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**PROCEEDINGS OF  
THE GROUP MEETING OF RESEARCH WORKERS (XI WORKSHOP)  
OF ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES**

**Held at  
KANAKAKUNNU PALACE, THIRUVANANTHAPURAM**

**during  
JULY 26 – 28, 1991**

**Project Coordinator : S. EDISON**



**ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES  
NATIONAL RESEARCH CENTRE FOR SPICES  
(Indian Council of Agricultural Research)  
CALICUT - 673 012, KERALA**

**1991**

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## ACKNOWLEDGEMENTS

The Group Meeting (in lieu of the XI Workshop) of the All India Coordinated Research Project on Spices was held at the Kenakakunnu Palace, Trivandrum. Shri K Karunakaran, Hon'ble Chief Minister, Government of Kerala inaugurated the National Group Meeting which was presided over by Shri P P George, Hon'ble Minister for Agriculture, Government of Kerala. We are indeed grateful to the Hon'ble Chief Minister and the Hon'ble Minister for Agriculture who have so kindly participated in the Inaugural function and delivered the inaugural and presidential addresses respectively.

Dr. K L Chadha, Deputy Director General (Horticulture), ICAR was kind enough to be present throughout the duration of the Workshop and guided us in the deliberations. He gave welcome address to the VIPs, dignitaries and other distinguished participants in the Trivandrum Workshop. I am extremely grateful to Dr. K L Chadha for his kindness and concern towards the research on spices and the deliberations during the Meeting. I am quite grateful to Dr. P Rethinam, Assistant Director General (Plantation Crops) who has been instrumental in obtaining the clearance from the ICAR headquarters and also the valuable advice provided from time to time in the conduct of the Workshop. I am also grateful to Dr. S Nagarajan, Assistant Director General (Plant Protection) who has been kind to participate in the deliberations and also discussed about the progress in research under the ICAR funded Adhoc Scheme on Ginger Rhizome Rot. There were many Directors of Agriculture/Horticulture from different States in the country who took part in the deliberations and we are grateful to them for their kind participation.

I am grateful to Dr. M K Nair, Director, Central Plantation Crops Research Institute, Kasaragod for his fullfledged support, continued encouragement and provision of various facilities in the smooth conduct of the Trivandrum Workshop. The colleagues from the CPCRI Research Centre, Palode have taken up enormous pains to ensure

the best of facilities to conduct the Workshop at Trivandrum. Dr. G.G.Nayar, Director, Central Tuber Crops Research Institute, Trivandrum has provided sufficient physical facilities as well as manpower to assist me in organising and conducting the Workshop. I am thankful to Dr. A Ramadasan, Offg. Director, National Research Centre for Spices, Calicut and the team of Scientists & other staff from NRCS who have helped in various stages in organising the Workshop at Trivandrum. Shri TA Sriram, Senior Technical Officer, ICAR has been a source of strength for us in critically monitoring and conducting the Proceedings from time to time and I am grateful to him.

Dr. KUK Namboodhiri, Principal Scientist-in-charge & his team, CPCRI Research Centre, Palode, Dr. M Thankappan, Dr.S G Nair & their team from CTCRI, Trivandrum have put in extraordinary hard work to enable provision of various facilities and enable the smooth conduct of the Workshop. Shri P Susheelan, Director (PPM Cell) & Additional Secretary, Department of Agriculture, Government of Kerala, Shri T Janardhanan Nair, Director of Agriculture, Shri M R Vijayan, Joint Director of Agriculture and Mrs. Remani, Principal Information Officer have been quite cooperative and extended valuable support in obtaining and mobilising various facilities from the Government of Kerala, Department of Agriculture and other Organisations in Trivandrum which has been responsible for the smooth and successful conduct of the Workshop.

Dr. K L Chadha, Dr. P Rethinam & Dr S Nagarajan have spared their valuable time to chair the Technical Sessions during the Workshop. Dr. M K Nair, Dr. M Aravindakshan, Dr. I Irulappan & Dr. EVV Bhaskara Rao, deserve special thanks for having chaired various Technical Sessions during the Workshop. The Scientists from the NRCS and the Coordinating Centres have been coopted to act as Rapporteurs for various Sessions and they have done an excellent job in providing the Proceedings of the Meeting in time and I am grateful to them.

During the Group Meeting there was a separate Technical Session to discuss about the production & distribution of planting material of spices and this was attended by the Directors of Agriculture from Kerala, Tamil Nadu, Maharashtra, Rajasthan, Mizoram states besides the Director, Directorate of Cocoa, Arecanut & Spices Development, Director, Central State Farm, Aralam. We are grateful to these Senior Officials who have taken pains to prepare their status papers for discussion. The Spices Board was represented by Dr. C K George, Executive Director, Dr. R Naidu, Director (Research) and several senior Scientists who had presented the progress in research on cardamom for the benefit of participants.

The various Horticultural Input Agencies had deputed their staff under their R & D wing for an effective discussion on the various inputs in improving spices productivity together with the cost factor. An important event during the Trivandrum Workshop was the active participation by the Progressive farmers from Kerala, Tamil Nadu & Karnataka who took special efforts in interacting with the Scientific Community on various aspects of research and development of Spices. The All India Radio, Trivandrum, Doordarshan as well as the mass-media (Newspapers) had also effectively participated and covered the inaugural function. I am grateful to the above Agencies for the support to the discussions on Spices Research.

I also thank the Vice Chancellors and Directors of Research of the various Agricultural Universities for having deputed their Scientists to participate in the Spices Workshop at Trivandrum. The Kerala Agricultural University in particular was kind enough to nominate the participation of Dr. M Aravindakshan, Director of Research as well as several Associate Directors whose presence was quite important in our deliberations.

Last but not least I thank the authorities of the Kenakakunnu Palace for making available all the facilities in good condition to enable the smooth conduct of the Workshop.

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## SUMMARY REPORT

A Group Meeting of the All India Coordinated Research Project on Spices - Research Workers' was held during July 26-28, 1991 at Trivandrum. About 100 delegates participated in the Group Meeting who were drawn from various States, representing the 14 Coordinating Centres under the AICRP on Spices: located in the State Agricultural Universities, the National Research Centre for Spices, the Central Plantation Crops Research Institute, the Indian Cardamom Research Institute (Spices Board), Haryana Agricultural University and the Directorate of Cocoa, Arecanut and Spices Development (Ministry of Agriculture). The inaugural session was held on the forenoon of the 26th July and was presided over by Shri P P George, Hon'ble Minister for Agriculture, Kerala and inaugurated by Shri K Karunakaran, Hon'ble Chief Minister of Kerala. The Chief Minister in his inaugural address highlighted the necessity of improving productivity of spices by adopting modern & scientific methods, use of high yielding varieties, adopting proper post harvest technology etc. He was also emphatic for fixation of optimum floor price for spices so as to enable/improve our performance in the export front. The Chief Minister also opined the Government to create a National Spices Research Institute in Kerala.

Dr. K L Chadha in his welcome address highlighted the relevance of spices research and development activities in the current economy. Dr. S Edison, Project Coordinator presented the up to date report of the Project, indicating the salient research achievements. He also mentioned about the availability of the number of new varieties, new techniques in planting material and control of pests and diseases. The Group Meeting was later conducted in 8 Sessions. The crops covered in the discussions were black pepper, cardamom, (small & large), ginger, turmeric, cumin, coriander, fennel and fenugreek. The proceedings of the individual sessions were presented in the Plenary Session on the 28th July, presided over by Dr. P Rethinam,

ADG (PC). Several technologies were identified for transfer to farmers. An important event has been the recommendation for the release of 11 varieties of spices.

In black pepper, Aimpriyan selection (No.856) with an yield potential of 5.25 fresh pepper/vine, with 4.7% piperine, 12.5% oleoresin & 3.4% essential oil was recommended for release; the recovery percentage was 36. A second variety in black pepper viz., Ottaplackal-1 with the primary character of tolerance to the root knot nematode viz., Meloidogyne incognita recommended for release gives an yield of 4.7 kg of green pepper vine.

In Cardamom, 5 varieties have been recommended for release viz., MCC-19 & MCC-61, CCS-1, Mudigere-1 & PV-1. Selection MCC-49 is a Malabar clonal material capable of yielding 325 kg dry capsules/ha under rainfed conditions; the yield will be 656 kg/ha under irrigated conditions. Another Selection, MCC-61 is a Mysore type, capable of yielding 375 kg dried capsules/ha under rainfed conditions; it yields 765 kg under irrigated conditions. These 2 varieties are adopted to Vandemmettu and Vandiperiyar areas. The variety Mudigere-1 is a prostrate type with an yield potential of 250-300 dry capsules/ha and is suitable for Malnad region of Karnataka. The Pampadumpara Centre in Idukki has identified a Valayar Local (Malabar) selection with an yield potential of 500 kg/ha and is suitable for all the cardamom growing areas; this is recommended for release as PV-1.

In Coriander, Co-3 from Coimbatore has been recommended for Gujarat, Andhra Pradesh and Tamil Nadu states. It has an yield potential of 650 kg/ha and is one week early in maturing than the ruling variety Co-2. This variety shows less incidence of wilt and grain mould diseases. The Guntur Centre has identified for release CS-2. In Cumin, MC-43-73, an induced mutant with an yield potential

of 573 kg/ha and has been recommended for release; it has an oil content of 4% and is moderately tolerant against blight. In ginger, a vegetative mutant V<sub>1</sub>K<sub>1</sub>-3 has been recommended from Pottangi Centre. It has an yield potential of 17.4 tones of fresh rhizomes/ha and 10.2% olcoresin.

Besides the varieties, a few more technologies have been recommended. During the Group Meeting, a protracted discussion was conducted under the Chairmanship of Dr. K L Chadha about the production and distribution of planting material of spices. The representatives from Tamil Nadu, Kerala, Rajasthan and Mizoram states presented their reports. The certified nursery programmes, nursery code, extension of "Seed Act" for spices and the collaborative efforts between the State Agricultural Universities and Development Departments were discussed. It was suggested to approach the Minister for Agriculture to establish clonal orchards so as to build elite planting material. The Group Meeting also expressed concern about initiation of research activities and tree spices under coordinated programme.

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## P R O G R A M M E

- Venue : Kanakakunnu Palace  
Museum Junction  
Trivandrum - 695 001  
KERALA
- Dates : July 26, 27 & 28, 1991
- July 26, 1991
- 0830 - 0930 : Registration
- 1000 - 1100 : Inaugural Session
- Welcome Address : Dr. K L Chadha  
Deputy Director General (Hort) ICAR
- Report of the Project Coordinator : Dr. S Edison  
Project Coordinator (Spices) ICAR
- Presidential Address : Shri P P George  
Hon'ble Minister for Agriculture &  
Animal Husbandry, Govt. of Kerala
- Inaugural Address : Shri K Karunakaran  
Hon'ble Chief Minister, Govt. of Kerala
- Vote of thanks : Dr. A Ramadasan  
Director, NRC for Spices, Calicut
- 1100 - 1230 : Technical Session I :  
"ACTION TAKEN ON THE RECOMMENDATIONS  
OF THE PREVIOUS WORKSHOP"  
(Chairman : Dr. K L Chadha, ICAR)  
Rapporteur : Dr. S Edison  
All 14 Centres presented reports.
- 1230 - 1330 ) : Technical Session II :  
1430 - 1530 ) "GENETIC RESOURCES"  
(Chairman : Dr. EVV Bhaskara Rao,  
Project Coordinator,  
NRC for Cashew, Puttur)  
Rapporteurs : Mr. B Krishnamoorthy  
Dr. K K Ibrahim
- Aspects of germplasm collection,  
description, evaluation, germplasm  
exchange etc.

- 1530 - 1800 : Technical Session III :  
"CROP IMPROVEMENT"  
[Including Physiology and Biochemistry]  
(Chairman : Dr. M K Nair, Director, CPCRI)  
Rapporteurs : Mr. K Nirmal Babu  
Dr. Peter GE Vedamuthu

All the 14 Centres presented their reports.

July 27, 1991

- 0900 - 1300 : Technical Session III (continued)
- 1400 - 1600 : Technical Session IV :  
"GROUP DISCUSSION ON PLANTING MATERIAL  
PRODUCTION & DISTRIBUTION OF SPICES"  
(Chairman : Dr. K L Chadha, DDG(H), ICAR)  
Co-Chairman : Dr. P Rethinam  
Dr. S Edison  
Rapporteur : Mr. K G Thomas

Directors of Agriculture & Horticulture  
from major States presented reports.

- 1600 - 2000 : Technical Session V :  
"PLANT PROTECTION"  
(Chairman : Dr.S Nagarajan, ADG(PP), ICAR)  
Co-Chairman : Dr. K M Rajan  
Rapporteurs : Mr. M N Venugopal  
Ms. C Parvathi

All the 14 Centres presented their report &  
the presentation from the ad hoc scheme  
Centres on ginger rhizome rot

July 28, 1991

- 0930 - 1330 : Technical Session VI  
"VARIETY RELEASE"  
(Chairman : Dr. M Aravindakshan  
Director of Research, KAU)  
Rapporteurs : Mr. A Manohar Rao  
Dr. N Kumar

- 1330 - 1530 : Technical Session VII :  
"AGRONOMY & SOIL SCIENCE"  
(Chairman : Dr. I Irulappan, Dean, TNAU)  
Rapporteurs : Dr. S Thamburaj  
Mr. VS Korikanthimath

All the 14 Centres presented their reports.

- 1630 - 1830 : Technical Session VIII :  
"PLENARY SESSION"  
(Chairman : Dr. P Rethinam, ADG(PC) ICAR)  
Rapporteur : Dr. S Edison

- Vote of thanks : Dr. S Edison, Project Coordinator

Group Meeting concludes.

**INAUGURAL SESSION**

**WELCOME ADDRESS BY DR K L CHADHA**  
**Deputy Director General (Hort) ICAR**

Hon'ble Chief Minister of Kerala, Sri K Karunakaran, Hon'ble Minister for Agriculture & Animal Husbandry, Kerala, Sri P P George, Dr. S Edison, Project Coordinator (Spices), Dr. A Ramadasan, Director, NRCS, Distinguished Guests, Friends from the Media, Ladies and Gentlemen,

1. First of all, on behalf of the ICAR and on my own behalf I would like to extend a very warm welcome to the Hon'ble Chief Minister of Kerala, Sri K Karunakaranji who has very kindly responded to our invitation and consented to inaugurate this national group meeting of research workers on spices. Sir, we are conscious of your multifarious commitments despite which you have chosen to be with us which shows your deep interest and commitment to the agricultural development of the country. Even at an earlier occasion when ICAR organised a discussion on the "problems of coconut production in Kerala", you participated in the discussion along with the then Hon'ble Union Minister of Agriculture, Dr. Dhillon and Shri Makwana, MOS Agriculture on September 27, 1986. You had even then stressed the urgency of increasing coconut production in the state and country. We are fortunate to have you again for the spices group meeting and I again extend you a very warm welcome on this occasion.

2. We are equally grateful to Sri P P George, Hon'ble Minister of Agriculture and Animal Husbandry, Kerala State for agreeing to preside over today's function. I also extend you a very warm welcome to this function. I am also grateful to all other participants, invitees, media men for responding to our invitation and joining the inaugural session.

3. The venue for the present meeting was fixed at Trivandrum as being the capital of the major spices growing state in the country. For those of you, who have come from other states, it may be of interest to

know that Kerala produce 96% of pepper, 70% of small cardamom and 25% of ginger in the country. It has a sizeable production of tree spices also.

No country in the world grows as many kinds of spices as India and the country's production of different spices is estimated at 2 million tonnes valued at Rs.35,000 million. The country holds the first position in the world in terms of area and production of spice crops in general. Indian contribution to global trade in spices is only about 20% valued at Rs.2825 million. There is a conscious and welcome effort now to diversify exports and to go in for value added items. World demand projected by 2000 AD is 411 thousand tonnes and this gives us a tremendous opportunity to improve our exports and is particularly a challenge to R&D personnel engaged on spices.

4. Considering the importance of spices in the country several steps have been taken to strengthen research support for these crops in recent years.

- i) ICAR upgraded the erstwhile Central Plantation Crops Research Institute Regional Station located at Calicut to the level of National Research Centre for Spices during 1986.
- ii) We are fully aware that the quick wilt disease of pepper caused by Phytophthora capsici is of great concern to the pepper growers as well as policy makers. Though causal organism and control measures of this malady are known, we are intensifying our efforts to develop disease resistant pepper varieties so that we can not only avoid use of pesticides and eliminate residue problems but also have a permanent solution to the disease.
- iii) Similarly Azhukal is a major problem in cardamom in Kerala for which also control measures are available but we are trying to develop resistant lines.
- iv) Similarly in ginger, rhizome rot is a serious problem in all the ginger growing areas and a network research project has been launched by ICAR recently at four centres namely Calicut, Solan

(Himachal Pradesh), Udaipur (Rajasthan) and Bhubaneswar (Orissa) to overcome this problem. The progress of this work will also be reviewed in the following days.

- v) During the VIII Plan, depending on the resource position considerable strengthening has been proposed both at the NRC for Spices at Calicut and the Coordinated Project.
- vi) Recently the DBT has come forward to finance schemes for micropropagation of pepper and tree spices, developing resistant lines to Phytophthora through protoplast fusion, cryopreservation of pepper etc. and identified NRC Spices, Botany Department, Calicut University, KAU and Spices Board to take up the above said projects and the project proposals are being prepared.
- vii) At the instance of Sri N.D. Tewari, the then Commerce Minister, the Ministry of Agriculture had set up a National Committee on Spices in 1988. I had the privilege of being the Chairman of the Working Group on Spices Research and presented a report on the future strategies for Spices Research to the Department of Agriculture which is under consideration.

5. On development side also, stress is being laid on several aspects.

- i) I understand that the Govt. of Kerala is laying lot of stress on spices development and the year 1989-90 was declared as 'pepper year' and a whole set of farmer oriented programmes were taken up to improve the pepper industry in Kerala. This needs to be commended.
- ii) Lack of improved planting material in adequate quantities is another constraint in spices. I am happy to say that ICAR has already sanctioned a Revolving Fund Scheme for augmenting production of planting material of pepper.
- iii) Similarly the Department of Agriculture and Cooperation, GOI has sanctioned a scheme entitled "Integrated programme for development of spices" mainly on pepper, ginger, turmeric,

chillies, tree spices and minor spices like cumin, coriander, fennel & fenugreek at an estimated cost of Rs.5.00 crores for 1991-92. This programme will be operated in 12 Agricultural Universities, 3 ICAR Institutes and 21 State Departments of Agriculture/Horticulture. The project will lay emphasis on large scale production of planting materials, rehabilitation of old pepper gardens in Kerala, supplying input kits to farmers to motivate them to take up scientific cultivation, plant protection and propagation of high yielding varieties. Of Rs.5.00 crores, Rs.3.27 crores has been allocated to Kerala State during the current year.

- iv) Very recently, the International Pepper Community also met in Cochin, Kerala State and discussed various aspects of pepper production, processing, marketing and export.
- v) Recently the Spices Board under the Chairmanship of Dr.M.S.Swaminathan had identified the priority areas of research and future strategy for export promotion of spices. These reports if implemented will definitely help reorient our programme and help in increase our exports.

6. The present group discussion which is the 11th in our series is almost an annual feature and is held under the aegis of All India Coordinated Research Project on Spices which was initiated in 1971. Under this project, we are working at 15 Centres in 9 States on various crops e.g., black pepper, cardamom (small and large), ginger, turmeric, cumin, coriander, fennel and fenugreek. Besides research achievements, we will also be reviewing the strategy for production of adequate planting material of different spice crops for which we have invited Director of Agriculture/Horticulture of all spice producing states besides Director of Cocoa, Arecanut and Spices, Govt. of India. In this meeting, we will be reviewing indepth, our programmes and achievements and would make modifications wherever needed. You would be glad to know that the All India Coordinated Research Project on Spices has several achievements to its credit. A document on 5 year research achievements has been brought out by Dr. Edison, Project Coordinator, for which he deserves

commendation. He will soon be bringing out a comprehensive compendium of all spice varieties released in India with their major characters. The Project Coordinator will be presenting a report of results, but I would highlight a few important achievements only.

- i) In pepper the major limitation was the non-availability of high yielding varieties except Panniyur-1 released during 1971. I am happy that today we have seven more varieties/hybrids at our disposal which can definitely help to meet the quality planting material requirement of the farmers. The High Production Technology to get 1000 kg dry pepper/ha developed at Calicut and demonstrated in the farmers field is yet another milestone for increasing the pepper production.
- ii) In cardamom, five varieties are now available of which four are in the pre-release stage. These high yielding varieties if multiplied through tissue culture and distributed will go a long way for increasing the cardamom production. Since the micro propagation technique is now being commercially used by a few private firms, it may not be that difficult to produce large scale planting material. In this crop also, the High Production Technology for getting about 770 kg capsule/ha was developed and demonstrated.
- iii) In ginger and turmeric, we are in a favourable position, as we have 3 ginger and 10 turmeric varieties at present.
- iv) In seed spices, which are also important from export point of view, we have the high yielding varieties. But still we have to increase the productivity of these crops which could be possible through collection of exotic germplasm and evaluation.
- v) In tree spices we spend nearly 25 crores/annum on import of clove and nutmeg. We need to do more work on these crops. Even though we have good collection of germplasm, the genetic base is quite narrow and this can be widened through exotic collection. However, using the high yielding clove trees the planting materials are being produced and distributed. Epicotyl grafting of nutmeg standardised by NRC for Spices helped to overcome sex



problems.

- vi) In the area of PHT, the cardamom dryer developed by CPCRI has become popular.

7. There are also some constraints in implementation of our programmes. We shall discuss these and try to rectify those which are possible. We are taking certain steps:

- i) For instance, we are constituting a high level team of experts to undertake a total review of our research on spices in various states which will help us to identify our strengths and weaknesses and to develop the future research strategy.
- ii) We have also taken steps to streamline the system of release of horticultural crop varieties and setting up a separate Horticultural Variety Release Committee is under the active consideration of the Govt. of India.

8. In the end, I once again thank the Hon'ble Chief Minister and Minister of Agriculture and Animal Husbandry, Govt. of Kerala, for agreeing to be with us this morning. Sir, your presence is a source of great strength to us. I can assure you on behalf of ICAR and on my behalf that we in ICAR are aware of the problems of production of plantation and spices crops predominantly grown in this state and we will put in our best resources and manpower to ensure higher production of these crops. We will also make efforts to take full advantage of the presence of a large number of scientists in reorienting programmes keeping in view the thrusts so that both production and productivity of spices in the country can be significantly increased.

Thank you.

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**PROJECT COORDINATOR'S REPORT BY DR. S EDISON**  
**All India Coordinated Research Project on Spices, NRCS, Calicut**

I have immense pleasure in presenting before the learned audience, a report on the progress of research of the All India Coordinated Research Project on Spices since we had conducted the last Meeting of this sort, viz., the X Workshop of the Project held at Coimbatore during August, 1989. This is the fourth independent Meeting of Spices Research Workers after the bifurcation of this Project in 1986 and essentially the eleventh in the series, initiated in 1971. This Coordinated Project was established during 1971 with four centres and gradually grew to fifteen centres by the end of the VII Plan. We have proposals to add one or two centres during the VIII Plan as well. The mandatory crops of this Project are black pepper, cardamom (small & large), ginger, turmeric, cumin, coriander, fennel & fenugreek and the research work is carried out under the various State Agricultural Universities as well as the ICAR Research Complex for NEH Region. We have therefore with us today, a cross section of our country with representatives of Scientists from Kerala to Himachal Pradesh, Orissa and Sikkim besides Progressive Farmers and representatives from the Horticultural Input Agencies. About 12 major States have been involved in our programme and under this heterogeneous audience, it may be an interesting interaction on all the spices especially those concerning research support from the ICAR system. A brief account of the progress under the Project during the last two years is briefly enumerated below:

**1. Genetic resources :**

Panniyur centre improved its Black pepper collection by addition from Karnataka, bringing to 200; Sirsi has 75 including wild accessions added during the year. Pottangi maintains the largest germplasm viz.,

155 in Turmeric and 124 in Ginger and this Centre has supplied material to Jagtial, Solan and Coimbatore Centres as well as NRCS. Solan Centre added 59 new accessions to the Ginger collections, though a NBPGK-joint survey. The Cardamom germplasm at Mudigere Centre was freely exchanged with the NRCS Appanayala Centre. In Large Cardamom, additional germplasm was brought from Arunachal Pradesh and parts of Sikkim. Germplasm in seed spices remain almost static and efforts are underway to import/exchange from mediterranean countries.

## 2. Crop Improvement :

Varieties Panniyur-2, Panniyur-3 and Panniyur-4 have been released with average yield of 1954 kg/ha, 1749 kg/ha and 975 kg/ha respectively. About 5 lakh rooted cuttings of these varieties have been distributed. PV-1 cardamom selection is in advanced stages for release by KAU and in case of M-1 cardamom variety from Mudigere (UAS), 25 kg of seed capsules were distributed, each kilo seed yielding @ 70000 seedlings. The cultivar 'Pink Golsey' in Large Cardamom has performed superior in 2 years successively; clone 4 (green cardamom) has been identified and both are being promoted for release as varieties. The Pottangi centre has released the second variety in Ginger viz., Suruchi and a third variety "Surabi" is under consideration for release; the last one has less fibre (4%) content and yields better. In Coriander, varieties 'Sadhana' and 'Swathi' have been released by the APAU. These two varieties have an average yield, essential oil and fixed oil of 1025 kg/ha, 0.2% & 9.2% and 885 kg/ha, 0.3% & 9.6% respectively. The Coimbatore centre has released a new variety Co-3 with an yield of 644 kg/ha and had less incidence of wilt and grain mould; Co-3 had a seed oil content of 0.4%. At Guntur, coriander acc. ATP 82 recorded the highest yield of 692 kg/ha.

## 3. Crop Production :

The most economical dose of NPK for Black Pepper has been recommended as 50:50:150 kg NPK (per ha) respectively. Among the live standards for Black Pepper those grown on Ailanthus malabaricum gave

maximum yield. At Yercaud, high density planting of cardamom with a closer spacing of 1M x 1M for Malabar was found superior.

In Coriander application of N @ 60 kg/ha in 3 equal splits, applied as basal, 30 days after as top dressing and again after 60 days - under irrigated conditions - gave higher yields at Jobner. Leaf plucking if done 75 days after sowing, up to 50% did not affect grain yield of coriander. Sowing coriander in kharif in Guntur gave 658 kg/ha when sown on 15th September. Cumin when broadcast and applied with 30 kg N/ha in single dose gave higher yields. In Fennel, application of N @ 90 kg/ha in 3 equal splits given as basal, 30 DAS and 60 DAS gave higher production in Jobner. For producing the "Chewing type", fennel can be harvested when the grains are of "half length size" and 30 days after anthesis. Fenugreek when sown in the first week of November gives profitable crop. At Jobner, it was found that when the IW/CPE ratio is kept at 1.0, the fenugreek crop gives the highest seed yield of 1400 kg/ha; along with  $P_2O_5$  can be applied @ 60 kg/ha.

#### 4. Crop Protection :

Phytophthora foot rot disease can be controlled by spraying with 1% Bordeaux Mixture done thrice and drenching the basin once, before onset of monsoon. Metalaxyl and Al-Fosetyl compounds are superior in performance at Sirsi and on par with Bordeaux mixture at Panniyur; however the cost of treatment was high. At Mudigere, the cardamom cultivar "Pink Pseudostem" was identified as tolerant to leaf spot disease. The Pestalotiopsis leaf spot of Large Cardamom is controlled by spraying Blitox 50 @ 0.3%.

In Cardamom, the azhukal disease was controlled by spraying 1% Bordeaux mixture as well as soil drenching. Nematode infestation in cardamom nurseries was controlled by application of Temik granules, whereas the root grub has been effectively checked by Carabofuran 3% G @ 8-10 g/clump, applied during June-July & November-December. Leaf diseases in cardamom nurseries have been controlled by spraying with

Dithane M-45 (0.25%).

Weed control in cumin has been achieved with Terbutryn @ 0.5 kg a.i./ha. Cumin blight caused by Alternaria burnsii was controlled by spraying Dithane M45 or Cupramar @ 0.8 to 1.0 kg/ha, the first spray to be given at the time of flowering, followed by fortnightly intervals. Grain mould of coriander has been controlled by spraying Carbendazim 0.1%, applied 20 days after grain set.

A quick look into the research achievements made under the Project in the recent past have enabled us to select the most important technologies which are already ready for transfer and a few are listed below:

1. Thirty eight varieties released for high yield/quality; 14 more being proposed for release; the varieties include contribution from NRCS, ICRI etc. also;
2. Technology for raising 'Eush pepper' in pots;
3. Use of IBA 1000 ppm for better rooting in black pepper;
4. Control of foot rot disease (quick wilt) of black pepper by phytosanitary practices; prophylactic spraying & drenching with 1% Bordeaux mixture;
5. For better germination of cardamom seeds by scarification for 10 minutes in 25% Nitric acid;
6. Azhukal and capsule rot of cardamom controlled by spraying 1% BM;
7. Thrips of cardamom controlled by spraying Monocrotophos (0.05%) in May; followed by Phosalone 30-40 days later;
8. Optimum seed rhizome size 20-25 g (with 2 buds) for ginger;
9. Ginger collection of SG 547 (from Solan) moderately resistant to rhizome rot;
10. Seed rhizome treatment with Dithane M45 (0.25%) & Bavistin (0.1%) reduced rhizome rot of Ginger both in field and storage;
11. Mother rhizomes, 25-30 g pieces ideal for seed material in turmeric;
12. Cumin EC 109635 highly resistant to wilt pathogen; useful in breeding;
13. Three year crop rotation, application of neem cake and seed treatment with Bavistin + Captan reduced wilt in cumin;

14. Powdery mildew diseases of cumin, coriander, fennel & fenugreek controlled by spraying Karathane or Sulfax;
15. Sowing during first fortnight of November best for seed spices;
16. Root rot of coriander & fenugreek controlled by drenching Bavistin (0.1%);
17. Leaf plucking up to 50% foliage in coriander when crop is 60-75 days old gave economic (total) returns.

**Planting material :**

A very important item in improving the productivity of spices has been the production and distribution of adequate quantities of elite planting material and we have with us today about 50 varieties of various spices which have capacities for high yielding, better quality and in some cases tolerance to diseases and pests. I am glad to inform you that a Group Discussion on this important activity will be held at this venue tomorrow. The Coordinating Centres under the Project have the moral responsibility to produce and make available the nucleus planting material for this activity. It will be the endeavour of the District Agricultural Farms or District Seed Farms to take up further multiplication and ensure timely distribution of seed-kit to the farmers. We also made an effort to survey the tree spices areas in Tamil Nadu and Kerala to enlist some of the problems faced in growing of these crops; they are:

1. Inadequate availability of elite planting material;
2. Lack of adequate market support price & the role of middle men;
3. Factors like wind damage, sparseness of foliage, drought, malnutrition etc;
4. Inadequate financial support for specialised facilities like drip irrigation.

Since we spend approximately Rupees 25 crores of foreign exchange every year to import clove, nutmeg, etc., it will be necessary to take up intensive research efforts on tree spices and the scope of this AICRP may be extended to cover this group as well.

It is also my duty to bring to your knowledge, some of our weaknesses like frequent transfer of Scientists in the Project work, non-performance of some of the Centres due to long term vacancies & absence of the Scientists in Group Meetings & Research Workshops like this, non-availability of sufficient germplasm base especially in seed spices, to mention a few.

It is indeed a matter of great pleasure that we have with us the Hon'ble Chief Minister of Kerala, the Hon'ble Minister for Agriculture, Government of Kerala as well as several Senior Officials from almost every State interested in Spices Research & Development besides the Directors from ICAR Institutes, Development Departments and the Secretariat of the Government of Kerala. We are eagerly looking forward to listen to the advice from the VIPs and it is hoped the deliberations during the next three days will enable a fruitful interaction and lead to increased importance given to spices research, by way of physical and financial allocations from the Governments.

THANK YOU

**INAUGURAL SPEECH BY SHRI K KARUNAKARAN**  
**Hon'ble Chief Minister, Government of Kerala**

My colleague Mr. P.P.George, Minister for Agriculture, Dr. K.L.Chadha, Deputy Director General, ICAR, Dr. S Edison, Project Coordinator, Dr.Ramadasan, Director, NRCS, Ladies & Gentlemen,

It gives me immense pleasure to be with you at this important national meet. I am aware that this august audience consists of Scientists, working under the All India Coordinated Research Projects on Spices, ICAR Institutes like the National Research Centre for Spices, Calicut, Central Plantation Crops Research Institute, Kasaragod and its Oil Palm Research Centre at Palode, Central Tuber Crops Research Institute, Trivandrum, officials from the Kerala Agricultural University, Heads of Departments of Agriculture and Horticulture from the Governments of Kerala, Tamil Nadu and other states. I am certainly thankful to the organisers for choosing Trivandrum as the venue for this important All India Conference on Spices Research. The group of spices and condiments, viz., black pepper, cardamom, ginger, turmeric, cumin, coriander, fennel, fenugreek and large cardamom are so vital and important to the economy of our country and Kerala in particular. I am aware that we produce about 18 lakh tonnes of spices and export only 1 lakh tonne every year. The export earning is at an average of about Rs.280 crores per annum. The share of Kerala in realising this earning of foreign exchange is phenomenal and we are proud of the same.

Our country had a pre-eminent position in the world trade of spices until three decades ago, but the same has started declining in view of the heavy competition from countries like Brazil, Guatemala, Indonesia, Malaysia etc.

However, the principal spices viz., pepper, ginger and cardamom are grown to a large extent in Kerala occupying an area of 1,57,000 ha, 14,200 ha and 64,550 ha respectively. Besides, this state also grows tree



spices like nutmeg, clove and cinnamon. Turmeric is also grown to a limited extent in an area of 3,080 ha. The productivity of most of these spices have been unfortunately very low, thereby promising a scope for its further development and increase. A look into the total export earnings from the spices indicate that about 75% of the amount, viz., Rs.200 crores is earned by contribution from Kerala alone. This is in addition to the export earnings by us from cashew, tea and other plantation crops.

I am informed that the Indian Council of Agricultural Research has been operating a network of All India Coordinated Research Projects since 1957 which is essentially to take care of the specific research requirements of various agro-climatic regions by way of conducting adaptive trials, to develop agro-techniques multilocation trials to identify new varieties, evolving control measures for pests and diseases, attending to post harvest problems etc. It is our fortune that there is such a project on spices which was initiated in 1971 in Kerala. The All India Coordinated Research Project on Spices has been located at the 'National Research Centre for Spices'. This has been an encouraging step taken up by the ICAR for the cause of spices research.

This Project has done an excellent service to increase the productivity of spices by various methods; a significant achievement under the project has been the development, promotion and release of different varieties of spices. To mention a few, Panniyur-2, Panniyur-3 and Panniyur-4 in black pepper and PV-1 in cardamom, Suprabha and Suruchi in ginger, Roma and Suroma in Turmeric. I understand that a large amount of seed material of these improved varieties have also been distributed by the various coordinating centres located in different states. I understand that there will be a special session on production and distribution of elite planting material of spices during the course of this Spices Workshop. Specific control measures against diseases and pests, irrigation and fertiliser schedules have also been developed and recommended.

The Coordinated network of Research Centres also have a wide array of germplasm holdings on all the mandatory crops viz., pepper, ginger, small cardamom, large cardamom, turmeric, cumin, coriander, fennel and fenugreek in the Centres located in the various Agricultural Universities. There has been an intensive activity of collection and exchange of germplasm between the University Centres and the National Research Centre at Calicut. This is a very healthy beginning of a process which will ultimately result in improving the productivity of the spices. It has been projected that yield level of 1300 kg/ha, 900 kg/ha, 11000 kg/ha, 14000 kg/ha, 1457 kg/ha, 1068 kg/ha could be realised from the black pepper, cardamom, ginger, turmeric, cumin and coriander respectively by intensive research efforts and the availability of high production technologies. However, the important problem remains to be production and distribution of adequate quantities of elite planting materials.

There is also a need to sort out and settle some of the chronic problems and production constraints like foot rot disease and slow decline of black pepper, 'katte' and root grub problem in cardamom, rhizome rot in ginger and turmeric both in field and storage, wilts, root rots, mildews, and blights for the seed spices. There is also an urgent need to arrive at a minimum floor price and arrest the price fluctuation especially in ginger and cardamom. There is also a need to intensify our activities on ensuring better quality of spices, production of value added spice products, restriction of residues in the produce etc.

The recent changes in trade policy have created a congenial atmosphere for a sustained increase in the export of spices. However, there has been a feeling that the full export potential has not been tapped by the farmers. I would request you to apply your mind and suggest how the farmer can derive the maximum benefit from the opportunities that have arisen.

Taking an overall view, it is the responsibility of all research and development agencies to tackle the production constraints of spice crops with greatest earnestness and extend the research achievements to the practical advantage of the farmer. Transfer of technology is the need of the hour and I am highly optimistic that the deliberations during today and the next two days will be really productive and fruitful in planning and reshaping our future strategies.

It has been informed that adequate funding has not been possible for spice research and I appeal to the learned guests here to work out specific strategies and demand for more funds for spices research. I assure you that my Government always stands by the recommendations of learned bodies like this.

I am extremely happy to meet all of you from different parts of the country; I am sure that you will pool your wisdom and experience to solve various problems facing the farming community involved in spices. On behalf of the Government of Kerala, I extend to all the distinguished delegates a very happy welcome. I am sure that you will enjoy your stay here.

Last but not the least, it is my pleasant vision and desire that a National Spices Research Institute or perhaps an International Institute is shortly opened in Kerala. I wish all the success in your deliberations. I formally declare this Workshop inaugurated.

JAI HIND

**PRESIDENTIAL ADDRESS BY SHRI P P GEORGE**  
**Hon'ble Minister for Agriculture & Animal Husbandry**

Honourable Chief Minister Shri Karunakaran, Dr. Chadha, Dr. Edison, Distinguished Scientists, Extension Personnel, Ladies & Gentlemen,

I consider it as my privilege to preside over this Conference in which Scientists and extension personnel from the various States are participating. I have great pleasure to preside over this meeting in the presence of our Honourable Chief Minister Shri K Karunakaran whose commitment towards the development of Agriculture on scientific basis is inspiring. His presence adds importance to this meeting in which eminent agricultural Scientists and experts from all parts of India are deliberating on the plans and prospects of the development of spices in which the state of Kerala stands out with its glorious traditions and high economic stake.

Kerala State blessed with its ideal soil and congenial climate is known as the "Spices garden of India". Hence it is only in the fitness of things that the organisers have chosen this small and beautiful state as the venue for this function.

Spices play an important part in human dietary and they impart agreeable flavour and aroma to food and add greatly to the pleasure of eating. Apart from the culinary uses, spices are flavouring agents in beverages, active ingredients in ayurvedic medicines, colouring agents in textiles and important constituents in cosmetics & perfumes. Some spices have from ancient times been used for sacred offerings.

There are however, significant shifts in the consumption pattern with the food service industry becoming more important. Spices are predominantly used in the processing of meat, fish, vegetable products, bakery goods and other prepared foods. In many countries, the meat

industry is by far the largest consumer of a wide range of spices. Spices are largely of tropical and Asian origin. Search for spices by the European explorers led to the discovery of new continents and waterways. Earlier commercial ties had existed between India and the Middle East countries for the trade in spices.

India occupies a dominant position in the world trade of spices. It has been estimated that the total area under cultivation of various spices such as pepper, cardamom, ginger, clove, nutmeg, chillies etc. is about 2 million hectares and the production is about 1.8 million tonnes. We also export about 1.2 lakh tonnes valued at Rs.3000 million per year. Our small state of Kerala is responsible for the lion's share of the export earnings from spices. The principal pepper growing state in the country is Kerala which accounts for 97% of the area under the crop. Similarly about 60% of the cardamom production in the country is accounted for by Kerala. Ginger is grown in almost all the states. However dry ginger for commercial purpose is produced mainly in Kerala which accounts for 30% of the area under cultivation of this crop in the country. Clove, nutmeg and cinnamon which are often collectively referred to as tree spices are grown in the southern states of Kerala, Tamil Nadu & Karnataka. Organised cultivation of cinnamon on a plantation scale is prevalent only in Kannur district of Kerala.

The main problems we encounter are low productivity of crops, fatal diseases of certain crops, high cost of production and insufficient post-harvest technology. The average productivity of pepper in India is reported to be around 280 kg/ha, as against 550 kg in Indonesia, 1200 kg in Brazil and 1575 kg in Malaysia. Regarding cardamom, compared to India's productivity, it is estimated that yield per ha, in Guatemala is over 200 kgs. The chronic & grave disease problems such as foot rot in pepper, soft rot in ginger etc. are to be solved. High yielding varieties coupled with disease resistance are to be evolved. It may be seen that the task ahead of the scientists and extension personnel in tackling the problems of spice production are ardent and challenging.

Kerala is fortunate in having the headquarters of the National Research Centre for Spices at Kozhikode and the All India Coordinated Research Project under ICAR. This Project is doing excellent service to increase the spice production. The research activities of Kerala Agricultural University, CPCRI, RRL are also commendable. The part played by Spices Board in the development of spices is important. The role of the Department of Agriculture in popularising the results of research among the farming community is equally important.

In due recognition of this aspect, the State Department of Agriculture has programmed to launch this year an integrated programme for development of pepper through 'Kurumulaku Samrakshana Samithies' constituted for this purpose. The state is also implementing an Integrated Programme for Development of Spices in collaboration with the Directorate of Cocoa, Arecanut & Spices Development at Kozhikode with a total financial outlay of Rs.369,275 lakhs, fully financed by Govt. of India.

I feel extremely happy in having got an opportunity to meet the Scientists, administrators and experts from various states who have assembled here for a three-day deliberations on the research and other development strategies on spices in our country. I only want to remind you Scientists that agricultural technology should intellectually be satisfying and economically rewarding in order to attract and retain youth in farming and related activities. A hearty welcome to one and all. I wish this function all success.

Thanking you,

JAI HIND

Technical Session I : ACTION TAKEN ON THE  
RECOMMENDATIONS OF THE  
X WORKSHOP

Chairman : DR K L CHADHA

Rapporteur : DR S EDISON

Technical Session I : Action taken on the recommendations of the X Workshop and the previous Workshops.

1. No. of papers presented: The Project Coordinator presented the report on the action taken by him on the recommendations/decisions made during the X Spices Workshop, held at Coimbatore as well as the previous two Workshops held at Guntur and Solon.
2. Centres where work was done : 14 Centres
3. Non-performing Centres : Nil if any
4. Brief description of the work done as well as results reported :

The status on action taken on the decisions made during the X Workshop (conducted at Coimbatore during August 22-24, 1989) was presented. The annual report for the period 1989-90 and a document on Research Achievements 1985-90 were also made available to the participating Centres in addition to the regular yearly Research Highlights (1990-91) of AICRP on Spices. A document entitled 'Workshop input document' was prepared compiling all the informations on the up-to-date progress of research on various experiments and presented to the delegates attending the XI Group Meeting.

The above reports were discussed in detail during the various Technical Sessions and the action taken pertaining to Technical Session-I are appended.

In addition, the following general recommendations/decisions were also made in the Session:

- 1) A joint exploration for genetic resources should be taken up at NRCS, TNAU, KAU and UAS (under the Chairmanship of Dr. M Aravindakshan) to work out strategies for the same (time limit 2 months).
- 2) Spices Board's Research activities have to be limited to cardamom only.
- 3) The redeployment of Breeder from Pampadumpara to Ambalavayal to work on Black pepper is to be decided.



- 4) It was noted that performance of the Chintapalli centre has improved.
- 5) Physical facilities for conducting experiments on drip irrigation on cardamom may be provided by the ICAR.
- 6) Details on high yielding varieties in cardamom is to be worked out by NRCS, Appangala Centre.
- 7) Results of experiments on drought tolerance in cardamom as well as that of the Biochemistry & quality analysis of seed spices, ginger and turmeric may hereafter be reported in the technical session on "Crop Improvement".
- 8) Lead centre concept for seed spices was approved for Jobner Centre. It was suggested that the Jagudan centre can be considered for lead centre on cumin and fennel, while Jobner will continue to be the main centre for coriander and fenugreek work.

5. Recommendations ready ) Given under individual  
for transfer of ) Sessions  
Extension Agency )  
if any )
6. Programmes proposed ) Details are given under  
for the next year ) individual Sessions.

ACTION TAKEN ON THE RECOMMENDATIONS OF THE X WORKSHOP ON SPICES  
HELD AT COIMBATORE DURING AUGUST 22-24, 1990

CHAIRMAN : DR K L CHADHA    ::    RAPORTEUR : DR S EDISON

Decision

Action taken/remarks

1. GENERAL

1. Four varieties in black pepper viz., two from NRCS, Calicut and two from Pepper Research Station, Panniyur, two varieties of turmeric (both from NRCS) and two varieties of coriander (both from Regional Agricultural Research Station, Guntur) were recommended for release.
2. A team of Scientists from NRCS, ICRI, KAU TNAU, UAS(B) will work out a strategy for survey and collection of wild types of cardamom & pepper from the forest areas in Kerala, Tamil Nadu, Karnataka and North Eastern States.

Out of the eight varieties recommended for release, seven have been released by the duly constituted State/Central Varieties Release Committees. Panniyur-2, Panniyur-3 and Subhakara in black pepper, Suguna and Sudharsana in turmeric and Sadhana & Swathi in Coriander have been released. The variety Sreekara in black pepper is under consideration of the Variety Release Committee.

Dr. M Aravindakshan, Director of Research, KAU was requested to conduct a meeting to resolve the issue and identify priorities as well as suggest the action to be taken by individual agencies.

3. The survey and collection of germplasm in Cardamom and black pepper from the evergreen forests of Western Ghats will be a collaborative programme among NRCS and KAU. A group meeting may be organised by XAU and NRCS to work out the strategies.
4. New promising accessions from Jobner Centre should be exchanged immediately to Jagudan centre for screening against Fusarium wilt.
5. The Project Coordinator would discuss the issue of overlapping of research programmes of the Spices Board with the Director, CPCRI shortly.
6. Project Coordinator may ensure that exchange of planting material is completed and sufficiently early so that the multilocation trials will not suffer due to non-availability of planting material.

Same as in item No."2" above.

The exchange has been made.

The DDG mentioned the research component on Spices will be taken up by the ICAR system. However, the research on cardamom which was already initiated by the Spices Board at ICRI, Myladumpara during 1978 would continue.

This has been ensured by the Project Coordinator. However in the case of Pampadumpara centre, the Centre has not lifted the planting material for three years from the participating Centres. The Associate Director has promised that this deficiency will be rectified immediately by taking up the planting of the experiment during August 1991 planting season.

7. The continuance of Pampadumpara centre under the AICRP on Spices will be discussed with the authorities of KAU at a later date.

8. A Committee under the Chairmanship of Dr. A. Kamadasan will study the details of evaluation of quality parameters in turmeric and finalise necessary guidelines for future quality analysis.

9. Cost : benefit ratio should be worked out while concluding the experiments. The results should be tested in "on farm trials" in farmers holding before it is recommended for adoption. The funds allotted for the respective centre will have to be utilised for this.

10. The need for taking up research programmes in Biofertilizers in spice crops was emphasized. The interested centres may consult the Professor & Head, Department of Microbiology for taking up observational trials. The cultures required will be supplied by the Department of Microbiology, Tamil Nadu Agricultural University. The Project Coordinator (Spices) will interact with TNAU, in formulating suitable programmes in seed spices and pepper.

The performance of the Centre is being closely monitored and during the Trivandrum Group Meeting, a sincere effort was made to project its progress. Three of the four Scientists under the Scheme at Pampadumpara have participated in the Workshop. The Centre also proposed for release a variety in cardamom and which has since been recommended for release.

The information has been compiled and communicated to all the Coordinating Centres well in time. The Director, NRCS has agreed to take up the evaluation of turmeric samples from the Coordinating Centres.

All the Centres have been advised about this requirement and requested to provide necessary data especially for the technologies which are recommended for transfer to the farmers.

A training programme was conducted at the Departments of Plant Pathology & Microbiology at TNAU, Coimbatore with participation from Coimbatore, Panniyur & Sirsi Centres. Necessary stock cultures of biofertilizers and biocontrol agents were supplied to the participants. Pot culture studies have already been initiated in all these Centres.

11. Biological control of Phytophthora foot rot disease of black pepper by use of antagonists as well as rhizome rot of cardamom may be taken up.

12. It was decided to have a thorough discussion about the Entomology Project and formulate new technical programmes.

13. The biochemists at Jobner will analyse the coffee/pepper samples of Jagudan & Guntur Centres also.

14. The Chairman of the Plenary Session expressed the necessity for initiating seed technology research on seed spices especially on the aspects like seed storage, seed health and viability.

15. The new multilocation trial on cardamom initiated during 1987 has been laid out in all the Coordinating Centres excepting Pampadumpara.

The work has been initiated at Chintapalli, Penniyur & Sirsi Centres; the Mudigere Centre has also started similar work with rhizome rot of cardamom.

The technical programmes for the four experiments in Entomology at Mudigere & Pampadumpara centres were discussed in a Seo group meeting at Trivandrum and the revised programme approved in the Workshop. It has been decided to take up work on black pepper also at Mudigere and Pampadumpara centres. The programmes were further discussed at the Group Discussion of Entomologists at Lucknow during August 12-13 and were approved.

The Biochemist at Jobner has been requested to ensure the facility for Jagudan & Guntur Centres.

The Project Coordinator will take up the matter with the Head, Department of Seed Technology, TNAU and work out further details.

The matter has been taken up at the highest level and a letter issued by the ICAR to the Vice Chancellor, K.U. In addition, a few more experiments are still pending to be laid out at the Pampadumpara Centre. The ADG made a joint visit to the Centre with Project Coordinator during March, 1991 and reviewed the progress. The Associate Director-in-charge of the Pampadumpara Centre appreciated the situation and promised necessary corrective measures in this regard.

16. There is a need to redistribute the technical session subjects on Biochemistry, Physiology & Quality analysis.

## II. SPECIFIC ITEMS, CROP-WISE

### A. Black Pepper

17. The Scientists from Sirsi Centre, may visit CPCRI-Regional Station, Vittal along with the Project Coordinator and Agronomist/Soil Scientist from CPRI/NRCS and fix base the technical programme for the newly laid out irrigation cum-fertilizer trial for pepper.

18. The methodology for the use of systemic fungicides in plant disease control may be communicated to all pepper centres for adoption.

19. An altogether new programme for the control of Phytophthora disease has been advised to be developed under the Chairmanship of Dr. P. Jayarajan, Professor & Head, Plant Pathology, TNAU; the same will be presented in the concerned Technical Session.

Henceforth these aspects discussed as part of the Technical Session on Crop Improvement.

The joint meeting was held at CPCRI Regional Station, Vittal and the technical programme finalised and communicated to the Sirsi Centre. The programme has since been implemented.

This aspect was further discussed at the "Group discussion of Plant Pathologists working in the Coordinated Projects of Horticultural Crops" held at Bangalore during June 1990 and the relevant suggestions communicated for adoption. The Centres have taken action accordingly.

The programme was discussed in detail by an expert group during the "Group Discussion of Plant Pathologists Working in the Coordinated Projects of Horticultural Crops" at Bangalore and the technical programme communicated to all the Coordinating Centres. Centres have taken action accordingly.

20. The survey for wild germplasm at Anjiri Pradesh and Kerala centres for turmeric and black pepper respectively may be speeded up.

21. Ambalavayal Centre of KAU will be a cooperating centre of AICRP on spices and a Breeder from Pampadumpara centre may be re-employed to look after the MLT of pepper at Ambalavayal.

22. The MLT involving promising cultures of black pepper from Panniyur may be laid out at NRC, Sirsi and Yercaud also.

23. The Chintapalli Centre is identified as a non-performing Centre. The Project Coordinator (Spices) will critically review the progress of research project at Chintapalli Centre and submit a report to the ICAR.

The Chintapalli Centre has initiated activity on wild germplasm of black pepper and added five entries. The Panniyur centre has taken up survey for wild germplasm of black pepper in Karnataka and Kerala and added about 12 new entries.

The KAU has deployed an Associate Breeder at the Ambalavayal Centre to take up multilocation trials on Black pepper.

The list of promising cultures from Pepper Research Station, Panniyur and NRC, Calicut have been identified and communicated to the Panniyur and Sirsi centres; the Yercaud centre may take up programme on black pepper during the next planting season and also add black pepper to their mandate. This was approved in the Trivandrum Group Meeting.

The Project Coordinator visited the Chintapalli centre and provided a critical review on the performance of the Centre to the ICAR headquarters. The Centre has progressed in its performance and has also started programmes on ginger and turmeric on a voluntary basis.

## B. Cardamom

24. The screening for 'Katte' resistance should be restandardised and the testing conducted in a sick-plot.

25. A new combining ability study proposed for the Mudigere Centre may be shelved.

26. The mutation breeding programme on cardamom may be taken up by NRCS.

27. The experiment on drip irrigation, weed control and mulching planned to be initiated during 1988-90 in consultation with Director, W.T.C., TNAU.

28. Efforts will be made to collect the reported high yielding clones from Plantations of Manjusree Estates, AVT and Hindustan Levers.

29. Experiments on effect of irradiation, mutagenesis and combining ability in cardamom may be de-linked from the coordinated project and may be taken as a University Project.

This has been taken up at Mudigere centre.

The Centre has since been informed and has complied with the decision.

The work has been initiated at NRCS.

The necessary physical facilities for drip irrigation will have to be provided under the Project funds in the VIII Plan. The three agronomic experiments will be initiated during 1991 in consultation with the ADG (PC). The Project Coordinator, Dean (Horticulture), TNAU and the ADG (PC) may visit the Mudigere Centre and finalise the programme.

The clones have been collected.

All the cardamom centres have been informed about this development and they have since complied with the decisions.



30. Observational trials with natural products like Digitalin and Pitin which induce resistance may be tried in cardamom.

31. Studies to induce somaclonal variants through tissue culture to obtain 'Katte' resistant types may be intensified at NRCS and ICRI.

32. Treatments and methodology of drought screening experiment in Cardamom will be finalised after the meeting of the Plant Physiologist, ICRI, Kasaragod will be utilised while formulating the programme on drought. Shri Guruswamy, Jr. Plant Physiologist should visit NRCS, Calicut during September, 1989 for finalising the programme.

#### C. Large Cardamom

33. Yield loss studies in large cardamom due to leaf streak disease, severity of the disease as well as response of Topsin and Carlemdazim may be taken up at Gangtok.

The Mudigere Centre has taken up this programme under glass house conditions.

The programme has been taken up at NRCS, Calicut/Appangaia and at ICRI, Myladumpara

The Physiologist from Mudigere Centre had visited NRCS for detailed discussion; he also discussed the programme with Dr. V. Rajappa at ICRI, Kasaragod and finalised. The revised technical programme was again discussed at Calicut and communicated to the Mudigere Centre for follow up action. The experiment has been laid out as per the decisions taken at Calicut.

Yield loss studies have been done in a compact block in the Research Station.

#### D. Ginger

34. It is necessary to introduce low fibre ginger varieties to the Coordinating Centres for evaluation. The Solan Centre will supply the low fibre varieties to all the Coordinating Centres. Import of exotic germplasm from Indonesia may be arranged through NBPGR.

35. The Project Coordinator will convene a Meeting of Expert Committee to finalise an alternative new management trial to control rhizome rot of ginger.

#### E. Turmeric

36. The samples of turmeric from the Coordinating Centres may be sent to the Joint Director, NRCS with adequate basic information through the Project Coordinator.

37. It was decided to standardise the sampling procedures for curcumin analysis in turmeric as well as loss of curcumin during storage.

The NBPGR has been requested, again to obtain the material from exotic sources; a comprehensive list has been provided to the Project Coordinator by the NBPGR. The matter will be further pursued with the NBPGR.

In the "Group Discussion of Plant Pathologists Working in the Coordinated Projects of Horticultural Crops" held at Bangalore during June 1990, detailed discussions were conducted and the revised technical programme communicated to all the Centres under the programme. The programme has been taken up accordingly.

Uniform procedure for sending of turmeric samples have been communicated to all the Centres. Analysis has been done by the Scientists at NRCS.

The detailed procedure has been sent to all the five centres under Turmeric. The studies on loss of curcumin during storage has already been taken up at Solan Centre.

## F. Seed Spices

38. There is a need to enhance the activity of import of germplasm of seed spices from Mediterranean countries and West Europe. NBFGR will be further pursued to help import of exotic germplasm in seed spices.

39. The Project Coordinator (Spices) will send a detailed report on the possibility of obtaining the available exotic germplasm at CIMPO to ICAR for further action. A team under the Chairmanship of Dr. S. Rajan, Project Coordinator (Spices) will prepare a proposal for "Advanced Centre for Genetic Resources in Grain Spices" and submit to ICAR.

40. The Project Coordinator will critically review the progress of work on grain spices at Jagudan centre.

The matter will be further pursued by the Project Coordinator.

The proposal has been sent to the ICAR headquarters by the Project Coordinator. This was also discussed with the Director, NBFGR. During the VIII Plan a "Lead Centre" will be created on seed spices at Jabner. The Jagudan Centre has requested for consideration of a portion of the work under lead centre to be allotted to it. The matter will be further discussed with the ICAR headquarters by the Project Coordinator.

The critical review was made about the performance of the Jagudan Centre; the Centre is making satisfactory progress.

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Technical Session II : GENETIC RESOURCES

Chairman : DR E.V.V.BHASKARA RAO

Rapporteurs : Mr. B KRISHNAMCORTHY  
Dr. K.K.JBRAHIM

Technical Session II : GENETIC RESOURCES

1. Number of papers presented : All the Centres presented the reports except Gangtok
2. Centres where work was done : 14 Centres; 9 Crops
3. Non-performing centres, if any : Nil
4. Brief description of the work done and salient results reported :
  - i) Black pepper : Panniyur has 200 collections; Sirsi 175 including 15 wild accessions and 17 cultivated and 19 wild germplasm accessions at Chintepalli Centre. Among the wild germplasm collected at Chintepalli, 'Chittempadu' and 'Madem Acc. No.9' were superior.
  - ii) Cardamom : Mudigere, Pampadumpara & Yercaud have 245, 71 and 35 accessions respectively. In Yercaud, the local Malebar and local Mysore types exhibited better performance.
  - iii) Ginger : Pottangi has 740 and Solan 192 collections; SG-547 has shown good performance at Solan.
  - iv) Turmeric : Pottangi has 185, Solan 157, Jagtial 80 & Coimbatore 105 entries.
  - v) Seed spices : In cumin, Jobner has 219 and Jagudan 167 collections; in coriander, a germplasm collection of 441, 278, 126 and 120 at Jobner, Jagudan, Coimbatore and Guntur respectively is being maintained. A germplasm collection of 130 and 170 in fennel are being maintained at Jobner & Jagudan centres; they have 171 and 134 fenugreek collections, followed by Coimbatore with 84 and Guntur 70 accessions.

RECOMMENDATIONS/DECISIONS :I. Black pepper :

- 1) The descriptor list finalised by the NRCS may be uniformly adopted by the Centres for collection of data as well as for description.
- 2) Chintapalli centre has presented the data on the good performance of Panniyur-1 at high elevation. The identity of Panniyur-1 and the yield data may be scrutinised.
- 3) The wild pepper collections made by different Centres may be collected by NRCS and established at Appangala centre as a National Gene Bank for Wild Pepper Collections.

II. Cardamom :

For assessing the performance of individual clones, annual sucker production per plant may be used as one of the criteria.

III. Ginger :

- 1) Pottangi Centre has presented data on the incidence of soft rot disease in some of the accessions. It was decided that hence-forth screening for the diseases and pests in the germplasm need to be recorded only at such centres where the incidence is severe.
- 2) Screening of the germplasm against soft rot is also in progress at Solan. The possibility of fixing threshold value for the inoculum in the field may be determined.
- 3) As maintenance of live collections in ginger is difficult due to incidence of soft rot disease, in vitro conservation may be standardised by the NRCS.

IV. Turmeric :

Pottangi centre may modify the classification of Curcuma longa and Curcuma aromatica types listed by them. Chromosome number may be used as an additional criteria for distinguishing longa and aromatica types.

V. Seed spices (Coriander, Cumin, Fennel & Fenugreek) :

- 1) All the Centres reported low variability in the indigenous collections. It is suggested, in order to avoid the same accessions being repeatedly collected and evaluated, the collection programme may be defined in terms of the collections to be made by the different Centres.
- 2) Mutation breeding programme may be initiated for inducing variability.
- 3) The exotic germplasm accessions obtained in Coriander and Fenugreek by Jagudan Centre may be multiplied and made available to other Centres.

VI. Large cardamom :

ICRI, Myladumpara may consider establishing a national gene bank in large cardamom collections.

GENERAL DECISION ON GERMPLASM COLLECTION AND EXCHANGE

1. The NRCS, Calicut will establish a National Gene Bank for pepper, ginger, turmeric and tree spices.
2. ICRI, Myladumpara will establish a National Gene Bank for cardamom and large cardamom.
3. The wild pepper collections will be conserved by the NRCS at Appangala/Calicut.
4. The following Centres will be alternative Centres for germplasm:

Black pepper	-	Panniyur
Cardamom	-	Appangala
Wild pepper	-	Ambalavayal
Ginger and Turmeric	-	Pottangi

5. The accession numbers assigned by the National Gene Bank will be uniformly followed by all the Centres. However, it will be ensured that, under the source column, the original number assigned by the collector will be retained in the National Gene Bank. A catalogue of available collections in National Gene Bank may be published and circulated to all Centres/Workers.
  6. In the minor spices, national collections will be maintained at Jobner and Jagudan, while Guntur and Coimbatore will serve as alternate Centres.
  7. NRCS will organise the expeditions for germplasm collections in collaboration with the NBPGR and the Coordinating Centres.
  8. The National Gene Banks identified will also be responsible for supply of accessions to other Centres for utilizing in their breeding programmes.
  9. The request for germplasm should clearly specify accession number or the characters desired.
  10. When the varieties being released are from the germplasm collections obtained from other Centres, due credit should be given to the original collectors or Centres.
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5. Recommendations ready for transfer to extension agency, if any : Nil
  6. Programme proposed for the next year :
    - a) Ongoing experiments : Continuing the ongoing programme
    - b) New experiments : Nil

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Technical Session VI : VARIETY RELEASE

Chairman : DR M ARAVINDAKSHAN

Rapporteurs : Dr. N KUMAR  
Mr. A MANOHAR RAO

Technical Session III : CROP IMPROVEMENT, PHYSIOLOGY  
& BIOCHEMISTRY

1. Number of papers presented : 40
2. Centres where work was done : 14 centres
3. Non-performing centres if any : Nil
4. Brief description of the work done and salient results reported :
  - i) Black Pepper : At Panniyur, Culture No.331 has consistently recorded maximum mean yield followed by 239. Of the 343 seedlings of pepper, Culture No.5128 and 1558 are the best.
  - ii) Cardamom : The variety PV-1 of cardamom is performing well in most of the location tested. It is being proposed for release. The ICRI has proposed MCC-49 & MCC-61 for release as varieties.
  - iii) Large Cardamom : Cultivar 'Pink Galsey' recorded the highest yield in the CYT of high yielding clones in large cardamom.
  - iv) Ginger : In the MLT of ginger at Pottangi, selection V<sub>1</sub>K<sub>1</sub>-3 has out yielded all the other lines, hence it may be recommended for release.
  - v) Turmeric : PTS-28 and PTS-9 are superior along with Roma in the CYT of turmeric selections at Pottangi.
  - vi) Seed spices : The coriander CS-2 has out yielded other selections in the CYT at Guntur. Evaluation of 14 M2 lines in Coriander indicated significant variation between progenies for plant height, days to maturity, number of umbellates per plant etc. The cumin MC-43-73 has registered 10.4% high yield than the released variety Guj. Cumin-1 in the MLT. This variety may be recommended for release.

RECOMMENDATIONS/DECISIONSI. Black pepper :

- 1) The old MLT in Panniyur Centre may be closed.
- 2) Project Coordinator is to review the work and suggest new MLT for Panniyur Centre.
- 3) Accession number has to be specified when using the names of the cultivars.
- 4) A new MLT on pepper with released varieties from NRCS and Panniyur may be laid out at Ambalavayal and in all Cardamom Centres viz., Mudigera, Yercaud and Pampadumpara. Central State Farm, Aralam may be considered as another location for the experiment. The NRCS & Panniyur Centre will supply the planting material, Coordinated by the Project Coordinator.
- 5) Research on tree spices may be included in the AICRP on Spices. Horticultural Research Stations, Yercaud & Pechipareai may be a voluntary centre for black pepper & tree spices.

II. Cardamom :

- 1) The CYT (1984) in Yercaud may be closed. A Committee consisting of the following will develop viable research programmes on cardamom and tree spices for the Centre:
 

Dr. P Rethinam	Dr. S Themburaj
Dr. I Irulappan	Dr. S Rangeswamy
Dr. S Edison	Er. P B Pillai
- 2) A decision regarding the AICRP programmes in Pampadumpara Centre (KAU) will be taken by ADG (FC) in consultation with Vice-Chancellor, KAU.
- 3) A proposal for the release of FV-1 will be submitted by the Pampadumpara Centre. The ICRI (Spices Board) will support this with their yield data.
- 4) The high yielding cardamom selections developed at ICRI may be included in the yield trials.

- 5) A new MLT (III) may be taken up in Mudigere and Pampadumpara.
- 6) In cardamom, though the plot size recommended is 12 plants, an 18-plant plot size may be adopted in a 6 (row) x 3 (plants) pattern. The plant population at Myladumpara and Pampadumpara will be 1600; and that in Mudigere, Appangala and Sakleshpur will be 3000.
- 7) The multiplication factor for Myladumpara and Pampadumpara will be 1440 and for Mudigere, Appangala and Sakleshpur it will be 2700.
- 8) In cardamom, Mysore and Malabar types are to be evaluated separately in separate yield trials.
- 9) 1) The MLT (1991) - (Malabar type) : with 13 entries of Cardamom selections as follows:

1.	CCS	872	)	
2.	CCS	893	)	Appangala
3.	CCS	800	)	
4.	CL	679	)	
5.	CL	683	)	Mudigere
6.	CL	726	)	
7.	SKP	13	)	
8.	SKP	14	)	Sakleshpur
9.	SKP	72	)	
10.	SKP	73	)	

Controls :

11. MCC-34 - Thadiyankudissai
12. Mudigere-1 (planting material will be supplied by Mudigere)
13. PV-1 (planting material will be supplied by Appangala)

Locations :

Appangala, Mudigere, Sakleshpur, Thadiyankudissai

ii) MLT - (1991) (Mysore type): with 5 entries of cardamom collections as follows:

1. MCC - 12 )
2. MCC - 21 ) Myladumpara
3. MCC - 85 )
4. SKP - 51 - Sakleshpur
- Control :
5. MCC - 61 ( Myladumpara)

Location :

Myladumpara, Sakleshpur, Appangala & Mudigara

### III. Ginger & Turmeric :

- 1) A proposal for release of ginger, V<sub>1</sub>K<sub>1</sub>-3 may be submitted by the Pettangi Centre.
- 2) The new MLT of ginger planted at Selin and Pettangi (1991) were approved.
- 3) The IET and CYT programmes on ginger and turmeric will be laid out in Selin Centre also.
- 4) The multiplication factor for estimating ginger and turmeric yields per ha based on 3 x 1 m beds (@ 40 plants/bed) will be 2010. Multiplication factor for estimation of ginger and turmeric yields per ha based on ridges and furrow will be 1,00,000 plants/ha. The minimum plot size should be 0.5 x 2 M<sup>2</sup> (@ 100 plants/plot).
- 5) The existing IET at Pettangi may be closed and a new IET may be taken up in turmeric.
- 6) From the MLT (II) at Pettangi, the two better performing varieties of turmeric may be proposed for release.
- 7) The new turmeric MLT (III) laid out during 1991 at Pettangi, Selin, Coimbatore & Jagtial is approved. The details of the entries are provided under new experiments.

- 8) The new ginger IET (15 entries) CYT (6 entries) and MLT (10 entries) will be laid out by Solan & Pattangi Centres as decided in the Sub-Group meeting. The details of the experiments are provided under new experiments.

#### IV. Coriander :

- 1) The MLT at Jobner may be closed as there is no significant difference between the treatments and the report submitted to the FC.
- 2) Lower doses of  $\text{Co}^{60}$  - irradiation may be used (2 - 15 KR) for mutation breeding of coriander.
- 3) The old multiloational trial in Guntur may be closed.
- 4) The Guntur Centre will provide seed material of CS-2 coriander to Jobner Centre (50 kg seeds will be sufficient for planting 2 ha). The Director of Horticulture, Rajasthan will provide land for the multiplication.
- 5) An ad-hoc scheme on mutation breeding of coriander will be prepared jointly by Coimbatore and Jobner centres & submitted to ICAR.

#### V. Cumin :

- 1) Proposal for release - MC-43-73 may be submitted by Jagudan Centre.
- 2) A new CYT may be formulated for both Jagudan and Jobner centres by the Project Coordinator (Spices), Dr. K.G. Mehta and Dr.K.K. Sharma.

#### VI. Fennel :

The existing MLT in Jobner will be continued for one more year..

#### VII. Fenugreek :

- 1) The existing trials will continue.
- 2) The work done at the Hisar Station (Voluntary centre) was commendable and appreciated by all. It may be made a regular co-ordinating centre in 8th Plan.



3. In turmeric and coriander varieties of different maturity groups (long & short) are to be evaluated in the same location and in separate yield trials.

Coriander : 100 days and less (short duration)  
above 100 days (long duration)

Turmeric : Up to 180 days (short duration)  
above 180 days (long duration)

4. The Project Coordinator (Spices) along with workers on seed spices will finalise similar standards and new multilocation trials.

Quality analysis :

5. The curcumin content is very low in turmeric at Solan. The samples may be sent to NRCS for rechecking.
5. Recommendations ready for transfer to extension agency, if any : Suitable varieties have been proposed for release in Session VI on Variety Release.
6. Programme proposed for next year :
- a) Ongoing experiments : The ongoing experiments will continue except the ones which were recommended to be closed.
- b) New experiments :
1. A new MLT on pepper with released varieties from NRCS and Panniyur may be laid out in all Cardamom centres viz., Mudigera, Yarcud and Pampadumpara.
  2. A new MLT (III) of cardamom selection should be taken up in Mudigera and Appangala.
  3. The IET and CYT programmes on ginger and turmeric will be laid out in Solan centre also.



4. The new MLT (III) on Turmeric has been laid out at Pottangi, Solan, Coimbatore and Jagtial centres. Entries included are PTS-9, PTS-19, PTS-38, Roma and Surema from Pottangi, ST-510 and ST 365 from Solan, Armeer from Jagtial, TC-2, TC-4 and BSR-1 from Coimbatore and VK-70.
5. An ad-hoc scheme on mutation breeding of coriander will be prepared jointly by Coimbatore, Jagudan and Jobner centres and submitted to ICAR.
6. A new CYT may be formulated for cumin for both Jagudan & Jobner centres by the Project Coordinator (Spices), Dr. K.G Mehta and Dr.R.K.Sharma.
7. As decided by the Sub group Meeting the IET with 15 entries, CYT with 6 entries and MLT with 10 entries in ginger will be attended by Solan and Pottangi Centres. The details of the experiments are details below:
  - a) Initial evaluation trial (IET) (Best 15 collections from the germplasm shall be studied along with local control)  
Design : RBD Replications : 2 Plot size : 3 x 1 m
  - b) Comparative yield trial (CYT) (Best 6 collections from IET shall be studied along with local control).  
Design : RBD Replications : 4 Plot size : 3 x 1m
  - c) Multilocation trial (MLT) 10 Entries ( $V_1S_1-7$ ,  $V_1-K_1-3$ ,  $V_1E_4-4$ ,  $V_1S_1-2$ , Suprabha, SG-646, SG-666, SG-547, Rajgarh Local and Moran).  
Design : RBD Replications : 3 Plot size : 3 x 1m

Observations to be recorded for the above trials :

- |                            |                             |
|----------------------------|-----------------------------|
| 1. Survival percentage     | 5. Leaf length (cm)         |
| 2. Plant height (cm)       | 6. Rhizome weight/plant (g) |
| 3. Number of tillers/plant | 7. Yield/plot (kg)          |
| 4. Number of leaves/plant  | 8. Calculated yield/ha (g)  |
|                            | 9. Disease incidence        |

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Technical Session IV : GROUP DISCUSSION ON PLANTING  
MATERIAL PRODUCTION &  
DISTRIBUTION OF SPICES

Chairman : DR. K L CHADHA

Co-Chairman : Dr. P RETHINAM  
Dr. S EDISON

Rapporteur : Mr. K G THOMAS

Technical Session IV : GROUP DISCUSSION ON PLANTING MATERIAL  
PRODUCTION & DISTRIBUTION OF SPICES

1. Number of papers presented : 5 papers - 5 agencies

RECOMMENDATIONS/DECISIONS :

i) Black pepper :

- a) In view of the massive damage occurring regularly to the pepper nurseries due to the incidence of fungal diseases, nursery techniques have to be streamlined and plant protection measures scrupulously followed to avoid the incidence and spread.
- b) The nucleus planting materials supplied from the research stations may be utilised to the extent possible for the multiplication programmes to ensure the quality of the materials.
- c) Nucleus planting materials produced by the NRCS and Agril. Universities may be restricted to the departmental nurseries alone for the present for further multiplication and distribution to farmers.
- d) Collection of planting materials (runner shoots) from the private gardens should be discouraged to the extent possible with ultimate aim to utilise quality materials alone for the multiplication programmes.

ii) Cardamom :

- a) Quality control should be ensured in planting material production especially in the certified nursery programme.

iii) Tree spices :

- a) Elite trees of clove and nutmeg identified by the NRCS alone may be used for collection of seed materials. Information in this regard should be made available to the development agencies by the Director, NRCS.

- b) Seedling progenies of nutmeg may be discouraged and vegetative propagation methods recommended by the NRCS should be utilised for the future planting materials production programme to ensure the production potential of the crop.
- c) Improved strains of cinnamon available at NRCS alone may be utilised for the planting material multiplication programme.

iv) Ginger, turmeric & chilli :

- a) Acute shortage of quality seed material of ginger being the major bottle-neck in the development of the crop, the research stations may draw up suitable seed multiplication programmes availing the facilities extended under the central sector programme.
- b) High yielding varieties of turmeric available may be utilised in the future planting programmes so as to replace the local types.

v) Seed spices :

- a) Agricultural Universities functionaries in the major seed spice growing states may formulate programmes for the production of foundation seeds to meet the requirements of mini-kit distribution programmes under central sector.

vi) General :

- a) The consensus on certified nursery programme was discussed in detail. The quality of planting material being the most important factor, it was suggested that the nucleus planting material supplied by the research station should be used to the extent possible.
- b) A comprehensive nursery programme may be formulated and submitted to NABARD for institutional finance.
- c) In the group meeting representatives from five State Departments/Organizations participated. It was decided that the views of other agencies concerned with programme may be obtained or another meeting convened for detailed discussions on the subject.

- d) The Coordinating Centres would provide periodical reports to the Project Coordinator (Spices) about the work done under this chapter.

2. Centres where work was done : 1) NRCS, Calicut  
2) ICAR (RC) for NEH Region  
3) Agril. Universities  
4) State Agril/Hort.Depts.  
5) Spices Board

3. Non-performing centres, if any : Nil

4. Brief description of the work done and salient results reported :

i) Black pepper :

- a) A regular rooted cutting production programme is in operation in 12 States and one union territory under central sector programme. Fifty-three lakhs rooted cuttings produced and distributed in 1990-91 and 57 lakhs programmed for the current year.
- b) Simultaneously, a nucleus planting material production programme is also under operation in the Agricultural Universities in Kerala, Tamil Nadu, Maharashtra and Assam and NRCS, Calicut, under the Central sector scheme. During the current year it has been programmed to produce three lakhs nucleus planting materials.
- c) Spices Board on an average produces 4 lakhs rooted cuttings through their departmental nurseries, 50 lakhs rooted cuttings through the certified nurseries and 3 lakhs rooted cuttings through Coffee Board demonstration farms annually.

ii) Cardamom :

- a) The Spices Board on an average produces 30 lakhs quality seedlings of small cardamom annually through their departmental nurseries and certified nursery programme. Similarly, for large cardamom 5 lakhs seedlings are produced and distributed annually.

iii) Tree spices :

- a) Elite trees of clove and nutmeg have been identified for collection of seed in the important crop growing regions by the NRCS.
- b) A regular nursery programme for the distribution of seedlings is in operation through the Department of Agriculture/Horticulture in the States of Kerala, Karnataka, Tamil Nadu, Goa and UT of Andaman & Nicobar Islands under the central sector scheme since V Plan. During 1990-91, 0.9 lakhs seedlings distributed and 1.5 lakhs seedlings are programmed for distribution during 1991-92.
- c) The Spices Board on an average produces 2000 seedlings annually. The Board is also having certified nursery programme for production of 50,000 nutmeg seedlings.

iv) Ginger, turmeric and chillies :

- a) The seed multiplication programme being implemented under central sector is expected to make available 150 tonnes, 200 tonnes and 3 tonnes of foundation seed materials of ginger, turmeric and chillies during the current year.

v) Seed spices :

- a) In the Agril. Universities in 11 major seed spices growing states, seed multiplication programme is in operation for the production of 50 tonnes of foundation seeds during the current year.

- 5. Recommendations ready for transfer to extension agency, if any : Quality seed materials obtained from reliable sources alone may be used for the future planting programme.
- 6. Programme proposed for the next year : The planting material production programme outlined also will be continued under centre sector with the participation of ICAR Institutes, Agricultural Universities and State Departments of Agril/Hort. with wider targets to meet the growing demand.

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Technical Session V : PLANT PROTECTION

1. Number of papers presented : Except ICAR Research Complex, Gangtok all the Centres participated & presented their reports
2. Centres where work was done : 9 Centres
3. Non-performing Centres if any : Nil
4. Brief description of the work done and salient results reported ) Scientists from various Coordinating Centres presented the present status and progress of work and were ) discussed at length.

RECOMMENDATIONS/DECISIONS :

A. PLANT PATHOLOGY

I. Black Pepper :

1. Foot rot management trial should be conducted as per the decision of Bangalore Group Discussions, June 1990.
2. Biological control trial may be modified with greater emphasis on the indigenous isolates from suppressive soils and use of organic amendments.
3. Package for generation of healthy planting material may be compiled and made available for the benefit of developmental agencies.
4. Pilot trials with newer compounds for controlling foot rot of pepper and biocontrol of nematodes with myco-parasites like Paccilomyces lilacinus may be taken up.

II. Cardamom :

1. Timing of fungicidal application against 'Azhukal' disease should be readjusted to give extended period of protection and different formulations as granular etc. be evaluated.

2. Complete interaction in the rhizosphere is to be studied to develop a system for bio-control of rhizome rot pathogen.
3. Mutation breeding work to isolate resistant and tolerant types against 'Ketto' virus may be continued.

### III. Ginger :

1. Rating scale should be uniformly adopted by all centres to score the severity of rhizome rot.
2. The progress of cess fund project on rhizome rot of ginger may be made available to PC (Spices) periodically.

### IV. Seed Spices :

1. Resistant sources may be short listed and donors may be utilised in breeding for resistance to wilt disease. This will be constituted as an elite nursery and given to all breeders concerned.
2. Fungicidal control trials should be conducted critically with correct target products with an emphasis on the spectrum of activity of fungicides.

### GENERAL DECISIONS

- 1) Team leader may be identified for each programme to knit the implementation and reporting the progress of identified research programmes.
- 2) A common record book with experimental protocols is to be given to each centres to record the data in various trials. At the end of season, the note book with complete data would be sent to the PI/PC.
- 3) All the programmes finalised in Bangalore Group Discussion (1990) should be implemented in conducting disease management trials.
- 4) New programmes should be developed based on common IPM principles by integrating cultural, agronomic, chemical and biological control practices. This IPM programme will cover diseases, insect pests, nematodes etc.



Technical Session V : PLANT PROTECTION

Chairman : DR. S NAGARAJAN

Co-Chairmen : Dr. K M RAJAN

Rapporteurs : Dr. M N VENUGOPAL  
Dr.(Mrs) C PARVATHI

Technical Session VI : VARIETY RELEASE

Chairman : DR M ARAVINDAKSHAN

Rapporteurs : Dr. N KUMAR  
Mr. A MANOHAR RAO

### B. ENTOMOLOGY

The two projects assigned to Pampadumpara and Mudigere Centres are running for the last 18 years. The effective insecticides were identified for the control and management of thrips and shoot & capsule borer.

#### New experiments in Entomology :

New Technical programme was drawn in a group discussion consisting of Dr. Nagarajan ADG (PF), ICAR, Dr. P Rethinam, ADG (PC), ICAR, Dr. S Feista (PC) Spices, Sri Devesahayam, NRCS, Smt. G Parvathi, RPS, Mudigere, Smt. Suma Paulose, KAU, Pampadumpara, Dr. S Varadarajan, Scientist, ICRI & Dr. B Gopa Kumar, ICRI to study the pests of cardamom. The group stressed the need to reorient the programme with emphasis on:

- i) Bio-suppression using natural enemies
- ii) Bio-ecology of pests and develop IPM for major pests and diseases of cardamom by integrating cultural, chemical, agronomic and bio-control methods.

#### DECISIONS

1. The control trials for the management of thrips and shoot & capsule borer may be modified in consultation with plant protection group (Mudigere & Pampadumpara Centres)
  2. Inventory survey for pests and diseases of pepper in high altitude should be undertaken by Yercaud, Mudigere & Pampadumpara centres.
5. Recommendations ready for transfer to extension agencies if any :
- 1) Phytophthora foot rot disease of pepper can be controlled by spraying with 1% Bordeaux mixture done thrice and drenching the basin once before onset of monsoon.

- 2) Pre-sowing, seed treatment with Bavistin 0.1% and combination of Dithane M-45 (0.25%) + Bavistin (0.1%) followed by Captan (0.25%) for 60 minutes, increased the germination and reduced post emergence rot of ginger.
  - 3) Spraying and drenching with 1% Bordeaux mixture at fortnightly interval was effective in managing diseases in pepper nursery.
6. Programmes proposed for the next year :
- a) Ongoing experiments : All the ongoing programmes in Plant Pathology will continue (As per the decisions of Bangalore Group Discussions).
  - b) New experiments  
The following programme was formulated to study pests of cardamom and pepper.
- Cardamom :
- 1) Bio-ecology of natural enemies of major pest (Mudigere)
  - 2) Cultural and chemical control of thrips and shoot and capsule borer (MLT) (Pampadumpara, Mudigere).
- Pepper
- 1) Survey for pests at high altitude (Pampadumpara, Mudigere & Yercaud)
  - 2) Chemical control of scales (Pampadumpara).

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Technical Session VI : VARIETY RELEASE

A special Technical Session was convened to discuss the proposals for release of varieties on spices received from the different coordinating centres. The proforma prescribed by the Central Sub-Committee on Crop Standards, Notification and Variety Release was followed for presentation.

The data relating to release of the following crops/varieties were presented in the XI Group Meeting/Workshop and recommended for release.

VARIETY RELEASE PROPOSALS

S.No.	Centre	Crop	Culture No.
1.	NRCS, Calicut	Pepper	Aimpiriyan (Coll.No.856)
2.	NRCS, Calicut	Pepper	Ottaplackal-1 (Coll.No.812)
3.	NRCS, Calicut	Cardamom	CCS-1
4.	ICRI, Myladumpara	Cardamom	MCC-61
5.	ICRI, Myladumpara	Cardamom	MCC-49
6.	RRS, Mudigere	Cardamom	Mudigere-1
7.	CRS, Pampadumpara	Cardamom	PV-1
8.	HARS, Pottangi	Ginger	V <sub>1</sub> K <sub>1</sub> -3 (Surabhi)
9.	TNAU, Coimbatore	Coriander	Acc.No.695(CO-3)
10.	RARS, Guntur	Coriander	CS-2 (Sindhu)
11.	SRS, Jagudan	Cumin	MC-43-73 (GAU Cumin-2)

a) Black pepper :

NRCS, Calicut proposed two black pepper selections :

- 1) Aimpiriyam Selection (Coll.856) is having an yield potential of 5.2 kg fresh pepper yield/vine, 8320 kg green pepper yield/ha. Its other features are piperine 4.7%, oleoresin 12.5%, essential oils 3.40% and recovery percentage 34.0%. This variety has attractive characters like high fruit set and moderate quality.
- 2) Ottaplekal-1 (Coll.812) has yield potential of 4.7 kg/vine of green pepper, 7526 kg of green pepper/ha. Though the yield is comparable with Karimunda and Panniyur-1, the special features are tolerance to root-knot nematode (M. incognita) and may out-yield other varieties in soils infested with the above nematode. This variety has long spike, moderate fruit set and bold berries with high oleoresin.

b) Cardamom :

- 1) CCS-1 (Coorg Cardamom Selection-1) proposed by the NRCS Cardamom Research Centre, Appangala. It is an open pollinated seedling of Clone-37. It is high yielding with an yield potential of 408.9 kg dry capsules/ha which is nearly 68% increase over local check. This selection has high content of essential oil (8.7%).
- 2) MCC-69 - Proposed by Indian Cardamom Research Institute, Wyladumpara. It is a clonal selection from a Malabar type procured from Chakupallam area of Idukki district. It is adaptable to Vandanmedu and Vandiperiyar areas. It is having an yield potential of 325 kg dry capsules/ha under rainfed conditions and 656 kg/ha under irrigated conditions which is nearly 22 and 65% respectively higher than local check.
- 3) MCC-61 - Proposed by Indian Cardamom Research Institute, Myladumpara. It is a clonal selection from Mysore type collected from Pampadumpara of Idukki district. This variety is adaptable to Vandanmedu and Anamalai hills of Tamil Nadu. It is having an yield potential of 375 kg of dry capsules/ha and 766 kg/ha under irrigated conditions which is nearly 40 and 92% increase over check.

- 4) Mudigere-1 - Proposed by RRS, Mudigere. It is a clonal selection from prostrate Malabar type YT.II.50081. It has an yield potential of 250-300 kg dry capsules/ha. It is suitable for Malnad region of Karnataka State.
- 5) PV-1 - Proposed by Cardamom Research Station, Pampadumpara. It is a clonal selection from Walayar local (Malebar type) and has an yield potential of 500 kg/ha suitable for all cardamom growing areas.

c) Ginger :

V.K<sub>1</sub>-3 (Surabhi) proposed by High Altitude Research Station, Pettangi (Orissa). It is developed by induced mutation and has got an yield potential of 17.4 tonnes of fresh rhizomes/ha which is nearly 20% higher yield than Suprabha. The special feature of this variety is high oleoresin content of 10.2% as against 8.9% in Suprabha.

d) Coriander :

- 1) CO-3 - Proposed by TNAU, Coimbatore. It is a selection from accession 695. It has got an yield potential of 648.8 kg/ha under Tamil Nadu conditions and the crop comes to maturity earlier by 6.4 days compared to CO-2. It is having low incidence of wilt and grain mould disease. The performance of this variety is found to be encouraging in Andhra Pradesh and Gujarat.
- 2) CS-2 (Sindhu) - Proposed by RARS, Lam, Guntur (Andhra Pradesh). The variety was developed through mass selection from the indigenous material collected from Warangal district (A.F.). It has an yield potential of 1000-1100 kg/ha is recommended for release for Andhra Pradesh.

e) Cumin :

MC-43-73 (GAU Cumin-2) - proposed by Jagudan Centre (Gujarat). It is an induced mutant having an yield potential of 573 kg/ha and is having high essential oil content (4.0%), moderately tolerant against blight disease.

It was also recommended that clonal material should be supplied wherever vegetative propagation is feasible.

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**Technical Session VII** : **AGRONOMY & SOIL SCIENCE**

**Chairman** : **DR I IRULAPPAN**

**Rapporteurs** : **Dr. S THAMBURAJ**  
**Mr. V S KORIKANTHIMATH**



Technical Session VII : AGRONOMY & SOIL SCIENCE

1. No. of papers presented : The progress of 24 experiments were presented.
2. Centres where work was done : 12 Centres - 8 crops
3. Non-performing centres if any : Nil
4. Brief description of the work done and salient results reported : The progress of work presented were discussed and the following decisions/recommendations were taken up to streamline the projects.

RECOMMENDATIONS/DECISIONS :

I. Cardamom :

1. Foliar application of urea at 3%, single superphosphate at 1% and muriate of potash at 2% improves the yield of cardamom (for on-farm trial).
2. Irrigation to cardamom from January to August in low rainfall tracts at the rate of 4 litres per clump per day through drip increases the crop yield by 63% over the control (no supplementary irrigation)
3. Micro-pot method of raising cardamom seedlings may be popularised till clonal and tissue culture methods are strengthened.
4. The following herbicide application is recommended for on-farm testing to effectively control weeds in cardamom plantations for a period of 90 days.
  - a) Paraquat @ 0.4 kg a.i./ha with Atrazine 1.0 kg a.i./ha
  - b) Glyphosate 0.8 kg a.i./ha with Diuron 1.0 kg a.i./ha
  - c) Diuron or Atrazine 1.0 kg a.i./ha.

## II. Ginger :

1. Fertiliser recommendation of 125:100:100 kg of NPK/ha for maximum benefit.
2. A compatible crop combination of ginger + soya bean is recommended.

## III. Turmeric :

A high return crop combination of turmeric + maize or turmeric + chillies or turmeric + castor is beneficial.

## IV. Cumin :

A planting distance of 15 cm, a seed rate of 8.0 kg/ha, application of 30 kg N/ha through broadcasting (in addition of 10 t/ha of FYM or compost/ha) in two equal splits of 30 and 60 days of crop growth and use of herbicide, Terbutrin at 0.5 kg a.i./ha or Oxadizone at 0.5 kg a.i./ha or Fluchloralin or Pentamethalin at 1.0 a.i./ha to control the weeds are recommended.

## V. Coriander :

1. A spacing of 30 cm and application of N at 60 kg/ha, in three equal splits - basal 30 and 60 days after sowing under irrigated conditions are recommended for Rajasthan.
2. The optimum time of sowing in Guntur is on 15th September.
3. In Gujarat, harvesting when 100% fruits turn to yellow colour in the whole plant is recommended to get significantly high yield.

## VI. Fennel :

1. Application of N at the rate of 90 kg/ha in 3 equal splits as basal, 30 and 60 days after sowing is recommended for Rajasthan.
2. Under Gujarat conditions, fertilisation with 90 kg N + 45 kg  $P_2O_5$ /ha and umbel picking of fruits turned to yellow colour in the whole plant gave high yields.

### VII. Fenugreek :

An optimum sowing period of first fortnight of November, a row spacing of 20 or 30 cm, a water requirement at IW/CPE ratio of 1:0 and application of 65 kg  $P_2O_5$ /ha are recommended for high yields under Rajasthan conditions.

### GENERAL DECISIONS

- 1) The ADG(PC) observed that all Scientists working in cardamom should visit ICRI, Myladumpara, Kerala to acquaint with the ongoing research projects there.
- 2) The ADG(PC) remarked that the Scientists of the disciplines of Horticulture, Agronomy and Soil Science from NRCS and CPCRI will critically go through the ongoing programmes and will suggest any mid-term corrections or will propose new programmes as the case may be. Further, the ADG(PC), PC (Spices) and Soil Scientist/Agronomist of NRCS, Calicut will visit all the Coordinating Centres and review the progress of the research programmes.
- 3) In all the fertilizer and manurial trials, detailed information on the nutrient use efficiency should be gathered.
- 4) In all the irrigation experiments, information on water use efficiency should be collected.
- 5) Experiments may be envisaged on the use of bio-fertilizers for the different spice crops, since encouraging evidences are available in pepper and tree spices in this direction.
- 6) Recent surveys by ICRI, Myladumpara have indicated micronutrient deficiencies in cardamom soils (Zn, B and Mn). Therefore, experiments involving micronutrients may be planned in different cardamom research centres.
- 7) In all the agro-technique trials the experimental population should be of vegetatively propagated materials.
- 8) There should be uniformity in the plot size, number of plants per treatment and in the maintenance of guard rows in all the centres.

- 9) In view of the apprehensions expressed by the planter participants regarding more of vegetative growth in certain pepper types, employment of horticultural techniques like pruning and training and use of growth regulators has to be attempted.
- 10) The pepper trial on irrigation allotted for Chintapalli needs a re-examination in view of the constraints explained.
- 11) The various trials allotted under cardamom for Yercaud Centre are to be reviewed in the light of decisions taken to phase out cardamom research at this Centre. Suitable trials on pepper and tree spices are to be proposed for this Centre. The PC may initiate necessary action involving TNAU & KAU Centres and organise a "Group sitting" to finalise the programme.
- 12) Wherever experiments have been continued for three years, they are to be concluded immediately and completion reports sent to the Project Coordinator (Spices) within a month's time.
5. Recommendations ready for transfer to extension agency if any ) The technologies developed were mentioned under item No.4 (page 63 - 65)
6. Programme proposed for the next year :
- a) Subject to the above decisions the current technical programmes would continue.
- b) The new programmes on irrigation schedule, time of harvest etc. for the Jobner & Jagudan Centres will be discussed & finalised by the Project Coordinator & ADG(PC).

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PLENARY SESSION

Chairman : DR P RETHINAM

Rapporteur : DR S EDISON

## PLENARY SESSION

1. The Plenary Session of the Group Meeting of the Research Workers of AICRP on Spices - in lieu of the XI Workshop of the Coordinated Project - was held on the afternoon of the 28th July, 1991 under the chairmanship of Dr. P Rathinam, Assistant Director General (Plantation Crops). The Chairman while initiating the discussions, complimented the Scientists attending the Spices Workshop for having done a detailed exercise during the past three days under the guidance of Dr. K.L.Chadha, Deputy Director General (Horticulture). He was particularly glad that there was a separate Session on Production & Distribution of planting material of Spices involving various agencies like the Departments of Agriculture/ Horticulture from the States of Kerala, Tamil Nadu, Rajasthan and Mizoram as well as the Directorate of Cocoa, Arecanut & Spices Development and the Spices Board.
2. The Chairman expressed happiness that the proposal for release of 11 varieties of spices was considered in depth during the Workshop and they were recommended for release. He expressed concern about the weakness of the Technical Programmes and their implementation especially in the disciplines of Agronomy & Soil Science. It is also pertinent to mention here that we have only five Agronomists in the entire Project and no Soil Scientist. It was recommended that the Assistant Director General (PG) and the Project Coordinator (Spices) along with the Agronomists & the Soil Scientists from the NRCS would make an in depth review of these programmes

in the various Coordinating Centres. It was mentioned by the Project Coordinator that a special discussion was arranged for this purpose even during the X Workshop of the Project held at Coimbatore under the chairmanship of Dr. S. Senkaran and that the guidelines given by that Group can be suitably adopted.

3. A similar view was expressed in view of the lack of adequate support in the Entomology programmes. There are only two Entomologists in the entire Scheme and they are working on small cardamom only. In view of the expansion of the mandate of the Project to include Black Pepper in all the Cardamom Centres, additional work-load will be found. It was also proposed to have Entomologists for seed spices and this will be discussed in detail during the forthcoming Group Discussion of Entomologists of Horticultural Projects scheduled to be held at Lucknow during August, 1991. The Entomologists of Mudigere & Pampadumara centres were advised to undergo a short refresher/familiarization programme at NRCS, Coicut.
4. The ADG specifically mentioned his serious concern regarding the non-keeping of the experiments especially at the Pampadumara Centre. He also appealed to the Scientists in the Projects to maintain and keep available Permanent Ledgers/Log books for each research experiment/project. This will enable periodical scrutiny of the research data that have accumulated and presented in the Registers.
5. It was suggested that the practice of holding Group Meetings on Seed Spices Research Workers may be revived. This would enable to provide sufficient time for this group of crops to be dealt at length. The voluntary Centre at Hisar has offered to hold the next Meeting and the Project Coordinator (Spices) will take further necessary action in this regard. It was also

suggested that there is a need to identify Principal Investigators for each subject/discipline and the details will be worked out by the Project Coordinator in consultation with the Director, NRCS.

6. The ADG desired that the 20 years research highlights of the Co-ordinated Project may be brought out at the earliest.
7. The Sessional Chairman of each Technical Session presented the recommendations and decisions taken during the concerned Session and after a discussion, they were approved in the Plenary Session; wherever there were necessity, suitable modifications were made. The specific technologies recommended for transfer to the farmers have been proposed and approved at the appropriate Technical Sessions.
8. The list of varieties recommended for release during the Trivandrum Workshop are presented below:

<u>S.No.</u>	<u>Centre</u>	<u>Crop</u>	<u>Culture No.</u>
1.	N.R.C.S. Calicut	Black Pepper	Aimpiriyam (Coll.No.856)
2.	N.R.C.S. Calicut	Black Pepper	Ottaplackal-1 (Coll.No.812)
3.	N.R.C.S. Calicut	Cardamom	CCS-1
4.	I.C.R.I. Myladumpara	Cardamom	MCC-61
5.	I.C.R.I. Myladumpara	Cardamom	MCC-49
6.	R.R.S. Mudigere	Cardamom	Mudigere-1



7.	C.R.S. Pampadumpara	Cardamom	PV-1
8.	H.A.R.S. Pettangi	Ginger	V <sub>1</sub> K <sub>1</sub> -3 (Surabhi)
9.	T.N.A.U. Coimbatore	Coriander	ACC.No.695 (CO.3)
10.	R.A.R.S. Guntur	Coriander	C.S-2(Sindhu)
11.	S.R.S. Jagudan	Cumin	MC-43-73 (GAU Cumin-2)

9. At the end, Dr. S Edison, Project Coordinator proposed the vote of thanks to all those connected in organising and conducting the Trivandrum Workshop, due acknowledgements provided at pages 2-3 of this Proceedings. He once again extended his hearty thanks to Dr.K.L.Chadha, Deputy Director General for having guided the deliberations for the entire period of three days of the Workshop. He thanked Dr. P Rethinam, ADG(PC) for having critically helped in conducting the Proceedings and also chairing the Plenary Session. The Workshop came to a close at 1830 hrs on July 28, 1991.

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