



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(12): 1387-1394
Received: 02-11-2025
Accepted: 05-12-2025

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Comparative evaluation of turmeric germplasm for growth yield and quality traits in Telangana

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DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i12r.4788>

Abstract

The present investigation, entitled “*Germplasm Evaluation of Turmeric (Curcuma longa L.)*”, was undertaken to evaluate the performance and genetic diversity of turmeric germplasm under the agro-climatic conditions of Telangana. The experiment was conducted during the kharif seasons of 2017-18 and 2018-19 at the Turmeric Research Station, Kammarapally, Nizamabad district, Telangana, using diverse turmeric genotypes. Genetic diversity analysis based on Mahalanobis D² statistics revealed substantial variability among the genotypes, which were grouped into four distinct clusters. Among the traits studied, rhizome length and size of mother rhizome contributed the highest (58%) to the total genetic divergence, highlighting their importance in genotype differentiation. Considering both genetic divergence and mean performance for growth and yield traits, five genetically diverse and superior genotypes—Selam, ACC-94, Tekurpet, Lakadong, and Kasturiavidi—belonging to clusters II, III, IV, and V were identified as promising parental lines for future hybridization and varietal improvement programmes in turmeric.

Keywords: Turmeric, *Curcuma longa* L., Germplasm evaluation, Genetic diversity, Rhizome yield, Telangana

Introduction

Turmeric (*Curcuma longa* L.) is a rhizomatous, herbaceous perennial plant belonging to the family Zingiberaceae. Native to tropical South Asia, it is widely cultivated across tropical and subtropical regions of the world. Turmeric is highly valued for its underground orange-coloured rhizomes, which are extensively used as a spice, natural colouring agent, and as a raw material in cosmetic and dye industries. Since ancient times, turmeric has also been an integral component of traditional systems of medicine and is commonly used as a household remedy for ailments such as anorexia, cough, diabetic wounds, rheumatism, and sinusitis.

The medicinal significance of turmeric is primarily attributed to the presence of curcuminoids, a group of polyphenolic compounds comprising curcumin, demethoxycurcumin, and bis-demethoxycurcumin. Among these, curcumin is the principal bioactive constituent responsible for the characteristic yellow colour of turmeric and is widely used as a natural food colourant and additive. Curcumin is an orange-yellow crystalline compound, practically insoluble in water, and exhibits diverse pharmacological properties including antioxidant, anti-inflammatory, antimicrobial, and antiviral activities. Certain curcuminoids have also been reported to inhibit human immunodeficiency virus type-1 (HIV-1), underscoring the therapeutic potential of turmeric.

India is the largest producer, consumer, and exporter of turmeric, contributing nearly 90 per cent of global production. Major turmeric-growing states include Telangana, Andhra Pradesh, Tamil Nadu, Odisha, West Bengal, Karnataka, and Kerala. Andhra Pradesh remains one of the leading producers, followed by Tamil Nadu and Karnataka. The combined area under turmeric cultivation in Telangana and Andhra Pradesh is approximately 71,488 ha, with a total production of about 4,43,226 tonnes, predominantly grown on clay loam soils. In Telangana alone, turmeric is cultivated over an area of 42,535 ha, producing nearly 1,84,285 metric tonnes (2015-16). The districts of Nizamabad, Karimnagar, Warangal, and Adilabad account for almost 90 per cent of the state's total turmeric production.

Turmeric is a cross-pollinated, triploid species ($3n = 63$) that is vegetatively propagated through underground rhizomes (Sasikumar, 2005). Most commercial cultivars are sterile triploids, which severely restricts the scope of conventional hybridization. As a result, varietal improvement in turmeric has largely relied on clonal selection and mutation breeding, with limited success. In contrast, some related species such as *Curcuma aromatica* are tetraploids ($2n = 84$) and capable of sexual reproduction. Recent reports of viable seed production in turmeric under Kerala conditions have opened new avenues for recombination breeding in this clonally propagated crop (Sasikumar *et al.*). Nevertheless, owing to the limited feasibility of hybridization under most conditions, genetic improvement in turmeric continues to depend primarily on systematic germplasm collection, evaluation, and selection.

In this context, the evaluation of diverse turmeric germplasm under specific agro-climatic conditions is crucial for identifying genetically superior and diverse genotypes with high yield potential, adaptability, and desirable horticultural traits. Therefore, the present investigation was undertaken to evaluate turmeric germplasm under the agro-climatic conditions of Telangana, with the objective of identifying promising genotypes for future crop improvement programmes.

Materials and Methods

Experimental Site and Duration

The present investigation entitled “*Germplasm Evaluation of Turmeric (Curcuma longa L.)*” was conducted during the kharif seasons of 2017-18 and 2018-19 at the Turmeric Research Station, Kammarapally, Nizamabad district, Telangana. The experimental site represents one of the major turmeric-growing regions of the state and is characterized by clay loam soils and a tropical climatic condition.

Experimental Material

The experimental material consisted of 46 turmeric germplasm lines collected from diverse agro-climatic regions. The germplasm included indigenous collections as well as popular cultivars maintained at the Turmeric Research Station.

Experimental Design and Layout

The experiment was laid out in a randomized block design (RBD) with three replications. Each germplasm line was planted in plots of uniform size following the recommended agronomic practices for turmeric cultivation under Telangana conditions.

Crop Management

Healthy, disease-free, and uniform rhizomes were used as planting material. All cultural operations, including land preparation, planting, irrigation, weeding, earthing-up, and plant protection measures, were carried out uniformly across all treatments in accordance with the package of practices recommended by the state agricultural university.

Observations Recorded

Observations were recorded on germination, growth, yield, and yield-attributing characters. Germination parameters included days to sprouting, days to 50 per cent sprouting, and percentage of sprouting. Growth parameters such as pseudostem habit, plant height, number of tillers per plant, number of leaves on the main shoot, leaf disposition, petiole length, leaf lamina length, and leaf lamina width were recorded at appropriate growth stages. Yield and yield-related characters included weight of mother rhizomes per plant and weight of finger rhizomes per plant. Observations were recorded from randomly selected plants in each plot.

Statistical Analysis

Data recorded over the two seasons were pooled and subjected to statistical analysis. Analysis of variance (ANOVA) was performed to test the significance of differences among genotypes. Genetic divergence among germplasm lines was assessed using Mahalanobis D^2 statistics, and genotypes were grouped into clusters based on divergence values. The relative contribution of individual characters to the total genetic divergence was also estimated.

Results and Discussion

The mean performance of 46 turmeric genotypes for germination, growth, and yield-related traits was evaluated, and the results are discussed character-wise. Mean values for 34 biometric characters are presented in the respective tables.

Germination Parameters

Days to Sprouting

Significant variation was observed among the genotypes for days to sprouting, which ranged from 16.17 to 25.67 days. The genotype BDJR-1183 required the maximum time for sprouting (25.67 days), whereas Rajendra Sonalika and Tekurpeta recorded the earliest sprouting (16.17 days). Twenty-three genotypes exhibited significantly lower values than the grand mean, indicating their potential for early establishment under Telangana conditions.

Days to 50 Per Cent Sprouting

Days to 50 per cent sprouting ranged from 22.83 to 31.50 days. The genotype BDJR-1183 again showed delayed sprouting (31.50 days), while Parbhani, Roma, and LTS-2 attained 50 per cent sprouting earliest (22.83 days). Twenty-four genotypes recorded significantly lower values than the grand mean, reflecting wide variability in sprouting behaviour among the germplasm.

Percentage of Sprouting

The sprouting percentage varied significantly among genotypes, ranging from 77.57 to 94.75 per cent. Selam recorded the highest sprouting percentage (94.75%), whereas BDJR-1183 exhibited the lowest (77.57%). A higher sprouting percentage is a desirable trait as it ensures better crop establishment, and several genotypes performed superior to the grand mean.

Growth Parameters

Pseudostem Habit

Based on pseudostem habit, the genotypes were categorized into compact and open types. A majority of the genotypes (31) exhibited an open pseudostem habit, while 15 genotypes were classified as compact. Variation in pseudostem habit influences canopy architecture, light interception, and ultimately plant productivity.

Plant Height

Plant height exhibited significant variation, ranging from 117.17 to 163.83 cm. Selam recorded the tallest plants (163.83 cm), while CO-1 exhibited the shortest plants (117.17 cm). Twenty-six genotypes showed significantly greater plant height than the grand mean, indicating substantial variability in vegetative vigour.

Number of Tillers per Plant

The number of tillers per plant ranged from 1.83 to 3.83. Selam recorded the maximum number of tillers (3.83), whereas PCT-7, JTS-38, BDJR-1183, Kasturi Araku, Sonajuli, and Waigon

recorded the minimum (1.83). Only five genotypes showed significantly higher tiller numbers than the grand mean. Higher tiller production is generally associated with enhanced rhizome yield.

Number of Leaves on Main Shoot

The number of leaves on the main shoot varied from 7.83 to 17.17. Kasturi Avidi recorded the maximum number of leaves (17.17), while CCA-301 recorded the minimum (7.83). Twenty-three genotypes exceeded the grand mean, indicating variability in photosynthetic potential.

Leaf Disposition

At maturity, genotypes were classified based on leaf disposition into erect and semi-erect types. Twenty-four genotypes exhibited erect leaf disposition, while 22 genotypes showed a semi-erect habit. Leaf orientation plays a vital role in efficient light interception and overall plant productivity.

Leaf Petiole Length

Leaf petiole length ranged from 5.83 to 8.40 cm. Kasturi Avidi recorded the longest petiole length (8.40 cm), whereas Parbhani exhibited the shortest (5.83 cm). Twenty-three genotypes recorded significantly higher petiole length than the grand mean.

Leaf Lamina Length

Leaf lamina length ranged from 38.67 to 52.50 cm. CA-19/1 recorded the maximum lamina length (52.50 cm), while NDH-4

recorded the minimum (38.67 cm). Twenty-four genotypes exhibited values significantly higher than the grand mean, indicating wide variability for this trait.

Leaf Lamina Width

Leaf lamina width varied from 13.72 to 16.67 cm. Selam recorded the maximum lamina width (16.67 cm), whereas BDJR-1183 recorded the minimum (13.72 cm). Twenty-two genotypes showed significantly higher values than the grand mean.

Yield and Yield-Attributing Characters

Weight of Mother Rhizomes per Plant

The weight of mother rhizomes per plant ranged from 37.62 to 116.67 g. Selam recorded the highest mother rhizome weight (116.67 g), whereas JTS-3 recorded the lowest (37.62 g). Twenty-three genotypes exhibited significantly higher values than the grand mean, indicating considerable variability for this yield-contributing trait.

Weight of Finger Rhizomes per Plant

The weight of finger rhizomes per plant varied widely, ranging from 164.93 to 441.52 g. Selam recorded the highest finger rhizome weight (441.52 g), while Shillong recorded the lowest (164.93 g). Nineteen genotypes performed significantly better than the grand mean. Since finger rhizomes contribute substantially to total yield, this trait plays a crucial role in the selection of superior genotypes.

Table 1: Mean values for germination parameters of 46 genotypes in turmeric

Treatments	Time taken for sprouting	2018-19	pooled	Time taken for 50% Germination	2018-19	pooled	Percentage of sprouting (%)	2018-19	pooled
	2017-18			2017-18			2017-18		
T ₁ -ACC-94	23.67	25.00	24.33	30.67	29.67	30.17	80.83	83.50	82.17
T ₂ -BDJR-1183	25.00	26.33	25.67	32.00	31.00	31.50	76.57	78.57	77.57
T ₃ -BDJR-1082	22.33	23.33	22.83	29.00	28.00	28.50	78.30	80.30	79.30
T ₄ -CASOMPET	24.67	25.67	25.17	31.00	30.00	30.50	84.67	86.67	85.67
T ₅ -CCA-304	22.33	23.33	22.83	30.00	29.00	29.50	85.00	87.00	86.00
T ₆ -CLI-24	23.33	24.33	23.83	29.67	28.67	29.17	87.33	89.33	88.33
T ₇ -CCA-301	21.33	22.33	21.83	29.33	28.33	28.83	90.33	92.33	91.33
T ₈ -CA-19/1	22.00	23.00	22.50	29.00	28.00	28.50	83.00	85.00	84.00
T ₉ -CLI-342	23.67	24.67	24.17	31.00	30.00	30.50	84.00	86.00	85.00
T ₁₀ -PCT-7	24.00	25.00	24.50	31.00	30.33	30.67	85.00	87.00	86.00
T ₁₁ -CLI-322	21.00	22.00	21.50	27.33	26.33	26.83	84.00	87.00	85.50
T ₁₂ -CLI-JYOTHI	20.33	21.33	20.83	27.00	26.33	26.67	90.00	92.33	91.17
T ₁₃ -ST-34	21.00	22.00	21.50	28.00	27.00	27.50	77.00	79.67	78.33
T ₁₄ -Daghi	18.33	19.33	18.83	25.33	24.33	24.83	81.00	83.00	82.00
T ₁₅ -GL-Puram	20.67	21.67	21.17	28.00	27.00	27.50	87.00	89.00	88.00
T ₁₆ -JTS-3	21.00	22.00	21.50	28.33	27.33	27.83	90.00	91.67	90.83
T ₁₇ -Kasturiaraku	18.67	19.67	19.17	25.67	25.00	25.33	81.83	83.83	82.83
T ₁₈ -CA-90	17.33	19.33	18.33	24.67	23.33	24.00	84.33	86.33	85.33
T ₁₉ -CO-1	21.00	22.00	21.50	27.67	26.67	27.17	87.17	89.17	88.17
T ₂₀ -Shillong	18.00	19.00	18.50	28.00	27.00	27.50	86.53	88.53	87.53
T ₂₁ -NDH-79	18.67	19.67	19.17	25.00	24.33	24.67	84.17	86.17	85.17
T ₂₂ -PTS-62	21.00	22.00	21.50	26.33	25.67	26.00	83.13	85.13	84.13
T ₂₃ -JTS-38	20.67	21.67	21.17	27.33	27.00	27.17	86.07	88.07	87.07
T ₂₄ -Jamairika	18.33	19.33	18.83	25.00	24.00	24.50	86.70	88.70	87.70
T ₂₅ -KTS-1	17.00	18.00	17.50	24.00	23.00	23.50	86.83	88.83	87.83
T ₂₆ -Lakadong	18.33	19.33	18.83	25.67	24.67	25.17	91.67	93.67	92.67
T ₂₇ -Kasturiavidi	20.67	21.67	21.17	27.33	26.33	26.83	87.67	89.67	88.67
T ₂₈ -Manipurlocal	18.33	19.33	18.83	24.67	23.67	24.17	88.50	90.50	89.50
T ₂₉ -NDH-4	17.67	18.67	18.17	25.00	24.00	24.50	79.97	81.97	80.97
T ₃₀ -Parbhani	16.33	17.33	16.83	23.33	22.33	22.83	81.83	86.17	84.00
T ₃₁ -Rajendrasonalika	15.67	16.67	16.17	26.33	25.33	25.83	79.33	81.33	80.33
T ₃₂ -RH-5	20.00	21.00	20.50	26.00	25.00	25.50	83.50	85.50	84.50
T ₃₃ -SB-1084	20.33	21.33	20.83	27.00	26.00	26.50	82.07	84.07	83.07

T ₃₄ -Sonajuli	18.67	19.67	19.17	26.33	25.33	25.83	87.00	89.00	88.00
T ₃₅ -Waigon	17.00	18.00	17.50	25.00	24.00	24.50	80.17	82.17	81.17
T ₃₆ -Tekurpet	15.67	16.67	16.17	23.33	22.33	22.83	88.73	90.73	89.73
T ₃₇ -SLP-389/1	17.33	18.33	17.83	25.00	24.00	24.50	79.67	81.67	80.67
T ₃₈ -Nagalandlocal	18.67	19.67	19.17	25.67	24.67	25.17	88.97	90.97	89.97
T ₃₉ -Nizamabadlocal	21.00	22.00	21.50	28.00	27.00	27.50	91.67	93.67	92.67
T ₄₀ -PTS-43	20.33	21.33	20.83	27.33	26.33	26.83	92.33	94.33	93.33
T ₄₁ -NO.94-02	18.33	19.33	18.83	25.33	24.33	24.83	77.67	79.67	78.67
T ₄₂ -Roma	16.33	17.33	16.83	23.33	22.33	22.83	78.50	80.50	79.50
T ₄₃ -LTS-2	15.67	16.67	16.17	23.33	22.33	22.83	80.87	82.87	81.87
T ₄₄ -KTS-8	17.33	18.33	17.83	24.33	23.33	23.83	85.00	87.00	86.00
T ₄₅ -CT-1	18.67	19.67	19.17	25.67	24.67	25.17	85.50	87.50	86.50
T ₄₆ -Selam	19.00	21.00	20.00	26.00	26.00	26.00	93.50	96.00	94.75
Mean	19.71	20.77	20.24	26.83	25.90	26.37	84.67	86.78	85.73
CD(5%)	1.090	1.220	0.305	1.370	1.410	0.301	4.650	4.700	0.577
Sem±	0.390	0.440	0.107	0.490	0.500	0.105	1.650	1.670	0.202

Table 2: Mean values for vegetative parameters of 46 genotypes in turmeric

Treatments	Pseudo stem habit	2018-19	Plant height (cm)	2018-19	pooled	Number of tillers	2018-19	Pooled
	2017-18		2017-18			2017-18		
T ₁ -ACC-94	compact	compact	138.00	147.70	142.85	2.33	3.67	3.00
T ₂ -BDJR-1183	compact	compact	130.60	140.27	135.43	1.33	2.33	1.83
T ₃ -BDJR-1082	open	open	141.63	151.30	146.47	1.33	2.67	2.00
T ₄ -CA SOMPET	open	open	140.97	150.63	145.80	1.33	2.67	2.00
T ₅ -CCA-304	compact	compact	138.77	148.43	143.60	1.67	3.33	2.50
T ₆ -CLI-24	open	open	142.93	152.60	147.77	1.67	2.67	2.17
T ₇ -CCA-301	open	open	127.07	136.73	131.90	1.67	2.67	2.17
T ₈ -CA-19/1	open	open	137.30	146.97	142.13	1.67	2.67	2.17
T ₉ -CLI-342	compact	compact	143.60	153.27	148.43	1.67	2.67	2.17
T ₁₀ -PCT-7	open	open	143.43	153.10	148.27	1.33	2.33	1.83
T ₁₁ -CLI-322	open	open	127.17	136.40	131.78	1.67	2.67	2.17
T ₁₂ -CLI-JYOTHI	open	open	142.33	152.27	147.30	1.67	2.67	2.17
T ₁₃ -ST-34	open	open	139.30	149.23	144.27	1.67	2.67	2.17
T ₁₄ -Daghi	compact	compact	137.80	147.47	142.63	1.67	2.67	2.17
T ₁₅ -GL-Puram	open	open	128.03	137.70	132.87	1.67	2.67	2.17
T ₁₆ -JTS-3	compact	compact	144.20	153.87	149.03	1.67	2.67	2.17
T ₁₇ -Kasturiaraku	open	open	127.33	137.00	132.17	1.33	2.33	1.83
T ₁₈ -CA-90	open	open	124.70	134.37	129.53	1.67	2.67	2.17
T ₁₉ -CO-1	open	open	112.33	122.00	117.17	1.67	2.67	2.17
T ₂₀ -Shillong	open	open	141.37	151.03	146.20	1.67	2.67	2.17
T ₂₁ -NDH-79	compact	compact	136.77	146.43	141.60	1.67	2.67	2.17
T ₂₂ -PTS-62	compact	compact	148.47	158.13	153.30	1.33	2.33	1.83
T ₂₃ -JTS-38	open	open	138.87	148.53	143.70	1.33	2.33	1.83
T ₂₄ -Jamairika	open	open	128.97	138.63	133.80	1.67	2.67	2.17
T ₂₅ -KTS-1	open	open	126.60	136.27	131.43	1.67	2.67	2.17
T ₂₆ -Lakadong	open	open	142.50	152.17	147.33	2.67	3.67	3.17
T ₂₇ -Kasturiavidi	open	open	155.13	164.80	159.97	2.00	3.00	2.50
T ₂₈ -Manipur local	compact	compact	153.40	163.07	158.23	1.67	2.67	2.17
T ₂₉ -NDH-4	compact	compact	136.60	146.27	141.43	1.67	2.67	2.17
T ₃₀ -Parbhani	open	open	126.20	135.87	131.03	1.33	2.33	1.83
T ₃₁ -Rajendrasonalika	open	open	143.97	153.63	148.80	1.67	2.67	2.17
T ₃₂ -RH-5	open	open	128.50	138.17	133.33	1.67	2.67	2.17
T ₃₃ -SB-1084	open	open	130.10	139.77	134.93	1.67	2.67	2.17
T ₃₄ -Sonajuli	compact	compact	127.03	136.70	131.87	1.33	2.33	1.83
T ₃₅ -Waigon	compact	compact	127.93	137.60	132.77	1.33	2.33	1.83
T ₃₆ -Tekurpet	open	open	143.87	153.53	148.70	1.67	2.67	2.17
T ₃₇ -SLP-389/1	open	open	138.53	148.20	143.37	1.67	2.67	2.17
T ₃₈ -Nagaland local	open	open	129.17	138.83	134.00	1.67	2.67	2.17
T ₃₉ -Nizamabad local	open	open	126.30	135.97	131.13	1.67	2.67	2.17
T ₄₀ -PTS-43	open	open	153.30	162.97	158.13	1.67	2.67	2.17
T ₄₁ -NO.94-02	compact	compact	143.53	153.20	148.37	1.67	2.67	2.17
T ₄₂ -Roma	compact	compact	126.17	135.83	131.00	1.67	2.67	2.17
T ₄₃ -LTS-2	open	open	136.77	146.70	141.73	1.67	2.67	2.17
T ₄₄ -KTS-8	open	open	126.53	136.37	131.45	1.67	2.67	2.17
T ₄₅ -CT-1	open	open	127.07	137.10	132.08	1.67	2.67	2.17
T ₄₆ -Selam	compact	compact	158.93	168.73	163.83	3.33	4.33	3.83
Mean			136.310	146.000	141.150	1.670	2.710	2.190
CD(5%)			4.280	4.310		0.550	0.690	0.181
Sem±			1.520	1.530		0.200	0.250	0.063

Table 3: Mean values for vegetative parameters of 46 genotypes in turmeric

Treatments	Number of leaves on main shoot	2018-19	pooled	Leaf disposition	2018-19	Leaf petiole length	2018-19	Pooled
	2017-18			2017-18		2017-18		
T ₁ -ACC-94	10.33	12.67	11.50	Erect	Erect	6.67	7.40	7.03
T ₂ -BDJR-1183	9.33	11.67	10.50	Semi erect	Semi erect	6.50	7.23	6.87
T ₃ -BDJR-1082	11.67	14.00	12.83	Erect	Erect	6.30	7.03	6.67
T ₄ -CA SOMPET	7.67	10.33	9.00	Erect	Erect	6.30	7.03	6.67
T ₅ -CCA-304	11.33	13.67	12.50	Erect	Erect	7.03	7.77	7.40
T ₆ -CLI-24	14.00	16.33	15.17	Erect	Erect	6.47	7.20	6.83
T ₇ -CCA-301	6.67	9.00	7.83	Semi erect	Semi erect	5.53	6.27	5.90
T ₈ -CA-19/1	10.67	13.00	11.83	Semi erect	Semi erect	7.53	8.27	7.90
T ₉ -CLI-342	11.67	14.00	12.83	Erect	Erect	7.33	8.07	7.70
T ₁₀ -PCT-7	11.67	14.00	12.83	Erect	Erect	6.93	7.67	7.30
T ₁₁ -CLI-322	9.33	11.67	10.50	Erect	Erect	7.50	8.23	7.87
T ₁₂ -CLI-JYOTHI	9.67	12.00	10.83	Erect	Erect	6.87	7.60	7.23
T ₁₃ -ST-34	11.67	14.00	12.83	Erect	Erect	7.23	7.97	7.60
T ₁₄ -Daghi	9.67	12.00	10.83	Semi erect	Semi erect	6.37	7.10	6.73
T ₁₅ -GL-Puram	11.67	14.00	12.83	Erect	Erect	7.23	7.97	7.60
T ₁₆ -JTS-3	11.67	14.00	12.83	Erect	Erect	7.63	8.37	8.00
T ₁₇ -Kasturiaraku	11.67	14.33	13.00	Semi erect	Semi erect	6.70	7.43	7.07
T ₁₈ -CA-90	10.67	13.00	11.83	Erect	Erect	6.23	6.97	6.60
T ₁₉ -CO-1	11.00	13.33	12.17	Erect	Erect	6.50	7.23	6.87
T ₂₀ -Shillong	9.67	12.00	10.83	Semi erect	Semi erect	6.50	7.23	6.87
T ₂₁ -NDH-79	9.67	12.00	10.83	Semi erect	Semi erect	7.13	7.87	7.50
T ₂₂ -PTS-62	8.67	11.00	9.83	Semi erect	Semi erect	6.20	6.93	6.57
T ₂₃ -JTS-38	7.33	9.67	8.50	Semi erect	Semi erect	6.30	7.03	6.67
T ₂₄ -Jamairika	9.33	11.67	10.50	Semi erect	Semi erect	6.20	6.93	6.57
T ₂₅ -KTS-1	12.67	15.00	13.83	Erect	Erect	6.70	7.43	7.07
T ₂₆ -Lakadong	11.67	14.00	12.83	Semi erect	Semi erect	7.67	8.40	8.03
T ₂₇ -Kasturiavidi	16.00	18.33	17.17	Semi erect	Semi erect	8.03	8.77	8.40
T ₂₈ -Manipur local	12.67	15.00	13.83	Erect	Erect	6.87	7.60	7.23
T ₂₉ -NDH-4	12.67	15.33	14.00	Erect	Erect	7.50	8.23	7.87
T ₃₀ -Parbhani	9.00	11.33	10.17	Semi erect	Semi erect	5.47	6.20	5.83
T ₃₁ -Rajendrasonalika	9.00	11.33	10.17	Erect	Erect	7.07	7.80	7.43
T ₃₂ -RH-5	9.00	11.33	10.17	Semi erect	Semi erect	5.97	6.70	6.33
T ₃₃ -SB-1084	9.00	11.33	10.17	Erect	Erect	6.53	7.27	6.90
T ₃₄ -Sonajuli	7.33	10.33	8.83	Erect	Erect	7.07	7.80	7.43
T ₃₅ -Waigon	7.33	9.67	8.50	Semi erect	Semi erect	6.33	7.07	6.70
T ₃₆ -Tekurpet	7.33	10.00	8.67	Semi erect	Semi erect	7.13	7.87	7.50
T ₃₇ -SLP-389/1	7.67	10.33	9.00	Semi erect	Semi erect	6.30	7.03	6.67
T ₃₈ -Nagaland local	8.67	11.00	9.83	Erect	Erect	6.47	7.20	6.83
T ₃₉ -Nizamabad local	10.67	13.00	11.83	Semi erect	Semi erect	5.80	6.53	6.17
T ₄₀ -PTS-43	9.67	12.00	10.83	Erect	Erect	7.27	8.00	7.63
T ₄₁ -NO.94-02	13.33	15.67	14.50	Erect	Erect	7.20	7.93	7.57
T ₄₂ -Roma	11.33	14.00	12.67	Semi erect	Semi erect	6.07	6.80	6.43
T ₄₃ -LTS-2	11.33	13.67	12.50	Semi erect	Semi erect	6.93	7.67	7.30
T ₄₄ -KTS-8	8.67	11.00	9.83	Semi erect	Semi erect	7.47	8.20	7.83
T ₄₅ -CT-1	9.00	11.67	10.33	Semi erect	Semi erect	7.20	7.93	7.57
T ₄₆ -Selam	12.67	15.67	14.17	Erect	Erect	7.13	7.87	7.50
Mean	10.290	12.700	11.500			6.770	7.500	7.140
CD(5%)	1.040	1.220	0.251			0.500	0.500	0.010
Sem±	0.370	0.440	0.088			0.180	0.180	0.003

Table 4: Mean values for vegetative parameters of 46 genotypes in turmeric

Treatments	Leaf lamina length(cm) 2017-18	2018-19	pooled	Leaf lamina width(cm) 2017-18	2018-19	pooled
T ₁ -ACC-94	46.23	48.57	47.40	14.80	16.63	15.72
T ₂ -BDJR-1183	48.07	50.40	49.23	12.80	14.63	13.72
T ₃ -BDJR-1082	44.43	46.77	45.60	13.57	15.40	14.48
T ₄ -CA SOMPET	39.07	41.40	40.23	14.13	15.97	15.05
T ₅ -CCA-304	41.97	44.30	43.13	14.43	16.27	15.35
T ₆ -CLI-24	45.60	47.93	46.77	15.37	17.20	16.28
T ₇ -CCA-301	43.00	45.33	44.17	14.73	16.57	15.65
T ₈ -CA-19/1	51.33	53.67	52.50	14.20	16.03	15.12
T ₉ -CLI-342	46.53	48.87	47.70	14.17	16.00	15.08
T ₁₀ -PCT-7	43.73	46.07	44.90	13.93	15.77	14.85
T ₁₁ -CLI-322	46.37	48.70	47.53	14.10	15.93	15.02
T ₁₂ -CLI-JYOTHI	45.47	47.80	46.63	13.87	15.70	14.78

T ₁₃ -ST-34	45.63	47.97	46.80	14.30	16.13	15.22
T ₁₄ -Daghi	47.17	49.50	48.33	13.30	15.13	14.22
T ₁₅ -GL-Puram	40.40	42.73	41.57	13.67	15.50	14.58
T ₁₆ -JTS-3	43.53	45.87	44.70	14.30	16.13	15.22
T ₁₇ -Kasturiaraku	46.83	49.17	48.00	15.10	16.93	16.02
T ₁₈ -CA-90	49.53	51.87	50.70	13.23	15.07	14.15
T ₁₉ -CO-1	48.50	50.83	49.67	14.00	15.83	14.92
T ₂₀ -Shillong	43.83	46.17	45.00	13.00	14.83	13.92
T ₂₁ -NDH-79	40.77	43.10	41.93	14.20	16.03	15.12
T ₂₂ -PTS-62	44.40	46.73	45.57	15.10	16.93	16.02
T ₂₃ -JTS-38	39.20	41.83	40.52	14.70	16.53	15.62
T ₂₄ -Jamairika	43.63	46.30	44.97	13.77	15.60	14.68
T ₂₅ -KTS-1	45.20	47.53	46.37	14.07	15.90	14.98
T ₂₆ -Lakadong	48.27	50.60	49.43	14.57	16.40	15.48
T ₂₇ -Kasturiavidi	49.73	52.07	50.90	14.50	16.33	15.42
T ₂₈ -Manipur local	46.93	49.27	48.10	13.87	15.70	14.78
T ₂₉ -NDH-4	37.50	39.83	38.67	14.00	15.83	14.92
T ₃₀ -Parbhani	38.17	40.50	39.33	14.77	16.60	15.68
T ₃₁ -Rajendrasonalika	41.50	43.83	42.67	13.10	14.93	14.02
T ₃₂ -RH-5	45.53	47.87	46.70	14.23	16.11	15.17
T ₃₃ -SB-1084	45.53	47.87	46.70	13.80	15.63	14.72
T ₃₄ -Sonajuli	42.67	45.00	43.83	14.00	15.83	14.92
T ₃₅ -Waigon	44.17	46.50	45.33	13.40	15.23	14.32
T ₃₆ -Tekurpet	44.23	46.57	45.40	12.83	14.67	13.75
T ₃₇ -SLP-389/1	43.47	45.80	44.63	13.20	15.03	14.12
T ₃₈ -Nagaland local	46.87	49.20	48.03	14.23	16.07	15.15
T ₃₉ -Nizamabad local	46.20	48.53	47.37	13.97	15.80	14.88
T ₄₀ -PTS-43	44.17	46.50	45.33	12.93	14.77	13.85
T ₄₁ -NO.94-02	44.90	47.23	46.07	13.67	15.57	14.62
T ₄₂ -Roma	40.63	42.97	41.80	13.90	15.73	14.82
T ₄₃ -LTS-2	43.53	45.87	44.70	13.27	15.10	14.18
T ₄₄ -KTS-8	44.87	47.20	46.03	13.87	15.80	14.83
T ₄₅ -CT-1	47.10	49.43	48.27	14.23	16.07	15.15
T ₄₆ -Selam	50.90	53.90	52.40	15.70	17.63	16.67
Mean	44.720	47.090	45.900	14.020	15.860	14.940
CD(5%)	2.760	2.830	0.173	0.670	0.670	0.036
Sem±	0.980	1.010	0.060	0.240	0.240	0.013

Table 5: Mean values for yield and yield attributing parameters of 46 genotypes in turmeric

Treatments	Weight of mother rhizomes(g)	2017-18	2018-19	Weight of finger rhizomes(g)	2017-18	2018-19
	pooled			pooled		
T ₁ -ACC-94	26.13	76.80	87.97	82.38	404.77	408.50
T ₂ -BDJR-1183	24.07	66.67	77.83	72.25	394.60	398.33
T ₃ -BDJR-1082	24.33	67.80	78.97	73.38	402.57	406.30
T ₄ -CA SOMPET	24.90	56.70	67.87	62.28	404.33	408.07
T ₅ -CCA-304	24.43	40.47	51.63	46.05	423.03	426.77
T ₆ -CLI-24	24.20	62.77	73.93	68.35	408.03	411.77
T ₇ -CCA-301	23.40	54.60	65.77	60.18	394.13	397.87
T ₈ -CA-19/1	24.47	73.63	84.80	79.22	358.53	362.27
T ₉ -CLI-342	24.20	45.37	56.53	50.95	216.80	220.53
T ₁₀ -PCT-7	23.63	34.93	46.10	40.52	235.57	239.30
T ₁₁ -CLI-322	21.37	54.63	65.80	60.22	225.87	229.60
T ₁₂ -CLI-JYOTHI	21.33	50.30	61.47	55.88	260.80	264.53
T ₁₃ -ST-34	23.53	57.83	69.00	63.42	216.03	219.77
T ₁₄ -Daghi	23.57	66.40	77.57	71.98	205.77	209.50
T ₁₅ -GL-Puram	23.60	64.00	75.17	69.58	198.13	201.87
T ₁₆ -JTS-3	19.70	32.03	43.20	37.62	211.90	215.63
T ₁₇ -Kasturiaraku	24.53	72.83	84.00	78.42	302.73	306.47
T ₁₈ -CA-90	23.53	49.27	60.43	54.85	259.63	263.37
T ₁₉ -CO-1	20.50	57.77	68.93	63.35	229.37	233.10
T ₂₀ -Shillong	21.50	75.87	87.03	81.45	163.07	166.80
T ₂₁ -NDH-79	23.33	57.33	68.50	62.92	351.47	355.20
T ₂₂ -PTS-62	24.50	73.87	85.03	79.45	288.50	292.23
T ₂₃ -JTS-38	20.40	58.23	69.40	63.82	188.90	192.63
T ₂₄ -Jamairika	23.33	48.63	59.80	54.22	276.83	280.57
T ₂₅ -KTS-1	22.03	70.40	81.57	75.98	193.40	197.13
T ₂₆ -Lakadong	82.90	94.07	88.48	412.60	416.33	414.47

T ₂₇ -Kasturiavidi	62.93	74.10	68.52	232.73	236.47	234.60
T ₂₈ -Manipur local	60.70	71.87	66.28	236.50	240.23	238.37
T ₂₉ -NDH-4	60.70	71.87	66.28	244.93	248.67	246.80
T ₃₀ -Parbhani	73.27	84.43	78.85	235.50	239.23	237.37
T ₃₁ -Rajendrasonalika	51.03	62.20	56.62	227.73	231.47	229.60
T ₃₂ -RH-5	64.27	75.43	69.85	331.27	335.00	333.13
T ₃₃ -SB-1084	47.77	58.93	53.35	241.20	244.93	243.07
T ₃₄ -Sonajuli	55.20	66.37	60.78	266.83	270.57	268.70
T ₃₅ -Waigon	62.77	73.93	68.35	259.33	263.07	261.20
T ₃₆ -Tekurpet	80.57	91.73	86.15	385.10	388.83	386.97
T ₃₇ -SLP-389/1	51.57	62.73	57.15	268.87	272.60	270.73
T ₃₈ -Nagaland local	73.23	84.40	78.82	212.37	216.10	214.23
T ₃₉ -Nizamabad local	60.67	71.83	66.25	244.77	248.50	246.63
T ₄₀ -PTS-43	74.83	86.00	80.42	292.40	296.13	294.27
T ₄₁ -NO.94-02	69.23	80.40	74.82	193.10	196.83	194.97
T ₄₂ -Roma	78.43	89.60	84.02	332.03	335.77	333.90
T ₄₃ -LTS-2	64.30	75.47	69.88	224.50	228.23	226.37
T ₄₄ -KTS-8	58.57	69.73	64.15	416.10	419.83	417.97
T ₄₅ -CT-1	58.57	69.73	64.15	290.10	293.83	291.97
T ₄₆ -Selam	110.47	122.87	116.67	440.27	442.77	441.52
Mean	62.420	73.610	68.010	287.020	290.730	288.880
CD(5%)	4.560	4.650	0.272	20.320	20.250	
Sem±	1.620	1.650	0.095	7.230	7.210	

Table 6: Mean values for quality parameters of 46 genotypes in turmeric

Treatments	Curcumin content (%)			Curing percentage(%)			Antioxidants (%)		
	2017-18	2018-19	pooled	2017-18	2018-19	pooled	2017-18	2018-19	pooled
T ₁ -ACC-94	1.47	1.47	1.47	20.41	20.00	20.20	4.47	3.60	4.03
T ₂ -BDJR-1183	1.48	1.47	1.47	18.47	18.70	18.58	0.48	0.47	0.47
T ₃ -BDJR-1082	1.83	1.77	1.80	19.07	19.00	19.04	0.83	0.77	0.80
T ₄ -CA SOMPET	3.04	2.97	3.01	14.93	14.90	14.91	2.04	1.97	2.01
T ₅ -CCA-304	2.55	2.77	2.66	13.72	13.70	13.71	1.55	1.77	1.66
T ₆ -CLI-24	2.78	2.47	2.63	12.73	12.70	12.72	1.78	1.47	1.63
T ₇ -CCA-301	3.18	3.17	3.18	14.92	14.90	14.91	2.18	2.17	2.18
T ₈ -CA-19/1	3.38	3.37	3.37	15.58	15.70	15.64	2.38	2.37	2.37
T ₉ -CLI-342	3.07	3.07	3.07	14.68	14.70	14.69	2.07	2.07	2.07
T ₁₀ -PCT-7	3.47	3.47	3.47	13.79	13.80	13.80	2.47	2.47	2.47
T ₁₁ -CLI-322	3.62	3.77	3.69	15.17	15.10	15.14	2.62	2.77	2.69
T ₁₂ -CLI-JYOTHI	2.77	2.77	2.77	13.82	13.80	13.81	1.77	1.77	1.77
T ₁₃ -ST-34	3.63	3.87	3.75	12.10	12.00	12.05	2.63	2.87	2.75
T ₁₄ -Daghi	3.07	3.07	3.07	16.69	16.80	16.75	2.07	2.07	2.07
T ₁₅ -GL-Puram	3.16	3.17	3.16	15.98	15.80	15.89	2.16	2.17	2.16
T ₁₆ -JTS-3	3.37	3.37	3.37	14.10	14.00	14.05	2.37	2.37	2.37
T ₁₇ -Kasturiaraku	4.73	4.62	4.67	15.79	15.80	15.80	3.73	3.62	3.67
T ₁₈ -CA-90	3.67	3.67	3.67	14.58	14.70	14.64	2.67	2.67	2.67
T ₁₉ -CO-1	3.47	3.47	3.47	15.65	15.70	15.68	2.47	2.47	2.47
T ₂₀ -Shillong	3.22	3.17	3.19	14.19	14.00	14.09	2.22	2.17	2.19
T ₂₁ -NDH-79	5.58	5.57	5.57	17.52	17.50	17.51	4.58	4.57	4.57
T ₂₂ -PTS-62	4.37	4.47	4.42	15.18	15.10	15.14	3.37	3.47	3.42
T ₂₃ -JTS-38	2.98	2.97	2.97	15.78	15.80	15.79	1.98	1.97	1.97
T ₂₄ -Jamairika	2.70	2.77	2.73	14.49	14.40	14.44	1.70	1.77	1.73
T ₂₅ -KTS-1	2.68	2.67	2.67	14.59	14.70	14.64	1.68	1.67	1.67
T ₂₆ -Lakadong	5.48	5.47	5.47	17.42	17.30	17.36	4.48	4.47	4.47
T ₂₇ -Kasturiavidi	5.18	5.17	5.17	17.41	17.40	17.41	4.18	4.17	4.17
T ₂₈ -Manipur local	2.29	2.37	2.33	17.76	17.80	17.78	1.29	1.37	1.33
T ₂₉ -NDH-4	4.40	4.47	4.44	14.30	14.10	14.20	3.40	3.47	3.44
T ₃₀ -Parbhani	2.71	2.67	2.69	16.38	16.40	16.39	1.71	1.67	1.69
T ₃₁ -Rajendrasonalika	4.33	4.47	4.40	14.67	14.70	14.68	3.33	3.47	3.40
T ₃₂ -RH-5	3.82	3.87	3.84	15.72	15.80	15.76	2.82	2.87	2.84
T ₃₃ -SB-1084	3.19	3.17	3.18	13.80	13.80	13.80	2.19	2.17	2.18
T ₃₄ -Sonajuli	3.40	3.47	3.43	14.64	14.80	14.72	2.40	2.47	2.43
T ₃₅ -Waigon	3.85	3.87	3.86	13.75	13.80	13.77	2.85	2.87	2.86
T ₃₆ -Tekurpet	3.98	3.97	3.97	18.64	18.80	18.72	2.98	2.97	2.97
T ₃₇ -SLP-389/1	3.18	3.17	3.17	13.79	13.80	13.80	2.18	2.17	2.17
T ₃₈ -Nagaland local	2.62	2.77	2.69	14.69	14.70	14.70	1.62	1.77	1.69
T ₃₉ -Nizamabad local	2.55	2.67	2.61	13.11	13.00	13.06	1.55	1.67	1.61
T ₄₀ -PTS-43	4.60	4.57	4.58	14.15	14.10	14.13	3.60	3.57	3.58

T ₄₁ -NO.94-02	2.83	2.77	2.80	14.79	14.80	14.80	1.83	1.77	1.80
T ₄₂ -Roma	5.48	5.47	5.47	17.27	17.30	17.29	4.48	4.47	4.47
T ₄₃ -LTS-2	4.45	4.47	4.46	13.69	13.70	13.70	3.45	3.47	3.46
T ₄₄ -KTS-8	3.48	3.47	3.48	14.78	14.80	14.79	2.48	2.47	2.48
T ₄₅ -CT-1	3.15	3.17	3.16	13.62	13.80	13.71	2.15	2.17	2.16
T ₄₆ -Selam	6.49	5.07	5.78	19.38	19.30	19.34	5.49	4.07	4.78
Mean	3.580	3.540	3.562	15.380	15.380	15.381	2.58	2.54	2.56
CD(5%)	0.260	0.170	0.373	0.310	0.040	0.164	0.16	0.15	0.27
Sem±	0.090	0.060	0.130	0.110	0.014	0.057	0.05	0.03	0.09

Conclusion

The present investigation revealed substantial variability among the turmeric genotypes for germination, growth, and rhizome yield traits under the agro-climatic conditions of Telangana. Among the evaluated genotypes, Selam, Tekurpet, ACC-94, and Kasturi Avidi exhibited superior performance in terms of early sprouting, vigorous vegetative growth, and enhanced rhizome yield attributes. These genotypes were identified as promising and genetically diverse lines and can be effectively utilized as potential parental material in future breeding programmes aimed at improving yield, adaptability, and overall performance of turmeric.

Acknowledgement

The author expresses sincere gratitude to the Turmeric Research Station, Kammarapally, for providing the germplasm and necessary facilities to carry out the present study. The author also gratefully acknowledges Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, for extending financial support and providing the opportunity to undertake this research work.

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