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

Held at

STATE INSTITUTE FOR AGRICULTURAL MANAGEMENT
AGRICULTURAL RESEARCH STATION CAMPUS
RAJASTHAN AGRICULTURAL UNIVERSITY
JAIPUR, RAJASTHAN.

during

AUGUST 23-25, 1995

Project Coordinator: Dr. S. EDISON



**ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES
INDIAN INSTITUTE OF SPICES RESEARCH**

(Indian Council of Agricultural Research)
CALICUT-673 012, KERALA.

1995

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INTRODUCTION

The XIII Workshop of the All India Coordinated Research Project on Spices was held under the auspices of the Rajasthan Agricultural University and the venue was the State Institute for Agricultural Management located at the Agricultural Research Station campus at Durgapura, Jaipur. This Workshop was very unique due to the fact that the highest importance was given from the Planning Commission, Govt. of India for the Proceedings. Dr. Jayant Patil, Member (Agriculture), Planning Commission was the Chief Guest and delivered an invigorating inaugural address to the participants. The Workshop was felicitated by Dr.K.L.Chadha, Deputy Director General (Horticulture) who was kind enough to give his special remarks as well as felicitations to the participants. We had the illustrious presence of Dr.R.K.Patil, Vice Chancellor, Rajasthan Agricultural University who gave the presidential address and highlighted the history and role of the State of Rajasthan in Spices Development activities. Sri C.S.Rajan, IAS, Secretary, Department of Agriculture, Govt. of Rajasthan also could be with us and exchanged his remarks regarding Spices Development programmes and the need for increased research activities on seed spices. Dr.M.S.Manohar, Director of Research while welcoming the delegates, highlighted the achievements on spices research by the Rajasthan Agricultural University and strongly pleaded for upgradation of the research activities on spices.

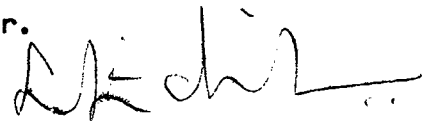
Dr. P. Rathinam, Asst. Director General (Plantation Crops) was present with us throughout the deliberations and guided the different technical sessions and especially that on Variety Release. We had participation from several State Governments, State Agricultural Universities, Directorate of Cocoa, Arecanut & Spices Development, Spices Board etc. as well as some progressive farmers from Rajasthan.

An important feature of this Workshop has been the recommendations for release of nine varieties of spices, one each in Black Pepper, Cardamom & Coriander and two each in Turmeric, Ginger & Cinnamon. The delegates very effectively participated in the deliberations and it is our pleasure to present before you the Proceedings of this National Group Meeting/Workshop of the AICRP on Spices in the following pages.

ACKNOWLEDGEMENTS

We place on record our gratitude and thankfulness to the Director General, ICAR & Secretary, Department of Agricultural Research & Education, Govt. of India, for having given the approval to hold the XIII Workshop (Group Meeting) of the All India Coordinated Research Project on Spices at Jaipur, Rajasthan. The guidance and support received from Dr.K.L.Chadha, Deputy Director General (Horticulture) and Dr.P.Rethinam, Asst. Director General (Plantation Crops) in organizing the National Group Meeting is duly acknowledged. Our sincere thanks are due to the hosts viz., the Rajasthan Agricultural University which has provided enormous support to organise and conduct the programmes. Dr.R.K.Patil, Vice Chancellor has been quite generous in meeting our requirements and he was ably assisted by Dr.M.S.Manchar, Director of Research who turned every stone to make our three-day deliberations, most meaningful. Mr. Sureshkumar, Principal, State Institute of Agricultural Management has provided all the physical facilities to conduct the Inaugural Session, Proceedings of the Technical Session as well as accommodation of the delegates attending the Workshop. Mr.C.S.Rajan, IAS, Secretary (Agriculture), Govt. of Rajasthan played a significant role in enabling the various facilities from the various Units attached to his Ministry in helping the smooth conduct of the Seminar.

The staff of the Jobner Centre of the AICRP on Spices under the dynamic leadership of Dr.R.K.Sharma as well as Dr.V.S.Kavadia, Dean, College of Agriculture, Jobner besides Dr.P.C.Gupta, Associate Director of Research and Dr. Sugen Singh Manchar, Professor, Rajasthan Agricultural University deserve our heart-felt thanks for all the activities taken for the excellent conduct of the Workshop. We are also grateful to the various State Agricultural Universities, Departments of Agriculture/Horticulture, Spices Board, Directorate of Cocoa, Arecanut & Spices Development and Indian Institute of Spices Research for having nominated several of their Scientists/Officials whose participation in the Seminar was quite instrumental in discussing the progress made so far and developing new programmes. I also take this opportunity to acknowledge with thanks the Director and staff of IISR, Calicut who have provided physical facilities in connection with the preparation of reports, etc. for the Spices Workshop at Jaipur.



(Dr. S EDISON)
PROJECT COORDINATOR

PROGRAMME

- Venue : Rajasthan Agricultural University
Agricultural Research Station
Campus Durgapura, Jaipur, Rajasthan
- Dates : 23-25 August, 1995
- August 23, 1995
- 08.00 - 09.00 : Registration
- 09.00 - 10.30 : Inaugural Session
- Welcome : Dr. M.S. Manohar
Director of Research
Rajasthan Agricultural University
Bikaner, Rajasthan
- Report of the Project
Coordinator : Dr. S. Edison
Project Coordinator
All India Coordinated Research Project on Spices
Indian Institute of Spices Research
Calicut, Kerala
- Special remarks : Dr. K.L. Chadha
Deputy Director General (Horticulture)
Indian Council of Agricultural Research
New Delhi
- Mr. C.S. Rajan, IAS
Secretary, Agriculture
Govt. of Rajasthan
Jaipur, Rajasthan
- Presidential address : Dr. R.K. Patil
Vice-Chancellor
Rajasthan Agricultural University
Bikaner, Rajasthan
- Key-note address &
Inauguration : Dr. Jayant Patil
Member, Planning Commission
Government of India
New Delhi
- Vote of thanks : Dr. P. Rethiram
Asst. Director General (PC)
Indian Council of Agricultural Research
New Delhi

National Anthem

10.30 - 11.00 : Inaugural Tea
 11.00 - 13.00 : Technical Session-I : GENETIC RESOURCES

Chairman : Dr. P.N. Gupta
 NBPGR, New Delhi

Rapporteurs : Mr. N. Hariprasad Rao
 APAU, Guntur

Mr. B. Krishnamoorthy
 IISR, Calicut

All the 16 Centres participate

14.00 - 18.00 : Technical Session-II :

CROP IMPROVEMENT & BIOCHEMISTRY

Chairman : Dr. P. Rethinam
 ICAR, New Delhi

Co-Chairman: Dr. R.K. Sharma
 RAU, Jobner

Rapporteurs : Dr. H.M. Chandrappa
 U.A.S.(B), Mudigere

Dr. B. Sasikumar
 IISR, Calicut

Dr. T. Thangaraj
 TNAU, Coimbatore

All the 16 centres participate

August 24, 1995

09.00 - 13.00 : Technical Session-III

PLANT PATHOLOGY & ENTOMOLOGY

Chairman : Dr. Y.R. Sarma
 IISR, Calicut

Co-Chairman: Dr. C.P.S. Yadava
 ICAR, Jaipur

Rapporteurs : Dr. M.N. Venugopal
 IISR, Appangala

Dr. V.A. Solanki
 GAU, Jagudan

All the participating Centres presented their report

14.00 - 16.00 : Technical Session-IV : AGRONOMY & SOIL SCIENCE

Chairman : Dr. S.N. Potty
ICRI, Myladumpara

Rapporteurs : Dr. A. Manchar Rao
APAU, Jagtial

Dr. K.N. Sathesan
KAU, Panniyur

All the participating centres presented their report

16.15 - 18.00 : Technical Session-V

TRANSFER OF TECHNOLOGY & INTERACTION
WITH DEVELOPMENT DEPARTMENTS

Chairman : Mr. E. Velappan
DCASD, Calicut

Co-Chairman: Dr. Y.S. Malik
HAU, Hisar

Rapporteurs : Dr. B. Rabindran
TNAU, Coimbatore

Dr. P.S. Rao
APAU, Jagtial

All the participating Centres presented their report

August 25, 1995

09.00 - 10.00 : Technical Session-V continued

10.00 - 13.00 : Technical Session-VI : VARIETY RELEASE

Chairman : Dr. B.S. Dhankar
HAU, Hisar

Co-Chairman: Dr. M.R. Sharma
NABARD, Bombay

Rapporteurs : Dr. B.N. Korla
YSPUHF, Solan

Dr. K.M. Kuruvilla
ICRI, Myladumpara

14.00 - 15.30 : Technical Session-VI continued

16.00 - 19.00 : PLENARY SESSION

Chairman : Dr. P. Rethinam
ICAR, New Delhi

Rapporteur : Dr. S. Edison
IISR, Calicut

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INAUGURAL SESSION

WELCOME ADDRESS

I, Man Singh Manchhar, Director of Research, RAA.U take this opportunity of welcoming you one and all to this "PINK CITY" of Jaipur also famous as the "Paris of India" However, before I proceed further, I would specially like to extend hearty greetings from my side as well as from the Rajasthan Agricultural University to our distinguished guests specially the honourable member of the Planning Commission Dr. Jayant Patal, the distinguished Vice Chancellor of this University Prof. R.K. Patal, the Deputy Director General of ICAR, Dr. K.L. Chadha, the Agricultural Production Secretary of Rajasthan, Mr. C.S. Rajan, the Assistant Director General of ICAR Dr. P. Rethinam and Dr. S. Edison, the Project Coordinator, on this 13th annual group meeting of the All India Coordinated Research Project on Spices.

Ladies and Gentlemen, a good spiced food leads to watering of the mouth. Jaipur and spices are somewhat similar in this respect. When the name of Jaipur is announced as a conference or seminar venue, the delegates' mouth start producing extra saliva to view the many splendid spots of Jaipur and enjoy its unsurpassed hospitality in addition to its delicious food specialities.

Jaipur, established some more than 250 years ago by the great fore runner of his times Maharaja Sawai Jai Singh Ji I. The wide perpendicular roads of Jaipur with Chaupars, the Hawa Mahal, Galtaji, Albert Hall, Nahargarh, Jaigarh and Amber forts in addition to the city palace, Jantar Mantar and the Govind Deo Ji temple is an architect's dream.

Ladies and gentlemen, we have gathered here from different parts of the country far and near, primarily to discuss the present status of research and development of spices and to chalk out the future strategies for developing potent technologies to step up the productivity and also the quality of the spices. Needless to say that spices are not only important from home consumption point of view but also they constitute an important source of foreign exchange earnings.

The country's foreign exchange earnings from export of spices during 1993-94 has reached the value of Rs.607 crores in 1994-95 surpassing the previous record of Rs.547 crores during 1993-94. To this amount, the seed spices contributed Rs.77.92 crores and it is significant to mention here that during the year, the country exported substantial quantity of turmeric and seed spices to South Africa.

Higher productivity with lower cost per unit area and good quality of the spices have become one of the important factors in enhancing the export potential through competing with other spices producing countries like China, Iran, Turkey, Indonesia, Mexico, etc.

As, you all know that the State of Rajasthan is known for production of large quantity of seed spices, contributing to nearly 40% of the total area of cumin, 40% of coriander, 85% of fenugreek and 20% of fennel which are cultivated in over 1.51 lakh ha in cumin, 3.51 lakh ha for coriander, 0.30 lakh in fenugreek & 0.18 lakh ha in fennel in the country.

Besides these, Ajwain and Dill (i.e., Suwa) are also cultivated in the southern part of the State covering over 5 to 15 thousand hectares each; they contribute 30 to 40% of the national production. The climatic condition of the state with clear, rain free weather during the end of the crop season, is especially suitable for attractive colour and lustre of the seed spices which is one of the important quality parameters. However, the productivity of these crops are low being nearly 5 q/ha in cumin, 7.5 q/ha in coriander, 10 q/ha in fenugreek and 9 q/ha in fennel. Traditionally, cultivation of these crops on marginal lands, without adequate inputs, inherent weaknesses of the crops e.g., slow early growth, poor yield potential, heavy incidence of diseases of pests and lack of proper adoption of improved package of practices are the main constraints which need to be taken care of.

This Workshop as such assumes great significance and I am thankful to ICAR for selecting Jaipur as the venue and to our Vice-Chancellor who readily accorded consent to host this meeting. The research on seed spices in Rajasthan was initiated way back in 1953 through a preliminary research project on cumin. However, the momentum in spices research was gained with the inception of a

coordinated research project since 1975 located at S.K.N. College of Agriculture, Jobner. Apart from Jobner, which is the lead centre, the research on seed spices is also being carried out to a limited extent at A.R.S., Mandora and A.R.S., Kota of R.A.U. While this University has decided to further strengthen spices research at Kota and Mandora under its ADP programme, however, RAU shall be grateful if ICAR can also help us by sanctioning its sub-centre at ARS, Jalore for research on cumin and fennel.

Consequent to the research efforts of our scientists, improved varieties of seed spices have been evolved and released. The prominent among them are RCr-41 in coriander, RZ-19 in cumin and RMt-1 in fenugreek. Proposals for some promising varieties will be put forth in this Workshop/Group Meeting for consideration. Apart from the development of improved genotypes, package of practices conducive to high yield realization have also been developed.

I am sure that the deliberations in the forthcoming days would lead to interesting and meaningful decisions and I entreat the delegates to kindly enjoy our facilities and make the stay comfortable and memorable. I wish the Workshop participants all the best.

JAI HIND

PROJECT COORDINATOR'S REPORT*

The All India Coordinated Research Project on Spices was formulated during the IV Five Year Plan (1971) as a combined AICRP on Spices and Cashewnut, and the first Workshop was held at CPCRI, Kasaragod in 1971 and research programmes were initiated at four Centres in four Spice Crops (Pepper, Cardamom, Ginger and Turmeric). During the V Plan, research on seed spices was initiated by adding four more centres. In VI Plan, two new Centres were added, one for pepper and the other for ginger and turmeric. During VII Plan, three more Centres were added, one for Coriander and Fenugreek, one for Turmeric and the third for Large Cardamom in Gangtok. In VIII Plan, two new centres were created, one at Hisar (Haryana) to work on seed spices (coriander, fennel and fenugreek) and the other at Dholi (Bihar) to work on coriander, fenugreek and turmeric. Research on tree spices (clove, cinnamon and nutmeg) was also added at Yercaud (TNAU), thus making a total of 16 Research Centres under AICRP based in 11 Agricultural Universities located in 11 States. Besides, seven voluntary/participating centres are also involved in our research efforts on spices.

Research activities :

The AICRP on Spices is vested with a mandate to develop location specific agro-techniques for sustainable spices production. A multipronged approach is envisaged and research projects formulated to step up production and tackle pests and diseases. There are 67 Research Projects in progress - 39 in crop improvement (including genetic resources), 13 in crop production, 5 in quality evaluation and 10 in crop protection. The crop-wise distribution of projects are - pepper 8, small cardamom 9, large cardamom 3, ginger 9, turmeric 6, tree spices 6, seed spices 26 (coriander 8, cumin 6, fennel 6 and fenugreek 6).

*Presented by DR.S.Edison, Project Coordinator

It is my privilege and pleasure to present the biennial report of work done/research accomplishments made by the All India Coordinated Research Project on Spices during 1993 to 1995 and the same is enumerated below:

Genetic resources

The total germplasm holding under the various Coordinating Centres stands at 4514 and this perhaps include duplicate entries as a result of exchange between the Centres. This is maintained in 16 Coordinating and Participating Centres. The Yercaud centre added three wild types in black pepper from Shevroys and Kolli Hills. The various areas in Vishakapatnam and Uttara Kannada districts were surveyed by the Chintapalli and Sirsi centres respectively. CI-802 and CI-683 have been identified with high value of yield attribute in cardamom at Mudigere. In ginger, Pottangi identified ZO-17 as the top yielder. The Jagtial centre made 46 new collections in turmeric during the years. Clove and nutmeg collections in Yercaud centre were strengthened by 12 and 15 elite/high yielding lines respectively. The Jagudan centre identified two exotic accessions (from Bulgaria) which has resistance to powdery mildew. The Jagtial centre has identified 22 accessions of turmeric with resistant reaction to Taphrina leaf spot. Efforts are also under way to import or exchange seed spices germplasm from Mediterranean countries. An important activity has been the publication of the "Descriptor for Cardamom" as a co-operative venture between the Scientists of the Coordinating Centres, National Institutes as well as International contacts; this document was released by the International Plant Genetic Resources Institute, Rome.

Crop Improvement

We have 57 varieties of various Spices released till date and this Jaipur Workshop is likely to hear the presentation for consideration for release of at least 15-20 varieties in various Spices. The research results from the various Coordinating Centres by way of numerous multilocation trials have culminated in proposals for release of varieties.

The publication on "Spices Varieties" by NRCS/ICAR has been well received and is available in the Workshop registration counter. Multilocation trials conducted under the aegis of the AICRP have led to release of these varieties; these trials are in progress at various Centres viz., 4 in Black pepper, 3 in cardamom, 1 each in ginger, turmeric, large cardamom, clove, cinnamon, cumin, coriander, fennel and fenugreek. Some of the varieties released during the last two years viz., HM-57 in fenugreek and DH-5 in coriander are dual purpose varieties and are becoming popular. The latest variety in black pepper viz., Panniyur-5 is also in great demand.

The inter-varietal hybridization in black pepper at Panniyur has resulted in four cultures, all of them yielding more than 1 kg green berries per vine. In the CYT in ginger at Pottangi, V₁E₈-2 gave the highest yield of 18 t/ha. At Dholi, "Sugandham" (from Gujarat) variety in turmeric yielded 38.79 t/ha. In the case of seed spices, the decisions taken during the Group Meeting held in Nov. 1992 are being implemented systematically by the concerned Coordinating Centres; a few multilocation trials, bio-control trials as well as quality analysis have been taken up. The Hisar centre identified UM-117 as the highest yielder in fenugreek, giving 1100 kg seeds/ha. Coriander accession ATP-147 yielded 1050 kg/ha, being the highest yield; however, in the case of leafy types, Pant Dhanla-1 proved better. Accession CC-964 gave 10.3% higher oil yield than all other varieties and also an yield of 1078 kg/ha. The mutation breeding and selection programmes with coriander is making progress in Coimbatore and Jobner centres; line 16/6 has been identified as most promising at Coimbatore. The Jobner centre has identified UF-125 with high yield potential in fennel. At Coimbatore, fenugreek CC-664 has been found to be quite promising giving 380 kg/ha.

Crop production :

In black pepper, highest yields could be obtained by regulating the irrigation at IW/CPE ratio of 0.25. Soaking of rooted cuttings of black pepper in 1% Potassium Sulphate for 12 hours gave higher percentage of rooting. The sucker production in cardamom increased to 1.25 lakhs/ha when the spacing is given at 0.3 M x 0.9 M. The

cardamom yield could be increased by 75% under irrigated conditions when compared to the rainfed situation. Application of Phosphobacteria @ 4g/kg of soil resulted in production of highest number of branches, viz., 3.6. Ginger yield could be raised to 14.35 t/ha when applied with NPK @ 125:100:100 kg/ha at Pottangi; this gives a net profit of Rs.53,000/ha. In turmeric, intercropping with Bhendi was found profitable at Dholi whereas Soybean planted after first mulching was beneficial at Pottangi. The seed rate for fenugreek was adjudged at 25 kg/ha at Jobnar, giving 11.12 Q/ha. Application of Pendimethalin @ 1 kg/ha is useful in controlling weeds in coriander. In the case of hard wood cuttings of cinnamon, 82.6% rooting was observed when dipped in 2500 ppm of NAA.

Crop protection :

The Phytophthora foot rot disease could be efficiently managed and kept under check by following "all the culture practices + 1 kg neem cake/vine + 3g a.i. Phorate/vine + 1% Bordeaux Mixture spray + 2 drenchings with 0.2% Copper oxychloride; this has worked well in Panniyur, Sirsi and Chintapalli centres. However, the on-farm trials at Panniyur indicated the efficacy of Bordeaux mixture spray + pasting and drenching along with application of neem cake @ 2 kg/vine and lime @ 1 kg/vine. Stunted disease has been noticed in Lower Pulneys of Tamil Nadu and defoliation due to semilooper pest in Chickmagalur in Karnataka. The use of Trichoderma in bio-control has given positive indications in Sirsi centre. Thrips in cardamom have been controlled by adopting selective thrashing in Feb-March in combination with insecticides spray; neem pesticides have also been found useful in thrips control. At Pampadumpara, six rounds of spray with Monocrotophos 0.05% with thrashing reduced thrips damage. The ginger rhizome rot has been controlled at Solan centre by pre-sowing treatment with Indofil M-45 0.25% + Bavistin 0.1% + Phorate @ 10 kg/ha. Soil application of Trichoderma viride has also reduced incidence of rhizome rot at Solan. At Jagtial, the turmeric accessions PCT-10, PCT-13 and PCT-14 continued to be free from rhizome rot. Cultivar Galsey was found tolerant to chirkey and foorkey diseases of large cardamom; anthracnose leaf spot has been controlled by spraying Dithane M-45 (0.2%) or Kavach (0.1%).

Cumin wilt could be easily controlled by following the three year crop rotation with cluster bean-cumin-cluster bean-wheat-cluster bean-mustard. Seed treatment with Trichoderma harzianum @ 4g/kg soil reduced wilt in coriander. Use of onion leaf extract (5%) as a spray reduced powdery mildew disease in coriander. Grain mould in coriander could be controlled by spraying Carbendazim 0.1%, applied 20 days after flowering. Seed dressing with Bavistin 0.1% was useful in reducing cumin wilt.

Quality :

SG-710, a ginger selection from Solan had the highest oil content whereas some accessions in cumin have been identified at Jobnar which had export potential.

Staff and budget :

The present staff strength of AICRP on Spices consists of 41 Scientific supported by 21 Technical and 3 Auxiliary making a total of 65 staff. The annual budget was increased from Rs.15.6 lakhs in 1985 to Rs.55.00 lakhs in 1994-95. With the addition of 4 Centres from April 1995, the staff strength sanctioned will be 53 Scientific, 29 Technical, 3 Auxiliary - totalling to 85.

Future thrust areas

- * Enrichment of germplasm including introduction of exotic germplasm especially of seed spices from Mediterranean region
- * Developing descriptors for all the spices
- * Exploitation of hybrid vigour in black pepper
- * Development of cropping systems
- * Studies on location specific nutritional requirement of spices including micro nutrients
- * Development of varieties with tolerance to soft-rot and bacterial wilt, low fibre and high oleoresin content in ginger
- * Development of dual purpose varieties in seed spices esp. coriander and fenugreek
- * Evolving black pepper cultivars with multiple resistance for Phytophthora foot-rot, slow decline and pollu beetle.

SPECIAL REMARKS BY DR K L CHADHA, DEPUTY DIRECTOR GENERAL

Dr. K.L. Chadha, Deputy Director General (Horticulture) while participating in the Inaugural Session, made a detailed and extempore address, highlighting the research achievements made on Spices in the country. He traced the history of spice research starting at the Pepper Research Station, Panniyur, Kerala in 1949. He also mentioned about the expansion of activities on spices research & development in various States like Himachal Pradesh, Assam, Orissa, West Bengal, Maharashtra and Tamil Nadu besides Kerala. Dr. Chadha mentioned about the impact of the Spices Enquiry Committee of the Govt. of India, set up in 1953, which pursued with vigour the various research programmes in different States. He mentioned about the ICAR's initiative in starting the All India Coordinated Research Project on Spices & Cashewnut, with headquarters at the Central Plantation Crops Research Institute, Kasaragod in 1971.

The participation of Scientists from the various Coordinating Centres in formulating the technical programmes under the Coordinated network was quite highlighted by the Deputy Director General. He mentioned about the advantages of the AICRP network, linking the various agro-climatic regions through the State Agricultural Universities. He also mentioned about the special future in the Workshops of the Division of Horticulture wherein there is participation from various development departments viz., Directors of Horticulture, Directors of Agriculture, Spices Board, Directorate of Cocoa, Arecanut & Spices Development, etc. He emulated the example of the Spices Project which offers the unique platform and served as an interface to assess the various technologies and those which are available for ready transfer.

Dr. Chadha mentioned about the availability of the excellent variability in the germplasm of the plantation spices like Black Pepper, Cardamom, Ginger & Turmeric, whereas he underlined the need for increasing its availability especially in seed spices like cumin, coriander, fennel, fenugreek. Dr. Chadha emphasised about the necessity for providing increased attention to the research programmes

on seed spices and especially the exchange/import of germplasm from the Mediterranean region viz., Egypt, Iran, Iraq, Morocco, Greece, France, etc. Dr. Chadha also mentioned about the valuable contributions made by the research project which has released over 60 varieties of various spices. He entreated the Scientists and development officials to give greater attention to the production and distribution of good quality planting material on spices especially in view of the importance attached by the Planning Commission, Govt. of India, on the spices programmes, which are export oriented.

The Deputy Director General enlisted the achievements made in developing integrated control measures against the Phytophthora foot rot disease of black pepper, rhizome rot of ginger and turmeric, capsule rot in cardamom and the packages developed for the control of wilt, blight and mildews in seed spices. He also exhorted the Scientists to develop meaningful biocontrol programmes against the pests and diseases of Spices. This gains importance in view of the reported pesticide residues in spices which are highly sensitive in view of the large export turn over. He mentioned that during the year 1994-95, we could export about 1.54 lakh tonnes of Spices worth Rs.607 crores and a large chunk of Rs.135 crores came from seed spices alone. He also underlined the necessity for increasing research input on seed spices as well as on quality and value added products of spices in general. The DDG advised the delegates to take a close look into the progress made on various research experiments on spices and enable meaningful discussion and development of viable technical programme for the forthcoming years.

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**SPECIAL REMARKS BY Mr. C.S. RAJAN, IAS,
SECRETARY (AGRICULTURE), GOVT. OF RAJASTHAN**

Mr. C.S. Rajan, Secretary (Agriculture), Govt. of Rajasthan offered felicitations to the participants attending the National Workshop on Spices Research at Jaipur and welcomed the delegates to the State. He highlighted the importance of seed spices in Rajasthan and the group of crops like coriander, fenugreek, fennel and cumin have greater vulnerability. In order to improve the yield levels of these crops, there is a need to develop more varieties that would be location specific. He complemented the Scientists of RAU at Jobner for having released improved varieties like RCr-41 in coriander, RZ-19 in cumin and RMT-1 in fenugreek. He also cautioned about the location of Jobner that is away from the major seed spices belt in the State.

Mr. C.S. Rajan reiterated the need for importing exotic varieties/germplasm of seed spices from Mediterranean countries like Egypt, Greece, Italy, Morocco, Iran, Iraq etc. Such a step would further help in improving the genetic material in the Jobner Centre, he stated. He also expressed his concern about the poor response to fertiliser application by the varieties released so far. Mr. Rajan mentioned about the preparation of a strategic development plan for Spices in Rajasthan and requested the GOI/ICAR to extend help. He also disclosed that under the "Contract Research Policy" of the Rajasthan Government, spices have been identified as an important sector.

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Presidential Address by Prof. R.K. Patel, Vice Chancellor
Rajasthan Agricultural University, Bikaner

Dr. Jayant Patil, Member, Planning Commission, Shri C.S.Rajan, Agriculture Production Secretary, GOR; Dr. K.L.Chadha, Deputy Director General (Horticulture), ICAR; Dr. P. Rethinam, Asst. Director General (PC), ICAR; Dr. S.Edison, Project Coordinator, Spices Research; Dr.M.S.Manchar, Director Research, RAU, distinguished scientists, guests; media personnel, Ladies and Gentlemen,

It is indeed, a matter of great pleasure and privilege for me to have the honour to address this distinguished gathering. The meetings of Scientists of Coordinated Research Projects provide a forum and an opportunity when those at the top of the echelons of country's research enterprise are able to reflect upon the state of its well-being. Such reflective interactions appropriately set forth the past record, present status and future direction of any pursuit.

Also relevant is the fact that the present meeting is being held in Rajasthan which contributes 50% of area and production of cumin, 40-50% area and production of coriander and 80% of the total produce of fenugreek of our country. Besides these, fennel, ajowan and suwa are also cultivated in the State. It is a matter of great privilege and satisfaction that this Workshop is being inaugurated by Dr. Jayant Patil whose contributions to the economic growth of the country are well-known. We feel really honoured by the gracious presence of Dr.K.L.Chadha who has been dynamically pursuing horticultural development in the country and Shri C.S.Rajan who has made immense contribution in the development of agricultural sector in Rajasthan.

Although in past four years, the country has witnessed sizable increase in spices export from a dismal level of Rs.242.14 crore in 1990-91 to whopping Rs.540.12 crore in 1993-94, assiduous efforts are required to achieve commanding position in the world market. The economic liberalization can be helpful to a point. The need of hour is to raise production so as to spare more for export after meeting the growing domestic demand.

Based on the projected growth rate assumed by the International Trade Centre, the world trade of the spices is likely to touch 6.25 lakh tonnes by 2001 A.D. This implies that even to maintain the current status, we will have to export 2.0 lakh tonnes. This would evidently require research based improvement in quality, value addition, packaging, market promotion and crisis management besides development of high-yielding, disease resistant varieties and the packages of agronomical practices conducive for higher yields.

India, historically known as home of spices, grows 52 different spices on 20 lakh ha with a production of 23 lakh tonnes valued at about Rs.4500 crores. The country contributes nearly 20% of the world's production, nearly 30% of trade in terms of quantity but only 10% in terms of value. The productivity of spices crops is not only low but is also static due to some important constraints like :

- * Cultivation in a traditional manner on marginal lands with low fertility
- * Lack of improved varieties to suit different agro-climatic conditions
- * Lack of proper adoption of improved varieties, package of practices and control measures for diseases and pests
- * Inherent weakness of the crops e.g. poor and slow germination in case of umbelliferous spices resulting in poor stand
- * Slow initial crop growth resulting into severe weed problem
- * High incidence of diseases like wilt, blight and powdery mildew of cumin; wilt and staminal of coriander; blight and gummosis of fennel; and powdery mildew, downy mildew and mycoelasma-like-organism of fenugreek.

Further, lack of proper adoption of harvesting and post harvest technology, and inadequate marketing facilities pose additional problems in the export endeavours.

In the last five years or so, the domestic and international opportunities and compulsions have increased. The spices research will have to adjust to these trends which would mean more flexibility, market orientation and above all a capacity to respond to changing conditions.

The Indian agricultural science will have to continue its search for professional excellence and yet develop creative interface with agriculture based industrialization and exports.

Our failure in recent past to enhance the exports was mainly due to non-competitive pricing and fluctuating and non-reliable supply. America and Europe, our major buyers, have stringent quality measures. To stay in international markets, we will have to upgrade the quality of our products rather than concentrating only on bulk production of spices. It is high time that we switch over to value added products like oils, oleoresins, spice powders, consumer packs of mixed spices, etc.

According to an estimate, a 30 per cent annual growth rate in oils and oleoresins can be achieved provided production and research back-up is ensured. For this, new dimensions in crop improvement programs will have to be added to meet the requirement of production of these value added items such as high curcumin in turmeric, high colour paprika, fibreless ginger, etc.

Despite various constraints, scientists have done excellent job in identifying, developing and releasing over 50 varieties of various spices in last two decades. Sreekara and Panniyur-2 in black pepper, Mudigere-1 and PV-1 in cardamom, Suprabha in ginger, Roma and Rasmi in turmeric, RC-41, Co-1 and Co-2 in coriander; GC-1, GC-2 and RZ-19 in cumin, PF-35 and GF-1 in fennel; and RMT-1, Co-1 and Lam Sel.1 in fenugreek are some of the outstanding varieties which not only produce higher yields but also supercede the indigenous/older varieties in disease and pest tolerance and quality parameters. The progress in development of agronomic package of practices and disease and pest management practices has also been commendable. Nevertheless, it must

be admitted that the impact of these advancements on the yield level has not been satisfactory.

There seems to be a serious paucity of genetic variability in seed spices specially for reaction to diseases and quality attributes. This warrants immediate updating the existing germplasm through addition of indigenous and exotic collections and indepth studies to understand the genetic architecture of these crops.

Apart from mutation breeding, the biotechnological approaches involving somaclonal variation, protoplast fusion and vector-mediated gene transfer could provide substantial assistance in creation and exploitation of genetic variability in these crops.

There are some major gaps in our research efforts which need immediate attention. These are : development of rapid multiplication methods, synthesis and utility of aneuploids/euploids, heterosis breeding, utilisation of Piper collubrinum to transfer resistance to Phytophthora foot rot and nematodes in black pepper; inter-cultivar hybridization in cardamom; induction of fertility and seed-set through polyploidy and mutations in ginger; and studies on rhizome development in turmeric.

An array of diseases and pests cause tremendous losses to the spices crops. The knowledge of host-pathogen-environment interactions is far from being adequate and indiscriminate use of chemicals cannot be encouraged in view of the residual toxicity concerns of our buyers. The situation calls for vigorous efforts in the arena of integrated disease and pest management. At macrolevel, chemical intervention should not be taken as a substitute for resistance but as an integrated approach. It is puzzling to note that few attempts have been made to study the interactions of sprayed/applied chemicals with host resistance. Indeed, the total biological design must be considered to evolve the biorational approach. Of the other strategies of disease management, the biological control is gaining momentum but hardly a few attempts in this area have been made to manage disease/pests of spices crops.

Cumin wilt continues to cause heavy crop losses. The past half-a-century has witnessed severe onslaught due to this disease. While modern diagnostic techniques like Nucleic Acid Spot Hybridization (NASH) and immunological probes are finding routine place in disease identification, spices pathology continues to depend on conventional approaches which have revealed too little to be of practical value.

In order to achieve excellence in spices production, productivity, protection, quality improvement, processing, marketing and export, following measures must be taken :

A. Production

- * Advanced breeding methods for evolving high-yielding varieties with greater stability and desirable traits be evolved/applied
- * Germplasm be collected and screened for quality attributes
- * Spices-based crop rotations be evolved
- * Methods for application of nutrients including biofertilizers be evolved particularly in light soils
- * Various agronomic practices apart from rotation be standardized for different agroclimatic conditions
- * Seed village schemes be implemented
- * On-farm processing and storage studies be conducted
- * Incentives for seed production be provided

B. Protection

- * Benefit : Cost ratio be worked out for various control practices

- * Reliable techniques for diagnosis, host resistance screening and pathogenic variation be evolved
- * Least-cost, applicable and ecofriendly strategies for pest and disease management be evolved
- * Biology, behaviour, population dynamics and pest complex of spices crops be thoroughly studied

C. Processing, Packaging and Quality Improvement

- * The future demand of spice oils, oleoresins and other value added products on global basis over a span of time be found out
- * Continuous supply of adequate raw material of good quality at economic prices be ensured
- * Export possibilities in new markets be explored scientifically
- * Research be intensified on novel uses of spices products, better host varieties/agroclimatic conditions, grading at producer's level, and better post harvest treatments like drying, cleaning, packaging etc.

D. Marketing and Export

- * Yield and loss forecasting models be evolved for both producer and trader
- * Credit facilities to the farmers for storage be provided
- * Cooperative marketing societies for seed spices be established
- * Regulated markets be set-up
- * Producer-buyer-seller meetings be regularly organised at production/processing/trading centres

The innovative contribution to the advancement and utilization of fund of knowledge has been very little. The academics must perceive reality. Refinement of package of practices, paucity of planting material/seed and weak infrastructural support have been the major bottlenecks in transfer of technology. These impediments must also be removed on a war-footing.

Before I close, I extend a warm welcome to you all. I am sure this distinguished gathering will address itself to crucial issues and evolve strategies to boost yields and exports of spices crops and their products.

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Inaugural Address by Dr. Jayant Patil, Member, Planning Commission
Govt. of India at the time of thirteenth Workshop of the
All India Coordinated Research Project on Spices held at Jaipur
from 23-25th August, 1995

The Hon'ble Vice Chancellor, Rajasthan Agricultural University
Dr.R.K. Patel, Dr. K.L.Chadha, Deputy Director General (Horticulture),
ICAR, New Delhi, Mr. C.S. Rajan, APS, Govt. of Rajasthan, Dr. M.S.
Manohar, Director of Research, Rajasthan Agricultural University, Dr. P.
Retnam, Assistant Director General (PC), ICAR, Dr.S.Edison, Project
Coordinator, Indian Institute of Spices Research and my dear scientific
colleagues, Directors and officials from various States and farmer
friends.

I am extremely happy to be with you in this historic city of Jaipur, the PINK CITY, as it is well known all over the world. As the august audience is aware, the spices belong to the group of high value horticultural crops which earn substantial foreign exchange to our country. We produce about 2.3 million tonnes of spices annually from about 2 million hectares. The value of spices produced is of the order of Rs.6000 crores and about 90 per cent of this is consumed by us, thus leaving only 10 per cent for export. Our country is proud to be called as "the LAND OF SPICES", growing black pepper, cardamom, ginger, turmeric, cumin, coriander, fennel, fenugreek, celery, chilli, garlic as well as the value added products like curry powder, spice oils and oleoresins. We exported 1.54 lakh tonnes valued at Rs.607.34 crores during the last year namely 1994-95.

The export of spices oil has increased from 2.6 metric tonne valued at Rs.92,000 during 1971-72 to 251.9 metric tonnes worth Rs.72.2 million during 1992-93 and that of oleoresin from 0.7 metric tonnes worth Rs.48,000 to 1008.7 metric tonnes worth Rs.594.1 million during the above period. It is evident that oils and oleoresins which are the value added products have greater potential for export. We have projected our exports to increase to 2 lakhs tonnes by 2001 AD and to achieve this, an all out effort will be necessary. The other side of the

con is, however, that we continue to import some spices like clove, nutmeg and cinnamon worth about Rs.25-30 crores every year and obviously there is a shortage in production in these items.

I am very happy to know that ICAR has taken adequate steps to intensify spices research. The Regional Research Station of CPCRI started during 1975 was upgraded as National Research Centre for Spices during 1986 and recently it was elevated to the level of an Institute known as Indian Institute of Spices Research for which the Planning Commission has given its approval.

This Institute had the mandate to conduct research on black pepper, ginger, turmeric and tree spices like clove, nutmeg and cinnamon. The cardamom research has, however, been initiated at Appangala (Karnataka) in 1974. The Spices Board has also a research set-up to work on small cardamom at their Indian Cardamom Research Institute at Myladumpara, Kerala with sub-stations in Karnataka, Tamil Nadu and Sikkim.

Similarly, the All India Coordinated Research Project started during 1971, with four co-ordinating centres was expanded to 16 centres during 7th Plan, and 20 centres during the 8th Plan. Recently based on the recommendation of the Parliament sub-committee on spices, 4 more centres were sanctioned one each in Maharashtra, Madhya Pradesh, Uttar Pradesh and West Bengal. I was very much involved in this and I am sure that this will eliminate the regional imbalances as far as spices research is concerned.

In addition, 7 more voluntary/participating centres are also assisting in our efforts. The research efforts of the Coordinating Centres are pursued in the various State Agricultural Universities; for example we have a centre for Seed Spices at Jobner, Rajasthan.

Similarly, the development programmes on spices have been taken up by the Agricultural Universities with the support from the Directorate of Cocoa, Aracanut and Spices Development. This Directorate has been sanctioned with a huge sum to operate the centrally sponsored

scheme for integrated spice development in various states. These programmes include provision of improved seeds and other package kits and this is executed largely through the efforts of scientists under the State Agricultural Universities on behalf of the respective Directors of Horticulture/Agriculture.

I am proud to find that the Govt. of Rajasthan has taken enormous interest in organising extensive infrastructure to help internal marketing and export promotion avenues for spices produced in Rajasthan through the State Marketing Board. Out of the 4.1 lakh hectares grown to spices in Rajasthan, coriander and cumin lead with 1.44 and 1.55 lakh hectares respectively. Of the 3.09 lakh tonnes of spices produced, 1.06, 0.77, 0.25 lakh tonnes are from coriander, cumin and fennel respectively. It has been observed that even though these crops are grown in the desert districts of Rajasthan, there is appreciation of its contribution to the economy of the State. However, bulk of seed spices of Rajasthan is still regulated through the Unjha Mandi in Gujarat. This Unjha Mandi has a tremendous record of turning over the highest amount of spices for domestic as well as international trade. We are also proud of the Southern States of Karnataka, Kerala, Tamil Nadu, Andhra Pradesh as well as Orissa, Madhya Pradesh and Maharashtra which do contribute substantially to the production of major spices like black pepper, cardamom, ginger, turmeric and garlic.

Our export of spices is to over 150 countries in the world although a few of them namely USA, UK, UAE, CIS, Japan, Sri Lanka, Germany, Bangladesh, Pakistan, France, Canada, The Netherlands, Italy, Malaysia, Yeman, Australia, Egypt and Saudi Arabia account for more than 80 per cent of our trade. Still we meet only approximately 20 per cent of the international trade compared to almost 35%, a few decades ago. The silver lining is however that the Indian spices are still most preferred around the globe, fitting into every cuisine only because of its intrinsic quality, the best blend of taste as well as the keeping quality. Another dimension to this situation is the coming up of value added spices like, spice oils and oleoresins, curry powder and paste, spices powder, green pepper etc. Even novel products like dehydrated green pepper, freeze dried pepper, pepper in brine, frozen pepper etc. are

becoming popular in the west. It may be seen that in the last year (1994-95), the export of seed-spices accounted for about Rs.135 crores out of the total export worth Rs.607 crores. Another spice of recent importance is cumin which earned almost Rs.22 crores in foreign exchange by export in the last year.

I had mentioned all these figures only to highlight the importance of spices cultivation, production, processing, export and international competition we may face in the years to come. The Govt. of India has, however, planned to increase the export of spices to 2 lakh tonnes in another 5 years by which we should achieve at least 25 per cent of the world market in spices. The report of the Forum for Export of Spices under the Chairmanship of Dr. M.S. Swaminathan has made several recommendations to the Govt. of India and to take up time-bound programme on research to reach high productivity, quality improvement, value addition, packaging, legal aspects as well as crisis management. I would like to compliment the enormous research efforts made by the Scientists working on Spices all over the country and especially under the network of the All India Coordinated Research Project on Spices, Indian Institute of Spices Research, Indian Cardamom Research Institute, as well as the State Agricultural Universities. Several technologies have been developed by these organisations and I would be carrying coal to New Castle if I enumerate their achievements. However, I am pleased to say that certain significant achievements like release of about 60 varieties of various spices, production and distribution of quality planting material of these spices, technologies for control of major diseases like Phytophthora foot rot disease of black pepper, azhukal disease in cardamom, control of rhizome rot of ginger and turmeric as well as wilt, blight and powdery mildew diseases of cumin, coriander etc. Besides, some of the important pests like shoot borer and thrips in cardamom, Pollu beetle in black pepper as well as storage pests in seed spices have also been studied in detail. I understand that many of the technologies have already found field acceptance and are rewarding in the farmers' fields. But we still have a long way to go.

It is my fond wish and desire that all of you who have assembled here may deliberate intensively on various aspects of research

on spices, taking into account our priorities in increasing productivity. Land area is limited and so we have also a severe constraint to find adequate funds to support. You will be doing a wonderful service if aspects like cropping systems research, nutrition, water and micro nutrient management, organic farming, eco spices production, use of bio-control agents in controlling pests and diseases as well as help in evaluating the technologies in the field. Another important activity will be about production and distribution of nucleus planting material of improved varieties, training of farmers and extension personnel and inculcate the spirit of accountability and time bound research output.

May I, therefore, in the benign presence of my respected friends Dr. R.K. Patel the Vice Chancellor, Rajasthan Agricultural University, Dr. K.L. Chadha, Dy. Director General (Horticulture), ICAR, New Delhi and other dignitaries, have the pleasure in inaugurating this XIII National Group Meeting of the All India Coordinated Research Project on Spices and wish you the best of discussion and come out with useful recommendations. I shall assure you that the highest consideration will be given to your deliberations by the Government in boosting the cause of research and development of spices.

JAI HIND

Technical Session I : GENETIC RESOURCES

Chairman : Dr. P.N.GUPTA

**Rapporteurs : Mr. N.HARIPRASAD RAO
Mr. B.KRISHNAMOORTHY**

Technical Session I : GENETIC RESOURCES

1. No. of Centres presented : 14
2. Centres where work was done: Panniyur, Sirsi, Chintapalli, Solan, Pottangi, Dholi, Mudigere, Pampadumpara, Jagtial, Jobner, Jagudan, Coimbatore, Hisar and Yercaud
3. Non-performing Centres : Gangtok
4. Salient results reported :

The session started with the Chairman's remark on the importance of genetic resources, their collection, evaluation and conservation, more so in the present changing global scenario in respect of germplasm. Thereafter, the coordinating centres presented their reports on different spice crops.

BLACK PEPPER :

In genetic resources of black pepper, progress of work done during the last two years (1993-94 and 1994-95) has been presented by all the four centres viz., Panniyur, Chintapalli, Sirsi and Yercaud. In Panniyur, three cultivars which appeared promising viz., Karimunda III, Karimunda I & Sullia are proposed to be included in multilocation trial. In Chintapalli centre, the vines in germplasm which are not/low yielding may still be maintained. In Sirsi centre, it was decided that the accessions which have been lost/destroyed due to heavy rains, may be made good by gap filling.

CARDAMOM

Progress of work in genetic resources of cardamom for 1993-94 and 1994-95 in two centres viz., Pampadumpara and Mudigere has been presented. In Mudigere, it was decided to collect the local germplasm materials in a phased manner from where collections were not made earlier. While collecting germplasm, Mudigere centre is requested to have collaboration with NBPGR (RC) nearer to Mudigere. Reporting of Hydathium sp. need not be made in the Workshop.

LARGE CARDAMOM

No one from Gangtok centre presented the work done.

GINGER

Progress of work in genetic resources at Solan, Pottangi & Dholi for 1993-94 and 1994-95 has been presented. While evaluating germplasm, Pottangi centre was asked to have a check for maintaining uniformity in evaluation and data analysis.

TURMERIC

Progress of work in genetic resources at Solan, Pottangi, Jagtial and Dholi for 1993-94 and 1994-95 has been presented. It was decided to discontinue forthwith the work on turmeric and final report to be submitted on the work done on turmeric at Solan.

TREE SPICES :

Work carried out in genetic resources only at Yercaud for 1993-94 and 1994-95 has been presented. Pechiparai & Thadiyankudissai reports were not presented. In Yercaud, it was suggested to try multiplication of cassia cinnamon through air layering in the month of June-July, as it has given about 80% success in IISR, Calicut. The Chairman opined that introduction of tree spices from exotic sources are to be made.

SEED SPICES

Jobner centre presented the progress of work on coriander and fenugreek. This centre maintained the germplasm of cumin and fennel.

Jagudan centre presented the work done on coriander, fenugreek, cumin and fennel for 1993-94 and 1994-95. The germplasm accession are to be characterized and evaluated for minimum descriptors at Jagudan centre.

Guntur centre presented the progress of work done on genetic resources of coriander and fenugreek for 1993-94 and 1994-95. The available germplasm materials in fenugreek may be evaluated for "greens" purpose also and simultaneously the germplasm from Jobner may be collected and evaluated.

The Coimbatore centre presented the work done on coriander and fenugreek for 1993-94 and 1994-95. This centre may visit and collect germplasm materials in these two crops at least from 4 different districts in Tamil Nadu viz., Madurai, Ramanad, Kamarejar and Kattabomman during 1995-96.

The Hisar centre presented the progress of work done on all the 4 seed spices for 1993-94 and 1994-95. The quality analysis for leafy types in coriander has to be carried out.

Dholi centre presented the work on fenugreek, coriander, fennel and onion. Germplasm materials of Ajowan to Guntur centre by Dholi and Hisar and exchange between Dholi and Hisar centres may be done.

General decisions :

- 1) Emphasis should be given for collecting the germplasm from local areas of the coordinating centre and a comprehensive exploration programme be prepared in phased manner duly approved by the Project Coordinator. Passport data should be maintained for all the germplasm collected.

- 2) Minimum descriptor has to be prepared for each spice by Project Coordinator. NBPGR's help can be sought.
- 3) While supplying germplasm to other centre, the supplying centre should give Passport data also.
- 4) While collecting germplasm, two trips may be made; once during flowering/full bearing time and next during proper time of collecting the propagules for raising the plant.
- 5) While collecting germplasm materials, possibilities of joint programme with NBPGR may be sought.
- 6) Germplasm conservation units with at least 1 AC room or refrigeration maintaining a temperature of 5 c are to be established for storing the active germplasm seeds for 2-3 years without loss of viability.
- 7) For ex-situ conservation of vegetatively propagated plants efforts be made to create clonal repositories.
- 8) Efforts need to be made to create plant quarantine units either at each University or region wise to issue phyto-sanitary certificates for collected germplasm and material for exchange.
- 9) For importing germplasm from abroad through NBPGR, the application should be made on prescribed proforma following the instructions prescribed therein.

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Technical Session II : CROP IMPROVEMENT & BIO-CHEMISTRY

Chairman : Dr. P.RETHINAM

Co-Chairman : Dr. R.K.SHARMA

Rapporteurs : Dr. H.M.CHANDRAPPA
Dr. B.SASIKUMAR
Dr. T.THANGARAJ

Technical Session II : CROP IMPROVEMENT & BIOCHEMISTRY

1. No. of papers presented : 18
2. Centres where work was done : 18 (Panniyur, Chintapalli, Sirsi, Yercaud, Pampadumpara, Mudigere, Myladumpara, Appangala, Pottangi, Solan, Jagudan, Jagtisi, Dholi, Coimbatore, Hisar and Guntur)
3. Non performing centres if any : one (Gangtok)
4. Brief description of the work done and salient results reported :
(crop wise)

BLACK PEPPER : 4 cultures namely, 5308, 4700, 5198 and 4563 performed better at Panniyur. In MLT, culture 1171 was promising in respect of productivity. Karimunda and Panniyur-5 showed promise under CYT.

CARDAMOM : The line TC 6 showed encouraging performance in Mudigere centre among eight tissue cultured selections.

GINGER : Culture V_8E_2 performed well in CYT at Pottangi. Under Solan conditions "Rajgarh" registered higher yields.

TURMERIC : PTS-19 in CYT and PTS-43 in IET were found promising at Pottangi centre. However, "Sugandham" was found better in Dholi.

CORIANDER : At Dholi, Pant Dhaniya-1 registered the highest leaf yield; CC 745 and CC 758 at Coimbatore, ATP 147 at Guntur under IET, JCO-64 at Coimbatore and CC-964 at Guntur under CYT emerged promising. The promising cultures selected from experiments at Jobnar can be tested for their productivity over larger plots (20 meters square plots).

FENNEL : UF-105 was found promising at Jobner centre. HF-33 and HF-39 showed maximum oil content.

FENUGREEK : CC 464 at Coimbatore and Hisar, HM 103 at Dholi and Hisar centres were encouraging.

5. Recommendations / Decisions (crop wise) :

- (1) Black pepper : The progress at Chintapalli is not satisfactory and PC will make a visit and review the progress including expenditure made under the project and send a report to the Council within three months. The IISR Calicut and Panniyur centres will supply the planting material for MLT at Chintapalli.

A crop cafeteria of all released black pepper varieties has to be established and maintained in all centres to serve as research and demonstration plots.

The Pottangi centre will send an adhoc scheme proposal on the feasibility of pepper cultivation in tribal areas.

- (2) Cardamom : The promising short listed cardamom lines of Mudigere need to be mass-multiplied through tissue culture. The ICRI, Myladumpara will take up the multiplication programme.

Appangala & Mudigere centres will spare planting material for MLT 1991 series III to Sakleshpur and Thadiyankudissai centres @ 75 suckers per entry. All centres working on cardamom will collect data on the - tiller number, number of bearing tillers, number of panicles, length of panicles, number of nodes per panicle, number of capsules per node and yield per plant.

- (3) Ginger : Pottangi centre will spare planting material of released ginger varieties to farmers outside the State. A greater attention for developing low fibre varieties will have to be made in ginger.

The experimental results on ginger at Chintapalli centre are to be compiled and sent to PC.

(4) Turmeric : An ad-hoc scheme on rhizome rot and leaf spot diseases of turmeric will be prepared by the PC. PC will be the Principal Investigator and the Project will be located in three selected centres.

(5) Seed Spices : The quality analysis facilities available at Jobner has to be availed by all testing centres. Quality improvement in coriander in particular for essential oil content is emphasised. It is suggested that an exploration for exotic types for oil content could be taken up on priority and attempts to grow them under the various agro-climatic conditions has to be made. The role of variety and agro-climatic situation on the quantity of oil has to be established for viable quality improvement programme.

(6) Tree Spices : The Yercaud centre will study in to the quality aspects of cinnamon bark on harvest during September this year.

6. Recommendation ready for transfer of extension agency if any :

Nil.

7. Programme proposed for next year (crop wise with experimental details)

ONGOING EXPERIMENTS

1) Black Pepper : Chintapalli centre will take up the MLT during the current year without omission. MLT 1987-IV series is to be discontinued as the entries have already become outdated.

2) Ginger : The data presented by Solan centre indicated that the yield levels are too low and it is suggested that a trial on the maximization of yield in ginger has to be laid out.

3) Cardamom : Thadiyankudisai centre will relay the MLT.

NEW EXPERIMENTS :

1. The Pottangi centre will also take up in MLT on black pepper with released varieties.

2. New MLT will also be taken up during next year with the following entries in seed spices:

- a) Coriander 5 kr - 40, 5 kr-68, and kr-50 from Jobner
 - 745 & 748 from Coimbatore
 - DH 13, DH 52 and DH 48 from Hisar

Eight entries with one local check

Replications - 3

- b) Fenugreek - 40 Kr-3-4, 40 Kr-1-15, 40 Kr-2-11 & 20 Kr-15-4
 from Jobner
 - 464 from Coimbatore
 - HM 110, HM 114, HM 291 & HM 295 from Hisar

Nine entries with one local check

Replications - 3

8. General decisions :

- 1) Frequent transfer of Scientists working in Coordinated programmes has to be discouraged. The Council has to take up the matter with the concerned SAUs.
- 2) The Scientists working in Coordinated projects have to attend the Workshops regularly. Besides, the Senior Breeders of concerned crops from various participating centres as well as the IISR, Calicut should make their presence and help in formulation of technical programmes by their active participation.
- 3) Any material for release has to be considered based upon an yield increase of 10-15% over the standard varieties or they

should possess desirable characters like better quality, adaptability or resistance to biotic and abiotic stresses.

- 4) The MLT experiments have to be initiated and laid out only when sufficient planting material in all the entries are made available. Only the best released/pre-release varieties should be entered in the MLTs. The PC will give the indent for plant materials well in advance to the source centres. Proper planning and precise data collection and interpretation has to be done in all evaluations.
- 5) In view of the growing awareness to environmental pollution and eco-friendly produce (pesticide residue free), more emphasis on reaction to pests and diseases will have to be laid during varietal screening.

9. Future thrust :

Many of the spice crops are export oriented. A few are low value crops with the hands of marginal and poor farmers. There is a growing awareness to environmental pollution and produce free from pesticidal and fungicidal residues leading to organic farming systems. Under such emerging trends it is felt that a strong breeding programme to evolve varieties for yield, quality and resistance to biotic and abiotic stresses is essential. Screening for biotic and abiotic stresses has to be made both in field and under controlled conditions.

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Technical Session III : PLANT PATHOLOGY & ENTOMOLOGY

Chairman : Dr. Y.R.SARMA

Co-Chairman : Dr. C.P.S.YADAVA

Reporteurs : Dr. M.N.VENUGOPAL
Dr. V.A.SOLANKI

- Technical Session, III : PLANT PATHOLOGY & ENTOMOLOGY
1. No. of papers presented : 14
 2. Centres where work was done : Mudigere, Pampadumpara, Panniyur, Jagudan, Jobner, Chintapalli, Jagtial, Coimbatore, Solan, Pottangi, Sirsi, Dholi
 3. Non-performing centres : Nil
 4. Salient results reported
 1. Combination of treatments involving all cultural practices + 1 kg of neem cake + 3 g a.i. phorate + spraying and drenching Bordeaux mixture as a premonsoon treatment and Akomin second round 0.04% as a post monsoon treatment was found effective against foot rot of pepper.
 2. Incorporation of Trichoderma viride and Trichoderma harzianum was found effective in reducing the root rot of pepper in pot culture experiments at all the centres.
 3. Exotic cultures of cumin and fenugreek have shown high degree of resistance against wilt at Jagudan centre.

Decisions taken

1. BLACK PEPPER
 - i) Nursery management results may be compiled and new schedule of treatments may be finalised.
 - ii) Incorporation of promising antagonists (Trichoderma viride & T. harzianum) may be started right from nursery stage. Solarisation of nursery mixture and incorporation of antagonists can form the part of Nursery Management Technology (Action : All centres)

- iii) An observation trial on impact of basin management with marigold may be assessed in relation to population of pathogenic nematodes of pepper. The required source material of marigold seeds of preferred variety will be supplied by M/s. Synthite (Action : IISR and M/s. Synthite)
- iv) Plantations of pepper may be monitored periodically in March-June-July-October) to assess the past incidence in hilly regions. (Action : RRS, Mudigere)

2. CARDAMOM

- i) All the data pertaining to the ecology and management of thrips may be compiled and submitted to Project Coordinator by October 1996. (Action : Entomologists, RRS, Mudigere, RRS, Pampadumpara)
- ii) Residue analysis may be carried out in all the chemical control trials to fix the safe limits (Action : All centres)

3. GINGER

To induce resistance in ginger against Fusarium, in vitro screening and screening somaclones will be taken up. Pathologist from Solan centre will visit IISR, Calicut for training on VAM Technology, toxin isolation and Tissue culture techniques (Action : Solan Centre)

4. TURMERIC

- i) Pathogenicity of Pythium sp. and Fusarium sp. singly and in combination may be undertaken to confirm the etiology of disease and the associated pathogens may be identified to the species level (Action : Jagtial centre)
- ii) Uniform screening methodology may be adopted both at Jagtial and Dholi centre for foliar diseases and rhizome rot of turmeric.
- iii) Pre-release materials may also be included in the on-going screening trials (Action : Jagtial and Dholi centres)

5. TREE SPICES

Periodical monitoring may be undertaken in all the centres for identifying the pest and disease problems of tree spices. Associated pest/pathogens, may be identified (Action: Yercaud, Thadiyankudissni & Ambalavayal)

6. SEED SPICES

- i) Results of screening work carried out since 1972 may be compiled and promising cultures may be short-listed and made use in the future MLT programme (Action: All centres)
- ii) Promising resistant lines should be exchanged in order to test their reaction in all the centres
- iii) Loads from bio-control trials may be incorporated in the finalisation of IDM of cumin and coriander wilts (Action : All centres)

General decisions :

- i) All the detailed reports may be duly sent to PC (Spices) in the specified time (Action : All centres)
- ii) The IISR may organise short-time training on isolation, mass multiplication and application of bio-control agents used in management of soil borne pathogens of spices.
- iii) Proper movement of planting material may be regulated to check the spread of potential pathogens through planting material. The IISR will give guidelines for undertaking preventive measures (Action : IISR and PC (Spices))
- iv) Information on the seed stock of seed spices may be updated and passed on to the concerned agencies (Action : PC (Spices))

Future thrust :

- i) Greater importance will be given for inducing host resistance against important diseases.
- ii) Bio-control programme will be intensified in order to develop Eco-friendly plant protection technology.
- iii) Study on efficacy of botanicals on suppression of pests & diseases may be intensified.
- iv) Major thrust would be to develop integrated pest and disease management to ensure pesticide free produce.

Transportation and exchange of planting materials**1. Black pepper**

- i) Exchange of planting material either for the experimental purpose or for large scale planting, should be only through either prerooted or unrooted shoots. Cuttings raised in poly bags with soils should not be taken from Kerala/Karnataka and also within the states and also to nontraditional areas. Runner shoots/rooted runners kept in polybags remain fresh for 5-7 days during transportation.
- ii) For large scale cultivation, it is desirable to use only released varieties with known productivity, available with SAUs/IISR.
- iii) In Government nurseries, collection of planting material from farmers in bulk for raising rooted cuttings from farmers should be stopped. In case of non availability of released varieties, high yielding mother vines should be identified in farmers' field in advance and runner shoots be coiled and kept on a stake to avoid contact with soil.

- iv) Runner shoots be washed thoroughly and pretreated with either with Akomin or Copper Oxychloride (2g/l) for 30 minutes.
- v) It is desirable to solarize the moist nursery mixture for 20-30 days and mixed with biocontrol agents like Trichoderma and Gliocladium. Treated cuttings are to be planted in such pretreated nursery mixture in poly bags.
- vi) When it is not possible to solarise nursery mixture, it can be mixed with biocontrol agents.

2. Cardamom

- i) Where multiplication is reported through seed, nursery beds should be solarised at least for 20-30 days. The nursery beds may be fortified with biocontrol agents raised in carrier media like coffee husk or sorghum seed or saw dust.
- ii) When suckers are used as planting material, they should be washed thoroughly and roots be pruned. Such suckers should be treated with Mancozeb for 30 mts before transportation and subsequent planting.

3. Ginger and Turmeric

Raising of seed rhizomes from nucleus material obtained from micropropagation through tissue culture is ideal. In the absence of such material, disease-free plots in the field should be identified well in advance and marked specifically. Seed rhizomes be collected only from such plots but not in bulk. The seed rhizomes be given a seed dip with mancozeb combination with Monocrotophos or Malathion for 30 mts. before storage and stored in ideal storage conditions as specified in package of practices.

4. Seed Spices

Seeds be collected exclusively from only such plots which are maintained disease free in the field, adopting the package of practices. Since many of the diseases are seed borne, regular fungicidal sprays need be resorted to check foliar diseases. Instead of harvesting plants along with root system, for seed purposes, collection of umbels and drying them is recommended; this would exclude the possibility of contamination in seed. Seed treatment with Carbendazim / Captan can be resorted to before storage.

NEW EXPERIMENTS :: PLANT PATHOLOGY

Experiment 1 : Epidemiological study of *Alternaria* blight of cumin

Objective : To quantify, several epidemiological parameters, which account the quantitative relationships of weather factors, crop factors and pathogen/disease development during an epidemic under natural conditions.

Treatments : Two sowing dates prior and after the recommended sowing date (location wise) with an interval of 10 days.

	<u>JAGUDAN</u>		<u>JOBNER</u>
1.	5th Oct.	-	10th Nov.
2.	15th Oct.	-	20th Nov.
3.	25th Oct.	-	30th Nov.
4.	10th Nov.	-	10th Dec.
5.	20th Nov.	-	20th Dec.

Design : R.B.D. Replications : Four
 Variety : Locationwise Seed rate : 15 kg ha⁻¹
 Method of sowing : Broadcasting Plot size : 4.0 x 2.5 mt

Fertilizers : As per recommended dose

Cultural practices : As per recommendation

Observations to be recorded :

1. Disease assessment : Severity of blight on plants will be scored by using a 0-5 scale (as under) and this will be started from 20 DAS and thereafter at weekly intervals.

<u>Rating scale</u>		<u>Infection/Phenotypic class</u>
0	-	Healthy
I	-	Spot on the stem
II	-	Spots on the stem, leaves and branches
III	-	Spots on the stem, leaves branches and umbells
IV	-	Partial blighting of plant (i.e. blighting of few umbells on plant)
V	-	Blighting of whole plant

2. Weather parameters : Daily weather parameters to be recorded
3. Yield

Experiment 2

Title : Integrated management of pests and diseases of cumin

Treatments : Main treatment

1. Seed treatment and soil application of Trichoderma harzianum
2. Seed treatment of Carbendazim @ 0.1% + soil application of Trichoderma harzianum
3. Application of oil cake (locally available and which has given good results)
4. Control

Sub treatment

1. Mancozeb @ 0.3%
2. Mancozeb @ 0.3% + Neem oil @ 1% + Tipol @ 1%
3. Mancozeb @ 0.3% + Monocrotophos @ 0.04%
4. Mancozeb @ 0.3% + Acophate @ 0.075%
5. Hexaconazole (contaf) @ 0.05%
6. Hexaconazole (contaf) @ 0.05% + Neem oil @ 1% + Tipol @ 1%
7. Hexaconazole (contaf) @ 0.05% + Monocrotophos @ 0.04%
8. Hexaconazole (contaf) @ 0.05% + Acophate @ 0.075%
9. Penconazole (Topas) @ 0.05%
10. Penconazole (Topas) @ 0.05% + Monocrotophos @ 0.04%
11. Thiophanate Methyl (Topsin M) @ 0.07%
12. Thiophanate Methyl (Topsin M) @ 0.07% + Monocrotophos @ 0.04%
13. Control (No spraying)

Design : Split plot

Replications : Three

Plot size : 4.0 x 2.5 mt

Variety : Recommended high yielding (Location wise)

Seed rate : 15 Kgha⁻¹
Method of sowing : Broadcasting
Fertilizers : As per recommended dose
Cultural practices : As per recommendation
Starting of spray : 25 DAS
No. of sprays : Three (fourth if required)
Interval between two spray : 12 days
Observations to be recorded :

1. Disease assessment before each spray and at harvest
2. No. of aphids and thrips per plant before and after 72 hr. of each spray
3. Yield
4. Population of Trichoderma & F. oxysporum at 0 day, 30, 45, 60 days. Trial should be conducted in sick plot or in highly disease prone area.

Experiment 3 :

Integrated disease management of coriander wilt, powdery mildew and grain moulds

Main plot

1. Seed treatment with T. viride 5g/kg seed
2. Seed treatment with Carbendazim 0.1% - 30 mts
3. Application of Neemcake - 150 kg/ha
4. Control

Sub plots

1. Hexaconazole (Contaf) 0.05%
2. Thiophanate methyl (Topos) 0.07%
3. Mancozeb
4. Control

Design : split plot
 Replication : 3
 Size : 4 x 2.5 M
 Variety : Recommended high yielding variety
 Seed rate : As per recommendation
 Starting of spray : 25 days after sowing
 No. of sprays : 3
 Frequency : 15 days

Observations

1. Percentage of germination
2. First time incidence of disease
3. Disease rating before each spray
4. Yield
5. Population of F. oxysporum and T. viride at 0 day, 30, 45 days

Trials should be conducted in sick plot or highly disease prone areas.

Experiment 4 :**Integrated disease management of Fenugreek root rot****Treatments :**

1. T-1 Seed treatment with Carbendazim (0.1%) for 30 minutes
2. T-2 Seed treatment with Trichoderma viride @ 4g/kg seed
3. T-3 Soil application of T. viride
10 days before sowing 100g/10 sq.m.
4. T-4 Application of neem cake 150 kg/ha
5. T4 + T1
6. T4 + T2
7. T4 + T3
8. Control

Design RBD - Plot size 4 x 2.5 m

Replication : 5

Seed rate : As per recommendation

Variety : Recommended high yielding variety

Observation :

1. Percentage of germination
2. Wilt incidence at 15 days interval
3. Population of R. solani - 0 day, 15, 30, 45 days
4. Population of T. viride - 0 day, 15, 30, 45 days
5. Yield

Experiment 5

Foot rot of black pepper

1. Screening germplasm for their reaction to P. capsici
2. Mass screening of seedling progenies of available cultivars/germplasm
3. Disease Management

Individual holding be taken for the disease management experiment and each holding will be taken as a replication. At least 6 holdings each with not less than 150 standards be chosen. The plot size be increased according to availability of vines in a plot. All the cultural practices including phyto sanitation to be strictly be followed.

Treatments :

1. Control
2. Bordeaux mixture treatment - pre and postmonsoon soil drenching with COC and foliar spraying with Bordeaux mixture - 2 rounds
3. Akomin (3 ml/l) spray and drenching - pre and post monsoon treatment
4. Biocontrol (soil application to the base @ 50g of inoculum + 5 kg of FYM/vine)
5. Akomin + Biocontrol application

Pre-treatment observations

No. of gaps in the garden

No. of vines showing foliar yellowing

No. of healthy vines

Post treatment observations

1. No. of vines showing foliar yellowing

Intensity	0	1	2	3	4	5
(Visual)	Nil	1-10%	11-25%	26-50%	51-75%	75%

2. No. of vines with foot rot & death of vines

3. Mixed infection (foot/root rot and foliar infection)

Apart from the above, a field experiment has to be laid out in Arecanut garden at Sirsi centre with different densities of pepper using any local pepper cultivar.

1. 25% of the standards with pepper
2. 50% of the standards with pepper
3. 75% of the standards with pepper
4. 100% of the standards with pepper.

Technical Session IV : AGRONOMY & SOIL SCIENCE

Chairman : Dr. S.N.POTTY

**Rapporteurs : Dr. A.MANOHAR RAO
Dr. K.N. SATHEESAN**

Technical Session IV : AGRONOMY & SOIL SCIENCE

1. No. of papers presented : 20
2. Centres : Panniyur, Sirsi, Mudigere, Pampadumpara, Pottangi, Dholi, Yercaud, Jobner, Hisar.
3. Non-performing centre : Nil
4. Recommendations/decisions -
Crop wise :

I. BLACK PEPPER :

1. The present experiment on irrigation cum fertilizer levels at Panniyur may be concluded after taking the current year's yield data and one new experiment on drip irrigation cum fertilizer may be laid out with latest released varieties (one each in open pollinated and hybrid) varieties. If a suitable area is available with a grown up pepper vines (100 numbers), one trial on drip irrigation with levels of fertilizers may also be laid out. The Director of Agriculture, Kerala will provide facilities for laying out drip irrigation trial.
2. At Sirsi the experiment on irrigation cum fertilizer requirement on pepper in a pepper arecanut mixed cropping system will be continued without any modification.

II. CARDAMOM

(A) Mudigere

1. The manurial experiments may be concluded and final report will be submitted to the Project Coordinator incorporating analysis report of soil and plant by 30th June 1996.
2. Trials on micronutrients and integrated management of organic and inorganic manures will be continued.
3. Trial on effect of spacing and growth regulators, cost of sucker production may be worked out and it may be tried in a larger area.

(B) Pampadumpara

The experiment on manurial and micronutrients will be continued. They may utilize the survey report on major and micronutrients status of that area, and modify the treatments if needed.

III. Ginger & Turmeric

1. Pottangi centre will submit final reports on (a) Fertilizer trial on ginger (b) Intercropping trial on turmeric
2. At Dholi centre, the experiments on ginger and turmeric may be concluded and final report submitted to the Project Coordinator.

IV. Tree Spices

1. All the experiments on tree spices at Yercaud will continue. Seeds of wild nutmeg available in the kollu region may be used for grafting.
2. In the bio-fertilizer trial on tree spices at Yercaud, the method of application may be standardized in the light of its incompatibility with inorganic fertilizers. The soil micro flora may be monitored continuously all round the year.

V. Seed spices

1. Dholi centre will continue the experiments on fenugreek.
2. In Jobner and Hisar, the weed management/control trials on fenugreek, coriander and fennel may be concluded and a final report is to be submitted to the Coordinator soon. The technology has to be demonstrated in the farmers' field.
3. The experiments on date of sowing, spacing, seed rate etc. may not be continued as sufficient information on these aspects is already available.

VI. Recommendation ready for transfer to Extension agency (if any)

1. In ginger the results of the NPK trial (Pottangi)
2. Intercropping of turmeric with soybean (Pottangi)
3. Size of seed rhizome in ginger and spacing trial in turmeric (Dholi)

4. Weed management/control in seed spices (Jobner and Hisar)

VII. General decisions:

1. In all the manurial experiments the soil and plant analysis should be taken up invariably.
2. In seed spices, the future experiments on date of sowing, spacing, seed rate etc. should cover studies on the relation between the climatic factors, soil moisture etc. so that such experiments need not be replicated in different locations.
3. In manurial trials the sources, method and time of application of fertilizers should be well defined so that such information would be useful for interpretation of results.

VIII Future thrust

1. Perfect agro techniques to combine bio-fertilizer and inorganic nutrients in order to ensure the effectiveness of bio-fertilizers.

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**Technical Session V : TRANSFER OF TECHNOLOGY & INTERACTION
WITH DEVELOPMENT DEPARTMENTS**

Chairman : Mr. E.VELAPPAN

Co-Chairman : Dr. Y.S.MALIK

**Rapporteurs : Dr. B.RABINDRAN
Dr. P.S.RAO**

Technical Session V : TRANSFER OF TECHNOLOGY

The Chairman expressed the importance of transfer of technology programmes to the farming community and requested the Scientists to provide utmost attention to the production and availability of good quality nucleus planting materials to the State Govt. nurseries as well as farmers. He further suggested to conduct a separate Workshop on the production of planting materials. The Chairman cautioned about the transportation and delivery systems of the planting materials because of the risk in spread of diseases and pests from one area to another.

Dr. M.R. Sharma (NABARD) stressed the need for interaction between farmers, development departments and financial agencies on productivity, production and quality of spices. He further stated that only about 1.5% of the total loan from the Bank is utilised by the Spice farmers whereas there is a vast scope to improve the percentage. There is a need to develop good varieties and good package of practices so as to encourage spices cultivation in large scale in view of the scope in export and earning of foreign exchange. He further stated the importance and need of location specific research.

The Director of Agriculture, Kerala State, Mr. Sadasivan pointed out the difficulties being faced by the farmers in the use of lime for preparation of Bordeaux mixture to contain the Phytophthora foot rot disease of black pepper. He also requested the Scientists to try and recommend alternate chemicals if possible and expressed his serious concern about the residual toxicity of BHC and DDT and stressed the need to ban these chemicals. The Director also requested the need to make available nucleus planting material to the Govt. approved nurseries and departmental farms. Finally the Chairman commented that whenever any Research experiment in the Spices Project is concluded, the valuable information/results obtained must be transferred to the farmers immediately.

After detailed deliberations, the following technologies have been recommended for adoption by the extension agencies.

1. Ginger (Pottangi Centre)

Application of $N_{125} P_{100} K_{100}$ kg/ha has given a fresh rhizome yield of 14.65 t/ha with the maximum net-profit of Rs.53,000/- per ha.

2. Turmeric (Pottangi Centre)

The intercropping of Soybean in turmeric gave the maximum rhizome yield of 17 t/ha besides a good soybean crop. The highest benefit of Rs.34,000/- is achieved per ha.

3. Ginger (Dholi Centre)

Seed rhizome size has been worked out as 18g pieces which would give maximum yields.

4. Turmeric (Dholi Centre)

A spacing of 30cm between rows and 20cm between plants in the row was found ideal for maximum production.

5. Fenugreek (Dholi Centre)

Sowing fenugreek by 15th October at a spacing of 30cm x 10cm is practical and economical.

6. Fenugreek (Jobner Centre)

For weed control, application of the weedicide Fluchloralin @ 0.75 kg/ha, supplemented with one hand weeding gave a high seed yield of 1.615 t/ha and a net profit of Rs.14,300/- per ha. The cost:benefit ratio was 1 : 3.79.

7. Coriander (Jobner Centre)

Maintaining the crop free of weeds (manual weeding) almost up to the harvest stage gave the highest seed yield of 9.14 Ql/ha and a net profit of Rs.12,073/ha (benefit:cost ratio = 1:3.09). The variety UD-20 has been recommended for release in Southern Rajasthan.

8. Fennel (Jobner Centre)

Keeping the field weed-free up to harvest stage gave 10.19 Ql/ha and the net profit of Rs.15,177/ha and a B:C ratio of 1:3.35.

Technical Session VI : VARIETY RELEASE

Chairman : Dr. B.S.DHANKAR

Co-Chairman : Dr. M.R.SHARMA

**Rapporteurs : Dr. B.N.KORLA
Dr. K.M.KURUVILLA**

TECHNICAL SESSION VI : VARIETY RELEASE

Total proposals submitted	:	16
Coriander	:	3
Black pepper	:	2
Tree spice : Cinnamon	:	2
Ginger	:	2
Cardamom	:	1
Turmeric	:	3
Mango ginger	:	1
Cumin	:	1
Fennel	:	1

The Chairman in his opening remarks informed the house that there are less recommended cultivars in spice crops than the other commercial crops and wherever the recommended cultivars in spices are not available, then the local elite material may be utilised.

Coriander (Jobner) RCr-435 and RCr-436 were approved by the house for testing at the farmers' field by the extension agencies in Rajasthan.

UD-20 : Recommended for release in the southern parts of Rajasthan. The package of practices of this variety need to be worked out for this region. The volatile oil data to be submitted to the Project Coordinator.

Black pepper : PLD-2 was recommended for release for cultivation in Trivandrum and Quilon districts of Kerala; the IISR will supply the basic planting material. The other entry PLD-1 may be tested further and the proposal may be submitted in the next Workshop.

Tree Spices - Cinnamon : SL-63 (IISR Madhurima) and In-189 (IISR Moorthy). The house recommended the release of these 2 varieties. The performance of these varieties studied at three coordinating centres should be included before the release of the Proceedings. IISR should ensure the supply of the planting material.

Ginger : SG-666 (Himgiri) Released for cultivation in Himachal Pradesh as green ginger type.

Accession-64 (IISR Varda) Recommended for release for cultivation in Kerala subject to the condition that information on dry ginger recovery, acceptability by the market and oleoresins will be collected. Three kg. dry ginger sample be supplied to the Spices Board for quality analysis.

Cardamom-Clone No.683 (Mudigere-2) recommended for release for Karnataka state. The name of all the Scientists associated in the development of this variety be given in the proposal.

Turmeric I. PTS-19 (Sonali) : The proposal was not accepted due to lack of proper protocol of presentation. It was commented that at least 50 copies of the proposal in a prescribed proforma be submitted.

Turmeric II. Accession 360 (IISR Prabha) and accession 361 (IISR Prathibha) : The proposal were not accepted by the house. The sample of these varieties be submitted to the Spices Board for quality analysis and the data available be supplied to the Project Coordinator as well as Breeder. The proposal may be revised after obtaining the analytical data on quality from the Spices Board.

Mango ginger CAM-3 (Amba) : The proposal was not accepted. It may be submitted in the next Workshop as per proforma.

Fennel UF-101 : Identified for testing at farmers' field by the extension agencies in Rajasthan

Cumin UC-201 : Identified for testing at the farmers field by the extension agencies in Rajasthan.

The Chairman concluded the Session with the following remarks :

1. The variety release proposal should be brought in the presentable way with sufficient number of copies. The Project Coordinator should ensure that sufficient number of copies are distributed one day before the Session otherwise the proposal should not be accepted.
2. The detailed varietal characters including quality attributes, diseases and pest resistance be given.
3. The varieties must be developed/bred in such a way so that it fits properly in the cropping system.

PLENARY SESSION

Chairman : Dr. P.RETHINAM

Rapporteur : Dr. S.EDISON

PLENARY SESSION

The Plenary Session was held on the evening of 25 August 1995 under the chairmanship of Dr.P.Rethinam, Asst. Director General (Plantation Crops), ICAR, New Delhi. The Chairman, in his introductory remarks congratulated the Project Scientists and the Project Coordinator for the exercise done for the last three days following the fund of advice given by Dr. Jayant Patil, Member, Planning Commission, GOI, Dr.K.L.Chadha, Deputy Director General (Horticulture), ICAR, Dr. R.K. Patil, Vice Chancellor, RAU and other high dignitaries who spoke during the inaugural session of the Workshop. The Chairman appreciated the effective participation from the spice processing industry in particular, the active support and co-operation from the Spices Board as well as the Development Departments. Some of the Centres like Dholi and Gangtok did not depute the Scientists for participation in the Workshop and this was resented by the Chairman and he wanted that the concerned Institutes/SAU may be informed about this important lapse.

The Chairman congratulated the Research Workers in the Spices Project for having enabled release of over 60 varieties in various Spices, especially about 30 of them on Seed Spices. He expressed his anxiety about the yield barrier in seed spices due to lack of adequate genetic variability and wanted to import additional/new germplasm from the Mediterranean zone. During the Jaipur Workshop, 16 varieties were proposed and after thorough discussion, 9 have been recommended for release viz., one each in Black pepper, cardamom and coriander, two each in cinnamon, turmeric and ginger. The Chairman appreciated in particular the proposals on release of cinnamon varieties - proposed for the first time in AICRP Workshops - and complemented the documentation efforts and the guidance provided by the Project Coordinator. He further stated that this proposal could be used as a model in future as well. It was also mentioned that wherever data on quality analyses were inadequate, the help from Spices Board could be taken and only after a thorough scrutiny, the final/formal proposals can be sent to the Central Sub-Committee on variety release. The list of varieties recommended for release (subject to certain conditions - vide concerned Technical Session) were :

Sl. No.	Centre	Crop	Culture No.	Remarks
1.	Palode	Black pepper	PIJ-2	Rec. for Trivandrum & Quilon districts
2.	Jobner	Coriander	UD-20	Rec. for Rajasthan
3.	Mudigere	Cardamom	CI.683	Rec. for Karnataka
4.	Solan	Ginger	SG-666	Rec. for green ginger in Himachal Pradesh
5.	Calicut	Ginger	Acc.64	Rec. for Kerala
6.	Calicut	Turmeric	Acc.360	Rec. for Kerala & Tamil Nadu
7.	Calicut	Turmeric	Acc.361	Rec. for Kerala & Tamil Nadu
8.	Calicut	Cinnamon	In 189	Rec. for Kerala & Tamil Nadu
9.	Calicut	Cinnamon	SI.63	Rec. for Kerala & Tamil Nadu

In addition to the varieties mentioned above, several agrotechniques have also been recommended as given in the Technical Session on Transfer of Technology.

The Directors of Development Departments were in particular interested in low input and high returns i.e., with higher cost:benefit ratios. The Chairman requested the Scientists to work towards the aim of recommending viable and low cost technologies.

The reports from the various technical sessions were presented and approved. Some of the salient points that were recommended for adoption are listed below:

- * Participation of all Scientists working in the Project must be ensured in future Workshops. Wherever the Scientists have not attended, the Project Coordinator would write to the concerned SAUs.
- * Project/progress reports must be sent regularly by the Centres to the Project Coordinator

- * Annual Report of the Project needs to be submitted to the Council by July 31; so that the Centres should submit their respective reports by May end to the Project Coordinator
- * In the ICAR/DARE meetings, it was decided to have in AICRP Workshops, independent Technical Sessions on Transfer of Technology and invite the Directors of Agriculture/Horticulture
- * Participation by Principal/Senior Scientists from each discipline should be ensured by the Director, IISR in future Workshops
- * Any salient feature(s) like promising varieties should be sent to the ICAR to publish in ICAR Reporter/ICAR Newsletter etc.
- * Planting material requirements should be assessed in every Workshop and the concerned Coordinating Centres/IISR should keep the material ready in the planting season
- * No trial should be taken up without adequate planting material. Centres/IISR should satisfy the availability of adequate quantities before proposing to include any "entry" in the Coordinated trials
- * Manurial experiments should be laid out only after assessing the fertility status of the soil
- * Efforts on large cardamom research are inadequate and action need to be initiated by ICAR/IISR etc. to take up programmes through the ICAR Research Complex
- * Training programmes may be separately conducted for perennial spices (at IISR) and seed spices (at RAU, Jabner) separately

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LIST OF PARTICIPANTS

- A. Indian Council of Agricultural Research, New Delhi
1. Dr. K.L. Chadha
Deputy Director General (Horticulture)
 2. Dr. P. Rothinam
Asst. Director General (Plantation Crops)
 3. Dr. S. Edison
Project Coordinator (Spices)
 4. Dr. C.P.S. Yadav
Project Coordinator (White grubs)
- B. Government of India
5. Dr. Jayant Patil
Member (Agriculture), Planning Commission
- C. Government of Rajasthan
6. Mr. C.S. Rajan, IAS
Secretary (Agriculture)
 7. Mr. R.K. Meena, IAS
Administrator
Rajasthan State Agricultural Marketing Board
 8. Mr. Sunandrakumar
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State Institute for Agriculture Management
- D. Rajasthan Agricultural University
9. Dr. R.K. Patil
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 10. Dr. Man Singh Manohar
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 11. Dr. P.C. Gupta
Assoc. Director of Research
 12. Dr. Sujan Singh Manohar
Assoc. Director of Research
- E. Government of India; DCASD, Ministry of Agriculture
13. Mr. E. Velappan
Director
 14. Mr. E. Remold
Deputy Director

F. Government of India, Ministry of Commerce

15. Dr. C.K. George
Executive Director
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16. Dr. S.N. Potty
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17. Dr. K.M. Kuruvilla
Scientist, ICRI, Myladumbara
18. Mr. P.J. Phillip
Deputy Director
19. Dr. Gopakumar
Scientist (Agronomy), ICRI

G. Indian Institute of Spices Research, Calicut

20. Dr. Y.R. Sarma
Principal Scientist
21. Dr. A.K. Sadanandan
Principal Scientist
22. Mr. B. Krishnamoorthy
Senior Scientist
23. Dr. B. Sasikumar
Senior Scientist
24. Dr. V.S. Korikanthimath
Scientist-in-charge
25. Dr. A.K. Johny
Technical Officer

H. NBPGR, New Delhi

26. Dr. P.N. Gupta
Head, Germplasm Evaluation

I. Coordinating Centres

Kerala Agricultural University

PAMPADUMPARA

27. Dr. J. Arthur Jacob
Assoc. Professor & Head
28. Mr. M. Murugan
Agronomist

PANNIYUR

29. Dr. K.P. Mammooty
Associate Professor & Head
30. Dr. A. Rajagopalan
Plant Pathologist (Hort.)
31. Dr. K.N. Sathesan
Asst. Professor (Agronomy)

Tamil Nadu Agricultural University

COIMBATORE

32. Dr. T. Thangaraj
Breeder/Assoc. Professor
33. Dr. B. Rabindran
Pathologist

YERCAUD

34. Dr. L. Pugalendhi
Asst. Professor (Horticulture)

University of Agricultural Sciences - Bangalore

MUDIGERE

35. Dr. H.M. Chandrappa
Breeder, Regional Research Station

University of Agricultural Sciences-Dharwad

SIRSI

36. Dr. N.K. Hegda
Horticulturist
37. Dr. M.S. Lokesh
Pathologist

Andhra Pradesh Agricultural University

CHINTAPALLI

38. Dr. M. Padma / Rajkumar
Horticulturist
39. Dr. Achutha Rama Rao
Plant Pathologist

GUNTUR

40. Mr. N. Hariprasad Rao
Asst. Research Officer

JAGTIAL

41. Dr. M.A. Rahman
Pathologist
42. Dr. A. Manohar Rao
Horticulturist

Orissa University of Agriculture & Technology

POTTANGI

43. Dr. D.C. Mohanty
Breeder
44. Mr. D.K. Dash
Breeder

Gujarat Agricultural University

JAGUDAN

45. Dr. V.A. Solanki
Plant Pathologist
46. Dr. G.M. Patel
Jr. Breeder

Rajendra Agricultural University

JOBNER

47. Dr. R.K. Sharma
Sr. Breeder & Head
48. Dr. S.L. Dashora
Breeder
49. Dr. G.R. Chaudhary
Asst. Agronomist
50. Mr. M.P. Jain
Asst. Plant Pathologist
51. Dr. S. Agrawal
Asst. Biochemist

Dr. Y.S. Parmar Univ. of Horticulture & Forestry

SOLAN

52. Dr. B.N. Korla
Breeder
53. Dr. N.P. Dohrao
Jr. Plant Pathologist
54. Dr. R.K. Goyal
Jr. Biochemist

Haryana Agricultural University

HISAR

55. Dr. K.K. Thakral
Olericulturist

56. Mr. Suresh Talian
Asst. Scientist (VC)

J. New Centres (representatives from SAUs)

57. Dr. C.R. Gupta
IGKV, Madhya Pradesh

58. Dr. R.D. Singh
NDAU, Uttar Pradesh

59. Dr. M.B. Magdum
KKV, Maharashtra

60. Dr. P. Hazra
BCKVV, West Bengal

K. Directors of Horticulture / Agriculture

61. Dr. C.R. Lodha
Director of Agriculture
Govt. of Rajasthan

62. Sri S Sadasivan
Director of Agriculture
Govt. of Kerala

L. Social Inviteses from Agricultural Universities

63. Dr. L. Janardhan Rao
Senior Scientist & Head
Andhra Pradesh Agricultural University
Hyderabad

64. Dr. P.S. Rao
Plant Pathologist
Regional Agricultural Research Station
Jagtial

65. Dr. B.S. Dhankar
Assoc. Dean
Haryana Agricultural University
Hisar

66. Dr. Y.S. Malik
Professor & Head
Haryana Agricultural University
Hisar

67. Dr. K.R. Maurya
University Professor & Head
Rajendra Agricultural University
Dholi - 843 121

68. Dr. I.D. Patil
 Research Scientist & Head
 Spices Research Station
 Gujarat Agricultural University
 Jagudan

M. Progressive farmers

69. Sri Sundaram Kumawat
 Danta, Tech-Danta
 Villi P.O., Dist. Sikar

70. Sri Prabuji
 Hajawala
 Villi P.O., Sanganeer
 Dist. Jaipur

N. Spice Industry / Horticultural Input Agencies

71. Dr. K. Rajamani
 Hindustan Ciba Geigy Ltd
 Bombay

72. Dr. S.K. Saha
 Manager (A.S.)
 Pyrites, Phosphates & Chemicals Ltd.
 NOIDA
 Near New Delhi

73. Dr. S.C. Tripathi
 Rallis India Limited
 Bangalore

74. Dr. V.S. Kavadia
 Dean, College of Agriculture
 RAU, Jobner

75. Dr. George Paul
 Director
 Synthite Industries

76. Mr. M.R. Sharma
 Chief General Manager
 NABARD

77. Dr. P.S. Ravindran
 Principal Scientist
 CPCRI, Palode

78 - 105 Participants from Agricultural Research Station,
 Rajasthan Agricultural University,
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C/o IISR, Calicut - 673 012, Kerala (Phone : 371794)

1. The Assoc. Director of Research
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13. The Joint Director
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19. Scientist-in-Charge
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