

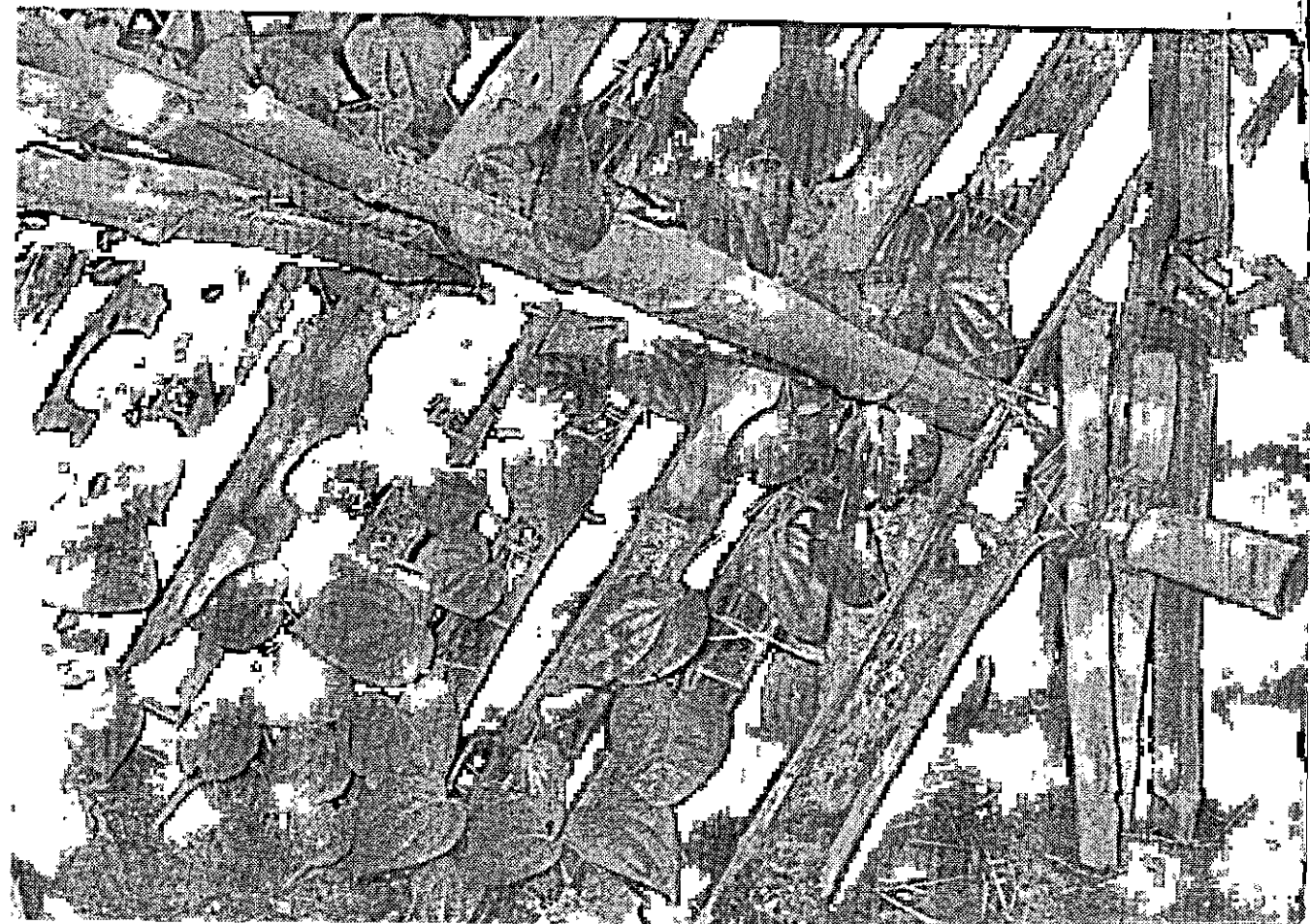
RESEARCH HIGHLIGHTS 1987



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NATIONAL RESEARCH CENTRE FOR SPICES

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MK Nair
Director
Central Plantation Crops Research Institute
Kasaragod 670 124, Kerala

Compiled and edited by
A Ramadasan
T Prem Kumar
YR Sarma

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Rapid multiplication of black pepper cuttings

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INTRODUCTION

Indian Council of Agricultural Research started spices' research at Central Plantation Crops Research Institute, Kasaragod during 1971 with the establishment of All India Co-ordinated Spices and Cashewnut Improvement Project. To further consolidate and intensify research on major spices viz., Pepper, Ginger, Turmeric, Nutmeg, Clove, Cinnamon and All Spice, ICAR established, Regional Station of CPCRI at Calicut, during November 1975.

During the 7th Plan ICAR separated spices research from CPCRI and elevated the CPCRI Regional Station to the status of National Research Centre for Spices in order to conduct mission oriented research. Accordingly the National Research Centre for Spices was established at Calicut during 1986, merging the CPCRI Regional Station, Calicut and Research Centre for Cardamom at Appangala. The Co-ordinating cell of All India Co-ordinated Research Project on Spices is also located at NRCS for a better co-ordination.

The following are the major areas of research identified for the implementation during the 7th plan period.

(i) Evolving high yielding varieties of black pepper having multiple resistance to *Phytophthora*, plant-parasitic nematodes and 'pollu' beetle (ii) Evolving drought tolerant types of pepper and cardamom (iii) Standardisation of input technologies in relation to nutrients, spacing and standards required for increasing productivity in pepper (iv) Evolving high yielding, high quality ginger varieties resistant to soft rot and bacterial wilt diseases (v) Analysis of pesticide residues in spice products with special emphasis to pepper and cardamom (vi) Rapid multiplication of elite planting material through tissue culture and (vii) Transfer of technology and building up of an effective net work for transferring the research results achieved at the NRCS in farmers' fields.

The production potential of Karimunda selections as indicated in the ongoing field trials, identification of drought tolerance in Kalluvally, identification of the *Phytophthora* tolerant lines, establishment of the major role of the nematode *Radopholus similis* in the etiology of slow wilt disease of black pepper, proven efficacy of metalaxyl in control of rhizome rot of ginger and quick wilt of black pepper, crop loss estimation of pepper berries due to 'pollu' beetle, mass multiplication of elite cardamom lines through tissue culture and standardisation of tissue culture technique for the multiplication of ginger are some of the important findings during 1987.

Establishment of world germplasm in different spice crops, pest and disease resistance and drought tolerance combined with productivity and pest and disease management continue to be the major thrust areas identified in order to give effective and sound package to boost up the production and productivity of spice crops.

Calicut
February 9, 1988

MK NAIR
Director
Central Plantation Crops Research Institute
Kasaragod 670 124, Kerala

QUICK WILT AND SLOW WILT DISEASES OF BLACK PEPPER

Forking in metalaxyl granules (Ridomil 5G) into soil @ 20 g/vine effectively checked quick wilt caused by '*Phytophthora palmivora*' MF4. Endosulfan and quinalphos at the recommended dose (0.05%) completely inhibited the growth of *P. palmivora*. These two insecticides are compatible with Ridomil-Ziram both *in vitro* and *in vivo*.

Temperature (22.5-29.6°C), shorter duration of sunshine hours (2.4-3.8 h/day), high rainfall (15.8-25 mm/day) and relative humidity (81-99%) contribute for the spread of quick wilt disease in areca-pepper mixed cropping system.

Screening programmes to locate resistance to *P. palmivora* were continued. Of the 75 hybrids screened, six hybrids gave tolerant reaction and will be subjected to further tests. All the 49 Karimunda selections screened were susceptible. Of the 85000 M₁ seedling progenies from Panniyur 1, Karimunda and Kottanadan screened, 90 seedlings remained uninfected and will be screened further.

Survey for the plant parasitic nematodes associated with black pepper in two pepper growing districts of Karnataka revealed the association of three endo/semi-endo parasitic nematodes viz., *Meloidogyne incognita*, *Radopholus similis* and *Trophotylechulus piperis* with the roots of black pepper. Among these, *M. incognita* was widely distributed followed by *R. similis* and *T. piperis*.

In the pathogenicity trials conducted in pots under simulated field conditions, the vines inoculated with *R. similis* showed varying intensities of damage to the root system. Vines

which received 1000 nematodes and above showed typical symptoms of slow wilt disease, viz., severe foliar yellowing, defoliation, die-back and reduction in the growth, vigour and productivity of the vines.

GERMPLASM OF SPICES

Black pepper

Fiftyfour shade tolerant collections were made from Kodagu dist. of Karnataka. Forty four collections apparently tolerant to drought with good vegetative growth were collected from Idukki and Cannanore dist. of Kerala. Sixty nine collections of wild relatives of black pepper were added to the germplasm from the forests of Kodagu dist. and Kanyakumari dist. of Tamil Nadu. Aimpriyan was the best yielder (5.7 kg green berries) followed by an unnamed accession (5.1 kg green) in the germplasm maintenance plot at Peechi (2nd year yield). In order to characterise the germplasm, 43 cultivated and seven wild accessions of *P. nigrum* were analysed for various morphological and anatomical characters. Floral biology studies of eight cultivars were completed.

Ginger and turmeric

During 1986-87 the highest yield in turmeric was given by Cls No.20 (15.73 kg/3 × 1m bed). Among the *aromatica* types the best yielder was 'Amnicad' (9.85 kg/3 × 1m bed).

In the multilocation trial, PCT-13 was the highest yielder (22.7 kg/3 × 1m bed) followed by PCT-14 (21.9 kg/3 × 1m bed). PCT-10, 13 and 14 yielded significantly higher than the local control giving 37.9, 59.4 and 53.7% yield increase respectively over the control.

Cardamom

One hundred and eighty three accessions of cardamom were screened

against local strain of 'katte' virus. One accession did not take up infection after three rounds of screening.

Tree spices

In cinnamon, preliminary studies have indicated that trees with purple flushes have more bark oil. Cataloguing of 379 cinnamon accessions was completed.

BREEDING FOR HIGH YIELD AND RESISTANCE TO PESTS AND DISEASES

Black pepper

One hundred and fifty lines of intercultivar hybrids were planted for preliminary yield evaluation. Over 2000 lines of inter cultivar hybrids are being maintained in the nursery.

During the second year of evaluation Acc. No. 96 and Acc. No. 63 of Karimunda selections were promising.

Of the Kottanadan selections maintained, four lines gave over 2kg green spikes during the second year of harvest, the highest being 4.37 kg/vine.

Cardamom

The 14 'katte' escapes reported earlier were again subjected to screening using the K1 strain of 'katte' virus, and all of them have taken up infection. From a survey in the 'katte' hotspot areas, 31 'katte' escapes were collected.

RHIZOME ROT OF GINGER AND TURMERIC

In pot culture studies, application of metalaxyl as granules @ 2.5 g of Ridomil 5G/3 kg of soil per pot, showed greater protection, more vegetative

growth and consequent increase in the yield of ginger. Under field condition Ridomil-Ziram (1000 ppm) as seed treatment also gave reduction of disease incidence to 0.9%, compared to 4.4% in untreated control.

The crude toxin produced by *Pseudomonas solanacearum* was isolated. Bioassay with cut shoots of ginger showed flaccidity and curling of leaves. The crude toxin was thermostable.

Ageratum conyzoides was found infected with *P. solanacearum* in ginger field and *Eupatorium odoratum* in turmeric field. These can serve as collateral hosts of *P. solanacearum*.

Studies conducted under green house and field conditions conclusively proved that the rhizome maggots *Mimogralla coeruleifrons* Macquart could infect only rhizome rot affected ginger and hence cannot be considered as a primary pest of the crop.

QUALITY ANALYSIS

Black pepper

Quality evaluation of 100 Karimunda selections indicated that Acc. No. 80, 21 and 148 contained highest piperine (7.7% w/w), oleoresin (14.5% w/w) and essential oil (5.5% v/w) respectively. Among the 37 accessions in cultivated germplasm Acc. Nos. 896, 1065 and 812 yielded high levels of piperine (7.0% w/w), oleoresin (16.9%) and essential oil (4.2% v/w) respectively.

Cinnamon

Highest eugenol content (60% v/w) in the cinnamon leaf oil was found in Acc. No. 312. Cinnamic aldehyde content (14.11% v/w) was highest in the Acc. No. 65.

Cardamom

Gas chromatographic analysis of essential oil of cardamom indicated that Acc.No.105 contained the highest level of α terpenyl acetate-primary cardamom flavour component.

NUTRITIONAL REQUIREMENT AND CROP MANAGEMENT

Black pepper

In the spacing cum varietal trial using RCC poles as standards, during the second year of bearing, Panniyur 1 under the spacing of 2.5m x 2.5m (1600 vines/ha) gave the highest mean yield of 1503g green pepper/vine followed by Karimunda with 1356g green pepper/vine. Under 2.5 x 1.5m spacing (2600 vines/ha) Karimunda and Panniyur 1 recorded 1298g and 1274g green pepper/vine respectively.

Mineralisation studies in pepper with five slow release fertilizers showed that the urea N in ureaform was highest and persisted for a longer period when compared to other slow release fertilizers.

Cardamom

The fertilizer levels of 120 : 120 : 240 and 160 : 160 : 320kg NPK/ha continued to give higher number of tillers and yield.

DROUGHT TOLERANCE IN BLACK PEPPER

Data on Epicuticular Wax Content (ECW), Specific Leaf Weight (SLW) Stomatal Resistance and Relative Water Content (RWC) in the 3 cultivars viz, Karimunda, Kalluvally and Panniyur-1, indicated that Kalluvally

is relatively more tolerant to moisture stress than the other two cultivars. In further studies on ECW in 10 cultivars, Kalluvally, Aimpiriyam and Kuthiravally showed higher values than others.

Considerable variability in the ability to withstand stress was noticed among the Karimunda selections studied so far. Panniyur-1 showed tolerance to high light intensity. The present studies, also showed mid-day closure of the stomata in pepper.

PEST MANAGEMENT

Black pepper

Screening of wild relatives of *P. nigrum* against 'pollu' beetle *Longitarsus nigripennis* Mots., showed that *P. attenuatum*, *P. hymenophyllum*, *P. longum*, *P. betle* and *P. colubrinum* were not preferred by the pest.

Studies on assessment of crop loss caused by 'pollu' beetle at Koothali (Calicut district) showed that 16% berries were damaged causing economic loss.

A survey for the incidence of top shoot borer, *Cydia hemidoxa* Meyr on black pepper conducted in Quilon, Alleppey, Pathanamthitta and Idukki districts showed that the pest was present in all the areas surveyed and the infestation ranged from 54-90 per cent in young vines.

A survey conducted to study the incidence of coccids on black pepper revealed that the percentage of infestation in the vines by *Lepidosaphes piperis*, *Aspidiotus destructor*, *Pseudaulacaspis* sp. and *Pseudococcus longispinus* was 32, 15, 3 and 7% respectively in

Idukki district while the percentage of infestations by the various coccids were 19, 7, 7 and 1 respectively in Wynad district.

Pseudaulacaspis sp. (Diaspididae) and *Icerya aegyptiaca* (Douglas) (Margarodidae) were recorded for the first time on black pepper.

Studies on the population dynamics of gall thrips *Liothrips karnyi* Bagnall on black pepper conducted at Kalpetta in Wynad dist. indicated that the pest population was high during July to September. The population of the common predators *Montandoniola moraguesi* (Anthocoridae) and *Androthrips flavipes* was also high during the same period. The fifth instar nymphs of the predator *M. moraguesi* fed on 6-12 larvae of gall thrips during a period of 4-6 days.

Field trials conducted with six insecticides indicated that spraying of monocrotophos 0.05% was most effective in controlling the thrips infestation.

BIOTECHNOLOGY

Ginger

Shoot tips when cultured in MS basal medium fortified with kinetin and 2, 4-D induced the formation of both friable and rosette types of calli. Regeneration of friable calli into plantlets could be obtained in the MS medium supplemented with NAA and BAP. The explants gave multiple shoots and abundant roots when cultured in MS agar medium followed by MS liquid medium supplemented with NAA, Kinetin and BAP.

Cardamom

A suitable technology for transplanting tissue cultured cardamom

plants to polybags with over 90% establishment has been standardised.

ESTIMATION OF CROP LOSSES

The survey conducted in Cannanore district to estimate the loss due to quick wilt disease of black pepper revealed that 9.4% of the vines were lost annually due to the disease resulting in an average production loss of 905 metric tonnes/annum.

PRODUCTION OF PARENTAL MATERIALS

Black pepper

About 4000 rooted pepper cuttings of high yielding selections of Kari-munda and Kottanadan were supplied to the departmental nurseries for multiplication and distribution to farmers.

Turmeric

Suvarna (PCT 8) the high yielding turmeric selection recommended for release is being multiplied in five centres of All India Co-ordinated Research Project on Spices.

Cardamom

Large scale multiplication of high yielding selections viz. Cl 37 and PV 1 using tissue culture technology has been implemented.

TRANSFER OF TECHNOLOGY

Training programmes

Seven training programmes were organised by NRCS on Spices Production Technology in which 55 officials from Department of Agriculture/Horti-

culture took part. Training was also imparted to 11 farmers from Andamans on the cultivation aspects of black pepper, ginger, turmeric and tree spices. Two trainees from Nepal sponsored by USAID were given training on production and processing of ginger.

At Appangala, 6 batches consisting of 123 farmers were trained on the cardamom production and management.

Research cum demonstration plots

A high production technology for increasing the productivity of black pepper was demonstrated in 51 farmer fields in three villages viz., Pannikottoor, Peruvanna and Puthuppadi in Calicut dist. At Pannikottoor and Peruvanna villages the yield increase was 209%. There was an yield increase of 303% at Puthuppadi.

In the high production technology plots for cardamom located in gentle slope yields of 805, 450 and 300 kg dry capsules/ha were obtained in IInd (1985), IIIrd (1986) and IVth year (1987) of planting respectively. In the valleys, the yield was 935 kg dry capsules/ha after the second year of planting.

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON SPICES

Crop improvement

Ginger selection PGS-35, turmeric selection PTS-10 and cumin selection

RZ-19 (UC-19) and fennel selection, VC-14-3-3 have been proposed for release as varieties. High yielding cardamom clones CL-679, CL-683 and CL-726 are under on-farm trials.

Coriander Co-2 performs well, as dual purpose variety in Tamil Nadu. It yields 500 kg/ha (dryland) to 800 kg/ha of grain (irrigated) in 110 days. The TNAU has identified a coriander selection CS-287 which could be harvested in 70 days. Companion cropping of coriander with mustard gives a maximum gross income of Rs. 8,400/ha in Andhra Pradesh. For fennel fertilizer application @ N 15 and P 50 kg/ha as basal dose followed by N 15 kg/ha as top dressing has been recommended. A dual purpose fennel variety viz., Co-1 has been released in Tamil Nadu.

Application of farm yard manure and green leaf mulch @ 7 kg/m² bed and 2.5 kg/m² respectively together with NPK @ 60:30:90/ha gave highest turmeric yield of 34 tonnes/ha (green rhizomes) in Orissa.

Disease management

The fungal 'pollu' disease of pepper causing 10-40% yield loss can be controlled by two sprayings with 1% Bordeaux mixture. Ginger selection SG 666 and turmeric selections ST-3 and ST-323, all from Solan, showed variable resistance to rhizome rot and *Taphrina* leaf spot respectively. The grain mould of coriander can be controlled by spraying 5% Potassium Chloride solution.