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International Journal of Current Research
Vol. 7, Issue, 12, pp.24660-24663, December, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

SYSTEMIC STUDIES ON THE DIFFERENT GERMPLASMS OF TURMERIC (*Curcuma longa L)* IN WEST BENGAL

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ARTICLE INFO

Article History:
Received 25th September, 2015
Received in revised form
28th October, 2015
Accepted 07th November, 2015
Published online 30th December, 2015

Key words:
Turmeric,
Germplasms,
Curcumin.

ABSTRACT

The present investigation entitled "Systemic studies on the different germplasms of Turmeric **(**Curcuma longa *L*) in West Bengal" was conducted at Horticultural Research Station, Mandouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during 2013-14 and 2014-15. The design adopted was Randomised Block Design (RBD) having 3 replications with 13 treatments. The germplasm under evaluation were RCE-3, Rajendra Sonia, Duggirala, Alleppy Supreme, Roma, NH-l, Suranjana, BSR-2, Pratibha, Kedaram, Rashmi, Megha Turmeric, Midnapur local. The investigation revealed that Maximum plant height (1.29 mt) was recorded in Rajendra Sonia and it was minimum(0.8 mt) in Midnapur (local cv.). Leaf production varies from 9.09-18.61 and it was highest in Roma. Maximum leaf length was recorded in Rajendra Sonia (48.58cm) and it was minimum in Midnapur (local cv.) (27.77cm). The result obtained in this investigation clearly showed that maximum weight of mother rhizomes per clump(120.23gm),primary rhizome per clump(143.83 gm), minimum weight of mother rhizome per clump(74.22gm), primary rhizome per clump(80.67 gm) .On the other hand maximum yield per ha was obtained in the germplasm Rajendra Sonia (31.965 ton/ ha) and it was minimum in Midnapur(local cv.) (14.285 ton/ha). In qualitative character the curcumin percentage was recorded highest with germplasm RCE-3 (4.21%) followed by Rajendra Sonia(4.075%) and it was minimum in Kedaram(1.015%)

Citation*:* Suddhasuchi Das, 2015. "Systemic studies on the different germplasms of turmeric (*Curcuma longa* L) in West Bengal", *International Journal of Current Research,* 7, (12), 24660-24663.

INTRODUCTION

Turmeric (*Curcuma longa* L.), the key spice in curry belongs to family *Zingiberaceae*, is a perennial herb distributed throughout tropical and sub tropical region of the world, being widely cultivated in Asiatic countries, mainly in India and China. The characteristics yellow matter (i.e. Curcumin) distributed throughout the plant is specially concentrated in the rhizomes. The rhizome has 1.8 to 5.4% curcumin and 2.5 to 7.2% essential oil. India contributes about 78%-80% of the world production and 60% to the total trade. Turmeric has been in continuous use for its flavouring, as a spice in both vegetarian and non –vegetarian food preparation digestive properties (Govindarajan. 1980). Turmeric powder (dried rhizome of *curcuma longa)* has been widely used as spice, cosmetic and medicine in Asian countries particularly in India, Bangladesh, Myanmar, Pakistan, Sri Lanka and Thailand (Hermann and Martin 1991; Ishimine *et al.,* 2003). The importance of turmeric in medicine took a new twist when it was discovered that the dried rhizome of *Curcuma longa* is very rich in phenolics, whose structures have been identified as curcuminoids (curcumin, demethoxycurcumin, and bis-demethoxycurcumin) that have anti-oxidant properties (Schieffer,2002).

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MATERIALS AND METHODS

The present investigation was carried out at the Instructional farm, Jaguli, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal in consecutive two seasons during 2013-14 and 2014-15 in Gangetic Alluvial Plains situated at 22.93^0N latitude and 88.53^0E longitude with elevation of 9.75 m above the mean sea level. The seedlings were planted in the plots measuring 3m x 1m with spacing of 30 cm (Row to Row) x 25 cm (Plant to Plant) and replicated thrice following RBD with 13 treatments and 3 replications. The treatment details of which are T_1 (cv.RCE-3), T_2 (cv. Midnapur local), T_3 (cv. Suranjana), T_4 (cv. NH-1), T_5 (cv. Duggirala), T_6 (cv. Rajendra Sonia), T_7 (cv. Megha Turmeric), T_8(cv. BSR-2), T_9(cv. Kedaram), T_{1O}(cv. Alleppy Supreme), T_{11}(cv. Roma), T_{12}(cv. Rashmi), T_{13}(cv. Pratibha). Observations were recorded on different parameters and analyzed statistically as per Gomez and Gomez (1983).

RESULTS AND DISCUSSION

Plant height

It is evident from Table:1 that different germplasm showed distinct variation among themselves with regard to plant height. Maximum plant height (1.29 mt) was recorded in Rajendra Sonia and it was minimum (0.8 mt) in Midnapur local.

Height of the plant was also recorded high in Roma (1.17 mt) and Megha Turmeric (1.14 mt). The performance of 22 trumeric (C. domestica [Curcuma longa) cultivars was studied in field experiment conducted in Terai,

West Bengal during the Kharif season by Jana and Bhattacharya (2001). Plant height was maximum in PTS-19 (160.13 cm) followed by Surama (156.11 cm) and Duggirala (155.96 cm).

Table 1. Plant heightand number of Leaves per plant

Treatments	Plant height (mt)			Number of Leaves per plant		
	2013-14	2014-15	Pooled	2013-14	2014-15	Pooled
T_1	1.09	1.13	1.11	14.02	13.53	13.78
T_2	1.50	1.08	1.29	13.53	13.77	13.65
T_3	1.12	1.03	1.08	11.73	12.08	11.91
T_4	1.11	1.05	1.08	14.40	14.22	14.31
T_5	1.22	1.11	1.17	18.13	19.09	18.61
T_6	1.12	1.10	1.11	13.37	16.77	15.07
T_7	0.89	1.00	0.95	13.27	12.92	13.10
T_8	1.00	0.99	1	14.66	14.58	14.62
T_9	1.03	1.02	1.03	14.61	15.11	14.86
T_{10}	0.92	1.04	0.98	13.80	13.82	13.81
T_{11}	1.18	1.05	1.16	10.97	11.47	11.22
T_{12}	1.21	1.07	1.14	9.70	11.67	10.69
T_{13}	0.83	0.77	0.8	8.07	10.10	9.09
SEm±	0.09	0.04	0.05	0.40	0.47	0.31
C.D. at 5%	0.26	0.13	0.14	1.16	1.37	0.87

T_1 (cv. RCE-3), T_2 (cv.Midnapur local), T_3 (cv. Suranjana), T_4 (cv. NH-1), T_5 (cv. Duggirala), T_6 (cv. Rajendra Sonia), T_7 (cv. Megha Turmeric), T_8(cv. BSR-2), T_9(cv. Kedaram), T_{1O}(cv. Alleppy Supreme), T_{11}(cv. Roma), T_{12}(cv. Rashmi), T_{13}(cv. Pratibha).

Table 2. Weight of mother rhizomes per clump and weight of Primary rhizomes perclump(gm)

	Weight of mother rhizomes per clump(gm)			Weight of Primary rhizomes per		
	2013-14	**2014-15**	**Pooled**	**2013-14**	**2014-15**	**Pooled**
T_1	106.07	107.20	106.64	97.00	110.33	103.67
T_2	123.50	116.95	120.23	113.33	174.33	143.83
T_3	97.50	105.67	101.59	85.00	130.53	107.77
T_4	99.27	94.53	96.9	105.00	162.67	133.84
T_5	103.00	106.83	104.92	124.33	123.67	124
T_6	108.37	100.17	104.27	133.33	135.67	134.5
T_7	101.67	121.83	111.75	105.00	105.10	105.05
T_8	81.33	94.47	87.9	104.00	106.00	105
T_9	82.33	96.42	89.38	100.00	118.33	109.17
T_{10}	98.00	100.17	99.09	86.67	97.33	92
T_{11}	105.00	104.33	104.67	90.00	92.53	91.27
T_{12}	113.50	107.17	110.34	118.33	106.00	112.17
T_{13}	70.00	78.43	74.22	70.00	91.33	80.67
SEm±	4.04	6.26	3.73	6.57	6.96	4.78
C.D. at 5%	11.79	18.28	10.59	19.17	20.31	13.60

T_1 (cv. RCE-3), T_2 (cv.Midnapur local), T_3 (cv. Suranjana), T_4 (cv. NH-1), T_5 (cv. Duggirala), T_6 (cv. Rajendra Sonia), T_7 (cv. Megha Turmeric), T_8(cv. BSR-2), T_9(cv. Kedaram), T_{1O}(cv. Alleppy Supreme), T_{11}(cv. Roma), T_{12}(cv. Rashmi), T_{13}(cv. Pratibha).

Table 3. Yield per ha (ton/ha) and curcumin percentage (%)

Treatments	Yield per ha(ton/ha)			Curcumin percentage(%)		
	2013-14	2014-15	Pooled	2013-14	2014-15	Pooled
T_I	20.24	19.67	19.955	4.17	4.25	4.21
T_2	31.86	32.07	31.965	4.06	4.09	4.075
T_3	30.67	30.21	30.44	1.33	1.33	1.33
T_4	19.47	19.58	19.525	1.51	1.31	1.41
T_5	23.15	23.38	23.265	1.20	1.18	1.19
T_6	22.69	22.02	22.355	2.07	1.82	1.945
T_7	17.79	18.02	17.905	3.15	3.28	3.215
T_8	18.86	18.72	18.79	2.32	2.31	2.315
T_9	20.39	20.21	20.30	2.41	2.49	2.45
T_{10}	17.02	17.27	17.145	1.02	1.01	1.015
T_{I1}	25.61	21.93	23.77	3.96	3.96	3.96
T_{12}	24.53	23.76	24.145	3.94	3.98	3.96
T_{13}	13.77	14.80	14.285	1.42	1.45	1.435
SEm	0.51	0.83	0.49	0.05	0.07	0.04
C.D. at 5%	1.48	2.42	1.38	0.16	0.20	0.13

T_1 (cv. RCE-3), T_2 (cv.Midnapur local), T_3 (cv. Suranjana), T_4 (cv. NH-1), T_5 (cv. Duggirala), T_6 (cv. Rajendra Sonia), T_7 (cv. Megha Turmeric), T_8(cv. BSR-2), T_9(cv. Kedaram), T_{1O}(cv. Alleppy Supreme), T_{11}(cv. Roma), T_{12}(cv. Rashmi), T_{13}(cv. Pratibha).

No. of leaves per plant

The data (Table:1) revealed that Roma produced the maximum no of leaves per plant(18.61) and it was statistically superior than all other germplasm under experiment, while minimum no of leaves per plant was recorded in Krishnanagar (local cv.)(9.09), but did not show any statistical difference with Megha tunneric (10.69), Rashmi (11.22) and Duggirala (11.9 1), Suranjana (1 3. 10).

Weight of mother rhizomes per clump

The statistically analyzed data of weight of mother rhizomes per clump in Table:2. revealed that the Rajendra Sonia produced the maximum weight (120.23gm) of mother rhizomes per clump and it was statistically at par with Suranjana (111.75gm). Midnapur local produced the lowest weight of mother rhizomes per clump (74.22gm). Weight of mother rhizomes per clump was also low in BSR-2 (87.9gm), Pratibha (89.38gm) and Alleppy Supreme (96.9gm). Yadav *et al*. (2006) reported that weight of mother rhizome had the highest positive direct effects on yield.

Weight of primary rhizome per clump

It is evident from the data presented in Table:2 that the different turmeric germplasm showed distinct variation among themselves with regard to the weight of primary rhizomes per clump. Rajendra Sonia produced the maximum (143.83 gm) weight of primary rhizomes per clump and significant differences were noted with other germplasm. Midnapur local produced minimum weight (80.67gm) of primary rhizomes per clump. The weight of mother rhizomes per clump was also recorded high in NH-1(134.5gm), Alleppy Supreme (133.84gm), Roma (124gm) and Megha Turmeric (112.17gm).

Performance of twenty-five genotypes was studied at Barapani for three consecutive years (Chandra *et al*, 1999). Among the 19 characters studied, weight of primary finger rhizome recorded the highest level of variability (38.94%) followed by number of primary and secondary finger.

Projected Yield per ha

The data on yield per hectare of different turmeric germplasm have been presented in Table:3. Maximum yield was recorded in Rajendra Sonia (31.965 ton) and the variation was statistically significant with all other germplasm under investigation. It was minimum in Midnapur local (14.285 ton) and it was at par with Kedaram (17.145 ton) and Suranjana (17.905 ton). The yield was also recorded high in Duggirala (30.44 ton) and Megha Turmeric (24.145 ton). According to Hriddek *et al*. (2006) variety Prabha showed superiority for yield and followed by Kedaram. However, all the released varieties evaluated were superior to the local variety.

Curcumin percentage

It is evident from the data presented in Table:3 that different germplasm showed a distinct variation among themselves with regard to curcumin percentage. Among the different turmeric germplasm significantly highest curcumin percentage was noted in RCE-3(4.21%) and lowest in Kedaram(1.015 %). Curcumin percentage was also high in Rajendra Sonia(4.075 %) and both in Megha Turmeric and Rashmi(3.96 %). The new turmeric (*Curcuma longa*) variety BSR2 derived by X ray mutagenesis from the variety Erode Local is described by Chezhiyan and Shanmugasundaram (2000). It produces 690-890 g fresh rhizome per plant, and has a curcumin content of 3.75%.

Conclusion

Based on the results obtained from the present investigation, it is recorded that Rajendra Sonia produced the highest yield followed by Megha turmeric, Duggirala and Roma. Investigation revealed that germplasm Roma, Rajendra Sonia, Megha turmeric, Alleppy Supreme can be made popular for cultivation in the gangetic plains of West Bengal due to their better growth, highest yield and for appreciable curcumin content instead of less productive local cultivars. Rajendra Sonia is best because of maximum yield and also appreciable curcumin content for cultivation in this zone but it is not commercially exploited in this zone.

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