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Estimates of Genetic Variability Parameters in Safflower

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ABSTRACT

Information on genetic variance, coefficient of variation, broad sense heritability and genetic advance for yield and related character has been given, using data from 66 genotypes of safflower evaluated during *rabi* 1992-93. The genetic coefficient of variances was higher for grain yield per plant, number of capitula per plant, 100-seed weight and number of secondary branches per plant. High heritability was recorded for days to 50 per cent flowering, grain yield per plant, 100-seed weight, number of capitula per plant and plant height. Further, grain yield per plant, number of capitula per plant and 100-seed weight had high genetic advance coupled with high heritability.

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INTRODUCTION

Safflower (*Carthamus tinctorius* L.) is an important and potential oilseed crop. Its oil is of the best quality for human consumption. India is one of the main safflower growing countries in world in acreage but productivity is low. Hence it required genetic improvement to fatch the oil seed demand. To develop such genetically improved cultivars, a systematic breeding programme has to be adopted. The knowledge of variability, heritability and genetic advance is useful in the choice of appropriate selection criterion.

MATERIALS AND METHODS

The field experiment with 66 safflower genotypes inculding check was carried out at Navsari (Gujarat) during *rabi* 1992-93. The trial was laid out in randomized block design with three replications. Each entry was represented by four rows spaced 45 cm apart with 10 cm distance between plants within rows. The usual agronomic practices were followed in raising the crop. Five plants were randomly selected from the middle rows at random for recording observations and their mean values were used for statistical analysis.

Using the mean values, analysis of variance was preformed for each character (Panse and Sukhatme, 1978). The variance components were estimated as explained by Jhonson *et al.* (1955). Hertitability (broad-sense) and genetic advance (at 5% selection intensity) were calculated by using the formula proposed by Allard (1960). Genotypic and phenotypic coefficients of variation were estimated according to Burton (1952).

RESULTS AND DISCUSSION

Analysis of variance indicated significant differences in respect of all characters. A wide range of phenotypic variation was present in respect of plant height and grain yield per plant, while, days to 50 per cent flowering and number of capitula per plant showed moderate range of phenotypic variation (Table 1). Similar results have also been reported by Deokar and Patil (1978). There was a close correspondance between genotypic and phenotypic coefficients of variance for most of the characters except plant height (Table1). These characters, therefore, were least influenced by environmental variation and the phenotype would provide a fairly close assesment of the genetic worth of a geno-type. The genotypic coefficient of variation ranged from 1.39 for oil content to 27.09 number of capitula per plant (Table 1). The difference between the values of phenotypic and genotypic coefficient of variation for number of capitula per plant, grain yield per plant, number of secondary branches per plant and number of primary branches per plant were more as compared to days to 50 per cent flowering, plant height, days to maturity, 100-seed weight and oil content suggesting that the latter characters were less influenced by environment, thus these can be improved through phenotypic selection. Due to the less difference in the value of PCV and GCV, the improvement by phenotypic selection for certain characters also reported by Deokar and Patil (1978) and by Narkhede *et al.* (1985). Though genetic coefficient of variation is helpful in comparing the genetic variability present in the quantitative characters, it is not possible to determine the extent of heritable variation with a genetic coefficient of variation alone. Burton (1952) had, therefore, suggested that genetic coefficient of variation along with heritability estimates would provide a better understanding of the amount of genetic advance expected by phenotypic selection.

The characters viz. days to 50 per cent flowering (88.38%), 100-seed weight (84.79%), grain yield per plant (84.01%), plant height (75.08%) and number of capitula per plant (72.47%) showed fairly high heritability while it was moderate to low for others (Table 1). Genetic advance was high for grain yield per plant (49.16%). Number of capitula per plant (47.50%), 100-seed weight (22.81%) and number of secondary branches per plant (22.63%) (Table 1). High heritability estimates coupled with high genetic advance were recorded for grain yield per plant, 100-seed weight and number of capitula per plant, Deokar and Patil (1978) also reported high genetic advance associated with high heritability for plant height, number of seeds for per capitulum and 100-seed weight and Narkhede *et al.* (1985) for characters viz. seed yield per plant and number of seeds per capitulum.

The occurance of such high heritability values coupled with high genetic advance for grain yield per plant, 100-seed weight and number of capitula per plant in the present investigation suggested the importance of additive gene action in their inheritance. This also supports the

TABLE 1

Range, mean, genotypic, phenotypic and environmental variances, GCV, PCV, H^2 (B.S.) and G.A. as % of $\bar{x}$ for the nine characters in safflower.

Character	Range	Mean	Genotypic variance	Pheno-typic variance	Environ-mentel varaince	GCV (%)	PCV (%)	H^2 (B.S.)	G. A. % of $\bar{X}$
Grain yield per plant (g)	9.58 - 31.47	16.79	19.09	22.73	3.64	26.03	28.40	84.01	49.16
Days to 50% flowering	49.67 - 66.67	59.15	18.56	21.00	2.44	7.28	7.75	88.38	14.10
Plant height (cm)	58.07 - 86.13	75.74	38.56	51.76	13.20	8.29	9.57	75.08	14.79
Days to maturity	116.33 - 127.00	122.04	6.26	13.05	6.79	2.05	2.96	47.97	2.93
100-seed weight (g)	5.00 - 8.57	6.88	0.69	0.81	0.12	12.02	13.06	84.79	22.81
No. of primary branches per plant	3.93 - 5.93	5.10	0.17	0.56	0.39	8.09	14.63	30.54	9.21
No. of secondary branches per plant	6.00 - 13.87	10.96	2.44	4.09	1.65	14.24	18.45	59.55	22.63
Number of capitula per plant	6.00 - 23.67	13.09	12.58	17.35	4.77	27.09	31.82	72.47	47.50
Oil content (%)	30.26 - 33.63	32.75	0.21	0.39	0.18	1.39	1.91	53.12	2.09

observations reported by Narkhede *et al.* (1985). Thus, while exploiting variability of present material, high weightage should be given to those characters in selection programme to be followed for safflower improvement because these characters are less influenced by environment and they can be improved through selection.

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