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Varietal evaluation of different turmeric (*Curcuma longa* L.) varieties for its suitability to hilly zone of Karnataka

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Abstract
Turmeric (*Curcuma longa* L.) is an important, sacred and ancient spice of India. The root, rich in diverse phytochemicals and minerals, exhibits numerous pharmacological properties including anti-inflammatory, antioxidant, anti-cancer and neuro-protective effects, primarily due to curcumin. India is the major producer and exporter of turmeric. India is also the largest consumer of turmeric in the world accounting for nearly 90% of total production. Sakleshpur falls under hilly zone of agro climatic zone-IX of Karnataka. Traditionally plantation crops like coffee, cardamom and black pepper are predominantly grown and rice is cultivated in the plain region. Due to escalating cost in paddy cultivation, farmers are alternatively attempting ginger cultivation in this area. Since ginger experiences high disease load and high cost in production alternatively turmeric is attempted. Turmeric is hardy with majority of biotic and abiotic stress in comparison to ginger. IISR has released various turmeric cultivars which are widely adopted across different agroclimatic zones. Hence an observational study was planned to evaluate various released and local cultivars and their suitability under Sakleshpur condition. The study reported here was initiated in April 2022 and was repeated for a period of two seasons (2022-2023. 2023-2024). The experiment was conducted under irrigated condition. The soil of experimental plot was sandy loam in texture, pH 5.9 organic carbon content 1.3%, phosphorus 18 kg/ha, potassium 338 kg/ha. The trail was laid out in Randomized complete block design (RCBD) with four replications and five turmeric cultivars. IISR-Pratibha, IISR-Pragathi, Alleppey Supreme, Pitambar and Mydukur local. Turmeric cultivar IISR Prathibha and Mydukur local recorded significantly higher plant height of (128.4 & 122.6 cm) and number of tillers/clump (6.4 & 5.8) at150 days after sowing, while IISR Pragathi recorded lower plant height (72.4 cm) and number of tillers/clump (2.3). Significantly higher fresh mother (78.4g), primary (278.9 g) and secondary (42.0g) rhizome weight was recorded in turmeric cultivar IISR-Prathibha. Similarly, per plant fresh rhizome yield was also significant higher in IISR-Prathibha (399.3g/plant) and Mydukur local (373.0 g/plant). On the contrary IISR Pragathi performance is absolutely poor from both growth and yield attributes. Similarly, the fresh rhizome yield per hectare was recorded maximum in IISR Prathibha (27.95 t/ha) and Mydukur Local (26.11 t/ha). Similarly, lowest fresh weight of rhizome was observed in IISR Pragathi (6.69 t/ha). Significantly higher dry recovery was observed in turmeric cultivar Mydukur local (24.02%). This ultimately assisted the Mydukur local turmeric cultivar to attain significantly higher dry rhizome (6.27 t/ha) in spite of higher fresh rhizome yield observed in IISR Prathibha. Hence higher net return and BC ratio was observed for Mydukur local turmeric cultivar (Rs 229013/- & 2.09).

Keywords: Turmeric cultivars, Curcuma longa, Yield performance, Agroclimatic adaptability, Sakleshpur conditions

Introduction

Turmeric (*Curcuma longa* L.) is an important, sacred and ancient spice of India. It is a major rhizomatous spice produced and exported from India. Turmeric is an herbaceous perennial plant, native to Tropical Southeast Asia, belonging to the family Zingiberaceae, under the order Scitaminae. It is cultivated for its underground rhizomes which are used as spice, condiment and dyestuff. It is used in the cosmetic and drug industry, particularly in the preparation of anti-cancer medicines. It is also used in auspicious religious occasions. Turmeric inhibits the development of cataracts, breast cancer, colon cancer and lymphoma (Devi *et al* 2011) [2]. Turmeric (*Curcuma longa* L.) use for treating ailments such as stress, depression, and skin conditions. The root, rich in diverse phytochemicals and minerals, exhibits numerous pharmacological properties including anti-inflammatory, antioxidant, anti-cancer and neuro- protective effects, primarily due to curcumin (Kumar *et al* 2018) [3] India is the major producer and exporter of turmeric. India is also the largest consumer of turmeric in the world accounting for nearly 90% of total production. The major states producing turmeric in India are Telangana, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Madhya Pradesh and West Bengal. Sakleshpur falls under hilly zone of agro climatic zone-IX of Karnataka. Traditionally plantation crops like coffee, cardamom and black pepper are predominantly grown and rice is cultivated in the plain region. Due to escalating cost in paddy cultivation, farmers are alternatively attempting ginger cultivation in this area. Since ginger experiences high

disease load and high cost in production alternatively turmeric is attempted. Turmeric is hardy with majority of biotic and abiotic stress in comparison to ginger. IISR has released various turmeric cultivars which are widely adopted across different agroclimatic zones. Hence an observational study was planned to evaluate various released and local cultivars and their suitability under Sakleshpur condition.

Material and Methods

An observational field trial was conducted at Spices Board, Indian Cardamom Research Institutes' Regional Research Station, Sakleshpur, Karnataka, India. The study reported here was initiated in April 2022 and was repeated for a period of two seasons (2022-2023. 2023-2024). The area falls under hilly zone, (IX agroclimatic zone of Karnataka). The experiment was conducted under irrigated condition. The soil of experimental plot was sandy loam in texture, pH 5.9 organic carbon content 1.3%, phosphorus 18 kg/ha, potassium 338 kg/ha. The trail was laid out in Randomized complete block design (RCBD) with four replications and five turmeric cultivars. IISR-Pratibha, IISR-Pragathi, Alleppey Supreme, Pitambar and Mydukur local. The plot size is 3m x 1m (18 plants) was maintained. The spacing followed was 45 cm x 30 cm. All agronomic practices *viz*., irrigation, manuring, fertilizer application, weeding, plant protection was done according to the IISR Kozhikode guidelines Observations on growth attributes were recorded at 150 DAP. Obtained data was statistically analysed following statistical procedures outlined by Gomez and Gomez.1984 [4].

Results and discussion

Plant height (cm) and Number of tillers / clumps: In the present study, at 150 DAP plant height and number of tillers per clump showed significant variations due to genotype. Turmeric cultivar IISR Prathibha and Mydukur local recorded significantly higher plant height of (128.4 & 122.6 cm) and number of tillers/clump (6.4 & 5.8) at150 days after sowing, while IISR Pragathi recorded lower plant height (72.4 cm) and number of tillers/clump (2.3). This significant variation in plant height can influence canopy development, light interception and overall productivity in turmeric cultivation Anitha *et al.* (2021) [1].

Yield attributes of turmeric

The fresh weight of different rhizomes part per plant varied significantly among the turmeric cultivars. Significantly higher fresh mother (78.4g), primary (278.9 g) and secondary (42.0g) rhizome weight was recorded in turmeric cultivar IISR-Prathibha. Similarly, per plant fresh rhizome yield was also significant higher in IISR-Prathibha (399.3g/plant) and Mydukur local (373.0 g/plant) (Table.1). On the contrary IISR Pragathi performance is absolutely poor from both growth and yield attributes. Similarly, the fresh rhizome yield per hectare was recorded maximum in IISR Prathibha (27.95 t/ha) and Mydukur Local (26.11 t/ha). Similarly, lowest fresh weight of rhizome was observed in IISR Pragathi (6.69 t/ha). These results indicate that maximum productivity in IISR Prathibha and Mydukur local were top performers in terms of yield and dry matter retention, while IISR Pragathi consistently showed the minimum performance, recorded low yield.

Table 1: Evaluation of turmeric cultivars for their performance in hilly zone (pooled data of two years)

Turmeric cultivars	Plant height (cm)	No of tillers / clump	Mother rhizome weight (g/clump)	Primary rhizome weight (g/clump)	Secondary rhizome weight (g/clump)	Fresh rhizome weight/clump (g/clump)
IISR-Prathibha	128.4	6.4	78.4	278.9	42.0	399.3
IISR-Pragathi	72.4	2.3	20.1	57.3	18.2	95.6
IISR- Alleppey Supreme	108.4	4.8	49.6	189.6	39.4	278.6
Pitambar	112.4	5.6	52.3	202.4	32.6	287.3
Mydukur Local	122.6	5.8	69.2	268.2	35.6	373.0
S.Em (±)	4.1	0.61	2.84	4.12	2.08	9.4
CD @5%	12.3	1.83	8.52	12.36	6.24	28.2

Maximum rhizome yield in turmeric varies among different genotypes might be due to genetic factors such as the plant ability to produce more tillers, greater biomass and efficient nutrient uptake. Varieties with robust superior photosynthetic efficiency also tend to have higher rhizome yields (Anitha *et al.,* 2021) [1]. The increased fresh rhizome yield observed in these genotypes can be attributed to factors such as greater plant height, a higher number of tillers and enhanced dry matter production and its distribution across different plant parts, all of which indirectly influence yield. These traits also showed direct positive correlations with yield. Additionally, a higher rhizome yield in these genotypes may be associated with Greater rhizome weight. Therefore, it can be concluded that rhizome yield is primarily dependent on plant vigour and the efficient production of yield components. On the contrary marketable product in turmeric is dried rhizome. Significantly higher dry recovery was observed in turmeric cultivar Mydukur local (24.02%). This ultimately assisted the Mydukur local turmeric cultivar to attain significantly higher dry rhizome (6.27 t/ha) in spite of higher fresh rhizome yield observed in IISR Prathibha. Hence higher net return and BC ratio was observed for Mydukur local turmeric cultivar (Rs 229013/- & 2.09) (Table.1). The results of the current study are in agreement with earlier findings of (Lakshmi *et al.,* 2017) for the same hilly zone 9.

Table 2: Evaluation of turmeric cultivars for yield and economics (pooled data of two years)

Turmeric cultivars	Fresh rhizome weight/ha (tonnes/ha)	Dry recovery %	dry rhizome weight/ha (tonnes/ha)	Gross return (Rs)	Net return (Rs)	B C ratio
IISR-Prathibha	27.95	22.12	6.18	432793	222793	2.06
IISR-Pragathi	6.69	20.80	1.39	97435	-112564	0.46
IISR- Alleppey Supreme	19.50	20.68	4.03	282311	72311	1.34

Pitambar	20.11	21.20	4.26	298447	88447	1.42
Mydukur Local	26.11	24.02	6.27	439013	229013	2.09
S.Em (±)	1.4	0.24	0.14	-	-	-
CD @5%	4.2	0.72	0.42	-	-	-

COP: Rs 2,10,000/- Cost of dried finger Rs. 70000/- tonne

Conclusion

Among the five genotypes evaluated in the current study it can be opined that, turmeric will be one of the ideal replacements for rice crop in hilly zone of Karnataka (IX zone). Among the cultivars evaluated both IISR Prathibha and Mydukur local are adaptable and give higher rhizome yield, net return and BC ratio.

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