

# Proceedings of XXII Workshop of All India Coordinated Research Project on Spices

18-19 June 2011

Swami Keshwanand Rajasthan Agricultural University  
Jaipur Campus, Rajasthan



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

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July 2011

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## PROGRAMME

18<sup>th</sup> June 2011

08.30-09.30 AM Registration

### INAUGURAL SESSION

09.40 AM-12.55 PM

0940-0945 hrs Inauguration of the workshop by Lighting of the lamp

0945 -1000 hrs Welcome address  
**Dr. M.P. Sahu, Director of Research, RAJAU**

1000-1013 hrs Presentation of AICRPS report  
**Dr. M. Anandaraj, Project Coordinator, AICRP on Spices**

1013-1025 hrs Remarks from ICAR  
**Dr. U. Srivastava, Asst. Director General (Hort. II)**

1025-1040 hrs Address by the Guest of Honour  
**Dr. S.B. Dandin, Vice-Chancellor, UHS, Bagalkot**

1040-1055 hrs Presidential Address  
**Dr. A.K. Dahama, Vice-Chancellor, RAJAU**  
Release of publication of RAJAU & ISSS

1055-1155 hrs Inaugural Address  
**Dr. H. P. Singh, Dy. Director General (Hort.)**

1155-1250 hrs **Session on Action Taken Report**  
**Chairman Dr. H.P. Singh, Dy. Director General (Hort.)**  
**Co-Chairman Dr. U. Srivastava, Asst. Director General (Hort. II)**  
Presentation of Action Taken Report and Discussion  
**Dr. M. Anandaraj, Project Coordinator, Spices**

1250-1255 hrs Vote of Thanks  
**Dr. E.V.D. Sastry, Head, Dept. of Plant Breeding & Genetics**  
**SKN College of Agriculture, Jobner, Rajasthan**

Rapporteurs  
**Dr. (Mrs.) J. Rema, Principal Scientist, IISR, Calicut**  
**Dr. (Mrs.) E. Jayasree, Sr. Scientist, IISR, Calicut**

1255-0130 hrs Tea Break

**SESSION I****GENETIC RESOURCES 01.30 PM- 02.45 PM**

Chairpersons	Dr. Umesh Srivastava, ADG (Hort.II), ICAR, New Delhi Dr. M.M. Anwer, Director, NRCSS, Ajmer
Rapporteurs	Dr. (Mrs.) N. Shoba, TNAU, Coimbatore Dr. Direndra Singh, RAJAU, Jobner
<b>Presentations</b>	
1. Cardamom	Dr. Biju Sasidharan, CRS, Pampadumpara
2. Large Cardamom	Dr. Utpal Gupta, ICRI Regional Station, Gangtok, Sikkim
3. Black pepper	Dr. Nagesh Naik, UHS, Sirsi
4. Ginger	Dr. Happy Dev, Dr. YSPUHF, Solan
Lunch	02.45 PM-03.30 PM
1. Tree Spices	Dr. J. Prem Joshua, HRS, Pechiparai
2. Coriander	Dr. Renjan, NRCSS, Ajmer
3. Cumin	Dr. R.K. Solanki, NRCSS, Ajmer
4. Fenne	Dr. R. S. Meena, NRCSS, Ajmer
15. Fenugreek	Dr. R. K. Kakani, NRCSS, Ajmer
6. Turmeric	Dr. Vikas Singh, CAU, Pasighat
Tea	05.45 PM-06.00 PM

**SESSION II****CROP IMPROVEMENT 06.00 PM-06.45 PM**

Chairpersons	Dr. V.A. Parthasarathy, Director, IISR, Calicut Dr. E.V.D. Sastry, RAJAU, Jobner
Rapporteurs	Dr. R.S. Meena, NRCSS, Ajmer Dr. D. Prasath, Senior Scientist, IISR, Calicut
<b>Presentations</b>	
1. Cardamom	Dr. K.M. Kurivalla, ICRI, Sakleshpur
2. Black pepper	Dr. (Mrs.) V.P. Neema, KAU, Panniyur
3. Ginger	Dr. D. K. Dash, OUAT, Pottangi
4. Turmeric	Dr. R. T. Desai, NAU, Gujarat
5. Tree Spices	Dr. U. B. Pethe, KKV, Dapoli
<b>XII Plan Discussion</b>	06.45 PM-8.00 PM

**19<sup>th</sup> June 2011****SESSION II****CROP IMPROVEMENT 8.45 AM-09.30 AM (Contd.)**

1. Cumin	Dr. Dharendra Singh, RAJAU, Jobner
2. Fennel	Dr. E. V. D. Sastry, RAJAU, Jobner
3. Fenugreek	Dr. S. K. Tehlan, CCS HAU, Hisar
4. Coriander	Smt. A. Regini, APHU, Guntur

**SESSION III****CROP MANAGEMENT 09.30 AM -11.15 AM**

Chairpersons Dr. M. P. Sahu, Directorate Research, RAJAU  
Dr. (Mrs.) B. Chempakam, IISR, Calicut

Rapporteurs : Dr. V. Srinivasan, IISR, Calicut  
Dr. A. C. Shivran, RAJAU, Jobner

**Presentations**

1. Cardamom Dr. D. Lakshmana, UHS, Mudigere
2. Black pepper Dr. (Mrs.) G.Heera., PRS, Panniyur
3. Ginger Dr. A.K.Mishra, RAU, Dholi
4. Turmeric Dr. (Mrs.) N. Shobha, TNAU, Coimbatore
5. Tree Spices Dr. R.G. Khandekhar, KKV, Dapoli
6. Coriander Dr. T. P. Mallik, CCS HAU, Hisar
7. Cumin Mr. A.U. Amin, SDAU, Jagudan
8. Fenne Dr. S. K. Tehlan, CCS HAU, Hisar
9. Fenugreek Dr. R. P. Saxena, NDUAT, Kumarganj

Tea 11.15 AM -11.30 AM

**SESSION IV****CROP PROTECTION 11.30 AM-13.30 PM**

Chairpersons Dr. S. Devasahayam, Head,  
Division of Crop Protection, IISR, Calicut  
Prof. Dr. S. Gangopadhyay, RAJAU, Rajasthan

Rapporteurs : Dr. (Mrs.) Muthu Lakmshi, TNAU, Coimbatore  
Dr. K.S. Shekhawat, RAJAU, Jobner

**Presentations**

1. Cardamom Dr. D. Jemla Naik, UHS, Mudigere
2. Large Cardamom Dr. Utpal Gupta, ICRI Regional Station, Gangtok
3. Black pepper Dr. M. S. Lokesh, UHS, Sirsi
4. Ginger Dr. (Mrs.) Meenu Gupta, YSPUHF, Solan
5. Turmeric Dr. (Mrs.) Muthulakshmi, TNAU, Coimbatore
6. Tree Spices Dr. V.A. Gadre, KKV, Dapoli
7. Coriander Dr. A. K. Singh, IGAU, Raigarh
8. Cumin Dr. K.D. Patel, SDAU, Jagudan
9. Fenugreek Dr. K. S. Shekhawat, RAJAU, Jobner

**SESSION V****TRANSFER OF TECHNOLOGY AND ON FARM TRIALS 2.30 PM -4.00 PM**

Chairpersons : Dr. G.L. Keshwa, Dean, SKN CA, RAJAU, Jobner  
Dr. S.K. Malhotra, ICAR, New Delhi

Rapporteurs : Dr. A. Ragini, APHU, Guntur  
Dr. S. Narasimha Rao, Kamarappally (Jagtial)

**Presentation of New Technologies, Technology Assessment Programme & Presentation and finalization of New Programmes for 2011-12** : Concerned centres & Concerned Scientists

**PLENARY SESSION 04.00 PM -6.00 PM**

Chairperson Dr. Umesh Srivastava, ADG (Hort.II), ICAR, New Delhi  
Rapporteurs Dr. V. Srinivasan, IISR, Calicut Dr. D. Prasath, IISR, Calicut

Tea 05.00 PM -05.30 PM

**Presentation and finalization of New Programmes for 2011-12** : **6.00 PM -8.50 PM(Cont.)**

**Presentation of proceedings of Technical Session I to IV & Discussion** : **Rapporteurs**

Technical Session – I	Genetic Resources	Dr. (Mrs.) Shoba
Technical Session –II	Crop Improvement	Dr. D. Prasath
Technical Session –III	Crop Management	Dr. V. Srinivasan
Technical Session –IV	Crop Protection	Dr. K. S. Shekhawat

**Remarks of Chairperson** : **Dr. Umesh Srivastava**  
ADG (Hort. II)

**Vote of thanks** : **Dr. M. Anandaraj**  
Project Coordinator, Spices

## INAUGURAL SESSION

The twenty second All India Coordinated Research Project on Spices Workshop (AICRPS) was held at Swami Keshwanand Rajasthan Agricultural University Campus, Durgapur, Jaipur, Rajasthan during 18<sup>th</sup>-19<sup>th</sup> June 2011. Dr. M.P. Sahu, Director of Research, RAJAU, Jaipur has given the welcome address. The meeting was inaugurated by Dr. H.P. Singh, Hon'ble Deputy Director General (Hort.), ICAR, New Delhi.

Dr. M. P. Sahu, Director of Research, RAJAU, in his welcome address shared his view on agricultural research in the country with more focus on Rajasthan. Declining production, declining water use efficiency, declining response to fertilizer and increasing cost of cultivation were discussed and a need for reorientation of research programmes in agriculture in the present scenario was emphasized.

Dr. M. Anandaraj, Project Coordinator (Spices), AICRPS, presented the salient achievements made during the previous year while presenting the Project Coordinator's report. Eight location specific technologies developed during 2010-11 in various spices were highlighted in his speech.

Dr. U. Srivastava, Asst. Director General (Hort. II) remarked that the genetic base is narrow in tree spices and seed spices and hence, the genetic base has to be widened by introduction of spices from centres of origin. He also emphasized the importance of need based and region based research programmes and directed AICRPS to formulate and undertake such programmes.

Dr. S. B. Dandin, Vice Chancellor, UHS, Bagalkot emphasized the need for following good spice cultivation practices. He said that there is a need for mapping of potential spice growing areas and identifying the most suitable crop for each area. To reduce seed cost and for making seed available for farmers locally, he stressed the need for ear marking seed zone / seed village and identifying seed farmers locally.

Dr A. K. Dahama, Vice chancellor, RAJAU emphasized the need for organic cultivation of spices and also the need for reorientation of research to suit the present scenario of climate change.

H. P. Singh, DDG, Horticulture in his inaugural address highlighted that the role of AICRPS has become more significant than before under the scenario of climate change. Conservation of land, water and nutrients is the focus for XII plan. Mechanization has to be given importance substituting labour. Adopting protected cultivation for growing crops need to be ventured though the initial investment may be more. Need based application of water and nutrients has to be standardized in spice crops. He recommended to adopt pulse irrigation for plants based on the water potential and oxygen requirement of soil. He suggested that hydroponics/areoponics may be adopted for pathogen free and healthy seed production.

## PROJECT COORDINATOR'S REPORT

**M. Anandaraj**

**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 vested with the mandate to conduct and coordinate research in 13 spice crops namely, black pepper, cardamom, cassia, cinnamon, clove, coriander, cumin, fennel, fenugreek, ginger, large cardamom, nutmeg and turmeric, with its headquarter at Indian Institute of Spices Research, Calicut. AICRPS has at present 34 centers which include 19 regular, 8 co-opting and 7 voluntary centres located in 21 states of India under 21 State/Central Agricultural Universities (SAUs)/Research Institutes. As per the decisions of the XXII AICRPS workshop, a new voluntary centre was added to take up specific work on seed spices at Horticultural Research Station Periakulam during the XI plan period. The XI Plan budget of AICRPS is Rs. 1400 lakhs with Rs 250 lakhs (ICAR share) during 2009 - 10.

Based on the decisions of XXI AICRPS workshop held at NRCSS, Ajmer during 5-6 July 2010, new programmes were initiated during the year. About 100 research programmes covering the mandate spice crops are being conducted at various centres. These programmes are carried out under the major disciplines of genetic resources, crop improvement, crop production and crop protection. The salient findings in the mandate crops are presented in this report.

### **Black pepper**

The germplasm of black pepper is collected and conserved in all the black pepper centres. An alternate repository of black pepper germplasm is being established at RARS, Ambalavayal. Among the various accessions of black pepper germplasm evaluated at Panniyur, Chalakudy, ICP- 48 and P- 5 were found to be promising during 2010. Two accessions PN- 33 & 57 continued to perform well at Yercaud. The intervarietal hybrid P6 x P 5 developed at Panniyur is promising with a green berry yield of 5 kg/vine. In a CVT trial in black pepper, CUL. 5308 recorded highest yield at Pampadumpara and Chintapalle. At Panniyur, CUL-5489 and CUL- 5308 were promising during the last three years where as at Ambalavayal, Panniyur-1 recorded maximum dry weight of berries/standard (1.89 kg) followed by PRS-21 (1.01 kg). A trial on evaluation of grafts, orthotropic and runner shoots of black pepper was initiated during the year and is in progress at various pepper centres. Standardized a technology for rooting of orthotropic shoots in black pepper at Dapoli, by treating the two-node orthotropic cuttings without leaves either in *Pseudomonas fluorescens* -10<sup>8</sup> powder formulation or in common sugar (2%) solution for one minute. Application of potassium phosphonate @ 0.3% as spray and soil application of *Trichoderma harzianum* @ 50 g/vine with one kg of neem cake to the

root zone and application of Bordeaux mixture 1% as spray and copper oxychloride @ 0.1% as drench is recommended for effective and economical management of foot rot disease of black pepper in the Konkan region. In black pepper growing tracts of Malnad region, three major species of *Erythrina* viz., *E. indica*, *E. fusca* and *E. subumbrans* are being used as black pepper standards. The incidence of gall wasp, a serious pest attacking black pepper standards was recorded in two species, namely, *E. indica* and *E. fusca* in all the places and no incidence was reported on *E. subumbrans*.

### **Cardamom**

In cardamom, the open pollinated progenies 21C<sub>8</sub> recorded highest dry capsule yield (195 kg/ha) followed by 23C8 (190.2 kg/ha) and 22C8 (189.6 kg/ha) at Mudigere. In a CVT at Pampadumpara, PS -27 recorded highest yield (386 g/plant). At Mudigere, clone CL-722 (292.0 kg/ha) and PS-27 (262.00 kg/ha) were found promising for dry capsule yield. Experiments on standardizing water requirement and irrigation schedule, fertigation through drip irrigation and organic farming was initiated during the year and is in progress. Spraying six rounds of quinalphos (0.05%) was most effective for the management of cardamom shoot and capsule borer and cardamom thrips at Pampadumpara.

### **Large cardamom**

Survey was conducted at Sukhia Pokhri and Rang bhang area of Darjeeling, Dentam and Hee-Gaon area of West Sikkim, Ravangla and Namchi area of South Sikkim, Dzongu area of North Sikkim and Assam lingzey, Pakyong area of East Sikkim and nine germplasm viz. SCC 218 (Hario Ramsey), SCC 219 (Rato Varlangey), SCC 220 (Ramsey), SCC 221 (Varlangey), SCC 222 (Asarey), SCC 223 (Ramsey), SCC 224 (Chivesey), SCC 225 (Allied Genera), SCC 226 (Hario Varlangey) were collected and planted at Kabi farm. Characterizations of the collected germplasm were made as per descriptor. Received IC numbers for 48 accessions of large cardamom from, NBPGR, New Delhi

### **Ginger**

Accessions NDG-55 (Kumarganj), GCP-32, GCP-14, GCP-33, GCP-54, GCP-01 (Pundibari) SG-26/04, SG-40/04, SG-8/04, SG-1029, SG-823 (Solan) and RG-43, RG-18 (Dholi) were identified as high yielders. At Pundibari, accession GCP-01, GCP-08 and GCP-51 recorded no pest or disease incidence during the year. In a CVT in ginger at Solan, two local entries namely, SG-707 (179.99 g/plant) and SG-827 (164.23 g/plant) recorded maximum yield. In an experiment to study the performance of ginger varieties in various agro climatic zones of the country, it was observed that the average yield of rhizome per plot was highest (5.682 kg) in Suprabha followed by Varada (4.616 kg) and Gorubathan (4.309 kg) at Kalyani. At Pasighat, (Arunachal Pradesh) the variety Surabhi and Nadia were found to be suitable whereas at Solan, variety Himigiri recorded maximum yield. Suprabha and Mahima were suitable for Ranchi. In an organic management trial in ginger at Dholi, fully organic treatment gave maximum yield as compared to integrated fertilizer management (organic and inorganic) and fully inorganic. At Kumarganj, application of 50% recommended dose of fertilizer (60:40:40 kg NPK kg/ha) + 50% FYM (10 t/ha) + *Azospirillum* (5 kg/ha) + seed treatment and soil application of *Pseudomonas fluorescens* + *Trichoderma* (50 g/3 m<sup>2</sup>) gave maximum fresh rhizome yield of 62.37 q/ha of fresh ginger rhizomes followed by a yield of 44.5 q/ha in application of 100%

FYM (20 t/ha) + seed treatment and soil application of *Pseudomonas fluorescens* + *Trichoderma* 50 g/3 m<sup>2</sup>. At Chintapalle, soft rot incidence was less and yield was high when rhizomes were treated with rhizobacterial antagonist or with Metalaxyl, Mancozeb 72% WP (1.25 g/l).

## **Turmeric**

Among the 29 early maturing germplasm evaluated at Kumarganj, NDH-79 (362.10q/ha of fresh rhizome yield) and NDH-74 (352.47q/ha) were found to be promising. Out of the 74 medium maturing germplasm, NDH-98 (421.60 q /ha) and NDH-18 (Narendra Haldi –1) (335.20q /ha) were found to be superior for yield. Among the 36 late maturing varieties, NDH-8 gave maximum fresh yield of 375.0 q/ha followed by 357.15 q/ha in NDH-7. The germplasm accessions RH-24 and RH-17 (Dholi), CLI-317 (Jagtial), Raigarh, IT-8, IT-3, IT-9, IT-41 (Raigarh), CHFT-8, CHFT-22, CHFT-30, CHFT-36 (Phasighat), TCP-137, TCP-120 and TCP-46 (Pundibari) were reported to be promising with high yield. In an IET in turmeric at Kumarganj, NDH-8 (346.33 q/ha) and NDH-9 (336.66q/ha) recorded high yield. In a CVT in turmeric, TCP-70 performed well at Pundibari, Kumarganj and Raigarh whereas, CL-101 and BSR-2 (13.25 kg/plot) were better performers at Coimbatore. In a Genotype and environment interaction study, the turmeric varieties VSR-II, Duggirala and Suranjana performed well at Kalyani, whereas at Pundibari TCP-2 and Narendra Haldi-1 performed well. At Calicut the maximum fresh yield was recorded in Rajendra Sonia followed by Narendra Haldi. Maximum dry yield was observed in Roma (8.6 t/ha) followed by Mega turmeric (6.3 t/ha) at Chintapalli whereas highest fresh rhizome yield was recorded in Rajendra Sonia (36.3 t/ha) followed by Roma and Suranjana (32 t/ha). The variety Suranjana was found to be the best at Raigarh. In a processing experiment in turmeric it was observed that turmeric cured by traditional water boiling method for 40, 60, 90 min, took 11 days for drying while turmeric cured in improved water boiler for 60, 45 and 30 min took 12, 23 and 24 days. Maximum retention of curcumin (5.91%) and essential oil (3.6%) was obtained for rhizomes cured by water boiling method for 40 min. Increase in curing time resulted in significant reduction in curcumin, starch, essential oil and oleoresin content. In an experiment to standardize of water requirement for turmeric through drip irrigation at Jagtial, it was observed that surface irrigation recorded highest rhizome yield (44.30 kg/ 60 plants) followed by drip once in a day at 80% PE (42.80 kg/ 60 plants). Application of 100% recommended dose of fertilizer (NPK @ 150:60:108 kg/ha) through drip - weekly once recorded highest rhizome yield at Kammarpally and Coimbatore. Soil application of micro nutrients on turmeric produced highest clump weight of 432.44 g and highest yield of 9.24 kg per plot whereas foliar spray of micro nutrients on turmeric produced clump weight of 341.17 g and yield of 8.98 kg per plot at Pundibari. Foliar spray - (propiconazole 0.1% on 45 and 90 days) or foliar spray with Carbendazim + Mancozeb (0.1%) on 45 and 90 days was effective for the control of leaf spot disease in turmeric. Foliar application of mancozeb + carbendazim (0.1%) was effective for the management of leaf blotch in turmeric at Jagtial/ Kammarpally.

## **Tree spices**

The germplasm of tree spices which include nutmeg, cinnamon, cassia and clove are collected, maintained, characterized and catalogued at Dapoli and Yercaud/ Pechiparai centres. In nutmeg the accession Sel.4 recorded the highest yield of 1005 fruits per tree and an oleoresin content of 8.67% at Pechiparai. Among the cinnamon accessions, Sel.65 performed well and attained a plant height of 3.90 m, stem girth of 29.35 cm, leaf yield of 7.83 kg/tree with a dry bark yield of 620 g/tree. In clove,

Sel.13 was found to be promising with a dry yield of 3.70 kg/tree. A CVT on cassia is also in progress.

### **Cumin**

Mean performance of the entries evaluated in CVT for two years at Jobner revealed superior performance of CUM-13 (677.61 kg/ha) followed by CUM-12 (595.14 kg/ha). UC-339 (726.74

kg/ha) and UC-336 (671.88 kg/ha) were found to be promising in an IET at Jobner and could be promoted to CVT. Application of *Trichoderma harzianum* @ 20 kg/ha + FYM @ 6 t/ha (BCR 1: 2.42) or *Trichoderma harzianum* @ 20kg/ha + FYM @ 3 t/ha (BCR 1: 2.16) at the time of sowing is recommended for the effective and economic management of cumin wilt at Jagudan.

### **Coriander**

Among the 275 coriander accessions evaluated at Coimbatore, CS 251 was found to be promising for yield. At Kumarganj, coriander accession, ND Cor-38 gave maximum seed yield (18.45 q/ha) followed by NDCor -2 (17.40 q/ha). At Guntur, LCC-303 recorded highest yield per ha (1770.8 kg) followed by LCC-301 (1728.2 kg), LCC-274 (1583 kg/ha), and LCC-279 (1458 kg/ha). At Dholi, coriander accessions, RD-420 and RD-395 were identified as high yielders.

Two new experiments on leafy type coriander was initiated during this year for identifying varieties in leafy type coriander and another on nutrient management in off season coriander leaf production. In a CVT in coriander, the coriander (COR-32) was found to be promising at Jabalpur and Udaipur, COR-25 at Kumarganj, COR-31 at Raigarh, COR-30 at Guntur, COR-27 at Jobner, COR-29 at Ajmer. In an IET of coriander for seed purpose, LCC-219, LCC-224 and LCC-229 were found to be promising. At Jobner UD-794 and UD-663 were found to be promising and may be promoted to CVT. The cumin genotypes UC-331, UC-274 and UC-225 were identified as high yielder in irrigated conditions, while, UC-239, UC-274 and UC-225 were the best genotypes in limited moisture conditions at Jobner. Following integrated nutrient package for coriander gave highest coriander seed yield (1250 kg/ha) at Coimbatore. At Guntur, application of 100% N + *Azospirillum* + 5 t/ha FYM recorded maximum yield (954kg/h) in coriander. Application of micronutrients copper as copper sulphate (soil application) 25 kg ha<sup>-1</sup> and foliar spray of zinc sulphate 0.5% (2 sprays-45 & 60 days of sowing) increased yield in coriander at Coimbatore. Large scale demonstration of the role of rhizobacteria in growth promotion of coriander is in progress in farmers plot. At Guntur, seed treatment and soil application with FK-14 and FL-18 recorded highest yields (1076 kg/ha & 1037 kg/ha respectively) which were on par with each other and significantly superior over control (851 kg/ha). A technology for production of leafy coriander under 50% shades during offseason was developed at Coimbatore.

### **Fennel**

At Dholi, the germplasm accessions RF-14 and RF-20 were reported as yielders. Two fennel entries UF-157 (2166.82 kg/ha) and UF-278 (2137.63 kg/ha) were found to be high yielders in an IET at Jobner and may be promoted to CVT. In a CVT at Jobner, FNL-43 (1904.22 kg/ha) and FNL-46 (1901.33 kg/ha) were found to be promising based on the yield performance. At Dholi, FNL-43 and FNL-41 were found to be promising.

## **Fenugreek**

Out of 105 fenugreek germplasm screened at Kumarganj, NDM-37 gave maximum seed yield of 23.70 followed by NDM-25 and NDM-48 (22.50q/ha). Among the accession evaluated at Guntur, LFC-122 recorded highest yield of (1270 kg/ha) followed by LFC-78 (1145 kg/ha). At Dholi, the fenugreek accession RM-201 was found to be promising with a yield of 1.10 kg/3.6 m<sup>2</sup>. In an IET in fenugreek NDM-61 and NDM-48 were found to perform well at Kumarganj. In an IET at Guntur, LFC-116, LFC-76, LFC-98 and LFC-93 were found to be superior than the check. At Jobner UM-126 (2595.61 kg/ha) and UM-222 (2419.22 kg/ha) were found to be superior to other varieties based on their yield performance. a CVT in fenugreek is in progress in various fenugreek growing centres. Large scale demonstration of the role of rhizobacteria in growth promotion of fenugreek was taken up in farmer's field. Seed treatment and soil application with FK-14 and seed treatment and soil application with FL-18 were on par with each other in leaf yields (1.54t/ha & 1.51t/ha respectively) and superior over control (1.33 t/ha) at Guntur. RMt-1, UM-29, UM-13 were found suitable for growing in irrigated conditions. Similarly in drought conditions, UM-36, UM-26, UM-10 were found to be ideal.

### ACTION TAKEN REPORT 2011

SL. No.	Decision	Action Taken
1.	AICRPS, NRCSS & NBPGR may collectively prepare a crop wise check list regarding maintenance of germplasm and introduced germplasm materials available at different centres.	The crop wise list of germplasm is maintained at both IISR and NRCSS and all the AICRPS centres
2.	IC number is a must for original/new collections and may be obtained by all the individual centres	The proposal for obtaining IC No. has been routinely followed by Guntur, Jagudan, Jobner, and Dapoli. Pampadumpara and Mudigere have obtained IC numbers for their cardamom collections.
3.	Performa of Data sheet for recording observations will be published in the AICRPS website	For all new experiments, the details of experiment, observations to be recorded are all placed in the website.
4.	All the centres should strictly adhere to the programme finalized in the workshop.	The centres are strictly adhering to the programmes. The allotted experiments have been laid out by all centres.
5.	Area of irrigation channels should be reduced when calculating yield of irrigation trials. Yield may be separated on the basis of net plot area.	Followed accordingly
6.	For analyzing the data, the centers may be grouped on the basis of similarity of the growing conditions, so that more regional recommendations may emerge.	This is followed for all trials
7.	Fine tuning of all MLT trials is to be taken up.	The spacing requirements for seed spice crops are followed as per location and growing conditions.
8.	Translation of the “Advanced Production Technology” booklet by NRCSS into Gujarati, Telegu, Tamil and Kannada should to be taken up. The responsibility of the translations is entrusted with Dr. Ravindra Babu, GAU, Jagudan (for Gujarati), Dr. C. Sarada, APHU, Guntur (for Telegu), Dr. N. Shoba, TNAU (for Tamil), and Dr. Anke Gowda, CRC, Appangala (for Kannada) respectively.	Translation in Telugu is under progress by Guntur. The translation in Tamil by Coimbatore centres has been forwarded to DASD, Calicut. NRCSS, Ajmer shall follow up the other translations.

9	In all the yield trials, per hectare yields should be calculated based on net plot yield only.	The per hectare yield are calculated on the basis of net plot yield in all the trails.
10	A good database of photographs and descriptors should be built for all promising entries by the respective centers, so that the proposals have good quality photos.	It will be followed accordingly.
11	Development of GAP for ginger and turmeric may be explored.	The technology developed by IISR shall be adopted at AICRPS centres.
12	All the centers should record the disease incidence along with weather parameters in order to correlate and develop the forecasting system of major diseases of all spice crops.	Weather parameters along with disease incidence are recorded at Sirsi centre. Other centres will be done from the ensuing rainy season of 2011.
13	All the resource persons identified should present the results after compiling the information from all the centers in a comparative manner instead of center wise.	It will be followed accordingly.
14	Credit of the release varieties may be shared among the principal Investigator/Chief Breeder/Scientist associated with PI and collaborating Centers including the AICRPS Head quarters.	Instruction will be followed.
15	For release of variety, data on multilocational trials for minimum of 2 years along with IC No. is essential.	Instruction will be followed while taking up new trials (CVT).
16 17.	Technology of growing leafy coriander under 50% shade net during off season was promising. The elite accessions LCC 244 and LCC 234 were promoted for CVT at Guntur, Coimbatore, Ajmer and Periyakulam centres.	The leafy coriander accessions LCC-244 & LCC-234 were under evaluation in 50% shade condition during 2011 at these centres.

#### TECHNICAL SESSION-I GENETIC RESOURCES

<b>Black Pepper</b>		
18.	Ongoing experiment at Chintapalli and Sirsi (PEP CI/1) may be concluded and final report may be submitted	The final reports has be submitted by the centres (Sirsi & Chintapalle)
<b>Small Cardamom</b>		
	All the AICRPS small cardamom centres should deposit its germplasm along with	The decision was complied with by Pampadumpara and Mudigere. However, the

	passport information to NAGS (CRC-Appangala) by August 2010.	ICRI is yet to comply with the decision
19.	The rhizome rot resistant accession of Pampadumpara may be sent to Appangala for further studies.	The decision will be followed up
<b>Large Cardamom</b>		
20.	ICRI Sikkim may explore the germplasm in collaboration with NBPGR RS Shillong	Being taken up this year
<b>Ginger</b>		
21.	For quality evaluation at Solan, Kumarganj centre should send samples within 15 days, Pundibari centre should send by Feb. 2011 and Dholi centre should send by March 2011.	Promising lines of ginger were already sent by Kumarganj centre.
<b>Turmeric</b>		
22.	Germplasm yield data should be presented per plot	Germplasm yield data is being presented as per plot basis.
23.	All the centres should send samples to Solan for quality analysis	Turmeric samples from promising lines of IET and micronutrients trials sent to Solan by Dholi and Coimbatore. The position of Biochemist has been filled up at Solan and the analysis will be done.
24.	Getting IC number is must for the promising materials before sending for CVT	IC number is being insisted for all CVT entries.
25.	Pasighat may be included as voluntary center	Pasighat is already a voluntary centre and is involved in the work on ginger and turmeric.
<b>Tree Spices</b>		
26.	Ambalavayal centre may be included for clove trial	The trial will be initiated during 2011.
<b>Seed Spices</b>		
27.	Augmented Block Design (ABD) should contain at least 2 checks. Each block (B) should have 15-20 accessions and the check (C) should be present in each block through randomization. The degrees of freedom (d.f.) of the experiments should be at least 12 i.e. (B-1) (C-1).	Augmented Block Design (ABD) is followed for seed spices.

28.	All seed spices germplasm including wild species along with passport information should be sent to NAGS (National Active Germplasm Site) within 20 days.	The seed spices germplasm entries were sent to NRCSS, Ajmer by Dholi, Guntur, and Jagudan. The other seed spices centres will be deposited in the ensuing season after multiplication in sufficient quantities.
29.	All the seed spice materials may be assembled at NRCSS and distributed to other centers for evaluation	NRCSS may follow this recommendation
30.	If more than 5 promising accessions are obtained in the germplasm evaluation, it should go to IET (Initial Evaluation Trial) at station level.	The promising accessions identified are being already evaluated in IET by all centres and further promoted to CVT.

### TECHNICAL SESSION –II CROP IMPROVEMENT

Seed Spices		
31.	Quality analysis of fenugreek of CVT and IET entries is to be taken up by AICRPS, Coimbatore centre and all the centers working on crop improvement of fenugreek are directed to submit the samples at the earliest.	The samples of fenugreek under CVT & IET after harvest will be sent to Coimbatore centres for quality analysis.
Black Pepper		
32.	The programme on black pepper grafting experiment in <i>piper conlubrinum</i> evaluation of grafts, orthotropic and runner shoots may be carried out at Thadiyankudisai (TNAU) as a testing centre.	The orthotropic runner shoots were grafted on rootstocks of IISR Shakthi & IISR Thevam and <i>P. colubrinum</i> . The grafting was done at Panniyur centre and material given to participating centres. Planting will be taken up in July 2011.

### TECHNICAL SESSION - III CROP MANAGEMENT

33.	A committee with Dr N Kumar, Dean, H C & RI, Coimbatore as a Chairman may formulate cardamom fertigation experiment	The programmes finalized and trials laid out.
34.	Presentations/reporting of trials with crop nutritional aspects both organic and inorganic should have nutritional status of the soil and variety tested. It also should have economics aspect so as to make solid recommendations. While working out economics 20% extra cost may be considered for organic products.	The centres are directed to follow the instructions.

35.	Turmeric irrigation experiment at Jagtial and Coimbatore should follow same irrigation schedule to draw meaningful information.	Followed as per the instructions.
36.	Mini-tractor type may also be tested in operating turmeric harvester and its efficiency recorded.	Instructions to be followed by Coimbatore centre.
37.	Plant population of treatment or unit area in turmeric harvesting in mechanization experiment should be uniform to avoid error in experimentation and reporting. This has to be included in the new workshop presentation.	This will be discussed in the technical session.
38.	CVT on drought resistant coriander lines may be initiated under crop improvement programme. One set of these lines may be deposited with NRCSS, Ajmer, if not done early.	This will be taken up as a new experiment on drought with NRCSS as the lead centre.
39.	NRCSS may take up basic studies on drought resistant work on coriander.	This is being done.
40.	Irrigation experiments should have the details on water savings / water productivity aspects for finalizing the recommendations.	Decision will be followed
41.	Dholi centre may bring out the <i>Azospirillum</i> application on fennel as a recommendation.	Application of <i>Azospirillum</i> is included in the recommendation of Dholi centre.
42.	In fennel short listed treatments on organic farming at different centre may go for large scale demonstration and adoption.	It is being followed in all seed spices centres.
43.	Clove vegetative propagation experiment may be stopped at Dapoli.	Decision followed
44.	Dapoli centre may publish the cinnamon post harvest work and bring out the recommendation. Sirsi may take up the same trial and Dr R Senthil Kumar, IISR may provide the results on cinnamon PHT work to PC (Spices) for compilation.	The report presented by the Dapoli centre. The same trial initiated at Sirsi.

## TECHNICAL SESSION – IV CROP PROTECTION

<b>Black Pepper</b>		
45.	PEP/CP/5.1 and 5.2 in black pepper should be closed	The experiment 5.1 closed during 2010 at 5.2 closed during 2011 and report to be submitted by the black pepper centres.
46.	Centers which developed the technology for management of <i>Phytophthora</i> foot rot disease should send the proposal for transfer of technology (Dapoli, Sirsi, Mudigere, Chintapalle, Panniyur and Pampadumpara).	The proposal for transfer of technology has been submitted by Dapoli. The technology of Sirsi centre has been accepted.
47.	Pruning and management studies to be conducted for the management of <i>Erythrina</i> gall wasp and survey has to be made for identification of natural enemies, alternate hosts and studies on biocontrol should be initiated by Mudigere and Pampadumpara centers.	The incidence of gall wasp has come down naturally. The concerned centres have to study the role of natural enemies.
<b>Cardamom</b>		
48.	CAR/CP/6.7: Project may be continued and conduct the experiment in the hot spot areas for pest and diseases since the incidence of pests and diseases was very low at places where experiments were conducted previously.	The experiments will be decided during the XXII workshop during 2011.
<b>Ginger</b>		
49.	The treatments showing higher incidence of all (>50%) should not be considered as effective.	Being followed.
<b>Turmeric</b>		
50.	Disease intensity along with weather parameters should be recorded for the foliar diseases in order to develop the forecasting system wherever facilities are available.	It is being followed at all turmeric centres. The leaf spot and leaf blotch intensity was recorded along with weather parameters by Coimbatore to develop forecasting systems.
51.	Resistant lines identified against rhizome rot by Jagtial center may be evaluated in the ensuing season. Also, yield data should be recorded and passed on to IET.	Directions followed

52.	Resistant lines identified by other centers for leaf spot and leaf blotch may be evaluated in the ensuing season and may be passed on to IET.	The turmeric cultures viz., CL-32, CL-34, CL-52, CL-54 & CL-101 at Coimbatore as field tolerant lines for both leaf spot and leaf blotch will be passed on to IET.
<b>Coriander</b>		
53.	Resistant lines/Accessions showing less than 20% disease incidence may be tested for one more year along with yield and passed on to breeders for further evaluation (Jobner and Guntur).	This decision will be implemented after studying this year's performance.
54.	Highly resistant accessions against stem gall and powdery mildew may be passed on the breeders for evaluation under IET.	Suggestions implemented
<b>Cumin</b>		
55.	In blight management trial, residues of mancozeb should be analyzed by sending samples to Spices Board. Survey should be done and samples should be collected and analyzed for residues of Mancozeb at IISR, Calicut (Jobner).	The RAJAU at Jaipur has a well established residue analysis centre at Durgapura. This facility may be utilized.
56.	In the project, best treatment in the management of wilt and blight may be taken up as a new adaptive trial involving wilt resistant variety GC-4.	Suggestions implemented at Jagudan.
<b>Fennel</b>		
57.	Etiology of sugary disease may be studied along with physiological and weather parameters in collaborative manner with plant protection scientists, Physiologists and PC Unit. (NRCSS, Ajmer, Jobner and Jagudan).	During the crop season of 2011-12 a joint team will visit and study the problem.

## TECHNICAL SESSION: I GENETIC REOURCES

**Chairpersons :**      **Dr. Umesh Srivastava, ADG (Hort. II), ICAR, New Delhi**  
                                 **Dr. M.M. Anwar, Director, NRCSS, Ajmer**

**Rapporteurs :**      **Dr. (Mrs.) N. Shoba, TNAU, Coimbatore**  
                                 **Dr. Dharendra Singh, RAJAU, Jobner**

Both the Chairmen Dr. Umesh Srivastava and Dr. M.M. Anwar emphasized the importance of germplasm in crop improvement programme. There were ten presentations but, after completion of all the presentations, it was observed that, there was no uniformity in presentations regarding the following items.

- i) Passport data
- ii) Accession numbers (either not indicated or not given)
- iii) Unit of yield expressed
- iv) Experimental design (both for IET & CVT) being followed
- v) Data analysis and presentation
- vi) Format for cataloguing etc.

To take note of the above, the Chairman has constituted a committee under the Chairmanship of Dr. S.B. Dandin. The committee of the following members constituted.

Dr. S.B. Dandin, Vice chancellor, UHS, Bagalkot	- Chairman
Dr. E.V.D. Sastry, Sr. Breeder, SKN College of Agriculture, Jobner	- Member
Dr. Nagesh Naik, UHS, Sirsi	- Member
Dr. Gopal Lal, NRCSS, Ajmer	- Member
Dr. N. Shoba, TNAU, Coimbatore	- Member
Dr. Dharendra Singh, RAJAU, Jobner	- Member
Dr. M.K. Dhanya, KAU, Pampadumpara	- Member

After thorough discussion among them and the following recommendations emerged.

### **Recommendations**

- 1) All the NAGs centre may provide details of available germplasms along with passport data (information) to PC Unit by September, 2011 so that duplications can be avoided (**Action: All NAG Centers**)
- 2) Uniform pattern of the catalogue data has to be prepared by crop group leaders and circulated on website and followed by all centers for respective crops by September 2011 (**Action: Crop Expert Group**)

- 3) All National Active Germplasm Sites (centers) has the responsibility of compilation/consolidation of the data on germplasm for national registration by December, 2011 (**Action: All NAG Centers**)
- 4) NAGS centre in-charge may get Accessions numbers from the NBPGR by December, 2011
  - (i) IC (Indigenous) collections
  - (ii) EC (Exotic) collections (**Action: All NAG Centers**)
- 5) Design for germplasm evaluation both IET & CVT, uniform method of presentation of the data are to be followed as per AICRP on Spices by all PIs and Co-PIs and has to be followed by all centers to maintain uniformity (**Action: Crop Expert Group**)
- 6) Uniform presentation of the germplasm characterization data to be discussed and circulated once again. Proper format and Descriptors to be decided & provided for each center for each crop by September, 2011(**Action: Respective Crop Experts**)
- 7) For CVT trials of elite genotypes, uniform modalities shall be decided crop wise by the experts and circulated to all centers. This shall include experiment design, observation to be recorded, software for data to be analyzed, method of presentation etc.
- 8) Crop wise exploration programmes wherever necessary be planned annually and circulated well in advance. For example exploration programmes (at least 2-3) may be fomulated with partners among respective centers to take part in exploration trips. This may be circulated to all the members immediately (**NAGS centres**).
- 9) Preparation of crop wise manuals on “Exploration, collection, evaluation and conservation” of spice crops germplasm by December, 2011 (**Action: Respective Crop Experts**)

The meeting ended with thanks to the chair.

The crop wise NAGS centres & Coordinators as well as crop wise experts are as follows.

<b>Crop</b>	<b>Place (NAG Centers)</b>	<b>Co-ordinator</b>
Black pepper	Indian Institute of Spices Research, Calicut	
Cardamom	IISR Cardamom Research Centre, Appangala	Director, IISR, Calicut
Turmeric	Indian Institute of Spices Research, Calicut	
Ginger	-do-	
Nutmeg		
Clove		
Coriander	National Research Centre on Seed Spices, Ajmer	Director, NRCSS, Ajmer
Cumin	-do-	
Fennel		
Fenugreek		

<b>Crop</b>	<b>Name and Center of Crop wise Experts</b>
Cardamom	Dr. R. Senthil Kumar, IISR CRC, Appangala
Cardamom (Large)	Dr. Utpal Gupta, ICRI, Sikkim
Black pepper	Dr. K.V.Saji, IISR, Calicut
Turmeric	Dr. D. Prasath, IISR, Calicut
Ginger	Dr. B. Sasikumar, IISR, Calicut
Nutmeg & Clove	Dr. Prem Joshua, TNAU, Coimbatore
Coriander	Dr. Gopal Lal, NRCSS, Ajmer
Cumin	Dr. S.R. Solanki, NRCSS, Ajmer
Fennel	Dr. E.V.D. Sastry, SKN College, RAJAU, Jobner
Fenugreek	Dr. R. S. Meena, NRCSS, Ajmer

#### **Genetic Resources of Spices**

<b>Crop</b>	<b>AICRPS Centres maintaining germplasm</b>
Black pepper	Chintapalle, Dapoli, Panniyur, Pundibari, Sirsi, Ambalavayal & Yercaud
Cardamom	Mudigere & Pampadumpara
Large cardamom	Gangtok
Ginger	Dholi, Kumarganj, Pottangi, Pundibari, Raigarh & Solan
Turmeric	Coimbatore, Dholi, Jagtial, Kumarganj, Pottangi & Raigarh
Tree spices	Dapoli and Yercaud/Pechiparai
Coriander	Coimbatore, Dholi, Guntur, Hisar, Jagudan, Jobner & Kumarganj
Cumin	Jagudan & Jobner
Fennel	Dholi, Hisar, Jagudan, Jobner & Kumarganj
Fenugreek	Dholi, Hisar, Jagudan, Jobner, Kumarganj & Guntur

## **TECHNICAL SESSION: II CROP IMPROVEMENT**

- Chairman:** Dr VA Parthasarathy, Director, IISR, Calicut
- Co Chairman:** Dr. EVD Sastry, Head, Department of Plant Breeding and Genetics, SKN College, RAJAU, Jobner
- Rapporteurs:** Dr. RS Meena, NRCSS, Ajmer  
Dr. D Prasath, IISR, Calicut

### **General recommendations**

All the released varieties (extant) in black pepper, cardamom, ginger and turmeric may get registered with PPV&FRA, New Delhi. The proposal for registration need to be sent through Project Coordinator, Spices.

All the centres need to send replicated data for compilation and presentation at the workshop well in advance to the crop coordinators.

The missing/non germinated entries in CVT may be brought to the notice of Project Coordinator well in advance.

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.

The shortlisted entries in IETs may be included and proposed for new CVTs in seed spices.

In seed spices, a few centres recorded very low yield and these centres may follow better management practices

The presentation by Dr EVD Sastry may be taken as model compilation and presentation. The same may be followed by other centres in future.

### **Crop specific recommendations**

#### **Cardamom**

The new CVT for drought tolerance is proposed and recommended with 6 entries from IISR, Appangala for 2012 season. The trial will be conducted in three centres in Karnataka.

#### **Black pepper**

The data on the best performing entry in CVT 2000, Acc. 5489 may be compiled and presented for varietal release (Action: Panniyur).

The experiment on P6 x P5 may be dropped as this is already recommended as variety by previous workshop.

### **Ginger and turmeric**

Instead of presenting mean data, the G x E interaction need to be worked out and presented in the next workshop. Also, G x E interaction on quality parameters also to be worked out and presented (Action: IISR, Calicut).

### **Tree spices**

The data on the best performing entry in CVT of clove, SA 3 may be compiled and presented for varietal release (Action: Peechiparai).

### **Cumin**

National and local checks need to be included in all the centres for better comparison.

Japalpur centre may be discontinued from cumin trials, as crop is not performing well in that region.

Ajmer centre may take precautions to avoid crop failures and retain quantity of seeds for such exigencies.

### **Fennel**

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)

### **Fenugreek**

The three year data on the best performing entry in CVT, FGK 36 may be compiled and presented in 2012 workshop (Action: Jobner).

### **Coriander**

COR/CI/3.3 IET is concluded at Jobner and shortlisted entries (UD 794 and UD 663) may be included in new CVT (Action: Jobner)

The project Co-ordinator may write to centres which default in sending reports.

## **TECHNICAL SESSION: III CROP MANAGEMENT**

- Chairman** : **Dr MP. Sahu, Director Research, RAJAU, Rajasthan**
- Co Chairman** : **Dr. B. Chempakam, IISR, Calicut**
- Rapporteurs** : **Dr. V. Srinivasan, IISR, Calicut**  
**Dr. AC. Shivran, RAJAU, Jobner**

Eight presentations were made on the mandate crops.

### **The following points were discussed**

In organic farming experiments, soil fertility and quality parameters (including biochemical parameters) and also the quality of the produce need to be analysed to see the long term influence of organic management on soil health improvement and sustainability aspects of agro-ecosystem. Composition of the organics should be indicated in the experimental plan.

In fertilizer and micro nutrient trials, basic soil data and the nutrient build up before and after the harvest need to be recorded and presented. Nutrient management experiments, as far as possible, should not be compounded with plant growth regulators. Similarly, micro nutrient experiments also should be nutrient specific with proper delineation of the micronutrient deficiency constraining spices productivity.

More relevant data need to be recorded in experiments on water management, use of shade, rain gun etc.

### **Crop specific recommendations**

#### **Cardamom**

1. The delay in taking up the fertigation experiment at Pampadumpara centre need to be communicated to KAU

#### **Black pepper**

1. The effect of four year organic farming trial on soil health parameters as well as economics at Panniyur centre need to be worked out.
2. Soil micronutrient status may be presented for better understanding of the non significant effect of some treatments in micronutrient experiments.

#### **Ginger and Turmeric**

1. In micronutrient trials, the role of specific micronutrients may be assessed in detail based on its deficiency status. Photographs of prevalent micronutrient deficiencies can also be presented, if the deficiency is severe and widespread.

2. Irrigation scheduling experiments on turmeric need to be executed with utmost care, as the results indicate lesser efficiency for drip irrigation schedules as compared to surface irrigation at Kammarpally.

### **Cumin, Fennel & Fenugreek**

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1. Encouraging results on seed treatment or soil application of rhizobacteria in these crops were presented, based on field trials. As this is a low cost technology, this may be popularized through popular publications/ bulletins (in English and Hindi). Large scale field demonstrations may also be laid out in the region and 'farmers' day may be organized to highlight the significance of the technology amongst the farmers.

**TECHNICAL SESSION: IV  
CROP PROTECTION**

**Chairman** : Dr. S. Devasahayam, IISR, Calicut  
**Co Chairman** : Dr. S. Gangopadhyay, RAJAU, Rajasthan  
**Rapporteurs** : Dr. K.S. Shekhawat, SKN College of Agriculture, Jobner  
Dr. (Mrs.) P. Muthulakshmi, TANU, Coimbatore

In this session 9 presentations were made on 10 crops covered 21 projects. This work was carried out at Chintapalle, Dapoli, Panniyur, Pampadumpara, Pechiparai, Mudigere, Sirsi, Gangtok, Solan, Dholi, Pottangi, Pundibari, Kumarganj, Raigarh, Ambalavayal, Coimbatore, Jobner, Jagudan and Ajmer.

**Black Pepper**

PEP/CP/6.2

The experiments on evaluation of reported resistance of *E. subumbrans* to *Erythrina* gall wasp may be continued.

**Cardamom**

CAR/CP/6.7 The pooled analysis may be carried out for the experiment and CB ratio worked out and pretrial may be concluded at Mudigere

**Ginger**

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.

GIN/CP 6.6 and 6.7 The experiment may be closed and effective treatments against bacterial wilt and rhizome rot diseases may be recommended.

**Turmeric**

TUR/CP/7.2 The experiment may be closed and effective treatments against foliar diseases of turmeric and may be recommended.

**Tree spices**

TSP/CP/3.1 The experiment may be closed.

**Coriander**

COR/CP/6.2 Survey for incidence of stem gall disease may be continued.

**Cumin**

CUM/CP/6.1 The experiments may be closed and the best treatment for the management of cumin wilt found effective may be recommended.

**Fenugreek**

FGK/CP/5.1 No diseases were observed for last two years therefore this experiment may be closed.

### **General recommendations**

1. Pooled analysis of data should be done and C : B ratio worked out before recommendation of a technology.
2. In bio-control experiments, the compatibility of bio control agent with the chemicals should be tested in those experiments wherever chemicals are included.
3. In bio-control experiments, the load of microbial population in soil should be monitored at initial and final stages of the experiment.

**TECHNICAL SESSION V**  
**TRANSFER OF TECHNOLOGY AND ON FARM TRIALS**

**Chairpersons :** Dr. G.L. Keshwa, Dean, SKN CA, RAJAU, Jobner  
**Co-Chairman :** Dr. S.K. Malhotra, ICAR, New Delhi  
**Rappourteurs :** Dr. A. Ragini, APHU, Guntur  
Dr. S. Narasimha Rao, Kamarappally (Jagtial)

**BALCK PEPPER**

1. Rooting of orthotropic shoots of black pepper (Dapoli)

Treating two node orthotropic cuttings without leaves in *Pseudomonas fluorescens* -10<sup>8</sup> powder formulations or dipping in common sugar (2%) solution for one minute is recommended for rooting of black pepper.

2. Management of foot rot of black pepper (Dapoli)

Spraying of 1% Bordeaux mixture and drenching of 0.1% Copper oxychloride or spraying of 0.3% Potassium phosphonate and soil application of *Trichoderma harzianum* @ 50 g/vine with one kg of neem cake is recommended for management of leaf blight and foot rot of black pepper caused by *Phytophthora capsici*. The treatment has to be given twice first application be given with onset of monsoon and second application after sixty days.

**TURMERIC**

1. Management of foliar diseases in turmeric (Kamarapally)

Leaf spot disease of turmeric could be controlled by treating the rhizome with mancozeb carbendazim (0.1%) followed by foliar application of propiconazole (0.1%) at 40 days after planting.

2. Foliar application of mancozeb - carbendazim (0.1%) was effective for the management of leaf blotch in turmeric.

3. Management of foliar diseases in turmeric (Coimbatore)

Foliar spray with Propiconazole (0.1%) on 45 and 90 days after sowing was found to be effective for the management of foliar diseases of turmeric.

**GINGER**

1. Management of soft rot diseases of ginger by biofumigation (Dholi, Kumarganj, Raigarh & Pundibari)

2. Biofumigation with cabbage was effective for the management of rhizome rot disease of ginger.

**CARDAMOM**

1. The following spray schedule may be undertaken for the management of cardamom thrips (Mudigere)

I Spray: March – Methomyl @1.5 ml/l; II Spray: April – Phosalone @ 2 ml/l; III spray: May – Phosalone @ 2 ml/l.

**Assessment of Technologies Developed Under AICRPS Coordinating Centers  
(2008-'09 to 2011-12)**

**Chairman** : Dr. G. L. Keshawa, Dean, SKANCA, Jobner  
**Co-Chairman** : Dr. S. K. Malhotra, ICAR, New Delhi  
**Rappourteurs** : Smt. A. Rajani, Scientist, APHU, Guntur  
Sri. S. Narsimha Rao, Scientist, APHU, Kamarapalli

**General Recommendations:**

1. All the centres should submit a brief note on each technology assessed/demonstrated along with farmer name, name of the locations, per cent increase over the farmers practice, CB ratio and feedback from farmers.
2. Photographs of demonstration trials should be included in annual report.

**Centres /Technologies demonstrated**

**I Panniyur** - (Kerala Agricultural University)

1. Management of Phytophthora foot rot disease of black pepper

**II Coimbatore** – (Tamil Nadu Agril. Univeristy)

2. Integrated nutriment management in Turmeric

**III Guntur** - (Andhra Pradesh Horticultural University)

3. Demonstrations of the improved high yielding coriander variety for rainfed conditions (Sudha –LCC 128)
4. Use of growth regulators for enhancing seed set and yield in coriander

**IV Jobner** - (Rajasthan Agricultural University)

5. Demonstrations of the improved high yielding varieties of coriander (RCr 480)
6. Demonstrations of the improved high yielding varieties of cumin (RZ 223)
7. Demonstrations of the improved high yielding varieties of fennel (RF 143)

**V Jagudan** - (Gujarat Agricultural University)

8. Demonstration of wilt resistant variety of cumin (GC -4)
9. Demonstration of the high yielding variety of fennel (GF -11)
10. Demonstration of the high yielding variety of fenugreek (Guj. Methi -2)

**VI Hisar-** (Chaudharay Charan Singh Haryana Agril. University)

11. Demonstration of the of the leafy coriander variety (Hisar Bhoomit)
12. Response of coriander to micronutrients

**VII Dholi-** (Rajendra Agril. University)

13. Response of ginger to micronutrients- (Trail is under Progress)

**VIII Pundibari** - (Uttara Banga Krishi Vishwa Vidyalaya North Bengal Campus)

14. Efficacy of biofertiliser using *Azospirillum* on ginger

**IX Sirsi-**(University of Horticultural Sciences, Dharward)

15. Management of *Phytophthora* foot rot of black pepper under arecanut based cropping system

**X Chintapalle** (APHU)

16. Management of *Phytophthora* foot rot and slow decline of black pepper (Trial is under progress)

**XI Pampadumpara** - (Kerala Agricultural University)

17. Demonstration of cardamom variety (Pv -2)

**XII Yercaud-** (Tamil Nadu Agricultural University)

18. Management of *Phytophthora* foot rot of black pepper

**XIII Raigarh** - (Indira Gandhi Krishi Vishwa Vidyalaya)

19. Integrated disease management in ginger

**XIV Dapoli** - (Konkan Krishi Vidyapeeth)

20. High yielding nutmeg variety (Konkan Swad)

## PLENARY SESSION

**Chairman** : **Dr. Umesh Srivastava, ADG (Hort. II)**  
**ICAR, New Delhi**

**Rapporteurs** : **Dr. V. Srinivasan, IISR, Calicut**  
**Dr. D. Prasath, IISR, Calicut**

### General Recommendations:

1. All the centres should get the IC nos. for entries before initiating the CVT.
2. Cataloguing and characterization of germplasm for each crop in Seed spices should be done.

### Specific Recommendations:

1. A detailed report on MLT of seed spices from NRCSS sent to Project Coordinator for further recommendation during them for national release.
2. The centres that are ready with varieties for release should keep sufficient quantity of seed for supply.

**All India Coordinated Research Project on Spices  
List of New Research Programmes to be initiated during 2011-12**

**CROP IMPROVEMENT**

1. Initial evaluation trial in cardamom – **Pampadumpara**
2. Initial evaluation trial in ginger – **Solan and Pundibari**
3. Initial evaluation trial in coriander – **Jobner, Kota (Udaipur), Jagudan**
4. Initial evaluation trial in fennel – **Jobner**
5. Initial evaluation trial in Fenugreek – **Pantnagar, Jagudan**
6. CVT of drought tolerance in cardamom – **Appangala, Mudigere and Sakleshpur**

**CROP MANAGEMENT**

1. Liming in cardamom – **Pampadumpara** (To be reformulated with 4 centres)
2. Studies on the effect of rhizome size and nursery on growth and yield of turmeric – **Chintapalle, Coimbatore, Navasari, Bagalkot and IISR**
3. Evaluation of herbicides for the effective control of weeds in ginger – (**Chintapalle, Pottangi and Navasari**)
4. Micro irrigation management in Fennel – (**Bikaner and Jobner**)
5. Micro-irrigation management in Fenugreek (**Jobner**)
6. Evaluation of PGPR bioformulation on seed spices – (**Coimbatore, Guntur, Hisar, Jagudan, Jobner, Raigarh Guntur, NRCSS Ajmer and Kumarganj**)

**PLANT PROTECTION**

1. Effectiveness of new molecules of fungi toxicants against *Phytophthora* foot rot of black pepper in existing plantation – **Sirsi, Mudigere and Chintapalle**
2. Efficiency of different fungicide against leaf spot disease of ginger including new molecules - **Pundibari**
3. Field evaluation of different insecticides/ botanicals against seed midge, *Systole albipennis* Walker (Hymenoptera : Eurytomidae) infesting fennel – **Jobner, Jagudan and Ajmer**

<b>New Research Programme : 1</b>	
Crop	<b>Cardamom</b>
Title of the programme	Initial evaluation trial in cardamom (IET-2011)
Centre	Pampadumpara
Year of start	2011-12
Duration of the project	Three years
Design/spacing	RBD
No. of treatments/genotypes with details	Nine
No. of replications	Three replications
Plot size/spacing	3 m X 3 m
No. of plants/plot/treatment	10 plants / plot
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	June – August
Methodology Procedure to be adopted.	Evaluate the performance of high yielding accessions selected from CRS Farm, Pampadumpara
No. of Treatment/genotypes with details	<ol style="list-style-type: none"> <li>1. S1</li> <li>2. Pl.no14.</li> <li>3. pv2</li> <li>4. pv1</li> <li>5. GG</li> <li>6. hy9</li> <li>7. BEP 2</li> <li>8. ppk2</li> <li>9. Hy-6</li> </ol>
Observation to be recorded in detail	<ol style="list-style-type: none"> <li>1. Yield and yield attributing characters (Viz. Plant height, no. of tillers/plant, bearing tillers/plant, panicle/plant, racemes/plant, capsules/panicle fresh weight/plant length of panicle etc.,</li> <li>2. 100 capsule volume</li> <li>3. 100 capsule weight</li> <li>4. No. of seeds/capsule</li> <li>5. Yield / plant (kg)</li> <li>6. Percentage dryage</li> <li>7. Disease &amp; Pest incidence</li> <li>8. Quality parameters</li> </ol>

<b>New Research Programme : 2</b>	
<b>Crop</b>	<b>Ginger</b>
<b>Title of the programme</b>	Initial evaluation trial on ginger – (IET -2011)
<b>Centre</b>	Pundibari
<b>Year of start</b>	2011 – 12
<b>Duration of the project</b>	Three years
<b>Design</b>	RBD
<b>No. of treatments</b>	11 genotypes + 1 Garubathan (Local check) = 12 $V_1$ – GCP 1 $V_7$ – GCP 33 $V_2$ – GCP 8 $V_8$ – GCP 45 $V_3$ – GCP 9 $V_9$ – GCP 48 $V_4$ – GCP 12 $V_{10}$ – GCP 49 $V_5$ – GCP 14 $V_{11}$ – GCP 54 $V_6$ – GCP 28 $V_{12}$ – Garubathan (Local check)
<b>No. of replications</b>	Three replications
<b>Plot size and spacing</b>	Plot size: 3.0 m × 1.0 m Spacing: 25 cm (row spacing) × 30 cm (intra-row spacing)
<b>No. of plants/plot/treatment</b>	40 plants
<b>Methodology &amp; Procedure</b>	Recommended package of practices will be followed
<b>Date of sowing/planting season</b>	Planting time – May/June
<b>Observations to be recorded</b>	1. Height of the plant 2. No. of tillers per plant 3. No. of leaves per tiller 4. No. of days to maturity 5. Yield per plot and per hectare 6. Disease & pest incidence 7. Quality parameters

<b>New Research Programme : 3</b>	
Crop	<b>Ginger</b>
Title of the Programme	Initial Evaluation Trial- (IET 2011)
Centre	Solan
Year of start	2011-12
Duration of the project	Three years
Design	RBD
Number of treatments	Ten genotypes + Himgiri (check) = 11 V <sub>1</sub> - SG-30 V <sub>2</sub> - SG-823 V <sub>3</sub> - SG-908 V <sub>4</sub> - SG-929 V <sub>5</sub> - SG-969 V <sub>6</sub> - SG-1029 V <sub>7</sub> - SG-1032 V <sub>8</sub> - SG-8/04 V <sub>9</sub> - SG-26/04 V <sub>10</sub> - SG-40/04 V <sub>11</sub> – Himgiri (Local check)
Number of replications	Three replications
Plot size/spacing	Plot size: 3.0 m X 1.0 m, Spacing: 30 cm X 25 cm
Number of plants/plot/ treatment	40 plants
Methodology & Procedure	Recommended package of practices will be followed
Date of planting	April-May
Observation to be recorded	1. Tiller length (cm) 2. No. of tillers per plant 3. No. of leaves per tiller 4. Rhizome length (cm) 5. Rhizome breadth (cm) 6. Yield per plant (g) 7. Disease incidence (%) 8. Quality parameters

<b>New Research Programme : 4</b>	
Crop	<b>Coriander</b>
Title of the programme	Initial Evaluation Trial in Coriander (IET-2011)
Centre	Jobner
Year of start	Rabi 2011-12
Duration of the Project	Three years (will be concluded in Rabi 2013-2014)
Design	RBD
No. of treatments/genotypes with details	7 genotypes + 3 checks =10 Ten treatments including three checks. Entries: UD-61, UD-82, UD-123, UD-139, UD-169, UD-307 and UD-411 Checks: RCr-436, RCr-728 and Local check
No. of replications	Three replications
Plot size/spacing	Plot size: 3 m X 2.40 m Spacing: 30 cm X 10 cm drilling
No. of plants/plot/treatment	240 plants per plot
Date of sowing/planting and season(Kharif/Rabi/Zhiad)	Rabi 2011-12 (Sowing time October)
Lay-out Plan	As per the requirement of the design
Methodology & Procedure to be adopted	The entries will be sown as per the requirement of the design. The observations will be recorded on the characters given below and evaluated.
Observations to be recorded in detail	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. No. of primary branches per plant</li> <li>3. No. of secondary branches per plant</li> <li>4. Days to 50% flowering</li> <li>5. No. of Umbels per plant</li> <li>6. No. of Umbellets per umbel</li> <li>7. No. of grains per umbel/umbellet</li> <li>8. Days to maturity</li> <li>9. Test weight 1000 seeds (g)</li> <li>10. Seed yield per net plot and per hectare (kg/ha)</li> <li>11. Disease and pest incidence</li> <li>12. Quality parameters (Volatile oil %)</li> </ol>

<b>New Research Programme : 5</b>	
<b>Crop</b>	<b>Coriander</b>
<b>Title of the programme</b>	Initial Evaluation Trial in Coriander (IET-2011)
<b>Centre</b>	Kota (MPUAT, Udaipur)
<b>Year of start</b>	Rabi 2011-12
<b>Duration of the Project</b>	Rabi
<b>Design</b>	RBD
<b>No. of treatments/genotypes with details</b>	12 genotypes + 3 checks =15 Fifteen treatments including three checks. Entries: RKD 11, RKD 20, RKD 21, RKD 24, RKD 34, RKD 36, RKD 39, RKD 136, RKD 137, RKD 147, RKD 153, RKD 155. Checks: RCr 436, RCr 728 and RCr 480
<b>No. of replications</b>	Three replications
<b>Plot size/spacing</b>	Plot size: 4 m X 2.4 m Spacing: 30 cm X 10 cm drilling
<b>No. of plants/plot/treatment</b>	240 plants per plot
<b>Date of sowing/planting and season (Kharif/Rabi/Zhiad)</b>	Rabi 2011-12 (Sowing time October/November)
<b>Lay-out Plan</b>	As per the requirement of the design
<b>Methodology &amp; Procedure to be adopted</b>	The entries will be sown as per the requirement of the design. The observations will be recorded on the characters given below and evaluated.
<b>Observations to be recorded in detail</b>	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. No. of primary branches per plant</li> <li>3. No. of secondary branches per plant</li> <li>4. Days to 50% flowering</li> <li>5. No. of umbels per plant</li> <li>6. No. of umbellets per plant</li> <li>7. No. of Seeds per umbel/umbellate</li> <li>8. Days to maturity</li> <li>9. Test weight 1000 seeds (g)</li> <li>10. Seed yield per plot and per hectare (kg/ha)</li> <li>11. Disease and pest incidence</li> <li>12. Quality parameters (Volatile oil %)</li> </ol>

<b>New Research Programme : 6</b>	
Crop	<b>Coriander</b>
Title of the programme	Initial Evaluation Trial in Coriander (IET-2011)
Centre	Jagudan
Year of start	Rabi 2011-12
Duration of the Project	Three years (will be concluded in Rabi 2013-2014)
Design	RBD
No. of treatments/genotypes with details	<p>9 genotypes + 1 check =10            Ten treatments including one check</p> <p><b>Entries/genotypes :1.</b></p> <p>JCr-377                    6. JCr-3952.            JCr-384                    7. JCr-3993.            JCr-388                    8. JCr-4014.            JCr-389                    9. JCr-4045.            JCr-392                    10. GCr-2 (Ch)</p>
No. of replications	Three replications
Plot size/spacing	Plot size: 4.0 m X 1.80 m <sup>2</sup> (Gross), 3.0 m X 1.80 m <sup>2</sup> (Net) Spacing: 30 cm X 10 cm (Drilling)
Date of sowing season	Rabi 2011-12 (Sowing time November)
Lay-out Plan	As per the requirement of the design
Methodology & Procedure to be adopted	The entries will be sown as per the requirement of the design. The observations will be recorded on the characters given below and evaluated.
Observations to be recorded in detail	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. No. of primary branches per plant</li> <li>3. No. of secondary branches per plant</li> <li>4. Days to 50% flowering</li> <li>5. No. of Umbels per plant</li> <li>6. No. of Umbellates per umbel</li> <li>7. No. of seeds per umbel/umbellate</li> <li>8. Days to maturity</li> <li>9. Disease and pest incidence</li> <li>10. Test weight 1000 seeds (g)</li> <li>11. Seed yield per net plot and per hectare (kg/ha)</li> <li>12. Volatile oil (%)</li> </ol>

<b>New Research Programme : 7</b>	
<b>Crop</b>	<b>Fennel</b>
Title of the programme	Initial Evaluation Trial in Fennel (IET-2011)
Centre	Jobner
Year of start	Rabi 2011-12
Duration of the Project	Three years (will be concluded in Rabi 2013-2014)
Design	R.B.D
No. of treatments/genotypes with details	7 genotypes + 3 checks =10 Ten treatments including three checks. Entries: UF-53, UF-135, UF-149, UF-161, UF-168, UF-191 and UF-236 Checks: RF-101, RF-205 and Local Check
No. of replications	Three replications
Plot size/spacing	Plot size: 3 m X 2.4 m Spacing: 30 cm X 10 cm
No. of plants/plot/treatment	240 plants per plot
Date of sowing/planting and season(Kharif/Rabi/Zhiad)	Rabi 2011-12 (October/November)
Lay-out Plan	As per the requirement of the design
Methodology & Procedure to be adopted	The entries will be sown as per the requirement of the design. The observations will be recorded on the characters given below and evaluated.
Observations to be recorded in detail	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. No. of primary branches per plant</li> <li>3. No. of Secondary branches per plant</li> <li>4. Days to flowering</li> <li>5. Days to 50% flowering</li> <li>6. Umbels per plant</li> <li>7. Umbellate per umbel</li> <li>8. Seeds per umbel</li> <li>9. Test weight (g)</li> <li>10. Seed yield per plot and per hectare (kg/ha)</li> <li>11. Disease and pest incidence</li> <li>12. Quality parameters</li> </ol>

<b>New Research Programme : 8</b>											
<b>Crop</b>	<b>Fenugreek</b>										
<b>Title of the programme</b>	Initial Evaluation Trial in Fenugreek (IET-2011)										
<b>Centre</b>	Jagudan										
<b>Year of start</b>	Rabi 2011-12										
<b>Duration of the Project</b>	Three years (will be concluded in Rabi 2013-2014)										
<b>Design</b>	RBD										
<b>No. of treatments/genotypes with details</b>	<p>9 genotypes + 1 check =10            Ten treatments including one check</p> <p><b>Entries/genotypes :1.</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">JFg-148</td> <td style="width: 50%;">6. JFg-2392.</td> </tr> <tr> <td>JFg-221</td> <td>7. JFg-2443.</td> </tr> <tr> <td>JFg-223</td> <td>8. JFg-2454.</td> </tr> <tr> <td>JFg-224</td> <td>9. JFg-2695.</td> </tr> <tr> <td>JFg-226</td> <td>10. GM-2 (Check)</td> </tr> </table>	JFg-148	6. JFg-2392.	JFg-221	7. JFg-2443.	JFg-223	8. JFg-2454.	JFg-224	9. JFg-2695.	JFg-226	10. GM-2 (Check)
JFg-148	6. JFg-2392.										
JFg-221	7. JFg-2443.										
JFg-223	8. JFg-2454.										
JFg-224	9. JFg-2695.										
JFg-226	10. GM-2 (Check)										
<b>No. of replications</b>	Three replications										
<b>Plot size/spacing</b>	Plot size: 4.0 m X 1.80 m <sup>2</sup> (Gross), 3.0 m X 1.80 m <sup>2</sup> (Net) Spacing: 30 cm X 10 cm <sup>2</sup> (Drilling)										
<b>Date of sowing      Season</b>	Rabi 2011-12 (Sowing time November)										
<b>Lay-out Plan</b>	As per the requirement of the design										
<b>Methodology &amp; Procedure to be adopted</b>	The entries will be sown as per the requirement of the design. The observations will be recorded on the characters given below and evaluated.										
<b>Observations to be recorded in detail</b>	<ol style="list-style-type: none"> <li>1. Height of the plant.</li> <li>2. No. of primary branches per plant</li> <li>3. No. of secondary branches per plant</li> <li>4. Days to 50% flowering</li> <li>5. No. of pods per plant</li> <li>6. No. of grains per pod</li> <li>7. Length of pod</li> <li>8. Disease &amp; pest incidence</li> <li>9. Days to maturity</li> <li>10. Test weight 1000 seeds (g)</li> <li>11. Seed yield per net plot &amp; per hectare (kg/ha)</li> <li>12. Quality parameters</li> </ol>										

<b>New Research Programme : 9</b>	
Crop	<b>Fenugreek</b>
Title of the programme	Initial Evaluation Trial in Fenugreek (IET-2011)
Centre	Pantnagar
Year of start	2011-12
Duration of the Project	Three years
Design	RBD
No. of treatments/genotypes with details	8 genotypes + 2 check = 10 Ten treatments including two checks <b>Entries:</b> 1. PM(C)-1,                      6. PM-6, 2. PM-2,                              7. PM-7, 3. PM-3,                              8. PM-8, 4. PM-4,                              9. Pant Ragani 5. PM-5,                              10. Pusa Early Bunching
No. of replications	Three replications
Plot size/spacing	Plot size: 3.0 m X 1.5 m, Spacing: 30 cm X 10 cm
No. of plants/plot/treatment	150 plants/plot
Date of sowing/planting and season(Kharif/Rabi/Zhiad)	Rabi 2011-12 sowing time October/November Rabi
Lay-out Plan	As per the requirement of the RBD
Methodology & Procedure to be adopted	The genotype will be sown as per the requirement of the design
Observations to be recorded in detail	1. Height of the plant. 2. No. of branches per plant 3. No. of secondary branches/plant 4. Days to 50% flowering umbellate/plant 5. No. of umbel per plant 6. No. of umbellets per umbel 7. No. of secondary umbellets 8. Test weight 1000 seeds (g) 9. Seed yield per plant/net plot & per ha (kg/ha) 10. Disease & pest incidence 11. Quality parameters (Volatile oil %) 12. No. of pods per plant 13. Length of pod 14. No. of grains per pod 15. No. of days to maturity

<b>New Research Programme : 10</b>	
Crop	<b>Cardamom</b>
Title of the programme	CVT of drought tolerance in Cardamom (CVT-2012)
Centre	Appangala, Mudigere, Sakleshpur
Year of start	2012
Duration of the Project	
Design	RBD Main treatments (1) Control (2) Moisture stress (after establishment) Sub treatments : 6 genotypes
No. of treatments/genotypes with details	IISR, CRC Appangala - Four genotypes * AICRPS Mudigere - Two genotypes *
No. of replications	Three replications
Plot size/spacing	Plot size: 3 m X 3 m
No. of plants/plot/treatment	12 plants/plot
Date of sowing/planting and season(Kharif/Rabi/Zhiad)	July 2011-
Lay-out Plan	1. Plant height
Methodology & Procedure to be adopted	2. No. of bearing suckers/clump
Observations to be recorded in detail	3. Total no. of tillers / plant 4. Height of tallest tiller 5. No. of Panicles/clump 6. Length of panicles 7. Racemes per panicle 8. No. of capsules/panicle 9. Fresh wt. per plant 10. No. of capsules/ spike 11. No. of seeds/capsule 12. Dry capsule yield (kg/ha) 13. Quality parameters 14. Disease and pest incidence

\* The genotypes will be multiplied by rapid clonal nursery at IISR Appangala & Mudigere during the current season and the trail will be laid out during 2012.

<b>New Research Programme : 11</b>	
Crop	<b>Cardamom</b>
Title of the programme	Liming in cardamom *
Centre	Pampadumpara
Year of start	2011-12
Duration of the project	Three years
Design	RBD
No. of treatments/genotypes with details	Five
No. of replications	Four replications
Plot size/spacing	3 m X 3 m
No. of plants/plot/treatment	10 plants / replication
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	November – March 2011-12
Lay-out plan	
Methodology & Procedure to be adopted	Soil application during May-June before onset of S.W Monsoon Treatments 1. Burnt Lime (1 Kg/plant) 2. Burnt Lime (2 Kg/plant) 3. Dolomite(1 Kg/plant) 4. Dolomite( 2 Kg/plant) 5. Ground lime stone ( 1 Kg/plant) 6. Ground lime stone ( 2 Kg/plant) 7. Control ( without liming treatments)
Observation to be recorded in detail	1. P <sup>H</sup> of soil 2. Plant height 3. Stem girth 4. No. of bearing seeds/clump 5. No. of panicles/clump 6. No. of capsules/panicle 7. Stem borer infestation (%) 8. Azhukal disease incidence (%) 9. Yield / plant (kg), yield /ha (kg) 10. Percentage dryage 11. Quality parameters of cardamom 12. Occurrence of other pest and disease 13. Soil analysis for available nutrients and micro flora before and after conducting the expert 14. Observations to be recorded as per treatment, three months after first treatment at monthly intervals

\* To be reformulated after discussion with the 4 Cardamom centres

<b>New Research Programme : 12</b>	
<b>Crop</b>	<b>Turmeric</b>
<b>Title of the programme</b>	Studies on the effect of rhizome size and nursery on growth and yield of Turmeric
<b>Centre</b>	Chintapalle, Coimbatore, Navasari, Bagalkot & IISR
<b>Year of start</b>	2011-12
<b>Duration of the project</b>	2 years
<b>Design</b>	RBD
<b>No. of treatments/genotypes with details</b>	T1 = Single node cuttings (5 g) directly planting in field
	T2 = Two node cuttings (10 g) directly planting in field
	T3 = Mother rhizome pieces (10-15 g) directly planting in the field (4 Pieces)
	T4 = Single node cutting (5 g) planting in pro tray (1 month)
	T5 = Two node cutting (10 g) planting in Pro tray (1 month)
	T6 = Mother rhizome pieces (10-15 g) planting in pro tray (1 month)
	T7 = Primary full length rhizome (25-30 g) planting directly in the field
	T8 = Secondary rhizomes (15-20 g) directly planting in the field
	T9 = Mother rhizomes (35-40 g) directly planting in the field
<b>No. of replications</b>	Three replications
<b>Plot size/spacing</b>	Plot size: 3 X 1m <sup>2</sup> , Spacing: 30 X 25 cm
<b>No. of plants/plot/treatment</b>	40 plants per plot/bed
<b>Date of sowing/planting and season (Kharif/Rabi/Zhiad)</b>	Kharif 2011
<b>Methodology &amp; Procedure to be adopted</b>	Recommended package of practices will be followed
<b>Observation to be recorded in detail</b>	Plant height, No. of tillers/plant, Leaf length, Leaf breadth, Rhizome weight/clump, Rhizome yield/ha, Dry yield/ha. Pests & Disease incidence, Quality parameters and Cost Benefit ratio.

<b>New Research Programme : 13</b>	
Crop	<b>Ginger</b>
Title of the programme	Evaluation of herbicides for the effective control of weeds in Ginger
Centre	Chintapalle, Pottangi & Navasari
Year of start	2011-12
Duration of the project	2 years
Design	RBD
No. of treatments/genotypes with details	<p>T1 = Pendimethalin (Pre-emergent) 30% EC, 1.5 kg a.i./ha</p> <p>T2 = Oxyflurofen (Pre-emergent) 23.5% EC, 0.3 kg a.i./ha</p> <p>T3 = T1 followed by Quazilofop ethyl (30 days of crop) 5% EC, 0.05 kg a.i./ha</p> <p>T4 = T1 followed by Propaquizafop (30 days of crop) 10% EC, 0.05 kg a.i./ha</p> <p>T5 = T2 followed by Quazilofop ethyl (30 days of crop) 5% EC, 0.05 kg a.i./ha</p> <p>T6 = T2 followed by Propaquizafop (30 days of crop) 10% EC, 0.05 kg a.i./ha</p> <p>T7 = T3 followed by hand weeding (90 days of crop)</p> <p>T8 = T4 followed by hand weeding (90 days of crop)</p> <p>T9 = T5 followed by hand weeding (90 days of crop)</p> <p>T10 = T6 followed by hand weeding (90 days of crop)</p> <p>T11 = Un weeded control</p> <p>T12 = Weed free check (Regular Hand weeding)</p>
No. of replications	Three replications
Plot size/spacing	Plot size: 3 X 1 m <sup>2</sup> , Spacing: 30 X 25 cm
No. of plants/plot/treatment	40 plants per plot/bed
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Kharif
Lay-out plan	-
Methodology & Procedure to be adopted	Recommended package of practices will be followed
Observation to be recorded in detail	Plant height, No. of tillers/plant, Leaf length, Leaf breadth, Rhizome weight/clump, Rhizome yield/ha, Dry yield/ha. Phytotoxicity of herbicides and Cost Benefit ratio.

<b>New Research Programme : 14</b>	
Crop	<b>Fennel</b>
Title of the programme	Micro irrigation management in Fennel
Centre	Jobner and Bikaner
Year of start	2011-2012
Duration of the project	Three years
Design	RBD
No. of treatments/genotypes with details	<ol style="list-style-type: none"> <li>1. Surface irrigation at 1.0 IW/CPE ratio</li> <li>2. Drip irrigation at 1.0 IW/CPE ratio with normal row planting</li> <li>3. Drip irrigation at 1.0 IW/CPE ratio with paired row planting</li> <li>4. Drip irrigation at 0.8 IW/CPE ratio with normal row planting</li> <li>5. Drip irrigation at 0.8 IW/CPE ratio with paired row planting</li> <li>6. Drip irrigation at 0.6 IW/CPE ratio with normal row planting</li> <li>7. Drip irrigation at 0.6 IW/CPE ratio with paired row planting</li> <li>8. Drip irrigation at 0.4 IW/CPE ratio with normal row planting</li> <li>9. Drip irrigation at 0.4 IW/CPE ratio with paired row planting</li> </ol>
No. of replications	Four replications
Plot size/spacing	6 m x 4 m spacing 50 cm x 20 cm
No. of plants/plot/treatment	27
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 POP will be followed
Observation to be recorded in detail	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. Branches per plant</li> <li>3. Umbels per plant</li> <li>4. Umbellets per umbel</li> <li>5. Seeds per umbel</li> <li>6. Test weight (g)</li> <li>7. Seed yield (kg/ha)</li> </ol>

<b>New Research Programme : 15</b>	
Crop	<b>Fenugreek</b>
Title of the programme	Micro irrigation management in Fenugreek
Centre	Jobner
Date/Year of start	Rabi 2011-2012
Duration of the Project	Three years
Design	R. B. D.
No. of treatments/genotypes with details	1. Surface irrigation at 1.0 IW/CPE ratio
	2. Drip irrigation at 1.0 IW/CPE ratio with normal row planting
	3. Drip irrigation at 1.0 IW/CPE ratio with paired row planting
	4. Drip irrigation at 0.8 IW/CPE ratio with normal row planting
	5. Drip irrigation at 0.8 IW/CPE ratio with paired row planting
	6. Drip irrigation at 0.6 IW/CPE ratio with normal row planting
	7. Drip irrigation at 0.6 IW/CPE ratio with paired row planting
	8. Drip irrigation at 0.4 IW/CPE ratio with normal row planting
	9. Drip irrigation at 0.4 IW/CPE ratio with paired row planting
No. of replications	Three
Plot size/spacing	6 x 3 m spacing: 30x10 cm
No. of plants/plot/treatment	27
Date of sowing/planting and season(kharif/Rabi/Zhiad)	Rabi
Lay-out Plan	As per the requirement of the design
Observations to be recorded in detail	<ol style="list-style-type: none"> <li>1. Plant height (cm)</li> <li>2. Branches per plant</li> <li>3. Pods per plant</li> <li>4. Seeds per pod</li> <li>5. Pod length (cm)</li> <li>6. Test weight (g)</li> <li>7. Seed yield (kg/ha)</li> </ol>

<b>New Research Programme : 16</b>	
Crop	<b>Coriander, Cumin, Fennel &amp; Fenugreek</b>
Title of the programme	Evaluation of PGPR bioformulations on seed spices
Centre	Coimbatore/Guntur/Hisar/Jagudan/Jobner/Raigarh/ Kumarganj/NRCSS Ajmer
Year of start	2011-12
Duration of the project	Two years
Design/spacing	RBD with 4 replications
No of treatments with details	Five treatments T1 - Bioformulation of FK 14 T2 - Bioformulation of FL 18 T3 - Bioformulation of FK 14+ FL 18 T4 - Control T5 - Local popular variety
Replications	Four
Plot size /spacing	Standard spacing for each crop
Methodology: procedure to be adopted	Uniform package of practices
Observation to be recorded	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 Umbels per plant 6. No. of Umbellets per umbel 7. Seed per umbel 8. Days to maturity 9. Yield (kg/ha) 10. Check yield 11. Percentage of yield increase over check 12. Disease incidence if any

**Centres identified for each crop**

Cumin	:	Jobner, Jagudan and NRCSS Ajmer
Coriander	:	Coimbatore, Guntur, Hisar, Jagudan, Raigarh & NRCSS Ajmer
Fennel	:	Hisar, Jagudan, Raigarh & NRCSS Ajmer
Fenugreek	:	Jagudan, Jobner, Guntur, Hisar & Kumarganj

<b>New Research Programme : 17</b>	
Crop	<b>Black pepper</b>
Title of the programme	Effectiveness of new molecules of fungi toxicants against Phytophthora foot rot of black pepper in existing plantation *
Centre	Sirsi, Mudigere & Chintapalle
Year of start	2011-12
Duration of the project	Two years
Design	RBD
No. of treatments/ genotypes with details	Five Treatments
	T <sub>1</sub> – Spraying and drenching with 0.1 % of Fenamidon (10%) + Mancozeb (50 %) (Sectin)
	T <sub>2</sub> – Spraying and drenching with 0.1 % of Fenamidon (10%)+ Mancozeb (50 %) (Sectin)+ Soil application of <i>T. harzianum</i> (MTCC 5179) 50 g/vine with 1 kg neem cake
	T <sub>3</sub> – Spraying and drenching with 0.2 of kocide + after 10 days soil application of <i>T. harzianum</i> (MTCC 5179) 50g/vine with 1 kg neem cake
	T <sub>4</sub> – Potassium phosphonate (0.3%) + <i>Trichoderma harzianum</i> (MTCC-5179)
	T <sub>5</sub> – Control Time of application: June/July 2011 and August/September 2011.
No. of replications	Three
Plot size/spacing	2.7 m X 2.7 m in arecanut plantation
No. of plants/plot/treatment	6 vines per treatment
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	June/July 2011
Lay-out plan	
Methodology & Procedure to be adopted	Spraying (2 l <sup>-vine</sup> ) to aerial parts of the vine and drenching (3 l <sup>-vine</sup> ) to the root zone during monsoon and peak monsoon.
Observation to be recorded in detail	Leaf infection (%) Yellowing 0-3 (No yellowing; 1-upto 25 % of leaf yellowing; 2- up to 50% yellowing ; 3->75 % yellowing)Defoliation 0-3 (No defoliation; 1-upto 25 % defoliation; 26 up to 50% defoliation ; 3->75 % defoliation) 0-3 Scale Grade 0 – No disease, Grade 1- 1to 25 per cent, 2- 25-50 per cent , Grade 3 ->50 per centDeath of vine (%)Yield (kg/vine)

\* Would be done next year after getting the result of the priliminary experiment.

<b>New Research Programme : 18</b>	
Crop	<b>Ginger</b>
Title of the programme	Efficiency of different fungicide against leaf spot disease of ginger including new molecules
Centre	Pundibari
Year of start	2011-12
Duration of the project	
Design	RBD
No. of treatments/genotypes with details	<p>8 Treatments1.</p> <ol style="list-style-type: none"> <li>1. Foliar spray with Mancozeb (0.3%) first at disease appearance and then 2 times at 20 days interval2.</li> <li>2. Foliar spray with Carbendazim (0.1%) first at disease appearance and then 2 times at 20 days interval3.</li> <li>3. Foliar spray with Carbendazim + Mancozeb (0.1%) first at disease appearance and then 2 times at 20 days interval</li> <li>4. Foliar spray with Blitox (0.4%) first at disease appearance and then 2 times at 20 days interval5.</li> <li>5. Foliar spray with Propiconazole (0.1%) first at disease appearance and then 2 times at 20 days interval</li> <li>6. Foliar spray with Tricyclazole (0.1%) first at disease appearance and then 2 times at 20 days interval</li> <li>7. Foliar spray with Hexaconazole (0.1%) first at disease appearance and then 2 times at 20 days interval</li> <li>8. Control</li> </ol>
No. of replications	Four
Plot size/spacing	3 m x 1 m & 30 cm x 20 cm
No. of plants/plot/treatment	On ebed per treatment /replication
Date of sowing/planting and season (Kharif/Rabi/Zhiad)	Kharif
Lay-out plan	To be decided by randum number table
Methodology & Procedure to be adopted	Methodology: Planting pits should be prepared by applying 50 g <i>Trichoderma harzianum</i> and 250 g neem cake per bed (3 m × 1 m). Other intercultural operations should be as par recommended for commercial cultivation of ginger. Before planting ginger seed rhizomes should be treated with Metalaxyl Mancozeb (0.15%) and then dried in shade before sowing. This should be done to check the rhizome rot incidence in ginger field.
Observation to be recorded in detail	Observations to be recorded: Germination percentage, Yield per plot (Kg), Projected yield (t/ha), Percent Disease Index (PDI) and Percent disease reduction over control.

<b>New Research Programme : 19</b>	
Crop	<b>Fennel</b>
Title of the programme	Field evaluation of insecticides/ botanicals against seed midge, <i>Systole albipennis</i> Walker (Hymenoptera : Eurytomidae) infesting fennel
Centre	Jagudan, Jobner and Ajmer
Year of start	2011-12
Duration of the project	3 Year
Design	RBD
No. of treatments	Eight
No of replications	Four replications
Plot size/spacing	Gross : 4.5 X 6.0 sqm; Net : 2.7 X 4.8 sqm; Spacing: 90 cm X 60 cm
Treatments	T1 - Neem Seed Kernel Extract (NSKE) 5% T2 - Cartap hydrochloride 50SP @ 0.15% T3 - Spinosad 45SC@ 0.01% T4 - Abamectin 1.9EC @ 2ml/lit. T5 - Achook 3ml/lit. T6 - Acetamiprid 20SP @0.004% T7 - Endosulfan 35EC @0.07% T8 - Untreated Check(Control)
Methodology	Two foliar sprays of different insecticides/botanicals will be undertaken with the help of manually operated knapsack sprayer. First spray will be undertaken at fruit-set and subsequent spray will be made at 5 days after the first spray.
Observation to be recorded	1. Number of damaged seeds per umbel will be recorded on three pre-tagged umbels per plant from five earmarked plants per plot at weekly interval starting just after fruit set. 2. Seed yield (Kg/ha) 3. Economics & Impact analysis

Technical Programme (2011-12)		
BLACK PEPPER		
Project Code	Title	Centres
PEP/CI/1	<b>Genetic Resources</b>	
PEP/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Chintapalle, Dapoli, Panniyur, Pundibari, Sirsi, Ambalavayal & Yercaud
PEP/CI/2	<b>Hybridization Trial</b>	
PEP/CI/2.1	Intervarietal hybridization to evolve high yielding varieties	Panniyur
PEP/CI/3	<b>Coordinated Varietal Trial (CVT)</b>	
PEP/CI/3.2	CVT 2000 – Series V	Chintapalle, Pampadumpara, Panniyur, Sirsi & Ambalavayal
PEP/CI/3.3	CVT 2006 – Series VI	Chintapalle, Dapoli, Panniyur, Pampadumpara, Pundibari, Sirsi, Ambalavayal, Yercaud / Pechiparai
PEP/CI/3.4	Evaluation of grafts, orthotropic and runner shoots in black pepper	Ambalavayal, Panniyur, Sirsi Yercaud & Thadiyankudassi*
PEP/CM/4	<b>Nutrient Management Trial</b>	
PEP/CM/4.4	Development of organic package for spices based cropping system – Observational trial	Chintapalle, Sirsi, Panniyur, & Dapoli
PEP/CM/4.5	Organic farming in black pepper - 2006	Panniyur, Dapoli, Pechiparai, Sirsi & Yercaud
PEP/CP/5	<b>Disease Management Trial</b>	
PEP/CP/5.1	Adaptive trial on management of <i>Phytophthora</i> foot rot of black pepper in farmers field	Ambalavayal
PEP/CP/5.2	Trial on management of <i>Phytophthora</i> foot rot of black pepper in existing plantation	Chintapalle, Dapoli, Panniyur, Pampadumpara, Mudigere & Sirsi
PEP/CP/5.3	Trial on management of <i>Phytophthora</i> foot rot of black pepper in new plantation	Chintapalle, Dapoli, Panniyur, Pampadumpara, Pechiparai, Mudigere & Sirsi
PEP/CP/5.4	Effectiveness of new molecular of fungi toxicants against <i>Phytophthora</i> foot rot of black pepper in existing plantation	Sirsi, Mudigere & Chintapalli
* Testing Centre		
PEP/CP/6	<b>Pest Management Trial</b>	
PEP/CP/6.2	Management of <i>Erythrina</i> gall was, a popular standard of black pepper	Mudigere

<b>CARDAMOM</b>		
<b>CAR/CI/1</b>	<b>Genetic Resources</b>	
CAR/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Mudigere, Pampadumpara & Myladumpara
<b>CAR/CI/2</b>	<b>Hybridization</b>	
CAR/CI/2.1	Evaluation of OP progenies under intensive management	Mudigere
CAR/CI/2.2	Hybridization & selection in cardamom	Mudigere
<b>CAR/CI/3</b>	<b>Coordinated Varietal Trial</b>	
CAR/CI/3.5	CVT 2005-Series V	Pampadumpara, Mudigere & Myladumpara
CAR/CI/3.6	CVT 2007/2009 -Series VI	Mudigere, Pampadumpara, Sakleshpur, <del>Ambalavayal</del> & Myladumpara
CAR/CI/3.7	CVT of drought tolerance in Cardamom -Series VII	Appangala, Mudigere, Sakleshpur
<b>CAR/CI/4</b>	<b>Varietal Evaluation Trial (VET)</b>	
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
<b>CAR/CM/5</b>	<b>Nutrient Management Trial</b>	
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
<b>CAR/CP/6</b>	<b>Pest and Disease Management Trial</b>	
CAR/CP/6.7	Evaluation of new insecticides/ biopesticide in cardamom against thrips and shoot and capsule borer	Mudigere & Pampadumpara
CAR/CP/6.8	Comparison of effect of chemical treatments as well as biocontrol agents against pseudostems rot of cardamom	Pampadumpara & Mudigere
<b>LARGE CARDAMOM</b>		
LCA/CI/1	Germplasm Collection & Evaluation of large cardamom	Gangtok
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
<b>GINGER</b>		
<b>GIN/CI/1</b>	<b>Genetic Resources</b>	
GIN/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Dholi, Kumarganj, Pottangi, Pundibari & Solan
<b>GIN/CI/2</b>	<b>Coordinated Varietal Trial</b>	
GIN/CI/2.3	CVT 2006 – Series VII	Pottangi & Pundibari
<b>GIN/CI/3</b>	<b>Varietal Evaluation Trial</b>	
GIN/CI/3.1	Initial evaluation trial -2010	Dholi & Solan
GIN/CI/3.2	Initial evaluation trial -2011	Pundibari
GIN/CI/3.3	Initial evaluation trial -2011	Solan
GIN/CI/3.4	Comparative yield trial	Pottangi
GIN/CI/3.5	Genotype X Environment interaction on quality of ginger	Appangala, Ambalavayal, Barapani, Calicut, Chintapalli, Dapoli, Dholi, Kanke, Kalyani, Mizoram, Navsari, Pantnagar, Pasighat, Pottangi, Pundibari, Raigarh & Solan
<b>GIN/CI/4</b>	<b>Quality Evaluation Trial</b>	
GIN/CI/4.1	Evaluation of germplasm for quality	Solan
GIN/CI/4.2	Evaluation of germplasm from other centers	Solan
<b>GIN/CM/5</b>	<b>Nutrient Management Trial</b>	
GIN/CM/5.2	Organic farming in ginger - 2006	Solan, Pundibari, Pottangi, Dholi & Kumarganj
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, Pottangi & Navasari
<b>GIN/CP/6</b>	<b>Disease Management Trial</b>	
GIN/CP/6.2	Biocontrol studies on rhizome rot of ginger	Pottangi
GIN/CP/6.5	Management of rhizome rot in ginger	Chintapalle, Sirsi, Mudigere & Dapoli
GIN/CP/6.6	Management of soft rot of ginger (Biofumigation using Mustard)	Dholi, Solan, Chintapalle, Pundibari, Kumarganj & Raigarh

GIN/CP/6.7	Management of soft rot of ginger (Biofumigation using cabbage)	Dholi, Solan, Chintapalle, Pottangi, Kumarganj, Ambalavayal & Raigarh
GIN/CP/6.8	Management of bacterial wilt of ginger (Biofumigation using mustard)	Dholi, Solan & Pundibari
GIN/CP/6.9	Management of bacterial wilt of ginger (Biofumigation using cabbage)	Dholi, Solan, Ambalavayal & Pottangi
GIN/CP/6.10	Efficiency of different fungicide against leaf spot disease of ginger including new molecules	Pundibari
<b>TURMERIC</b>		
<b>TUR/CI/1</b>	<b>Genetic Resources</b>	
TUR/CI/1.1	Germplasm collection, characterization, evaluation and conservation	Coimbatore, Dholi, Jagtial, Kumarganj, Pottangi & Raigarh
<b>TUR/CI/2</b>	<b>Coordinated varietal trial</b>	
TUR/CI/2.4	Coordinated Varietal Trial - 2009	Ambalavayal, Chintapalle, Jagtial, Dholi, Coimbatore, Kumarganj, Pottangi, Pundibari, Pasighat, Pantnagar, Raigarh & Navasari
<b>TUR/CI/3</b>	<b>Varietal evaluation trial</b>	
TUR/CI/3.2	Initial Evaluation Trial 2006	Kumarganj, Pottangi & Pundibari
TUR/CI/3.3	Initial Evaluation Trial 2010	Pantnagar
TUR/CI/3.4	Initial Evaluation Trial 2009	Dholi
TUR/CI/3.5	Genotype x Environmental interaction on quality	Dholi, Chintapalle, Jagtial, Pottangi, Kumarganj, Pundibari, Coimbatore & Mizoram (Kalyani 2011-12)
<b>TUR/CI/4</b>	<b>Quality Evaluation</b>	
TUR/CI/4.1	Quality evaluation of germplasm	Coimbatore
<b>TUR/CM/5</b>	<b>Nutrient Management Trial</b>	
TUR/CM/5.2	Effect of organic farming in turmeric	Dholi & Pundibari
TUR/CM/5.4	Efficacy of biocontrol agents for control of rhizome rot of turmeric	Pottangi
TUR/CM/5.5	Standardization of water requirement for turmeric through drip irrigation	Coimbatore, Dholi, Jagtial, Kumarganj, Raigarh, Guntur & Pottangi

TUR/CM/5.6	Standardization of fertigation in turmeric	Coimbatore & Jagtial
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
<b>TUR/CM/6</b>	<b>Post Harvest Technology</b>	
TUR/CM/6.1	Standardization of processing in turmeric	Calicut & Coimbatore
TUR/CM/6.2	Mechanical harvesting in turmeric (Observational trial)	Coimbatore
<b>TUR/CP/7</b>	<b>Disease Management Trial</b>	
TUR/CP/7.1	Survey and identification of disease causing organisms in turmeric and screening of turmeric germplasm against diseases	Coimbatore, Pundibari, Raigarh & Dholi
TUR/CP/7.2	Management of foliar disease of turmeric	Dholi, Chintapalle, Pottangi, Kumarganj, Pundibari, Jagtial, Raigarh & Coimbatore
<b>TREE SPICES</b>		
<b>TSP/CI/1</b>	<b>Genetic Resources</b>	
TSP/CI/1.1	Germplasm collection, characterization, evaluation and conservation of clove, nutmeg and cinnamon	Dapoli and Yercaud/ Pechiparai
<b>TSP/CI/2</b>	<b>Coordinated Varietal Trial</b>	
TSP/CI/2.1	CVT 1992 – clove	Yercaud & Pechiparai
TSP/CI/2.2	CVT 2001- nutmeg	Dapoli & Pechiparai
TSP/CI/2.3	CVT 2001 – cassia	Pechiparai & Dapoli
TSP/CM/2.2	Post harvest technology studies in cinnamon	Dapoli & Pechiparai
<b>CORIANDER</b>		
<b>COR/CI/1</b>	<b>Genetic Resources</b>	
COR/CI/1.1	Germplasm collection, description, characterization, evaluation, conservation and screening against diseases	Coimbatore, Dholi, Guntur, Hisar, Jagudan, Jobner & Kumarganj
COR/CI/1.2	Multilocation Evaluation of germplasm	Jagudan, Guntur & Jobner
<b>COR/CI/2</b>	<b>Coordinated Varietal Trial</b>	
COR/CI/2.4	Coordinated Varietal Trial 2009 – Series - VIII	Ajmer, Dholi, Guntur, Hisar, Jabalpur, Jagudan, Jobner, Kumarganj, Navasari, Pantnagar, Raigarh & Udaipur
COR/CI/2.6	Coordinated varietal trial on coriander (Leafy type during off season) CVT 2010	Guntur, Ajmer, Coimbatore & Periyakulam**
**Testing centre		

<b>COR/CI/3</b>	<b>Varietal Evaluation Trial</b>	
COR/CI/3.1	Initial evaluation trial 2010	Dholi, Jobner & Jagudan
COR/CI/3.2	Initial evaluation trial 2010 (Leaf purpose)	Pantnagar
COR/CI/3.3	Initial Evaluation Trial 2010 (Seed purpose)	Pantnagar, Kumarganj, Guntur & Hisar
COR/CI/3.4	Initial Evaluation Trial 2011	Jobner, Kota (udaipur) & Jagadan
COR/CM/3.5	Production of leafy type of coriander in off season	Kumarganj
<b>COR/CI/4</b>	<b>Quality Evaluation Trial</b>	
COR/CI/4.1	Quality evaluation in coriander	Jobner
<b>COR/CM/5</b>	<b>Nutrient Management Trial</b>	
COR/CM/5.3	Identification of drought/ alkalinity tolerant source in coriander	Guntur, Coimbatore, Kumarganj & Jobner
COR/CM/5.4	Nutrient supplementation though organic manures for growth and yield of coriander	Coimbatore, Dholi, Hisar, Jagudan, Jobner, Kumarganj & Raigarh
COR/CM/5.5	Effect of micronutrients on yield of coriander	Coimbatore & Dholi
COR/CM/5.6	Irrigation management for sustainable coriander production	Guntur
COR/CM/5.7	Nutrient management in off season coriander leaf production	Periyakulam*, Guntur, Ajmer & Coimbatore
* Testing centre		
<b>COR/CP/6</b>	<b>Disease Management Trial</b>	
COR/CP/6.2	Survey to identify the disease incidence collection and identification of casual organism Dholi	Dholi
COR/CM/6.3	Management of stem gall disease of coriander Dholi, Pantnagar, Jabalpur, Udaipur, Kumarganj & Raigarh	Dholi, Pantnagar, Jabalpur, Udaipur, Kumarganj & Raigarh
COR/CM/6.5	Evaluation of PGPR Bioformulation on Coriander	Coimbatore, Guntur, Hisar, Jagudan & Raigarh
<b>CUMIN</b>		
<b>CUM/CI/1</b>	<b>Genetic Resources</b>	
CUM/CI/1.1	Germplasm collection, characterization, evaluation conservation and screening against diseases	Jagudan & Jobner
CUM/CI/1.2	Multilocation Evaluation of germplasm	Jagudan & Jobner
<b>CUM/CI/2</b>	<b>Coordinated Varietal Trial</b>	
CUM/CI/2.3	Coordinated Varietal Trial - 2009	Jobner, Jagudan, Ajmer & Jabalpur

<b>CUM/CI/3</b>	<b>Varietal Evaluation Trial</b>	
CUM/CI/3.2	Initial evaluation trial -2008	Jagudan
CUM/CI/3.3	Initial evaluation trial-2009	Jobner
<b>CUM/CI/4</b>	<b>Quality Evaluation Trial</b>	
CUM/CI/4.1	Quality evaluation in cumin,	Jobner
<b>* Testing centre</b>		
<b>CUM/CM/5</b>	<b>Nutrient management trial</b>	
CUM/CM/5.1	Identification of drought tolerance	Jobner
<b>CUM/CP/6</b>	<b>Disease Management Trial</b>	
CUM/CP/6.1	Management of wilt and blight diseases in cumin	Jobner & Jagudan
CUM/CP/6.2	Survey for identification of yellowing causing organisms in cumin	Jobner, Jagudan & Ajmer
CUM/CM/6.4	Evaluation of PGPR Bioformulation on Cumin	Jagudan & Jobner
<b>FENNEL</b>		
<b>FEL/CI/1</b>	<b>Genetic Resources</b>	
FNL/CI/1.1	Germplasm collection, characterization, evaluation, conservation and screening against diseases	Dholi, Hisar, Jagudan, Jobner & Kumarganj
FNL/CI/1.2	Multilocation Evaluation of Germplasm	Jagudan
<b>FNL/CI/2</b>	<b>Coordinated Varietal Trial</b>	
FNL/CI/2.4	Co-ordinated Varietal Trial - 2009-Series VII	Ajmer, Dholi, Hisar, Jabalpur, Jagudan, Jobner, Kumarganj, Pantnagar, Udaipur & Raigarh
<b>FNL/CI/3</b>	<b>Varietal Evaluation Trial</b>	
FNL/CI/3.1	Initial evaluation trial	Hisar, Jobner , Kumarganj & Jagudan
FNL/CI/3.2	Initial evaluation trial-2009	Jabalpur
FNL/CI/3.3	Initial evaluation trial 2011	Jobner
<b>FNL/CI/4</b>	<b>Quality evaluation trial</b>	
FNL/CI/4.1	Quality evaluation in fennel	Jobner
<b>FNL/CM/5</b>	<b>Nutrient Management Trial</b>	
FNL/CM/5.2	Identification of drought/alkalinity tolerance source in fennel	Kumarganj
FNL/CM/5.3	Micro irrigation management in Fennel	Jobner & Bikaner

<b>FNL/CP/6</b>	<b>Disease Management Trial</b>	
FNL/CP/6.1	Survey, identification of disease causing organisms and survey of germplasm against disease	Dholi
FNL/CP/6.2	Field evaluation of different insecticides/ botanicals against seed midge <i>Systole albipennis</i> walker fennel	Jagudan, Jobner & Ajmer
FNL/CM/6.3	Evaluation of PGPR bioformulation on Fennel	Hisar, Jagudan, & Raigarh
<b>FENUGREEK</b>		
<b>FGK/CI/1</b>	<b>Genetic Resources</b>	
FGK/CI/1.1	Germplasm collection, characterization, evaluation conservation and screening against diseases	Dholi, Hisar, Jagudan, Jobner, Kumarganj & Guntur
<b>FGK/CI/2</b>	<b>Coordinated Varietal Trial</b>	
FGK/CI/2.1	Coordinated Variety Trial 2009 series - VII	Ajmer, Coimbatore, Dholi, Guntur, Hisar, Jabalpur, Jagudan, Jobner, Kumarganj, Pantnagar, Raigarh & Udaipur
<b>FGK/CI/3</b>	<b>Varietal Evaluation Trial</b>	
FGK/CI/3.2	Initial evaluation trial 2009	Jabalpur, Guntur
FGK/CI/3.3	Initial evaluation trial 2009	Jobner & Kumarganj
FGK/CI/3.4	Initial evaluation trial 2010	Dholi
FGK/CI/3.5	Initial evaluation trial 2011	Pantnagar & Jagudan
<b>FGK/CM/4</b>	<b>Nutrient Management Trial</b>	
FGK/CM/4.2	Identification of drought/tolerance source in fenugreek	Jobner & Guntur
FGK/CM/4.3	Microirrigation management in fenugreek	Jobner
FGK/CM/4.5	Evaluation of PGPR bioformulation on Fenugreek	Jagudan, Jobner, Guntur, Hisar & Kumarganj

**List of participants –XXII AICRP on Spices Workshop  
18-19 June 2011 RAJAU, Jaipur, Rajasthan**

**LIST OF DELEGATES**

**Indian Council of Agricultural Research, New Delhi**

1. Dr. H.P. Singh, Deputy Director General (Hort.)
2. Dr. U. Srivastava, Asst. Director General (Hort-II)

**Special Invitees**

3. Dr. V.A. Parthasarathy, Director, IISR, Calicut
4. Dr. M.M. Anwer, Director, NRC on Seed Spices, Ajmer
5. Dr. S.K. Malhotra, Principal Scientist, ICAR, KAB, New Delhi
6. Dr. S.B. Dandin, Vice Chancellor, University of Horticultural Sciences, Bagalkot and Chairman RAC, IISR

**Project Coordinator's Unit**

7. Dr. M. Anandaraj, Project Coordinator, AICRP on Spices
8. Dr. J. Rema, Principal Scientist (Hort.)
9. Dr. A. K. Johny, Technical Information Officer

**COORDINATING CENTRES**

**Regular Centers**

**Cardamom Research Station, KAU, Pampadumpara**

10. Dr. M. K. Dhanya, Associate Professor (Plant Pathology)
11. Dr. Biju Sidharthan, Professor (Pl. Breeding)

**Pepper Research Station, KAU, Panniyur**

12. Dr. V. P. Neema, Associate Professor (Jr. Breeder)
13. Ms. Heera, Asst. Professor (Pathology)

**Regional Research Station, UHS (Bagalkot), Mudigere**

14. Dr. S. D. Rangaswamy, Pathologist
15. Dr. D. Lakshmana, Breeder
16. Mr. D. Jemla Naik, Jr. Entomologist

**Agricultural Research Station, UHS (Bagalkot), Sirsi**

17. Mr. M. S. Lokesh, Associate Professor (Jr. Pathologist)
18. Dr. Nagesh Naik, Asst. Professor (Jr. Horticulturist)

**Horticultural Research Station, TNAU, Yercaud/Pechiparai**

- 19. Dr. Arul Mozhiyan, Prof. & Head, Yercaud
- 20. Dr. J. Prem Joshua, Jr. Breeder (Hort.), Pechiparai

**Department of Spices & Plantation Crops, TNAU, Coimbatore**

- 21. Dr. (Mrs.) N. Shoba, Breeder (Horticulturist)
- 22. Dr. (Mrs.) P. Muthulakshmi (Jr. Pathologist)

**Regional Agricultural Research Station, APHU, Chintapalle**

- 23. Dr. K. Ravindra Kumar, Sr. Scientist (Hort.) & Head in-charge
- 24. Dr. Sesha Kiran, Sr. Sci. Plant Pathology

**Regional Agricultural Research Station, APHU, Guntur**

- 25. Smt. A. Rajani, Horticulturist

**Regional Agricultural Research Station, APHU, Jagtial**

- 26. Sri. S. Narashima Rao (Jr. Pathologist)

**Department of Vegetable Crops, Dr YSPUHF, Solan**

- 27. Dr. Happy Dev, Breeder (Oleiculturist)
- 28. Dr. (Mrs.) Meenu Gupta (Jr. Pathologist)
- 29. Dr. Vipin Sharma, (Jr. Biochemist)

**High Altitude Research Station, OUAT, Pottangi**

- 30. Dr. D. K. Dash, Jr. Breeder

**Department of Plant Breeding, SKN College of Agriculture, RAJAU, Jobner**

- 31. Dr. E. V. D. Sastry (Sr. Breeder)
- 32. Dr. Dharendra Singh (Breeder)
- 33. Dr. A.C. Shivran, Asst Professor (Agronomy)
- 34. Dr. K. S. Shekhawat (Jr. Pathologist)
- 35. Dr. S. S. Rajput

**Spices Research Station, GAU, Jagudan**

- 36. Dr. K. D. Patel (Pathologist)
- 37. Mr. N. R. Patel (Jr. Breeder)
- 38. Dr. B.G. Praja Pati, Assoc. Research Scientist (Entomology)
- 39. Dr. A.U. Amin, Research Scientist (Agronomy)

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- 40. Dr. Suresh Tehlan, Assistant Scientist (VC)
- 41. Dr. T.P. Malik (Olericulturist/Horticulturist)

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- 42. Dr. S. P. Singh, Horticulturist
- 43. Dr. A. K. Mishra, Jr. Pathologist

**Konkan Krishi Vidya Peeth, Dapoli**

- 44. Dr. R. G. Khandekar (Horticulturist)
- 45. Mr. U. B. Pethe (Jr. Spices Breeder)
- 46. Dr. V. A. Gadre (Jr. Pathologist)

**Narendra Dev University of Agriculture and Technology, Kumarganj**

- 47. Mr. R. K. Gupta, Horticulturist
- 48. Dr. V. P. Pandey (Jr. Breeder)
- 49. Dr. R. P. Saxena (Jr. Pathologist)

**Indira Gandhi Krishi Vishwa Vidhyalaya, Raigarh**

- 50. Dr. A. K. Singh (Jr. Breeder)

**Uttar Banga Krishi Viswa Vidhyalaya, Pundibari**

- 51. Dr. S. Khalko (Asst. Prof. of Plant Pathology)
- 52. Dr. B.C. Saha, Breeder (In-Charge)
- 53. Dr. J.C., Jana, Associate Professor
- 54. Dr. H. Bhattacharya

**Co-Opting Centers**

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- 56. Dr. Utpal Gupta

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- 57. Dr. Sree Krishna Bhat

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**ICAR Res. Complex for NEH Region R S, Mizoram Centre, Kolasib, Mizoram**

60. Dr. B.K. Singh, Scientist

**Voluntary Centers**

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62. Dr. Dharendra Singh, Head, Dept. of Vegetable Science

63. Dr. J.P. Singh, Director, Dir. of Experimental Station

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69. Dr. B. K. Verma

**NRC Seed Spices, Ajmer**

70. Dr. Gopal Lal, Principal Scientist

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72. Dr. Y.K. Sharma, Sr. Scientist, Plant Pathology

73. Dr. R.S. Meena, Scientist, Plant Breeding

74. Dr. R.S. Mehta, Sr. Scientist
75. Dr. R.K. Solanki
76. Dr. J.K. Ranga, Sr. Scientist, (Hort.)
77. Dr. S. S. Rathore, Sr. Scientist
78. Dr. B. K. Misra, Sr. Scientist
79. Say Ram Meena, Technical Officer
80. Shri. Pramod Kumar
81. Dr. S. S. Meena
82. Dr. M. K. Vishal
83. Dr. R. K. Singh
84. Dr. Krishna Kant
85. Dr. R. D. Meena

**Indian Institute of Spices Research, Calicut & Appangala**

86. Dr. S. Devasahayam, Principal Scientist
87. Dr. B. Chempakam, Principal Scientist
88. Dr. V. Srinivasan, Senior Scientist
89. Dr. D. Prasath, Senior Scientist
90. Dr. E. Jayasree, Senior Scientist
91. Dr. S.J. Anke Gowda, Head

**NBPGR, Jodhpur**

92. Dr. A. K. Singh

**Host University, RAJAU, Bikaner, Rajasthan**

93. Dr. M. P. Sahoo
94. Dr. S. Gangopadhyay

