

## Performance of turmeric (*Curcuma longa* L.) cultivars in open and partially shaded conditions under coconut

P LATHA, M P GIRIDHARAN & B JAYAPRAKASH NAIK

Regional Agricultural Research Station  
Pilicode - 671 353, Kasaragod, Kerala, India.

### ABSTRACT

The performance of 15 turmeric (*Curcuma longa*) cultivars grown under open and partially shaded conditions (25-30 per cent shade intensity) as an intercrop in a coconut (*Cocos nucifera*) garden was evaluated at Pilicode (Kerala State, India). Plant height, number of secondary fingers and total weight of fresh rhizomes were higher in all the cultivars under partially shaded conditions. However, curing percentage was higher under open conditions. The cultivar Chayapasupu recorded the highest yield (43.73 t ha<sup>-1</sup> of fresh rhizomes) followed by VK-31 (42.42 t ha<sup>-1</sup>) under partially shaded conditions. The yield of cured rhizomes was highest in VK-116 (5.74 t ha<sup>-1</sup>) followed by VK-77 (5.63 t ha<sup>-1</sup>) under the same conditions. As pure crop, VK-31 (35.06 t ha<sup>-1</sup>) and VK-55 (34.66 t ha<sup>-1</sup>) were the high yielders in terms of fresh yield and VK-77 recorded the highest yield (6.96 t ha<sup>-1</sup>) of cured rhizomes followed by VK-114 (6.87 t ha<sup>-1</sup>). The study indicated the need for standardising optimum light requirement for each cultivar for maximum production of cured rhizomes.

Key words: *Curcuma longa*, curing, intercrop, turmeric, yield.

### Introduction

Though turmeric (*Curcuma longa* L.) is traditionally cultivated as a pure crop in India, it comes up well under partially shaded conditions also (Sundararaj & Thulasidas 1976). However, the performance of various cultivars also varies with the cropping situation. In ginger, another zingiberaceous crop, good quality rhizomes were obtained under low to medium shade (Joseph & Jayachandran

1993). The present study was undertaken to screen various turmeric cultivars under open and partially shaded conditions in order to select those suited to each situation.

### Materials and methods

Fifteen cultivars of turmeric known for their better performance were raised under open (as pure crop) and partially shaded (as intercrop in coconut garden with 25-30 per cent shade) conditions

for two seasons during 1993-94 and 1994-95 at the Regional Agricultural Research Station, Pilicode (Kerala State, India).

The experiment was laid out in a Randomised Block Design with three replications. Planting was done in beds of 3 m × 1 m size at a spacing of 25 cm × 25 cm. All the cultural operations including plant protection measures were followed according to the recommendations suggested by Kerala Agricultural University (1993). Observations on biometric and yield characters were recorded and the data subjected to statistical analysis (analysis of variance) as suggested by Panse & Sukhatme (1985).

## Results and discussion

### *Vegetative growth*

The cultivars exhibited significant variations with respect to plant height and number of tillers under both situations. The cultivars VK-82 (36.3 cm) and Sugandham (48.1 cm) recorded the highest plant height under open and partially shaded conditions, respectively (Tables 1 & 2). The cultivars, VK-116, VK-31, PTS-24, VK-114, Chayapasupu, VK-55, VK-47 and Sugandham produced more number of tillers under open conditions while the reverse was true for the remaining cultivars. Though the cultivars differed significantly in the number of functional leaves per plant under open conditions, the variation was not significant under shaded conditions.

### *Yield attributes*

The cultivars responded differently in terms of number of rhizomes produced to different levels of light intensity. Variation in production of primary

fingers which was significant under open conditions was nonsignificant under partially shaded conditions. When grown as pure crop, PTS-10 recorded maximum number of primary fingers (5.8) which was on par with VK-31, VK-116, VK-82, VK-47, Vontimitta and VK-11. Under both conditions, significant variations occurred in production of secondary fingers. Under open conditions, highest number of secondary fingers (20.6) was recorded in PTS-10, followed by VK-31, whereas, VK-31 recorded maximum number of secondary fingers (19.8) when grown as intercrop in coconut gardens. In general, production of more number of primary fingers under partial shade and secondary fingers under open conditions was observed in a majority of cultivars.

The mother rhizomes were larger in size under open conditions whereas an increase in size of finger rhizomes was observed under partial shade. The cultivars differed significantly in girth of mother rhizomes and was maximum in Chayapasupu (14.35 cm). Significant differences were also observed for finger length which was maximum in VK-55 (9.7 cm). Under partial shade, significant differences between cultivars were observed for length and girth of mother rhizomes and length of fingers. The length of mother rhizomes ranged from 2.95 cm in VK-55 to 7.35 cm in Chayapasupu and its girth ranged from 8.75 cm in VK-55 to 13.10 cm in VK-47. Yield of fresh rhizomes ranged from 25.56 t ha<sup>-1</sup> (Pilicode Local) to 35.06 t ha<sup>-1</sup> (VK-31) under open conditions and from 18.68 t ha<sup>-1</sup> (Pilicode Local) to 43.73 t ha<sup>-1</sup> (Chayapasupu) when grown under partial shade. In both situations, fresh yield, curing percentage and yield of cured turmeric were found to vary significantly. Under open conditions,

Table 1. Performance of turmeric cultivars under open conditions

Cultivar	Plant ht. (cm)	No. of functional leaves	No. of till-ers	No. of PF	No. of SF	Length of MR (cm)	Girth of MR (cm)	Length of PF (cm)	Girth of PF (cm)	Fresh yield (t ha <sup>-1</sup> )	Curing percentage	Yield of cured turmeric (t ha <sup>-1</sup> )
VK-116	32.9	6.0	5.05	5.4	18.0	5.65	12.10	5.30	6.15	25.72	19.5	5.02
PTS-10	33.5	6.4	3.65	5.8	20.6	5.60	11.55	6.65	6.55	30.63	15.0	4.59
VK-31	32.1	7.3	3.70	5.5	19.9	5.45	10.95	6.15	5.60	35.06	13.0	4.56
Vontimitta	30.2	7.4	3.15	4.9	14.9	6.80	11.10	5.30	5.30	26.60	21.5	5.72
PTS-24	28.5	5.7	3.15	4.5	14.0	5.20	12.10	4.95	6.10	27.38	15.0	4.11
VK-11	31.2	6.3	3.25	4.8	14.6	5.90	12.60	5.40	5.70	27.56	18.0	4.96
VK-77	30.0	7.5	4.00	4.2	16.1	6.20	11.60	4.90	5.40	30.25	23.0	6.96
VK-114	32.8	7.4	3.75	3.8	14.1	5.75	11.55	6.45	6.35	30.52	22.5	6.87
VK-70	31.9	6.3	3.20	4.3	16.8	5.70	11.30	5.70	5.40	32.79	19.5	6.39
Chayapasupu	32.5	6.5	3.55	3.5	15.5	6.80	14.35	6.65	6.85	29.20	12.5	3.65
VK-55	32.8	8.0	3.00	3.6	13.8	5.90	10.70	9.70	8.10	34.66	14.0	4.85
VK-47	33.2	6.9	4.15	5.0	13.0	5.60	13.80	5.05	6.55	29.25	20.0	5.85
YK-82	36.3	6.9	3.00	5.4	13.8	5.35	11.40	5.30	5.45	26.88	24.5	6.80
Sugandham	32.4	6.6	6.50	3.9	13.2	4.75	13.30	6.35	6.45	32.92	13.5	4.44
Pilicode Local	28.4	6.5	3.20	4.4	17.1	6.20	12.30	5.60	6.00	25.56	18.4	4.70
CD (P=0.05)	3.68	1.09	0.86	1.32	2.78	NS	1.89	0.80	NS	2.72	2.36	0.48

PF- Primary fingers; SF- Secondary fingers; MR- Mother rhizome; NS- Not significant

Table 2. Performance of turmeric cultivars under partially shaded conditions

Cultivar	Plant ht. (cm)	No. of functional leaves	No. of tillers	No. of PF	No. of SF	Length of MR (cm)	Girth of MR (cm)	Length of FR (cm)	Girth of FR (cm)	Fresh yield (t ha <sup>-1</sup> )	Curing percentage	Yield of cured turmeric (t ha <sup>-1</sup> )
VK-116	43.05	5.7	4.00	4.20	7.10	6.10	10.25	6.70	6.15	39.64	14.5	5.74
PTS-10	35.30	6.3	4.50	4.90	12.30	5.70	11.95	7.50	6.55	37.99	14.5	5.50
VK-31	38.25	6.3	3.10	6.90	19.80	5.00	10.20	7.75	6.35	42.42	11.0	4.67
Vontimitta	40.40	6.5	3.65	4.70	7.20	7.20	10.30	6.50	6.80	35.64	15.5	5.52
PTS-24	34.10	6.3	2.85	7.25	10.65	3.95	11.90	6.80	6.65	27.62	17.5	4.83
VK-11	37.40	6.6	4.20	5.30	12.30	5.10	12.15	7.80	6.70	34.03	16.0	5.44
VK-77	37.90	6.4	4.75	6.00	12.20	5.80	11.00	7.10	6.10	38.81	14.5	5.63
VK-114	36.10	6.5	3.25	6.60	14.75	4.20	10.65	8.60	6.30	31.66	17.1	5.41
VK-70	37.30	6.5	3.20	5.70	14.90	3.90	10.40	7.10	6.20	30.42	15.5	4.72
Chayapasupu	42.50	7.1	3.25	5.10	10.80	7.35	12.35	7.80	7.40	43.73	11.1	4.85
VK-55	32.80	6.3	2.80	5.05	14.05	2.95	8.75	11.65	8.00	36.16	11.0	3.98
VK-47	37.80	6.4	3.40	5.70	12.70	3.65	13.10	8.10	6.90	26.39	17.5	4.62
VK-82	37.60	6.4	2.75	5.00	19.50	3.50	11.40	10.30	6.50	27.45	16.0	4.39
Sugandham	48.10	6.3	3.00	6.80	14.60	4.20	12.30	9.30	6.90	29.27	12.5	3.66
Pilicode Local	34.00	6.4	3.70	4.15	3.30	4.05	9.60	7.30	4.80	18.68	16.0	2.99
CD (P=0.05)	5.08	NS	1.03	NS	3.50	1.45	1.85	1.95	1.11	6.10	1.86	0.77

PF - Primary fingers; SF - Secondary fingers; MR - Mother rhizome; NS - Not significant

VK-82 recorded the highest curing percentage (24.5%) closely followed by VK - 77 (23.0%) which was the highest yielder of cured turmeric. Under shaded conditions, the highest curing percentage was recorded by PTS-24 and VK-47 (17.5%) and the yield of cured turmeric ranged from 2.99 t ha<sup>-1</sup> in Pilicode Local to 5.74 t ha<sup>-1</sup> in VK-116. Under both situations, curing percentage was very low in VK-31, Chayapasupu, VK-55 and Sugandham. Except VK-116, PTS-10, VK-31, PTS-24, VK-11 and Chayapasupu, all other cultivars recorded higher yield of cured turmeric under open conditions.

In turmeric, increased vegetative growth generally results in increased production and storage of photosynthates in rhizomes which accounts for higher yield. All the cultivars recorded an increased plant height under partial shade. Pujari, Patil & Sakpal (1987) reported highly significant variations among turmeric varieties in plant height, number of fingers and green turmeric yield. The present results are also in agreement with those reported by Philip & Nair (1983). They also opined that variation in yield and curing percentage when grown under same agroclimatic conditions might be due to genetic factors. Subbarayudu, Reddy & Rao (1976) reported that the variation in curing percentage among different types was mainly genetic rather than environmental. However, in the present study, the curing percentage was found to vary with light intensity, being higher in the crop grown under open conditions. This indicated the influence of environment on curing percentage. On the contrary, fresh yield was more under partial shade. This may be due to the higher amount of moisture present in the rhizomes resulting in a low curing

percentage and thereby low recovery of cured produce. The same reason may be attributed to the very low recovery percentage for cultivars which produce large rhizomes under both conditions as reported earlier by Philip (1983). Higher percentage of curing may be due to higher rate of dry matter production under open conditions. Satheesan & Ramadasan (1980) opined that the superiority in yield may be due to the higher crop growth rate during bulking of rhizomes and higher solar energy input under open conditions during this period. The results of the study indicated the need to optimise the light requirement of each cultivar for maximum production of cured rhizomes. Based on the yield of cured rhizomes, the cultivars VK-116, VK-77, Vontimitta, PTS-10, VK-11 and VK-114 can be recommended for cultivation as intercrop in coconut gardens with 25-30 per cent light intensity.

## References

- Joseph A & Jayachandran B K 1993 Effect of shade and fertilizer on the quality of ginger (*Zingiber officinale* Rosc.). South Indian Hort. 41 : 219-222.
- Kerala Agricultural University 1993 Package of Practices Recommendations 'Crops'. Directorate of Extension, Kerala Agricultural University, Mannuthy, Thrissoor.
- Panse V G & Sukhatme P V 1985 Statistical Methods for Agricultural Workers. 4th ed. Indian Council of Agricultural Research, New Delhi.
- Philip J 1983 Studies on growth, yield and quality components in different turmeric types. Indian Cocoa, Arecanut & Spices J. 6 : 93-97.

- Philip J & Nair PCS 1983 Morphological and yield characters of turmeric types. *Indian Cocoa, Arecanut & Spices J.* 6 : 61-67.
- Pujari P D, Patil R B & Sakpal R T 1987 Studies on growth, yield and quality components in different turmeric varieties. *Indian Cocoa, Arecanut & Spices J.* 11 : 15-17.
- Satheesan K V & Ramadasan A 1980 Growth and productivity of turmeric grown as a pure crop and as an intercrop in coconut garden. In: Nair M K, Premkumar T, Ravindran P N & Sarma Y R (Eds.) *Proceedings of the National Seminar on Ginger and Turmeric* (pp. 69-75). Central Plantation Crops Research Institute, Kasaragod.
- Subbarayudu M, Reddy R K & Rao M R 1976 Studies on varietal performance of turmeric. *Andhra agric. J.* 23 : 195-198.
- Sundararaj D D & Thulasidas G 1976 *Botany of Field Crops*. The Mac Millan Co. of India Ltd., Delhi.