Proceedings of XXIII Workshop of

All India Coordinated Research Project on Spices

29th September - 1st October 2012

Indian Institute of Spices Research, Kozhikode

ALL INDIA COORDINATED RESERCH PROJECT ON SPICES
Indian Institute of Spices Research
(Indian Council of Agricultural Research)
KOZHIKODE -673 012, KERALA

Complied & Edited by

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Principal Scientist (Agronomy)

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PROGRAMME

29th September 2012

8.30 AM -930 A M **REGISTRATION**

INAUGURAL SESSION		**10 AM – 11.30 PM**
10.00 AM - 10.05 AM	Invocation	(ICAR song)
10.05 AM - 1010 AM	Welcome	**Dr. M. Anandaraj** Director, IISR, Calicut
10.10 AM - 10.15 AM	Address	**Dr. Balraj Singh** Director, NRCSS, Ajmer
10.15 AM - 10.20 AM	Presidential Address	**Dr V.A. Parthasarathy** Emeritus Scientist and Former Director, IISR, Calicut
10.20 AM - 10.35 AM	Inauguration of Workshop & Inaugural Address	**Dr. Umesh Srivastava** Asst. Director General (Hort.) ICAR, New Delhi
10.35 AM - 11.00 AM	Vote of Thanks	**Dr. K. Nirmal Babu** Project Coordinator, AICRPS
11.00 AM – 11.30 AM	Tea	

SESSION I	:	GENETIC RESOURCES	11.45- 4.45 PM

Chairpersons : **Dr. Umesh Srivastava**, ADG (Hort.), ICAR, New Delhi
Dr Balraj Singh, Director, NRCSS, Ajmer.

Rapporteurs : Dr. (Mrs)N. Shoba, TNAU, Coimbatore
Dr. K.V. Saji, IISR, Kozhikode

11.45 AM -1.40 PM : Session on Action Taken Report.
Presentation of Action taken Report and Discussion
K. Nirmal Babu, Project coordinator, AICRPS

1.40 PM-2.30 PM : Lunch

2.30 PM - 4.45 PM

Presentations

Black pepper	:	Dr. Nagesh Naik, Horticulturist, UHS, Sirsi
Large Cardamom	:	Dr. Utpal Gupta, ICRI Regional Station, Gangtok, Sikkim
Cardamom	:	Dr(Mrs). Maya, Cardamom Research Station, Pampadumpara
Ginger	:	Dr. Happy Dev, Dr. YSPUHF, Solan
Turmeric	:	Dr. B.C. Saha, UBKV, Pundibari
Tree Spices	:	Dr. J. Prem Joshua, HRS, Pechiparai
Coriander	:	Dr. K. Giridhar, HRS, Guntur
Cumin	:	Dr. E.V.D. Sastry, RAJAU, Jobner
Fennel	:	Dr. D.G. Patel, SDAU, Jagudan
Fenugreek	:	Dr. S.P. Singh, RAU, Dholi

SESSION II :	CROP IMPROVEMENT	4.45 PM – 8.00 PM

Chairpersons : **Dr. B. Krishnamoothy**, Head, CI&B, IISR, Kozhikode
Dr. E.V.D. Sastry, Principal Scientist, SKRAU, Jobner

Rapporteurs : Dr. R.R. Nair, IISR, Kozhikode
Dr. K. Giridhar, Dr. YSRHU, Guntur

Presentations

Black pepper	:	Dr. P.M. Ajith, KAU, Panniyur
Cardamom	:	Dr. Sreekrishna Bhat, CRS, Sakleshpur
Ginger	:	Dr. Parsuram Sial, HARS, Pottangi
Turmeric	:	Dr. Uma Masheswari, TRS, Kammarpally
Tree Spices	:	Dr. U.B. Pethe, KKV, Dapoli
Coriander	:	Dr. E.V.D. Sastry, RAJAU, Jobner
Cumin	:	Dr. E.V.D. Sastry, RAJAU, Jobner
Fennel	:	Dr. S.K. Tehlan, CCS HAU, Hisar
Fenugreek	:	Dr. R. K. Kakani, NRCSS, Ajmer

30th September 2012

SESSION III :	CROP MANAGEMENT	9.30 AM - 11.30 AM

Chairpersons : **Dr. T.J. Zachariah**, Head, Crop Production & PHT, IISR, Kozhikode
Dr. Suresh Malhotra, Principal Scientist, ICAR, New Delhi

Rapporteurs : Dr.(Mrs) N.K. Leela, IISR, Kozhikode
Dr. K. Ravindra Kumar, Dr.YSRHU, Chintapalli

Presentations

Black pepper	:	Dr. K. Ravindra Kumar, Dr. YSRHU, Chintapalli
Cardamom	:	Dr. K.M. Devaraju, UHS, Mudigere
Ginger	:	Dr. S. P. Singh, RAU, Dholi
Turmeric	:	Dr. (Mrs.) N. Shobha, TNAU, Coimbatore
Tree Spices	:	Dr. U.B. Pethe, KKV, Dapoli
Coriander	:	Dr. T. P. Malik, CCS HAU, Hisar
Cumin	:	Dr. D.G. Patel, SDAU, Jagudan
Fennel	:	Dr. T.P. Malik, CCS HAU, Hisar
Fenugreek	:	Smt. A. Rajani, Dr.YSRHU, Guntur

SESSION IV :	CROP PROTECTION	11.30 AM - 1.30 PM

Chairpersons : **Dr. S. Devasahayam**, Head Crop Protection, IISR, Kozhikode
Dr Shekhawat, RAJAU, Jobner

Rapporteurs : Dr. R. Suseela Bhai, IISR, Kozhikode
Dr. (Mrs.) Meenu Gupta,Dr.YSPUHF,Solan

Presentations

Black pepper	:	Dr. M.S. Lokesh, UHS, Sirsi
Large Cardamom	:	Dr. Utpal Gupta, ICRI Regional Station, Gangtok, Sikkim
Cardamom	:	Dr. S.D. Rangaswamy, UHS, Mudigere
Ginger	:	Dr. Meenu Gupta, Dr. YSPUHF, Solan
Turmeric	:	Dr. (Mrs) Muthulakshmi, TNAU, Coimbatore
Tree Spices	:	Dr. V.A. Gadre, KKV, Dapoli
Coriander	:	Dr. A.K. Singh, IGAU, Raigarh
Cumin	:	Dr. K.D. Patel, SDAU, Jagudan
Fennel	:	Dr. A. K. Misra, RAU, Dholi
Fenugreek	:	Dr. A. K. Misra, RAU, Dholi

Lunch 1.30 PM – 2.30 PM

SESSION V	:	VARIETAL RELEASE SESSION	2.30 PM - 4.30 PM

Chairpersons : **Dr. Umesh Srivastava**, ADG (Hort.), ICAR
Dr. M. Anandaraj, Director, IISR, Calicut

Rapporteurs : Dr. S.K. Tehlan, CCS HAU, Hisar
Dr. K. Kandiannan, IISR, Kozhikode

Presentation crop wise

Black Pepper	:	1. Dr. Tripathi. P. C, CHES, Chettali
		2. Dr.(Mrs) Neema V.P, PRS, Panniyur
Cardamom	:	1. Dr. Maya, Professor (Horticulture), CRS, Pampadumpara
		2. Dr. Srikrishna Bhat, ICRI, Sakleshpur
Turmeric	:	1. Dr. S.K. Tehlan, CCS HAU, Hisar
		2. Smt Uma Maheswari, TRS, Kammarappally
Clove	:	1. Dr. Prem Joshua, TNAU, Pechiparai
Fenugreek	:	1. Dr. R.K. Kakani, NRCSS, Ajmer.
		2. Dr. K. Giridhar, Dr.YSRHU, Guntur
Ajwain	:	3. Dr. S.K. Tehlan , CCSHAU, Hisar

SESSION VI : TRANSFER OF TECHNOLOGY AND ON FARM TRILS 4.30 PM -6.00 PM

Chairpersons	:	**Mr. P.A. Mathew**, IISR, Peruvannamuzhi **Dr Homey Cherian**, Director, DASD, Kozhikode
Rapporteurs	:	Dr (Mrs)T. V. Aupama, Panniyur KAU, Dr R. Senthil Kumar, CRS, Appangala

Presentation crop wise

Cardamom	:	Dr. (Mrs) K.B. Deepthy,CRS,Pampadumpara
Turmeric	:	Dr. (Mrs.) N. Shoba ,TNAU,Coimbatore
Turmeric	:	Dr. A. K. Singh, IGAU,Raigarh
Coriander	:	Dr. N.K.Giridhar,Dr.YSRHU,Guntur
Coriander	:	Dr. (Mrs.) N. Shoba , TNAU,Coimbatore
Fenugreek	:	Dr. A.K. Singh, IGAU,Raigarh
Black Pepper	:	Dr. M.S. Lokesh,UHS,Sirsi

1st October 2012

SESSION VII :	**PLENARY SESSION**	**9.00 AM -11.00 AM**

Chair : **Dr. S. Edison**, Former Director, CTCRI, Trivandrum & Former Project Coordinator, AICRPS
Dr. V.A. Pathasarathy, Former Director, IISR, Kozhikode

Rapporteurs : Dr. D. Prasath ,IISR,Kozhikode
Dr. V. Srinivasan, IISR, Kozhikode

9.00 AM - 9.05 AM	Welcome	**Dr. S. Devasahayam** Head, Crop Protection, IISR,Kozhikode
9.05 AM - 9.45 AM:	Presentation of Session Reports by Chairman of Various Sessions & Discussion	
Technical Session – I	Genetic Resources	Dr. N. Shoba, TNAU, Coimbatore
Technical Session – II	Crop Improvement	Dr. R.R. Nair, IISR, Kozhikode
Technical Session – III	Crop Management	Dr. K. Ravindra Kumar, Dr YSRHU, Chintapalli
Technical Session – IV	Crop Protection	Dr. Suseela Bhai, IISR, Kozhikode
Technical Session – V	Variety Release	Dr. K. Kandiannan, IISR, Kozhikode
Technical Session – VI	Transfer of Technology	Dr. R. Sentil Kumar, IISR, Kozhikode
9.45 AM - 9.50 AM		
Presentation on Main Technical programme for 2013-14 & 12th Plan focus		**Dr. K Nirmal Babu** Project Coordinator, AICRPS
9.50 AM - 10.10 AM	Remarks	**Dr Balraj Singh** Director, NRCSS, Ajmer
10.10 AM - 10.20 AM	Remarks	**Dr M. Anandaraj** Director, IISR, Kozhikode
10.20 AM - 10.30AM	Remarks	**Dr. S. K. Malhotra,** Principal Scientists (Hort.), ICAR, New Delhi
10.30 AM – 11.0 0 AM	Chairman's concluding Remarks	**Dr. S. Edison,** Former Director, CTCRI,Trivandrum
11.00 AM - 11.05 AM	Vote of Thanks	**Dr. T.J. Zachariah** Head, Crop Production, IISR, Kozhikode
11.05 AM - 11.10 AM	National Anthem	
11.10 AM - 1140 AM	Tea	

INAUGURAL SESSION

The National group meeting (XXIII Workshop) of All India Coordinated Research Project on Spices (AICRPS) was held at Indian Institute of Spices Research, (IISR), Kozhikode during 29th September to 1st October 2012.

Dr. M. Anandaraj, Director, IISR, Kozhikode has given the welcome address and wanted the AICRPS which he coordinated for 6 years to develop location specific technologies which needed better visibility with an eye on commercialization.

Dr. V. A. Parthasarathy, Scientist Emeritus and former Director, IISR, Kozhikode in his presidential address stressed the need to concentrate on secondary agriculture to enhance productivity by at least 20% in the XII plan period. He requested the scientists to enhance the productivity by releasing new high yielding, climate resilient varieties and by crop intensification.

The National group meeting was inaugurated by Dr. Umesh Srivastava, Assistant Director General (Hort.), Indian Council of Agricultural Research (ICAR), New Delhi. In his inaugural address he stressed the need for concerted efforts to register unique and important genotypes and guard against bio piracy of spices germplasm. He also emphasized the importance of urban horticulture for food and nutritional security, varieties for different agro ecological zones of the country, varieties resistant to biotic and abiotic stress *vis-à-vis* climate change and use of safe green chemicals for crop disease management. He also opined that genetic basis of seed spices need to be widened and emphasis may be given for cost effective conservation of germplasm, cultivation of underutilized seed spices and enhancing the crop productivity by crop diversification.

Dr. Balraj Singh, Director, NRCSS, Ajmer emphasized the importance and recent advances in protected cultivation and its suitability for spices.

Dr. K. Nirmal Babu, Project Coordinator (AICRPS) gave vote of thanks.

PROJECT COORDINATOR'S REPORT

K. Nirmal Babu
Project Coordinator
All India Coordinated Research Project on Spices
Indian Institute of Spices Research, Calicut - 673 012, Kerala

The All India Coordinated Research Project on Spices (AICRPS) is located in Kerala with its headquarters at IISR, Kozhikode. The independent AICRPS presently has 34 centers which include 19 regular, 8 coopting and 7 voluntary centres spread over 21 states of the country representing various agroclimatic zones suitable for spices. The mandate crops includes black pepper (9 centres) , small cardamom (4 centres), fennel (9 centres), fenugreek (12 centres), Tree spices *viz.*, clove, Cinnamom and nutmeg (3 centres each). About 110 research programmes covering 12 mandate spice crops are being carried out under the major disciplines of genetic resources, crop improvement, crop production, crop protection and Transfer of Technology.

Black Pepper

The Germplasm of black pepper is collected and conserved in all the black pepper centers. Among the accessions of black pepper germplasm evaluated at Panniyur, the cultivar Angamali recorded maximum green berry yield (3.60 kg/ plant) followed by ICP 48 (3.120 kg/ plant). Two accessions ACC 57 and 33 continued to perform well at Yercaud.

In a CVT of black pepper, Acc 5308 recorded maximum yield at Chintapalle and Pampadumpara. At Panniyur Acc 5489 was promising where as at Sirsi and Ambalavayal Panniyur I recorded maximum yield of 1.20 kg and 1.54 kg respectively.

At Sirsi grafts of Panniyur 1 runner shoots on IISR Thevam as rootstock recorded better growth in terms of plant height and number of leaves.

Under organic farming, integrated nutrient management recorded maximum berry yield at Panniyur, Pechiparai and Sirsi where as organic nutrient management recorded maximum berry yield at Yercaud.

At Sirsi, black pepper variety IISR Shakthi confirmed its tolerance to *Phytophthora* foot rot and the diseases incidence was least in vines sprayed (2l/ vines) and drenched (3l/ vines) with consortium of bacteria IISR 6 and IISR 859 (for growth, nematode and *Phytophthora* suppression) and soil application with *Trichoderma harzianum* (MTCC 5179) @ 50 g per vines with one kg of neem cake to the root zone during pre monsoon (June 2011) and post monsoon (Aug 2011). At Sirsi spraying and drenching with new molecules of fungitoxicants 0.1% of Fenamidon + Mancozeb (50%) (Sectin) alone resulted in reduced yellowing of vines (7.34 PDI) and maximum yield (3.12 kg/vine).

Studies on natural incidence of gall wasp, a serious pest attacking black pepper standards, revealed that incidence was recorded in 2 spices namely *Erythrina indica and Erythrina fusca* , while no incidence was observed on *Erythrina subumbrans,* indicating its possible resistance.

Small cardamom

In a CVT at Pampadumpara , PS -27 recorded maximum dry capsule yield (597g/pl) and in Mudigere MCC -309 recorded maximum dry capsules yield (290 kg/ha) followed by PS 27 (280.15kg /ha). In another CVT at Sakleshpur, maximum per plant yield was recorded by IC 34987 (958 g/plant) followed by SKP 164 (948.8 g/plant).

Application of irrigation water 9 liters/clump/day through drip along with 75 % recommended dose (125 :125 : 250 NPK kg/ha) recorded highest capsule yield (180.15 kg/ha) that was on par with irrigation 9 liters / clump/day with 75% recommended fertilizer dose (179.78 kg/ha) at Mudigere. Under organic farming, recommended package, FYM 30 t/ha + NPK (125: 125 : 250 kg/ha) at Mudigere recorded maximum dry capsule yield (230.66 kg/ha).

Entomopathogenic nematode *Heterohabditis indica* alone or in combination with Imidacloprid (0.006%) effectively reduced the root grub population of cardamom. At Mudigere application of new insecticides such as Methomyl @ 1.5g/l of water and Acetamiprid @ 0.5 gm and Imidacloprid @ 0.5 ml found to be effective to control thrips and capsule borer at Mudigere. Effective management of Pseudostem rot of cardamom using Bavisitn 0.2% and bio control agents, *Trichoderma harzianum* 50g +1kg neem cake as basal application + consortium of bacteria as spray and application of *Trichoderma harzianum* 50 g +1kg neeam cake as basal application and *Pseudomonas fluorescens* 2 % as spray were standardized at Pampadumpara.

Large Cardamom

Survey was conducted at Sikkim and Darjeeling district of west Bengal, 19 accessions of germplasms were collected and conserved at germplasm conservatory. IC numbers were received for 13 collections.

Fourteen disease escapes (blight caused by *Colletotrichum gloeosporioides*) were collected from Sikkim and Darjeeling hills of West Bengal. Cultivation of Varlangey variety in 75% shade resulted in maximum growth and yield (253 kg/ha). Neem formulations like Nimbicidine @3 ml/l and *Bacillus thuringiensis* @ 2g/l are found to be effective against leaf eating caterpillar, shootfly and stem borer of Large Cardamom at Gangtok.

Ginger

Under IET at Solan the genotype SG-26/04 (27. 8 t/ha), SG-908 (27.6t/ha) and SG -08/04 (26.7 t/ha) were highest yielders.

In CVT ginger V_1E_4-5 recorded maximum yield (22.0 t/ ha) at Pottangi where as top yielders at Pundibari and Kumarganj were NDG1 (17 t/ha) and V_2E_5-2 (14 t/ha) respectively.

In the experiment on genotype X environment interaction on quality of ginger, local check SG 827 recorded maximum yield of 21.67t/ha at Solan, Varada (22.24 t/ha) at Chintapalli, V_1E_8 (21.60 t/ha) at Pottangi, Himgiri (18 t/ha) at Mizoram, Supraba (28.4 t/ha) at Kanke, Surabhi (24.2 t/ha) at Pasighat , Mahima (15.76t/ha) at Appangala, GCP 5(11.7 t/ha) at Pundibari, Gorubathan Local (25.18 t/ha) at Kalyani were the highest yielders. Regarding quality of ginger at Pundibari, Suprabha recorded maximum dry matter (18.26%) and oleoresin (6.8%), Surabhi had highest essential oil (1.8%) and Mahima registered maximum crude fiber (5.2%). Essential oil and oleoresin contents of forty best performing collections were analysed at Solan. High yielding collections SG-26/04 and SG-908 were found superior/comparable for dry matter, essential oil, oleoresin and crude fiber contents to the check Himgiri.

Integrated nutrients applied as 50 % recommended dose of fertilizer (60: 40: 40 kg NPK kg/ha) + 50% FYM (10 t/ha) + *Azosporillum* (5 kg /ha) + seed treatment and soil application of *Pseudomonas flourscence* + *Trichoderma* (50 g/ m^2) produced maximum yield in ginger at Kumarganj and Raigarh whereas organic and inorganic nutrients application recorded maximum yield at Pundibari and Pottangi respectively.

At Solan, Chintapalli, Pundibari and Raigarh soft rot incidence was less (2.56 %) and yield was high when rhizomes were treated with Metalaxyl Mancozeb. Bio fumigation using cabbage resulted in lowest incidence of soft rot and maximum yield at Pundibari, Ambalavayal, Raigarh and Pampadumpara. Bio fumigation using mustard and cabbage evolved as a tool for the management of bacterial wilt in Solan and Pundibari also.

Turmeric

Among the 30 early maturing germplasm accessions at Kumarganj NDH 4 (35 t/ha) and NDH 79 (35 t/ha) and out of 80 medium maturing germplasm accessions NDH -98 (42.14 t/ha) and NDH-14 (35.24 t/ha) were found to be superior for yield. Among 36 late maturing varieties NDH -8 exhibited maximum fresh yield (35.28 t/ha) was found to be promising. The germplasm accessions found promising at various centers for yield are TU No-6 (Pottangi), TCP 90 (Pundibari), CLI-316 (Kammarapally), IT-I3 (Raigarh), CHFT-8 and CHFT-32 (Pasighat).

In the CVT in Turmeric, RH-80 performed well at Coimbatore and Kumarganj, RH 9/90 was better performer at Pasighat, Patnagar and Navasari whereas TCP-70 performed well at Pundibari and Raigarh.

In an IET on turmeric NDH-18 at Kumarganj, PTS-47 (22 .t/ha) at Pottangi, TCP-64 at Pundibari, were promising. In G X E interaction study, the turmeric varieties Roma at Chintapalli, NDH 18 at Kumarganj , Duggirala Red at Kammarapally, IISR Kedaram at Pundibari, RCT 1 at Mizoram, Rajendra Sonia at Kalyani, Duggirala at Coimbatore, Suranjana at Raigarh recorded maximum yield. Integrated nutrient application FYM 20 t/ha, ½ NPK, P-solubilizers, *Pseudomonas fluorescens* and *Trichoderma* as seed treatment and soil application @ 50 g/ 3 sq. m. with spray/ drench of Bordeaux mixture @ 0.5% and Malathion @ 0.1% at 21 days interval produced maximum turmeric yield in Pundibari and Raigarh.

At Coimbatore and Kammarapalli water saving irrigation drip once in a day at 60% and 80% respectively recorded maximum yield. Fertigation, (100% RDF through drip -weekly once) in turmeric was standardized at Coimbatore and Kammarapally. In a series of studies for micro nutrient requirement at various agro climatic regions, Soil application of Ferrous sulphate @ 25kg ha $^{-1}$ recorded maximum projected yield at Dholi whereas application of boron recorded the maximum yield (20.67 t/ha) at Pundibari and soil application of zinc @ 25 kg /ha recorded maximum yield (30 t/ha) at Kumarganj.

Studies on the effect of rhizomes size on yield at Coimbatore and Chintapalli indicated that mother rhizomes pieces (35-40 g) directly planting in the field recorded maximum yield at Coimbatore. Turmeric cured by traditional water boiling method for 40, 60, 90, min and those cured in improved steam boiler for 30, 45, 60 and 90 min took 10 days for drying. But in the case of rhizomes dipped in boiling water for 10 min and then dried, the drying time increased to 13 days.

At Coimbatore Leaf spot (18 %) and leaf blotch (22 %) intensity was less in the treatment foliar spray with Propiconazole (0.1%) on 45 and 90 days after planting (15.23 PDI) whereas at Pundibari and Kumarganj rhizome treatment as well as foliar spray with Hexaconasole (0.1%) at 45 and 90 days after planting was the best. At Chintapalli rhizomes treatment with Propiconazole + foliar spray of Propiconazole (0.1%) on 45 and 90 DAP recorded lowest leaf spot incidence. At Raigarh and Pottangi foliar diseases intensity was reduced when rhizomes treated with carbendazim + Mancozeb (1:1) and spray (0.1%) at 45 and 90 DAS.

Tree Spices

A total of 176 Accessions of tree spices (nutmeg, cinnamon, cassia, and clove) germplasm are collected, maintained, characterized and catalogued at Dapoli, Pechiparai and Yercaud centers. Among 24 clove accessions at Pechiparai SA13 recorded highest tree height 8.22 m, dry bud yield 3.89 kg/tree, clove bud oil (2.78%) and oleoresin 2.56%. In clove, SA 3 was found to be promising in terms of yield characters (2.95kg) of dry buds/ tree at Pechiparai.

At Pechiparai among the nutmeg accessions MF-4 recorded maximum number of fruits of 999 numbers /tree, highest single fruit weight (73.45 g) and dry mace yield (419 g).

Among the cinnamon accessions CV-5 recorded the maximum dry bark yield of (545 g per tree) whereas local check recorded 260 g per tree.

In a CVT nutmeg at Pechiparai, accession A9/150 recorded maximum plant height of 1.98 m, stem girth 11.81 cm and maximum stem girth 40 cm, leaf yield 390 g/tree and bark yield 226 g/tree.

Among the genotypes tried at Pechiparai Keeriparai-1 with 1 m length and 5-6 cm thickness of the stem has recorded maximum dry weight of quills (130 g) and 82 g of quillings and featherings. The essential oil and oleoresin percentage was also highest in the same treatment with 2.6 per cent bark oil and 9.1 per cent oleoresin respectively.

Coriander

A total of 2220 accessions were maintained at Jobner, Jagudan, Ajmer, Dholi, Guntur, Coimbatore and Kumarganj centres. At Dholi among the promising accessions, RD-418 recorded maximum yield (1.40 g/5.4 m^2). Among the sixty one germplasm entries evaluated at Guntur LCC-272, LCC-268, LCC-262, LCC-275 and LCC-276 were found significantly superior in yield over the best check Sudha (4.02 g/plant).

In a CVT 2009 maximum yield obtained was with COR 29 at Jagudan and Guntur, COR-27 at Jobner, COR-31 at Raigarh and COR-33 at Pantnagar and Jabalpur, COR-32 at Hisar and COR-26 at Udaipur.

In a CVT, leaf type coriander during offseason LCC-232 recorded maximum green yield at Guntur, LCC-243 at Coimbatore and Periyakulam.

In an IET of coriander for seed purpose, UD-61 was found to be promising at Jobner, RD-377 at Dholi, JCR-379 and JCR-380 at Jagudan, DH-281 and DH-314 at Hisar, ND COR-38 at Kumarganj, LCC-219 at Guntur and PD(S)-21 at Pantnagar. In the case of IET of coriander on leaf purpose, maximum fresh yield was recorded by PD (L) 51 followed by PD (L) -11 at Pantnagar. Among fourteen entries of coriander analysed for volatile oil content at Jobner the entry COR-27 ranked first (7.37l/ha) followed by COR-34 (6.50l/ha). Out of ten entries of coriander under IET analyzed for volatile oil at Jobner, maximum recorded by UD-663 (7.73l/ha) followed by UD-565 (6.83l/ha).

In identification of drought source in coriander at Jobner UD 115 had the maximum yield. In nutrient supplementation through organic manures in coriander integrated nutrient management recorded maximum yield at Coimbatore, Dholi, Hisar, and Raigarh, where as recommended chemical fertilizer registered maximum yield at Guntur and Kumarganj. At Coimbatore spraying of 0.5% foliar spray of zinc sulphate recorded maximum grain yield (772.44 kg/ha) where as soil application of micro nutrient @ 25 kg/ha recorded more yield (2.42t/ha) at Dholi. At Coimbatore and Pantnagar seed treatment of coriander with Propiconazole was a technology to control stem gall disease. In IET at Jobner, UC 339 recorded maximum yield (726.74 kg/ha) followed by UC 336 (671.88 kg/ha.)

Cumin

A total of 590 accessions were maintained at Jagudan and Jobner centres. The Cumin accession CUM-13 recorded maximum seed yield of 687.5 kg/ha and volatile oil in the CVT at Jobner. UC-239 followed by UC-274 and UC-225 were the best genotypes suited to limited moisture conditions. Application of *Trichoderma harzianum* @ 10kg/ha+ FYM @3t/ha resulted in the minimum wilt diseases incidence (1.78%) and maximum seed yield 579kg/ha at Jobner where as soil solarization + soil application of *Trichoderma harzianum* + spray of Mancozeb @0.25% at 60 DAS recorded low incidence of wilt at Jagudan.

Fennel

A total of 711 accessions were maintained at Dholi, Guntur, Hisar, Jagudan, Jobner and Kumarganj Centres. In the CVT of fennel, FNL 43 was the top yielder at Jobner, Dholi and Jabalpur whereas at Kumarganj NDF-5 (check), FNL 40 at Jagudan, FNL 42 at Udaipur, were the top yielders. In IET entries JF 671-1 (1273 kg/ha), HF 151 (2182 kg/ha), NDF 46 (1371 kg/ha) recorded maximum yield at Jagudan, Hisar and Kumarganj respectively. Under IET, UF 168 recorded maximum seed yield (2306.67 kg/ha) at Jobner. Under CVT maximum volatile oil yield was recorded by FNL 46 (49.43l /ha) followed by FNL 43(46.94 l/ha). In the evaluation of different insecticides / botanicals against seed midge, application of Thiamethoxam 25 WG @ 0.0084% recorded the least seed wasp damage (8.73%) at three and seven days after spraying at Jagudan.

Fenugreek

A total of 1127 Accessions were maintained at Dholi, Guntur, Hisar, Jagudan, Jobner, Kumarganj and Coimbatore Centres. Under CVT accession FGK 33(467 kg/ha) at Coimbatore, Rajendra Kanthi at Dholi (2270kg/ha), FGK 28 (525 kg/ha) at Guntur, FGK 35(2276kg/ha) at Jagudan, FGK 37(2410 kg/ha) at Jobner, FGK 34(1630 kg/ha) at Jabalpur, FGK 27(585 kg/ha) at Raigarh were the top yielders.

Under IET at Guntur LFC 98 (562 kg/ha) at Jobner, UM 126 (2373 kg/ha) were the top yielders. Among IET trial 2010, RM 188 recorded maximum yield (2.19 t/ha) at Dholi whereas HM-425 (3.0 t/ha) performed well at Hisar, RMt-1, UM29, UM13 were the top yielders in irrigated conditions at Jobner. Similarly in drought conditions UM 36, followed by UM 26, UM 10 was found to be ideal. Significant beneficial effect of PGPR bioformulations were obtained in Fenugreek by treating seeds with FK14 + FL18 at Jobner, Hisar and Kumarganj whereas seed treatment with FL18 recorded maximum yield at Guntur.

ACTION TAKEN REPORT- on XXIII AICRPS Workshop 2011 at IISR, Kozhikode

Sl. No	Decision	Action taken
General		
1	All the released varieties (extant) in black pepper, cardamom, ginger & turmeric may get registered with PPV & FRA, New Delhi. The proposal for registration need to be sent through Project Coordinator, Spices.	Proposal of Duggirala Red variety sent for registration by Kammarapalli. This is being done in phased manner. The proposals for registration of PV1 and PV2 is being submitted by Pampadumpara center.
2	All the centers need to send replicated data for compilation and presentation at the workshop well in advance to the crop coordinators.	Followed accordingly
3	The missing/non germinated entries in CVT may be brought to the notice of Project Coordinator well in advance.	Followed accordingly.
4	The data should be recorded and presented in uniform units as decided by earlier AICRPS workshops. The term 'culture' in breeding trials may be replaced with appropriate terms.	Followed accordingly.
5	The short listed entries in IETs may be included and proposed for new CVTs in seed spices.	Promising entries from concluded IETs were included in new CVT in Seed Spices.
6	In seed spices, a few centres recorded very low yield and these centres may follow better management practices	Followed accordingly. This year because of wilt, the cumin CVT did not perform well at Jobner, hence a decision was taken to repeat the same next year.
7	The presentation by Dr. EVD Sastry may be taken as model compilation and presentation. The same may be followed by other centres in future.	Followed as suggested.
8	In organic farming experiments soil fertility and quality parameters and also the quality of the produce need to be analysed.	Followed accordingly.
9	All the centers should submit a brief note on each technology assessed / demonstrated along with farmer name, name of the location, per cent increase over the farmers practice, CB ratio and feedback from farmers.	Followed.
10	All the centres should get the IC /EC nos. for entries before initiating the CVT.	This being followed in phased manner by various centers.
11	Cataloguing and characterization of germplasm for each crop in Seed spices should be done.	Data submitted to NRCSS, Ajmer for compilation by Guntur center.
12	Pooled analysis of data should be done and C:B ratio worked out before recommendation of a technology.	Followed accordingly.
13	In bio-control experiments, the compatibility of bio control agent with the chemicals should be tested in those experiments wherever chemicals are included.	Compatibility is always tested before short listing bio control agents in AICRPS crops.

14	In bio-control experiments, the load of microbial population in soil should be monitored at initial and final stages of the experiments.	Followed.
TECHNICAL SESSION – I GENETICS RESOURCES		
15	All the NAGs centre may provide details of available germplasm along with passport data (information) to PC Unit so that duplications can be avoided (Action: All NAG Centers)	The details were requested and are yet to come.
16	Uniform pattern of the catalogue data has to be prepared by crop group leaders and circulated on website and followed by all centres for respective crops.	The catalogue data will be prepared displayed on AICRPS Website.
17	All National Active Germplasm sites (NAG centers) has the responsibility of compilation/consolidation of the data on germplasm for national registration (Action: NAG Centers)	Information along with pass port data & planting materials submitted to CRC, Appangala by Mudigere center.
18	NAGS centre in-charge may get Accessions numbers from the NBPGR by December, 2011 (i) IC (Indigenous) collections (ii) EC (Exotic) collections (Action: NAG Centers)	This is being done in phased manner by various centers. Submitted for IC Number by Mudigere center. I.C. Numbers of 7 released varieties and two hybrids were obtained by Panniyur center.
19	Design for germplasm evaluation both IET & CVT, uniform method of presentation of the data are to be followed as per AICRPS model prepared by all PIs and Co-PIs and has to be followed by all centers to maintain uniformity(Action : Respective crop experts)	Followed as suggested.
20	Uniform presentation of the germplasm characterization data to be discussed and circulated once again. Proper format and Descriptors to be decided & provided for each centre for each crop (Action : Respective crop experts)	Draft is ready, will be finalized through consultants.
21	For CVT trials of elite genotypes, uniform modalities shall be decided crop wise by the Experts and circulated to all centres. This shall include experiment design, observation to be recorded, software for data to be analyzed, method of presentation etc.	Implemented as suggested.
22	Crop wise exploration programmes wherever necessary to be planned annually circulated well in advance. For example exploration programmes (at least 2-3) may be formulated with partners among respective centres to take part in exploration trips. This may be circulated to all the members immediately (NAGS centres)	Exploration Programme is being undertaken in consultation with other centers, NAG center and NBPGR whenever possible.

23	Preparation of crop wise manuals on "Exploration , Collection, Evaluation and Conservation" of spice crops germplasm (Action : Respective crop experts)	A calendar was prepared for collection. Materials for conservation and evaluation will be prepared.
TECHNICAL SESSION -II CROP IMPROVEMENT		
Black pepper		
24	Data on the best performing entry in CVT 2000, Acc. 5489 may be compiled and presented for varietal release	Data on the best performing entry in CVT 2000, Acc 5489 and Acc. 5308 is compiled and presented for varietal release.
Cardamom		
25	The new CVT for drought tolerance is proposed and recommended with six entries from IISR, Appangala for 2012 season	This trial was initiated in Appangala, Mudigere and Sakaleshpur.
Ginger and Turmeric		
26	Instead of presenting mean data, the G × E interaction need to be worked out and presented in the next work shop. Also G × E interaction on quality parameters also to be worked out and presented (Action: IISR, Calicut)	Presented as suggested.
Tree spices		
27	The data on the best performing entry in CVT Clove, SA 3 may be compiled and presented for the varietal release.	Presented as suggested.
Cumin		
28	Jabalpur center may be discontinued from cumin trials as crop is not performing well in that region	The work on Cumin discontinued at Jabalpur center.
Fennel		
29	FNL/CI/4.3 IET is concluded at Jobner and shortlisted entries (UF 157 and UF 278) may be included in new CVT (Action: Jobner)	Already included in new CVT FNL 2012 Series VIII
Fenugreek		
30	The three year data on the best performing entry in CVT, FGK 36 may be compiled and presented in 2012 workshop (Action: Jobner).	Presented at the XXIII AICRPS workshop
Coriander		
31	COR/CI/3.3 IET is conducted at Jobner and shortlisted entries (UD 794 and UD 663) may be included in new CVT	Already included in coriander CVT 2012 Series IX.
TECHNICAL SESSION -III CROP MANAGEMENT		
CARDAMOM		
32	The delay in taking up the fertigation experiment at Pampadumpara centre need to be communicated to KAU (Action Pampadumpara center)	New scientist has joined and the experiment started in March 2012
33	In fertilizer & micro-nutrient trials basic soil data and the nutrient build up before and after the harvest need to be recorded and presented (Action Dholi center)	The soil data and national built up data were presented.
GINGER &TURMERIC		
34	In micronutrient trial, the role of specific micronutrients may be assessed in detail based on its deficiency status. Photographs of prevalent micronutrients deficiencies can be presented if the deficiency is severe and widespread.	It will be followed accordingly.

35	Irrigation scheduling experiments on turmeric need to be executed with utmost care.	Followed as suggested.
36	Effect of micro nutrients on turmeric experiment should be started.	This experiment has also been started in 2011 at Pundibari center
37	Standardization of water requirement of turmeric through drip irrigation should be started. An experiment is in progress at Coimbatore.	A drip irrigation experiment was started at Kammarapalli and has been started at Pundibari centre from 2012 - 2013 season onwards.
38	Pooled analysis of data should be done and C: B ratio worked out before recommendation of a technology.	This will be followed accordingly.
CUMIN, FENNEL & FENUGREEK		
39	Large scale field demonstrations may be laid out for seed treatment or soil application of Rhizobacteria and publication/bulletins maybe published	Implemented. This technologies being popularized in farmers fields by Jagudan, and Jobner centres. The new trials on seed pelleting technology were also being conducted and demonstrated in farmer's field.
TECHNICAL SESSION- IV CROP PROTECTION		
Black pepper		
40	PEP/CP/6.2, The experiments on evaluation of reported resistance of *E. Subumbrans* to *Erythrina* gall wasp may be continued	The experiment is being continued
Ginger		
41	GIN/CP/6.1 The experiment may be closed and the data on incidence of rhizome rot in various regions may be consolidated and presented (Action. Dholi center)	The experiment may be allowed to continue since majority of regions of district of the state is yet to be surveyed by Dholi center.
Coriander		
42	COR/CP/6.2 Survey for incidence of stem gall disease may be continued	Experiment is being continued

TECHNICAL SESSION: I
GENETIC RESOURCES

Chair persons : **Dr. Umesh Srivastava, ADG (Hort.), ICAR, New Delhi**
Dr. Balraj Singh, Director, NRCSS, Ajmer.

Rapporteurs : Dr. (Mrs) N. Shoba, TNAU, Coimbatore
Dr. K. V. Saji, IISR, Kozhikode

Dr. K. Nirmal Babu, PC Spices, presented the action taken report of the previous workshop. Various suggestions raised during the report presented are:

The possibility of a separate fund, if possible, may be provided , at AICRP head quarters at Calicut to meet the additional travel and expenses.

Status report on exploration, collection for seed spices need to be prepared (Action: NAGS- Seed spices).

Seeds of CVT should be sent in sufficient quantity. Care should be taken to send good quality seeds to other centers (Action: All centers)

For characterization and evaluation, a data sheet in uniform format may be prepared for seed spices. This will be forwarded to all the centers for recording the observations (Action: (Dr. E.V.D. Sastry, SKRAU, Jobner & DR. Kakani, NRCSS, Ajmer)

NAGS centers will include the AICRPS centres in PGR platform for getting more funds and resources for collection, evaluation and comments maintaining the germplasm of AICRP centres. (Action: PC Spices)

The committee constituted for monitoring various CVT on seed spices are handicapped by lack of TA funds.

Germplasm accessions of different centres may be shared, characterized and evaluated.

One scientist may be identified as a nodal person for each crop for monitoring and compiling the research work.

Recommendations

Black pepper: The germplasm accessions having unique characters may be registered with NBPGR for their unique characters.

Large cardamom: The germplasm accessions having unique characters may be registered with NBPGR.

Cardamom: Unexplored areas may be identified for further collection. New farmer's "varieties" may be collected for involving in the breeding programme.

Ginger: Raigarh center may concentrate in collecting the local germplasm as good diversity is available in the tribal areas.

TECHNICAL SESSION: II
CROP IMPROVEMENT

Chairpersons : **Dr. B Krishnamoorthy,** Head –in-charge, Crop Improvement IISR, Kozhikode
Dr. E. V. D. Sastry, SKRAU, Jobner

Rapporteurs : Dr. R R Nair, IISR, Kozhikode
Mr. K. Giridhar, Dr. YSRHU, Guntur

The session started with the brief introduction by the Chair. They advised the scientists concerned to present the salient achievements of the trials by comparing the performance at different centres. Subsequently the reports on different trials were presented by scientists concerned and decisions were taken.

General recommendation

Inclusion of the underutilized spices like Ajowan in AICRPS may be considered.

A separate CVT for Leafy spices (Fenugreek/Coriander), another CVT for testing of Fenugreek/Coriander under rain-fed conditions may be considered.

Black pepper:

Varietal release proposal for Acc.5308 may be prepared and submitted in variety release session.

Under CVT-2000-Series V PEP/C1/3.2, comparative table of different centers may be prepared for better conclusion. The trial may be concluded if all the required data is generated.

Cardamom:

The experiment CVT- 2005 Series V –CAR C1/3 is concluded.

The experiment has shown that location specificity among the genotypes tested; hence the genotypes for specific location may be identified.

MHC-26 has performed well in the CVT. So it may recommend for release.

The experiment CVT-2009- CAR C1/3.6 will be continued for one more year.

Ginger:

The data collected G x E Trial 2009: GIN/CI/3.2 may be analyzed. All the replicated data including yield, quality and weather data up to 2012 may be provided to coordinator without delay, by all the centers involved. Dr. D. Prasath, IISR, Kozhikode is requested to do the statistical analysis. The centers where 3 year data is not available may continue the trial for 1 more year.

Promising entries from the experiment IET-2005: GIN/CI/3.2 may be tested in new CVT-2013 comprising 2 entries from IISR, 3 from Pottangi, 1 from Dholi along with national check Varada and local check.

Turmeric:

The trial IET 2006-: TUR/CI/3.2 completed the three year testing period, and may be concluded. The centers where 3 year data is not available may continue the trial for 1 more year. The promising varieties viz. four entries from IISR, two from Pundibari, two from Kumarganj and two from Pottangi will form new CVT. IISR will be one of the center for AICRPS trial.

Based on the performance in G x E trial, the Duggiralla selection is identified as promising. Dr. Uma Maheswari will prepare a proposal for presentation to varietal release committee.

All the centers will give replicated data for all the characters along with weather parameters and the same will be submitted to the Co-ordinator. Dr. D. Prasath of IISR will help in analyzing the same and to draw suitable conclusions.

Tree Spices:

Based on the performance selection 3 of clove is identified for state variety release .

Coriander:

COR/CI/3.3: The IETs at several centers completed three years. The promising entries from different centers will be included in a new CVT.

COR/CI/3.2: The CVT 2009 completed three years of testing. This may be concluded and based on the performance in different locations, DH 220, DH 223 and UD 475 found superior and may be submitted for varietal release.

Cumin:

The present IET CUM/CI/3.4 will be dropped as the centers reported low yield than checks. A new IET may be initiated.

The CVT CUM/CI/3.2: completed 2 years testing at Jagudan and 3 years at Jobner. The trial will be continued for 1 more year and the CVT of Jobner was to be continued for one more year as the trial was partially damaged by wilt.

The CVT at Jagudan have non-significant differences between entries and some entries were found yielding low in comparison to check GC4 which is the ruling variety with highest yield. It was therefore recommended to be continued for one more year. It was also recommended to compare the performance with another National Check GC2 also for arriving at conclusions.

Fennel:

FNL/CI/3.4: As the present IET at centers completed three years testing, it is recommended to evaluate promising entries from different centers in a new CVT.

FNL/CI/3.2: The CVT completed 3 years of testing, based on the performance around the centers/years; UF 281 and HF 143 were found superior and may be considered for varietal release.

Fenugreek:

FGK/CI/3.2: The entries qualified in the IET viz. LFC 98, LFC 116, and JF g 245, RMt 351, NDM 61, NDM 69, NDM 72, RM 188, RM 194, AFG 5 and AFG 6 will be tested in a new CVT.

FGK/CI/ 3.4: The CVT completed three years' testing. Based on the performance FGK 36, FGK 27 and FGK 28 were found superior and may be considered for varietal release.

TECHNICAL SESSION: III

CROP MANAGEMENT

Chairpersons : **Dr. T. John Zachariah,** Head, Crop Production & PHT, IISR, Kozhikode
Dr.S.K Malhotra, ICAR, New Delhi

Rapporteurs : Dr.(Mrs) N.K. Leela, IISR, Kozhikode
Dr. K. Ravindra Kumar, Dr YSRHU, Chintapalli.

General recommendations

1. While conducting integrated management trials in all crops, fertilizers may be applied as half the recommended dose of NPK and remaining half as organic (like FYM and other inputs).
2. While giving recommendations in organic farming trials, care should be taken on bio safety aspects on organic products like Panchagavya, jeevamritha, vermiwash etc.
3. As quality control is most important in organic farming trials, sample should be analyzed in Acredited Test laboratories.
4. Experiments on identification of drought/alkalinity tolerance sources in coriander, cumin, fennel and fenugreek may be shifted to crop improvement part and identified lines may be incorporated in comparative variety trial (CVT).
5. In all experiments yield data units may be presented uniformily.
6. Benefit: cost ratio should be worked out for all concluded experiments.
7. In completed experiments the recommendations should be translated into technology and popularized through technical bulletins.

Crop specific recommendations

Cardamom

In irrigation experiments water-use efficiency of each treatment should be worked out.

Pest and disease incidence may be recorded in organic farming trials.

Ginger

Experiments on organic farming in ginger may be concluded and pooled data may be submitted for analysis .

Turmeric

Experiment on effect of organic farming may be analysed and specific recommendations may be brought out as technology, and the experiment may be concluded if all the objectives are met.

The technology generated in experiment on standardization on processing in turmeric may be popularized in North East and other states.

Tree spices

Cinnamon

Experiment on harvest technology (peeling) studies on cinnamon may be concluded and recommendations may be brought out.

Seed Spices

Coriander

Experiment on effect of micronutrients on yield of coriander may be concluded and specific recommendation may be brought out.

Recommendations on the experiment on irrigation management for sustainable coriander production may be brought out.

TECHNICAL SESSION: IV
CROP PROTECTION

Chairman	:	**Dr S. Devasahayam**, Head, Crop Protection, IISR, Kozhikode
	:	**Dr Shekhawat,** SKRAU, Jobner
Rapporteurs	:	Dr Suseela Bhai, IISR, Kozhikode
		Dr (Mrs.) Meenu Gupta, Solan

In this session, 10 presentations were made in 10 crops covering 19 experiments. The major decisions taken in various projects are highlighted here.

General recommendations

A new project on surveillance and developing forecasting models against pests and diseases of seed spices may be formulated by NRCSS, Ajmer for implementation in various coordinating centers.

The experiment on screening of fenugreek germplasm may be reported under crop improvement.

Black pepper

PEP/CP/5.3 Trial on management of *Phytophthora* foot rot of black pepper in new plantation

Pechiparai centre will start the experiment during the current year and other centers will continue the experiment.

PEP/CP/6.2 Management of Erythrina gall wasp, a popular standard of black pepper.

The identity of *E. subumbrans* is to be confirmed.

Small cardamom

CAR/CP/6.7 Evaluation of new insecticides /bio pesticides in cardamom against thrips and shoot and capsule borer.

The experiment on management of cardamom thrips at Mudigere center is concluded and suitable recommendation is to be brought out.

Ginger

GIN/CP/6.1 Disease surveillance and etiology of rhizome rot in ginger.

The experiment may be concluded and data from various centers may be consolidated.

GIN/CP/6.6 Management of soft rot of ginger (Bio fumigation using mustard).

The experiment may be concluded and the promising treatments may be demonstrated in farmer's fields.

GIN/CP/6.7 Management of soft rot of ginger (Bio fumigation using cabbage).

The experiment may be concluded except at Ambalavayal, Pampadumpara and Pundibari and the promising treatments may be demonstrated in farmer's fields.

GIN/CP/6.8 Management of bacterial wilt of ginger (Bio fumigation using mustard).

The experiment may be concluded except at Pundibari and the promising treatments may be demonstrated in farmer's fields.

GIN/CP/6.9 Management of bacterial wilt of ginger (Bio fumigation using cabbage).

The experiment may be concluded except at Pampadumpara and Pundibari and the promising treatments may be demonstrated in farmer's fields.

Turmeric

TUR/CP/7.1 Survey and identification of disease causing organism in turmeric and screening of turmeric germplasm against diseases.

The promising tolerant lines against leaf spot and leaf blotch may be evaluated in CVT at respective centres (Pundibari, Coimbatore, Dholi and Raigarh).

TUR/CP/7.2 Management of foliar diseases of turmeric .

The experiment may be concluded and the promising treatments may be demonstrated in farmer's fields.

Tree spices

TSP/CP/1.1 Survey for disease incidence in tree spices

The experiment on survey and management of diseases in tree spices may be differed for the time being .

Coriander

COR/CP/6.3 Management of stem gall disease in coriander.

The experiment may be continued and the best treatment may be demonstrated in the farmer's fields.

Cumin

CUM/CP/6.1 Management of wilt and blight disease in cumin

The experiment is to be concluded and the best treatments may be demonstrated in farmer's fields.

CUM/CP/6.2 Survey for identification of yellowing causing organism in cumin

Since no organism was isolated, so it was recommended to study the role of plant nutrition, soil factors and involvement of phytoplasma in yellowing of cumin.

Fennel

FNL/CP/6.2 Field evaluation of different insecticides, botanicals against seed midge *Systole albipennis.*

The treatment with endosulfan may be substituted with a suitable insecticide. All the centers may adopt the same treatments as indicated in the proceedings of the XXII workshop. Residues of insecticides are to be determined before recommendations.

TECHNICAL SESSION: V

VARIETAL RELEASE

Chairpersons : **Dr. Umesh Srivastava,** ADG (Hort.), ICAR, New Delhi
Dr. M. Anandaraj, Director, IISR, Kozhikode

Rapporteurs : Dr. S. K. Tehlan, CCS HAU, Hisar
Dr. K. Kandiannan, IISR, Kozhikode

General recommendations

The varieties proposed may be registered with NBPGR/PPV & FRA, wherever, applicable.

The centers may provide required additional data within three weeks to PC for consideration in totality.

In future, all the proposal should be submitted in a prescribed format with all the necessary data from collection to, evaluate to MLT without which they will not be considered.

Package of Practices under which the variety was tested may be added in varietal release proposal.

Only AICRPS tested variety will be considered for recommendation under AICRPS. Centers may have to submit separate proposal to States for consideration and state level release as each states have their own evaluation procedures.

There were eighteen varieties were proposed for consideration i.e.

Black pepper	:	2
Cardamom	:	3
Turmeric	:	2
Clove	:	1
Coriander	:	3
Fennel	:	2
Fenugreek	:	4
Ajowain	:	1
Total		18

Nine new varieties were recommended for release. Sufficient planting material of all the varieties need to be generated for supply once there varieties were released by central /state varietal releases committee. One set of all the released varieties will be deposited at NAG Center.

Black pepper

Variety proposed by Central Horticultural Experimental Station, Chettali in the name 'Arka Coorg Excel ' is not considered as a national variety as it was tested only two locations in the same agro-ecological region (Kodagu) also it is not tested under AICRPS centers. However, by considering its unique characters like consistent yield and lengthy spikes, proposal may be submitted to Karnataka State Varietal release Committee for consideration also it may registered with NBPGR & PPV & FRA, New Delhi. The planting material may be provided to AICRPS Centre for testing under new CVT.

Proposal 'Panniyur-9' by Pepper Research Station, Panniyur, KAU is deferred as year wise yield data, observations on pest and disease resistance is not presented. It is suggested to present in next workshop with required data in the prescribed format. Meantime sufficient planting material also needs to be generated for distribution.

Cardamom

Two varieties of cardamom viz., PS-27 and S-1 submitted by Cardamom Research Station, Pampadumpara, KAU is differed as additional data is required. They were asked to re-submit with required data next year.

ICRI-8 proposed by ICAR Station Sakleshpur (Spices Board) is recommended for Karnataka State release under rain fed with live saving irrigation. Appropriate POP under which they were tested should be provided and planting materials of this variety may be provided to NAGS, Appangala.

Turmeric

NDH-9 (Narendra Haldi-3) from Kumarganj, Faizabad is considered, if data on nematode resistance is made available within three weeks time. Required data submitted and recommended for release.

Duggirala Red from Kammarapally may be re-submitted with detailed yield data in a prescribed format for consideration in next year.

Clove

PPI (CL) 1 from HRS, Pechiparai is recommended for release for the state of Tamil Nadu as a state variety.

Coriander

DH 220 from Hisar is recommended and data on powdery mildew resistance may be provided within three weeks to PC.

Proposal of the varieties RCr-475 is differed. It was suggested to register with NBPGR and generate additional data on leaf yield and disease resistance for future consideration.

Suguna (LCC-236) is recommended for Gujarat, Andhra Pradesh, semi arid eastern plains of Rajastan and Eastern Plain Zone of Uttar Pradesh.

Fennel

HF-143 from Hisar is recommended for national release.

RF-281 from Jobner is also considered and state wise yield over the years may be provided within three weeks.

Fenugreek

Ajmer Fenugreek-3 from NRCSS, Ajmer for yield stability and quality and Rmt-365 from Bikaner for yield is recommended for release.

Lam Methi-3(LFC-103) from Lam, Guntur is deferred for want of additional data on adoptability to moisture stress and the same may be proposed during next workshop with data. HM-348 from Hisar was also differed.

Ajowain

Hisar Ajowain-18(HAJ-18) is recommended for state level release for Haryana State.

TECHNICAL SESSION: VI

TRANSFER OF TECHNOLOGY AND ON FARM TRIAL

Chairpersons : **Mr. P. A. Mathew,** IISR, Kozhikode
Dr. Homey Cherian, Director in-charge, DASD, Kozhikode

Rapporteurs : Dr (Mrs). V. Anupama, Panniyur, KAU
Dr. R. Senthil Kumar, IISR, CRC, Appangala

General Recommendation:

Director IISR suggested, use of Rhizobacterium in seed spices should go as a technology from AICRP-spices to all the seed spices centers for generating data for its commercialization.

Director NRSS suggested any better performing treatment consecutively three years should go as technology invariably from any crop.

Technology to be transferred or OFT should be highlighted while presenting the results of the experiment in future presentations.

The following technologies were recommended with modification/clarification suggested.

Black pepper

Management of scale insects of black pepper with organic products .

Instead of giving commercial name (NEEM GOLD)"Neem formulation" may be given

Small cardamom

Effect of combined application of entomopathogenic nematodes and Imidacloprid in the management of cardamom root grub.

Since the treatments included is combining with yellow labeled chemical instead of combinations of such chemical, single chemical which gives on par result may be considered as technology.

Turmeric

Fertigation technology for turmeric (Coimbatore)

Application of 100% RDF with urea and potash as straight fertilizers and P as water soluble fertilizer weekly once which gives an yield of 49.11 t/ha with BC ratio of 2.94.

Nutrient management (Dholi)

For organic cultivation of turmeric soil application of FYM @30 t/ha + Vermicompost @20 q/ha + Neem oil cake @ 8 q/ha is recommended since it gave yield 48.82 t/ha (68% increase in yield over control) and C: B ratio of 1:3.64.

Application of bio-fertilizer *Azospirillum* (Dholi)

Soil application of inorganic N @150 kg/ha + *Azospirillum* @1.5 kg/ha + FYM @5 t/ha is recommended since it gave a yield of 56.61 t/ha (35% increase in yield over control) and C: B ratio of 1:5.27.

Coriander

Nutrient supplementation through organic manure in coriander (Coimbatore (TN) & Guntur (AP).

Nutrient supplementation through the application of FYM 50% + vermi compost (50%) recorded a seed yield of 753.25 kg with the B:C ratio of 2.05 which was on par with application of chemical fertilizer alone (RDF). This technology is recommended for coriander growing areas of Andhra Pradesh and Tamil Nadu.

Micronutrient requirement (Coimbatore in Tamil Nadu)

For the saline soils where there is zinc deficiency (less than 2 ppm) spraying of 0.5% of zinc sulphate (2 spray- 45 and 60 days after sowing) recorded the highest seed yield of 772.44 kg/ha with BC ratio of 2.10 in coriander.

Role of micro-irrigation in the production of coriander in rainfed vertisols (Guntur in AP).

If water is available for only one irrigation, irrigation with Raingun/Sprinkler at flower initiation is beneficial. If water is available for two irrigations irrigation with Raingun/Sprinkler at flower initiation and grain filling stages is highly beneficial. This is suitable for rainfed heavy soils that prevail in coriander growing areas across the country. Demonstration of rain gun may be popularized in the farmers plot.

Integrated nutrient management (Dholi in Bihar)

Soil application of inorganic N @33 kg/ha + *Azospirillum* @1.5 kg/ha + FYM @ 5 t/ha is recommended since it gave a yield of 1.98 t/ha (56% increase in yield over control) and C: B ratio of 1:1.77.

Cumin (Jagudan)

Seed treatments of *pseudomonas florescence* @10 g/ kg seed + soil application of T*richoderma harzianum* @ 2.5 kg/ha and *pseudomonas florescence* (IISR6) 10^8 cfu as a spray at 60 DAS is recommended

Fenugreek

Integrated nutrient management

Soil application of inorganic N @13kg/ha + *Azospirillum* @1.5 kg/ha + FYM @ 5t/ha is recommended since it gave yield 2.29 t/ha (67% increase in yield over control) and C: B ratio of 1:2.06.

Seed treatment with Rhizobacterium FL-18

Seed treatment with rhizobacterial strain from IISR (FL-18) @ 20g/ kg seed is recommended (since it gave an yield of 2. 00t/ha (54% increase in yield over control) and C:B ratio of 1:1.78).

TECHNICAL SESSION: VII
PLENARY SESSION

Chairpersons : **Dr. S. Edison,** Former Director, CTCRI, Trivandrum & Former Project Coordinator, AICRP on Spices, IISR, Kozhikode.

Dr. V.A. Parthasarathy, Emeritus Scientist, ICAR & Former Director, IISR, Kozhikode

Rapporteurs : Dr. D. Prasath, IISR, Kozhikode
Dr. V. Srinivasan, IISR, Kozhikode

Dr. S. Edison, Former Director, CTCRI, has reminded that the AICRPS has grown under the effective participation of all administrative and scientific colleagues, and the role played by AICRPS in increasing Spices production, productivity and management. He urged the scientists to continue the good work keeping in view of local climate, farmer, marketing and industry requirement.

Dr. V. A. Parthasarathy, Former Director, IISR, Kozhikode and Emeritus scientist, IISR, Kozhikode urged the scientists to strictly follow the underlying the scientific principle and work with good understanding, uniformity and collaboration. He urged importance of genetic purity and identity with clear distinguishing characters, without which getting varieties could get mixed up.

Dr. S.K. Malhotra, Principal Scientists, (Hort.), ICAR, New Delhi has complimented the AICRPS contribution, and promised continued support and guidance for AICRP from the Council.

Specific Recommendations

Genetic resources

1. Passport, Evaluation and conservation data on germplasm may be provided to the PC and NAG center for compilation. Status report on evaluation of germplasm material available at various centers may be prepared.
2. Dr. M. Ananadaraj, Director, IISR and Dr. Balraj Singh Director, NRCSS offered best possible cooperation, collaboration and use of the facilities for AICRPS scientists to increased their standards of research publication.
3. IGPRI descriptors or standard descriptors available may be provided to all centers for avoiding duplicates.
4. Dr. Balraj Singh, Director, NRCSS has agreed to help in formulation of protected cultivation, strategies and models for Coriander and Fenugreek.
5. Proforma with minimum descriptors for avoiding duplicates in germplasm of spices may be prepared. Highest priority need to be the given to registration all unique accessions available at each center. Unique accessions and farmer varieties need to be collected and conserved especially in perennial tree and tropical spices and if needed with a project mode funding.

Crop Improvement

1. Time of maturity need to be noted for information on quality of coriander
2. In new IET for fenugreek, HM 314 (Hisar) may be included.
3. Concept note /Status paper on Ajowan may be prepared and based on need may be taken up as a mandatory crop.

Crop Management

1. IISR may be taken a lead in formulating standards, codes for organic farming in spices.

Crop protection

1. Best technologies for FLD may be identified and may be done for consecutive seasons at appreciable area.

Variety release

List of all released variety may be prepared and obsolete varieties may be identified. Sufficient quantity of planting materials should be made available while proposing a document for variety release.

RF 281 (Fennel) is recommended to release as a variety.

Transfer of technology

1. Recommendation/Technologies generated may be communicated to SAU's/KVK's for inclusion in Package of practice recommendation.

The following points may be included in New Research Programme

Off season production of coriander

1. Off season production of coriander.
2. Fertigation studies in ginger to reduce labour.
3. Micro rhizome studies at all turmeric & ginger centers for reducing planting materials requirement.
4. Adopting Cropping system models in existing plantation with mechanization
5. Programmes on drip irrigation & protected cultivation may be identified with the guidance of Director-NRCSS, Ajmer.
6. To develop INM/IPM relevant to climate change.
7. In XII plan, KAU may be included for collecting nutmeg genetic resources. Dapoli, Thrissur and Pechiparai may be identified to conserve tree spices and genetic resources in a project mode.
8. Research publications for AICRPS need to be improved.
9. Database development of Germplasm of AICRPS.
10. All the technologies developed by AICRPS centers may be documented and uploaded in AICRPS Website.
11. Focus on mechanization wherever possible as in the case of turmeric to mitigate labor shifting.

New Research Programme: 1	
Crop	Nutmeg
Title of the programme	Collection of unique Germplasm in Tree spices (nutmeg , Clove)
Centres	KAU, IISR, Pechiparai
Date/Year of start	2013
Duration of the Project	10 years
No. of treatments/genotypes with details	1. Collection from Ettumanur (Collected by IISR) 2. Collection from Idukki (Collected by pampadumpara) 3. Collection from Dharwad (Collected by IISR) 4. Collection from Dapoli (Collected by Dapoli) 5. Collection from Pechiparai
Design	--
No. of replications	--
Plot size/spacing	--
No. of plants /plot / treatment	--
Date of sowing/planting and season	--
Methodology & Procedure to be adopted	Preliminary Data to be collected for mother tree
Observation to be recorded in detail	1. Fresh Weight of fruit 2. Dry Weight of seed 3. Dry Weight of mace 4. Total dry recovery 5. Size of seed 6. Colour of mace 7. Colour of nutmeg seed 8. Volume of nut 9. Canopy spread 10. Height of tree at 9 years 11. Trunk girth at base (cm) (NS & EW) 12. Nature of flowering 13. Growth habit (Tree canopy) 14. Time taken for first flowering (years) 15. Number of fruit per tree 16. Reaction to major diseases, pest 17. Reaction of abiotic stresses

(The superior or unique mother plants will be identified and data collected for the next three years, grafts (25) and seeds bigger (100 each) will be procured and added to germplasm

New Research Programme: 2	
Crop	**Large Cardamom**
Title of the programme	Germplasm collection, characterization, evaluation and conservation to identify disease escapes
Centres	Gangtok (ICAR)
Date/Year of start	2013-14
Duration of the Project	Three years
No. of treatments/genotypes with details	Collection, multiplication survey and screening
Design	--
No. of replications	5
Plot size/spacing	--
No. of plants /plot treatment	--
Date of sowing/planting and season	--
Observation to be recorded in detail	1. Growth 2. Plant height (cm) 3. No. of bearing suckers 4. No. of panicle 5. Length of panicle 6. No. of capsules/plant 7. Yield & quality 8. Incidence of leaf blight 9.Incidence chirkey 10. Incidence of furkey

New Research Programme: 3	
Crop	**Black pepper**
Title of the programme	Hybridization to evolve varieties tolerant to biotic and abiotic stresses
Centres	Panniyur
Year of start	2013-14
Duration	Five years
Parentenal combinations	P1 x Arakkulamunda, Kottanadan x Ceylon, P x PRS 78 (Karinthakara) , P1 x PRS 48(Shimoga), P1 x PRS 64, P1 x Kottanadan

New Research Programme: 4	
Crop	**Cardamom**
Title of the programme	Evaluation of promising small cardamom (*Elettaria cardamomum* (L.) Maton) cultivars / varieties for organic cultivation
Centre	Pampadumpara, Mudigere
Year of start	2013
Duration of the project	8 years
Design	RBD
Number of treatments/ genotypes with details	Varieties 1. PV 1 2. PV 2 3. S 1 4. PS 27 5. PL.NO 14 6. NJALLANI 7. ICRI 2
Number of replications	Three
Plot size/spacing	3 x3 m
No. of plants /plot treatment	10
Date of sowing	June-2013
Layout Plan	As per the requirement of the design
Methodology & Procedure to be adopted	The cultivars will be raised without any chemical fertilizers and pesticides in organic system of management as per KAU , 2009.
Observations to be recorded	Tiller height, tiller number, no of productive tillers, leaf length, leaf width, root morphology, no of panicles per tiller, pest and disease incidence, fresh weight, dry weight, dry recovery percentage, 100 capsule weight, 100 capsule volume, essential oil content, oleoresin content, soil and plant tissue analysis for nutrient contents.

New Research Programme : 5	
Crop	**Ginger**
Title of the programme	Initial evaluation trial on ginger
Centre	Dholi
Year of start	2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1- RG-18 T_2 -RG-1 T_3 -RG-30 T_4-G-34 T_5 -RG-16 T_6-RG-2 T_7-RG-17 T_8-RG-29 T_9-RG-45 T_{10}-Nadia check
No. of replications	3
Plot size/spacing	3 m x 1.0 m, 30 cm x 25cm
No. of plants/plot/treatment	40 plants per plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	09.06.2013
Lay-out plan	As per the requirement of the design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1. Germination Percentage 2. Height of the plant 3. No. of tillers per plant 4. No. of leaves per tiller 5. No. of days to maturity 6. Disease and pest incidence 7. Rhizome yield per plot or per hectare 8. Essential oil, oleoresin content and dry recovery %

New Research Programme : 6	
Crop	**Ginger**
Title of the programme	IET on Ginger
Centre	Sikkim (ICAR)
Year of start	2013-14
Duration of the project	3 years
Design	RBD
Number of treatments/ genotypes with details	Genotypes/ varieties may be collected
Number of replications	Three
Plot size/spacing	Bed size 3 m x1 m, 25 m x 30 cm
No. of plants /plot treatment	40 plants/plot
Date of sowing	----------
Layout Plan	As per the requirement of the design
Methodology & Procedure to be adopted	--------
Observations to be recorded	1. Germination Percentage 2. Height of the plant 3. No. of tillers per plant 4. No. of leaves per tiller 5. No. of days to maturity 6. Disease and pest incidence 7. Rhizome yield per plot or per hectare 8. Essential oil, oleoresin content and dry recovery %

New Research Programme : 7	
Crop	**Turmeric**
Title of the programme	Initial evaluation trial on turmeric
Centre	Dholi
Year of start	2012-13
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1- RH-22 T_2 -RH-24 T_3 - RH-2/80 T_4- RH-413 T_5 -RH-415 T_6 - RH-417 T_7- RH-9/90 T_8- RH-421 T_9 -RH-7/80 T_{10} -RH-406 T_{11}- RH-401 T_{12} - Rajendra Sonia L.C
No. of replications	3
Plot size/spacing	3.0 m x 1.00 m, 30 cm x 20cm
No. of plants/plot/treatment	40 plants per plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	June 2013
Lay-out plan	As per the requirement of the design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1Height of the plant 2No. of tillers per plant 3No. of leaves per tiller 4No. of days to maturity 5Disease and pest incidence 6Rhizome yield per plot or per hectare 7Curcumin, essential oil, oleoresin content and dry recovery %

New Research Programme : 8	
Crop	**Turmeric**
Title of the programme	IET on turmeric
Centre	Sikkim
Year of start	2013-14
Duration of the project	3 years
Design	RBD
Number of treatments/ genotypes with details	Genotypes/ varieties may be collected
Number of replications	Three
Plot size/spacing	Bed size 3 m x1 m, 25 m x 25 cm
No. of plants /plot treatment	40 plants/plot
Date of sowing	--------
Layout Plan	As per the requirement of the design
Methodology & Procedure to be adopted	--------
Observations to be recorded	1. Height of the plant 2. No. of tillers per plant 3. No. of leaves per tiller 4. No. of days to maturity 5. Disease and pest incidences 6. Rhizome yield per plot or per hectare 7. Curcumin, essential oil, oleoresin content and dry recovery %

New Research Programme : 9	
Crop	**Turmeric**
Title of the programme	Initial evaluation trial on turmeric (IET)
Centre	Raigarh, Pottangi
Year of start	2013 - 2014
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	IT- 5 IT-16 IT- 7 IT-23 IT- 8 IT-36 IT- 9 IT-38 IT- 10 Narendra Haldi -1(Check)
No. of replications	3
Plot size/spacing	3.0 m x 1.0 m & 30 cm x 20 cm
No. of plants/plot/treatment	40 plants/plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Kharif, sowing time June last week.
Lay-out plan	As per the requirement of the design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1Height of the plant 2No. of tillers per plant 3No. of leaves per tiller 4No. of days to maturity 5Disease and pest incidence 6Rhizome yield per plot or per hectare 7Curcumin, essential oil, oleoresin content and dry recovery %

New Research Programme : 10	
Crop	**Coriander**
Title of the programme	Initial evaluation trial on coriander
Centre	Dholi
Year of start	Rabi 2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1- RD-412 T_2 - RD-414 T_3 - RD-41 T_4 - RD-417 T_5 -RM-202 T_6 - RD-366 T_7 - RD-416 T_8 - RD-393 T_9 - Rajendra Swati (L.C)
No. of replications	3
Plot size/spacing	3.0 m x 1m,30 cm x 20 cm
No. of plants/plot/treatment	20 plants per /row
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	--
Lay-out plan	As per the requirement of the design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1. Plant height (cm) 2. Primary branches per plant 3. No. of secondary branches/plot 4. Days to 50% flowering 5. Umbel per plant 6. Umbellets per umbel 7. Seeds per umbellate 8. Test weight (g) 9. Seed yield (kg/ha) 10. Disease and pest incidence, if any 11. Quality parameters

New Research Programme:11	
Crop	**Coriander**
Title of the programme	Initial Evaluation Trial(Leafy types)
Centres	Guntur
Date/Year of start	Rabi 2012-13
Duration of the Project	Three years
No. of treatments/genotypes with details	LCC-145, LCC-146, LCC-158, LCC-162, LCC-180, LCC-200, LCC-227, LCC-306, LCC-307, LCC-308, LCC-309, LCC-310, Sadhna, APHU Dhania-1(C) and LCC-236(C)
Design	R.B.D
No. of replications	Three
Plot size/spacing	4 x 2.4 m^2
No. of plants /plot / treatment	6 rows /plots
Date of sowing/planting and season	(Rabi)
Methodology & Procedure to be adopted	As per the recommended POP
Observation to be recorded in detail	1. Days to germination 2. Plant height (cm) at harvest (Harvest at 45 DAS) 3. No. Of leaves per plant (10 Plants observation) 4. 1st leaf length (cm) 5. 2nd leaf length (cm) 6. 3rd leaf length (cm) 7. Fresh plant yield (gm) 8. Fresh plant yield of net plot (kg) ie. Leaf yield 9. Disease & Pest incidence 10. Market price (Rs. Per kg)

New Research Programme : 12	
Crop	**Fennel**
Title of the programme	Initial evaluation trial on fennel
Centre	Dholi
Year of start	2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1- RF-16 T_2 -RF-38 T_3 -RF-57 T_4 -RF-63 T_5 - RF-54 T_6 -RF-59 T_7 -RF-62 T_8 - RF-15 T_9 -RF-68 T_{10} - GF-11 N.C T_{11}- RH-401 T_{12} - R. Saurabh L.C
No. of replications	3
Plot size/spacing	3.0 m x 2.4 m,60 cm x 60cm
No. of plants/plot/treatment	20 plants per /row
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Rabi
Lay-out plan	As per the requirement of the design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1. Plant height (cm) 2. Days to flowering 3. Branches per plant 4. Umbels per plant 5. Umbellets per plant 6. Seeds per umbel 7. Test weight 8. Seed yield per ha 9. Essential oil

New Research Programme : 13	
Crop	**Fenugreek**
Title of the programme	Initial evaluation trial on fenugreek
Centre	Dholi
Year of start	2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1- RM-170 T_2 -RM-16 T_3 - RM-208 T_4 -RM-196 T_5 -RM-202 T_6 - RM-18 T_7 - RM-14 T_8 - RM-204 T_9 - Rajendra Kanti (L.C)
No. of replications	3
Plot size/spacing	3.0 m x 1m, 30 cm x 10cm
No. of plants/plot/treatment	20 plants per /row
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Rabi
Lay-out plan	
Methodology & Procedure to be adopted	Recommended package of practices will be followed
Observation to be recorded in detail	1. Height of the plant. 2. No. of primary branches per plant 3. No. of secondary branches per plant 4. Days to 50% flowering 5. No. of pods per plant 6. No. of grains per pod 7. Length of pod 8. Days to maturity 9. Test weight 1000 seeds (g) 10. Umbels per plant 11. Umbellets/umbel 12. Seeds per umbel 13. Yield (kg/ha) 14. Disease & pest incidence

New Research Programme : 14	
Crop	**Turmeric**
Title of the programme	Coordinated Varietal Trial – 2009
Centres	IISR, Pottangi, Kumarganj , Pundibari
Date/Year of start	2013-14
Duration of the Project	Three years
No. of treatments/genotypes with details	IISR- Acc 48, Acc 79 Pottangi- PTS-12, PTS- 8, PTS-55 Pundibari-TCP 64 Suprabha Local check Kumarganj NDH 8, NDH 79, NDH 98
Design	RBD
No. of replications	5 replications
Plot size/spacing	3 m x 1m bed; 30 cm x 25 cm spacing
No. of plants /plot / treatment	40 plants /plot
Date of sowing	Kharif season
Methodology & procedure	Recommended package of practices will be followed
Observation to be recorded in detail	1. Plant height (cm) 2. No. of tillers/plant 3. No. of leaves/tiller 4. No. of days for maturity 5. Yield kg/plot 6. Disease & pest incidence 7. Quality - curcumin, oleoresin, essential oil and dry recovery % .

New Research Programme : 15	
Crop	**Ginger**
Title of the programme	CVT on ginger 2013
Centers	IISR, Pottangi, Dholi, Pundibari
Year of start	2013
Duration of the project	3 years
No. of entries	Pottangi,-V_1S_1-2 IISR - Acc 219, Acc 25 Dholi-RG-32, RG-3 Pundibari -GCP-49 Varada National check Suprabha Local check
Design	RBD
No. of replications	3 replications
Plot size/spacing	Bed size 3 m x 1m, 25 cm x 30 cm
No. of plot/plot treatment	40 plants/plot
Observation to be recorded	1. Morphological and yield characters (plant height, leaf area, number of tillers, yield per bed, dry recovery, yield per hectare) 2. Quality parameters - crude fiber, oil, oleoresin at harvest 3. Soil nutrient status before planting and at harvest (major, secondary & micronutrients) *Based on nutrient status of soil fertilizer recommendation will be given.
Observation to be recorded	1. Germination Percentage 2. Height of the plant 3. No. of tillers per plant 4. No. of leaves per tiller 5. No. of days to maturity 6. Disease and pest incidence 7. Rhizome yield per plot or per hectare 8. Essential oil, oleoresin content and dry recovery %

New Research Programme: 16	
Crop	**Fennel**
Title of the programme	CVT 2012 Series-VIII
Centres	Ajmer, Dholi, Hisar, Jabalpur, Jagudan, Jobner, Kumarganj , Pantnagar, Navasari , Raigarh
Date/Year of start	Rabi-2012-13 to -2014-2015
Duration of the Project	3 years
No. of treatments/genotypes with details	Ajmer: AJ Fnl-2, AF-05-1-3 Hisar: HF-119,HF-147 Jagudan: JF-671-1, JF-674-1 Jobner: UF-157,UF-278 Kumarganj: NDF-45, NDF-46 RF-101National check RF-205 National Check Local check
Design	R.B.D
No. of replications	3 replications
Plot size/spacing	4.0 m x 2.5 m; 45cm x 20 cm
No. of plants /plot / treatment	20 plants/row
Date of sowing/planting season	1st week of November (Rabi)
Procedure to be adopted	Recommended package of practices will be followed
Observation to be recorded in detail	1. Plant Height 2. No. of primary branches per plant 3. No. of secondary branches per plant 4. Days to 50% flowering 5. Days to maturity 6. Test weight 1000 seeds (g) 7. Umbels per plant 8. Umbellets/umbel 9. Seeds per umbel 10. Yield (kg/ha) 11. Quality 12. Disease & pest incidence

New Research Programme: 17	
Crop	**Fenugreek**
Title of the programme	CVT 2012 Series-VIII
Centres	Ajmer, Coimbatroe, Dholi, Guntur, Hisar, Jagudan, Jabalpur, Jobner, Kumarganj , Pantnagar, Navasari , Raigarh, Udaipur
Date/Year of start	Rabi-2012-13 to -2014-2015
Duration of the Project	3 years
No. of treatments/genotypes with details	Jagudan:JFg-245, JFg – 266 Ajmer: AFg-5, AFg-6 Guntur: LFc:98, LFc93 Hisar: Hm-259, Hm-2801 Jobner:Um:202, Um:354 Kumarganj:NDm:69, NDm-72 Dholi:Rm-188, Rm-194
Design	R.B.D
No. of replications	3 replications
Plot size/spacing	3.0 m x 1m, 30 cm x 10cm
No. of plants /plot / treatment	20 plants/row
Date of sowing/planting season	Rabi
Procedure to be adopted	Recommended package of practices will be followed
Observation to be recorded in detail	1. Height of the plant. 2. No. of primary branches per plant 3. No. of secondary branches per plant 4. Days to 50% flowering 5. No. of pods per plant 6. No. of grains per pod 7. Length of pod 8. Days to maturity 9. Test weight 1000 seeds (g) 10. Umbels per plant 11. Umbellets/umbel 12. Seeds per umbel 13. Yield (kg/ha) 14. Disease & pest incidence

New Research Programme: 18	
Crop	**Coriander**
Title of the programme	CVT 2012 Series-IX
Centres	Ajmer, Dholi, Guntur , Hisar, Jabalpur, Jagudan, Jobner, Kumarganj, Navasari, Pantnagar, Raigarh and Udaipur, Coimbatore
Date/Year of start	Rabi, 2012-2013
Duration of the Project	Three years (2012-2013 to 2014-15)
No. of treatments/genotypes with details	Jobner: UD- 794,UD-663 Jagudan: JCr-404, JCr-379 Guntur: LCC-219, LCC-224, LCC-242 (Dual purpose) Hisar: DH-277, DH-306. Kumarganj: NDCor- 38, NDCor-10 Ajmer: Acr 2, Acr 3 Udaipur: RKD-21, RKD-39 Pantnagar: PD21 , PD-7 seed purpose , PD-51, PD-11(leaf type) National check - Hisar Anand Pant Haritima (NC) (RCr 728 NC) All centers should include a National check &, State check (18+2 Checks)
Design	RBD
No. of replications	3 replications
Plot size/spacing	4.00 m x 2.40 m; x 30 cm x 10 cm
No. of plants /plot / treatment	8 rows/plot 320 plant/plot
Date of sowing/planting and season	First week of October/November (Rabi)
Methodology & Procedure to be adopted	As per the recommended package of practices
Observation to be recorded in detail	1. Plant height (cm) 2. Primary branches per plant 3. No. of secondary branches/plot 4. Days to 50% flowering 5. Umbel per plant 6. Umbellets per umbel 7. Seeds per umbellets 8. Test weight (g) 9. Seed yield (kg/ha) 10. Disease and pest incidence, if any 11. Quality parameters

New Research Programme: 19	
Crop	**Black pepper**
Title of the programme	Black pepper based mixed cropping system for sustainable productivity and food security
Centre	Panniyur, Pampadumpara , Ambalavayal, Sirsi
Year of start	2013-14
Duration of the project	Five years
Design	RBD
Number of treatments/ genotypes with details	6 nos. Black pepper+ Colocasia + Pineapple Black pepper+ Arrowroot + Pineapple Black pepper + Elephant foot yam + Pineapple Black pepper + Tapioca + Pineapple Black pepper+ Greater yam. Black pepper alone. Standard- Glyricidia. Spacing of Black pepper- 3 x 3 m Inter spaces of Black pepper (3x1 m) will be used for cultivating intercrops Planting of Standard –June 2013 **Colocasia** Make ridges at 60 cm apart and plant corms at 45 cm on ridges. Season- May june 2014 **Arrowroot** Pit size 15 cm x15 x15 . spacing 75 x 37.5 cm **Elephant foot yam** –Pit Size 50 x 50 x 45 cm & Spacing -90 x 90 cm sowing time - February-March 2014 **Tapioca** Pit size 45x45x45 cm & spacing -90 cm x 90 cm Season - April-May 2014 **Greater yam** Pit size 45 x 45 x 45 and spacing-100 cm x100 cm x100cm season - March-April 2014 **Pine apple** Make trenches of 30 cm width, 30 cm depth in between two black pepper plants (two sides only). spacing between two pine apple plants 30 x30 cm. Season - May- June 2014 **Varieties** Black pepper - IISR Thevam Elephant foot yam - Gajendra Tapioca- Sreejaya Greater Yam -Sree Kirthi Pineapple- Kew
Number of replications	Three
Observations	Black pepper- Height, Number of leaves, Number of laterals/50 cm^2, Number of spikes per 50 cm^2, yield/plant Tapioca- Height , Number of tubers/plant,yield Amorphopallus- Height, Number of tubers per plant,yield . Colocasia- Height, Number of tubers per plant , yield Arrowroot- Height, Number of tubers per plant , yield Disease incidence. After harvest of intercrops cowpea will be sown in the beds to improve the fertility.

New Research Programme: 20	
Crop	**Ginger**
Title of the programme	**Source sink relationship in Ginger**
Centres	Mizoram, Kanke, Solan, Pundibari, IISR
Date/Year of start	2013
Duration of the Project	3 years
No. of treatments/genotypes with details	Ginger-Variety Mahima, one prominent local variety
Design	-----
No. of replications	5
Plot size/spacing	3 x 1 m
No. of plants /plot / treatment	40
Date of sowing/planting and season	June 2013
Methodology & Procedure to be adopted	Sampling has to be done at monthly interval (starting from 45 days after planting till harvest). Five plants must be sampled (destructive sampling) at each sampling date.
Observation to be recorded in detail	1. Plant height, Number of tillers, Number of leaves per tiller, leaf length and width (at least central 4 leaves of each tiller). Then the plant may be separated in to root, rhizome, leaf and stem and both fresh and dry weight (after oven drying at 55 deg. for 3-4 days / sun drying to a constant weight, rhizomes may be cut in to small pieces for easy drying) has to be recorded. 2. These observations should be recorded at each sampling date. About 200 g dry composite samples (mixing of about 40 g from each plant) of individual parts (rhizome, root, stem and leaves) separately may be sent to IISR, Kozhikode for biochemical analysis. About 5 kg seed of local variety which you will be using may be sent to IISR immediately for planting at IISR. In addition temperature , relative humidity and rainfall also may be recorded for the entire period.

New Research Programme: 21	
Crop	**Turmeric**
Title of the programme	**Source sink relationship in turmeric**
Centres	Coimbatore, Barapani, Kammarapally, Dholi , Guntur, IISR
Date/Year of start	2013
Duration of the Project	3 years
No. of treatments/genotypes with details	Turmeric-Variety Prathibha, one prominent local variety
Design	---------
No. of replications	5
Plot size/spacing	3 x 1 m
No. of plants /plot / treatment	40
Date of sowing/planting and season	June 2013
Methodology & Procedure to be adopted	Sampling has to be done at monthly interval (starting from 45 days after planting till at harvest). Five plants must be sampled (destructive sampling) at each sampling date.
Observation to be recorded in detail	1. Plant height, Number of tillers, Number of leaves per tiller, leaf length and width (at least central 4 leaves of each tiller). Then the plant may be separated into root, rhizome, leaf and stem and both fresh and dry weight (after oven drying at 55 deg. for 3-4 days / sun drying to a constant weight, rhizomes may be cut in to small pieces for easy drying) has to be recorded. 2. These observations should be recorded at each sampling date. About 200 g dry composite samples (mixing of about 40 g from each plant) of individual parts (rhizome, root, stem and leaves) separately may be sent to IISR, Kozhikode for biochemical analysis. About 5 kg seed of local variety which you will be using may be sent to IISR immediately for planting at IISR. In addition temperature , relative humidity and rainfall also may be recorded for the entire period.

New Research Programme : 22	
Crop	Coriander
Title of the programme	Effect of integrated nutrient management on growth and yield of coriander.
Centre	Dholi
Year of start	2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1:- FYM- RDF (15t/ha) T_2:- NPK-RDF-(60:40:30 kg/ha) T_3:- FYM + 100% NPK T_4:- FYM + 75% NPK T_5:- FYM + 50% NPK T_6:- FYM + Azotobactor + PSB T_6:- FYM + 100% NPK + Azotobactor + PSB T_7:- FYM + 100% NPK+ Azotobactor + PSB T_8:- FYM + 75% NPK+ Azotobactor + PSB T_9:- FYM + 50% NPK+ Azotobactor + PSB T_{10}:- Control
No. of replications	3
Plot size/spacing	3.0 m x 2.0 m, 30 cm x 25cm
No. of plants/plot/treatment	100 plants
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Rabi
Lay-out plan	As per the requirement of design
Methodology & Proccdure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1. Height of the plant 2. No. of primary branches per plant 3. No. of secondary branches per plant 4. No. of umbels per plant 5. No. of umbellets per umbel 6. No. of grains per umbel 7. Yield per plot kg or kg/ha.

New Research Programme: 23	
Crop	Black Pepper
Title of the programme	Biological management of Slow Decline in Black pepper
Centres	Panniyur
Date/Year of start	2013
Duration of the Project	3 years
No. of treatments/genotypes with details	T1 – Soil application of *Trichoderma harzianum* + Neem cake @ 2kg/vine T2 – Soil application of *Trichoderma harzianum* followed by soil drenching with *P. fluorescens* @ 2% T3 – Soil application of *Pochonia chlamidosporia* followed by soil drenching with *P. fluorescens* @ 2% T5 – Soil application of *Pochonia chlamidosporia* @ 50g/vine followed by soil drenching with *P. fluorescens* @ 2% T6 – Soil application with Cartap hydrochloride @ 15g/vine T7 – Soil drenching with Copper oxy chloride @ 0.3% + Cartap hydrochloride @ 15g/vine T8 – Control
Design	RBD
No. of replications	Three
Plot size/spacing	Black pepper spacing - 4 x 2 m
No. of plants /plot / treatment	Six plants
Date of sowing/planting and season	In existing plantation
Methodology & Procedure to be adopted	*Pochonia Chlamydosporia* Mass multiplication @1.05 Kg culture/50 kg partially decomposed FYM and application @ 2 Kg /vine *Trichoderma harzianum*: Mass multiplication @1-2 Kg culture/100 Kg Neem cake+ Cow dung (1:9) mixture and application @ 2 Kg/vine Method of application – soil application in two splits. 1st in May-June and 2nd in August-September
Observation to be recorded in detail	1. Percent Disease incidence 2. Percent disease index (0-5 scale) 3. Yellowing % 4. Defoliation % 5. Death of vine % 6. Estimation of pathogen population in soil % 7. Yield parameters %

New Research Programme: 24	
Crop	Black Pepper
Title of the programme	Screening of local cultivars of Black pepper against *Phytophthora foot rot*
Centres	Sirsi
Date/Year of start	2013
Duration of the Project	4 years
No. of treatments/genotypes with details	Ademane Pepper Mottakare Okkalu Uddakare Thirupuuddakare Dodigya Malligesara Panniyur -1 IISR, Shakthi
Design	-
No. of replications	Three
Plot size/spacing	9 x 9 Spacing
No. of plants /plot / treatment	6 vines per treatment
Date of sowing/planting and season	In existing plantation
Methodology & Procedure to be adopted	
Observation to be recorded in detail	Initial Establishment Disease incidence

New Research Programme: 25	
Title of the programme	Evaluation of New insecticides/Bio pesticides against Black Pepper Mussel Scale, *Lepidosaphes piperis*
Centres	Mudigere
Date/Year of start	2013-14
Duration of the Project	Three years
No. of treatments/genotypes with details	T_1 Spinosad 0.25 ml T_2 Carbosulfan 2ml T_3 Fishoil 4ml T_4 Ponneem 3ml T_5 Chlomethrophin 0.2 ml T_6 Navoluron 1 ml T_7 Control
Design	-
No. of replications	Three
Plot size/spacing	6 vines with uniformily aged plants
No. of plants /plot / treatment	--
Date of sowing/planting and season	In existing plantation
Methodology & Procedure to be adopted	--
Observation to be recorded in detail	Incidence of scale insects, Yield per plant (Kg)

New Research Programme : 26	
Crop	**Ginger**
Title of the programme	Management of soft rot/ Rhizome rot of Ginger
Centre	Raigarh
Year of start	2013-14
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1 Rhizome treatment by metalaxyl mancozeb (1.25g/L)+ biofumgation using mustard crop. T_2 Rhizome treatment by metalaxyl mancozeb (1.25g/L)+ mustard cake (1kg/plot) T_3 Rhizome treatment by metalaxyl mancozeb (1.25g/L)+ soil application of 10g. elemental sulphur before planting (3x1m plot) T_4 Rhizome treatment by iprodione + carbendazim (2g. /L)+ Soil application of *Trichiderma* with 3kg FYM/plot + Green manuring (urd , moog , sunhemp, daincha) T_5 Rhizome treatment by (carboxin + thiram) 2g. /L.+ soil application of *Pseudomonas fluorescens* with 3 kg FYM /plot + Green manuring(urd , moog , sunhemp, daincha) T_6 Seed treatment with metalaxyl mancozeb T_7 Control
No. of replications	3
Plot size/spacing	3.0 m x 1.0 m & 30 cm x 20 cm
No. of plants/plot/treatment	40 plants/plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Kharif, Sowing time June last week
Lay-out plan	
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1. Percent discase intensity 2. Yield / plot (kg) 3. Germination count 4. Yield reduction over control

New Research Programme : 27	
Crop	**Turmeric**
Title of the programme	Fungicidal management of foliar diseases of turmeric by new molecules
Centre	Raigarh
Year of start	2013
Duration of the project	3
Design	RBD
No. of treatments/genotypes with details	T_1: Rhizome treatment with fusilazole (0.1%) + spray on 45, 75, 105 DAP T_2: Rhizome treatment with tabuconazole (0.1%) + spray on 45 , 75,105 DAP T_3 : Rhizome treatment with azystrobin (0.1%) + spray on 45, 75 , 105 DAP T_4: Spray of fusilazole (0.1%) on 45, 75, 105 DAP T_5 Spray of tabuconazole (0.1%) on 45 , 75,105 DAP T_6: Spray of azystrobin on 45, 75 , 105 DAP T_7: Best result of previous experiment or recommendation of the centre. T_8:Control
No. of replications	3
Plot size/spacing	3.0 m x 1.0 m & 30 cm x 20cm
No. of plants/plot/treatment	40 plants/plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Kharif, sowing time June last week
Lay-out plan	As per the requirement of design
Methodology & Procedure to be adopted	Recommended packages of practices will be followed
Observation to be recorded in detail	1 Yield / plot (kg) 2 Germination count 3 Percent disease intensity of leaf spot, leaf blotch

New Research Programme: 28	
Title of the programme	Evaluation of New insecticides / Bio-pesticides against Shoot borer in Ginger.
Centres	Mudigere
Date/Year of start	2013-14
Duration of the Project	Three years
No. of treatments/genotypes with details	T_1 Dimethoate 1.7ml T_2 Carbosulfan 2ml T_3 Spinosad 0.25 ml T_4 Ponneem 3ml T_5 Lamdacyhalothrin 0.5 ml T_6 Flubendamide 0.2 ml T_7 Control
Design	RBD
No. of replications	Three
Plot size/spacing	25 x 25 cm
No. of plants /plot / treatment	--
Date of sowing/planting and season	--
Methodology & Procedure to be adopted	--
Observation to be recorded in detail	Germination percentage, Yield per plot (g), Projected yield (t/ha), Percent pest incidence.

New Research Programme: 29	
Crop	**Clove**
Title of the programme	Efficiency of different fungicides against leaf rot disease of clove and nutmeg
Objective	To find out the effective and economical fungicide for management of leaf rot of clove (Observational trial).
Centre	Dapoli
Year of start	2012 – 13
Duration of the project	Three years
Design	-
No. of treatments with details	Seven T_1. Foliar spray with Mancozeb (0.3%) first at disease appearance and then two times at 20 days interval T_2. Foliar spray with Carbendazim (0.1%) first at disease appearance and then two times at 20 days interval T_3. Foliar spray with Carbendazim (0.1%) + Mancozeb (0.1%) first at disease appearance and then two times at 20 days interval T_4. Foliar spray with Copper oxychloride (0.2%) first at disease appearance and then two times at 20 days interval T_5. Foliar spray with Bordeaux mixture (1%) first at disease appearance and then two times at 20 days interval T_6. Foliar spray with Benomyl (0.1%) first at disease appearance and then two times at 20 days interval T_7. Control
No. of replications	Three
No. of plants/plot/treatment/ replication	One
Season	Kharif
Lay out of plan	To be decided by random number table
Methodology and Procedure to be adopted	Three foliar sprays of different fungicides will be undertaken with the help of manually operated knapsack sprayer
Observations to be recorded in detail	Percent Disease Index (PDI) and Percent Disease Reduction over control Yield

New Research Programme: 30	
Crop	**Cumin**
Title of the programme	Management of blight and powdery mildew by spacing and potash application
Centres	Jagudan
Date/Year of start	2013
Duration of the Project	3 years
No. of treatments/genotypes with details	Main Plot Treatment -5; Sub Plot Treatment -3
Design	Split Plot Design (SPD)
No. of replications	3
Plot size/spacing	4.00 X 3.00 sqm
No. of plants /plot / treatment	Main Plot Treatments: Spacing S_1: Broadcasting S_2: 30 x 5 cm S_3:30 x 10 cm S_4: 45 x 5 cm S_5: 45 x 10 cm Sub Plot Treatments: Dose of Potash K_0: 0 kg K_1: 10 kg K_2: 20 kg
Date of sowing/planting and season	December
Methodology & Procedure to be adopted	The entries will be sown as per the requirements of the design. The observation will be recorded on the characters given below and will be evaluated.
Observation to be recorded in detail	1. Plant height (cm) 2. No. of primary branches per plant 3. No. of secondary branches per plant 4. Days to 50 % flowering 5. No. of pods per plant 6. No. of grains per pod 7. Length of pod 8. Days to maturity 9. Disease and pest incidence 10. Test weight 1000 seeds (g) 11. Seed yield per net plot and per hectare (kg ha^{-1}) 12. Volatile oil (%)

New Research Programme : 31		
Centre	:	**Jagudan (Gujarat)**
Crop	:	**Cumin**
Crop &Variety	:	Cumin, Gujarat Cumin-4
Discipline	:	Plant Protectic
Title	:	Studies on plant protection schedule in cumin
Year of Start	:	Rabi 2013-14
Duration of the Project	:	3 Years
Design	:	Randomized Block Design (RBD)
Treatments	:	10
Treatments	:	T_1 : i. Grow sorghum as previous crop ii. Seed treatment with garlic extract 5% @ 10ml/kg seed iii. Spray the crop with garlic extract 5% at 40,50,60 and 70 Days After Germination iv. Spray the crop with Achook @ 3 ml/lit. at 60 and 70 Days After Germination v. Installation of yellow sticky traps @ 12/ ha
		T_2 : i. Grow sorghum as previous crop ii. Seed treatment with *Pseudomonas flourescens* 10 g/kg seed iii. Spray the crop with *P. flourescens* 10^8 at 40, 50, 60 and 70 Days After Germination iv. Spray the crop with *Verticillium lecanii* 1.15WP 4g/litre at 60 and 70 Days After Germination v. Installation of yellow sticky traps @ 12/ ha
		T_3 : i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10g/ kg seed iv. Spray the crop with mancozeb 75WP 0.2% at 40, 50 and 60 Days After Germination v. Dusting of sulphur dust @ 25kg/ha at 50 and 60 DAG vi. Spray the crop with dimethoate 30EC @ 0.03% at 50 Days After Germination vii. Spray the crop with imidacloprid 17.8SL @0.005% at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha
		T_4 : i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10 g/ kg seed iv. Spray the crop with mancozeb 75WP 0.2 % at 40 and 50 Days After Germination v. Spray the crop with difenconazole 25EC 0.025% at 60 Days After Germination vi. Spray the crop with dimethoate 30EC@ 0.03 % at 50 Days After Germination vii. Spray the crop with carbosulfan 25EC @ 0.05 % at 60 Days After Germination

		viii. Installation of yellow sticky traps @ 10/ ha
		T_5: i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10g/ kg seed iv. Spray the crop with mancozeb 75WP @ 0.2 % at 40 and 50 Days After Germination v. Spray the crop with Zineb 68% + Hexaconazole 4% @ 0.2% at 60 Days After Germination vi. Spray the crop with dimethoate 30EC@ 0.03 % at 50 Days After Germination vii. Spray the crop with thiamethoxam 25WG @ 0.0084 % at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha
		T_6: i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10 g/ kg seed iv. Spray the crop with mancozeb 75WP @ 0.2 % at 40 and 50 Days After Germination v. Spray the crop with difenconazole 25EC@ 0.025% at 60 Days After Germination vi. Spray the crop with thiamethoxam 25WG @ 0.0084 % at 50 Days After Germination vii. Spray the crop with carbosulfan 25EC @ 0.05 % at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha
		T_7: i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10 g/ kg seed iv. Spray the crop with mancozeb75WP@ 0.2% at 40 and 50 Days After Germination v. Spray the crop with difenconazole 25EC @ 0.025% at 60 Days After Germination vi. Spray the crop with thiamethoxam25WG@ 0.0084% at 50 Days After Germination vii. Spray the crop with imidacloprid 17.8SL @ 0.005% at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha

		T_8 : i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70 WS @ 10 g/ kg seed iv. Spray the crop with mancozeb75WP@ 0.2% at 40 and 50 Days After Germination v. Spray the crop with Zineb 68% + Hexaconazole 4% @ 0.2% at 60 Days After Germination vi. Spray the crop with imidacloprid 17.8SL@ 0.005% at 50 Days After Germination vii. Spray the crop with carbosulfan 25EC @ 0.05% at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha
		T_9 : i. Grow sorghum as previous crop ii. Seed treatment with mancozeb @ 3g/kg seed iii. Seed treatment with imidacloprid 70WS @ 10g/ kg seed iv. Spray the crop with mancozeb 75WP 0.2% at 40 and 50 Days After Germination v. Spray the crop with Zineb 68% + Hexaconazole 4% @ 0.2% at 60 DAG vi. Spray the crop with acetamiprid 20SP @ 0.004% at 50 Days After Germination vii. Spray the crop with thiamethoxam 25WG @ 0.0084% at 60 Days After Germination viii. Installation of yellow sticky traps @ 10/ ha
		T_{10} : Untreated Control
Replications	:	4(Four)
Observations to be recorded	:	1. Wilt disease intensity (%) 2. Blight Intensity (0-5 scale) 3. Powdery mildew intensity (0-4 scale) 4. Powdery mildew 5. Percent umbels Aphid Infestation 6. Population of natural enemies *viz;* coccinellids 7. Mean population of thrips at 3,6 and 9WAG (Weeks After Germination) 8. Seed Yield (kg ha^{-1}) 9. Volatile oil (%) 10. Residual Analysis 11. Economics of different treatments

Technical Programme (2012-13)

BLACK PEPPER		
Project Code	**Title**	**Centres**
PEP/CI/1	**Genetic Resources**	
PEP/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Chintapalli, Dapoli, Panniyur, Pundibari, Sirsi, Ambalavayal & Yercaud
PEP/CI/2	**Hybridization Trial**	
PEP/CI/2.1	Inter varietal hybridization to evolve high yielding varieties	Panniyur
PEP/CI/3	***Coordinated Varietal Trial (CVT)***	
PEP/CI/3.3	CVT 2006 – Series VI	Chintapalli, Dapoli, Panniyur, Pampadumpara, Pundibari, Sirsi, Ambalavayal, Yercaud and Pechiparai
PEP/C1/3.4	Evaluation of grafts, orthotropic and runner shoots in black pepper	Ambalavayal, Panniyur, Sirsi Yercaud & Thadiyankudasai*
PEP/CM/4	**Nutrient Management Trial**	
PEP/CM/4.4	Development of organic package for spices based cropping system – Observational trial	Chintapalli, Sirsi, Panniyur, & Dapoli
PEP/CM/4.5	Organic farming in black pepper - 2006	Panniyur, Dapoli, Pechiparai, Sirsi & Yercaud
PEP/CM/4.6	Standardisation of drip fertigation in black pepper	Panniyur
PEP/CM/4.7	Black pepper based mixed cropping system for sustainable productivity and food security	Panniyur, Ambalavayal, Pampadumpara & Sirsi
PEP/CP/5	**Disease Management Trial**	
PEP/CP/5.1	Adaptive trial on management of *Phytophthora* foot rot of black pepper in farmers field	Ambalavayal
PEP/CP/5.2	Trial on management of *Phytophthora* foot rot of black pepper in existing plantation	Chintapalli, Dapoli, Panniyur, Pampadumpara, Mudigere & Sirsi
PEP/CP/5.3	Trial on management of *Phytophthora* foot rot of black pepper in new plantation	Chintapalli, Dapoli, Panniyur, Pampadumpara, Pechiparai, Mudigere & Sirsi
PEP/CP/5.4	Effectiveness of new moleculas of fungi toxicants against *Phytophthora* foot rot of black pepper in existing plantation	Sirsi, Mudigere & Chintapalli
PEP/CP/5.5	Screening of local cultivars of Black Pepper against *Phytophothora foot rot*	Sirsi

PEP/CP/5.6	Biological management of Slow Decline in Black Pepper	Panniyur
PEP/CP/5.7	Evaluation of New insecticides/Bio pesticides against Pepper Mussel Scale, *Lepidosaphis piperis*	Mudigere
PEP/CP/6	**Pest Management Trial**	
PEP/CP/6.2	Management of *Erythrina* gall wasp, a popular standard of black pepper	Mudigere
CARDAMOM		
CAR/CI/1	**Genetic Resources**	
CAR/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Mudigere, Pampadumpara & Myladumpara
CAR/CI/2	**Hybridization**	
CAR/CI/2.1	Hybridisation and selection in cardamom	Mudigere
CAR/CI/2.2	Evaluation of Promising Small Cardamom (*Elettaria Cardamom*) (L.) Maton) cultivars/varieties for organic cultivation in the high ranges of Idukki district.	Mudigere & Pampadumpara
CAR/CI/3	**Coordinated Varietal Trial**	
CAR/CI/3.6	CVT 2007/2009 -Series VI	Mudigere, Pampadumpara, Sakleshpur, Ambalavayal & Myladumpara
CAR/CI/3.7	CVT of drought tolerance in Cardamom -Series VII	Appangala, Mudigere, Sakleshpur
CAR/CI/4	**Varietal Evaluation Trial (VET)**	
CAR/CI/4.1	Initial evaluation trial - I	Mudigere
CAR/CI/4.2	Initial evaluation trial - II	Mudigere
CAR/CI/4.3	Initial evaluation trial – 2011	Pampadumpara

CAR/CM/5	**Nutrient Management Trial**	
CAR/CM/5.1	Effect of different irrigation schedule and fertilizers on yield of cardamom	Mudigere
CAR/CM/5.2	Effect of fertigation on yield of cardamom through drips	Mudigere & Pampadumpara
CAR/CM/5.3	Organic farming in cardamom	Mudigere & Pampadumpara
CAR/CM/5.4	Liming in Cardamom	Pampadumpara
CAR/CP/6	**Pest and Disease Management Trial**	
CAR/CP/6.8	Comparison of effect of chemical treatments as well as bio control agents against pseudostems rot of cardamom	Pampadumpara & Mudigere
LARGE CARDAMOM		
LCA/CI/1	Germplasm collection and evaluation of large Cardamom	Gangtok, Gangtok (ICAR)
LCA/CI/3.1	Initial Evaluation Trial	Gangtok
LCA/CP/1.1	Evolving disease & pest tolerant lines in large Cardamom	Gangtok
LCA/CP/1.2	Integrated pest and disease management in large cardamom	Gangtok
GINGER		
GIN/CI/1	**Genetic Resources**	
GIN/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Dholi, Kumarganj, Pottangi, Pundibari & Solan
GIN/CI/2	**Coordinated Varietal Trial**	
GIN/CI/2.3	CVT 2006 – Series VII	Pottangi & Pundibari
GIN/CI/2.4	CVT on Ginger 2013	IISR, Pottangi, Dholi& Pundibari
GIN/CI/3	**Varietal Evaluation Trial**	
GIN/CI/3.1	Initial evaluation trial -2010	Dholi & Solan
GIN/CI/3.2	Initial evaluation trial -2011	Pundibari & solan
GIN/CI/3.3	Initial evaluation trial -2011	Solan
GIN/CI/3.4	Comparative yield trial	Pottangi
GIN/CI/3.6	IET on Ginger- 2012	Dholi, & Kumarganj
GIN/C1/3.5	Genotype X Environment interaction on quality of ginger	Barapani, Chintapalli, Kanke, Kalyani, Mizoram, Pasighat, Pottangi, Pundibari, & Solan
GIN/CI/4.1	Evaluation of germplasm for quality	Solan
GIN/CI/4.2	Evaluation of germplasm from other centers	Solan
GIN/CM/5	**Nutrient Management Trial**	
GIN/CM/5.3	Nutrient supplementation through organic manures for growth and yield of ginger	Dholi & Kumarganj

GIN/CM/5.4	Evaluation of herbicide for the effective control of weed in ginger	Chintapalli
GIN/CM/5.5	Source sink relationship in Ginger	Mizoram, Kanke, Solan, Pundibari & IISR
GIN/CP/6	**Disease Management Trial**	
GIN/CP/6.7	Management of soft rot of ginger (Biofumigation using cabbage)	Ambalavayal , Pundibari & Pampadumpara
GIN/CP/6.8	Management of bacterial wilt of ginger (Biofumigation using mustard)	Pundibari
GIN/CP/6.9	Management of bacterial wilt of ginger (Biofumigation using cabbage)	Pampadumpara, Pundibari& Pottangi
GIN/CP/6.10	Efficiency of different fungicide against leaf spot disease of ginger including new molecules	Dholi &Pundibari
GIN/CP/6.11	Management of soft rot/ Rhizome rot of Ginger	Raigarh
GIN/CP/6.12	Evaluation of New insecticides/Bio-pesticides against Shoot borer in Ginger.	Mudigere
TURMERIC		
TUR/CI/1	**Genetic Resources**	
TUR/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Coimbatore, Dholi, Kamarapalli, Kumarganj, Pottangi & Raigarh
TUR/CI/2	**Coordinated varietal trial**	
TUR/C1/2.5	CVT on Turmeric 2013	IISR, Pottangi, Kumarganj, Pundibari
TUR/CI/3	**Varietal evaluation trial**	
TUR/CI/3.3	Initial Evaluation Trial 2010	Pantnagar
TUR/C1/3.6	Initial Evaluation Trial 2012	Dholi & Kumarganj
TUR/CI/3.5	Genotype x Environmental interaction on quality	Kammarapalli, Raigrah, Pottangi Mizoram, Kalyani & Barapani
TUR/CI/3.7	IET on Turmeric 2013	Sikkim (ICAR)
TUR/CI/4	**Quality Evaluation**	
TUR/CI/4.1	Quality evaluation of germplasm	Coimbatore
TUR/CM/5	**Nutrient Management Trial**	
TUR/CM/5.5	Standardization of water requirement for turmeric through drip irrigation	Coimbatore, , Kammarapally, Kumarganj &, Guntur
TUR/CM/5.6	Standardization of fertigation in turmeric	Coimbatore & Kamarapally
TUR/CM/5.7	Effect of micronutrients on turmeric	Dholi, Kumarganj & Pundibari
TUR/CM/5.8	Studies on the effect of rhizome size and nursery on growth and yield of turmeric	Chintapalle, Coimbatore, Navasari, Bagalkot & IISR
TUR/CM/5.9	Assessment of fungicides& Biological control agents against foliar diseases of turmeric	Dholi

TUR/CM/6	**Post Harvest Technology**	
TUR /CM/6.3	Source sink relationship in turmeric	Coimbatore, Barapani, Kammarapally,Dholi
TUR/CP/7	**Disease Management Trial**	
TUR/CP/7.3	Fungicidal management of foliage diseases of turmeric by new molecules	Raigarh
TREE SPICES		
TSP/CI/1	**Genetic Resources**	
TSP/CI/1.1	Germplasm collection, characterization, evaluation and conservation of clove, nutmeg and cinnamon	Dapoli &Pechiparai
TSP/CI/2	**Coordinated Varietal Trial**	
TSP/CI/2.1	CVT 1992 – clove	Dapoli& Pechiparai
TSP/CI/2.2	CVT 2001- nutmeg	Dapoli & Pechiparai
TSP/CI/2.3	CVT 2001 – cassia	Pechiparai & Dapoli
TSP/CI/2.4	Evaluation of Unique Germplasm in Nutmeg	KAU, IISR & Pechiparai
TSP/CP/3.2	Influence of weather parameters on the incidence of leaf rot disease of clove & Nutmeg (observational trial)	Dapoli
CORIANDER		
COR/CI/1	**Genetic Resources**	
COR/CI/1.1	Germplasm collection, description, characterization, evaluation, conservation and screening against diseases	Coimbatore, Dholi, Guntur, Hisar, Jagudan, Jobner & Kumarganj, Ajmer
COR/CI/1.2	Multilocation Evaluation of germplasm	Coimbatore, Hisar , Ajmer & Guntur
COR/CI/2	**Coordinated Varietal Trial**	
COR/CI/2.5	Coordinated varietal trial on coriander 2012-Series IX	Ajmer, Dholi, Guntur, Hisar, Jabalpur, Jagudan. Jobner, Kumarganj, Navasri, Pantnagar, Raigarh, Udaipur & Coimbatore
COR/CI/2.6	Coordinated varietal trial on coriander (Leafy type during off season) CVT 2010	Guntur, Ajmer, Coimbatore & Periyakulam**
COR/CI/3	**Varietal Evaluation Trial**	
COR/CI/3.1	IET on coriander 2010	Hisar
COR/CI/3.4	Initial Evaluation Trial 2011	Jobner
COR/CI/3.6	Initial Evaluation Trial 2012	Jagudan, Kumarganj& Guntur
COR/CI/3.7	Initial Evaluation Trial 2012 Leaf type	Guntur
COR/C1/3.5	Production of leafy type of coriander in off season	Kumarganj
COR/CI/4	**Quality Evaluation Trial**	
COR/CI/4.1	Quality evaluation in coriander	Jobner

COR/CM/5	**Nutrient Management Trial**	
COR/CM/5.3	Identification of drought/ alkalinity tolerant source in coriander	Guntur , Coimbatore, Kumarganj & Jobner
COR/CM/5.4	Nutrient supplementation through organic manures for growth and yield of coriander	Coimbatore, Dholi, Hisar, Jagudan, Jobner, Kumarganj & Raigarh
COR/CM/5.7	Nutrient management in off season coriander leaf production	Periyakulam, Guntur, Ajmer & Coimbatore
COR/CP/6.6	Effect of integrated nutrient management on growth and yield of coriander	Dholi
COR/CP/6	**Disease Management Trial**	
COR/CP/6.2	Survey to identify the disease incidence, collection and identification of casual organism	Dholi
COR/CP/6.3	Management of stem gall disease of coriander	Dholi, Pantnagar, Kumarganj & Raigarh
COR/CP/6.5	Evaluation of PGPR bioformulation on Coriander	Coimbatore, Guntur, Hisar, Jagudan , Raigarh & Ajmer
CUMIN		
CUM/CI/1	**Genetic Resources**	
CUM/CI/1.1	Germplasm collection, characterization, evaluation conservation and screening against diseases	Jagudan & Jobner, Ajmer
CUM/CI/1.2	Multilocation Evaluation of germplasm	Ajmer
CUM/CI/2	**Coordinated Varietal Trial**	
CUM/C1/2.3	Coordinated Varietal Trial - 2009	Jobner, Jagudan, Ajmer & Jabalpur
CUM/CI/3	**Varietal Evaluation Trial**	
CUM/CI/3.3	IET on cumin 2009	Jobner & Jagudan
CUM/CI/4	**Quality Evaluation Trial**	
CUM/CI/4.1	Quality evaluation in cumin	Jobner
CUM/CM/5	**Nutrient management trial**	
CUM/CM/5.1	Identification of drought tolerance	Jobner
CUM/CP/6	**Disease Management Trial**	
CUM/CP/6.2	Survey for identification of yellowing causing organisms in cumin	Jobner
CUM/CM/6.4	Evaluation ofPGPR bioformulation on Cumin	Jagudan ,Jobner & Ajmer
CUM/CM/6.5	Studies on plant protection schedule in Cumin	Jagudan
CUM/CM/6.6	Management on blight and powdery mildew by spacing and potash application	Jagudan
FENNEL		
FEL/CI/1	**Genetic Resources**	

FNL/CI/1.1	Germplasm collection, characterization, evaluation, conservation and screening against diseases	Dholi, Hisar, Jagudan, Jobner & Kumarganj & Ajmer
FNL/CI/1.2	Multilocation Evaluation of Germplasm	Hisar & Ajmer
FNL/CI/2	**Coordinated Varietal Trial**	
FNL/CI/2.5	Coordinated Varietal Trial on Fennel 2012 Series VIII	Ajmer, Dholi, , Hisar, Jabalpur, Jagudan. Jobner, Kumarganj, Navasari, Pantnagar, Raigarh & Udaipur.
FNL/CI/3	**Varietal Evaluation Trial**	
FNL/CI/3.1	Initial evaluation trial	Hisar
FNL/CI/3.3	Initial evaluation trial 2011	Jobner,Raigarh & Hisar
FNL/CI/3.4	Initial evaluation trial 2012	Dholi, Jagudan & Kumarganj
FNL/CI/4	**Quality Evaluation Trial**	
FNL/CI/4.1	Quality evaluation in fennel	Jobner
FNL/CI/5.2	Identification of drought/alkalinity tolerance source in fennel	Kumarganj
FNL/CM/5	**Nutrient Management Trial**	
FNL/CM/5.3	Micro irrigation management in Fennel	Jobner & Bikaner
FNL/CP/6	**Disease Management Trial**	
FNL/CP/6.2	Field evaluation of different insecticides / botanicals against seed midge *Systole albipennis* walker fennel	Jagudan
FNL/CM/6.3	Evaluation of PGPR bioformulation on Fennel	Hisar, Jagudan, Raigarh & Ajmer
FENUGREEK		
FGK/CI/1	**Genetic Resources**	
FGK/CI/1.1	Germplasm collection, characterization, evaluation conservation and screening against diseases	Dholi, Hisar, Jagudan, Jobner, Kumarganj, Guntur & Ajmer
FGK/CI/1.2	Multilocation Evaluation of Germplasm	Ajmer
FGK/CI/2	**Coordinated Varietal Trial**	
FGK/C1/2.1	Coordinated Variety Trial 2009 series - VII	Ajmer, Coimbatore, Dholi, Guntur, Hisar, Jabalpur, Jagudan, Jobner, Kumarganj, Pantnagar, Raigarh & Udaipur
FGK/C1/2.2	Coordinared varietal Trial 2012 Series VIII	Ajmer, Coimbatroe, Dholi, Guntur, Hisar, Jagudan, Jabalpur, Jobner, Kumarganj , Pantnagar, Navasari , Raigarh & Udaipur

FGK/CI/3	**Varietal Evaluation Trial**	
FGK/CI/3.3	Initial evaluation trial 2009	Jobner
FGK/CI/3.4	Initial evaluation trial 2010	Hisar & Pantnagar
FGK/CI/3.5	Initial evaluation trial 2012	Guntur, kumarganj ,Jagudan & Jobner
FGK/CI/3.6	Initial evaluation trial 2012	Guntur, Kumarganj, Jagudan & Jobner
FGK/CM/4	**Nutrient Management Trial**	
FGK/CM/4.2	Identification of drought/tolerance source in fenugreek	Jobner
FGK/CM/4.3	Microirrigation management in Fenugreek	Jobner
FGK/CM/4.5	Evaluation of PGPR bioformulation on Fenugreek	Jagudan, Jobner, Guntur, Hisar & Kumarganj

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