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ASSESSMENT OF GENETIC VARIABILITY AMONG GENOTYPES OF *AMARANTHUS TRICOLOR*

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Abstract

Amaranthus tricolor is a very popular leafy vegetable in India as well tropical and subtropical area of globe and it can be grown throughout the year. Ten genotypes of amaranthus obtained from Horticulture Instructional cum Research Farm of Department of Horticulture, I.G.K.V., Raipur (C.G.), India were evaluated in the field for variability in 16 characters. Randomized block design with four replications per genotype was employed. Analyses of variance revealed highly significant for all characters. This indication of existence of sufficient variability among all the genotype for leaf yield and its components trait. The range, coefficient of variability, phenotypic and genotypic coefficients of variability also revealed high variability for each of the characters. The highest broad sense GCV, PCV, heritability and GA were obtained for leaf weight, which was also positive and significant correlated with leaf length and number of cutting at both genotypic and phenotypic level. These variations provide ample opportunities for plant breeders to carry out selection while designing plant breeding programmes for the improvement of the species.

Key words : Genotypic variation, phenotypic variation, randomized block design.

Introduction

Amaranthus (*Amaranthus tricolor*) is a very popular leafy vegetable in India as well tropical and sub-tropical area of globe and it can be grown throughout the year. Amaranthus preferred for both urban and rural population and it's also considered to be the cheapest and easiest source of nutrients, vitamins and protein leafy vegetable and it could be rightly described as a "poor man's vegetable" (Varalakshmi, 2004). The amaranthus can grow under varied soil and agro climatic conditions are resistant from heat, drought and major disease problems (Katiyar *et al.*, 2000; Shukla and Singh, 2000). As India is the center of origin of *Amaranthus* sp., the Chhattisgarh State has wide genetic variability of amaranthus in the local land races provides ample opportunity to develop or identify high yielding varieties with variable traits. Therefore, present investigation under taken to find out the genetic variability between various component characters and their showing the possibilities of further genetic improvement in amaranthus.

Materials and Methods

The experimental material consisted of 10 genotypes of *Amaranthus tricolor* selected from a germplasm collection maintained under AICRP on vegetable crops at the Department of Horticulture, IGKV, Raipur (C.G.), India. The material was grown in a randomized block design with four replications in winter (October, 2014). The genotypes were raised in flat beds of size 3 × 2 m^2 and evaluated under irrigated condition. Observations were recorded on 10 plants in each replication for the 16 characters *viz*., plant height, plant weight, number of leaves, leaf length, leaf width, leaf weight, stem weight, stem girth, internodal length, petiole length, panicle length, number of cutting, 1000 seed weight, seed yield, crop duration and leaf yield. The analysis of variance was carried out for each character separately as per method of Panse and Sukhatme (1967). The coefficient of variation for different characters was estimated by formula as suggested by Burton (1952). The heritability was estimated as per the formula suggested by Burton and De Van (1953) and the expected advance was calculated by the formula given by Johnson *et al*. (1955).

Results and Discussion

The analysis of variance for all the characters under study is presented in table 1. These analyses of variance

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Table 1 : Analysis of variance for leaf yield and its component characters in Amaranthus.

S. no.	Character (df)	Mean sums of square		
		Replication 3	Treatment 9	Error 27
1.	Plant height (cm)	5.674	5.862*	2.381
2	Plant weight (gm)	46.667	133.489*	53.148
3	Number of leafs/plant	0.899	24.774**	1.795
4	Leaf length (cm)	0.454	6.588**	0.802
5	Leaf width (cm)	0.753	1.172*	0.514
6	Leaf weight (gm)	0.008	1.756**	0.015
7	Stem weight (gm)	0.137	5.808**	0.223
8	Stem girth (cm)	0.036	0.320**	0.025
9	Internodal length (cm)	0.018	0.492**	0.060
10	Petiole length (cm)	0.061	0.874**	0.107
11	Panicle length (cm)	0.975	8.920**	2.578
12	Number of cutting	0.467	1.789**	0.522
13	1000 seed weight (gm)	0.005	0.006**	0.002
14	Seed yield (gm/plant)	3.811	4.776**	1.428
15	Crop duration	6.958	170.081*	70.236
16	Leaf yield (kg/plot)	92.737	22.131**	6.468

*: Significant at 5%, **: significant at 1%.

different characters are presented in table 2. High magnitude of genotypic as well as phenotypic coefficient of variations were recorded for traits *viz*., leaf weight (35.01 and 35.63), leaf length (19.69 and 24.50) and intermodal length (18.46 and 22.99) suggested the substantial improvement on amaranthus through selection for these traits. Moderate GCV and PCV were recorded for petiole length (13.59 and 14.46), stem weight (13.44 and 14.47), leaf width (13.36 and 15.12), leaf yield per plot (13.31 & 21.67), number of cutting (12.79 and 20.42) and number of leafs per plant (11.48 and 13.15) suggested existence of considerable variability in the population. The traits which showed high phenotypic and genotypic coefficient of variations are of economic importance and there is scope for improvement of these traits through selection. The present investigation high magnitude of heritability was recorded for most of characters. The highest heritability was recorded for the characters leaf weight (96.6%) stem weight (86.2%), petiole length (86.1%), leaf width (78.1%) and number of leaf per plant (76.2%). The moderate heritability was observed for leaf length (64.5%), intermodal length (64.5%) and low heritability was observed for 1000 seed weight (38.5%),

Table 2 : Genetic parameter of variability for leaf yield and its component character in Amaranthus.

S. no.	Characters	Mean	Range		Coefficient of Variation (%)		Heritability (h^2 %)	GA as percent of Mean
			Min^m	Max^m	GCV	PCV		
1.	Plant height (cm)	10.10	8.39	12.15	9.24	17.87	26.8	9.8
2.	Plant weight (gm)	62.20	52.50	70.50	7.21	13.76	27.4	7.76
3.	Number of leafs/plant	20.88	18.56	26.36	11.48	13.15	76.2	20.6
4.	Leaf length (cm)	6.14	4.83	8.98	19.69	24.50	64.5	32.5
5.	Leaf width (cm)	4.35	3.45	5.06	13.36	15.12	78.1	25.7
6.	Leaf weight (gm)	1.88	1.27	2.84	35.01	35.63	96.6	71.2
7.	Stem weight (gm)	8.79	7.38	11.49	13.44	14.47	86.2	11.4
8.	Stem girth (cm)	1.66	1.47	2.39	9.55	15.46	38.1	30.3
9.	Internodal length (cm)	1.78	1.36	2.51	18.46	22.99	64.5	25.7
10.	Petiole length (cm)	3.14	2.50	3.70	13.59	14.65	86.1	12.3
11.	Panicle length (cm)	12.99	9.75	14.70	9.60	15.71	38.1	16.1
12.	Number of cutting	4.40	3.75	5.75	12.79	20.42	37.7	16.8
13.	1000 seed weight (gm)	0.79	0.73	0.85	4.14	6.68	38.5	5.06
14.	Seed yield (gm/ plant)	10.18	8.52	11.54	8.99	14.78	37.0	11.2
15.	Crop duration	117.48	100.25	122.50	4.25	8.31	26.2	4.4
16.	Leaf yield (kg/plot)	14.87	10.13	17.83	13.31	21.67	37.7	16.8

revealed that mean sum of squares due to genotypes were highly significant for all characters. This is an indication of existence of sufficient variability among all the genotypes for leaf yield and its components traits. Genotypic and phenotypic coefficients of variation of panicle length (38.1%), leaf yield kg per plot (37.7%), number of cutting (37.7%), seed yield per plant (37.0%), plant weight (27.4%), plant height (26.8%) and crop duration (26.2%). The heritability value alone however, provides no indication of the amount of genetic

improvement that would result from selection of superior genotypes. The heritability estimates would be reliable if it is limited in broad sense, additive and non-additive gene effect are accompanied with high genetic advance. To facilitate the comparison of progress in various characters of different genotypes genetic advance was calculated as percentage of mean. Genetic advance as percentage of mean was observed high for leaf weight (71.2%), leaf length (32.5%), stem girth (30.3%), leaf width (25.7%), intermodal length (25.7%) and number of leafs per plant (20.6%). The high value of genetic advance for these traits showed that these characters are governed by additive genes and selection will be rewarding for the further improvement of such traits. Moderate genetic advance for the traits suggest that both the additive and non-additive variance are operating in these traits.

Heritability estimates along with genetic advance are more useful than the heritability value alone for selecting the best individual. High heritability coupled with high genetic advance was observed for number of leafs per plant, leaf width and leaf weight indicating that most likely the heritability is due to additive gene effects and selection may be effective. Therefore, selection based on phenotypic performance of these traits would be effective to select desirable genotypes and Ahammed *et al*. (2012) were also estimated higher heritability for leaf weight per plant (91.10%) and stem weight per plant (82.56%).

In conclusion, this study has actually highlighted the extent of variations of all characters that exist among the ten genotypes of *Amaranthus tricolor*. It is speculated that such variations or much more could exist among the entire collections of this species. This indicates that plant breeders have ample variations to guide the selection of genotypes and characters to be included in a breeding programme.

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