

Two new high yielding, high 'curcumin, turmeric (*Curcuma longa* L.) varieties- 'IISR Kedaram' and 'IISR Alleppey Supreme'

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Abstract

Two turmeric (*Curcuma longa*) varieties, 'IISR Kedaram' (Acc. 126) and 'IISR Alleppey Supreme' (Acc. 585) were developed at the Indian Institute of Spices Research, Calicut, through selection and recommended for release for their high yield and curcumin content. 'IISR Kedaram', matures in 215 days and has an average yield of 5.28 t ha⁻¹ (dry rhizome) and 301.10 kg ha⁻¹ curcumin whereas, 'IISR Alleppey Supreme', an Alleppey finger turmeric selection, matures in 220 days and yields 5.58 t ha⁻¹ (dry rhizome) and 309.69 kg ha⁻¹ curcumin.

Key words: curcumin, *Curcuma longa*, turmeric, yield.

The demand for turmeric (*Curcuma longa* L.) is likely to go up considerably globally because of its increasing use as a natural colouring pigment and in cosmetics. It is estimated that the requirement of turmeric production in India will be around 8,05,000 t by the end of the X Plan period requiring 9% annual growth rate in production (Selvan & Thomas 2002). High yielding, high curcumin varieties, free from major pests and diseases, especially better selections of the popular Alleppey finger turmeric (AFT) and other land races can play a significant role in achieving this demand. Varietal diversity is also an important aspect in any crop improvement programme, especially in a clonally propagated crop like turmeric.

Initial clonal evaluation of AFT available in the Germplasm Repository of the Indian Institute of Spices Research, Calicut, resulted in short-listing seven promising lines based

on yield and curcumin content. Further, evaluation of the other germplasm accessions for curcumin content and yield was also done simultaneously leading to short-listing of two accessions (Accs. 126 and 295). These seven selected AFT lines (Accs. 584, 585, 591, 593, 656, 657 and 691) along with the other two accessions (Accs. 126 and 295) were evaluated in replicated trials at Indian Institute of Spices Research, Experimental Farm, Peruvannamuzhi (Kerala) from 1998-99 to 2002-03. Accs. 584 and 585 (AFT selections) were also evaluated in replicated trials along with Accs. 126 and 295 at Sangli (Maharashtra) from 1998-99 to 2000-01 and Pundibari (North Bengal) during 2001. Accs. 126 and 585 were also evaluated in Brahmapur (Karnataka) during 1998 and 1999. The controls included were Prabha and Prathibha (uniform checks) and the respective local checks. The trials were laid out in randomized block design having 4 replica-

tions at Peruvannamuzhi and 3 replications at other locations. The plot size was 3 m² beds. Observations on fresh yield bed⁻¹, dry recovery and curcumin content were recorded at all locations and incidence of leaf blotch was recorded at Pundibari. The crop was raised as per the standard package of practices of various regions and the data were analysed statistically.

The fresh rhizome yield significantly differed at Peruvannamuzhi among the entries during three out of five seasons, though the en-

tries Accs. 126 and 585 were at par with the controls on a pooled mean basis (Table 1). The same trend was reflected for pooled mean yield at Sangli too (Table 2). At Brahmavar, the performance of Acc.126 was at par with the controls (Prabha, Prathibha and D K Local) during 1998. However during 1999, Acc. 585 performed superior to all the four controls (Table 3). At Pundibari, though the new lines did not yield higher than the checks, they recorded zero PDI (per cent disease incidence) values for leaf blotch as compared to the local selections (Table 4).

Table 1. Yield of promising turmeric lines at Peruvannamuzhi, Kerala

Line	Mean fresh yield kg (3 m ² bed) ⁻¹					Pooled mean fresh yield kg (3 m ² bed) ⁻¹
	1998-99	1999-2000	2000-01	2001-02	2002-03	
Acc. 126	15.50	12.50	16.25	25.7	16.25	17.25
Acc. 295	12.00	13.25	12.00	20.8	15.30	14.67
Acc. 584	18.25	12.25	10.63	24.0	16.75	16.37
Acc. 585	15.50	11.40	17.38	29.0	15.25	17.71
Acc. 591	14.87	9.00	14.50	28.0	13.35	16.00
Acc. 593	13.50	11.25	15.00	24.3	14.75	15.75
Acc. 656	12.00	17.10	13.25	15.0	14.12	19.29
Acc. 657	-	-	17.30	26.5	20.18	21.32
Acc. 691	-	-	17.30	18.3	17.20	17.60
Prabha (Control)	15.25	12.25	15.00	25.4	16.12	16.80
Prathibha (Control)	16.75	13.00	15.00	24.1	16.67	17.10
CD (P=0.05)	NS	0.70	2.13	4.4	NS	2.00
CV (%)		18.50	10.60	13.2		14.00

Table 2. Yield and quality of promising lines of turmeric at Sangli, Maharashtra

Line	Mean fresh yield kg (3 m ² bed) ⁻¹				Dry recovery (%)	Dry yield (q ha ⁻¹)	Curcumin content (%)	Curcumin yield (kg ha ⁻¹)
	1998-99	1999-2000	2000-01	Pooled mean				
Acc. 126	8.21	8.76	10.00	8.99	19.50	49.94	5.62	280.66
Acc. 295	4.66	4.47	6.50	5.21	19.50	28.84	6.16	177.60
Acc. 584	4.34	6.31	10.20	6.95	18.30	38.63	5.86	226.37
Acc. 585	4.40	6.13	8.06	6.19	19.00	34.43	4.05	170.42
Acc. 591	6.48	8.62	7.46	7.52	19.25	41.82	4.39	183.58
Alleppey (Control)	8.69	7.04	10.20	8.24	19.75	48.04	5.41	259.89
Prabha (Control)	9.85	9.04	9.06	9.32	19.50	57.79	4.85	251.18
Prathibha (Control)	9.25	11.32	9.46	10.0	19.50	55.57	5.32	295.63
Salem (Control)	13.14	12.48	14.80	13.4	21.00	74.67	4.20	314.45
Rajapuri (Control)	11.92	11.49	10.30	11.24	20.00	62.45	3.65	228.05
CD (P=0.05)	1.90	4.42	1.70	2.25				
CV (%)	12.00	13.00	11.50	12.00				

Table 3. Yield and quality of promising turmeric lines at Brahmavar, Karnataka

Line	Cured dry rhizome yield (t ha ⁻¹)		Curcumin (%)		Oleoresin (%)	
	1998	1999	1998	1999	1998	1999
Acc. 126	4.97	5.40	5.56	5.63	13.70	13.60
Acc. 585	-	9.00	-	6.00	-	16.00
Alleppey (Control)	4.01	4.31	6.13	6.16	17.43	16.86
Prabha (Control)	4.80	5.53	6.13	6.30	16.40	16.13
Prathibha (Control)	5.37	5.93	6.56	6.70	15.10	14.93
D K local (Control)	4.51	5.31	3.87	4.30	15.13	14.93
CD (P=0.05)	0.62	0.92	-	-	-	-
C V (%)	10.00	12.00	-	-	-	-

Quality traits of the promising turmeric lines indicated the higher yield of curcumin ha⁻¹ in Accs. 126 and 585 as compared to the control, Prathibha (Table 5). However, the overall mean performance of the new lines from four locations for dry yield and curcumin ha⁻¹ (Table 6) clearly established the superiority of the new lines, Accs. 126 and 585, over both the uniform checks (Prabha and Prathibha) besides consistency in curcumin content of Acc. 126. Based on the superiority for dry yield, curcumin ha⁻¹, and/or consistency in curcumin content, these two lines were proposed for release (State Variety Release, Kerala) as 'IISR Kedaram' and 'IISR

Alleppey Supreme', respectively. Though AFT is originally from Central Travancore region of Kerala, evaluation of the material at different locations indicates that it maintains its superiority in quality outside the home tract too. The salient morphological features of the new varieties are given in Table 7. The effectiveness of strain selection in improving yield and quality of turmeric has been already reported (Babu *et al.* 1993; Sasikumar & Sardana 1989).

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Table 4. Yield of promising turmeric lines at Pundibari, North Bengal

Line	Wt. of primary rhizome clump ⁻¹ (g)	Wt. of secondary rhizome clump ⁻¹ (g)	No. of secondary rhizomes clump ⁻¹	Length of secondary rhizome clump ⁻¹ (cm)	Projected fresh yield (t ha ⁻¹)	PDI values for leaf blotch
Prabha	147.07	36.52	13.11	4.75	27.44	0.0
PTS-52	140.23	104.92	17.78	4.99	23.24	0.0
TCP-1	148.73	110.46	18.85	5.19	27.04	0.0
Acc-126	116.40	113.49	14.01	4.51	29.00	0.0
PTS-59	168.20	109.15	16.33	5.57	16.90	22.5
TCP-2	173.27	110.89	16.75	6.75	32.06	24.6
Acc-584	170.20	111.36	19.03	5.85	25.40	7.8
PTS-11	153.10	86.67	13.07	4.77	22.22	10.6
Prathibha	135.93	102.70	12.22	5.50	24.64	2.3
PTS-55	161.67	90.53	12.88	5.04	26.56	2.3
TU-1	161.77	98.60	10.36	5.65	25.96	2.3
Acc-585	125.53	100.56	11.50	4.77	19.94	0.0
PTS-15	117.93	89.67	18.40	5.47	21.30	2.3
RH-5	146.57	119.93	11.66	6.00	25.96	61.8
CD (P=0.05)	13.73	10.94	1.70	1.02	4.28	-

Source: Annual Report 2000-01, AICRP (Spices), Calicut.

PDI=Per cent disease incidence

Table 5. Quality traits of promising turmeric lines at Peruvannamuzhi, Kerala

Line	Dry recovery (%)	Dry yield (q ha ⁻¹)	Curcumin content (%)	Curcumin yield (kg ha ⁻¹)
Acc. 126	18.90	66.00	5.5	358.0
Acc. 295	17.75	51.50	5.1	265.6
Acc. 584	21.50	70.00	5.5	387.1
Acc. 585	19.30	70.70	6.0	410.6
Acc. 591	12.45	57.89	5.7	251.4
Acc. 593	19.05	60.99	5.8	356.2
Acc. 656	15.59	44.60	4.9	215.7
Acc. 657	19.45	84.72	5.8	455.3
Acc. 691	17.20	61.20	-	-
Prabha (Control)	20.00	60.80	6.5	419.1
Prathibha (Control)	18.70	65.57	5.6	349.1

Table 6. Overall mean yield and curcumin content of new turmeric lines

Line	Dry yield (t ha ⁻¹)				Mean yield (t ha ⁻¹)	Curcumin content (%)			Mean curcumin content (%)	Curcumin yield (kg ha ⁻¹)
	Peruvanna-muzhi	Pundibari	Sangli	Brahmavar		Peruvanna-muzhi	Sangli	Brahmavar		
Acc. 126	6.60	5.80	3.50	5.25	5.28	5.50	5.62	5.59	5.70	301.10
Acc. 585	7.07	3.90	2.35	9.00	5.58	6.00	4.05	6.00	5.55	309.69
Prabha (Control)	6.00	5.48	3.63	5.16	5.00	6.50	4.85	6.21	5.85	292.50
Prathibha (Control)	6.50	4.93	3.90	5.65	5.24	5.60	5.32	6.30	5.74	300.00

Table 7. Salient agronomic features of new turmeric varieties at Peruvannamuzhi, Kerala

Line	Plant height (cm)	No. of tillers clump ⁻¹	No. of leaves clump ⁻¹	Length of leaf (cm)	Width of leaf (cm)	No. of mother rhizomes clump ⁻¹
Acc. 585	57.00	3.00	14.50	72.60	17.30	2.00
Acc. 126	50.80	2.50	12.50	63.70	16.20	1.85
Prabha (Control)	44.14	2.07	11.50	59.60	17.33	3.00
Prathibha (Control)	42.91	1.60	12.50	59.33	16.71	1.30

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References

- Babu K N, Sasikumar B, Ratnambal M J, Johnson K George & Ravindran P N 1993 Genetic variability in turmeric (*Curcuma longa* L.). Indian J. Genet. 53 : 91-93.
- Sasikumar B & Sardana S 1989 Genetic variability in turmeric (*Curcuma longa* L.). J. Hill Res. 2 : 187-191.
- Selvan T M & Thomas K G 2002 Turmeric. In: Singh H P, Sivaraman K & Tamil Selvan M (Eds.) Indian Spices - Production and Utilization. Proceedings, National Consultative Meeting for Accelerated Production and Export of Spices (pp. 97-109). Coconut Development Board, Cochin.