

Journal of Plantation Crops 14 (2): 94-98 December, 1986

## HIGH YIELDING TURMERIC SELECTION PCT-8\*

M. J. RATNAMBAL and M. K. NAIR

Central Plantation Crops Research Institute, Regional Station  
Calicut 673 012, Kerala, India

### ABSTRACT

Of the 184 accessions of turmeric collected in an All India survey, based on preliminary evaluation for three years, 9 high yielding accessions designated as PCT-1 to PCT-9 were selected during 1982. These 9 accessions were evaluated for their yield performance in a multi-location trial (4 centres) for 3 years. Based on pooled analysis of the data it was concluded that (i) there were significant differences in the mean yield of accessions (ii) there was accessions  $\times$  place interaction over all the 3 years (iii) the selections PCT-2, 5 and 8 were significantly superior, and (iv) among the selections, PCT-8 (Fig. 1) had the maximum yield potential (31.2 t/ha) and high curcumin content (8.7%).

### INTRODUCTION

India produces an estimated 1,67,500 tonnes of turmeric annually from an area of 86,400 ha earning about 8 per cent of the total export earnings from spices. Although about 50 commercial cultivars of turmeric belonging to *Curcuma domestica* Val. and *C. aromatica* Salisb. are recognized in this country, crop improvement work in the past had been confined to varietal trials in few agricultural research stations. Some of the improved varieties already reported are CLL-326 Mydukur with an yield of 25-37 tonnes raw turmeric per ha (Rao, Reddy and Subbarayudu 1975) Kesar with an yield of 10.86 t/ha (Mehta and Patel, 1982) and Chayapasuppu and Kuchipudi with an yield of 41 and 38 tonnes respectively (Philip et al., 1982). However, a critical examination of these reports indicate

that most often the projected yields are based on individual plant yields and the varieties included in the trials were both from *C. domestica* and *C. aromatica*. A caution has been given (Govindarajan, 1982) against mixing of *domestica* and *aromatica* types in field experimentation because *aromatica* cannot be used for culinary purpose. Selection of three high yielding turmeric cultivars PCT-2, 5 and 8 (*C. domestica*) with high curcumin percentage is reported in this paper.

### MATERIALS AND METHODS

One hundred and eighty four accessions of turmeric were collected during 1976-77 in an All India Survey conducted by the Central Plantation Crops Research Institute (CPCRI) in collaboration with the National Bureau of Plant Genetic Resources (NBPGR).

\* Contribution No. 533 Central Plantation Crops Research Institute, Kasaragod.

New Delhi and Himachal Pradesh Agricultural University, Solan. The materials were multiplied at CPCRI Regional Station Farm, Peruvannamuzhi during 1977-78.

Fifty out of the 184 accessions in which adequate planting materials were available were compared in a preliminary yield evaluation conducted during 1979-81. The accessions were also evaluated for quality parameters like percentage dry recovery, oil, oleoresin and curcumin content (Ratnambal, 1986). Based on the yield and quality evaluation, nine high yielding accessions designated as PCT-1 to PCT-9 were selected during 1982 for multilocation trials. The name of accessions, selection numbers and places of collection are presented in Table I.

These nine selections were evaluated in a multilocation trial for three years during 1982-84 at Calicut, Palode, Kasaragod (Kerala) and Hirehalli (Karnataka). The trial was laid out in a

Table II. Fresh rhizome yield in 9 turmeric selections

	Mean yield in kg/3 sq. m plot					Projected yield in tonnes/ha (mean)	Projected yield in tonnes/ha (maximum at one location)
	Calicut	Palode	Kasaragod	Hirehalli	Grand mean		
PCT-1	8.05	6.75	4.17	10.18	7.29	14.94	20.87
PCT-2	11.17	7.86	4.83	9.72	8.39	17.21	22.90
PCT-3	8.31	7.47	2.90	8.26	6.82	13.98	17.03
PCT-4	7.25	4.33	3.51	11.86	6.74	13.83	24.31
PCT-5	14.18	9.77	4.47	6.25	8.67	17.77	29.06
PCT-6	13.14	10.08	4.27	4.21	7.92	16.24	26.93
PCT-7	12.54	9.63	4.60	4.12	7.72	15.83	25.70
PCT-8	15.21	9.86	4.99	3.94	8.50	17.42	31.17
PCT-9	12.01	9.57	5.63	4.63	7.96	16.32	24.63
Mean	11.32	8.41	4.37	7.02	7.78	15.95	24.73

Table I. Name and place of collection of 9 accessions

Selection number	Name of accession	Place of collection
PCT-1	Vontimitta	Andhra Pradesh
PCT-2	Moovattupuzha	Kerala
PCT-3	Duggirala	Andhra Pradesh
PCT-4	Ethamukula	Andhra Pradesh
PCT-5	Jorhat	Assam
PCT-6	Gaspani	Nagaland
PCT-7	Kangpong	Meghalaya
PCT-8	Maran	Assam
PCT-9	Dibrugarh	Assam

Randomized Block Design with plot size of 3 sq m and four replications at each location.

#### RESULTS AND DISCUSSION

The mean yield at each location for the 9 cultivars are presented in Table II along with projected yield in t/ha as well as maximum yield at a single location. The results of pooled analysis are presented in Table III.

Fig. 1. Turmeric selection PCT-8

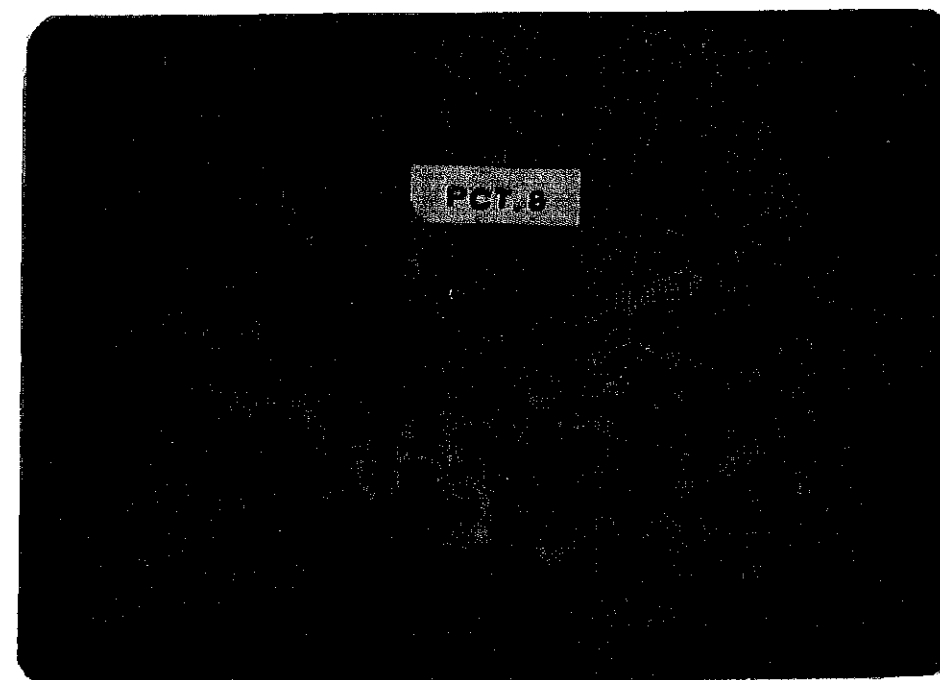


Table III. Pooled ANOVA

Source	Df.	MSS
Locations	3	225.6305
Years	2	104.8376
Locations × years	6	134.1345
Selections	8	5.9824
Locations × Selections	24	19.7674
Years × Selections	16	1.8061
Locations × Selections × Years	48	3.6927
Pooled error	268	2.4191
C. D. (0.05)		1.044 kg

Selections:

PCT-4, PCT-3, PCT-1, PCT-7, PCT-6, PCT-9, PCT-2, PCT-8, PCT-5	6.738, 6.820, 7.287, 7.720, 7.924
Mean yield/ 3m × 1m	7.962, 8.394, 8.500, 8.667.

Table IV. Percentage of dry recovery, oil, oleoresin and curcumin in nine turmeric selections

Selections	Dry recovery (%)	Oil (%)	Oleoresin (%)	Curcumin (%)
PCT-1	18.0	6.5	10.5	5.4
PCT-2	20.1	5.0	11.5	7.0
PCT-3	17.6	5.0	14.0	7.5
PCT-4	22.5	5.0	15.0	5.5
PCT-5	21.7	7.5	10.8	6.9
PCT-6	24.4	8.0	11.0	4.5
PCT-7	21.4	7.5	13.2	5.6
PCT-8	26.0	7.0	13.5	8.7
PCT-9	20.3	6.5	12.5	6.0

Table V. Morphological and rhizome characteristics of the three high yielding turmeric selections

Characteristics	PCT-2		PCT-5		PCT-8	
	Mean	Range	Mean	Range	Mean	Range
Height of pseudostem (cm)	68.5	58.0-76.0	67.2	55.0-76.0	69.4	66.0-72.2
No. of tillers	2.2	2-5	2.5	2-5	2.6	1-6
No. of leaves-tiller	7.9	4-15	6.5	3-12	6.3	6-8
Length of leaf (cm)	64.5	51.0-75.5	66.2	55.0-72.0	66.4	64.0-71.0
Breadth of leaf (cm)	15.7	13.0-19.5	16.0	13.5-18.6	17.4	14.0-20.7
No. of mother rhizome (cm)	2.1	1-4	2.5	1-8	3.0	1-5
Length of mother rhizome (cm)	4.9	3.2-6.5	5.0	4.0-6.0	4.6	2.6-5.0
Circumference of mother rhizome (cm)	3.6	3.4-3.9	2.5	2.1-2.7	2.8	2.1-3.3
No. of nodes in mother rhizome	8.5	6-12	10.5	9-13	9.1	7-11
Internodal distance in mother rhizome (cm)	0.6	0.5-0.7	0.5	0.4-0.7	0.5	0.4-0.7
No. of primary fingers	14.7	4-30	15.9	5-33	14.8	9-32
Length of primary fingers (cm)	6.2	4.6-7.5	9.9	7.0-14.0	10.4	7.0-12.0
Circumference of primary finger (cm)	2.0	1.6-2.5	1.8	1.4-2.1	1.7	1.6-1.9
No. of nodes in primary finger (cm)	10.0	6-12	11.3	7-14	11.9	9-14
Internodal length in primary finger (cm)	0.7	0.5-0.9	1.0	0.8-1.2	1.0	0.9-1.2
No. of secondary fingers	15.8	6-28	33.9	12-32	28.2	10-50
No. of tertiary fingers	7.0	6-9	6.0	4-10	8.6	2-15

From the above analysis the following conclusions are drawn:

- i) There were significant differences in the mean yield of selections averaged over four places and three years.
- ii) There was selection x place interaction consistently over all the three years under study.
- iii) The differences between selections were consistent over the set of places, and over the three years under study.

- iv) The selection PCT-4 gave the lowest yield of 6.738 kg/3 sq. m and PCT-5 recorded the highest yield of 8.667 kg. However, the selections PCT-7, PCT-6, PCT-9, PCT-2, PCT-8 and PCT-5 can be considered to be on par based on a CD value of 1.044 kg.
- v) The three selections PCT-2, PCT-8 and PCT-5 were significantly superior to selections PCT-3 and PCT-4. While the curcumin content in the 184 accessions ranged from 2.32 to 10.9 per cent (Ratnambal, 1986),

the three selections PCT-2, PCT-5 and PCT-8 have 7.0, 6.9 and 8.7 per cent curcumin respectively (Table IV.).

The morphological characteristics of the three high yielding selections are given in Table V.

The three selections PCT-2, PCT-5 and PCT-8 have uniformly high yield at four locations over a period of three

years in addition to high curcumin percentage. Among these PCT-8 has maximum yield potential (31.2 t/ha) as well as curcumin content (8.7 per cent). The VII Workshop of All India Coordinated Spices Improvement Project held at Trivandrum in November 1985 has recommended this variety for release in Kerala, Karnataka and Andhra Pradesh and the same is being multiplied on a large scale for making it available to the farmers.

## REFERENCES

- GOVINDARAJAN, V. S. 1982. In *Ginger and Turmeric*. P. 23. Discussion. (eds) M. K. Nair, T. Prem Kumar, P. N. Ravindran and Y. R. Sarma. Proc. Natl. Sem. (1980). Central Plantation Crops Research Institute, Kasaragod-670 124, Kerala, India.
- MEHTA, K. G. and PATEL, R. H. 1982. Phenotypic stability for yield in turmeric. In *Ginger and Turmeric*. pp. 34-38, (eds) M. K. Nair, T. Prem Kumar, P. N. Ravindran and Y. R. Sarma, Central Plantation Crops Research Institute, Proc. Natl. Sem. (1980), Kasaragod-670 124, Kerala, India.
- PHILIP, J., SIVARAMAN NAIR, P. C., NYBE, E. V. and MOHANAKUMARAN, N. 1982. Variation of yield and quality of turmeric cultivars. pp. 42-46. In *Ginger and Turmeric*. (eds) M. K. Nair, T. Prem Kumar, P. N. Ravindran, and Y. R. Sarma. Proc. Natl. Sem. (1980), Central Plantation Crops Research Institute, Kasaragod-670 124, Kerala, India.
- RAO M. R., REDDY, R.C. and SUBBARAYUDU, M. 1975. Promising turmeric types of Andhra Pradesh. *Areca nut and Spices Bull.* 6 (3): 59-62.
- RATNAMBAL, M. J. 1986. Evaluation of turmeric accessions for quality. *Plants Food Hum. Nutr.* 36: 243-252.