of released varieties in black pepper (ICAR-IISR, Kozhikode) and saplings of citrus, mango and ramphal in a participatory mode with the villagers at Appangala (ICAR-IISR Regional Station, Appangala) were organized. An awareness session on vermicomposting and waste recycling was also organized during the occasion.

A contingent of volunteers of the institute undertook a cleanliness programme at Government Mental Health Centre, Kuthiravattam by cleaning the banana plot established previous year as a part of Swachhta drive during which, the plants were provided with organic manures and fertilizers besides foliar nutrition.

Literary competition in Kannada and English on "Rights and responsibilities of countrymen towards clean India" were conducted as a drive towards creating awareness. Various housekeeping activities were organized to maintain cleanliness in the office buildings, rooms, laboratories, canteen, campus, planting material production units and residential area in which all the staff members actively participated. Emphasis

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was also given for speedy disposal and weeding out of files and monitoring punctuality of staff by heads of various divisions/ sections/units.

The day-to-day activities undertaken under the cleanliness drive were also posted at institute website.



Glimpses of Swachhta activities at ICAR-IISR, Kozhikode

World Environment Day celebrations

ICAR-IISR observed June 5 as World Environment Day with a slew of activities. To reaffirm our commitment towards protecting the deteriorating environment, the staff members availed public transport to commute to and from the office. The staff members planted saplings of tree spices adding to the campus greenery. The day long activities concluded with a motivational speech by Fr. Bobby Jose Kattikad. Shri

K.C. George the farmer behind developing 'Agali pepper' was honoured on the occasion. Shri. K.F. George, Asst. Editor, Malayala Manorama also spoke during the occasion. At KVK, Peruvannamuzhi, Mr.Girish, Deputy Range Officer, Forest Department, Peruvannamuzhi, Ms. Sisily, Ward Member, Chakittapara Panchayat were the guest in which staff of KVK and ICAR-IISR farm participated the programme. Cleaning of KVK road side and planting of crotons in KVK avenues were carried.



Glimpses of World Environment Day celebration

Inauguration of Krishidhan Nursery at ICAR-IISR campus on World Environment Day, June 5, 2017.

The nursery established under the ITM-BPD Unit of IISR is an initiative to supply good quality certified planting materials of



spices, horticultural, plantation and ornamental crops. The unit caters to the need of plant lovers in Kozhikode as well as from other states by providing good quality planting materials at a reasonable cost. The unit has sold planting materials worth more than Rs. 5.0 lakhs since its inception.



Director, Dr. Nirmal Babu with Dr. C.K. Thankamani, Dr. B Sasikumar, Mr. K. V. Pillai during the inauguration of Krishidhan Nursery and a view of the nursery



International Yoga Day

Third International Yoga Day was observed on 21st June 2017 at ICAR-IISR, Headquarters Kozhikode, ICAR-IISR Regional Station, Appangala, Kodagu, Karnataka, ICAR-IISR Experimental Farm and Krishi Vigyan Kendra, Peruvannamuzhi

along with all the staff members.

The Yoga day celebrations at ICAR-IISR headquarters started with a formal programme including welcome address by Dr. R. Praveena and address by Dr. K. Nirmal Babu, Director, ICAR-IISR, which was followed by a lecture on Yoga by Mrs. Meena,

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K. Menon from Vyathi Vikas Kendra. She explained the effect of Yoga on health, improvement in the relationship between people, reduction in stress and anxiety etc. In continuation, Mrs. Meena K. Menon, Mr. Liyas P.N and Mr. Sajith from Vyathi Vikas Kendra conducted a practical session on several yoga techniques.

At ICAR-IISR Regional Station the session started with the welcome address by Dr. Mohammed Faisal Peeran, Scientist followed by a practical session. Suryanamaskara was performed by all the staff members, followed by Bhastrika Pranayam (Bellows Breath), Kapalbhatai Pranayam (Shining Forehead Breath), Anulom Vilom Pranayam (Alternate Nostril Breath), Bhramari Pranayama (Bee Breath) and Laughter yoga (Hasyayoga). Following this certain asanas were also practiced such as Baddha Konasana, Uttana Padasana and Setu Bandhasana.

At ICAR-IISR Experimental Farm and Krishi Vigyan Kendra, Peruvannamuzhi the celebrations started with a lecture by Shri. Saseendran, Sahaja Yoga, Kozhikode on Yoga and spiritual farming. Dr. P.S. Manoj, Subject matter Specialist and Mr. Balakrishnan gave a talk on Yoga awareness and importance of Indoor gardening followed by a practice session conducted by Shri. Prajeesh, Sahaja Yoga Centre, Kozhikode.



Preliminary meeting for the Development of SAP in Spices

The preliminary meeting for the development of Sustainable Agricultural Practices (SAP) for Spices was held on 14th June 2017 at ICAR-IISR, Kozhikode under the Chairmanship of Dr. K. Nirmal Babu, Director, ICAR-IISR, Kozhikode. The Chairman in his introductory remarks stressed on key issues ailing the present spice industry in the country and reiterated the immediate need to produce clean spices at low cost, which would ensure competitive price, enhance market demand and simultaneously create exportable surplus. Dr. Gopal Lal, Director, ICAR-NRCSS, Ajmer also reiterated the immediate and urgent need to formulate SAPs on these spice crops and requested the scientists concerned to expedite the issue and formulate a robust and sustainable package for each crop. The Preliminary draft of SAP on spice crops like turmeric, coriander, cumin and chilli was prepared.



Meeting for the development of SAP for Spices

First Dr. Y. R. Sarma Memorial Lecture delivered

Dr. Y. R. Sarma, noted plant pathologist and former Director of Indian Institute of Spices Research, Kozhikode, was remembered in a public function organized on 28 June, 2017 at ICAR-IISR. Inaugurating the memorial lecture series Dr. K. Mohammed Basheer, Hon. Vice Chancellor, University of Calicut called upon the scientific fraternity and students to emulate

Dr. Sarma in undertaking pioneering research to address the burning problems of farmers. Dr. Dileep Kumar B.S., Sr. Principal Scientist & Head, Agro-Processing and Technology Division of CSIR-NIIST, Thiruvananthapuram delivered the first memorial lecture on the topic "Plant Growth Promoting Rhizobacteria". Dr. K. Nirmal Babu, Dr. P.N. Ravindran, Dr. N. Ramachandran, Mr. E. Radhakrishnan, Mr. Ahamedkutty P.K. Ms. Aruna Sreenivas and Dr. Santhosh J. Eapen also spoke on the occasion. Around one hundred participants comprising of scientists, students and farmer representatives took part in the meeting.



Inauguration of Dr. Y. R. Sarma memorial lecture by delegates

Research Advisory Committee meeting

The first meeting of the VIII RAC was held on 19-20 May 2017 at ICAR-IISR, Kozhikode. Prof. M.C. Varshneya, Vice Chancellor, Kamdhenu University, Gandhinagar, Gujarat, was nominated by ICAR, New Delhi as the Chairman of VIII RAC of ICAR-IISR. As Prof. Varshneya could not attend the meeting due to certain unavoidable personal problems, the meeting was held under the Chairmanship of Dr. R.N Pal (Former DDG (Hort), ICAR, New Delhi and Member, RAC) with the permission from ICAR. The other honourable members of the RAC were: Dr. V.S. Korikanthimath, Former Director, ICAR-CCARI, Goa; Dr. Srikant Kulkarni, Former Head-Plant Pathology, UAS, Dharwad, Dr. Suresh Walia, Emeritus Scientist, Division of Agrochemicals, ICAR-Indian Agricultural Research Institute, New Delhi; Shri. T P. Suresh and Shri. K. K. Rajeevan (IMC members); Dr T Janakiram, ADG (HS-I) ICAR, Hqr, KAB II, New Delhi; Dr K Nirmal Babu, Director, ICAR-IISR, Kozhikode and Dr J. Rema, Member Secretary. During the inaugural session, Dr. R.N. Pal, launched a mobile app on black pepper. The Research Highlights of the institute for 2016-17, was released by Dr. T. Janakiram, ADG (HS-II), ICAR.



First meeting of VIII RAC at ICAR-IISR



Releasing research Highlights -2016-17 of the institute

Institute Research Committee meeting

The Institute Research Council (IRC) meeting of ICAR-IISR was held during 22-24 & 27 June 2017. Dr. K. Nirmal Babu, Director of the institute chaired the overall review meeting. The session on Crop Improvement and Biotechnology was chaired by Dr. B. Sasikumar, HD (Crop Improvement and Biotechnology). The session on Crop Production and Post-Harvest Technology was chaired by Dr. C.K. Thankamani, HD (i/c) (Crop Production & PHT) and the session on Crop Protection was chaired by

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Dr. Santhosh J. Eapen, HD (Crop Protection). The session on Social Sciences was chaired by Dr. B. Sasikumar, HD i/c (Social Sciences). During these four days, the progress made in each of the projects was presented and discussed critically and appropriate suggestions were made for the improvement of the projects.

Study Visit of the Parliamentary Standing Committee on Agriculture to ICAR-IISR Regional Station Appangala



The Parliamentary Standing Committee on Agriculture on a study visit to Coorg (Kodagu), visited IISR Regional Station at Appangala, Madikeri on 28 April 2017. Shri. Hukamdeo Narayan Yadav, Chairman of the Standing Committee was accompanied by members from Rajya Sabha and Lok Sabha. The Committee was escorted by senior officials from the Parliament Secretariat, ICAR and IIHR. The list of Committee members that visited Regional Station Appangala are given below:

Chairman

1. Shri. Hukamdeo Narayan Yadav MP (LS)

Members

1. Shri. Mohd. Ali Khan MP (RS)
2. Shri. Nalin Kumar Kateel MP (LS)
3. Shri. Meghraj Jain MP (RS)
3. Shri. Badaruddoza Khan MP (LS)
5. Shri. Vegad Shankarbhai N. MP (RS)
6. Dr. Tapas Mandal MP (LS)

At Appangala, the Chairman and members were received by Director and staff of the Institute. Dr. T. Janakiram, ADG (Hort.) welcomed the dignitaries in the official meeting that ensued. Dr. K. Nirmal Babu, Director, ICAR-IISR made a detailed presentation on the programmes and progress of the ongoing research activities carried out by the Institute. Shri. Hukamdeo Narayan Yadav, Chairman of the Standing Committee and members evinced keen interest in the programmes of ICAR-IISR. The Committee appreciated and congratulated the Institute for its excellent research work in the field of spices. An exhibition depicting the achievements and success stories of technologies developed by the Institute and a field visit were organized for the delegates.

News from Institute Technology Management Unit

ITM-BPD unit undertook large scale planting of ginger in growbags for generating planting material for supply to licencees and farmers. About 1300 grow bags of ginger variety IISR Varada was planted in the Institute campus. The unit has also planted IISR Prathibha and IISR Pragathi at Experimental Farm, Peruvannamuzhi for planting material production and sale through Krishidhan Nursery.

News from Human Resource Development

Review meeting for the Ph.D. scholars of the Institute was held on 05 April 2017. Also, interview for the selection of Ph.D. aspirants was conducted on 15 June 2017 and a candidate was selected for pursuing Ph.D. in Botany.

HINDI NEWS

Hindi Workshop

A Hindi workshop was organized at ICAR-IISR, Kozhikode, to popularize official language on 14 June 2017. Dr. V. Balakrishnan, Deputy Director (Impl.) delivered a lecture on Hindi Noting and Drafting.

OLIC meeting

The Official Language Implementation Committee meeting was held at Director's chamber on 29 June 2017.

Publication

Hindi version of Organic Spices Production was published during this quarter.

Transfer of Technology

Technology inputs and Advisory services from ATIC

A total of 723 farmers availed advisory services from ATIC. Two hundred and fifty three students from various institutions visited on study tour. A total revenue of Rs.12,51,950 was generated through the sale of technology inputs like planting material. Micronutrient mixtures, Bio control agents etc.

Under Tribal sub plan project a portable pump set was given to Madomkundu Tribal Hamlet, Wayanad district, Kerala for irrigation of Paddy cultivated under SRI method and vegetable gardens. Demonstration of improved varieties of black pepper was also initiated by distributing 300 single noded cuttings of varieties released from the institute in two hamlets, Madomkundu and Kuzhimukku.

Four on campus training programmes (one sponsored by KVK on 20 April and three sponsored by ATMA during July) were attended by 71 farmers. Three Monthly technology Advisory Services were organized in which Block Development Managers and Pest scouts attended.

Activities of ITM-BPD Unit

Technology commercialization

A non exclusive license to M/s Raja G Enterprises, Salem for commercial production of Cardamom micronutrient mixture has been granted. The firm will be catering to planters and farmers in Karnataka as well as Kerala



Handing over of non-exclusive license agreement for cardamom micronutrient mixture.

Success story

A success story of allspice from Muttill, Wayanad.

Mr. Jayanthan a young Farmer earns about Rs.3-4 lakhs per annum by growing allspice. Having inherited about 15 acres ancestral farm land with black pepper, coffee, arecanut etc. It was an advertisement about the scope of allspice that changed his mindset! Lured by the prospects of this introduced spice, he obtained about 200g ripe seed berries from the Mangalam Carp Estate, Wayanad for Rs.1000/- and raised the seedlings. The selected seedlings were planted as an intercrop among the existing crops. These seedlings have grown into trees (~100) of 6-10 meter height and are in thick, profuse bearing for several years now. Some of the trees yield up to 30 kg. The dried berries are sold locally @ Rs.800-1200 per kg.



The Wayanad Social Service Society (WSS) and the local spices traders are the ones who source the produce from Mr. Jayanthan. Traders from Erattupetta, Kottayam also buy *pimento* from farmers. The produce is sent to the North Indian market by the local traders or even to outside the country for end products manufacturing.

Buoyed by the success of Mr. Jayanthan, some other farmers from places like Ambalavayal, Mananthody, Meppadi, Vythiri, Pulppally etc., all in Wayanad, have also now taken up allspice cultivation.



KRISHI VIGYAN KENDRA

Front Line Demonstration

KVK has initiated two new FLDs during the period. One is on the "Introduction of a HYV of turmeric *viz.*, IISR Pragati and another is on "Demonstration on production of healthy ginger seed". The following other FLDs continued during this period.

- ▶ Demonstration on integrated management of Tanjore wilt of coconut (continuing): 15nos.
- ▶ Performance evaluation of rooted top shoots of high yielding varieties of Black pepper: 10 nos.
- ▶ Demonstration of Java long pepper (*Piper chaba*) as a mixed crop in arecanut/coconut gardens: 10 nos.
- ▶ Culture of fishes using formulated feed: 8 nos.
- ▶ Demonstration of soil application of banana micro-nutrient mixture *viz.*, AYAR in nendran banana for higher yield: 15 nos.



Harvesting fish in FLD Plot

On Farm Testing

The following OFTs continued during the period.

- ▶ Performance evaluation of grafted pepper (Continuing) - Third year.
- ▶ Assessment of comparative performance of tissue culture plants and suckers of Nendran banana under High Density Planting.
- ▶ Assessment of organic management practices against Sigatoka leaf spot in banana.
- ▶ Scientific farming of milkfish (*Chanos chanos*) in brackish water ponds.

- ▶ Evaluation of different techniques for the Production of Dehydrated banana.

Training Programmes

A total of 14 training programmes were organized for farmers and rural youth including women. 339 persons attended these programmes. A three day paid training on plant propagation techniques, two days vocational training on Ornamental fish farming for school students, Integrated Pest Disease and Nutrient Management in Scientific Coconut Cultivation, Poultry farming, Mechanized coconut climbing were the other important training programmes organized by KVK during the period.

Besides, a series of training programmes were conducted exclusively on jack fruit processing, in different parts of the district, considering the need of the hour. A total of nine training programmes were organized by Ms. A. Deepthi, SMS (Home Science) during the period, which were benefitted by 369 farmers.

PUBLICATIONS

Research papers

Bhat A I, Martin A, John A, Isaac N & Eapen SJ 2017 Indian Plant Virus Database - a platform for showcasing research on plant viruses in India. *Current Science* 113: 27-29.

Deeshma K P & Bhat A I 2017 Occurrence of endogenous Piper yellow mottle virus in black pepper. *Virus Disease* 28:213-217.

Saranya B, Sulfikarali T, Chindhu S, Muneeb A M, Leela N K & Zachariah T J 2017 Turmeric and cinnamon dominate in antioxidant potential among four major spices. *Journal of Spices and Aromatic Crops* 26(1):27-32.

Sasikumar B, Rema J & Saji K V 2017A note on a seed sterile nutmeg from the secondary centre of origin. *Journal of Spices and Aromatic Crops* 26:44-46.

Sruthi D & John Zachariah T 2017 In vitro antioxidant activity and cytotoxicity of sequential extracts from selected black pepper (*Piper nigrum L.*) varieties and *Piper* species. *International Food Research Journal* 24(1):75-85.

Book chapters

Ankegowda S J, Venugopal M N, Srinivasan V, Kandiannan K, Krishnamurthy K S & Biju C N 2017 Advances in production technology in Black Pepper. In: Doreyappa Gowda I N, Sankar V, Senthil Kumar R, Karunakaran G & Mahendran B (Eds.), *Souvenir and Abstracts, National conference on Horticultural crops of humid tropics - diversification for sustainability*, 20-21 May 2017 held at Madikeri, Kodagu, Karnataka, pp.113-117.

Kandiannan K, Muhammed Nissar V A, Sharon A & Nirmal Babu K 2017 Spices an option for enhancing the farmers income. In: Singh H P, Pathak A R, Tyagi R K, Sumangala H P, Sherry R Jacob & Rajeev K Singh (Eds.), *Shodh Chintan: Technological changes and innovations in agriculture in enhancing farmer's income*, ASM Foundation, New Delhi, Vol. 9: 356p.

Nirmal Babu K, Saji K V, Rema J & Ankegowda S J 2017 Genetic wealth of tree spices of humid tropics. In: Doreyappa Gowda I N, Sankar V, Senthil Kumar R, Karunakaran G & Mahendran B (Eds.), *Souvenir and Abstracts, National conference on Horticultural crops of humid tropics - diversification for sustainability*, 20-21 May 2017 held at Madikeri, Kodagu, Karnataka, pp. 100-104.

Srinivasan V, Dinesh R, Ankegowda S J & Hamza S 2017 Integrated nutrient management in Black pepper. In: Doreyappa Gowda I N, Sankar V, Senthil Kumar R, Karunakaran G & Mahendran B (Eds.), *Souvenir and Abstracts, National conference on Horticultural crops of humid tropics - diversification for sustainability*, 20-21 May 2017 held at Madikeri, Kodagu, Karnataka, pp. 110-112.

Popular articles

Ankegowda S J, Sharon Aravind & Alagupalamuthirsolai M 2017 Triumph of small cardamom growers in Idukki. *Spice India* 30(4): 33-34.

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Deepthi A 2017 Mayam kalaratha sourabhyavum sugandhavum. Kerala Karshakan (Malayalam) 62(9):56.

Praveena R & Suseela Bhai R 2017 Kurumulaku thottam chittayode. Kerala Karshakan (Malayalam) 62(10):56.

Rajeev P, Kandiannan K, Srinivasan V, Biju C N & Vijeeshna V 2017 How to tap black pepper potential of Arunachal Pradesh. Spice India 30(4): 17-19.

Rajeev P, Srinivasan V, Kandiannan K, Biju C N & Vijeeshna V 2017 Arunachal Pradeshil kurumulaku krishi vyapippikkuvan sadhayathakal ottere. Spice India (Malayalam) 30(4): 28-29.

Sasikumar B & Lijo Thomas 2017. A royal decree against black pepper that came a cropper. Spice India 30(4):12-16.

Sasikumar B & Lijo Thomas 2017 History reveals that there

was a ban for black pepper!. Kerala Karshakan (Malayalam) 62(10):54-55.

Sasikumar B, Muhammed Nissar V A, Sivaranjini R & Lijo Thomas 2017 Allspice peppered with success. Spice India 30(6):28-31.

Sharon D'Silva, Ankegowda S J & Biju C N 2017 Mealybug: A major pest in black pepper. Spice India 30(6): 21-23.

Sharon D'Silva, Ankegowda S J & Biju C N 2017 Meelimutta: Kurumulakine nashippikkunna shathrukeedam. Spice India (Malayalam) 30(6): 17-19.

Papers presented in symposia/ seminars/ workshops /conferences

During the period, 3 research papers were presented by the scientists of the institute in various national seminars/ symposia.

Ph.D. Awarded

Name	Title of thesis	University	Guide
Ms. Anu Cyriac	Development of microsatellite markers for small cardamom (<i>Elettaria cardamomum</i> Maton)	Mangalore University	Dr. K. Nirmal Babu
Ms. Suraby E. J.	Isolation and cloning of disease resistance gene candidates using degenerate primers from NBS region in black pepper and related <i>Piper</i> species	Mangalore University	Dr. K. Nirmal Babu

M.Sc. Dissertations

Student	Topic	University	Guide
Ms. Gopika A	Cloning and partial genome sequencing of <i>Banana bract mosaic virus</i> associated with chlorotic streak disease of cardamom	Kannur University	Dr. A. I. Bhat

New Appointment

Name	Post	Date of joining
Dr. P. Vadivukkarasi	Post Doctoral Fellow	02.06.2017



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