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STUDIES ON CORRELATION COEFFICIENT IN TURMERIC (*CURCUMA LONGA* L.)

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Abstract

An experiment was conducted with 80 turmeric genotypes for 12 characters to know the correlation coefficient in turmeric. The present investigation found correlation coefficient for various traits in turmeric. Weight of fresh rhizome per plant showed highly significant and positive correlation with plant height (0.458), weight of mother rhizome (0.999), number of primary rhizome per plant (0.489), number of secondary rhizome (0.696), number of tertiary rhizome per plant (0.321) and significant and positive correlation with rhizome yield (0.264). The non-significant but positive correlation of weight of fresh rhizome per plant was recorded with number of tillers per clump (0.153), number of leaves per plant (0.130), weight of primary rhizome per plant (0.171) and dry matter (0.068). However, weight of fresh rhizome per plant showed negatively non-significant correlation with TSS% (-0.197). Dry matter percent showed non-significant but positive correlation with weight of mother rhizome (0.063), number of primary rhizome per plant (0.026), number of secondary rhizome per plant (0.066), number of tertiary rhizome (0.019). However, TSS% showed negatively non-significant correlation with plant height (-0.113), number of tillers per clump (-0.001), number of leaves per plant (-0.120), weight of primary rhizome per plant (-0.106) and rhizome yield (-0.047).

Key words : Correlation coefficient, germplasm, fresh rhizome, turmeric.

Introduction

India has always been known as 'land of spices', where, 63 kinds of spices are grown (Pruthi, 1998), but according to Spices Board, Calicut, Kerala, only 52 spices are grown in India. Turmeric (*Curcuma longa* L.) is one of the most important spice crops of the country. Total area and production under turmeric in India is 0.22 million hectare and 1.17 million tons respectively (N.H.B.D., 2013), which is extensively cultivated in the states of Andhra Pradesh, Tripura, Tamil Nadu, Orissa, Assam, Maharashtra and to a little extent in Karnataka and Kerala (Rajyalakshmi *et al*., 2013). It is an herbaceous perennial is native to the Indo-Malayan region and belongs to family Zingiberaceae. It is the third important spice crop of India, next only to chillies and black pepper. India is the largest producer and exporter of turmeric contributing 82% of production and 46% of export. Turmeric, the golden spice of life, is one of the most essential spices used as important gradient in culinary all over the world. Turmeric is valued globally as a condiment, food colourant, dye, drugs and medicine. The rhizome contains yellow colouring component curcumin (3-9%), essential oil (5-9%) and oleoresin (3-13%) that are using in different ways.

Curcumin is gaining more importance in food industries, pharmaceuticals, preservatives and cosmetics. The ban on artificial colour has prompted the use of curcumin as a food colourant. In pharmaceuticals it is valued for the anti-cancerous, anti-inflammatory, antiseptic, anti-microbial and anti-proliferative activities (Srimal, 1997). Curcumin also protects the liver from toxic compounds and it also acts as anticoagulant by inhibiting collagen and adrenaline induced platelet aggregation (Srivastava *et al*., 1985). It possesses wound healing properties and has antifungal effects. Antiviral properties in curcumin have been found to be effective against HIV (Srimal, 1993). Curcumin has anti-cancerous effects and has potential in the treatment of various forms of cancer, including prostate, skin and colon (Rao *et al*., 1995).

It is basic need to develop high yielding varieties with better quality to increase the production and productivity

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of ginger in India. The success of any breeding programme depends on the nature and amount of genetic variability present in the breeding materials. Selection and hybridization approaches are fallowed for desired improvement. It is urgent need to exploit the existing ginger germplasms for assessing genetic variability and heritability. Therefore, an experiment was conducted to assess the nature and magnitude of variability, heritability and genetic advance for various characters in turmeric germplasms for present as well as for future crop improvement programme.

Materials and Methods

The experimental material comprised of eighty genotype of turmeric which was evaluated in three checks at main experiment station of Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Faizabad (U.P.). Geographically, the experimental site falls under humid subtropical climate and is located at 26.47° N latitude and 82.12° E longitude at an altitude of 113 meter above the mean sea level.

The rhizomes of large shiny, free from diseases and eye injury were cut into pieces of 4-5 cm in the length, 15-20 g in weight and treated with fungicide like carbendazim by dissolving 30 g of the chemicals in 15 litres of water. Turmeric rhizome was planted in the month of June at a spacing of 30×20 cm as per routine agronomic practices were adapted for raising healthy crop. The observations were recorded from five randomly selected plants from each treatment in each replication. Observations on the following parameters were recorded using the standard procedure: plant height (cm), number of tillers per clump, number of leaves per plant, weight of fresh rhizome per plant (g), weight of mother rhizome (g), number of primary rhizome per plant, weight of primary rhizome per plant (g), number of secondary rhizome per plant, number of tertiary rhizome per plant, rhizome yield (q/ha), dry matter (%) and TSS (%). The genotypic and phenotypic variances were calculated according to Johnson *et al*. (1955) and Comstock and Robinson (1952). Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were calculated by the method suggested by Singh and Chaudhary (1985). Genetic advance (GA) was calculated by the method suggested by Johnson *et al*. (1955). The Experiment was laid out in an augmented design and data were calculated with analysis of variance (ANOVA).

Results and Discussion

The estimates of correlation coefficient among the different characters of turmeric (*Curcuma longa* L.) genotypes are presented in table 1. Weight of fresh rhizome per plant showed highly significant and positive correlation with plant height (0.458), weight of mother rhizome (0.999), number of primary rhizome per plant (0.489), number of secondary rhizome (0.696), number of tertiary rhizome per plant (0.321) and significant and positive correlation with rhizome yield (0.264). The non-significant, but positive correlation of weight of fresh rhizome per plant was recorded with number of tillers per clump (0.153), number of leaves per plant (0.130), weight of primary rhizome per plant (0.171) and dry matter (0.068). However, weight of fresh rhizome per plant showed negatively non-significant correlation with TSS% (-0.197). TSS% showed highly significant and positive correlation with number of tillers per clump (0.442) and number of leaves per plant (0.487) and highly significant and negative correlation with number of secondary rhizome per plant (-0.299). The non-significant but positive correlation TSS% was recorded with plant height (0.019), number of primary rhizome per plant (0.049), dry matter% (0.042). However, TSS% showed negatively non-significant correlation with weight of mother rhizome (-0.195), weight of primary rhizome per plant (-0.105), number of tertiary rhizome per plant (-0.155) and rhizome yield (-0.071). Dry matter percent showed non-significant but positive correlation with weight of mother rhizome (0.063), number of primary rhizome per plant (0.026), number of secondary rhizome per plant (0.066), number of tertiary rhizome (0.019). However, TSS% showed negatively non-significant correlation with plant height (-0.113), number of tillers per clump (-0.001), number of leaves per plant (-0.120), weight of primary rhizome per plant (-0.106) and rhizome yield (-0.047). The present findings are supported by Datta *et al*. (2006), Kumar *et al*. (2007) and Singh *et al*. (2012) in turmeric.

Rhizome yield showed highly significant and positive correlation with number of tillers per clump (0.295), number of leaves per plant (0.295), weight of primary rhizome per plant (0.390) and number of tertiary rhizome per plant (0.853) and significant and positive correlation with plant height (0.2263) and weight of mother rhizome (0.263). The non-significant but positive correlation rhizome yield was recorded with number of secondary rhizome per plant (0.083). However, rhizome yield showed negatively non-significant correlation with number of primary rhizome per plant (-0.019). Number of tertiary rhizome per plant showed highly significant and positive correlation with weight of mother rhizome (0.319) and weight of primary rhizome per plant (0.476) and significant and positive correlation with number of tillers per clump

Table 1 : Estimates of Simple correlation coefficients between different characters in Turmeric germplasm.

S. no.	Characters	Plant height (cm)	Number of tillers per clump	Number of leaves per plant	Weight of mother rhizome (g)	Number of primary rhizomes per plant	Weight of primary rhizomes per plant (g)	Number of secondary rhizomes per plant	Number of tertiary rhizomes per plant	Rhizome yield (q/ha)	Dry matter (%)	TSS (%)	Weight of fresh rhizomes per plant (g)
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1.	Plant height (cm)	1	0.3597**	0.4171**	0.4610**	0.4365**	0.1299	0.3444**	0.1187	0.2263*	-0.1133	0.0199	0.4581**
2.	Number of tillers per clump		1	0.8647**	0.1568	0.0531	0.3023**	0.1384	0.2447*	0.2954**	-0.0013	0.4422**	0.1529
3.	Number of leaves per plant			1	0.1355	0.1938	0.2402*	0.1044	0.2204*	0.2951**	-0.12	0.4866**	0.1302
4.	Weight of mother rhizome (g)				1	0.4902**	0.1749	0.6924**	0.319**	0.2627*	0.0630	-0.1948	0.9987**
5.	Number of primary rhizomes per plant					1	-0.0452	0.2899**	0.0398	-0.0194	0.0257	0.0488	0.4897**
6.	Weight of primary rhizomes per plant (g)						1	0.3754**	0.4757**	0.3904**	-0.1058	-0.1053	0.1709
7.	Number of secondary rhizomes per plant							1	0.1989	0.0828	0.0651	-0.2996**	0.6907**
8.	Number of tertiary rhizomes per plant								1	0.8533**	0.0199	-0.1554	0.3211**
9.	Rhizome yield (q/ha)									1	-0.0471	-0.0711	0.2643*
10.	Dry matter (%)										1	0.0419	0.0677
11.	TSS (%)											1	-0.1975

* - Significant at 5 per cent probability level, ** - Significant at 1 per cent probability level.

(0.2447) and number of leaves per plant (0.2204). The non-significant but positive correlation of number of tillers per plant was recorded with plant height (0.119), number of primary rhizome per clump (0.039) and number of secondary rhizome per plant (0.199). Number of secondary rhizome per plant showed highly significant and positive correlation with plant height (0.344), weight of mother rhizome (0.692), number of primary rhizome per plant (0.289) and weight of primary rhizome per plant (0.375). The non-significant but positive correlation of number of secondary rhizome per plant was recorded with number of tillers per clump (0.138), number of leaves per plant (0.104). Weight of primary rhizome per plant showed highly significant and positive correlation with number of tillers per clump (0.302) and significant and positive correlation with number of leaves per plant (0.240). The non-significant but positive correlation of weight of primary rhizome per plant was recorded with plant height (0.129) and weight of mother rhizome (0.175). However, weight of primary rhizome per plant showed negatively non-significant correlation with number of primary rhizome per plant (-0.045). Number of primary rhizome per plant showed highly significant and positive correlation with plant height (0.436) and weight of mother rhizome (0.490). The non-significant but positive correlation of number of primary rhizome per plant was recorded with number of tillers per clump (0.053) and number of leaves per plant (0.194). Weight of mother rhizome showed highly significant and positive correlation with plant height (0.461). The non-significant but positive correlation of weight of mother rhizome per plant was recorded with number of tillers per clump (0.157) and number of leaves per plant (0.135). Number of leaves per plant showed highly significant and positive correlation with plant height (0.417) and number of tiller per plant (0.865). Number of tiller per clump showed highly significant and positive correlation with plant height (0.359). Such findings are in agreement of Rao *et al*. (2004), Singh *et al*. (2008) and Tomar *et al*. (2005).

Conclusion

In the present study, weight of fresh rhizome per plant showed highly significant and positive correlation with plant height, weight of mother rhizome, number of primary rhizome per plant, number of secondary rhizome, number of tertiary rhizome per plant and significant and positive correlation with rhizome yield at phenotypic level and genotypic level.

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