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Genetic Evaluation and Path Analysis in Amaranthus

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Estimates of genetic parameters, genotypic correlation coefficient and path analysis were made on seedling performance with 19 different genotype collections in *Amaranthus sp.* which is the chief source of green leafy vegetable in tropics. This study of seedling population for green leafy yield and its components was made during April and July seasons in 1976. The studies brought out significant differences among genotypes in respect of the yield components and also higher extent of variation as revealed by genetic estimates. The variation was high in length of stem and weight of plants followed by number of leaves. All these characters offered scope for selection in that order mentioned only, as inferred from estimates of H and GA. The genotypic correlation was higher than phenotypic correlations in both the seasons. However, in respect of number of leaves per plant and weight of stem the relationship got reversed i.e. phenotypic correlation was higher than genotypic in April as compared to July sowing. The direct effect of length of stem on yield as shown by path analysis also was reversed in April season as compared to July season. The investigation also brought out the existance of strong Genotype x Environment (G x E) interactions in the diverse genetic population of *Amaranthus*.

Amaranthus spp. is major source for green leafy vegetables. The seedlings or juveniles or their leaves constitute the source for green leafy vegetables rich in energy and nutrients contents. Species of *Amaranthus* grown as greens vary in number. The seedlings population raised as greens from different varieties or genotypes represent different stages of variation in the genus.

The genetic behaviour of the population of *Amaranthus* has received practically no assessment. Hence a study was carried out to estimate the seedlings behaviour in respect of growth, number of leaves per plant and plant weight. All these three charactets studies herein contribute towards the bulk of green matter yield which forms green leafy vegetables. In the present study, an evaluation of the genetic behaviour of seedling population of diverse sources has been made and the results are presented.

MATERIAL AND METHODS:

Ninteen genotypes from different sources were grown during two seasons viz. April 1976 and July 1976 at the farm of Krishi Vigyan Kendra, Pondicherry. The 19 varieties grown are Co. 1, Culture 2, Ai, A3, A16, A19,

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A44, A56, Selection 1 and 2, *Thandukeerai, Arakeerai, Thandukeerai Red, Sirukeerai, Molai Keerai, Paruppukkeerai* and *Green Braad leaf*. The experiment was conducted in a randomised complete block design with three replications. The gross plot size was 1.2 M × 1.2 M and the net plot size was 1 M × 1 M. A basal dose of 1.5 kg FYM per M^2 and top dressing in the form of urea at the rate of 25 kg/ha was given on 15th day. Twenty days old seedlings were harvested and data were recorded on ten randomly selected plants from each plot.

Analysis of variance, estimates of genetic parameters such as genotypic and phenotypic coefficient of variations, heritability, genotypic and phenotypic correlations and path analysis were done with the data. Heritability estimates were computed as suggested by Rawlings *et al.* (1958). Phenotypic and genotypic correlation coefficients were computed by procedures suggested by Johnson *et al.* (1955). Path analysis was done by the method of Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of varience showed that differences among the varieties were significant for all the plant characters in both seasons excepting for the weight of plants in July season. The characters evaluated namely height of plant, number of leaves and weight of plants exhibited wide range of variation in expression of the traits among the 19 genotypes during April sowing (Table I). Length of stem and weight of plants showed higher extent of variation than number of leaves. The P. C. V. was higher than G.C.V. Likewise in expression of H and G.A. as percentage over mean also the traits showed the same trend. In general, the genetic expression in the greens was highest for weight of plants.

A comparison of the performance of the same genotypes in July exhibited almost a similar trend in respect of the traits for genetic expression such as PCV, GCV, H, and G.A., weight of plants always showing higher expression. The estimates for H was however, much higher in April than in July season especially for weight of plants. The mean expression of all the traits was higher in July season than in April season.

The estimates of the phenotypic and genotypic correlation coefficients brought out that in general, the genotypic correlation was higher than phenotypic correlation (Table II) in both the seasons excepting between number of leaves and weight of plants in April sowing in which the relative magnitude of phenotypic and genotypic correlation was reversed as compared to July season. The genotypic correlations were also significant indicating scope for higher responses for effective selections to achieve significant improvements in breeding

TABLE I: Mean, Range, Estimates of G. C. V., P. C. V., Heritability and Genetic Advance in *Amaranthus*

	April 1976			July 1976		
	Length of stem (cm)	No. of leaves per plant	Wt. of 10 plants (g)	Length of stem (cm)	No. of leaves per plant	Wt. of 10 plants (g)
Mean	14.6	5.5	18.4	18.8	8.9	20.6
F. test	**	*	**	*	*	N.S.
S. C. M.	1.19	0.45	1.64	1.69	0.60	—
C. D.	3.87	1.30	4.70	4.87	1.72	—
Range	8.7-84.1	4-10	9-31	8.8-29.3	8-13	10-38
Phenotypic C. V. (%)	21.6	14.8	24.5	14.5	10.5	25.6
Genotypic C. V. (%)	20.0	12.4	22.8	11.3	7.5	13.5
Heritability (%)	85.8	69.4	86.8	61.1	58.4	27.7
Genetic advance in per cent over mean	38.2	17.9	43.8	18.2	12.6	14.9

* and ** significant at P=0.01, and P=0.05 respectively
N.S: Not significant

TABLE II: Estimates of Phenotypic (rp) & Genotypic (rg)-Correlation Cefficients for Yield Components in *Amaranthus*.

Character		April 1976		July 1976	
		No. of leaves per plant	Wt. of 10 plants	No. of leaves per plant	Wt. of 10 plants
Length of stem	rp	0.4519	0.3609	0.3002	0.5703*
	rg	0.5667*	0.4469	0.6572**	0.7411**
No. of leaves per plant	rp		0.4751*		0.2959
	rg		0.3725		0.5836*

* Sig. at p=0.05
** Sig. at p=0.01

Note: Correlation coefficients exceeding 0.456 and 0.575 are significant at 0.05 and 0.01 levels respectively.

TABLE: III. Path Coefficient Analpsis for Yield Components in *Amaranthus*

	Effects through		Genctypic correlation with yield	Residual
	Length of stem	No. of leaves per plant		
APRIL 1976				
Length of stem	**0.2618**	0.1851	0.4469	0.8531
No. of leaves per plant	0.1483	**0.3268**	0.4751	
JULY 1976				
Length of stem	**0.6294**	0.1117	0.7411	0.6591
No. of leaves per plant	0.4137	**0.1699**	0.5836	

Figures Bold connote the direct effects and the rest indicate indirect effects.

for quick growing and high green matter producing greens.

The path analysis carried out to bring out the direct effect of each of the components on the green yield showed that the direct effect of number of leafs per plant on yield was higher than the direct effect of length of stem in April season and that of direct effect of length of stem higher than the direct effect of number of leaves during July season (Table III). Among the indirect effect length of stem through number of leaves was higher than the other indirect effect in April season (Table III). This trend was also quite reversed in July season as compared to April season. It is inferred from the presen study that there exist strong G + E interactions in repect of individual characters and in their contribution to the overall performance of seedling population. An overall consideration indicate that the length of stem, number of leaves per plant and seedling weight offer scope for selection in view of their expression of high values of H´and GA and also higher values in genotypic correlations besides the larger G.C.V. and fairly high direct effects in path analysis.

In this study, in both the season, the genotypic correlations were higher than phenotypic revealing that greater reliance could be made in selections in juvenile/seedling population for effecting improvement in green yields. The path analysis also corroborated the high direct effects of length of stem in April season and that is number of leaves during July season connoting differential influence of seasons due to strong G x E.

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