

From the Director's Desk



2015 has arrived in all its glory.

At the outset, I wish to convey my choicest wishes to all members and families of ICAR-IISR. May the New Year bring peace, happiness, joys of success and prosperity.

2014 has passed in a jiffy leaving a trail of fond memories. How time flies. Whoever said that time and tide waits for none is obviously more than correct. **You can use it wisely or waste it. The choice is yours but let us use it wisely.**

Looking back at the year 2014, we have performed well in terms of infrastructure, research, extension, commercialization and human resource development. No one expected that ginger and turmeric could be cultivated at our Chelavoor campus. But we proved our critics wrong and now expect a fairly good yield. Our column method of black pepper propagation and ginger multiplication using protrays have indeed been a revelation of sorts. While commercialization of our micronutrient mixtures is a given, the popularization of encapsulation and smart delivery of agriculturally important microorganisms has attracted big players who have expressed keen interest in licensing this technology.

The International Symposium on Plantation Crops (PLACROSYM XXI) hosted by ICAR-IISR in December 2014 was a great success and it was made all the more momentous with Prof. M.S. Swaminathan inaugurating the symposium. As the General Chairman of the Symposium and the President of Indian Society for Plantation Crops, I take this opportunity to thank everyone associated with the success of this international event.

In this year, with the Tribal Sub Plan, we expect to make critical forays into the tribal areas especially the North Eastern States. We have launched our network program on High Value Compounds and Organic Horticulture. All these are ambitious ventures that will supposedly make us more nimble, more surefooted, more alert to new opportunities and quicker to convert a prospect to invention and an invention to a commercializable product.



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As we look at the past, we have made impressive strides, thanks to the untiring efforts of our seniors. However, the show must go on. Therefore, we have no option but to improve on our performance and to grow continuously at unprecedented rates, not just nationally but also globally. While we have been receiving a host of accolades for our performance, let us be cautiously optimistic about the year ahead by ensuring optimal performance and create value for the farmers and prospective entrepreneurs. Let us endeavor to strengthen our commitment by helping farmers and end users to develop and achieve their full potential.

Finally, I would like to thank all the staff of ICAR-IISR for their contribution throughout the year 2014 and wish we still perform better in the year 2015. STAY BLESSED.

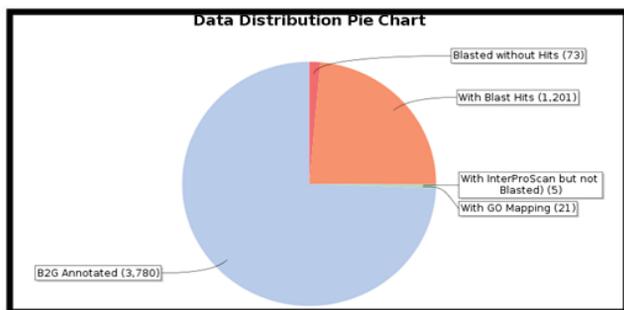


M Anandaraj

Research update

Whole genome sequencing of two *Ralstonia solanacearum* strains infecting ginger

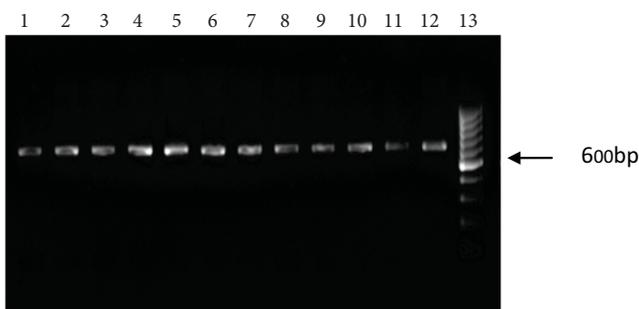
Whole genome of two strains of *Ralstonia solanacearum* (MEP and SIK) was Illumina sequenced and the data has been assembled using A5-miseq. Annotation of the assembled genome was carried out using Prokka (a software tool for the rapid annotation of prokaryotic genomes). Around 5120 coding sequences (CDS), 80 tRNA and 1 transfer-messenger RNA (tmRNA) were predicted for the MEP strain while for SIK strain, 5080 CDS, 63 tRNA and 1 tmRNA were predicted. The annotation was further refined using Blast2GO with 1.0E-3 as e-value cut off and 33 as HSP cut off length.



Blast2GO data distribution of *Ralstonia* genomes

Standardisation of barcoding loci *rbcl* and ITS for *Myristica* species

A protocol was developed to isolate high quality DNA from nutmeg mace. The PCR temperature profiles were optimized with annealing temperatures of 52.5°C and 56°C for *rbcl* and ITS loci respectively for *Myristica* species. The *rbcl* and ITS amplicons yielded products of 600 bp and 500 bp respectively.



Amplification of *rbcl* locus. Lanes 1-4 *Myristica fragrans*, lanes 4-8 *M. malabarica*, lane 9 *M. andamanica*, lane 10 *M. fatua*, lane 11 *M. beddomei* & lane 12 *M. amygdalina*.

Unique nutmeg germplasm accessions collected

Few unique nutmeg accessions were collected in a farmer participatory germplasm collection programme from the eastern highlands of Kozhikode District, Kerala. These include thick entire mace type (250 dry mace weigh 1 kg), bold nut type (60 dry nuts weigh 1 kg) and monoecious type (nutmeg is generally dioecious in nature).



Narrow leaved thick mace type tree with thick whole mace (inset).



Mr. Verghese, Kunnil with the bold nut type tree. (Inset) Bold nuts

On-site DUS testing of spices varieties

An expert committee was constituted by Protection of Plant Varieties and Farmer's Rights Authority (PPV & FRA), New Delhi for on-site DUS Testing of Spices varieties. Dr. V.A. Parthasarathy, Retd. Director, ICAR-IISR was the Chairman and Dr. M. Anandaraj, Director ICAR-IISR, Dr. Johnson George, K., Dr. D. Prasath, Dr. Utpala Parthasarathy of ICAR-IISR were members of the committee with Dr. Manoj Srivastava, Registrar, PPV & FR Authority, as Member Secretary. The committee visited farmers plots in Idukki and Palghat districts during October- December 2014, for evaluating farmers claims for registering their varieties under the authority. The





committee also visited Peruvannamuzhi (ICAR-IISR Kozhikode), Appangala and Madapura areas in Coorg District of Karnataka for evaluation of farmers/varieties of common knowledge in black pepper and small cardamom during the above period.

Field screening of NAGS accessions of cardamom for leaf blight and rhizome rot resistance

Field screening of 57 cardamom accessions for leaf blight and rhizome rot resistance yielded 3 resistant accessions to leaf blight (FGB 67, FGB 87, FGB 113) and one highly resistant accession to rhizome rot (FGB 118).

Occurrence of perfect stage of *C. gloeosporioides* infecting cardamom

Surveys carried out in cardamom plantations revealed manifestation of different kinds of foliar symptoms *viz.*, spot, blight and shredding. The cultures isolated from these symptomatic samples exhibited variations in colony morphology and colour (dull white, whitish grey and greyish white). The greyish white culture appeared puffy with a faster growth rate (14 mm/day) and produced dark brown-black, globose perithecia in culture. Microscopic examination of perithecia revealed the presence of cylindrical, unitunicate asci with hyaline, aseptate, cylindrical ascospores. In black pepper, perfect stage was induced artificially under *in vitro* condition by adopting mating test method.

Characterization of nutmeg *Phytophthora*

The colony morphology of *Phytophthora* isolates from nutmeg showed five different patterns *viz.*, chrysanthemum, floral, floral with cottony mycelia, stellate and stellate with cottony mycelia. Different types of sporangial morphology *viz.*, globose, ovoid- obpyriform, ovoid, obpyriform and elliptical were also observed. Genetic diversity studies indicated their similarity towards *P. colocasiae* and certain isolates to *P. meadii*. However *P. capsici* and *P. tropicalis* were also found among the isolates.

Cytotoxicity of sequential extracts of *Piper* species revealed

Chloroform extract of berries of *Piper* species *viz.*, *Piper nigrum*, *Piper chaba*, *Piper longum* and *Piper colubrinum*

and of six black pepper varieties (Sreekara, Subhakara, Malabar Excel, Panniyur-1, Panchami and Thevam) showed high cytotoxicity on CaSki cancer cell line. Cytotoxicity increased with increase in the amount of extract as well as time of exposure of extract to CaSki. Among chloroform extracts of black pepper varieties, Malabar Excel was more toxic to CaSki. This is the first report regarding variability in antioxidant activity and cytotoxicity among black pepper varieties and cytotoxicity of *P. colubrinum*.

Personalia

Deputation abroad

Dr M. Anandaraj, Director, ICAR-IISR who is the chairman of R & D committee of International Pepper Community was deputed to Ho Chi Minh City, Vietnam during 26-28 October 2014 to attend III R & D Committee meeting of International Pepper Community and 42nd Pepper Tech Meeting.

Awards

Distinguished Scientist Award

Dr M. Anandaraj, Director, ICAR-IISR and **Dr K. Nirmal Babu**, Project Coordinator, AICRP on Spices have bagged Distinguished Scientist Awards instituted by Dr C.S. Venkataraman Memorial Trust for their outstanding contribution in the field of Plantation Crops Research and Development. The award was conferred during the inaugural function of International Symposium on Plantation Crops (PLACROSYM XXI) held at Kozhikode on 10 December 2014.

Dr Muthuswami Anandaraj Award for best poster

The poster entitled 'Diversity and community analysis of nematodes associated with black pepper rhizosphere from Idukki District (Kerala), India' authored by **Pervez R, Eapen S J, Jacob T K, Hamza S & Srinivasan V** won the best poster award instituted by Dr Muthuswami Anandaraj in International Symposium on Plantation Crops (PLACROSYM XXI) held at Kozhikode during 10-12 December 2014.



PLACROSYM XXI Best Logo Award

Dr Santhosh J Eapen bagged the best logo award instituted by PLACROSYM XXI for the logo design.

ICAR-IISR bags second prize in the Swasraya Bharat Exhibition at Kasaragod

ICAR-Indian Institute of Spices Research won the second prize in the science and technology exhibition titled 'Swasraya Bharat-2014' held during 14-19 October 2014. The exhibition was organized by the Swadeshi Science Movement at College of Agriculture, Padannakkad, Kasaragod.



ICAR-IISR exhibition stall, which won the second prize in Swasraya Bharat-2014

Honours/ Recognitions

Anandaraj M

Kerala Agricultural University EC and GC member representing ICAR

Ishwara Bhat A

Member, Assessment Committee for considering promotion of Technical Personnel, ICAR-CPCRI, Kasaragod, 30 October 2014.

External Examiner, evaluation of PhD (Plant Pathology) thesis of UAS, Bengaluru and M.Sc (Biotechnology) thesis of KAU, Vellayani.

John Zachariah T

Chairman, Assessment Committee for promotion of category I and II technical personnel, ICAR-CPCRI, Kasaragod, 30 October 2014.

Chairman, Selection Committee for SRFs for ICAR Network project on high value compounds and phytochemicals, ICAR-IISR, Kozhikode, 16-20 December 2014.

Rajeev P

Chaired a session on Prospective development plan for

spices development in Spices seminar organized by Spices Board, Itanagar, Arunachal Pradesh, 25-26 October 2014.

Santhosh J Eapen

Member, Board of Studies (Zoology), St. Berchmans College, Changanacherry.

Suseela Bhai R

Nominated as member of the expert group for development of microbiological standards on spices, FSSAI, New Delhi.

News and events

ICAR-IISR hosts International Symposium on Plantation Crops

The International Symposium on Plantation Crops (PLACROSYM XXI) hosted by Indian Institute of Spices Research, Kozhikode, and organized by 12 research and development organizations dealing with plantation crops in the country was held during 10-12 December 2015 at Kozhikode. The symposium was inaugurated by Prof. M.S. Swaminathan, Emeritus Chairman, MSS Research Foundation, Chennai, and Dr. P. Rajendran, Vice Chancellor, Kerala Agricultural University presided over the function and Dr. N.K. Krishna Kumar, Deputy Director General (Hort. Science), ICAR, New Delhi delivered the keynote address. Dr. M. Anandaraj, Director, ICAR-Indian Institute of Spices Research, Kozhikode and President ISPC & General Chairman, PLACROSYM XXI welcomed the gathering while Dr. S. Devasahayam, General Convenor, proposed the vote of thanks.

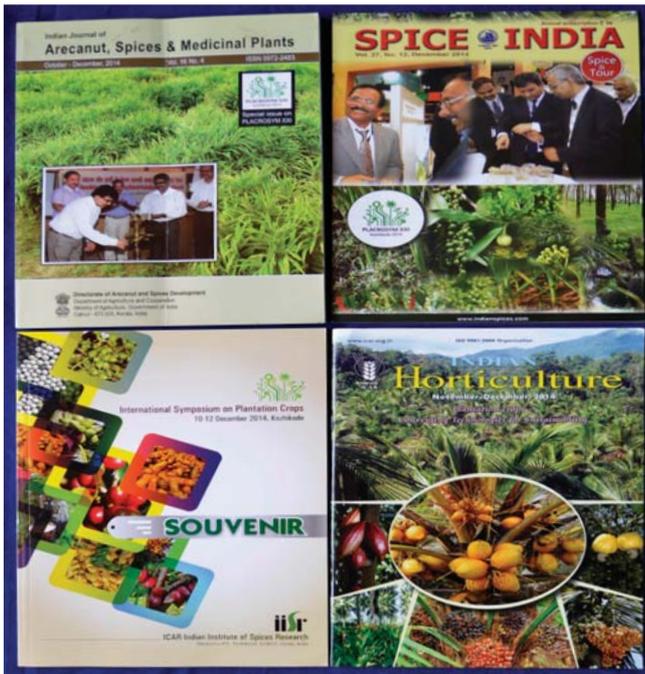


Prof. M.S. Swaminathan, Emeritus Chairman, MSSRF, Chennai lighting the inaugural lamp





Several publications *viz.*, special issues of Indian Horticulture, Spice India and Journal of Arecanut, Spices and Medicinal Plants and a book on 'Phytophthora Diseases of Plantation Crops' apart from Abstract of papers and Souvenir of PLACROSYM XXI were released to mark the occasion. Awards were presented to distinguished scientists and farmers which included the following. Distinguished Scientist Award from Dr. C. S. Venkataraman Memorial Trust to Dr. M. Anandaraj and Dr. K. Nirmal Babu; Best Research Paper Award of Journal of Plantation Crops to Dr. Molly Thomas et al.; Supari Federation Award for Best Scientist to Dr. Anita Karun and Dr. Gobinda Acharya; Supari Federation Award for Best Arecanut Farmer to Mr. B. A. Narayana and Mehta Foundation Award for Best Innovative Farmer to Mr. J. N. Jagath Bhusan. Eleven lead talks, 26 oral papers and 220 poster papers were presented in six technical sessions. The symposium was attended by over 350 delegates from abroad and India.



Publications released during PLACROSYM XXI

Swachh Bharat Abhiyan conducted at ICAR-IISR

As per ICAR directive, the Prime Minister's Swachh Bharat campaign was kicked off at ICAR-IISR head quarters by the Director Dr M. Anandaraj on 2 October 2014. The campaign started with entire staff taking Swachhata Shapath followed by a cleanliness drive. The entire staff participated in the campaign with all seriousness and sincerity. IISR premises was cleaned and the degradable and non-degradable wastes were separated. Office as

well as laboratories were also cleaned and all the very old and unserviceable items were disposed off. The Institute premises, laboratories and office are kept tidy and clean as usual. This is followed in IISR Experimental Farm and KVK, Peruvannamuzhi and IISR Regional Station, Appangala, Madikeri, Karnataka. IISR Recreation Club SARANI conducted drawing and elocution competitions for staff as a part of Swachh Bharat campaign.



Swachh Bharat campaign at Chelavoor campus

Cardamom Research Centre, Appangala elevated to Regional Station

In the XII Plan EFC of ICAR-IISR, the Cardamom Research Centre, Appangala, Kodagu, Karnataka is elevated into Regional Station.

Institute Research Committee Meeting

The midterm Institute Research Council meeting for the year 2014-15 was held during 11-12 November 2014. Dr. M. Anandaraj, the Director of the institute chaired the review meeting. He emphasized the importance of prioritization of research projects and output in terms of technologies. He flagged some of the issues where research intervention is required *viz.*, influence of weather parameters on sex expression in nutmeg, drought management using hormones, varietal degeneration in vegetatively propagated crops and organic carbon vs soil health. Dr. K. Nirmal Babu, Project Coordinator, AICRP on Spices stressed the need for sharing technology details and infrastructure facilities with AICRP centers. The session on Crop Improvement and Biotechnology and also on Social Sciences was chaired by Dr. B. Sasikumar, the session on Crop Production and Post Harvest Technology was chaired by Dr. T. John Zachariah and that of Crop Protection was chaired by Dr. S. Devasahayam. Midcourse corrections in technical programmes were made and constraints in executing the work elements were identi-



fied. During these two days, the progress made in each of the projects was presented and discussed.

News from Bioinformatics Centre

The major works undertaken by the Bioinformatics Centre during the period are (1) identification and characterization of miRNAs from *Piper colubrinum* through transcriptome analysis, (2) docking studies of a glucanase inhibitor from *Phytophthora capsici* and beta 1-3 glucanase from *Piper colubrinum*, (3) prediction of AMPs from *Zingiber officinale* and *Curcuma amada* and (4) comparative genomics of *Phytophthora capsici*. The Centre has also extended their expertise in analyzing NGS data from the following institutions: ICAR-Indian Institute of Horticulture Research, Bengaluru (*Ralstonia* genome); ICAR-Sugarcane Breeding Institute, Coimbatore (*Colletotrichum falcatum* transcriptome); ICAR-Central Institute of Fisheries Technology, Kochi (transcriptomes of marine bacteria). Besides NIT, Kozhikode and Calicut University also availed the facilities for various analysis.

News from Library

Three issues of the electronic version of 'AGRI titbits' were published. 42 CeRA requests were catered online. Subscription to Indian/foreign journals were renewed. 11 books and 6 Technical Reports were added to the library stock. 12 books were added to the greenstone database. Hands on sessions of effective use of library resources using EBSCO Discovery tool was held in the library on 14 November 2014 by Dr. Santhosh J Eapen. 17 external users and 750 internal users made use of the library facilities.

हिन्दी अनुभाग

राजभाषा कार्यान्वयन गतिविधिय

संस्थान की राजभाषा कार्यान्वयन समिति की बैठक डॉ. एम. आनन्दराज, निदेशक की अध्यक्षता में दिनांक 29 दिसम्बर 2014 को संपन्न हुई। जिसमें गत तिमाही में राजभाषा कार्यान्वयन की गतिविधियों पर चर्चा हुई। संस्थान में दिनांक 17 दिसम्बर 2014 को एक हिन्दी कार्यशाला आयोजित की गयी जिसमें श्री रशीद वी. वी., हिन्दी अध्यापक, केन्द्रीय विद्यालय - II, कोषिकोड ने हिन्दी व्याकरण विषय पर व्याख्यान दिया। इस कार्यशाला में कुल 26 अधिकारियों एवं कर्मचारियों ने भाग लिया। गत तिमाही में मसाला समाचार खण्ड 25 भाग (3) का प्रकाशन किया गया।

राजभाषा शील्ड पुरस्कार

नगर राजभाषा कार्यान्वयन समिति की 54 वीं अर्ध वार्षिक बैठक एवं पुरस्कार वितरण समारोह दिनांक 18 नवंबर 2014 को होटल मलबार पैलस, कोषिकोड में संस्थान को राजभाषा कार्यान्वयन के लिये राजभाषा शील्ड - 2014 पुरस्कार से सम्मानित किया गया। यह पुरस्कार डा. एम. आनन्दराज, निदेशक ने समारोह के मुख्य अतिथि श्री. हिमांशु कुमार राय, आई ए एस से ग्रहण किया। इस बैठक में निदेशक महोदय के अतिरिक्त डा. राशिद परवेज़, वरिष्ठ वैज्ञानिक, सुश्री. एन. प्रसन्नकुमारी, वरिष्ठ तकनीकी अधिकारी एवं श्री. ए. सुधाकरन, तकनीकी अधिकारी ने भाग लिया।



राजभाषा शील्ड - 2014 पुरस्कार प्राप्त करते डा. एम. आनन्दराज, निदेशक

Distinguished visitors

Dr P. Rethinam, Former ED, APCC, Jakarta, Indonesia on 5/11/2014

Dr P.L. Saroj, Director, Directorate of Cashew Research, Puttur, Karnataka on 5/11/2014

Dr S.D. Sawant, Director, NRC for Grapes, Pune, Maharashtra on 5/11/2014

Delegation from Ministry of Industries, Ethiopia led by Dr Afsede Assafa on 6/11/2014

Transfer of Technology

Technology inputs and Advisory services from ATIC

Four hundred and Seventy Two farmers (including 44 farmers from other states) availed advisory services of





ATIC during October-December. Apart from this 244 students from different schools and colleges were given orientation to spices research programmes. Seven farmer groups benefited from sponsored exposure visits to the institute. Nine one day training programmes (7 for farmer groups and 2 for students), one two days training programme (for technical officers) and three exposure visits for officers were also organized by ATIC. The total revenue generated from the sale of technology and information products was Rs. 2,34,460 for the period.

ICAR-IISR participated in Global Agro Meet at Angamaly, Kochi

IISR was one among the 50 selected organizations and firms which were invited to the exhibition during the Global Agro Meet- an International Conference and Exposition on Value Added Agriculture and Food Processing at Adlux International Convention centre Angamaly, Kochi, Kerala from 6th to 8th November 2014. Institute's participation in the event is expected to generate opportunities for new linkages with other firms both in public and private sector.

Field visit organized for ATMA personnel for technology showcasing

The institutional Monthly Technology Advisory (MTA) meeting of the Agricultural Technology Management Agency (ATMA) was leveraged for showcasing the promising technologies developed by ICAR-Indian Institute of Spices Research. Promising interventions in up-land paddy cultivation, being popularized by Krishi Vigyan Kendra, Peruvannamuzhi was also shown during the meeting. A brief presentation on the bio-capsule technology was also made in the meeting to provide information regarding the technology to the officials.

ICAR-IISR takes initiative to create community assets for tribal farmers

ICAR-Indian Institute of Spices Research joined hands with Department of Agriculture, Government of Kerala to strengthen its activities under the Tribal Sub Plan component. To facilitate technology adoption in tribal hamlets, ICAR-IISR has provided two sprayers to the farmers of Anakkal Hamlet at Pudur, Attapadi in Palakkad district. The assets were handed over to Anakkal Uru Vikasana Samithi by Dr. M. Anandaraj, Director, ICAR-IISR on 20th December, 2014 at Anakkal Uruvikasana Committee hall.



Dr. M Anandaraj, Director ICAR-IISR handing over sprayer to Hamlet Development Samithi

Training on black pepper production technology organized for tribal farmers

A one day training programme on improved production technology for black pepper for 65 tribal farmers from Sulthan Bathery block was organized by ICAR-Indian Institute of Spices Research in collaboration with MSSRF, puthurvayal on 30th October 2014 at Puthenkunnu, Nenmeni Panchayath, Sulthan Bathery. Smt. A. S. Vijaya, President, Sulthan Bathery Block Panchayath inaugurated the training programme.



Inaugural function of Tribal Sub Plan at Sulthan Bathery, Wayanad

ICAR-IISR marks its presence in Public Information Campaign

The Indian institute of Spices Research participated in the public information campaign organized by the Press Information Bureau (PIB) functioning under the Union Ministry of Information and Broadcasting. The campaign was organized at Karuvarakundu in Malappuram District during 01-03 December 2014. The purpose was to showcase the major flagship programmes of the Union government and to raise the awareness of the general



public about the services and facilities available with various institutions/departments. The technologies developed by ICAR-IISR were displayed in the exhibition held in connection with the campaign which attracted huge interest from the visitors.

Krishi Vigyan Kendra

SAC meeting of KVK organized at ICAR-IISR, Chelavoor campus

The sixteenth Scientific Advisory Committee (SAC) meeting of KrishiVigyan Kendra (ICAR-IISR, Kozhikode), Peruvannamuzhi was held on 19 November 2014 at ICAR-IISR, Kozhikode under the Chairmanship of Dr. M. Anandaraj, Director, ICAR- IISR. Dr. Sreenath Dixit, Zonal Project Director, Zonal Project Directorate, Zone VIII, Bengaluru, Dr. P.V. Balachandran, Director of Extension, Directorate of Extension & Registrar-in-charge, KAU, Thrissur and Dr. B. Sasikumar, Scientist- in-charge, KVK & Head, Division of Crop Improvement and Biotechnology, ICAR-IISR also attended the meeting.



SAC meeting in progress

Front Line Demonstration The following FLDs have been under taken during the period by KVK.

1. Demonstration of high yielding foot rot tolerant variety of black pepper
2. Demonstration of use of PGRR encapsulated bio-capsules for management of soft rot
3. Introduction of a high yielding variety of amaranthus Rensusree
4. Seed production of pearlspot fish in fresh water area
5. Production and marketing of value added products

6. PTB-60 a recently released semi tall short duration variety with good grain and straw yield suitable for direct seeding in upland situation with KAU POP recommendations

Production of upland rice variety 'Vaishak' was successfully demonstrated at ICAR-IISR, Chelavoor under the FLD programme of KVK, Peruvannamuzhi. Though the variety usually takes 120 days to mature, at the ICAR-IISR farm, Chelavoor it matured in 105 days as a second crop and the harvesting was kick started by Dr. M. Anandaraj, Director of the Institute.



Demonstration of Vaishak at IISR



News paper clipping on Vaishak cultivated at IISR farm

On Farm Testing

The OFTs conducted during the period are as follows.

- a. Management of *Phytophthora* foot rot of black pepper





- b. Assessment of transplanting technique for ginger using pro-trays
- c. Culture of Asian Seabass (*Lates calcarifer*) in brackish water ponds
- d. Performance evaluation of grafted black pepper

Training Programmes

A total of 37 training programmes were organized for farmers, rural youth and extension functionaries. 1136 persons attended the programmes. KVK also participated in five exhibitions and undertook 63 field visits.



Participants involved in a hands-on session in a training programme on bee keeping

Publications

Research papers

Deeshma K P & Bhat A I 2014 Complete genome sequencing of Piper yellow mottle virus infecting black pepper, betelvine and Indian long pepper. *Virus Genes* DOI 10.1007/s11262-014-1134-0.

Deeshma K P & Bhat A I 2014 Further evidence of true seed transmission of Piper yellow mottle virus in black pepper (*Piper nigrum* L.). *Journal of Plantation Crops* 42: 289-293.

Jacob T K, Sharon D'Silva, Senthil Kumar C M, Devasahayam S, Rajalakshmi V, Sujeesh E S, Ishwara Bhat A & Siljo Abraham (2014) Single strain infection of adult and larval cardamom thrips (*Sciothrips cardamomi*) by *Wolbachia* subgroup *Con* belonging to supergroup B in India, *Invertebrate Reproduction & Development*, DOI: 10.1080/07924259.2014.970237

Jayashree E & Visvanathan R 2014 Studies on development of concentric drum, brush type ginger peeler. *Agricultural Mechanization in Asia, Africa and Latin America* 45(4): 82-87.

Jayashree E, Visvanathan R & John Zachariah T 2014 Quality of dry ginger by different drying methods. *Journal of Food Science and Technology* 51(11): 3190-3198.

Pervez R, Devasahayam S & Eapen S J 2014 Effect of temperatures on the infectivity of entomopathogenic nematodes. *Annals of Plant Protection Sciences* 22(2): 410-413.

Utpala Parthasarathy, Nandakishore O P, Senthil Kumar R & Parthasarathy V A 2014 A comparison on the physico-chemical parameters of seedbutters of selected Indian *Garcinia* spp. *Journal of Global Biosciences* 3(6): 872-880.

Books

Dinesh R, Santhosh J Eapen, Senthil Kumar C M, Prathapan K, Ramakrishnan Nair R, John Zachariah T & Anandaraj M (Eds) *Souvenir-PLACROSYM XXI, International Symposium on Plantation Crops*, ICAR-Indian Institute of Spices Research, Kozhikode, Kerala, India, p.162.

Dinesh R, Santhosh J Eapen, Senthil Kumar C M, Ramakrishnan Nair R, Devasahayam S, John Zachariah T & Anandaraj M (Eds) *Abstracts-PLACROSYM XXI, International Symposium on Plantation Crops*, ICAR-Indian Institute of Spices Research, Kozhikode, Kerala, India, p.242.

Book chapters

Anandaraj M, Prasath D & Kandiannan K 2014 Spices propagation – Challenges and opportunities to meet changing climate. In: Srivastava A K, Babita Singh, Patel N L, Ahlawat T R & Alka Singh (Eds.), *ASM Foundation, New Delhi and Jain Irrigation System Pvt. Ltd., Jalgaon*, pp.231-239.

Pervez R, Eapen S J & Devasahayam S 2014 Biodiversity of entomopathogenic nematodes. In: Kambasa Kumar Behra (Ed.), *Advances Frontier of Biotechnology*. Jaya Publishing House, New Delhi, pp.125-143.



Santhosh J Eapen & Reena N 2014 Bioinformatics tools and resources for *Phytophthora* research. In: Jacob Mathew, Bindu Roy C, Kuruvilla Jacob C & Muraleedharan N (Eds.), *Phytophthora* diseases of plantation crops. Westville Publishing House, New Delhi, pp.156-161.

Popular articles

Anandaraj M, Dinesh R, Srinivasan V, Hamza S & Bini Y K 2014 Feeding spice crops for quality produce. Indian Horticulture 59(6): 22-24.

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Papers presented in symposia/ seminars/ workshops /conferences

About 55 research papers were presented by scientists and research scholars of the institute during the period in various symposia / seminars / workshops /conferences.





New Appointment

Name	Post	Date of joining
Mr. Narendra Choudhary	Scientist (Spices, Plantation, Medicinal & Aromatic Plants)	13-10-2014
Dr. Prativa Lakhota	Scientist (Spices, Plantation, Medicinal & Aromatic Plants)	20-10-2014
Dr. Awadhesh Kumar	Scientist (Plant Biochemistry)	20-10-2014

Promotion

Name	Promoted as	w.e.f
Mr. Binoy, V.S.	Technician	20-12-2014
Mr. Sivadas, O.G.	Technician	20-12-2014
Mr. Sundaran, P.	Assistant Administrative Officer	22-12-2014
Mr. Krishnadas, K.	Technical Officer	01-01-2014

Transfer

Name	Post	Joined date / from
Ms. Rajna, S.	Scientist (Agricultural Entomology)	ICAR-IISR, RS, Appangala on 26-12-2014 (from ICAR-IINRG, Ranchi)

Resignation

Name	Post	w.e.f
Mr. Jithin, S.	SRF (PhytoFuRa)	25-11-2014
Mr. Kannan, S.	Farm manager, KVK	31-12-2014



Retirement



Mr E.V. Ravindran
Senior Tech. Asst., 30-11-2014



Mr T.T. Soman
SSS, 30-11-2014



Mrs Alice Thomas
Personal Asst., 1-12-2014



SPICES NEWS

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