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**PROCEEDINGS OF THE XVII WORKSHOP  
OF ALL INDIA COORDINATED  
RESEARCH PROJECT ON SPICES**

**3-5 February 2004  
Indian Institute of Spices Research  
Calicut, Kerala**

*Project Coordinator : Dr K V Ramana*



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INDIAN INSTITUTE OF SPICES RESEARCH  
(*Indian Council of Agricultural Research*)  
Calicut – 673 012, Kerala**

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## INTRODUCTION

The All India Coordinated Research Project on Spices (AICRPS) is the largest spices research network, comprising 19 coordinating centers and 8 voluntary centers based in 15 SAUs. The Workshop was presided by Dr. S.N. Pandey, ADG (Hort. & PC), ICAR, New Delhi and was inaugurated by Prof. (Dr.) K.V. Peter, Vice Chancellor, KAU, Trichur. The Plenary Session was chaired by Dr. G. Kalloo, DDG (Hort. & CS). About 105 research projects in 12 mandate spice crops which are in progress at various centers were critically reviewed and new need based research programmes were formulated in the biennial workshop held at Indian Institute of Spices Research, Calicut during 3-5 February 2004.

About 100 delegates including scientists working in 27 AICRPS research centres under 15 SAUs, experts from Spices Board, IISR, KAU, DASD and NBPGR, farmers, representatives from agro input agencies, Principal Investigators of ICAR Adhoc Schemes and officials from Agriculture Departments participated in the three day deliberations.

An important feature of this workshop was the identification and recommendation of 17 spices varieties to State/Central Variety Release Committees. The varieties are IISR-Thevam, IISR-Girimunda, IISR-Malabar Excel and P-24 in black pepper developed by IISR; IISR - Kedaram and IISR - Alleppey Supreme in turmeric developed by IISR; RZ - 223 (cumin), RMt - 305 (fenugreek), RF - 143 (fennel) from Jobner (RAU, Rajasthan); Hisar Surabhi (coriander) and Hisar Swarup (fennel) from Hisar (CCHAU, Haryana); Gujarat fennel - 11 from Jagudan (GAU, Gujarat). Other seed spice varieties recommended were Ajmer Nigella - 1, Ajmer Ajowan - 1, Ajmer Ajowan - 2, Ajmer Dill - 1 (European dill variety) and Ajmer Dill - 2 (Indian dill variety) developed by National Research Center on Seed Spices, Ajmer, Rajasthan.

Another distinct feature of this workshop was the conduct of six subgroup meetings to reorient the ongoing research projects and formulation of new research programmes on priority basis as per the recommendations of the current Workshop/QRT. The meetings were held at IISR, Calicut on Genetic Resources and Crop Improvement & Biochemistry on 25-2-2004 for cardamom, on 23-3-2004 and 25-3-2004 for black pepper, ginger, turmeric and tree spices, 26-3-2004 on Crop Production aspects of major spices and 27-4-2004 for formulating new technical programmes in seed spices. Subsequently a meeting was held at NRCSS, Ajmer during 29-6-2004 to 30-6-2004 under the chairmanship of Dr. B.B. Vashishtha, Director, NRCSS, Ajmer to finalize the technical programmes in seed spices. The two day meeting was attended by Scientists from all seed spice research centers besides, Scientists from IISR, Calicut. New technical programmes of the mandate seed spice crops were formulated and finalized. Proceedings of all these meetings are also included in this Workshop Proceedings.





**NATIONAL GROUP MEETING (XVII WORKSHOP)  
OF RESEARCH WORKERS OF ALL INDIA COORDINATED  
RESEARCH PROJECT ON SPICES**

**3-5 February, 2004**

**Venue : Silver Jubilee Hall, Indian Institute of Spices Research, Calicut**

**PROGRAMME**

**3 February 2004 (Tuesday)**

<b>09.30 - 10.30</b>	<b>INAUGURAL SESSION</b>
10.30 - 11.00	Tea
<b>11.30 - 13.15</b>	<b>SESSION I : GENETIC RESOURCES</b> (9 Projects, 39 Presentations)
Chairman	Dr. V.A. Parthasarathy (IISR, Calicut)
Co-Chairman	Mr. B. Krishnamoorthy (IISR, Calicut)
Rapporteurs	Mr. K.V. Saji (IISR, Calicut) Ms. C. Sarada (ANGRAU, Guntur)
13.15 - 14.00	Lunch
<b>14.00 - 15.00</b>	<b>SESSION I : GENETIC RESOURCES - Continued</b>
15.00 - 15.15	Tea
<b>15.15 - 18.00</b>	<b>SESSION II : CROP IMPROVEMENT AND BIOCHEMISTRY</b> (50 Projects, 119 Presentations)
Chairman	Dr. R.K. Sharma
Co-Chairman	Dr. K. J. Madhusoodanan (ICRI, Myladumpara)
Rapporteurs	Dr. J. Rema (IISR, Calicut) Dr. D.K. Dash (OUAT, Pottangi)



#### 4 February 2004 (Wednesday)

09.00 - 10.30	<b>SESSION II : CROP IMPROVEMENT AND BIOCHEMISTRY - Continued</b>
10.30 - 10.45	Tea
10.45 - 13.15	<b>SESSION II : CROP IMPROVEMENT AND BIOCHEMISTRY - Continued</b>
13.15 - 14.00	Lunch
14.00 - 15.00	<b>SESSION II : CROP IMPROVEMENT AND BIOCHEMISTRY - Continued</b>
15.00 - 15.15	Tea
15.15 - 18.30	<b>SESSION III : CROP PRODUCTION (21 Projects, 58 Presentations)</b>
Chairman	Dr. B. B. Vashishtha (NRCSS, Ajmer)
Co-Chairperson	Dr. B. Chempakam (IISR, Calicut)
Rapporteurs	Dr. C. K. Thankamani (IISR, Calicut) Dr. S. Subramanian (TNAU, Coimbatore)

#### 5 February 2004 (Thursday)

09.00 - 10.30	<b>SESSION IV : CROP PROTECTION (21 Projects, 59 Presentations)</b>
Chairman	Dr. M. Anandaraj (IISR, Calicut)
Co-Chairman	Dr. B. Gopakumar (ICRI, Thadiyankudisai)
Rapporteurs	Dr. A. Kumar (IISR, Calicut) Dr. G. Sivakumar (KAU, Panniyur)
10.30 - 10.45	Tea
10.45 - 13.15	<b>SESSION IV : CROP PROTECTION - Continued</b>
13.15 - 14.00	Lunch





14.00 – 15.00

**SESSION V : IDENTIFICATION OF VARIETIES  
& RECOMMENDATIONS FOR  
EXTENSION AGENCIES**

Chairman  
Co-Chairman

Dr. G. Kalloo (ICAR, New Delhi)  
Dr. S.N. Pandey (ICAR, New Delhi)

Rapporteurs

Dr. K. S. Krishnamurthy (IISR, Calicut)  
Mr. M. Narayana Swamy (UAS-B, Mudigere)

15.00 - 16.00

**SESSION VI : ICAR ADHOC SCHEMES**

Chairman  
Co-Chairman

Dr. G. Kalloo (ICAR, New Delhi)  
Dr. S. N. Pandey (ICAR, New Delhi)

Rapporteurs

Dr. K. S. Krishnamurthy (IISR, Calicut)  
Dr. M. Narayana Swamy (UAS-B, Mudigere)

16.00 – 16.15

Tea

16.15 – 17.15

**SESSION VII : PLENARY SESSION**

Chairman  
Co-Chairmen

Dr. G. Kalloo (ICAR, New Delhi)  
Dr. S.N. Pandey (ICAR, New Delhi)  
Dr. K.V. Ramana (IISR, Calicut)

Rapporteurs

Dr. V. Srinivasan (IISR, Calicut)  
Dr. A.K. Johny (IISR, Calicut)

Presentation of Reports of Technical Sessions I-V

Remarks of Chairman & Co-Chairmen

Vote of Thanks

Dr. K.N. Shiva (IISR, Calicut)





## INAUGURAL SESSION

The XVII Workshop of AICRP on Spices (AICRPS) was held at Indian Institute of Spices Research (IISR), Calicut during 3-5 February 2004. The workshop was jointly organized by Indian Council of Agricultural Research (ICAR), New Delhi and Indian Institute of Spices Research, Calicut. The 3 day workshop was inaugurated by Prof. (Dr.) K.V. Peter, Vice Chancellor, Kerala Agricultural University, Trichur at the Silver Jubilee Hall, IISR, Calicut. The inaugural function was presided over by Dr. S.N. Pandey, Asst. Director General ((Hort. & PC), ICAR, New Delhi. Dr. V.A. Parthasarathy, Director, IISR, Calicut welcomed the delegates. Dr. K.V. Ramana, Project Coordinator (Spices), presented the significant achievements and overall progress of work during the past two years (2001-2002 & 2002-2003) at various centers of AICRPS. The highlights covered the progress made in varietal improvement, crop management, crop production and crop protection under 105 projects in 12 mandate spice crops of AICRPS.

Dr. K. V. Peter, Vice Chancellor in his inaugural address stressed the need for a change in the farming system. According to the Vice Chancellor the effective coordination among the Agricultural Institutions, scientists, farmers and Agricultural departments has changed the farm scenario in the state. Dr. Peter also said that the agricultural scenario had undergone a sea change and it has become an agri-business, especially with high priced crops like vanilla. He also mentioned that Kerala excels in homesteads, with 15 lakh homesteads, providing employment to about 75-85% of the agricultural labours. Sixty per cent of our agricultural income in Kerala comes from homesteads.

He mentioned that the productivity in certain crops is very low, and the cost of production is high. He stressed the need to bring down the production cost, forecasting a paradigm shift in the country's agriculture scenario.

Dr. Peter predicted another revolution in the offing in the horticulture after the green, blue, white and yellow revolutions. He also said that there was a remarkable increase in the production and productivity of spices during the past two decades. Black pepper production, that was hovering around 26,160 t with a productivity of 218 kg/ha in 1970-71 increased to 79,000 t with a productivity of 361 kg/ha in 2000-2001. Similarly, the productivity increased from 34.65 kg to 149 kg/ha in cardamom, 155.73 kg to 236 kg/ha in large cardamom, 1357 kg to 3250 kg/ha in ginger, 1871 kg to 3931 kg/ha in turmeric, 372 kg to 499 kg/ha in coriander and 324 kg to 403 kg/ha in cumin.

In his presidential address, Dr. S. N. Pandey, Asst. Director General (Hort.&PC) said the annual production of spices and spices trade during the last two years is a matter of concern. The post WTO regime brings in to focus the much needed changes in the quality standards of our produce and products. A comprehensive strategic plan has to be formulated and implemented to enhance the export.



The technological packages have to be demonstrated in the farmer's field. Ecological/natural/organic farming is necessary for stable and sustainable agriculture production. To have an ecological balance, there is a need to use optimum dose of chemical fertilizers, pesticides and other chemicals. He was of the opinion that adoption of hi-tech horticulture like micro-irrigation, micro-propagation, high density planting, use of biofertilizers, biopesticides and genetically modified varieties is the need of the country. He also mentioned that there is a high demand for organically produced products and fetching premium price and requested for a change in the farming system to ensure quality to meet the international standards.



*Prof. (Dr.) K.V. Peter, Vice Chancellor, KAU inaugurating the XVII AICRPS Workshop. Dr. K.V. Ramana, Dr. S.N. Pandey, Dr. V.A. Parthasarathy and Dr. M.N. Venugopal are also seen (L→R)*



## PROJECT COORDINATOR'S REPORT

The All India Coordinated Research Project on Spices (AICRPS) is the largest network in the country in the spices research. The AICRP on Spices was started in 1971 (IV Plan) as a combined project on spices and cashew. It was bifurcated in to two projects, one each for spices and cashew in 1985 and since then the AICRPS started functioning with a full time Coordinator with headquarters at Indian Institute of Spices Research (IISR), Calicut.

At present 19 centres spread over in 15 states based at 15 Agricultural Universities are functioning under AICRPS. In addition, eight co-operating/voluntary centres are collaborating with this project. The total staff strength of AICRPS is 83, which includes 51 scientists and 32 technical/auxiliary staff. The ICAR is meeting 75% expenditure of each centre and 25% is met by the respective State Agricultural University (SAU). The budget of the project for the year 2001-2002 was Rs. 155.92 lakhs with Rs.117.00 lakhs as ICAR share and for 2002-03 it was Rs. 209.329 lakhs with Rs. 157.00 lakhs as ICAR share. The research achievements for the period 2001-2003 are as follows.

About 105 research projects covering 12 mandate spice crops are being operated at various centres under AICRPS. During the workshop in 2001 held at Kerala Agricultural University, Trichur, seven promising varieties and four technologies were recommended and new programmes were formulated with specific emphasis on inter-varietal hybridization, integrated pest and disease management and organic farming in spices.

In crop improvement, 59 projects with 35 programmes are being carried out. The AICRPS centers strengthened the genetic resources of spice crops and the germplasm for different parameters was evaluated and promising accessions in each crop were identified. At present, the germplasm holdings of AICRPS centers consist of black pepper - 650, cardamom - 369, ginger - 644, turmeric - 1307, tree spices - 228 and seed spices - 3901. Five new CVT and 3 CYT were initiated during the period.

At Ambalavayal, black pepper accessions Panchami, Panniyur - 4, Panniyur - 3, Acc - 2445, Acc - 2426 and Panniyur - 2 were found promising for the high range region of Kerala. Cardamom accessions CL - 730, CL - 692 and D - 237 were found promising and included in varietal evaluation trials at Mudigere.

Under initial evaluation trial in ginger, highest fresh rhizome yield was recorded in  $V_3S_1 - 8$  ( $28.25 \text{ t ha}^{-1}$ ) at Pottangi. In turmeric, highest fresh rhizome yield was recorded in PTS - 39 ( $26.62 \text{ t ha}^{-1}$ ) at Pottangi. At Solan, five collections viz., ST - 365, BDJR - 1244, CIs - 29, PTSS - 24 and DKH - 26 showed increase in yield to the extent of 17.64 to 32.62% over the check. Besides, ginger accessions with desirable quality parameters were identified. The dry matter content of ginger accessions varied from 13.00 to 22.50%. Oleoresin and essential oil contents ranged between 4.00 to 9.67% and 0.25 to 2.00%, respectively and crude fibre varied from 3.93 to 5.95% in different ginger accessions.



Hybridization in cumin was successful. In fenugreek accessions, HM - 444 (23.9 q ha<sup>-1</sup>) a green seed coat mutant and HM - 372 and HM - 376 yellow seed coat mutants gave highest seed yield (33.85 and 32.65 q ha<sup>-1</sup>, respectively). Among them, HM - 444 is also resistant to both downy mildew and powdery mildew diseases. At Jobner, RTP - 4 proved its superior performance by yielding 1518.33 kg ha<sup>-1</sup> followed by RTP - 8 (1477.67 kg ha<sup>-1</sup>) and RTP - 9 (1471.33 kg ha<sup>-1</sup>), which will be evaluated under CVT. Besides, 70 promising accessions were identified for yield and 21 accessions for quality attributes through CVT/CYT.

In crop production, 11 programmes under 21 projects are being operated. In black pepper-arecanut mixed cropping system, irrigation with 20 l vine<sup>-1</sup> day<sup>-1</sup> and a fertilizer dose of NPK 100:40:140 g vine<sup>-1</sup> gave the highest yield (2.69 kg vine<sup>-1</sup>) at Sirsi. In a drip irrigation trial in black pepper at Panniyur, irrigation at 2 l vine<sup>-1</sup> day<sup>-1</sup> increased the yield (1.74 kg vine<sup>-1</sup>) and among the varieties, Panniyur - 5 responded positively to drip irrigation and recorded the highest yield (2.08 kg vine<sup>-1</sup>). *Azospirillum* in combination with inorganic nitrogen and farmyard manure increased the yield in most of the spice crops. The role of micronutrients in increasing yield of ginger and coriander was well established. October to March was found to be the most congenial period for soft wood grafting in nutmeg with highest success during January.

In crop protection, 21 projects are being operated under 9 programmes. Black pepper cuttings planted in solarized soil fortified with *Trichoderma harzianum* and VAM reduced the incidence of *Phytophthora* disease and increased sprouting. Metalaxyl Gold MZ and *T. harzianum* combination was found to be highly effective in controlling the foot rot disease of black pepper at Pampadumpara and Sirsi centers. Application of carbofuran (100 g plant<sup>-1</sup>) followed by imidacloprid (0.5 ml l<sup>-1</sup>) was found to be effective against root grubs in cardamom.

Ginger rhizomes treated with hot water at 51° C for 10 minutes followed by treatment with *T. harzianum* mixed with neem cake resulted in minimum incidence of rhizome rot disease with maximum yield at Kumarganj. Foliar diseases like leaf spot and leaf blotch in turmeric could be checked effectively by application of mancozeb + carbendazim as seed treatment and foliar spray. Rhizome rot of turmeric could be controlled by applying biocontrol agents, *Trichoderma viride* and *Pseudomonas fluorescense*. *Trichoderma harzianum* as seed treatment and soil application was found effective in checking wilt disease in coriander and wilt and blight diseases in cumin. For the control of aphids in cumin, two sprays of monocrotophos and acephate were found more effective. Carbendazim as seed treatment alone or along with soil drenching proved highly effective against root rot in fenugreek. Fifty eight accessions resistant to major pests and diseases in different spice crops were also identified.

AICRPS centres multiplied and distributed nucleus planting materials (cuttings/suckers/seeds) of different spice crops.



The Project Coordinator's Cell in collaboration with the Institute (IISR) has organized a training programme on "Experimental Designs & Computer Applications in Spices Research" during 16-26 September 2003 to the AICRPS Scientists at IISR, Calicut. Efforts are being made to bring out a publication on "Genetic Resources of Spices", as directed by Dy. Director General (Hort. & CS) and all the centers are requested to supply the information required. As desired by Dy. Director General (Hort. & CS) in Project Coordinators Meeting held at CISH, Lucknow, proformae for developing database on various aspects of spices and for reporting the data for the Annual Report were circulated to all the centers. Performance of each centre was also evaluated.

I place on record the good work done by the Scientists of various centers in spite of many constraints. I am extremely thankful to each one of them for the support and cooperation given to me. I am also thankful to the Dy. Director General (Hort. & CS) and Asst. Director General (Hort. & PC), ICAR and Director, Indian Institute of Spices Research for the all their support in successful running of the project.



**ACTION TAKEN REPORT ON THE RECOMMENDATIONS OF THE XVI  
WORKSHOP ON SPICES HELD AT KAU, TRICHUR DURING  
NOVEMBER 2001 AND ON THE EARLIER DECISIONS**

Decision	Action taken
<b>GENERAL</b>	
1. The new trials on organic fertilizers and biofertilizers have to be initiated in black pepper, turmeric, coriander, ginger, fenugreek and cardamom.	Trials viz., "Efficacy of biofertilizer using <i>Azospirillum</i> " and "Efficacy of biofertilizer using P-solublizer" are laid out at different centres in black pepper, ginger, turmeric, cardamom and seed spices.
2. Organize a group meeting of seed spices scientists at Jobner in Feb or March, 2002 to chalk out short and long-term strategies for future research in seed spices.	Efforts have been made to organize the same but could not be materialized. However, a meeting of scientists working in seed spices was held at NRC on Seed Spices, Ajmer to formulate new programmes during 29-30 June 2004.
3. One set of germplasm from all coordinating centres should be sent to IISR Calicut/NBPGR, New Delhi, NRC on Seed Spices, Ajmer.	The centers are directed to comply the suggestion. Seeds of coriander, cumin, fennel, fenugreek and ajwain were sent to NRC Seed Spices, Ajmer. Coimbatore center deposited the released varieties of coriander with NBPGR.
4. Passport data of the accessions collected should be prepared and sent to NBPGR, Delhi at the earliest with a copy to Project Coordinator, AICRPS, Calicut with voucher specimens.	Instructions have been issued to all the centers. Only Mudigere, Coimbatore and Pundibari submitted passport data of accessions in cardamom and turmeric, respectively. The Panniyur center sent the passport data of black pepper collections made during 2000 to NBPGR. The passport data of ginger germplasm has been submitted by Raigarh center.
5. Work on other seed spices (ajwain, dill and nigella etc.) to be made at Jobner.	Collection was made during the year 2001-2002 and 15 ajwain, 12 dill and 8 nigella accessions were collected and are being evaluated.
6. Utilization of germplasm collected should be given more emphasis.	More emphasis is being given for the utilization of the collected germplasm. Some centres have no facility for quality analysis.





7. Short-listed varieties of ginger can be sent to IISR for crude fiber analysis.	The short listed varieties of ginger were analyzed for crude fiber at Solan itself. This was also discussed with the biochemist of IISR and accordingly the analysis was done at Solan.
8. Reproductive biology of seed spices should be given as postgraduate/Ph.D. work and thoroughly studied (Jobner).	There is no Ph.D. student to take up this work. So, M.Sc. students have started research on variability in cumin, fennel and fenugreek.
9. Release/identification: Proposals for good performing varieties.	Centres are directed to submit the proposals for release in XVII AICRPS Workshop.
10. Emphasis may be given to isolate native strains of all biofertilizers and use it in the concerned experiments.	Isolation of native strains is being initiated at all the centers. <i>Glomus mosseae</i> was isolated from the native field by Pampadumpara center.
11. In all the organic manuring experiments, same plots may be maintained for treatment imposition over the period.	Will be followed.
12. In all the organic farming experiments, content of volatile oil should be analyzed	All the centres are directed to get the samples analyzed for quality and is being done by Jobner center.
13. All centres should follow the uniform technical programme as decided in the workshop.	PC cell has informed all the centres to follow the technical programmes finalized in the workshop.
14. Effect of biofertilizer on quality may be analyzed.	It is being taken up.
<b>BLACK PEPPER</b>	
15. Germplasm collection: Extensive survey for germplasm collection should be done in Sagar, Shimoga and Sidhapur areas by Sirsi.	Local germplasm is being collected by Sirsi center.
16. Dapoli should improve collection programme.	The germplasm of black pepper is improved by collecting the germplasm from different centres and also from different locations from Konkan region of Maharashtra state by Dapoli center. Dapoli center has collected the germplasm from IISR, Calicut.
17. Inter-varietal hybridization in black pepper may be intensified at Panniyur.	This programme is being carried out and a new trial was started with 13 lines.



18. The insects (natural enemies) recorded on black pepper by Pampadumpara in Idukki District may be identified.	Steps are being taken for identifying the insects (natural enemies) recorded on black pepper.
19. Survey for the occurrence of diseases in black pepper may be modified as "Incidence, epidemiology and management of anthracnose disease of black pepper".	The title of the experiment was changed accordingly and technical programme is also modified.
20. Residues of metalaxyl should be analyzed in the trials against <i>Phytophthora</i> foot rot disease	At Spices Board, Cochin, no specific column is available for carrying out residue analysis. The charges claimed by TNAU, Coimbatore is very high (Rs. 5000/- per sample + Rs.20,000/- consultancy charge). Efforts are being made to get the samples analysed at KAU, Trichur.
21. A new CVT in black pepper to be started in June 2000 at four centres viz., Panniyur, Sirsi, Pampadumpara and Ambalavayal with 13 treatments and 3 replications.	CVT - 2000 Series V was started in black pepper during 2002-03.
22. A new trial to be initiated in black pepper for the management of <i>Phytophthora</i> foot rot in areca -pepper cropping system at Sirsi centre.	Experiment entitled " <i>Phytophthora</i> foot rot incidence in black pepper under different densities in arecanut garden" has been initiated at Panniyur and Sirsi centers.
23. All centres should have a common programme for foot rot management with major emphasis on biocontrol agents.	It is being adopted and the biocontrol agent <i>Trichoderma harzianum</i> as one of the treatments in the management of <i>Phytophthora</i> foot rot of black pepper.
24. Collection of elite lines of Karimalligesara to be initiated by Sirsi and collection from Uttara Kannada area to be completed within next two years by Sirsi.	Elite lines of Karimalligesara were collected from different places in Uttara Kannada District and are being maintained at the station.
25. At Sirsi, variability in Karimalligesara has to be collected.	Collection is being made and these will be evaluated.



26. Evaluation of elite lines of Karimalligesara should be initiated at Sirsi.	It is being initiated. These collections are included in the evaluation trials.
27. Irrigation-cum-fertilizer requirement of black pepper and arecanut in the mixed cropping experiment.	It is being continued at Sirsi.
28. Transfer of required germplasm to IISR, Calicut by Sirsi centre.	Action is being taken. Karimalligesara has been supplied to IISR, Calicut by Sirsi
29. Chintapalle center should procure all released varieties/hybrids in black pepper.	Released varieties (viz., Panniyur - 1 to 5, Sreekara, Subhakar, Panchami, Pournami and Palode - 2) were already collected. Panniyur - 6 and 7 will be collected from Pepper Research Station, Panniyur during 2003.
<b>CARDAMOM</b>	
30. For any comparative yield trial the highest yielding variety should be used as local check.	The high yielding released varieties, Mudigere - 1 and Mudigere - 2 are being used as standard checks in all yield evaluation trials. Green Gold and PV - 2 were included as local checks in the CYT at Mudigere.
31. Collections from plantations should be carried out to locate super clones and document after characterization & evaluation by Mudigere centre.	Two clones having distinct phenotypic traits were collected and these will be evaluated by Mudigere center.
32. Mudigere and Pampadumpara should collect promising clones from Spices Board.	Six promising clones along with two more accessions viz., narrow leaf & cleistogamous genotypes were collected from the ICRI (Spice Board), Myladumpara, Kerala by Mudigere center.
33. Integrated nutrient management on cardamom at Pampadumpara center may be concluded.	Concluded and final report is submitted.
34. New trials with locally popular varieties as well as released varieties or varieties ready for release may be laid out, both under irrigated and rainfed situations at Pampadumpara.	The trials will be taken up.



35. A new trial on the "Effect of neem cake on productivity and pest and disease incidence on cardamom" may be initiated at 4 centers.	The trial was initiated at Pampadumpara and Mudigere centers.
36. Preliminary evaluation of microbial pathogens against root grubs and whiteflies may be carried out at Pampadumpara.	The evaluation studies will be taken up.
37. Volatile oil profile and content must be estimated in the PV - 2 and the center should establish a demonstration plot of PV - 2 with intensive management.	Volatile oil profile was estimated and demonstration plot is being established.
38. In CVT of cardamom, the potential yield of different types included in the trial should be brought out. For that it is suggested that one separate block with experimental design may be maintained for which intensive management practices should be provided - Pampadumpara.	Such attempts will be given to CVT 1991/ 1998 Malabar types from 2003-2004 onwards at Mudigere. Pampadumpara centre is also directed to do so.
39. Application of biofertilizers may be done in two splits and biometric observations may be recorded 60 days after treatment application. Soil and leaf nutrient status may be analyzed once in a year - Pampadumpara.	The center was directed to implement the suggestion.
40. The PI of Mudigere center may contact ICRI, Myladumpara for getting the treatment details of zinc nutrition.	The center started identifying the zinc deficit soils of Mudigere farm.
41. In the evaluation of genotypes, reaction to biotic and abiotic stresses should be recorded.	Reactions to biotic stress are being recorded in all the trials.
42. Detail discussion should be conducted by cardamom scientists regarding inclusion of Mysore types in CVTs of Karnataka state and modify the technical programme accordingly.	Detailed discussion will be held among the scientists of CRS, Appangala and ICRI, Sakleshpur before the next workshop. Mudigere centre will coordinate the meeting.



43. Intensive survey should be taken up in different cardamom growing tracts to locate superior clones, to locate better performing types under average management and to locate drought tolerant types.	This could not be carried out due to non availability of the vehicle at Mudigere center. Surveys for collection of germplasm are being taken up in CHR, of Idukki District and Mehamala hills of Tamil Nadu.
44. The frequency of sprays may be increased in the evaluation of plant based insecticides for the control of thrips and fruit borers and Eco-neem may be included in this trial.	Eco-neem has been included as one of the treatments in the experiment at Mudigere.
<b>GINGER</b>	
45. New trial will be initiated for the "Integrated management of <i>Pythium</i> , <i>Fusarium</i> and <i>Ralstonia</i> " and would be formulated by the IISR and KAU.	The trial has been formulated and initiated accordingly at Solan, Pundibari and Dholi centers.
46. Effect of biofertilizer on quality of ginger may be taken up.	This has been taken up at all the centers.
47. Yield data should be presented per plot basis rather than single plant basis and also on per hectare basis.	The centre is directed to follow the suggestion.
48. Complete collection from southern districts by Pottangi.	Action has already been taken.
49. In quality evaluation trial, along with quality attributes, yield data should also be presented together.	This will be followed.
50. The existing variability should be exploited fully, (by collecting and evaluating) and then, the effort should be made to create the variability.	Action will be taken.
51. Crop rotation with legumes may be adopted as a practice during fallow season in experiments with ginger crop at Pottangi and Raigarh.	This is implemented. The Pottangi centre also has to follow the decision.
52. Utilization of germplasm collected should be given more emphasis at Raigarh.	Emphasis is being given



53. The germplasm collection work can be completed after intensive survey within two years at Raigarh.	Germplasm collection has been completed.
54. Complete the ginger collections from Himachal Pradesh – by Solan	The centre is directed to do so. This was partially done and has to be completed.
<b>TURMERIC</b>	
55. Oil quality of germplasm should also be evaluated along with other characters by Solan centre.	Essential oil extraction of the germplasm is being done by the Solan centre. However the fractionalization of the oil cannot be done due to the lack of facilities.
56. A new IET for turmeric should be taken up by Solan center.	The trial was taken up.
57. For identification of <i>Curcuma</i> sp., the centres can take the help of Dr. K.C. Velayudhan, Principal Scientist, NBPGR, Vellanikkara, Trissur. Herbarium specimens are advisable.	Action will be taken.
58. Quality analysis of the entries in CVT should be done either by sending samples to IISR, Calicut or to Spices Board, Quality Control Laboratory at Kochi.	Action will be taken.
59. In the quality evaluation programme the high content of curcumin (Coimbatore) and high oleoresin (Solan) should be rechecked at Spices Board, Quality Control Laboratory.	The issue was raised by the biochemist, IISR and the value was misunderstood as of ginger. The contents reported in turmeric are not higher.
60. If possible, the quality attributes of the selected types at different centres should be rechecked at IISR Laboratory also.	Action will be taken.
61. The Coimbatore centre would also be included in the project "Investigations on casual organisms of rhizome rot of turmeric and survey of biocontrol agents for the management and identification of disease causing organism in turmeric and screening of germplasm against diseases".	A modified trial was formulated with all the centers working on turmeric and IISR as collaborating center.



62. Effect of biofertilizers on quality of turmeric may be analyzed.	Study is under progress and results are provided in Annual Report 2001-2002.
63. Characterization and documentation of existing germplasm of turmeric by Raigarh	Work is in progress
64. Experiment on leaf blotch and leaf spot diseases may be finalized and new experiment on rhizome rot formulated.	Experiment is in progress. Please see item No. 61.
65. Chintapalle centre should submit a report on biennial turmeric.	Biennial turmeric samples were already collected, analyzed at IISR and the report has been sent to Chintapalle by PC Cell.
66. Pundibari may be included in TUR/CM/1.2.	Included and the trial is in progress.
<b>TREE SPICES</b>	
67. The new trial CVT on nutmeg and cassia should be initiated at Dapoli Sirsi, Pechiparai and Ambalavayal centers.	New CVTs on nutmeg and cassia have been initiated at all the centers.
68. Survey for disease incidence of tree spices should be conducted by Ambalavayal and Pechiparai.	Survey of diseases of tree spices will be conducted during 2003 by Ambalavayal center.
69. CVT 1992 in cinnamon is to be concluded at Yercaud and Ambalavayal after quality analysis.	The trial has been concluded at Yercaud and it is being continued at HRS, Pechiparai. Samples were sent to IISR, Calicut for quality analysis of eugenol in leaf oil and cinnamaldehyde in bark oil by Ambalavayal center.
<b>CORIANDER</b>	
70. Stop collection of coriander and concentrate on characterization - Jobner.	Characterization of few collections was completed and the report was sent to the PC.
71. Hybridization programme should be initiated at Jobner.	Work is in progress.
72. It is advised to carryout quality analysis work of good performing coriander lines by the centers.	Quality analysis of best performing lines is being taken up at Coimbatore.



73. Solan center is also identified to work on coriander.	Efforts for collection of germplasm have been made.
74. The Coimbatore centre would also be included in the project "Management of wilt and powdery mildew diseases in coriander".	The project is taken up at Coimbatore.
75. The pest and disease reaction of the lines selected for CVTs should be recorded by the centers.	It is being recorded.
76. The biofertilizer trial, three more treatments to be included in coriander by the concerned centers.	Will be included in the trial to be laid out.
<b>CUMIN</b>	
77. Complete collection programme from different districts - Jobner.	Germplasm collection is a continuous process and is in progress.
78. Jagudan, Jobner and NRC on Seed Spices should jointly bring out a document on "Genetic Resources of cumin in India".	Under preparation.
79. Jagudan can discontinue collection and should concentrate on evaluation and documentation of germplasm.	Being done.
80. An intensive effort should be made in the inter-varietal hybridization programme. The lack of success in this crossing may be investigated.	Best efforts were made for successful cross in cumin, fennel and fenugreek.
<b>FENNEL</b>	
81. Hybridization programme should be intensified.	A 12 x 12 varietal diallel has been made among the diverse parents and F <sub>1</sub> 's were evaluated.
82. Crosses between var. <i>dulce</i> and var. <i>panmorium</i> (i.e. sweet fennel and indian fennel) should be made by Jobner.	Germplasm of sweet fennel has not been received.





FENUGREEK	
83. Complete the collection, characterization and evaluation of fenugreek and submit a document before March 2002 – Coimbatore and Jobner centers.	Germplasm collection is a continuous process and is in progress. Characterization of few collections was completed and report was sent to the PC by Jobner and Coimbatore centres.
84. Register the valuable germplasm accessions with NBPGR - Jobner.	Registered with the NBPGR, New Delhi(UM - 305 - first determinate, multipodded, dwarf, early and resistant to powdery mildew).
85. HM - 350, a superior performing line from CVT 1995 Series - III at Jagudan may be proposed for release.	The variety release proposal was submitted by Jagudan center.
86. Solan center is also identified for work on fenugreek.	Efforts for collection of germplasm has been made.
87. Quality evaluation should be carried out in fenugreek.	Will be carried out by Coimbatore.



## TECHNICAL SESSIONS

### Technical Session I

### GENETIC RESOURCES

Chairman : Dr. V.A. Parthasarathy    Co-Chairman : Shri. B. Krishnamoorthy

Rapporteurs : Mr. K.V. Saji  
Dr. C. Sarada

1. No. of papers presented : 39
2. Names of the centers where work was done : Panniyur, Sirsi, Chintapalle, Yercaud, Dapoli, Pundibari, Mudigere, Pampadumpara, Solan, Pottangi, Kumarganj, Raigarh, Coimbatore, Jagtial, Jobner, Guntur, Hisar & Jagudan
3. Non-performing centers if any : Nil
4. Brief description of the work done and salient results reported (crop-wise) : The centers presented the reports
5. Recommendations/decisions (crop-wise) :

#### A. Black Pepper

1. A minimum descriptor for evaluation of black pepper germplasm has to be prepared in collaboration with IISR and NBPGR (Action: PC and HD Crop Improvement, IISR).
2. Report of the work done during the last 2 years has to be presented in the Workshop (Action: Panniyur center)
3. The data has to be analyzed statistically and only the analyzed data need to be presented in the Workshop (Action: Sirsi center)
4. The details of passport data of the germplasm have to be submitted to the PC immediately (Action: Sirsi center).
5. Enrich the germplasm (local germplasm) by exploring the potential areas (local areas - Chintapalle center; Maharashtra State - Dapoli center; Kolli Hills - Yercaud center; areas bordering Bhutan, particularly Jotopara regions - Pundibari center )
6. Adaptive trials in the farmers field have to be taken up to evaluate the performance of Narayakodi and Thevanmundi, identified by the center as promising in the area (Action: Chintapalle center).



7. A set of drought tolerant types collected by Dapoli center has to be deposited at IISR, Calicut (Action: Dapoli center and HD Crop Improvement, IISR).

## **B. Cardamom:**

1. Indian Cardamom Research Institute (ICRI) Myladumpara, Spices Board may be considered as a regular center instead of a voluntary center (Action: PC).
2. Characterization of the remaining 99 germplasm accessions (out of 256 accessions) of the center as per IPGRI Descriptor has to be completed (Action: Mudigere center).
3. IC No. for germplasm accession, if obtained should be mentioned (All the centers to note) (Action: Mudigere center).
4. List of germplasm collections of Mudigere center (other than the accessions obtained from other coordinating centers) may be sent to PC Cell to obtain IC Nos. from NBPGR (Action: Mudigere center).
5. A set of promising/potential germplasm accessions may be deposited at IISR (CRC, Appangala) (Action: Mudigere center).
6. Byrapur and Kalasa areas of Western Ghats have to surveyed intensively for germplasm during 2004-05 (Action: Mudigere center).
7. Proper irrigation should be given to all the experimental plots to obtain the potential yield (Action: Mudigere center).
8. It was suggested that the minimum yield level has to be specified for considering any accession as promising. Accordingly the accession giving a minimum cumulative (3 years) yield of 300 g/clump (dry) can be considered as promising line and can be further evaluated (Action: All the centers conducting research on cardamom).

## **C. Ginger**

1. IC numbers of germplasm should also be mentioned in the reports, wherever it is available (Action: Solan center).
2. Original collection number/IC number from the donor institute/ center/ organization has to be mentioned for all the entries included in the experiments and also while reporting the results (Action: All centers).



3. Standard bed size (3 x 1 m) has to be followed for all field trials (**Action:** All centers).
4. Since Raigarh center is identified as a hotspot area for soft rot of ginger, germplasm from all coordinating centers can be collected at this center for evaluating the reaction of the germplasm to the disease (**Action:** Raigarh center).

#### **D. Turmeric**

1. Programmes on turmeric can be deleted from Solan center as this is not a traditional area for turmeric and the existing germplasm at this center has to be transferred to IISR/Pottangi. However, the center can maintain a set of the germplasm under the University project (**Action:** Solan center).
2. The identity of the *C. aromatica* has to be confirmed, since all these accessions come under *C. longa* (**Action:** Pottangi center).
3. Passport data of the locally collected germplasm except turmeric should be sent to NBPGR for obtaining IC numbers, meanwhile the center should also contact NBPGR to get the IC numbers of turmeric for the samples sent already (**Action:** Coimbatore center).
4. In future the reports should be submitted as per the guidelines provided by Project Coordinator (**Action:** Jagtial center).
5. A set of potential germplasm has to be deposited at IISR (**Action:** Jagtial center).
6. Quality analysis of potential germplasm accessions has to be done (**Action:** Jagtial and Pundibari centers).
7. The spread of the released varieties in farmers' field has to be monitored to assess the performance of these varieties (**Action:** Pundibari center).
8. All the data has to be analyzed statistically and presented in the Workshop (**Action:** Raigarh center).

#### **E. Tree spices**

1. Pechiparai may be considered as a regular center to work on tree spices, paprika and vanilla (**Action:** PC).
2. Intensive surveys have to be conducted to collect the local germplasm (**Action:** All centers).



#### **F. Coriander**

1. Since Jagudan is a hotspot area for powdery mildew disease, the germplasm can be tested for their reaction to disease at this center (**Action:** Jagudan center).
2. Accessions K. selections and ND Cor-2 are recommended for CVT trial (**Action:** Kumarganj center).

#### **G. Cumin**

1. Keeping in view of the increasing area under cumin in Raigarh and adjacent districts in Chattisgarh, Raigarh center has to initiate work under the project CUM/CI/1.1: Germplasm collection, characterization, conservation and screening against diseases. The center may give emphasis to collect the locally available germplasm. The germplasm of the released varieties should be supplied to Raigarh center by other centers (**Action:** Jobner and Jagudan centers).
2. Under the project CUM/CI/1.1, Jagudan Center will screen the germplasm for the reaction to powdery mildew. Each center should send 20 entries during this year to Jagudan center (**Action:** Jagudan, Coimbatore, Hisar, Raigarh and Kumarganj centers; Jobner & Guntur centers will contribute the germplasm to Jagudan).

#### **H. Fennel**

1. Germplasm, accessions H.F. 118 and H.F.125 are recommended for CVT (**Action:** Hisar center).

#### **I. Fenugreek**

1. Some entries with different names from different centers were proposed for release. This has to be checked before proposing an entry for release (**Action:** Jagudan center).
6. Recommendations ready for transfer to extension agency, if any: Nil
7. New Programmes proposed:

#### **A. Paprika (New crop):**

**PAP/CI/1.1** Germplasm collection, characterization, evaluation and conservation of paprika and paprika alike chillies

##### *Centers identified:*

1. IISR, Calicut (ICAR)
2. HC & RI, TNAU, Coimbatore (TNAU)
3. HRS, Pechiparai (TNAU)
4. HRS, Yercaud (TNAU)
5. ARS, Guntur (ANGARU)
6. ICRI, Myladumpara (Spices Board)



## B. Vanilla (New crop):

### VAN/CI/1.1 Germplasm, collection, characterization, evaluation and conservation of vanilla

#### *Centers identified:*

1. IISR, Calicut (ICAR)
2. HC & RI, Coimbatore (TNAU)
3. HRS, Pechiparai (TNAU)
4. ICRI, Myladumpara (Spices Board)
5. ARS, Ambalavayal (Kerala Agricultural University)(High elevation)
6. PRS, Panniyur (Kerala Agricultural University)(Low elevation)
7. KKV, Dapoli (KKV)(Coastal)
8. ARS, Sirsi (UAD-D) (High elevation)
9. ARS, Mudigere (UAS-B)

#### 8. General decisions, if any:

1. The Head, NBPGR, Regional Station, Trichur in his remarks, emphasized the need of getting IC numbers for the collections to avoid duplication and registration of pre-released varieties for their special characters with supporting document with NBPGR for protecting the rights (**Action:** All centers).
2. For all the germplasm accessions of all the crops maintained at each center, the centers accession number should be followed by the accession number of the center from where it is collected and also IC No. if obtained in the parenthesis to avoid duplication and to identify the original sources of the accession (**Action:** All centers).
3. Due recognition/credit should be given to the organization/ scientist which/ who made the germplasm collection while proposing the entry for release, research publication etc (**Action:** All centers).
4. The centers are requested to collect the local germplasm rather than collecting it from the headquarters and other centers (**Action:** All centers).



5. All the reports should be presented with statistically analysed data (**Action:** All centers).
6. Use of visual aids in the power point is suggested for presentation in the workshop (**Action:** Pampadumpara center).
7. Passport data of the germplasm accessions should be sent to Project Coordinator immediately for forwarding it to NBPGR, New Delhi for assigning IC numbers (**Action:** All centers).
8. Characterization and documentation of seed spices may be done before June 2005. The descriptor developed by NRCSS, Ajmer may be followed (**Action:** All centers).
9. In seed spices, a list of exotic germplasm to be introduced should be prepared along with source and address, specific traits required, etc., and submitted to PC by the end of August 2004 (**Action:** All centers and NRCSS, Ajmer).
10. In spice crops, performance of exotic germplasm introduced so far from the beginning, should be prepared and submitted to PC by the end of August 2004 (**Action:** All centers and NRCSS, Ajmer).



## Technical Session II

## CROP IMPROVEMENT & BIOCHEMISTRY

Chairman : Dr. R. K. Sharma      Co-Chairman : Dr. K. J. Madhusoodanan

Rapporteurs : Dr. J. Rema  
Dr. Dilip Kumar Dash

1. No. of papers presented : 119
2. Names of the centers where work was done: Pampadumpara, Panniyur, Sirsi, Chintapalle, Yercaud/ Pechiparai, Dapoli, Pundibari, Mudigere, Solan, Pottangi, Kumarganj, Jagtial, Raigarh, Coimbatore, Jobner, Guntur, Hisar, Shakleshpur & Jagudan
3. Non-performing centers if any : Nil
4. Brief description of the work done and salient results reported (crop-wise) : The centers presented the reports
5. Recommendations/decisions (crop-wise) :

### A. Black Pepper

1. The trial on CVT 1991 series IV may be concluded at Panniyur, Chintapalle, Ambalavayal and Pampadumpara centers. The trial would continue for one more year at Yercaud center (**Action:** Respective centers).
2. The data on CVT 1987 series III and CVT 1991 series IV of all the centers may be sent to Projector Coordinator for analysis (**Action:** Respective centers).
3. CVT 2000 - Series V would continue at all the centers. As the area selected for the trial at Chintapalle was not suitable, it was decided to layout the trial in another area suitable, for black pepper (**Action:** Respective centers and Chintapalle center).





## B. Cardamom

1. All the registers pertaining to the project on 'Evaluation of synthetics and OP progenies' may be obtained from the previous project leaders and submitted to PC for verification (**Action:** Mudigere center).

A meeting was held on 25 February 2004 at IISR, Calicut to examine the progress of various trials in cardamom. The meeting was attended by Dr. K. J. Madusoodanan, ICRI, Myladumpara, Mr. M. Narayanaswamy, Mudigere, Mr. K.V. Saji, IISR, Dr. K.V. Ramana (PC) and Dr. K. N. Shiva, Scientist (Hort.), PC Cell. The registers were scrutinized in the meeting and the following decisions were taken:

- (i) The title of the project (CAR/CI/2.1 Evaluation of synthetics and OP progenies) may be modified as "Evaluation of OP progenies under intensive management" and the project will continue (**Action:** Mudigere center).
- (ii) A new trial under CAR/CI/2.2 Hybridization may be initiated at Mudigere (**Action:** Mudigere center). Please see item No. 7.
- (iii) CVT 1998 - Series II may be concluded (**Action:** Respective centers).
- (iv) Both the trials CAR/CI/3.2 CVT 1991/1998 - Series III with Malabar types and CAR/CI/3.3 CVT 1991/1998 - Series III with Mysore types at all the centers may be concluded since these trials were conducted for more than 3 years. The final reports of the projects have to be submitted to Project Coordinator (**Action:** Respective centers).
- (v) CVT 2000 - Series IV CAR/CI/3.4 CVT 2000 - Series IV will be continued at all the centers (**Action:** Respective centers).
- (vi) A new trial (CAR/CI/3.5 CVT 2004) is proposed (**Action:** Myladumpara, Pampadumpara, Mudigere and Thadiyankudisai centers). Please see item No. 7.
- (vii) Both the trials CAR/CI/4.1 Yield evaluation of open pollinated seedling progenies (VET-1) and CAR/CI/4.2 Yield evaluation of promising cardamom selection (VET-II) may be concluded (**Action:** Mudigere center).



- (viii) The title of the project (CAR/CI/4.3 Yield evaluation of promising cardamom selections (VET-III)) may be modified as "Initial evaluation trial (IET-I)" and the trial will be continued (Action: Mudigere center).
- (ix) The title of the project (CAR/CI/4.4 Yield evaluation of promising cardamom selections (VET-IV)) may be modified as "Initial evaluation trial (IET-II)" and the trial will be continued (Action: Mudigere center).
- (x) CAR/CI/5 Screening of cardamom clones for abiotic stress may be closed as there is no Plant Physiologist at Mudigere center and due to the poor stand of the crop (Action: Mudigere center).
- (xi) The germplasm materials (drought tolerant lines) may be maintained under germplasm (Action: Mudigere center).

### C. Ginger

1. The CVT 2000 – Series V: would continue. The best entries namely VJE8-2 and V3S1-8 identified from CVT 2000 - Series V from Pottangi center may be included in the adaptive trials (Action: Pottangi center).
2. Comparative yield trials, CYT - I & II will be concluded at Pottangi center, but would be continued at Solan and Raigarh centers (Action: Respective centers).
3. The promising entry, S-558 from initial evaluation trial at Pottangi may be included in CVT. Initial evaluation trial may be concluded at Pottangi. The trial may continue at Solan (Action: Pottangi and Solan centers).
4. Scientists of Raigarh center may contact Crop Protection Division of IISR for advice on plant protection measures against rhizome rot of ginger before laying out the trial in the coming season (Action: Raigarh center)
5. Quality analysis of ginger may be carried out by all the centers. The facility available at Solan center may be utilized for the analysis (Action: Respective centers).



#### **D. Turmeric**

1. The trial, CVT 2000 - Series V at Chintapalle, Pottangi and Kumarganj centers may be concluded and the data may be sent to Project Coordinator for analysis. The trial will be continued for one more year at Raigarh and Jagtial centers (**Action:** Respective centers).
2. Entries, PTS-11, 52 & 55 were identified as promising from the Coordinated Varietal Trial at Pottangi. These entries may be included in adaptive trials (**Action:** Pottangi center).
3. TUR/CI/3.1 Comparative yield (Coordinated varietal) trial 1999-2000, may be concluded at Pottangi and Jagtial centers. The trial may be continued for one more year at Pundibari. Decision to conclude the trial at Raigarh center would be taken during the visit of Project Coordinator to the center (**Action:** PC).
4. The list of promising entries from comparative yield (Coordinated varietal) trial may be sent to Project Coordinator for formulating new CVT. Based on the promising entries identified at the centers, a new CVT (TUR/CI/2.3) is formulated (**Action:** Respective centers). Please see item No. 7.
5. The promising entries PTS-34 & 39 identified from TUR/CI/3.2 IET at Pottangi may be included in CVT (**Action:** Pottangi center and PC).
6. Quality parameters, especially curcumin content in turmeric accessions may be analysed (**Action:** All centers).
7. Turmeric accessions which recorded curcumin above 5% at Coimbatore center may be sent to Spices Board, Cochin for confirmation (**Action:** Coimbatore center).
8. The data of the trial 'Impact of environment on quality of turmeric' (TUR/CI/4.2) should also contain the details of environmental parameters (**Action:** Pottangi and Coimbatore centers).

#### **E. Tree Spices**

1. The trial CVT 1992 in cinnamon may be concluded at Yercaud/ Pechiparai and Ambalavayal centers after recording the quality parameters including cinnamaldehyde and eugenol contents (**Action:** Respective centers).



2. The trials in clove (CVT 1992), nutmeg (CVT 2001) and cassia (CVT 2001) will continue (**Action:** Respective centers).

#### **F. Coriander**

1. CVT 1993 - Series II, CVT 1996 - Series III and CVT 1998 - Series IV may be concluded. The pooled data may be sent to Project Coordinator before 1st of August 2004 (**Action:** Respective centers).
2. The promising entry DH-246 from CVT 1998 - series IV may be proposed for release from Hisar center (**Action:** Hisar center).
3. CVT 2001 - Series V will continue at all the centers (**Action:** Respective centers).
4. Initial evaluation trial (COR/CI/3.2) at Jobner will be concluded after recording the data for the current season (**Action:** Jobner center).
5. The quality analysis of entries of Jagudan center may be undertaken at Jobner center and the analysed data may be sent to Jagudan center (**Action:** Jobner and Jagudan centers)

#### **G. Cumin**

1. Hybridization trials at Jagudan center may be continued using marker characters like hairiness, white colour of flower and non-splitting in cumin. However, the programme need not be continued as a coordinated programme of AICRP on spices (**Action:** Jagudan center)
2. CVT 1999 - Series IV of cumin may be concluded at all the centers (**Action:** Respective centers).
3. CVT 2001 - Series V trials may continue at all the centers for one more year (**Action:** Respective centers).
4. Initial evaluation trial at Jagudan center may be concluded. The trial would continue at Jobner center (**Action:** Jagudan and Jobner centers).
5. UC-223 identified as promising line from CVT 1999 - Series IV at Jobner center may be proposed for state release (**Action:** Jobner center).



6. The quality analysis of cumin entries from Jagudan center may be undertaken at Jobner center and the report may be sent to Jagudan center (**Action:** Jobner and Jagudan centers).

#### **H. Fennel**

1. Co-ordinated varietal trial CVT 1997 - Series III may be closed at all the centers. A new CVT (FNL/CI/3.3 CVT 2004) may be taken up during this year (**Action:** Respective centers). Please see item No.7.
2. The promising entries, JF-192 from Jagudan center, HF-33 from Hisar center and UF-143 from CVT 1994/1997 - Series III may be proposed for release by Jobner center (**Action:** Jobner center).
3. CVT 2001 - Series IV and Initial evaluation trials in fennel may be continued at all the centers (**Action:** Respective centers).

#### **I. Fenugreek**

1. CVT 1995 - Series III & CVT 1999 - Series IV may be concluded at all the centers. Series V will continue (**Action:** Respective centers).
2. The promising entries of CVT 1999 - Series IV, HM-346 from Hisar, UM-305 from Jobner, JF-210 and 204 from Jagudan may be proposed for release (**Action:** Jagudan center).
3. The incidence of powdery mildew in CVT 2001- Series V may be recorded at Coimbatore center (**Action:** Coimbatore center).
4. The promising entries identified from Jobner center namely RTP-4, 8 & 9 from the initial evaluation trial may be included in the CVT (**Action:** Jobner center).
5. Quality analysis with special emphasis on 'disogenin' content in fenugreek may be carried out by all the centers for this, each center should supply 250 g of seed samples per entry to Coimbatore center (**Action:** Respective centers).
6. Under the trial, FGK/CI/2.1 Evolving varieties resistant to powdery mildew, Kumarganj center may be included (**Action:** Kumarganj center).



6. Recommendations ready for transfer to extension agency, if any: Nil  
7. New Programmes proposed:

**A. Cardamom**

**CAR/CI/2.2 Hybridization in cardamom**

*Center identified:* Mudigere

*Technical details:*

Design : RBD  
Plot size : 16 plants/plot  
Replication : 3

*Entries:*

Mudigere - 1  
Mudigere - 2  
Green Gold  
HS - 1  
CL - 726

Observations to be recorded:

- Growth, yield and quality parameters

**CAR/CI/3.5 Coordinated Varietal Trial – 2004**

*Centers identified:* Myladumpara (ICRI), Pampadumpara, Mudigere, Thadiyankudisai (ICRI) and Sakleshpur (ICRI)

*Technical details:*

Design : RBD  
Plot size : 18 plant/plot  
Replication : 3

*Entries:*

Myladumpara - MCC - 73, MCC - 246, MCC - 309  
MHC - 26  
Mudigere - CL-722  
Pampadumpara - PS-27  
National check -

Each center is requested to obtain the planting materials of other entries from the respective centers and start the trial (**Action:** All the centers mentioned above).



Observations to be recorded:

- Growth, yield and quality parameters

## B. Turmeric

### TUR/CI/2.3 Coordinated Varietal Trial – 2004

*Centers identified:* Coimbatore, Raigarh, Pundibari, Kumarganj,  
Pottangi, Chintapalle, Jagtial

#### *Technical details:*

Design : RBD  
Plot size : 3 x 1 m bed  
Replication : 3

#### *Entries:*

Coimbatore	CL-101 CL-147
Raigarh	IT-1, IT-2 & IT-3
Pundibari	TCP-82, TCP-56 & TCP-11
Kumarganj	NDH -9
Pottangi	PTS-34 PTS-39
National check	IISR-Prabha (Acc.No.360)

Each center is requested to obtain the planting materials of other entries from the respective centers and start the trial (**Action:** All the centers mentioned above).

Observations to be recorded:

- Growth, yield and quality parameters

## C. Coriander

### COR/CI/2.5 CVT - Production of leafy type coriander during off season

*Centers identified:* Coimbatore, Hisar, Guntur, Ajmer, Hisar

#### *Technical details:*

Design : RBD  
Sowing time : 1<sup>st</sup> week of March  
Plot size : 4.0 m X 2.7 m  
Replication : 3



**Entries:**

Coimbatore	CO <sub>2</sub> , CO <sub>4</sub>
Hisar	DH-202, DH- 228
Guntur	LCC-232, LCC-234
NRCSS, Ajmer	ACr-250, ACr-256
Hisar	National check- Pant Haritma

Each center is requested to obtain the planting materials of other entries from the respective centers and start the trial (**Action:** All the centers mentioned above).

- 150 g seed samples of each entry should be sent to other centers by the concern center
- 150 g seed samples of Pant Haritma may be supplied to all the centers by Hisar center (**Action:** Hisar center)

**Observations to be recorded:**

- No. of days taken for germination
- No. of days taken for first harvest
- No. of pickings during the crop period
- No. of compound leaves
- Yield (kg/plot)

Each center may also maintain one row of each entry as a ratoon crop under observational trial. The following observations have to be recorded:

- No. of days taken for first harvest
- Yield (kg/plot)

**Note:** Each center can explore the possibilities of providing suitable natural/artificial shade for obtaining maximum leaf production





#### D. Fennel

##### FNL/CI/3.3 Coordinated Varietal Trial – 2004

*Centers identified:* Kumarganj, Jobner, Jagudan, Hisar, Dholi

*Technical details:*

Design	:	RBD
Sowing time	:	Rabi 2004
Plot size	:	4.0 x 2.5 m
Replications	:	3

*Entries:*

Kumarganj	NDH-12
Jobner	UF-205, UF-206 & UF-207
Jagudan	JF-421 JF-444-1
Hisar	HF-118, HF-125
National check(s)	RF-101, GF-2

Each center is requested to obtain the planting materials of other entries from the respective centers and start the trial (**Action:** All the centers mentioned above).

Observations to be recorded:

- Growth, yield and quality parameters

All the centers should include National check(s) & Local check(s) for each CVT.

#### 8. General decisions, if any:

1. Entry without having the data on quality parameters may not be promoted to CVT (**Action:** All centers).
2. HM-346-was already proposed for release in the last AICRP Workshop (2001, Trichur) (**Action:** Hisar center).
3. Technical programme with recommendations to test the newly introduced lines/varieties should also be given in the proceedings (**Action:** PC).
4. Releasing varieties only on yield is becoming subjective matter. Hence economic traits/quality (chemical constituents) & disease resistance/ tolerance etc should be given importance (**Action:** All centers).



5. Committee consists of Directors IISR & NRC on Seed Spices), ADG (PC) & Project Coordinator may scrutinize the projects & suggest uniform testing of lines (Action: PC).
6. Uniformity in plant population, management, date of planting etc have to be followed (Action: All centers).
7. In all annual crops, only CVT & IET have to be conducted & close all series I, II, III IV barring V (Action: PC).
8. In seed spices, 250 g of seed samples for each entry may be sent for quality analysis to Jobner (coriander, cumin and fennel) and Coimbatore (fenugreek) (Action: All centers).
9. Proposals for identification of varieties under AICRPS may be considered, only if specific characters (yield, quality etc.) are available. The proposals for the same may be submitted at least 2 months in advance to PC (Action: All centers.)
10. In view of continuance of CVT Series V in cumin, coriander and fenugreek, a new CVT would commence from next year (Action: All the centers concerned). But new CVT on fennel would be initiated this year (Action: Concern centers). Please see item No. 7 of this session.
11. Characterization and documentation of seed spices may be done before June 2005. The descriptor developed by NRCSS, Ajmer may be followed (Action: All centers)
12. Good quality photographs and details of the released varieties in seed spices should be provided to PC along with CD for making an album (Action: All centers).
13. For conducting CVT trials in seed spices, 100 g of seed samples for each entry should be distributed among the centers (Action: All centers).
14. For conducting CVT trials in seed spices, the following uniform plot size should be adopted (Action: All centers).



<u>Crop</u>	<u>Plot size</u>
Coriander	4.0 x 2.4 m
Cumin	4.0 x 2.4 m
Fennel	4.0 x 2.5 m
Fenugreek	4.0 x 2.4 m

15. Jagudan center may use 'JCr' as code for assigning accession numbers in coriander (Action: Jagudan center).



### Technical Session III

### CROP PRODUCTION

Chairman : Dr. B. B. Vashishtha Co-Chairperson : Dr. B. Chempakam  
Rapporteurs : Dr. C. K. Thankamani  
Dr. S. Subramanian

1. No. of papers presented : 58
  2. Names of the centers where work was done : Panniyur, Sirsi, Chintapalle, Ambalavayal, Pampadumpara, Yercaud, Pechiparai, Dapoli, Pundibari, Mudigere, Dholi, Myladumpara, Kumarganj, Solan, Pottangi, Coimbatore, Raigarh, Jobner, Guntur & Jagudan
  3. Non-performing centers if any : Nil
  4. Brief description of the work done and salient results reported (crop-wise) : The centers presented the reports.
  5. Recommendations/decisions (crop-wise) :
- A. Black pepper**
1. Trial on irrigation (PEP/CM/1.1) at Sirsi and Panniyur centers may be closed and the final report should be submitted to PC (Action: Sirsi and Panniyur centers).
  2. The title of PEP/CM/2.1 may be changed as "Effect of biofertilizer, *Azospirillum* on the yield of black pepper" (Action: All centers).
  3. The title of PEP/CM/2.2 may be changed as "Effect of biofertilizer, P-solubilizer on the yield of black pepper" (Action: All centers).
  4. In the experiments PEP/CM/2.1 and PEP/CM/2.2, soil nutrient analysis has to be done before starting the experiment and also after harvest of the crop. Leaf analysis has to be done after the harvest of the crop (Action: All centers).
  5. Rapid multiplication trial (PEP/CM/3.1) may be closed at Dapoli center and final report should be submitted to PC (Action: Dapoli center).



## B. Cardamom

1. Organic carbon, available nitrogen, population of microorganisms may be monitored in the experiments CAR/CM/1.4 & CAR/CM/1.5 (**Action:** All centers).
2. Yield attributing parameters to be recorded are to be specified. (**Action:** PC and All Centers).
3. The titles of CAR/CM/1.4 may be changed as "Effect of biofertilizer, *Azospirillum* on yield of cardamom" and CAR/CM/1.5 as "Effect of biofertilizer, P-solubilizer on cardamom" (**Action:** All centers).
4. Treatments decided in the workshop for all the experiments should be strictly followed (**Action:** All centers),.

## C. Ginger

1. GIN/CM/1.1 "Efficacy of biofertilizer using *Azospirillum* on ginger" at Solan may be concluded and the final report to be submitted to PC (**Action:** Solan center).
2. Quality analysis of ginger of different treatments under the projects GIN/CM/1.1 & GIN/CM/1.2 is to be done with the help of Solan center (**Action:** All centers).
3. Under organic farming (GIN/CM/1.2), the quality analysis is to be done and final report to be submitted to Project Coordinator (**Action:** Solan and Pottangi centers).

## D. Turmeric

1. The experiments (TUR/CM/1.1 and TUR/CM/1.2) under nutrient management trial are to be continued (**Action:** All centers).
2. Data on quality analysis under the trial TUR/CM/1.1, has to be completed and the final report should be sent to Project Coordinator (**Action:** All centers).
3. Under organic farming (TUR/CM/1.2), quality parameters are to be analyzed (**Action:** All centers).
4. The title of the project TUR/CM/1.1 may be changed as "Effect of biofertilizer, *Azospirillum* on turmeric" (**Action:** Respective centers).



## E. Tree spices

1. The project on cinnamon, TSP/CM/1.1 may be concluded and the final report may be sent to the Project Coordinator (**Action:** Pechiparai center).
2. Rootstocks, other than jamum may be tried for grafting in clove. Best season for softwood grafting may be found out. The trial on nutmeg TSP/CM/1.1 has to be concluded and approach grafting may be tried in clove in consultation with Shri B. Krishnamoorthy and Dr. J. Rema, IISR, Calicut (**Action:** Dapoli center).

## F. Coriander

1. Nutrient management trial on coriander (COR/CM/1.1) may be closed and new project may be taken up after carrying out quality analysis with the help of Jobner center (**Action:** Kumarganj center).
2. Project under biofertilizer (COR/CM/1.2) may be concluded after completing quality analysis (**Action:** Jobner center).
3. Under biofertilizer experiment (COR/CM/1.2) samples may be sent to Jobner for quality analysis and the project may be continued by including *Azospirillum* as seed treatment @ 1.5 kg/ha (**Action:** Kumarganj center). The treatments should be as given below:

### Coriander - COR/CM/1.2

Design: : RBD

Treatments : 10

Replication : 3

#### *Treatment :*

T1 - Inorganic N (100%) + *Azospirillum* + 5 t/ha FYM

T2 - Inorganic N (75%) + *Azospirillum* + 5 t/ha FYM

T3 - Inorganic N (50%) + *Azospirillum* + 5 t/ha FYM

T4 - FYM (5 t/ha)

T5 - FYM (5 t/ha) alone

T6 - FYM (10 t/ha) + *Azospirillum*

T7 - FYM (10 t/ha) alone



T8 - 100% Inorganic N

T9 - *Azospirillum* @ 1.5 kg/ha alone

T10- Absolute control

Note: FYM levels will be 5 t/ha and 10 t/ha. *Azospirillum* @ 1.5 kg/ha as seed treatment

4. Coimbatore center has to do quality analysis and the project COR/CM/1.2 will continue (**Action:** Coimbatore center).

#### G. Cumin

1. Under nutrient management trial (CUM/CM/1.1), quality parameters have to be analyzed with the help of Jobner center (**Action:** Jagudan center)

#### H. Fennel

1. The treatments in the trial, FNL/CM/1.2 are to be as follows as that of other centers (**Action:** Jobner and Kumarganj centers).

##### Fennel - FNL/CM/1.2

Design : RBD

Treatments : 10

Replication : 3

##### *Treatments:*

T1 - Inorganic N (100%) + *Azospirillum* + 5 t/ha FYM

T2 - Inorganic N (75%) + *Azospirillum* + 5 t/ha FYM

T3 - Inorganic N (50%) + *Azospirillum* + 5 t/ha FYM

T4 - FYM (5 t/ha)

T5 - FYM (5 t/ha) alone

T6 - FYM (10 t/ha) + *Azospirillum*

T7 - FYM (10 t/ha) alone

T8 - 100% Inorganic N

T9 - *Azospirillum* @ 1.5 kg/ha alone

T10 - Absolute control

Note: FYM levels will be 5 t/ha and 10 t/ha. *Azospirillum* @ 1.5 kg/ha as seed treatment



## I. Fenugreek

1. Quality analysis may be done with the help of Coimbatore center (Action: All centers).
2. The trial FGK/CM/2.2 was not properly laid out with the proposed treatments at Kumarganj center. The treatments should be as given below (Action: Kumarganj center).

### Fenugreek - FGK/CM/2.2

Design: : RBD

Treatments : 10

Replication : 3

#### Treatments:

T1-Inorganic N (100%) + *Azospirillum* + 5 t/ha FYM

T2-Inorganic N (75%) + *Azospirillum* + 5 t/ha FYM

T3-Inorganic N (50%) + *Azospirillum* + 5 t/ha FYM

T4-FYM (5 t/ha)

T5-FYM (5 t/ha) alone

T6-FYM (10 t/ha) + *Azospirillum*

T7 - FYM (10 t/ha) alone

T8 - 100% Inorganic N

T9 - *Azospirillum* @ 1.5 kg/ha alone

T10- Absolute control

Note: FYM levels will be 5 t/ha & 10t/ha  
*Azospirillum* @ 1.5 kg/ha as seed treatment

3. The title of the trial FGK/CM/2.2 may be changed as "Effect of *Azospirillum* and *Rhizobium* on fenugreek" (Action: Respective centers).
4. Quality analysis in the trial, FGK/CM/2.2 may also be done (Action: Coimbatore center).
6. Recommendations ready for transfer to: Nil





7. New programmes proposed:

**A. Black pepper:**

**PEP/CM/2.4 Development of organic package for spices based cropping system – Observational trial**

*Centers identified:* Dapoli, Sirsi, Chintapalle and Panniyur

*Treatments:*

1. With organic package of practices including
  - (a) Cover/green manure crops suitable to the location/areas  
- Grow it in the interspace and incorporate in the black pepper basin
  - (b) On-farm composting with locally available organic residues/sources
  - (c) Biocontrol agents and botanical pesticides and natural enemies for controlling major pests and diseases

2. Recommended package of practices

Observations to be recorded:

- (i) Growth, yield and quality parameters of spice crops and other crops in the system
- (ii) Cost benefit ratio of cropping system
- (iii) Nutrient status of the soil (major & micro nutrients) before imposing treatments and after harvest
- (iv) Weather parameters (temperature, relative humidity, light intensity, sunshine hours etc.) may be recorded daily and given in standard weeks



## B. Ginger:

### GIN/CM/1.4 Effect of micronutrients on ginger

*Centers identified:* Dholi, Pottangi, Raigarh, Kumarganj, Pundibari and Solan

#### *Technical details:*

Design	: F-RBD
Plot size	: 3.0 x 1.0 m
Replications	: 3
Factors	: 3 (Zinc sulphate, Borax, Ferrous sulphate)
Levels	: 3 levels each [Zinc sulphate – 0, 25 kg/ha, 0.5% foliar sprays (60 & 90 DAP); Borax – 0, 10 kg/ha, 0.2% foliar sprays (60 & 90 DAP); Ferrous sulphate – 0, 10, 1.0% foliar sprays (60 & 90 DAP)]

#### *Treatments:*

<u>Factors</u>		<u>Levels</u>
1. Zinc sulphate	-	0 kg/ha 25 kg/ha 0.5% foliar sprays (60 & 90 DAP)
2. Borax	-	0 kg/ha 10 kg/ha 0.2% foliar sprays (60 & 90 DAP)
3. Ferrous sulphate	-	0 kg/ha 10 kg/ha 1.0% foliar sprays (60 & 90 DAP)

#### Observations to be recorded:

- Growth, yield and quality parameters
- Nutrient status of soil (major and micro nutrients) before planting and after harvesting



**C. Coriander:**

**COR/CM/1.3 Effect of bio-regulators on coriander**

*Centers identified:* Dholi, Coimbatore, Guntur, Jobner, Hisar,  
Jagudan and Kumarganj

*Technical details:*

- Design : F-RBD  
Plot size : 4.0 x 2.7 m<sup>2</sup>  
Replications : 3  
Factors : 4 (Triacontanol - 0.5 ml/liter, 1.0 ml/liter, NAA –  
50 ppm, Water spray)  
Levels : 3 levels each (one spray – 40 DAS, two sprays - 40 and 60  
DAS, three sprays – 40, 60 and 80 DAS)

*Treatments :*

<u>Factors</u>	<u>Levels</u>
1. Triacontanol - 0.5 ml/liter -	One spray - 40 DAS Two sprays - 40 and 60 DAS Three sprays - 40, 60 and 80 DAS
2. Triacontanol - 1.0 ml/liter -	One spray - 40 DAS, Two sprays - 40 and 60 DAS Three sprays - 40, 60 and 80 DAS
3. NAA – 50 ppm -	One spray - 40 DAS Two sprays - 40 and 60 DAS Three sprays - 40, 60 and 80 DAS
4. Water spray -	One spray - 40 DAS Two sprays - 40 and 60 DAS Three sprays - 40, 60 and 80 DAS

Absolute control (no water spray)

Observations to be recorded:

- Growth, yield and quality parameters



#### **COR/CM/1.4 Identification of drought/alkalinity tolerance source in coriander**

*Centers identified* : Coimbatore, Guntur and NRCSS

*Materials to be screened*: Existing germplasm

##### **1. Drought tolerance**

Observations to be recorded:

- (i) Seed germination (%)
- (ii) Root & shoot ratio
- (iii) Branching pattern at monthly interval
- (iv) Height of the plant at maturity
- (v) Total biomass
- (vi) Yield (kg/plot)

##### **2. Alkalinity tolerance - Observational trial**

*Center identified*: Kumarganj

The parameters standardized for other crops (vegetables) may be utilized for identifying the alkalinity tolerant sources in seed spices. The Scientist at Kumarganj may formulate the programme in consultation with experts available in the university and intimate the same to Project Co-coordinator (**Action**: Kumarganj center)

#### **D. Cumin**

##### **CUM/CM/1.2 Identification of drought tolerance source in cumin**

*Center identified*: NRCSS

*Materials to be screened*: Existing germplasm

Observations to be recorded:

- (i) Seed germination (%)
- (ii) Root & shoot ratio
- (iii) Branching pattern at monthly interval
- (iv) Height of the plant at maturity
- (v) Total biomass



(vi) Yield (kg/plot)

## E. Fennel

### **FNL/CM/1.3 Identification of drought/alkalinity tolerance source in fennel**

*Centers identified:* NRCSS, Ajmer

*Materials to be screened:* Existing germplasm

Observations to be recorded:

- (i) Seed germination (%)
- (ii) Root & shoot ratio
- (iii) Branching pattern at monthly interval
- (iv) Height of the plant at maturity
- (v) Total biomass
- (vi) Yield (kg/plot)

## 2. Alkalinity tolerance - Observational trial

*Center identified:* Kumarganj

The parameters standardized for other crops (vegetables) may be utilized for identifying the alkalinity tolerant sources in seed spices. The Scientist at Kumarganj may formulate the programme in consultation with experts available in the university and intimate the same to Project Co-coordinator (**Action:** Kumarganj center).

## F. Fenugreek

### **FGK/CM/2.3 Identification of drought tolerance source in fenugreek**

*Centers identified:* Coimbatore, Guntur and NRCSS

*Materials to be screened:* Existing germplasm

Observations to be recorded:

- (ii) Seed germination (%)
- (ii) Root & shoot ratio
- (iii) Branching pattern at monthly interval
- (iv) Height of the plant at maturity
- (v) Total biomass
- (vi) Yield (kg/plot)



8. General decisions, if any:

1. All the trials conducted under crop production should also generate data on quality analysis (**Action:** All centers).
2. Nutrient status of soil before conducting experiment and after harvest and leaf analysis after harvest should be carried out in all the trials under crop production (**Action:** All centers).
3. Meteorological data should also be recorded (in standard weeks). The following weather parameters have to be recorded (**Action:** All centers).

Temperature (maximum & minimum)

Relative humidity (morning & evening)

Sunshine hours

Rainfall (mm)

Rainy days

Wind speed (km/ph)

Evaporation (mm)

4. As the experiments on efficacy of biofertilizer completed 2/3-4 years in seed spices, new experiment shall be formulated (**Action:** PC). Please see item No.7.
5. As there is no Agronomist in position at Jagudan center, nutritional trial on cumin may be kept under abeyance (**Action:** Jagudan center).
6. The title of the technical session - 'Crop Management' may be changed as "Crop Production" (**Action:** PC).
7. All programmes under crop management have to be recasted by a committee consisting of Director, NRC Seed Spices, PC & experts. (**Action:** PC). Please see item No. 7.
8. More orientation on spices based cropping system research has to given. (**Action:** PC).
9. For agronomic and fertilizer trials in seed spices, uniform plot size of 4.0 x 2.7 m may be adopted (**Action:** All centers).
10. A document on the data generated by the Hisar and Jagudan centers on salinity, water and weed management may be supplied to the Project Co-ordinator (**Action:** Hisar and Jagudan centers.)



## Technical Session IV

## CROP PROTECTION

Chairman : Dr. M. Anandaraj Co-Chairman : Dr. B. Gopakumar

Rapporteurs : Dr. A. Kumar  
Dr. G. Sivakumar

1. No. of papers presented : 59
2. Names of the centers where work was done : Pampadumpara, Panniyur, Chintapalle, Ambalavayal, Sirsi, Mudigere, Pundibari, Kumarganj, Raigarh, Pottangi, Solan, Jagtial, Coimbatore, Yercaud/Pechiparai, Jobner and Jagudan
3. Non-performing centers if any : Nil
4. Brief description of the work done and salient results reported (crop-wise) : The centers presented the reports
5. Recommendations/decisions (crop-wise) :

### A. Black pepper

1. The title of the project PEP/CP/1.2: Biological control of *Phytophthora* foot rot of black pepper - nursery trial is changed as "Management of *Phytophthora* disease in black pepper nursery" (Action: Pampadumpara, Chintapalle and Ambalavayal centers).
2. Technical programme of the above trail as per the recommendation in XV Workshop (1999) has to be followed strictly in conducting the trial. The details are given below (Action: All centers).

#### Treatments:

- T<sub>1</sub>- Planting in solarized soil
- T<sub>2</sub>- Planting in non solarized soil
- T<sub>3</sub>- Planting in solarized soil fortified with *Trichoderma harzianum* @ 1 g kg<sup>-1</sup> soil and VAM inoculum @ 100 cc kg<sup>-1</sup> soil.
- T<sub>4</sub>- Planting in non solarized soil fortified with *Trichoderma harzianum* @ 1 g kg<sup>-1</sup> soil and VAM inoculum @ 100 cc kg<sup>-1</sup> soil.



- T<sub>5</sub>. Planting in solarized soil + Ridomil spray and drench (1.25 g l<sup>-1</sup> of Ridomil MZ 72 WP)
- T<sub>6</sub>. Planting in non solarized soil + Ridomil spray and drench (1.25 gl<sup>-1</sup> of Ridomil MZ 72 WP)
- T<sub>7</sub>. Planting in solarized soil + Bordeaux mixture 1% spray and Copper Oxychloride 0.2% (COC) drench.
- T<sub>8</sub>. Planting in non-solarized soil + Bordeaux mixture 1% spray and Copper Oxychloride 0.2% (COC) drench.
- ◆ Plant protection chemicals have to be applied two times, the first one at 50% of the cutting sprouted and second application 20 days after first application.
  - ◆ The experiment has to be conducted in polybags (15 x 20 cm size).
  - ◆ Use 3 node cuttings for planting in the poly bags.
  - ◆ Plant 4 cuttings in each poly bag.
  - ◆ For each treatment a minimum of 200 polybags having 4 cuttings each have to be maintained. Thus there will be a total of 1600 polybags (8 x 200) for the experiment.

*The following observations have to be recorded for each treatment:*

- a. Number of cuttings sprouted.
- b. Number of cuttings infested with the diseases at monthly intervals.
- c. Mortality of the cuttings due to disease at monthly interval.
- d. Length of the sprout at the time concluding the experiment (3-4 months duration).
- e. Number of leaves/cutting at the time of concluding the experiment (3-4 months duration).
- f. Number of roots/cutting at the time of concluding the experiments (3-4 months duration).
- g. Biomass of 25 cuttings selected randomly for each treatment (do not include the weight of original cutting planted in the bags. Take the weight of the sprouts and roots only).

The experiment can be concluded in 3-4 months after planting the cuttings. Avoid water drippings to fall on the cuttings in the nursery shed during rainy season.

3. The experiment PEP/CP/1.4 Control of *Phytophthora* disease in black pepper in farmers field – observational trial will continue. The details of observations to be recorded are given below (Action: All centers).  
Observations to be recorded:





(i) Foliar infection

- ◆ Record foliar infection by *P. capsici*: Select 3 areas (0.5 sq.m) randomly in the canopy, preferably each at lower level, middle level and upper level of the canopy and record number of leaves present and number of leaves infected by the disease and present as percent leaves infested by the disease.
- ◆ Defoliation: Defoliation index can be given using the following scale on visual observation.

<u>Index</u>	<u>Defoliation</u>
0	Nil
1	Up to 25%
2	25% to 50%
3	> 50%

- ◆ Number of vines died due to collar infection of the disease
- ◆ Foliar yellowing. Foliar yellowing index can be given using the following scale on visual observation.

<u>Index</u>	<u>Yellowing</u>
0	Nil
1	Up to 25%
2	25% to 50%
3	> 50%

- ◆ Observations-on defoliation and yellowing are to be recorded at
  - a. With the onset of monsoon (May/June)
  - b. During peak monsoon.(July/August)
  - c. Post monsoon (December/January)
- ◆ Yield (fresh and dry)
- ◆ Residue analysis of Metalaxyl Gold MZ 68 in berries and soil (Procedures for collection of berries and soil were communicated)



## B. Cardamom

1. The trial CAR/CP/2.1 Evaluation of plant based insecticides for the control of thrips and fruit borers in cardamom was conducted for 3 years at Mudigere center and the results indicated that none of the plant based insecticides was effective in controlling either thrips or fruit borers. Hence it was suggested to conclude the trial and the final report should be submitted to PC (**Action:** Mudigere center).
2. The trial CAR/CP/2.2 Management of root grub of cardamom will continue for one more year (**Action:** Pampadumpara center).
3. Infestation due to shoot fly in cardomom may be initiated as an observational trial at Mudigere and other centers this year (**Action:** Mudigere and other centers).
4. Predators/parasites/entomopathogens recorded on cardamom have to be identified and documented under the project CAR/CP/2.3 Bioecology of natural enemies of major pests of cardamom. Culturing and evaluation of potential biocontrol agents under laboratory conditions (initial screening) should be initiated (**Action:** Pampadumpara center).
5. The project CAR/CP/2.3 Bioecology of natural enemies of major pests of cardamom should be initiated immediately at Mudigere center (**Action:** Mudigere center).
6. The trial CAR/CP/2.4 Estimation of quantitative and qualitative losses due to thrips damage has to be initiated and the following procedure has to be followed (**Action:** Pampadumpara and Mudigere centers).
  - The harvested and dried capsules may be grouped into four categories based on the extent of surface area scabbed (0=no damage, 1=upto 10% scabbed area, 2=11 to 33% scabbed area and 3=>33% scabbed area).
  - For quality analysis, 100 g dried samples (capsules) each affected by thrips and unaffected (control) may be sent to IISR, Calicut.

## C. Ginger

1. The trial GIN/CP/1.1 Integrated management on rhizome rot of ginger may be modified as Disease surveillance and etiology of rhizome rot in ginger. The trial will continue for one more year (**Action:** Pundibari, Solan, Dholi centers).
2. The trial GIN/CP/1.2 Biocontrol studies on rhizome rot of ginger will continue (**Action:** Pottangi, Dholi, Kumarganj, Raigarh and Ambalavayal centers).



3. The trial GIN/CP/1.4 Integrated management of *Pythium*, *Fusarium*, and *Ralstonia* of ginger was formulated in the XVI Workshop and allotted to Solan, Dholi and Pundibari centers. However, none of the centers initiated the trial. This has to be taken up this year at all these centers including Raigarh and Kumarganj centers. The following technical programme has to be followed (Action: Solan, Dholi, Pundibari, Raigarh and Kumarganj centers).

*Treatments (seed treatments):*

- T<sub>1</sub>- Mancozeb (0.3%)  
T<sub>2</sub>- *T. harzianum* (250 g formulation in 10 litres of water for 10 kg seed rhizomes)  
T<sub>3</sub>- Rhizome solarization (solarization of rhizomes packed in polythene bags, 1 kg seed rhizomes in a polythene bag size 30 x 45 cm for 2 h (9 to 11 AM) before sowing)  
T<sub>4</sub>- Ridomil mancozeb (100 ppm of metalaxyl)  
T<sub>5</sub>- Hot water treatment (51°C for 30 minutes)  
T<sub>6</sub>- Control

Replications: 4

Note: The treatment of seed rhizomes with aerated steam originally proposed is deleted as the equipment for this is not available at many centers. Instead, Ridomil mancozeb (100 ppm of metalaxyl) is included.

General instructions:

- a. Apply *T. harzianum* (50 g) + neem cake 250 g/bed (3 x 1 m) in the planting pit.  
b. As soon as symptoms of disease appear, remove and destroy the affected plants and adopt appropriate control measures depending on the disease as given below:

*Pythium*- Mancozeb (0.3%) as drench  
*Fusarium*- Carbendazim (0.1%) as drench  
*Ralstonia*- Bleaching powder if moisture is there in the soil.

Observations to be recorded:

- (i) Sprouting of rhizomes  
(ii) Disease incidence  
(iii) Yield

Duration : 3 seasons



#### D. Turmeric

1. The trial TUR/CP/1.1: Survey and identification of disease causing organisms in turmeric and screening germplasm against diseases will continue at all the centers identified (Action: Coimbatore, Jagtial, Dholi, Pundibari and Raigarh centers). High priority will be given for survey and identification of casual organisms at Raigarh center (Action: Raigarh center).
2. The trial TUR/CP/1.3 : Effect of seed treatment on leaf spot and leaf blotch diseases of turmeric may be closed and final report submitted to PC (Action: Kumarganj, Pundibari and Raigarh centers).
3. The trial TUR/CP/1.4 : Investigations on casual organism of rhizome rot of turmeric and screening of biocontrol agents for the management will be conducted at all the centers identified and Pottangi, Raigarh, Kumarganj, Dholi and IISR- Calicut (collaborative center) will also take up this trial (Action: Coimbatore, Jagtial, Pundibari Pottangi, Raigarh, Kumarganj, Dholi and IISR-Calicut). Collection, identification of casual organisms of rhizome rot disease and their role in the rhizome rot complex of turmeric will be studied at IISR-Calicut (collaborating center) (Action: All respective centers).

#### E. Tree spices

1. The diseases recorded and their casual organisms documented under TSP/CP/1.1 Survey for disease incidence in tree spices should be published (Action: Dapoli center).  
Trial for the management of major diseases should be initiated (Action: Dapoli center).
2. The center may take the help of a pathologist from the University for survey and identification of diseases under TSP/CP/1.1 (Action: Yercaud/Pechiparai center).

#### F. Coriander

1. The trial COR/CP/1.2 Management of wilt and powdery mildew diseases in coriander will be closed and final report submitted to PC before 30 August 2004 (Action: Kumarganj and Coimbatore centers).
2. New trials may be formulated in the proposed group meeting to be held at NRC for Seed spices, Ajmer (Rajasthan) (Action: PC). A new trial is formulated. Please see item No. 7.



### G. Cumin

1. The trial CUM/CP/2.1 Integrated management of pests and diseases of cumin will be closed and final report submitted to PC (Action: Jobner and Jagudan centers)..
2. New trial may be formulated in the proposed group meeting to be held at NRC for Seed spices, Ajmer (Action: PC). A new trial is formulated. Please see item 7 of this session.

### H. Fennel.

1. New research programmes may be formulated in the proposed group meeting to be held at NRC for Seed Spices, Ajmer (Action: PC). New proposals were not received from the centers.
2. Sugary secretion in fennel to be taken as an observational trial to investigate the causes (Action: Jagudan center).

### I. Fenugreek

1. This trial FGK/CP/1.1 Biocontrol of root rot in fenugreek will be closed and final report to be submitted to PC (Action: Coimbatore center).
  2. New trials may be formulated in the proposed group meeting to be held at NRC for Seed spices, Ajmer (Action: PC). New proposals were not received from the centers.
6. Recommendations ready for transfer to agency: Nil
7. New programmes proposed:

### A. Black Pepper

**PEP/CP/2.3 : Management of scale-insects of black pepper with organic products**

*Centers identified:* Pampadumpara, Mudigere

Design : RBD  
No. of treatments : 5  
No. of replication : 4  
Plot size : Minimum of 10 vines



*Treatments (spray):*

- T<sub>1</sub> Neem oil 0.5%
- T<sub>2</sub> Commercial neem product 0.5%
- T<sub>3</sub> Fish oil rosin 3%
- T<sub>4</sub> Monocrotophos 0.05%
- T<sub>5</sub> Control

Schedule of spraying: T<sub>1</sub>-T<sub>3</sub>: Four sprays at 15 day intervals from the onset of pest infestation

T<sub>4</sub>: Two sprays at 21 day intervals from the onset of pest infestation.

Observations to be recorded:

Pré-treatment : Population of scales in 1 cm<sup>2</sup> area at 3 regions per leaf (and) 2.5 cm long twig

Post treatment : Population of scales to be recorded as above after 2<sup>nd</sup> and 4<sup>th</sup> spray in case of T<sub>1</sub>, T<sub>3</sub> and after 1<sup>st</sup> and 2<sup>nd</sup> spray in case of T<sub>4</sub>.

**B. Cardamom**

**CAR/CP/2.2 Management of root grub of cardamom**

*Centers identified:* Sakleshpur (ICRI) and Myladumpara (ICRI)

*Treatments:*

- T<sub>1</sub> Chlorpyrifos (0.05%)
- T<sub>2</sub> Chlorpyrifos (0.075%)
- T<sub>3</sub> Carbofuran 3 G 100g/plant (instead of phorate 10 G - 40g/plant)
- T<sub>4</sub> Carbofuran 3 G 150g/plant (instead of phorate 10 G - 40g/plant)
- T<sub>5</sub> Inidacloprid (Confidor) 0.5 ml/l
- T<sub>6</sub> Inidacloprid 0.75 ml/l
- T<sub>7</sub> Control

Replications: 3

Time of application: April-May-September-October



## C. Ginger

### GIN/CP/1.5 Survey and monitoring of diseases in ginger

*Centers identified:* Pottangi, Pundibari, Solan, Kumarganj, Raigarh, Dholi and IISR, Calicut (as a collaborating center)

Observations to be recorded :

- (i) Diseases occurring in storage
- (ii) Diseases occurring at different phases of crops growth in the field.
- (iii) Isolation and identification of casual organisms and study their interaction in the rhizome rot complex of ginger (IISR, Calicut will collaborate in this programme).

## D. Coriander

### COR/CP/1.3 Management of powdery mildew and stem gall in coriander

*Centers identified:* Jagudan, Jobner, Coimbatore, Dholi, Raigarh and Kumarganj

*Technical details:*

Design	:	RBD
No. of treatments	:	7
No. of replications	:	3
Plot size	:	4.0 m X 2.7 m

*Treatments :*

1. Soil solarization + Soil application of *Trichoderma* (1 kg/plot) + spray with Tridemorph (calixin) 0.1% after 60 days of sowing.
2. Seed treatment with *Pseudomonas fluorescens* (*P.f.*) (IISR-6) + Spray with *Pseudomonas fluorescens* (IISR-6)  $10^8$  cfu after 60 days.
3. Soil application of *Bacillus subtilis* (*B.s.*)  $10^8$  cfu + spray with *B.s.* after 60 days.
4. Seed treatment, soil drench Tridemorph (calixin) 0.1% + Spray with calixin 0.1% after 60 days.
5. Carbendazim (Bavistin) as soil drench and spray (0.1%)
6. Spray with wettable sulphur (0.2%)
7. Control



## E. Cumin

### CUM/CP/ 1.3 Management of wilt and blight in cumin

Centers identified : Jobner and Jagudan

Technical Programme :

Design	:	RBD
No. of treatments:	:	10
Replication	:	3
Plot Size	:	4.0 X 2.7 m

Treatments :

- (i) Soil solarization + Soil application of *Trichoderma* + FYM (5 t/ha) + Spray with Mancozeb 0.25% (60 DAS)
- (ii) *Trichoderma* + FYM + Spray with Mancozeb 0.25% (60 DAS)
- (iii) Vermicompost (2 t/ha) + *Trichoderma* + Spray with Mancozeb 0.25% (60 DAS)
- (iv) Neem cake (2 t/ha) + *Trichoderma* + spray with Mancozeb 0.25% (60 DAS)
- (v) Soil drench with Carbendazim 0.1% + spray with Mancozeb 0.25% (60 DAS)
- (vi) *Pseudomonas fluorescens* (IISR-6)  $10^8$  cfu as seed treatment and spray (60 DAS)
- (vii) *Bacillus subtilis* as soil application and foliar spray (60 DAS)
- (viii) *Pseudomonas fluorescens* + *Trichoderma* as soil application + *P.f.* (IISR-6)  $10^8$  cfu as spray (60 DAS)
- (ix) *B.s.* + *Trichoderma* as soil application + *P.f.* (IISR -6)  $10^8$  cfu as spray (60 DAS)
- (x) Control

Note: *Trichoderma*  $10^8$  cfu @ 1 kg/plot

Mancozeb @ 0.25%

*Bacillus subtilis* @ 1kg formulation/plot

*P.f.* (IISR - 6) @  $10^8$  (1 litre/10 sq.m)

DAS - Days after sowing

#### 8. General decisions, if any:

1. Weather parameters (temperature, relative humidity, rainfall, wind velocity etc.) should be recorded on daily basis and in standard weeks which are needed for interpretation of the results of all the trials under crop protection (Action: All centers).
2. PC may meet VC and Director of Research to discuss on the non-participation of Scientists from Dholi center in 3 consecutive meetings (XVI, XVII Workshops & Group meetings).





3. Procedures for grading disease and pest severity of various pests and diseases in seed spices were discussed and formulated as given below:

(i) **Alternaria blight** (Cumin)

- 0 - Healthy plant
- 1 - Blight symptoms on tips of the leaves
- 2 - Most of the leaves showing blight symptoms
- 3 - Symptoms on leaves and umbels
- 4 - Symptoms on leaves and umbels and few lesions on the stem
- 5 - Symptoms on leaves, umbels, seed and on the stem

Number of plants to be observed: 20 plants/plot

(ii) **Powdery Mildew** (Cumin/Coriander/Fenugreek)

- 0 - Healthy
- 1 - Whitish small spots on leaf
- 2 - Whitish growth covering the entire leaf
- 3 - Growth on leaf and stem
- 4 - Growth on leaf, stem and umbel/pod

Number of plants to be observed: 20 Plants/plot

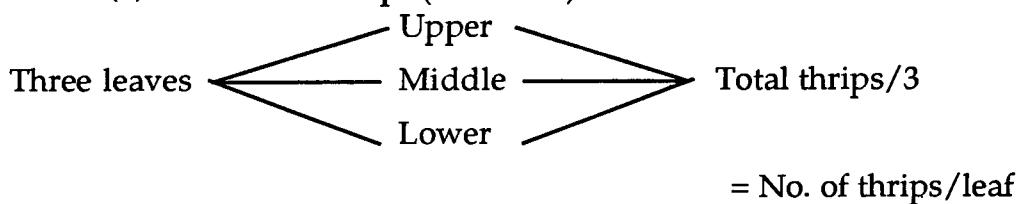
(iii) **Wilt** (Seed Spices)

Total number of plants  
No. of wilted plants  
Percentage of wilted plants

(iv) **Aphid:** All seed spices

- 0 - No aphids
- 1 - Isolated singly on few tender parts
- 2 - Singly on mature plant parts
- 3 - Colony countable
- 4 - Uncountable colony on whole plant  
20 Plant/plot

(v) **Cumin Thrips** (Common)





(vi) **Ramularia blight** (Fennel)

- 0 - Nil
- 1 - on leaf tip and leaves only
- 2 - on leaves and petiole
- 3 - on leaves, petiole and stem
- 4 - on leaves, stem, inflorescence
- 5 - on leaves, stem, inflorescence including

(vii) **Alternaria blight** (Fennel)

- 0 - Healthy
- 1 - Upto 25%
- 2 - Upto 50%
- 3 - Upto 75%
- 4 - >75%

(viii) **Sugary secretion** (Fennel)

Total no. of umbels/plant  
Total no. of infected umbels/plant  
Percentage

(ix) **Seed midge** (Seed Spices)

Field - Random 3 umbels – Random 3 umbellates  
- Total 9 umbellates  
- No. of infected umbellates

(x). **Stem gall** (Coriander)

- 0 - Healthy
- 1 - Galls on stem alone
- 2 - Galls on stem and leaf
- 3 - Galls on inflorescence
- 4 - Galls on stem, leaf and inflorescence

4. Instructions for recording disease incidence and collection of samples of diseased ginger (GIN/CP/1.5) and turmeric (TUR/CP/1.4) are given below:

**Recording incidence of soft rot in a bed size of 3x1 sq.m**

Count number of germinated rhizomes

Count number of diseased rhizomes in a bed. Tillers arise out of individual pit may be counted as one.

Count soft rot affected plants in at least 10 beds

In the case of ridges and furrow method, a compact area of 40 plant may observed for disease incidence



### Recording incidence of soft rot in a field

Count number of bed infected by soft rot in a field

Count soft rot affected beds in a field of at least 10 beds

Observe disease each/incidence in 10 compact area of 40 plants

### For sample collection

Carefully collect affected plants along with soil, rhizome and roots in a clean polythene bag

Fill up the format supplied

Assign sample number and date on the bag

Send at least five samples from a locality (Station farm, experimental farm and farmer's field, separately) (For example, Kumarganj can send samples from station farm, experimental farm as well as from farmer's field, separately)

P.S. Collect relatively fresh infection rather than highly infected one with rotting rhizomes

Apart from this, in both the crops, send the seed rhizomes 200 g each of 10 promising lines for yield and resistant/tolerant sources for screening against rhizome rot of turmeric and soft rot of turmeric. The format supplied should be filled; each accession should be labeled properly and sent to the Project Coordinator **by Speed Post** to avoid delay in receiving samples at IISR, Calicut.

### Format

Name of the Scientist:

Date:

Designation:

Address:

Sample Identity Number: (To be sent along with the samples)	
Details of the farmer and field	
Name of the farmer	
Village	
District	
State	
Nearby AICRPS center	
Contact address of the farmer including phone number	



<b>Details of the crop</b>		
Variety planted		
Source of planting material		
Method of Storage of rhizome		
If purchased from other source please indicate the cost of seed material		
Previous crop		
Please indicate diseases noticed in the previous crop		
Seed rate per acre and per bed (if bed system is adopted)		
Type of planting Bed/Ridges and furrow		
Soil type		
Irrigated or rain fed crop		
Pure or mixed crop		
Open or shaded field		
Shade crop used		
<b>Details of disease noticed during this season</b>		
Symptoms of the Disease	Tentative identification of the disease	Remarks



### Crop Management Practice

Seed treatment (Chemical or biological)	
Manure used	
Pesticides used	
Fungicides used	
Biological control agent used	
Source of biocontrol agent	
Other pest and disease management practices used including indigenous methods	
Fertilizers used	

Signature of the Scientist





### **Coriander (One proposal)**

1. DH-246 (Hisar)

Identified for State release

### **Fenugreek (One proposal)**

1. Rmt-305 (Jobner)

Identified for State release

### **Nigella (One proposal)**

1. Nigella – AN-01-1 (NRCSS, AN-1) (NRC SS, Ajmer)

Identified for State release

### **Dill (Two proposals)**

1. European Dill – AD-01-43 (NRCSS, AD-1) (NRC SS, Ajmer)

Identified for State release

2. Indian Dill – AD-01-6 (NRCSS, AD-2) (NRC SS, Ajmer)

Identified for State release

### **Ajowan (Two proposals)**

1. Ajowan – AA-01-61 (NRCSS, AA-1) (NRC SS, Ajmer)

Identified for State release

2. Ajowan – AA-01-19 (NRCSS, AA-2) (NRC SS, Ajmer)

Identified for State release







## PLENARY SESSION

Chairman : Dr. G. Kalloo

Co-Chairmen : Dr. S. N. Pandey  
Dr. K. V. Ramana

Rapporteurs : Dr. Johnny A. K  
Dr. V. Srinivasan

Dr. S.N. Pandey, Asst. Director General has given the following observations on the workshop.

- The workshop was exhaustive and timely.
- The scientists should follow uniform proforma for taking experimental observations.
- Presentations should be made with relevant data based on the priority of the subject area and should make an impressive presentations.
- Projects on organic farming should follow the guidelines/norms with sufficient waiting period of 2-3 years from conventional system of farming.
- In future, experiments only on single centre basis should not be encouraged as it deviates from AICRPS mandate.
- Scientists should propose relevant new experiments in place of closed experiments after thorough review of the present scenario.

Dr. G. Kalloo, DDG highlighted the importance of Spices in export, economic and health security in present day context. He also emphasized the need for studies to explore the medicinal aspects of spices and popularizing seed spices like Ajwain, Dill and Nigella for arid regions. He stressed the need for enhancing the quality, viability and effectiveness of project under AICRPS.



The proceedings and recommendations on different technical sessions were presented.

Dr. B. Krishnamoorthy, IISR, Calicut presented the recommendation of Technical Session I - Genetic Resources which was accepted with the following modifications.

1. Coimbatore centre has already submitted the required passport data on turmeric germplasm to NBPGR.
2. Solan centre shall maintain their turmeric germplasm as 'field germplasm maintenance' and need not report it as AICRPS-Project.

Dr. R. K. Sharma, RAU presented the recommendations for Technical Session II – Crop Improvement & Biochemistry and following observations were recorded.

1. In coriander, the promising entries from series IV may be proposed for release from Hisar (DS-246) centre.
2. In fenugreek, entry HM – 346 has already been proposed for release in XVI AICRPS Workshop at Thrissur.
3. For all the annual crops like ginger, turmeric & seed spices only IET and CVT will be continued here after and all the series I, II, III and IV trials will be closed barring series V which will be continued for one more year. Uniformity should be maintained on experimental designs, management practices etc. at all the centres.

Dr. Vashishtha, NRC-Seed spices has presented the recommendations on Technical Session III – Crop Management, where the following suggestions were made:

1. The experiments on 'efficacy of biofertilizers on seed spices' has completed 3-4 years, and hence new experiments should be formulated.



2. Difficulty in taking up nutritional trial on cumin at Jagudan centre was expressed as there is no Agronomist in position.

The chairman made the following remarks

1. The Technical Session on Crop Management can be renamed as it is very much subjective as crop production.
2. Whole experimental programme under this session has to be recasted/ reoriented towards spices based cropping system research and to develop some basic research aspects. An expert committee constituting Director, IISR, Project Coordinator (Spices) and subject experts can look into it.
3. Presently profitability in farming is getting reduced as the cost of inputs are increasing. Hence, projects should give more emphasis to reduce the cost of inputs like fertilizers/irrigation through the use of biofertilizers, PGPR, biodynamics and micro irrigation etc. and to popularize low cost inputs and varieties responding to low input agriculture.

Recommendations on Technical Session IV – Crop Protection was presented by Dr. M. Anandaraj, IISR on which the chairman made the following remarks

1. Chemical residues of insecticides and fungicides are to be kept low in the spice produces.
2. Integrated use of bio agents like PGPRs to control important diseases of spices should be fully exploited.
3. Refining of the experimental treatments is to be done for better viability, visibility and in depth study of the projects.



On proposals for variety release (Central/State), the Chairman pointed out that the data on CVT should be presented in AICRPS Workshop and a committee should critically analyze the data and forward it for Central Variety Release Committee. For any notification by Government of India (Ministry of Agriculture), the variety should be identified by the AICRPS Workshop.

Other general observations made by the Chairman are

1. Uniformity should be followed in presenting the data.
2. Registration of germplasm with NBPGR and its utilization in breeding programmes should be promoted.
3. Database on useful genes of germplasm accessions (potential germplasm) should be developed.
4. All the centres should be given with the details of technical programme for the next year along with the recommendations made for detailed discussion.
5. In variety release, importance should be given for economic traits, quality/chemical constituents and disease tolerance/resistance apart from yield potentials.

New proposals put forth by the PC for DDG's approval are

1. Inclusion of paprika and vanilla crops under AICRPS mandate.
2. Inclusion of the following centres as regular/voluntary under AICRPS.

- a. Regular centers  
Indian Cardamom Research Institute (Spices Board), Myladumpara  
Indian Cardamom Research Institute, Regional Station, Gangtok  
Horticultural Research Station (TNAU), Pechiparai
  
- b. Voluntary centers  
Semiligudu (Orissa University of Agriculture and Technology), Orissa  
Kalyani (Bidhan Chandra Krishi Vishwavidyalaya), West Bengal  
Pantnagar (GB Pant University of Agriculture and Technology), Uttar Pradesh
  
- c. Coordinating centers  
IISR, Calicut  
NRC SS, Ajmer



*Dr. G. Kalloo, DDG (Hort. & CS) chairing the Plenary Session*



## ACKNOWLEDGEMENT

We are highly grateful to Dr. Mangala Rai, Secretary, DARE and Director General, ICAR and Dr. G. Kalloo, DDG (Hort. & CS), ICAR for giving the approval to hold the XVII Workshop of AICRPS and to Dr. S.N. Pandey, ADG (Hort. & PC) for his support in organizing this Workshop.

Our sincere thanks to Dr. V.A. Parthasarathy, Director, IISR, Calicut for agreeing to hold the Workshop at IISR and his whole hearted support in organizing the Workshop.

Our profound gratitudes to all Chairmen, Co-chairmen and Rapporteurs of various sessions in conducting the deliberations more scientifically and experts who helped in the improvement and formulation of new research programmes.

We are grateful to the members of various organizing committees, scientists and all the staff members of the institute for their support in organizing the Workshop.

We are highly grateful to the following organizations who supported the Workshop

1. State Bank of India, Calicut
2. PLANTRICH, Chemicals & Fertilizers Ltd., Industrial Estate, Mannarkad (P.O.) – 686019, Kottayam
3. T. Stanes & Company Ltd., 23-24, Race Course Road, Coimbatore – 641 018
4. Southern Phosphate & Minerals Ltd.
5. Scientist Reserve Fund, IISR, Calicut



## LIST OF PARTICIPANTS

### List of delegates

#### A. Indian Council of Agricultural Research, New Delhi

1. Dr. G. Kalloo, Deputy Director General (Hort. & CS)
2. Dr. S.N. Pandey, Asst. Director General (Hort. & PC)

#### B. Project Coordinator

3. Dr. K.V. Ramana, AICRP on Spices, IISR, Calicut

#### C. Special Invitees

4. Dr. R.K. Sharma, Former Dean, PG Studies, Rajasthan Agril. University, B-143, Karani Nagar, Naganichji, Shiv Bari Road, Bikaner-334 003
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8. Dr. K. Vasantha Kumar, Assoc. Professor
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24. Dr. N. Chezhiyan, Professor & Head
25. Dr. E. Rajeswari, Research Associate

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27. Mr. M. Raja Naik, Horticulturist

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32. Dr. N. P. Dohroo, Jr. Plant Pathologist
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**High Altitude Research Station, OUAT, Pottangi**

34. Dr. D. K. Dash, Jr. Breeder
35. Dr. S. Rath, Breeder





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37. Mr. M. P. Jain, Jr. Plant Pathologist

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41. Dr. S. K. Tehlan, Assistant Scientist (VC)

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42. Dr. J. Dixit, Horticulturist
43. Dr. V. P. Pandey, Jr. Breeder
44. Dr. R. P. Saxena, Jr. Pathologist

**Uttar Banga Krishi Viswa Vidhyalaya, Pundibari**

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50. Dr. V.S. Pande, Plant Pathologist

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51. Dr. C.R. Gupta, Horticulturist
52. Dr. N. S. Tomar, Jr. Breeder
53. Dr. A. K. Singh, Jr. Pathologist



**E. Voluntary centres**

**Horticultural Research Station, Tamil Nadu Agricultural University,  
Pechiparai, Tamil Nadu**

- 54. Dr. Prem Jousha, Jr. Breeder (Hort.)
- 55. Dr. M. Selvarajan, Professor & Head

**Regional Research Station (KAU), Ambalavayal, Wynadu, Kerala**

- 56. Dr. N.V. Radhakrishnan, Plant Pathologist

**Indian Cardamom Research Institute, Myladumpara, Idukki, Kerala**

- 57. Dr. K. J. Madhusoodanan, Dy. Director
- 58. Dr. D.V. Patil,
- 59. Dr. M.A. Ansar Ali, Entomologist

**Indian Cardamom Research Institute Regional Station, Spices Board, Sakleshpur**

- 60. Dr. M.R. Sudarsan, Scientist-in-charge
- 61. Mr. S. Sreekrishna Bhat
- 62. Mr. B.A. Vadiraj

**Indian Cardamom Research Institute Regional Station, Dindigul,  
Thadiyankudisai**

- 63. Dr. B. Gopakumar, Scientist-in-charge

**F. Principal Investigators of Ad-hoc Schemes**

- 64. Dr. P.C. Rajendran, Principal Investigator, Kerala Agricultural University, Vellanikkara, Trichur-680 654
- 65. Dr. (Mrs.) Sabita , J.N. Baruah, Sr. Scientist (Vegetables) Dept. of Horticulture, Assam Agricultural University, Jorhat – 785 013, Assam
- 66. Mr. Manoj Kurien Jacob, Research Associate, Rajiv Gandhi Centre for Biotechnology, Trivandrum-695 014
- 67. Dr. R. Sridar, Associate Professor (Agril. Microbiology), Tamil Nadu Agricultural University, Coimbatore – 641 003, Tamil Nadu



### **G. Special Invitees for inaugural & Plenary Session**

68. Prof. (Dr.) K.V. Peter, Vice Chancellor, Kerala Agricultural University, Vellanikkara, Trichur-680 654
69. Dr. E.V. Nybe, Head, Dept. of Plantation Crops and Spices, Kerala Agricultural University, Vellanikkara, Trichur-680 654
70. Mr. Tamil Selvan, Director, Directorate of Arecanut and Spices Development, West Hill, P.O., Calicut-673 005
71. Mr. Babulal Meena, Directorate of Arecanut and Spices Development, West Hill P.O., Calicut-673 005
72. Dr. Z. Abraham, Head, NBPGR Regional Station, Thrissur
73. Mr. M. N. Babu, Principal Agricultural Officer, Department of Agriculture, Govt. of Kerala, Civil Station, Calicut – 673 020

### **H. Farmers Representatives**

74. Mr. Thomas, V., Karshakashree, Vettathu House , Vettilappara, Manacheri (Via), Malappuram (Dt.)
75. Mr. Abraham Mathew, Kerashree, Kadukammackal, Kallanodu, P.O., Via. Koorachundu, Kozhikode
76. Mr. Jo Jo Jacob, Randuplackal, Chempanodu, P.O., Peruvannamuzhi (Via) – 673 528
77. Mr. K. O. Sebastin, Vadakkekallungal, Muthukadu (P.O.), Kozhikode – 673 528
78. Mr. James Edacheery, Chakkittapara Panchayat, Peruvannamuzhi

### **I. Indian Institute of Spices Research, Calicut**

79. Dr. V.A. Parthasarathy, Director
80. Dr. K. N. Kurup, Principal Scientist
81. Dr. M. Anandaraj -do-
82. Dr. M. N. Venugopal -do-
83. Dr. B. Chempakam -do-
84. Dr. S. Devasahayam -do-
85. Sri B. Krishnamoorthy -do-
86. Dr. K. Nirmal Babu, Sr. Scientist
87. Dr. M.S. Madan, Sr. Scientist
88. Dr. John Zachariah, Sr. Scientist



89. Dr. B. Sasikumar, Sr. Scientist
90. Dr. J. Rema, Sr. Scientist
91. Dr. Johnson K. George, Sr. Scientist
92. Dr. Susheela Bhai, Sr. Scientist
93. Dr. A. Ishwara Bhat, Sr. Scientist,
94. Dr. R. R. Nair, Sr. Scientist
95. Dr. N. K. Leela, Scientist (SG)
96. Sri K. M. A. Koya, Scientist (SG)
97. Dr. S.J. Eapen, Scientist (SG)
98. Dr. C. K. Thankamani, Sr. Scientist
99. Dr. P. Rajeev, Sr. Scientist
100. Dr. K.S. Krishnamoorthy, Sr. Scientist
101. Dr. K. Kandiannan, Sr. Scientist
102. Mr. K.V. Saji, Scientist, Sr. Scale
103. Dr. A. Kumar, Scientist, Sr. Scale
104. Dr. V. Srinivasan, Scientist, Sr. Scale
105. Dr. K.N. Shiva, Scientist
106. Dr. A.K. Johny, Technical Information Officer
107. Sri P.A. Mathew, Scientist-in-Charge, Peruvannamuzhi
108. Dr. T.K. Jacob, CTO-in-Charge, KVK, -do-

**J. Other participants**

109. Mr. Santhosh E, M/s T. Stanes & Company Ltd., 23-24, Race Course Road, Coimbatore – 641 018
110. Mr. Baburaj, Field Manager, T. Stanes Co. Ltd., Puthiyara, Calicut-4
111. Mr. Bijumon Kurien, Managing Director, PLANTRICH, Chemicals & Fertilizers Ltd., Industrial Estate, Mannarkad (P.O.) – 686019, Kottayam
112. Mr. M.A. Bashyam, Managing Director, Southern Phosphate & Minerals Ltd., Cochin – 682 019



## Annexure II

### Group Meetings under AICRPS

The following six Group Meetings were organized and conducted at IISR, Calicut and NRCSS, Ajmer to review the progress and recasting of ongoing research projects and formulation of new research programmes on spices under AICRPS; as per the decision taken in XVII workshop held at Calicut during 3-5 February 2004.

Sl. No.	Date	Technical session/ discipline	Spices	Resource persons
<b>4. Indian Institute of Spices Research, Calicut</b>				
1	25-2-2004	Genetic Resources and Crop Improvement & Biochemistry	Cardamom	Dr. K.V. Ramana, PC (Spices), IISR, Calicut Dr. M.N. Venugopal, Head, IISR CRC, Appangala Dr. K. J. Madhusoodanan, Dy. Director, ICRI, Myladumpara Mr. Narayanasamy, Pl. Breeder, RARS, Mudigere Mr. K.V. Saji, Scientist (SS), IISR, Calicut Dr. K.N. Shiva, Scientist, PC Cell, IISR, Calicut
2	23-3-2004 & 25-03-04	Genetic Resources and Crop Improvement & Bio-chemistry	Black pepper, ginger, turmeric & tree spices	Dr. K.V. Ramana, PC (Spices), IISR, Calicut Mr. B. Krishnamoorthy, HOD, CI & Biotech., IISR, Calicut Dr. B. Sasikumar, Sr. Scientist, IISR, Calicut Dr. J. Rema, Sr. Scientist, IISR, Calicut Dr. K.V. Saji, Scientist (SS), IISR, Calicut Dr. K.N. Shiva, Scientist, PC Cell, IISR, Calicut
3	26-3-2004	Crop Production	Major Spices	Dr. K.V. Ramana, PC (Spices), IISR, Calicut Dr. K. Kandiannan, Sr. Scientist, IISR, Calicut Dr. V. Srinivasan, Scientist (SS), IISR, Calicut Dr. K.N. Shiva, Scientist, PC Cell, IISR, Calicut
4	27-4-2004	Crop Protection	Major Spices	Dr. K.V. Ramana, PC (Spices), IISR, Calicut Dr. M. Anandaraj, HOD, Crop Protection, IISR, Calicut Dr. S. Devasahayam, Principal Scientist (Ent), IISR, Calicut Dr. A. Ishwara Bhat, Sr. Scientist, IISR, Calicut Dr. A. Kumar, Scientist (SS), IISR, Calicut Dr. K.N. Shiva, Scientist, PC Cell, IISR, Calicut



1	25-5-04	Preliminary group meeting on seed spices	Coriander, cumin, fennel & fenugreek	Dr. V.A Parthasarathy, Director, IISR, Calicut Dr. B.B. Vashishtha, Director, NRCSS, Ajmer Dr. K.V. Ramana, PC (Spices), IISR, Calicut Dr. M. Anandaraj, HOD, Crop Protection, IISR, Calicut Dr. B. Sasikumar, Sr. Scientist, IISR, Calicut Dr. K.N. Shiva, Scientist, PC Cell, IISR, Calicut
<b>B. National Research Centre on Seed Spices, Ajmer</b>				
6	29-6-04 to 30-6-04	Group Meeting on Seed Spices (Main)	Coriander, cumin, fennel & fenugreek	Dr. B.B. Vashishtha, Director, NRCSS, Ajmer Dr. K.V. Ramana, PC (Spices), IISR, Calicut Dr. M. Anandaraj, HOD, Crop Protection, IISR, Calicut Dr. K.N. Shiva Scientist, PC Cell, IISR, Calicut Dr. S. K.Malhotra, Sr. Scientist, NRCSS, Ajmer Sh. R. S. Mehta, Scientist (SS) - NRCSS, Ajmer Dr. S. Subramanian, Assoc. Prof., TNAU, Coimbatore Dr. R.P. Saxena, Assoc. Professor, NDUAT, Faizabad Dr. (Mrs.) C. Sarada, Scientist (Hort.), RARS, Guntur Dr. N. S. Tomar, Sr. Scientist, RARS, IGAU, Raigarh Dr. K. D. Patel, Sr. Scientist, GAU, Jagudan Dr. K. K. Thakral, Sr. Scientist, HAU, Hisar Dr. D.L. Singhania, Prof.& Head, SKN College, Jobner Shri. M.P. Jain, Plant Pathologist, Jobner Dr. Dharendra Singh, Plant Breeder, Jobner



**List of Committees**

**I Organizing Committee**

Chairman : Dr. V.A. Parthasarathy  
Convenor : Dr. K.V. Ramana

**II Programme Committee**

Chairman : Dr. M. Aanandaraj  
Co-Chairman : Dr. S. Devasahayam  
Convener : Dr. A Ishwara Bhat  
Members : Mr. Santhosh J. Eapen  
Dr. N.K. Leela  
Dr. K.N. Shiva  
Ms. Dinu Antony  
Ms. R. Madhubala  
Ms. Tresa Thomas  
Ms. N. Preethi  
Mr. K.A. Manoj  
Ms. Sanitha Sukumaran

**III Reception & Registration Committee**

Chairperson : Dr. B. Chempakam  
Convenor : Dr. K. S. Krishnamoorthy  
Members : Dr. (Mrs.) R. Suseela Bhai  
Dr. C.K. Thankamani  
Dr. A.K. Johny  
Ms. Utpala Parthasarathy  
Mr. P. Gopinath  
Mr. T.T. Soman

**IV. Administrative and Finance Committee**

Chairman : Dr. K.N. Kurup  
Members : Mr. M.K. Sachidanandan  
Dr. T. John Zachariah  
Dr. M.S. Madan



## V Publicity Committee

Chairman : Dr. B. Sasikumar  
Members : Dr. P. Rajeev  
Mr. Shyam  
Ms. A.K. Lincy  
Mr. R. Sandeep Varma

## VI Hospitality Committee

Chairman : Mr. K. M.A. Koya  
Convener : Dr. Johnson K. George  
Members : Dr. R. Ramakrishnan Nair  
Mr. K.V. Saji

## VII Transport and Accommodation Committee

Chairman : Mr. B. Krishnamoorthy  
Members : Dr. P.A. Sheriff  
Dr. S. Hamza  
Mr. M.M. Augusthy  
Mr. K. Praveen  
Mr. Sinoj  
Mr. Sibi  
Mr. R. Aravind  
Mr. Karthik Prabhu

## VIII Hall Arrangement Committee

Chairman : Dr. K. Nirmal Babu  
Convener : Dr. J. Rema  
Members : Dr. A. Kumar  
Mr. K. K. Sasidharan  
Mr. K. Jayarajan  
Mr. A. Sudhakaran  
Ms. Minoo Divakaran  
Ms. Sumathi  
Mr. Vimala Jose  
Ms. Yamuna George  
Ms. V.K. Sindhu  
Mr. Martin Joseph  
Mr. V.P. Ramachandran





**IX. Exhibition Committee**

Chairman : Dr. T.K. Jacob  
Convener : Mr. K. Sivaraman  
Members : Mr. P.A. Mathew  
Dr. K. Kandiannan  
Dr. V. Srinivasan  
Mr. S. Prakash  
Mr. Choikutty

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