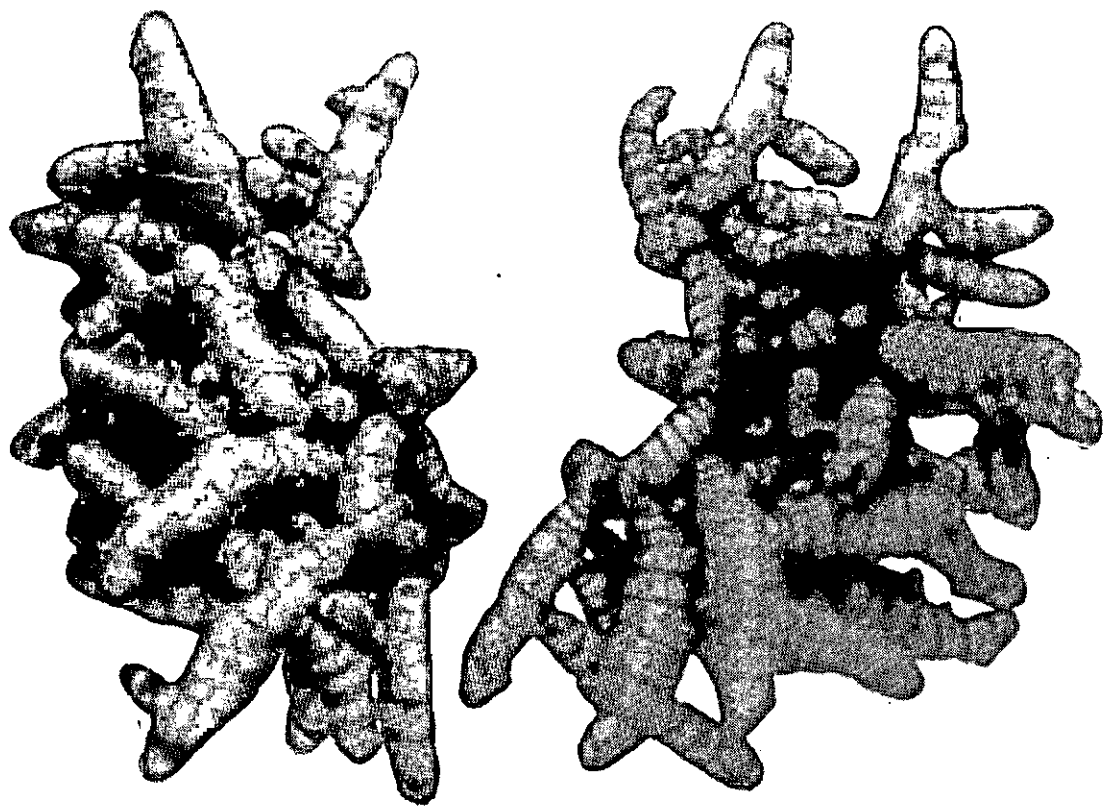


RESEARCH HIGHLIGHTS 1989-'90



ICSR-RH-3



NATIONAL RESEARCH CENTRE FOR SPICES
CALICUT, KERALA, INDIA

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PCT 13, A high yielding, high quality turmeric selection

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INTRODUCTION

The National Research Centre for Spices, Calicut was established during 1986 by merging the erstwhile Regional Station of Central Plantation Crops Research Institute at Calicut and Cardamom Research Centre at Appangala. The crops dealt by the NRCS include black pepper, cardamom, ginger, turmeric and tree spices like cinnamon, nutmeg, clove and allspice. The headquarters of the All India Co-ordinated Research Project on Spices is also located at NRCS, Calicut which co-ordinates the research work carried out on spices including minor spices in the co-ordinating centres.

The 29 research projects on these crops are arranged under four mini-missions, viz., 1. Increasing production of spice crops through management of diseases and pests 2. Developing agro-techniques for increasing production of spice crops 3. Increasing productivity of spice crops through crop improvement and 4. Supportive research programmes.

Some of the major achievements during 1989-'90 include development of two high quality and high yielding lines each of turmeric and black pepper, high production technology for black pepper which increased yields by 228% and 146% in pure and mixed cropping system respectively in farmers' fields, identification of resistance in *Piper colubrinum* to *Meloidogyne incognita* and *Radopholus similis* and identification of high quality lines in black pepper and cardamom.

The achievements made under different research projects during 1989-'90 are given in brief in this publication.

TISRPH-3



Calicut
20 April, 1990

(A. RAMADASAN)
Director

PHYTOPHTHORA AND NEMATODE DISEASES OF BLACK PEPPER

Black pepper

Open pollinated lines of black pepper, P 1352 and P 24 found to be tolerant to *Phytophthora capsici* under field evaluation at Sirsi, Karnataka the hot spot area for disease, remained healthy and one of the vines of P 24 yielded 4.25 kg of green berries during 1989.

Piper colubrinum was found resistant to *Meloidogyne incognita* and *Radopholus similis*.

A new optical brightener viz., stilbilynaphtho-triazole was found suitable for staining *Phytophthora* for fluorescence microscopy.

GERMPLASM IN SPICES

Black pepper

One hundred and twenty three collections of wild and related species of *Piper nigrum* were collected from Brymore, Palode, Silent valley, Sugandhagiri, Sholayar and Ranni areas of Kerala and Courtallam area of Tamil Nadu. One collection of *P. chaba* and two collections very much similar to *P. barberi* and one collection of *P. magnificum* were collected for the first time.

Two new taxa of *Piper* viz., *P. sugandhi* and *P. sugandhi* var. *leiospicata* were described and reported.

Ginger and turmeric

Two high yielding, high quality lines of turmeric PCT-13 and PCT-14 having mean yields of 29.2 and 28.8 tonnes of fresh rhizomes per hectare respectively were recommended for release in the X Workshop of AICRP on spices held at TNAU, Coimbatore during August 1989. (Table 1)

Twenty-nine collections of turmeric, and related species, 80 collections of ginger and related species were added to the germplasm.

Tree spices

Cinnamon: Ten collections of *Cinnamomum verum* and one collection of *Cinnamomum aromaticum* were added to the germplasm. Maximum rooting percentages of 86 and 82 were obtained with terminal shoots, treated with IBA and IAA 2000 ppm respectively. Air layering with IBA 3000 ppm gave 70% success.

Nutmeg: A wild collection, *Myristica dactyloides*, from Silent valley and 8 collections of *Myristica fragrans* were added to the germplasm. Detopping bearing trees at a height of 2m. produced large number of orthotropic shoots.

Table 1. Yield and curcumin content of three turmeric selections

Selection	Yield of fresh rhizomes (t/ha)		Curcumin %
	Mean	Yield potential	
Suvarna (PCT-8)	17.4	43.5	8.7
Suguna (PCT-13)	29.2	60.3	4.9
Sudarsana (PCT-14)	28.2	54.8	7.9

Clove: Fourteen elite trees were identified at Nagercoil, Tamil Nadu for seed collection. Vegetative propagation of clove by approach grafting on its own rootstock was standardised, with a success of 80% and 73% during December and August respectively.

BREEDING FOR HIGH YIELD AND RESISTANCE TO PESTS AND DISEASES

Black pepper

Two selections of Karimunda viz., K.S. 14 and K.S. 27 with high yield potential were identified as superior lines among the 100 lines tested. (Table 2). These were recommended for release by the X Workshop of AICRP on Spices held at Coimbatore during August 1989.

In the comparative yield evaluation trial of 5 promising cultivars, cv. Aimpiriyam (Coll. 856) gave the mean fresh berry yield of 5.5 kg/vine and the highest yield recorded was 12 kg/vine. Ottaplackal - 1 (Coll. 812), tolerant to root knot nematode, also performed well with a mean yield of 3.4 kg/vine and highest yield of 8.5 kg/vine.

Table 2. Yield and quality attributes of Karimunda selections in comparison with local Karimunda and Panniyur-1

Selection	per vine* at 5th year	YIELD (kg)				QUALITY PARAMETERS		
		Per hectare **		Yield potential***		Piperine	Oleoresin	Essential Oil
		Green	Dry	Green	Dry	%	%	%
Sreekarā (KS-14)	4.78	7650	2677	12000	4200	5.1	13.0	7.0
Subhakara (KS-27)	4.18	6720	2352	12640	4487	3.4	12.4	6.0
Karimunda (local)	2.55	4080	1428	8240	2184	4.4	11.0	4.0
Panniyur-1	1.77	2832	977	4000	1380	3.6	9.5	3.5

* Fresh weight

** at the rate of 1600 vines per hectare

*** based on highest yield recorded at 5th year (per ha)

QUALITY ANALYSIS

A scoring technique was standardised to identify high quality lines of black pepper and cardamom.

Black pepper

Among the 46 Karimunda selections, relatively high quality lines with respect to piperine, oleoresin and essential oil were Sel. No. 180 (4.5% piperine, 9.3% oleoresin and 3% oil) and Sel. No. 200 (4.2% piperine, 8.9% oleoresin and 3.3% oil). Selection No. 123, 169 and 180 showed high piperine (4.5 - 4.7%). Sel. No. 89, 187 and 197 contained high oleoresin (9.6 - 9.7%). Sel. No. 197, 200 and 58 gave high oil content (3.3% v/w).

Cardamom

Among 29 germplasm accessions Acc. No. 85 (oil -- 8.4%, F.R. -- (Flavour ratio i.e., α -terpinyl acetate|1, 8-cincole) 1.8) Acc. No. 160 (oil 8.3%, F.R. -- 1.7) and Acc. No. 81 (oil 7.9%, F.R. - 1.6) had relatively better oil yield and flavour ratio. Acc. No. 181 had the highest yield of volatile oil (9% v/w)

Among 40 CYT selections PVS -- 37 and PVS -- 39 (7.8% oil and F.R. 1.3) and Nel 1-4-8 (oil 8.1% F.R. -- 1.2) had better oil content and flavour ratio. Selections MA-10 KR M2-3, Cl 671 - 2.5 and Vazhukka clone contained high oil content (9% v/w)

White pepper

A modified technique for white pepper preparation was standardised. Among the cultivars evaluated, Panniyur-1 was the best for large sized berries and Arak-kulamunda, Kaniakkadan and Balankotta for the medium sized berries.

NUTRITIONAL REQUIREMENT AND CROP MANAGEMENT

Black pepper

Nitrogenous fertilizers under field and laboratory conditions in a laterite soil showed that neem-oil-coated urea was superior. The release of urea-N, ammonical and nitrate nitrogen was persistent for a longer period and the percentage recovery of applied nitrogen was high in the case of neem oil coated urea. The N content in soil, and leaf tissue was also high in this treatment and significantly increased the yield of pepper besides significantly increasing the girth of subabul which is used to trail pepper.

In a monocropping system, raising of black pepper using non-living standards like RCC posts (3.2 x 0.1 x 0.1 m) is economically viable, as revealed by BC ratio (1.23) and IRR (20.61%). Raising of annual crops like banana during the initial two years as well as maintaining a partial overhead shade by growing subabul and incorporating it into the soils improved soil conditions.

In the spacing cum varietal trial using RCC posts as standards during the fifth year of bearing Panniyur 1 gave the highest yield of green pepper (82.49 q/ha) in the spacing of 2x1 m followed by Karimunda (68.74, q/ha) and Aimpirian (66.27 q/ha). The cumulative yield of green pepper for the last five years (1986-'90) showed the superiority of Karimunda under closer spacing of 2x1 m accommodating 5000 plants/ha.

Cardamom

In the trial on system of planting-cum fertilizer levels in cardamom, under rainfed conditions trench system of planting gave a maximum yield of 294.2 kg capsule (dry)/ha followed by 246.2kg/ha by pit system. Application of 160:160:320 kg N P₂O₅ and K₂O/ha recorded a maximum crop yield of 390.4 kg capsules (dry)/ha in trench system followed by pit system (246. kg/ha);

DROUGHT TOLERANCE STUDIES

Black pepper

Of the ten Karimunda selections screened Sel. No. 114 was found to be relatively drought tolerant which recorded stomatal resistance of 11.77 s cm⁻¹, transpiration of 2.86 μg cm⁻² s⁻¹ and leaf water potential of -8.0 bars at 13.9% soil moisture content. Sel. No. 154 was relatively sensitive over the rest (rs. 20.9 s cm⁻¹, tr 0.78 μg cm⁻² s⁻¹ and water potential -12.6 bars).

PEST AND DISEASE MANAGEMENT

Black pepper

Surveys carried in major black pepper areas in Kerala, Karnataka and Tam

Nadu indicated a significant and positive correlation ($r=0.760^{**}$) between infestation by leaf gall thrips (*Liothrips karnyi*) and altitude. Among the various cultivars the pest infestation was significantly higher in Wynad local, Kalluvally and Arakkulamunda when compared to Karimunda and Panniyur-1.

Cardamom

Cardamom plants inoculated with *Meloidogyne incognita* showed significant reduction in the yield during the first year. Galling and stunting of roots were more prominent in cardamom seedlings infected with root-knot nematodes, than in adult suckers.

BIOTECHNOLOGY

Ginger

Micropropagation of ginger through callus from leaf tissues was standardised. About 500 micropropagated plants from vegetative bud, rhizomes, ovary and leaf tissues were transferred to soil in polybags for screening against *Pythium aphanidermatum* and *Pseudomonas solanacearum*.

PRODUCTION OF PARENTAL MATERIALS

Black pepper

Multiplication of elite lines of 20 Karimunda and 28 Kottanadan selections were undertaken. About 2935 rooted cuttings of these selections were distributed to developmental agencies. About 1700 rooted cuttings of Karimunda, Kottanadan, Panniyur-1 and Aimpirian were supplied to farmers. A total of 546 rooted cuttings of K.S. 14, 220 cuttings of K.S. 27 and 214 cuttings of K.S. 88 were multiplied.

Cardamom

A total of 865 kg of Cl. 37 seed capsules were supplied to Spices Board, Department of Horticulture and farmers during 1989 crop season for raising quality seedlings.

TRANSFER OF TECHNOLOGY

Black pepper

Large scale demonstration of High Production Technology (HPT) of black pepper in farmer's fields showed that there was an increase of 146% in yield of pepper under coconut/arecanut based mixed cropping system while in mono-cropping system, the yield increase was 228%. In the HPT plots *Phytophthora* foot rot incidence was reduced to 2.4%. The soil fertility status also improved due to the adoption of integrated nutrient management practice.

Cardamom

In the Research-cum-Demonstration plots 450 kg/ha dry cardamom was obtained during 1989-90 crop season. Over a period of six years (1984-'89) an average yield of 723.3 kg (dry)/ha was obtained.

Training programmes

Twelve training courses on different aspects of spices production were organised during the year in which 71 officials of Agriculture/Horticulture departments from different states/union territories participated. Apart from these 76 farmers were imparted one day training on spices cultivation at Calicut and 22 planters at Appangala.

A Kisan Mela was organised during December 1989 and was attended by about 500 farmers from Kerala and Karnataka.

Package of practices for black pepper, ginger, turmeric, cardamom and tree spices and one folder each on rapid multiplication of black pepper and storage of ginger and a technical bulletin on high production technology of cardamom were brought out.

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON SPICES

Black pepper

The two new cultures in black pepper viz., Culture No. 141 (Krishna - Panniyur-2) with an average dry yield of 1954 kg/ha, and 10.89% oleoresin content and Culture No. 331 (Shyama - Panniyur-3) with an average dry yield of 1749 kg/ha, and 12.67% oleoresin content from Panniyur were released as varieties. A fertilizer dose of 50:50:150 gm of NPK/vine/year was standardised at Panniyur.

Cardamom

The promising clones of CL-679 (652.8 kg/ha) CL-683 (704.4 kg/ha) and CL-726 (494.4 kg/ha) from Mudigere were identified as high yielders.

At Pampadumpara, PV-1 with capsules containing 21-24 seeds per capsule was identified possessing desirable characters like high yield, high percentage of seed set and tolerance to thrips infestation.

A fertilizer dose of 75:75:150 kg NPK/ha was found to be optimum. A fair degree of drought tolerance was recorded in Clone P-6 at Mudigere. The variety pink pseudostem was found to be tolerant to 'Katte' disease.

Ginger

In Pottangi V1 K1 - 3 revealed the superiority in yield (16.82 t/ha) over the released variety Suprabha (16.6 t/ha). The highest essential oil content (2.5%) was recorded in SG-54.

A combination treatment of seed rhizome with Dithane M-45 (0.25%) and Bavistin (0.1%) controlled the rhizome rot in ginger in storage as well as in field.

Turmeric

Spacing of 25 x 25 cm in raised beds of 3 x 1 m. was found optimum for turmeric cultivation. Whole mother rhizomes of 25-30 gm was found to be the best planting material.

Cumin

The advanced selection from Jobner (UC - 19) was released under the name RZ-19 and yielded 5.9 Q/ha, with volatile oil content of 2.6%. UC 19 was tolerant to cumin wilt. Exotic selection EC 109635 from Jagudan was continuously found moderately resistant to *Fusarium* wilt. Cumin blight was controlled by spraying of Dithane M-45 (0.2%).

Coriander

Two selections of coriander viz., Lam CS-4 and Lam CS-6 were recommended for release as 'Sadhana' and 'Swathi' respectively from Andhra Pradesh Agricultural University. The medium maturing variety 'Sadhana' gave an average yield of 1025 kg/ha containing 0.2% essential oil and 9.2% fixed oil and was resistant to aphids, tolerant to white fly, mites, powdery mildew and grain moulds. 'Swathi' an early matur-

ing variety with an average yield of 885 kg/ha, with 0.3% essential oil and 9.6% fixed oil content escaped powdery mildew infection due to its early maturity. This was also moderately tolerant to aphids and white fly. ACC. No. ATP. 179 gave the highest grain yield of 655 kg/ha at Guntur. An early maturing accession viz. CS - 287 was identified as suitable for dry rainfed tracts of Tamil Nadu. At Coimbatore, ACC. No. 695 was isolated as a potential strain with yield increase of 18% in Kharif and 13% in Rabi over Co2. The pre-release culture Acc. No. CS-287 had recorded the minimum wilt incidence of 8.9% as against 41.1% in Co2.

The causal organisms of grain moulds were identified as *Alternaria* sp., *Fusarium* sp., *Curvularia* sp., and *Helminthosporium* sp., and were effectively controlled by spraying Carbendazim (0.1%) 20 days after grain set. Spraying of Karathane 0.1% or Bavistin 0.1% or wettable sulphur 0.25% controlled powdery mildew caused by *Erysiphe polygoni*:

Fennel

Nitrogen application at 90 kg/ha gave maximum yield. The umbel picking at half

length size of grain 'yet green stage' recorded the highest yield.

Transplanting of fennel by 15 October after the crop of bajra (pearl millet) was beneficial than the normal transplanting done in August in Gujarat. A spacing of 60 x 15 cm gave significantly higher yields in fennel.

Fenugreek

Fenugreek variety RMt-1 was released for the state of Rajasthan by the State Variety Release Committee. Significantly higher yields of 495 kg/ha were obtained at irrigation level IW/CPE ratio of 1.0 and application of 80 kg P₂O₅/ha.

The variety Co-1 as well as Acc. No. 1084 were found to be tolerant to root rot disease caused by *Rhizoctonia solani* at Coimbatore. Drenching of 0.1% Bavistin or Brassicol effectively controlled the disease.

Large cardamom

The leaf streak disease caused by *Phyllosticta royenae* a major disease of cultivar 'Golsey' was controlled by spraying with copper oxychloride (0.3%) at an interval of 15 days.