

attention should be paid on the production of nucleus seed of recommended varieties and these should be made available to the National Seeds Corporation and other agencies for further multiplication. Building of a good seed industry is a prerequisite to any sound vegetable production programme. The question of working out control measures for various pests and diseases and also evolving varieties resistant or tolerant to some of these, need attention of the research workers in vegetables. While production of new varieties, the nutritive value of these should also be taken into consideration besides the higher yield, quality and other characters. The vegetables seed material should be shared and tested at various research centres for proper evaluation and assessment before release. The workshop concluded with a vote of thanks from Dr. T.R. Mehta, Deputy Director General (CS).

This proceeding does not have any recommendation.

II -Workshop

Venue : Punjab Agricultural University, Ludhiana
Date : 11th - 13th May, 1972

Scientific Session-I

Project Reports, germplasm, varietal trial, heterosis breeding for processing

At the outset, Dr. Vishnu Swarup, Project Coordinator presented the progress report of the All India Coordinated Vegetable Improvement Project for the year 1971-72. Among 17 centres (7 main centres and 10 sub centres) two centres namely, Solan (H.P.) and J&K did not initiate. In the varietal trials, the varieties which have proved promising listed by him, were Pusa Purple Long and Type-2 in long and S-16 in round brinjal, Synthetics and Pusa Katki in early and EC 12013 in late cauliflower and Arkel in early wrinkled peas and GC-411 in mid season peas. He informed that Shri Wakanker would be entering nine new lines of peas in varietal trial and Dr. H.B. Singh would provide seeds of three bhindi lines for testing. Some early lines of cauliflower from IARI will also be tested.

The next item to be taken up was varietal trial and Dr. Swarup felt that in one or two vegetables, trials can be categorised as observation trial, replicated row trial, plot yield trials, market acceptability trial and uniformity trial (for judging optimum plot size).

Breeding for processing:

Dr. J.C. Anand introduced the problems facing the industry and stressed the need upon processing qualities in pea, tomato and onion. In the discussion that followed the suggestions made, about the development of new products from brinjal, sarson ka sag, etc. Adoption of standards according to export requirements was stressed and for internal consumption lower standards can be prescribed. It was pointed out by Mr. Makankar that there are pea varieties, which can successfully be sown from October to December to provide for staggering of production of the factories. Dr. Anand stressed the need for higher crop yield and higher recovery in processing to reduce the cost of production, otherwise the Government will have to subsidize heavily to promote exports as has happened in the case of onion dehydration. There was a consensus that trial of processing varieties can be taken up and testing of processing, qualities should be done at the centres where facilities exist.

Germplasm collection: While recognizing the germplasm collection in vegetables as a stupendous task, it is desired that:

- a) Small beginning may be made in brinjal, bhindi and *Cucumis* species:

- b) All the centres will collect local material and send the seeds with details of places of collection, local name, season and date of collection and any special attribute, if known, to the Project Coordinator. This work should be taken up immediately. In the case of seeds, collection of local germplasm that are already available may be sent to the Project Coordinator by July, 1972.

Varietal trials: Varietal trials on different crops will be taken up as indicated in the technical programme.

Heterosis Breeding: The work may be initiated in onion, brinjal and cabbage.

Breeding for processing : On the basis of discussion, it was proposed to take up studies in these vegetables, namely, onion, tomato and peas.

- i) The programme of collection and maintenance of germplasm will continue as given below. In addition, it was desired that all the centres would collect the seeds of local varieties and species of brinjal, bhindi and cucumis and send the material to the Project Coordinator by July, 1972. These local collections may not be necessarily improved varieties of a variety in the pure form. The beginning should be made with any of the cultivated or wild types giving their places of collection and any other attribute if known. This work should be taken up immediately.

	Crop	Centres
1.	Brinjal	IARI, Bhubaneshwar & Hessaraghatta
2.	Cauliflower	
	Early	Sabour
	Mid Season	Kalyanpur
	Late	Katrain
3.	Cabbage	Katrain
4.	Okra	IARI, Hessaraghatta
5.	Onion	Rahuri
6.	Peas	Kalyanpur
7.	Tomato	IARI, Hessaraghatta
8.	Muskmelon	Ludhiana, Kalyanpur
9.	Watermelon	Udaipur
10.	Pumpkin	Coimbatore
11.	Squash	
	<i>Cucurbita maxima</i>	
	<i>Cucurbita pepo</i>	
12.	Bottle gourd	Jabalpur and Jorhat
13.	Tinda	Ludhiana and Udaipur
14.	Cucumber	Rahuri and Srinagar
15.	Root Vegetables	
	a) Temperate	
	1. Turnip and Radish	Solan
	2. Carrot	Srinagar
	b) 1. Radish	Udaipur
	2. Turnip	Ludhiana
	3. Carrot	Hisar
16.	Dolichos Bean	Jabalpur and Kalyanpur
17.	French Bean	Hessarghatta, Rahuri and Jorhat
18.	Amaranths	Coimbatore
19.	Chillies	Lam, Kovilpatti and Ludhiana
20.	Capsicum	Srinagar, Coimbatore, Kalyanpur and Hisar

Scientific Session II

Diseases and Breeding for Disease Resistance

Various workers interested in vegetable diseases from many centres took part in the discussion. It was pointed out by Dr. G.C. Dubey from Pantnagar University that in U.P. powdery mildew of peas and cucurbits is a serious problem and certain fungicides like Dikar and Morestan were successfully used to control these diseases. Dr. Vishnu Swarup, Project Coordinator (Vegetable Crops), IARI, New Delhi suggested that this discussion should highlight the important diseases of some of the major crops in the various regions of India so that the work on these diseases can be taken up in the coordinated project. Dr. J.S. Jhooty, Plant Pathologist (Vegetable), P.A.U., Ludhiana revealed the importance of root-rot of peas in Punjab and suggested that intensive work should be taken up to investigate this disease. It was suggested by the workers from Jabalpur that solanaceous vegetable were very seriously infected by bacterial wilt. Workers from Andhra Pradesh suggested that in chilli crop, dieback, powdery mildew and bacterial blight are important diseases. From Bangalore powdery mildew of cucurbits, powdery mildew of okra and mosaic diseases of both of these crops were reported to be of serious nature. Dr. B. Choudhury, Head of the Division of Vegetable Crops & Floriculture, IARI, New Delhi raised a point whether we should go for tolerant varieties or should look for resistant varieties. He was of the opinion that when the tolerance breaks down, then the breeders run short of the germplasm. Dr. J.S. Chauhan Professor and Head, Deptt. of Botany and Plant Pathology, P.A.U., Ludhiana pointed out that we should go for tolerant lines but once we found a tolerant line we should continue looking for new lines for resistance to various diseases. If one tolerant line becomes susceptible there should be other resistant or tolerant lines available for replacement. Dr. Kirti Singh, Head of Department of Vegetable Crops, Haryana Agricultural University, Hisar, also agreed that we should look for tolerant varieties and breeding for resistance should be a continuous process. Dr. V. Swamp pointed out that work on breeding for resistance and control by fungicidal should go side by side. It is very different to breed a resistant variety having genes for resistance for all the diseases. The variety should have resistance for major diseases and the rest of the diseases should be controlled by suitable fungicidal sprays. Dr. Majumdar of the Division of Mycology and Plant Pathology, IARI, New Delhi pointed out that up to this time there is no way to ensure the supply of disease free seed through any agency and efforts should be made to check the seed health before its distribution.

The second part of the session dealt with breeding for disease resistance under the Chairmanship of Dr. J.S. Chauhan, Professor and Head, Deptt. of Botany and Plant Pathology, P.A.U., Ludhiana. Dr. B. Choudhury, Head of Division of Vegetable Crops & Floriculture, IARI, New Delhi presented a paper and mentioned in his opening remarks that breeding for disease resistance in some vegetable crops were started in the Division of Horticulture, IARI, New Delhi, in 1962. Since then good progress has been made in his field. At present the work is underway for breeding resistant lines of tomato against *Fusarium* wilt, in brinjal against *Phomopsis vexans*, in muskmelon against powdery mildew, in cabbage and cauliflower against *Xanthomonas campestris* and stem rot and in tomato against viruses. A project has also been initiated at IARI for breeding peas resistance to *Fusarium* wilt.

Dr. J.S. Chauhan Professor & Head, Deptt. of Botany and Plant Pathology, P.A.U., Ludhiana, pointed out that while breeding for resistance, all the races of that particular organism should be taken into consideration.

Dr. Bineta Sen of the Division of Mycology and Plant Pathology, IARI, New Delhi pointed out that *Fusarium oxysporum* f. *pisi*. Races No. 1 and 2 are present in India which cause wilt of peas and tomato.

Dr. J.S. Jhooty, Plant Pathologist (Veg.), PAU, Ludhiana, explained the inoculation techniques relating to powdery mildew of cucurbits for creating artificial epiphytotics. Dr. Sukhdev Singh, Director of

Research, PAU, Ludhiana, remarked that since All India Coordinated Research Scheme is in its infancy, we should devote considerable time to plan out the programme for 1972-73 specifically and the guidelines for future years. Dr. Swarup, Project Coordinator, All India Vegetable Research Scheme assured Dr. Sukhdev Singh that during all the deliberations continuous efforts will be made to plan the work for coming years for research on vegetable disease. Shri S.L. Katyal, Asstt. Director General (Horticulture), ICAR, thanked Dr. J.S. Chauhan for spending his valuable time as Chairman of the session and making the discussion very useful.

Scientific Session III

Breeding for Nematodes, Insect Pests Resistance and Weed Control

In the beginning of the session, Dr. K.S. Nandpuri, Head of Deptt. of Horticulture, PAU, Ludhiana gave a history of vegetable improvement work done in Punjab state. He pointed out some of the earlier contributions made by late Dr. S.S. Purewal regarding the vegetable varieties. Then he briefly stated the research work done by him and his colleagues in the development of vegetable varieties such as S-12, Keekruth (Ageti), Keekruth, Punjab Tropic of tomato, Hara Madhu of watermelon and S-1 of brinjal etc. Through slides, he showed some of the methods of tomato growing with the help of polythene bags early during the winter season. According to him such a practice is suitable under Punjab conditions and it is being followed by some of the growers in Punjab.

Dr. C.L. Sethi made his opening remarks on the various species of nematodes affecting some of the important crops like tomato, okra, brinjal, chillies, cauliflower, cabbage, cucurbits, peas and beans. The important problems caused by nematodes were highlighted by him besides the association of bacterial, fungal and virus diseases with the nematodes. Some of the control measures such as use of cultural methods and chemicals were suggested by him. He also suggested the use of systemic nematicides for simple dips. As regards breeding of vegetable crops for resistance to nematode it was pointed out by him that considerable progress has been made in evolving varieties resistant to nematodes in other countries, but in India very little work has been done and he stressed the need for elaborate programmes of IARI, New Delhi, PAU, Ludhiana and other Agricultural Universities and Institutions may be taken up as the basis for strengthening the work in this direction. He stressed the need for some more staff for doing survey and control work at various places under Coordinated Project since there is no provision of such type of facilities at present in the coordinated scheme. Dr. D.S. Bhatti, from H.A.U., Hisar and Dr. S.K. Midha, from P.A.U., Ludhiana, made some general remarks about the research work on nematode control and creation of problem caused by the nematodes. Dr. Brahma Singh from H.A.U., Hisar, emphasised the need for conducting experiments on organic amendments like sawdust etc. for the control of nematodes. In addition, he presented some of the works at Hisar in this direction.

Shri S.L. Katyal while replying some of the queries regarding financial implications said that it may not be possible to provide funds for staff under Fourth Five-year Plan. However, some savings may be diverted from contingencies to create facilities lacking at various centres for this type of work. However, less funds may be available for doing work on specific problems pointed out by the various institutes and organizations.

2.3 Future lines of work suggested by Dr. C.L. Sethi

- Surveys have to be taken up on an extensive scale in different parts of the country to determine the important nematodes associated with vegetable crops, their population density, distribution, etc.
- Studies on host range of the selected species, their biology, life history, etc.
- Studies on the effect of ecological factors on the nematode population pathogenicity, population threshold necessary for crop loss, estimation of crop losses due to different species, etc.

- Studies on disease complexes involving nematodes, bacteria, fungi and viruses; crop losses caused by disease complexes as compared to those caused by nematodes alone.
- Control of nematodes by different methods, cultural methods, crop rotations, chemical methods using soil fumigants, systemic nematicides; use of soil amendments.
- Varietal screening of selected vegetable crops against root-knot nematode and reniform nematode.

Breeding for nematode resistance

- There is a need to look for polygenic type of resistance against nematodes since the type of genetic make up serves as a good source of control against possible evolution of many biotypes (resistance breaking)
- Combined sources of resistance against nematode as well as other organisms such as pathogenic fungi, bacteria and viruses should be incorporated in a desirable commercial variety, since there are a number of instances reported where nematodes plus other organisms form complexes causing additive injury to host plants. A close cooperation between nematologists, breeders, pathologists and agronomists is to be encouraged in this connection.
- While screening resistant varieties, care should be taken to ensure that observed resistance is generally controlled and not a case of environmentally induced resistance.

The above suggestions of future line of work were endorsed by Dr. Vishnu Swarup, Coordinator of the Project.

Insects

Future line of work was suggested by Shri Dutta for various crops such as cucurbits, brinjal, tomato, okra and root crops, pointing out the insects related to the crops and the work being done for and to be taken up at Hessarghatta and other places. In his view, the work on cucurbits, brinjal, tomato and okra should be taken up at Hessarghatta, cole crops at Katrain, brinjal at Ludhiana and dolichos at Coimbatore.

During the course of discussion, Dr. B. Choudhary, Head of the Division of Vegetable Crops and Dr. Vishnu Swarup, Project Coordinator, IARI, pointed out that breeding work may be restricted to only a few vegetable crops as already suggested in the coordinated project. Association of cucurbitacin content in relation to the resistance on insect pests such as red pumpkin beetle in cucurbits was pointed out by Dr. B. Choudhury and he emphasised that such type of biochemical constituents should be taken into consideration while working on particular crops. Dr. Swarup also emphasised the works on antibiotics, tolerance and preference with regard to insect pests and he further suggested that the good germplasm should be screened for the resistance breeding instead of small collection.

Weed Control

- Intensification of weed control research both in individual vegetable crops and in inter-crops.
- The question of using low doses of herbicides in combination with cultural methods of weed control has to be tested in different regions of the country.
- Experiments have to be taken up for devising safe, effective and economical methods of weed control in vegetable cultivation.
- The effects of continued use of herbicides on soil microflora, nematodes and other soil borne organisms have to be studied critically.



Weeds suppress crop growth

- Studies have to be initiated for determination of herbicide residues in vegetables consumed by man.
- The effect of herbicides on the quality of the vegetables.
- The possible accentuation or otherwise of insect, fungal, virus and bacterial applications from herbicide use.
- ICAR should launch an All India Coordinated Project for weed control in cropped as well as non-cropped land and appoint a coordinator to coordinate all the work and provide the necessary leadership in safer, effective and economical use of herbicides.

During the period of discussion, the need for testing herbicides for the control of weeds on regional basis, because of the environmental variations, was emphasised. There was more emphasis on the use of low doses of weedicide in order to avoid the toxic and residual effects. Shri Mani specifically pointed out that single herbicides should be used for more number of crops. He also stressed that the new herbicides should also be tried to test their potentialities and to avoid the non-availability of certain herbicides in the market.

Scientific Session IV

Agronomical Trials and Seed Production

Dr. K.S. Nandpuri in his opening remarks pointed out the necessity of trials being carried out on riverbed cultivation especially for cucurbits. The agronomical practices for vegetables grown for processing should also be evolved. He also suggested different sets of trials for seed production for various vegetable crops. He pointed out that investigations be carried out to know the efficacy of flat, furrow or ridge methods of planting. Mr. V.S. Mani suggested trials on foliar feeding, with the use of slow release fertilizer specially in the high rainfall areas and effect of different plant ideotypes should also be taken up.

It was suggested that in addition to the agronomical trials undertaken during 1971-72, the following trials may also be initiated during the year 1972-73. Irrigation and method of planting on tomato at Hisar, agronomy of seed production of onion at Rahuri, agronomical trial on pumpkin (*Cucurbita moschata*) and seed rate and fertilizer trial in methi at Rahuri. The centres for agronomical trials of different crops, as finalised in the Workshop was indicated in the technical programme. It was also suggested that gross plot and net plot size should be kept uniform.

Biochemical and Physiological Studies

The crops included in the proceedings of Workshop of 1971 were peas, tomato, watermelon, onion and brinjal. PAU, Ludhiana is the only centre working on these aspects. Data have been presented on brinjal, tomato, watermelon and peas. Dr. Bhatia in his introductory speech said that the exact meaning of quality of each crop first be defined. He referred to the importance of work to be started on different flavouring components of certain vegetable crops. He also referred that the texture in various vegetables should also be one of the main criteria for defining the quality. Dr. Rangil Singh then presented the data on brinjal, tomato, watermelon and peas. In peas, he referred that variety Arkel had recorded the highest protein content of nearly 27%. Dr. Mishra proposed some physiological experiments on few crops.

Fifth Five Year Plan

The last part of the session was devoted to a discussion on the Fifth Five year Plan. Shri S.L. Katyal opened the discussion inviting suggestions from the scientists present there about the basic principle on which the fifth Plan has to be formulated. He said that present budget under the fourth Plan is likely to be taken as committed expenditure under the fifth Plan and we may have some further scope for expansion.