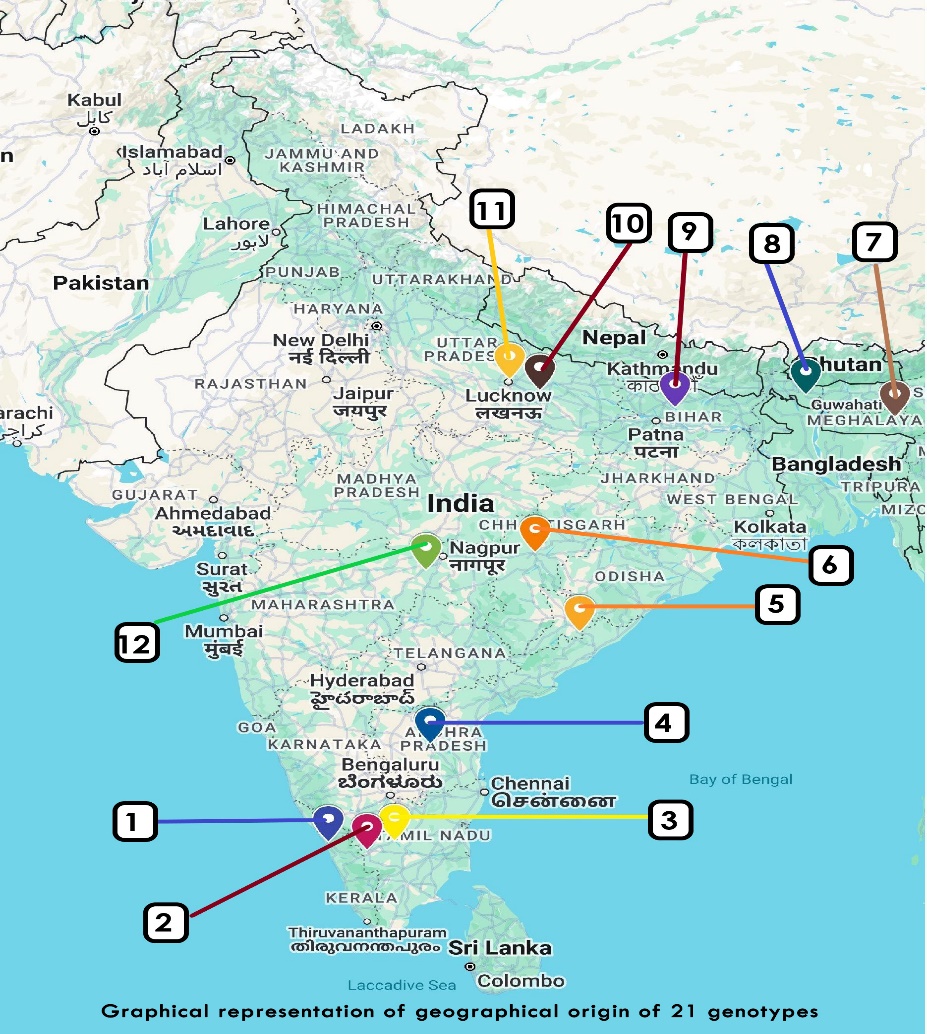
Table S1. List of turmeric genotypes used in the study.

|  |  |  |  |
| --- | --- | --- | --- |
| Genotype | Code | Characteristic features | Geographical origin of the genotype |
| IISR Pragati | G1 | Short duration (180-200 days), high curcumin (5-6%) stable genotype, short plant stature, tolerant to nematode and leaf diseases | ICAR-IISR, Kozhikode, Kerala |
| IISR Prathiba | G2 | Medium duration (220-240 days), plants tall and vigorous, high curcumin (5-6%), seedling progeny | ICAR-IISR, Kozhikode, Kerala |
| IISR Alleppey Supreme | G3 | Medium duration (220-240 days), plants tall and vigorous, high curcumin (5-6%), selection from Alleppey Finger Turmeric | ICAR-IISR, Kozhikode, Kerala |
| Rajendra Sonali | G4 | Short duration (180-200 days), high curcumin (5%) genotype, short plant stature, low dry recovery | Dr. Rajendra prasad Central Agricultural University, Pusa, Samastipur, Bihar. |
| Megha Turmeric 1 | G5 | High curcumin (6%) type, selection from Lakadong turmeric | ICAR Research Complex for NEH Region, Barapani, Meghalaya (Umiam) |
| Waigon Turmeric | G6 | Long and bold fingers, vigorous plants, selection from Waigon turmeric | Local cultivar, Maharashtra |
| Roma | G7 | Long duration (240 days), vigorous plants, low curcumin (3-4%), long and bold fingers, high dry recovery (20%) | Orissa High Altitude Research Station, Pottangi, Orissa. |
| CIM Pitambar | G8 | Short duration (180-200 days), high curcumin (5%) genotype | Council for scientific and industrial research-Central institute of medicinal and aromatic crops, Lucknow |
| Uttar Rangini | G9 | Tolerance to leaf spot and leaf blotch disease, high dry recovery | Uttara Banga Krishi Vishwavidyalaya, Pundibari, West Bengal |
| Chhattisgarh Haldi 2 | G10 | Tall, non-lodging and input responsive, low curcumin (3-4%). | Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh |
| NDH 8 | G11 | Salinity tolerant, long duration (240 days), vigorous plants, low curcumin (3%), high dry recovery (20%) | Narendra Dev University of Agriculture & Technology, Kumarganj, UP. |
| Co 3 | G12 | Tolerant to leaf spot and leaf blotch | Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu |
| Acc. 1545 | G13 | Long duration (240 days), vigorous plants, low curcumin (3%), long and bold fingers, high dry recovery (20%) | ICAR-IISR, Kozhikode, Kerala |
| Erode Local | G14 | Seedling progeny of Erode Turmeric, high curcumin (5%), high dry recovery (22-24%), dried rhizomes have good storage quality | Local cultivar selection at Erode region of Tamilnadu by ICAR-IISR, Kozhikode, Kerala |
| Mydukur Local | G15 | Long duration (240 days), vigorous plants, low curcumin, long and bold fingers, high dry recovery (20%) | Local cultivar selection at Mydukur region of Andhra Pradesh by ICAR-IISR, Kozhikode, Kerala |
| Acc. 849 | G16 | Extra-long duration (240 -260 days), bright yellow colour powder with characteristic aroma, low curcumin (1-2%), | ICAR-IISR, Kozhikode, Kerala |
| Acc. 379 | G17 | Medium duration, long and bold finger genotype | ICAR-IISR, Kozhikode, Kerala |
| Acc. 14 | G18 | Bright yellow colour, long and bold finger genotype | ICAR-IISR, Kozhikode, Kerala |
| Acc.179 | G19 | Long and bold finger genotype | ICAR-IISR, Kozhikode, Kerala |
| Acc. 214 | G20 | Long and bold finger genotype, high dry recovery | ICAR-IISR, Kozhikode, Kerala |
| Acc.69/5/22/I3 | G21 | Seedling progeny, bright yellow colour, short statured genotype, slender rhizomes | ICAR-IISR, Kozhikode, Kerala |

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**Figure S1- Graphical representation of geographical origin of 21 genotypes**

1. ICAR-Indian Institute of Spices Research, Kozhikode, Kerala-

IISR Pragati, IISR Prathiba, IISR Alleppey Supreme, Acc.1545, Acc. 849, Acc. 379, Acc. 14, Acc. 179, Acc. 214 and Acc. 69/5/22/I3

2. Tamilnadu Agricultural University, Coimbatore, Tamilnadu-

CO 3

3. Local cultivar selection at Erode region of Tamilnadu by ICAR-IISR, Kozhikode, Kerala-Erode Local

4. Local cultivar selection at Mydukur region of Andhra Pradesh by ICAR-IISR, Kozhikode, Kerala- Mydukur Local.

5. Orissa High Altitude Research Station, Pottangi, Orissa- Roma.

6. Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh-Chhattisgarh Haldi 2

7. ICAR Research Complex for NEH Region, Barapani, Meghalaya (Umiam)-Megha Turmeric 1

8. Uttara Banga Krishi Vishwavidyalaya, Pundibari, West Bengal-Uttar Rangini

9. Dr. Rajendra prasad Central Agricultural University, Pusa, Samastipur, Bihar- Rajendra Sonali

10. Aacharya Narendra Dev University of Agriculture & Technology, Kumarganj, UP- NDH 8.

11. Council for scientific and industrial research-Central institute of medicinal and aromatic crops, Lucknow- CIM Pitambar.

12. Local cultivar selection at Waigon region of Maharashtra by ICAR-IISR, Kozhikode, Kerala-Waigon Turmeric

Table S2. Mean performances of 21 genotypes for colour characteristics under three contrasting production environments

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Genotype | L\* | | | | | | A\* | | | | | | |
| L­­1 | | L2 | | L3 | | L­­1 | | L2 | | L3 | |
| E1 | E2 | E3 | E4 | E5 | E6 | E1 | E2 | E3 | E4 | E5 | E6 |
| G1 | 50.33i | 41.07n | 53.23k | 45.11j | 50.60hi | 44.29f | 20.69c | 17.56b | 24.52a | 20.52b | 22.90defg | 21.81f |
| G2 | 53.93d | 46.15g | 56.81e | 47.43d | 55.71b | 45.50de | 19.66e | 17.10d | 23.36b | 19.60d | 25.27abc | 22.10d |
| G3 | 53.23e | 45.85h | 58.55c | 47.69c | 54.85d | 47.46bc | 19.71e | 16.03h | 20.87fg | 19.03g | 25.27abc | 24.39a |
| G4 | 52.14g | 43.74k | 53.72j | 44.69k | 50.55hi | 44.13fg | 20.74c | 16.55f | 22.60c | 20.72a | 23.50cdef | 21.26i |
| G5 | 46.02l | 41.53m | 45.86p | 37.75r | 45.85n | 38.93k | 19.10f | 15.66j | 22.21d | 18.60k | 25.59ab | 19.94r |
| G6 | 48.18k | 41.13n | 53.92i | 43.20n | 50.39ij | 43.17h | 18.01i | 16.61e | 23.30b | 18.79i | 26.07a | 23.41b |
| G7 | 54.61c | 47.12d | 56.83e | 43.55m | 53.78f | 47.03c | 17.69j | 15.86i | 22.13d | 17.47o | 25.42ab | 21.99e |
| G8 | 51.59h | 46.32f | 54.59h | 43.50m | 52.44g | 47.04c | 22.01b | 14.85n | 24.20a | 19.10f | 24.32abcd | 20.94j |
| G9 | 49.01j | 45.41i | 47.17o | 41.59q | 48.79l | 42.56i | 14.68m | 15.08m | 18.95i | 16.94p | 21.35gh | 19.92r |
| G10 | 52.37fg | 45.36i | 52.32m | 45.96h | 50.27j | 43.74g | 15.84l | 14.58o | 20.22h | 17.84m | 21.85fgh | 19.98q |
| G11 | 52.54f | 42.58l | 52.78l | 46.22g | 50.74h | 44.38f | 19.92d | 17.22c | 21.29e | 20.31c | 24.24abcd | 21.29h |
| G12 | 49.16j | 44.54j | 54.51h | 44.11l | 53.86f | 47.51b | 18.56g | 15.55l | 23.23b | 18.25l | 22.93defg | 20.13p |
| G13 | 53.83d | 46.70e | 59.08b | 45.54i | 55.73b | 48.58a | 18.96f | 15.61k | 23.39b | 17.56n | 26.05a | 23.14c |
| G14 | 51.63h | 45.91h | 52.71l | 43.07o | 50.43ij | 45.68d | 22.23a | 17.74a | 21.38e | 18.91h | 23.83bcde | 20.85k |
| G15 | 58.30a | 51.22a | 60.74a | 45.98h | 57.44a | 45.26de | 17.37k | 10.47q | 15.97k | 14.81r | 21.28gh | 17.41t |
| G16 | 52.96e | 47.00d | 53.97i | 46.66f | 49.98k | 45.18e | 18.24h | 16.09g | 20.67g | 17.57n | 22.55defgh | 20.33n |
| G17 | 54.37c | 47.11d | 55.55g | 46.96e | 54.85d | 47.29bc | 18.43gh | 15.54l | 20.81fg | 18.25l | 22.83defg | 21.37g |
| G18 | 54.73c | 46.41f | 57.07d | 47.48d | 55.28c | 47.05c | 17.61j | 14.60o | 21.14ef | 19.02g | 23.98bcde | 20.73l |
| G19 | 56.32b | 50.09b | 56.05f | 48.11b | 54.52e | 47.18bc | 17.26k | 14.83n | 20.92fg | 18.66j | 22.28efgh | 20.64m |
| G20 | 54.77c | 47.85c | 56.05f | 49.16a | 55.17c | 44.13fg | 17.82ij | 15.84i | 20.92fg | 19.28e | 23.98bcde | 19.04s |
| G21 | 48.35k | 41.18n | 50.28n | 41.96p | 46.98m | 40.86j | 18.58g | 10.83p | 17.34j | 16.14q | 20.75h | 20.27o |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Genotype | B\* | | | | | | hue° | | | | | |
| L­­1 | | L2 | | L3 | | L­­1 | | L2 | | L3 | |
| E1 | E2 | E3 | E4 | E5 | E6 | E1 | E2 | E3 | E4 | E5 | E6 |
| G1 | 54.60hij | 24.12kl | 52.89j | 25.98ef | 58.87abcd | 25.74h | 69.23n | 53.94n | 65.11j | 51.70g | 68.75a | 49.72j |
| G2 | 65.08a | 27.62c | 58.77g | 27.17bc | 68.48a | 26.86f | 73.18def | 58.24j | 68.32gh | 54.19d | 69.80a | 50.55h |
| G3 | 63.57ab | 27.35cd | 61.85f | 27.48ab | 64.21ab | 28.04ab | 72.76efg | 59.62gh | 71.35cde | 55.30c | 68.51a | 48.98k |
| G4 | 61.97bc | 25.90h | 55.12i | 24.94g | 56.98bcd | 25.40i | 71.48ij | 57.43k | 67.69hi | 50.27h | 67.58a | 50.07i |
| G5 | 54.17ijk | 25.45i | 43.03k | 20.40m | 52.54cde | 23.30m | 70.55l | 58.40j | 62.65k | 47.65i | 64.01a | 49.44j |
| G6 | 52.76kl | 24.29k | 56.05hi | 24.38hi | 54.41bcde | 25.54hi | 71.14jk | 55.63l | 67.42i | 52.38f | 64.37a | 47.48l |
| G7 | 59.01ef | 28.12b | 56.91ghi | 24.13ij | 59.53abcd | 27.79bc | 73.31de | 60.58e | 68.74g | 54.09d | 66.86a | 51.65f |
| G8 | 58.28ef | 26.92e | 64.82cde | 23.88j | 56.80bcd | 27.37de | 69.30n | 61.11d | 69.52f | 51.34g | 66.81a | 52.58d |
| G9 | 51.52lm | 26.37g | 55.07i | 22.87kl | 51.48cde | 24.46k | 74.09bc | 60.24f | 71.00e | 53.46e | 67.46a | 50.84gh |
| G10 | 57.33fg | 26.28g | 64.30de | 25.70f | 52.45cde | 25.12j | 74.54ab | 60.98d | 72.53b | 55.23c | 67.37a | 51.50f |
| G11 | 58.43ef | 23.95l | 62.75ef | 24.71gh | 50.04de | 24.91j | 71.16jk | 54.28m | 71.25de | 50.57h | 64.14a | 49.48j |
| G12 | 53.55jk | 25.15j | 64.46de | 23.20k | 56.91bcd | 27.66cd | 70.87kl | 58.27j | 70.17f | 51.80g | 68.04a | 53.95c |
| G13 | 58.36ef | 26.48fg | 69.10a | 24.37hi | 44.69e | 28.17a | 71.99hi | 59.47h | 71.29de | 54.23d | 57.07b | 50.60gh |
| G14 | 55.64ghi | 25.92h | 58.11gh | 23.08kl | 52.03cde | 25.65hi | 68.22o | 55.61l | 69.79f | 50.66h | 65.38a | 50.89g |
| G15 | 65.12a | 29.06a | 69.06a | 24.72gh | 62.65abc | 25.75h | 75.07a | 70.18a | 76.98a | 59.07a | 71.22a | 55.93a |
| G16 | 59.85de | 26.88e | 63.62ef | 26.21e | 53.72bcde | 26.11g | 73.04ef | 59.10i | 72.00bcd | 56.16b | 67.21a | 52.09e |
| G17 | 60.85cd | 26.69ef | 65.99bcd | 26.18e | 57.82abcd | 27.43d | 73.14def | 59.79gh | 72.50b | 55.12c | 68.44a | 52.07e |
| G18 | 56.29gh | 26.30g | 67.26ab | 26.65d | 59.73abcd | 26.82f | 72.60fg | 60.96d | 72.54b | 54.49d | 68.13a | 52.30de |
| G19 | 58.86ef | 28.97a | 66.71bc | 26.97cd | 55.44bcde | 26.82f | 73.65cd | 62.89c | 72.58b | 55.32c | 68.09a | 52.42d |
| G20 | 55.91ghi | 27.29d | 64.85cde | 27.78a | 57.81abcd | 27.10ef | 72.31gh | 59.87g | 72.11bc | 55.23c | 67.46a | 54.90b |
| G21 | 50.75m | 22.24m | 55.68i | 22.69l | 45.30e | 23.95l | 69.90m | 64.04b | 72.69b | 54.57d | 65.38a | 49.75j |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Genotype | C\* | | | | | | A\*/B\* | | | | | |
| L­­1 | | L2 | | L3 | | L­­1 | | L2 | | L3 | |
| E1 | E2 | E3 | E4 | E5 | E6 | E1 | E2 | E3 | E4 | E5 | E6 |
| G1 | 58.39fg | 29.84g | 58.30l | 33.10cd | 63.17bcd | 33.73g | 0.38b | 0.73a | 0.46b | 0.79c | 0.39b | 0.85c |
| G2 | 67.99a | 32.48ab | 63.24i | 33.50ab | 73.01a | 34.78d | 0.30jkl | 0.62e | 0.40de | 0.72f | 0.37b | 0.82e |
| G3 | 66.56ab | 31.70c | 65.27h | 33.42bc | 69.01ab | 37.16a | 0.31ijk | 0.59g | 0.34hi | 0.69g | 0.39b | 0.87b |
| G4 | 65.35b | 30.73e | 59.58kl | 32.42f | 61.64bcde | 33.12h | 0.34fg | 0.64d | 0.41cd | 0.83b | 0.41b | 0.84d |
| G5 | 57.44gh | 29.88g | 48.43m | 27.60n | 58.44cdef | 30.66m | 0.35d | 0.62e | 0.52a | 0.91a | 0.49b | 0.86c |
| G6 | 55.74i | 29.43h | 60.70jk | 30.78i | 60.33bcde | 34.64de | 0.34ef | 0.68c | 0.42c | 0.77d | 0.48b | 0.92a |
| G7 | 61.60de | 32.28b | 61.06jk | 29.79jk | 64.73abcd | 35.44c | 0.30kl | 0.56ij | 0.39ef | 0.72f | 0.43b | 0.79g |
| G8 | 62.30cd | 30.74e | 69.19bcde | 30.58i | 61.79bcde | 34.46e | 0.38b | 0.55k | 0.37fg | 0.80c | 0.43b | 0.77i |
| G9 | 53.57j | 30.37f | 58.24l | 28.46m | 55.73def | 31.55k | 0.29mn | 0.57hi | 0.34h | 0.74e | 0.42b | 0.81ef |
| G10 | 59.48f | 30.05g | 67.40efg | 31.28h | 56.82cdef | 32.09j | 0.28no | 0.55jk | 0.31j | 0.69g | 0.42b | 0.80g |
| G11 | 61.73d | 29.49h | 66.26gh | 31.98g | 55.60def | 32.77i | 0.34ef | 0.72b | 0.34hi | 0.82b | 0.48b | 0.85c |
| G12 | 56.67hi | 29.57h | 68.52cdef | 29.51k | 61.35bcde | 34.21f | 0.35de | 0.62e | 0.36g | 0.79c | 0.40b | 0.73j |
| G13 | 61.36de | 30.74e | 72.95a | 30.03j | 52.45ef | 36.46b | 0.33gh | 0.59fg | 0.34hi | 0.72f | 0.68a | 0.82ef |
| G14 | 59.91ef | 31.41d | 61.92ij | 29.83jk | 57.23cdef | 33.05h | 0.40a | 0.68c | 0.37g | 0.82b | 0.46b | 0.81f |
| G15 | 67.40a | 30.88e | 70.88b | 28.82l | 66.17abc | 31.08l | 0.27o | 0.36n | 0.23k | 0.60i | 0.34b | 0.68l |
| G16 | 62.56cd | 31.32d | 66.89fgh | 31.55h | 58.26cdef | 33.09h | 0.30jk | 0.60f | 0.32ij | 0.67h | 0.42b | 0.78h |
| G17 | 63.58c | 30.88e | 69.19bcde | 31.91g | 62.17bcde | 34.77d | 0.30jkl | 0.58g | 0.32j | 0.70g | 0.40b | 0.78h |
| G18 | 58.98fg | 30.08g | 70.50bc | 32.74ef | 64.36abcd | 33.89g | 0.31ij | 0.56jk | 0.31j | 0.71f | 0.40b | 0.77hi |
| G19 | 61.33de | 32.55a | 69.91bcd | 32.79de | 59.75bcde | 33.84g | 0.29lm | 0.51l | 0.31j | 0.69g | 0.40b | 0.77hi |
| G20 | 58.68fg | 31.55cd | 68.14defg | 33.81a | 62.59bcd | 33.12h | 0.32hi | 0.58gh | 0.32ij | 0.69g | 0.41b | 0.70k |
| G21 | 54.04j | 24.73i | 58.32l | 27.84n | 49.83f | 31.37k | 0.37c | 0.49m | 0.31j | 0.71f | 0.46b | 0.85c |

Table S3. ANOVA for colour characteristics under three different production environments

(2021-22)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Df | Source | Replication | Treatment | Error |
| 1 | 20 | 20 |
| E1 | L\* | 0.19\* | 17.78\*\*\* | 0.03 |
| A\* | 3.60E-03 | 6.71\*\*\* | 0.01 |
| B\* | 90.93\*\*\* | 34.10\*\*\* | 0.63 |
| hue angle | 8.05\*\*\* | 6.82\*\*\* | 0.06 |
| C\* | 81.78\*\*\* | 33.20\*\*\* | 0.58 |
| a\*/b\* | 3.02E-03\*\*\* | 2.56E-03\*\*\* | 2.47E-05 |
| Curcuminoids | 0.06 | 1.81\*\*\* | 0.13 |
| E2 | L\* | 0.70\*\*\* | 15.60\*\*\* | 3.30E-03 |
| A\* | 0.01\*\*\* | 6.78\*\*\* | 3.00E-04 |
| B\* | 3.35\*\*\* | 5.58\*\*\* | 0.02 |
| hue angle | 3.54\*\*\* | 25.21\*\*\* | 0.03 |
| C\* | 2.36\*\*\* | 5.33\*\*\* | 0.01 |
| a\*/b\* | 2.02E-03\*\*\* | 0.01\*\*\* | 1.81E-05 |
| Curcuminoids | 0.00 | 0.44\*\*\* | 0.00 |
| E3 | L\* | 0.56\*\*\* | 25.91\*\*\* | 4.20E-03 |
| A\* | 0.07. | 9.00\*\*\* | 0.02 |
| B\* | 96.25\*\*\* | 83.03\*\*\* | 0.91 |
| hue angle | 7.93\*\*\* | 18.75\*\*\* | 0.13 |
| C\* | 86.63\*\*\* | 70.14\*\*\* | 0.82 |
| a\*/b\* | 3.19E-03\*\*\* | 0.01\*\*\* | 5.94E-05 |
| Curcuminoids | 0.24 | 1.36\*\*\* | 0.7 |
| E4 | L\* | 0.55\*\*\* | 14.21\*\*\* | 3.10E-03 |
| A\* | 3.00E-04 | 4.02\*\*\* | 1.00E-04 |
| B\* | 2.03\*\*\* | 7.03\*\*\* | 0.04 |
| hue angle | 2.40\*\*\* | 13.01\*\*\* | 0.05 |
| C\* | 1.34\*\*\* | 7.37\*\*\* | 0.02 |
| A\*/B\* | 1.77E-03\*\*\* | 0.01\*\*\* | 4.51E-05 |
| Curcuminoids | 0.17 | 1.18\*\*\* | 0.14 |
| E5 | L\* | 0.80\*\*\* | 19.69\*\*\* | 0.01 |
| A\* | 1.12 | 5.22\*\*\* | 0.61 |
| B\* | 219.66\*\* | 65.70\*\* | 22.30 |
| hue angle | 33.32. | 16.43. | 8.85 |
| C\* | 187.25\*\* | 57.05\*\* | 16.17 |
| A\*/B\* | 0.02. | 0.01 | 0.01 |
| Curcuminoids | 0.00 | 5.04\*\*\* | 0.02 |
| E6 | L\* | 0.49\*\* | 11.56\*\*\* | 0.04 |
| A\* | 2.00E-03\*\*\* | 4.70\*\*\* | 1.00E-04 |
| B\* | 3.42\*\*\* | 3.80\*\*\* | 0.02 |
| hue angle | 3.63\*\*\* | 8.12\*\*\* | 0.02 |
| C\* | 2.17\*\*\* | 5.75\*\*\* | 0.01 |
| A\*/B\* | 3.00E-03\*\*\* | 0.01\*\*\* | 1.94E-05 |
| Curcuminoids | 0.04 | 5.89\*\*\* | 0.05 |

Where Df-Degrees of freedom,

Vertical structures - L1(E1: 2021-22), (E2: 2022-23),

Greenhouse - L2 (E3: 2021-22), (E4: 2022-23),

Field condition - L3 (E5: 2021-22), (E6: 2022-23).

Table S3. Pooled ANOVA for colour characteristics under three different production environments (2022-23)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Df | Source | Replication | Treatment | Error |
| 1 | 20 | 20 |
| L1 | L\* | 494.50\*\*\* | 15.49\*\*\* | 1.20 |
| A\* | 112.98\*\*\* | 4.78\* | 1.97 |
| B\* | 10388.70\*\*\* | 14.50\* | 5.30 |
| hue angle | 1621.27\*\*\* | 11.63\* | 4.38 |
| C\* | 9569.30\*\*\* | 13.70\* | 5.60 |
| A\*/B\* | 0.74\*\*\* | 0.01\* | 2.33E-03 |
| Curcuminoids | 1.25. | 0.77\* | 0.36 |
| L2 | L\* | 915.27\*\*\* | 17.10\*\*\* | 2.96 |
| A\* | 91.61\*\*\* | 5.47\*\*\* | 1.04 |
| B\* | 13497.00\*\*\* | 29.20. | 15.80 |
| hue angle | 3007.08\*\*\* | 14.33\*\*\* | 1.55 |
| C\* | 11770.90\*\*\* | 23.60 | 15.10 |
| A\*/B\* | 1.56\*\*\* | 0.01\*\*\* | 8.20E-04 |
| Curcuminoids | 0.38 | 1.14\*\*\* | 0.13 |
| L3 | L\* | 544.64\*\*\* | 13.86\*\*\* | 1.76 |
| A\* | 72.81\*\*\* | 4.14\*\*\* | 0.83 |
| B\* | 9210.00\*\*\* | 20.70 | 14.00 |
| hue angle | 2513.19\*\*\* | 7.09 | 5.19 |
| C\* | 7713.10\*\*\* | 19.80 | 11.60 |
| A\*/B\* | 1.44\*\*\* | 3.62E-03 | 4.17E-03 |
| Curcuminoids | 0.40 | 4.32\*\* | 1.15 |

Where Df-Degrees of freedom,

Vertical structures - L1(E1: 2021-22), (E2: 2022-23),

Greenhouse - L2 (E3: 2021-22), (E4: 2022-23),

Field condition - L3 (E5: 2021-22), (E6: 2022-23).