



Evaluation of turmeric (*Curcuma longa* L.) genotypes for yield attributes, yield and reaction to foliar diseases

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Abstract

An experiment was conducted during 2005–06 to 2008–09 at Raigarh (Chhattisgarh) to assess the variability of thirteen genotypes of turmeric for yield and disease resistance. The results indicated that entries TCP-11 and TCP-82 produced maximum yield *i.e.*, 20.3 and 18.8 t ha⁻¹, respectively. Entry TCP-11 showed resistance to leaf spot and blotch while TCP-82 was found to be moderately resistant to *Colletotrichum* leaf spot and resistant to *Taphrina* leaf blotch. The check variety IISR Prabha showed moderate resistance to both the diseases and yielded 14.4 t ha⁻¹.

Keywords: *Curcuma longa*, *Colletotrichum*, disease resistance, *Taphrina*, turmeric, yield

Turmeric (*Curcuma longa* L.) crop is affected by two major diseases caused by *Colletotrichum* leaf spot (Reddy *et al.* 1963) and *Taphrina* leaf blotch (Rao 1995). Although, many of the varieties/entries were evaluated by many workers against foliage diseases, information on the extent of genetic variability on resistance/susceptibility and yield is lacking and it is useful for varietal improvement.

Field trial was conducted during four years from 2005–06, 06–07, 07–08 and 2008–09 at Indira Gandhi Agriculture University, Regional Agricultural Research Station, Boirdadar farm, Raigarh (Chhattisgarh) with thirteen turmeric entries *viz.*, IT-1, IT-2, IT-3, CL-147, TCP-82, TCP-11, TCP-56, NDH-9, PTS-34, PTS-39, RH9/90, RH-13/90 and IISR Prabha. The experimental site is located in between 21° 20' to 23° 13' N latitude and 82° 55' to 84° 20' E longitude having an elevation of 237 meter

from MSL. The minimum temperature falls 8°C during winter (December–January) and maximum temperature goes as high as 47°C to 49°C during summer (May–June). The average annual rainfall of the area is about 1200 mm, received from South–West monsoon, mostly concentrated during the month of July to September. The experimental soil had organic carbon (%) 0.60 available N (kg ha⁻¹) 185.4 available P (kg ha⁻¹) 8.4 available K (kg ha⁻¹) 216.6, soil pH 6.8, texture sandy loam. Crop was planted in last week of June every year in a plot size of 3 m × 1 m under ridge and furrow method. The recommended dose of N; P₂O₅; K₂O fertilizers @ 150: 100: 120 kg ha⁻¹ was applied. All the recommended packages and practices were adopted. Data regarding yield and yield attributes *i.e.* plant height, leaf length, leaf width, number of leaves, number of tillers were recorded randomly selected ten plants at

Table 1. Yield, yield attributes, disease resistance and area under disease progress curve of turmeric entries (Mean of four years)

Entries	Yield attributes of turmeric entries				Rhizome yield (t ha ⁻¹)				Average yield (t ha ⁻¹)		Colletotrichum		Taphrina leaf			
	Plant height (cm)	Tillers plant ⁻¹	Leaves plant ⁻¹	Leaf length (cm)	Mother rhizome weight (g)	Primary rhizome No.	Wt (g)	2005–2006	2006–2007	2007–2008	2008–2009	leaf spot Reaction AUD-2008	leaf spot Reaction AUD-2009	blotch	disease PC	
IT-1	105.8	2.6	7.7	54.9	37.8	7.8	85.6	14.9	15.6	13.7	8.0	13.1	M	532.7	M	521.4
IT-2	114.6	2.9	7.3	56.4	42.2	7.8	63.9	17.3	16.4	15.3	9.0	14.5	M	522.4	M	511.6
IT-3	105.5	3.5	7.1	53.1	40.0	7.9	67.2	16.4	12.9	12.7	15.3	14.3	M	329.0	M	519.4
CL-147	95.8	2.7	7.9	49.1	46.8	6.9	85.0	5.8	14.7	13.9	14.9	12.3	M	527.4	M	524.6
TCP-82	96.2	3.6	6.9	45.3	25.0	5.0	82.8	22.0	18.6	15.3	19.5	18.8	M	533.4	R	245.7
TCP-11	87.6	3.5	7.4	40.0	22.2	4.3	74.6	21.7	20.7	17.5	21.1	20.3	R	245.7	R	224.6
TCP-56	98.9	3.4	7.3	47.7	51.9	10.4	104.4	13.4	16.7	14.7	16.8	15.4	R	239.7	M	531.6
NDH-9	99.5	2.4	7.8	54.3	30.9	7.0	76.2	12.9	13.7	11.1	14.5	13.0	M	524.90	M	529.4
PPTS-34	100.0	3.7	8.0	51.9	42.8	7.3	62.8	8.7	11.9	10.9	15.3	11.7	S	1231.3	M	527.4
PPTS-39	105.9	3.0	8.4	49.8	57.1	7.7	78.8	10.0	12.3	12.5	11.3	11.5	S	1224.6	M	521.6
RRH-9/90	89.8	3.1	7.2	42.5	50.0	7.8	85.0	14.7	15.8	14.5	5.4	12.6	M	521.70	M	532.4
RRH-13/90	89.5	3.5	6.5	44.6	63.9	7.6	91.1	12.0	13.9	13.1	16.5	13.9	M	527.40	M	528.9
IISR Prabha	91.4	3.1	7.5	46.9	38.9	7.1	76.1	11.8	17.2	14.9	13.5	14.3	M	524.40	M	527.6
CD at 5%	1.64	2.54	2.59	3.62	4.84	-	29.56	-	22.42	-	-	-	-	-	-	-

AUDPC=Area Under Disease Progress Curve; R=Resistant; M=Moderately Resistant; S=Susceptible

maturity stage. Calculation of area under disease progress curve (AUDPC) for *Colletotrichum* and *Taphrina* were observed at weekly intervals. For the accuracy of disease intensity, first relative lesion height % was calculated (Sharma *et al.* 1990). The disease scoring of the leaves were based on (1–9) scale, they were classified as highly resistant (HR) 0 disease intensity, resistant (R) up to 10% disease intensity, moderately resistant (M) >10% to 20% disease intensity, susceptible (S) >20% to 50% disease intensity and highly susceptible (HS) > 50% disease intensity described by Rao & Rao (1987). The AUDPC value were calculated as formula;

$$\text{AUDPC} = \sum_{i=1}^k \frac{1}{2} (y_i + y_{i-1}) \times D$$

where y, disease incidence in ith day or evaluation; k=number of successive evaluation; D=interval between i and i-1; evaluation of disease by Wilcoxon *et al.* (1975). Data on yield were taken at the time of harvesting.

The genotypes TCP-11 (20.3 t ha⁻¹) and TCP-82 (18.8 t ha⁻¹) (Table 1) were found to be the maximum yielders among all the entries including the check (IISR Prabha). All the entries were found to be moderately resistant, however, TCP-11 and TCP-56 were resistant and PTS-34 and PTS-39 were found susceptible against *Colletotrichum* leaf spot. All entries were found moderately resistant to *Taphrina* leaf blotch, except TCP-82 and TCP-11 which were resistant against the disease. On the basis of area under disease progress curve, maximum AUDPC was found in variety PTS-34 (1231.3) and PTS-39 (1224.6) against *Colletotrichum* leaf spot. Yeh & Bonman (1986) employed area under disease progress curves to assess partial resistance to *Pyricularia oryzae* in rice cultivars. Resistant and moderately resistant entries were found statistically at par for both the diseases. Genetic variability for yield attributes in turmeric were reported earlier (Dash *et al.* 2002; Kumar *et al.* 2004; Singh *et al.* 2003) and for diseases also reported (Rao *et al.* 1994; Tarafadar & Chatterjee 2003).

It is concluded that TCP -11 produced better yield and was resistant to diseases and TCP -82 was found equally better than other genotypes evaluated.

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