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INFLUENCE OF SEGREGATING GENERATIONS ON CHARACTER ASSOCIATION IN SESAME

A. R. G. RANGANATHA,* T. SRINIVAS, K. VIRUPAKSHAPPA, D. M. MAHISHI AND G. SHIVASHANKAR

University of Agricultural Sciences, Bangalore 560065

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ABSTRACT

Analysis of character association in the F_3 and F_4 generations of three sesame crosses revealed differences in mean and variance for maturity duration, primary branches, productive capsules and seed yield. The association between seed yield and number of capsules was highly positive and consistent over generations in all the crosses. Similarly, the positive association of primary branches with seed yield, number of capsules and days to maturity was also consistent over generations in all the three crosses. The association of seed yield with oil content which was generally nonsignificant indicated that selection cannot be practiced for oil improvement in segregating generations. Further, character pairs showing medium to moderate associations showed high degree of fluctuation in the correlation coefficients.

Key words: Character associations, segregating generations, sesame.

The release of concealed variation, which largely depends on the frequency of genetic recombination, determines the potential of a hybrid/segregating population. Further, the magnitude of variation for component characters and the differences in character association from generation to generation [1—3] are important from the point of handling the segregating populations. However, little information is available on these aspects in sesame. The present study has been undertaken to determine the magnitude of variation and shift in the nature and extent of character association in the segregating generations of three crosses of sesame.

MATERIALS AND METHODS

Based on the genetic and geographical diversity of the parents involved, three crosses were made in sesame: Jordan Early x E-8, C-7 x Kanakapura Local and (Jordan Early x

*Present address: Directorate of Oilseeds Research, Rajendranagar, Hyderabad 500030.

Kanakapura Local) x TNAU-2. In F2, 120 best plants out of one thousand plants were selected in each cross to raise the F3 generation as plant-to-row progeny in randomized block design with two replications. Further, 70 best plants selected from the best performing F3 progenies were used to raise F4 generation. The plots in each progeny were single rows of 3 m length. The recommended agronomic practices were followed to raise a healthy crop. The observations were recorded for five quantitative traits on 15 random plants from the center of the plot in each progeny (Table 1). The results were analyzed by standard statistical methods [4] to calculate mean and variability parameters. Simple correlation coefficients for various characters were computed in the F3 and F4 generations from the progeny means.

RESULTS AND DISCUSSION

The crosses studied in the present investigation exhibited differences for mean and variance in respect of maturity duration, number of primary branches, productive capsules and seed yield in F3 and F4 generations (Table 1). Mean values for productive capsules increased, reflecting response to selection, but variability narrowed down due to directed selection for seed yield. Further the superiority of medium duration sesame over late types, established in studies on sesame breeding [5] was also reflected in the present study in the higher means for productive capsules and lower means for maturity duration recorded in

Table 1. Mean and variance for yield and its component characters in 120 F3 and 70 F4 progenies of three crosses of sesame

Cross	Character	Mean ± SE		Phenotypic variance	
		F3	F4	F3	F4
Jordan Early x E-8	Days to maturity	94.6 ± 0.8	96.2 ± 0.8	80.3*	47.7*
	Primary branches	2.2 ± 0.1	2.1 ± 0.1	0.5*	0.3*
	Productive capsules	32.9 ± 1.0	34.0 ± 0.9	131.6*	67.6*
	Seed yield/plant (g)	3.5 ± 0.1	2.5 ± 0.1	2.3	0.8*
	Oil content (%)	43.8 ± 0.1	44.6 ± 0.2	1.8	2.4*
C-7 x Kanakpura Local	Days to maturity	100.0 ± 0.8	92.7 ± 0.7	80.1*	32.9*
	Primary branches	2.3 ± 0.1	2.6 ± 0.1	0.5*	0.4*
	Productive capsules	31.6 ± 1.1	37.0 ± 1.2	146.4*	112.4*
	Seed yield/plant (g)	3.6 ± 0.1	2.9 ± 0.1	2.5*	1.3*
	Oil content (%)	43.0 ± 0.1	44.9 ± 0.2	2.2*	2.2*
(Jordan Early x Kanakpura Local) x TNAU-2	Days to maturity	100.4 ± 0.7	95.0 ± 0.7	64.5*	34.6*
	Primary branches	2.5 ± 0.1	2.1 ± 0.1	0.6*	0.3*
	Productive capsules	33.6 ± 1.0	38.6 ± 0.8	117.7	50.4*
	Seed yield/plant (g)	3.8 ± 0.1	2.7 ± 0.1	1.8*	0.8*
	Oil content (%)	42.8 ± 0.2	44.4 ± 0.2	3.6*	2.5*

*Significant at 0.05 level.

Note. The variances are significantly different from their respective error variances.

F_4 as against F_3 for (Jordan Early x Kanakapura Local) x TNAU-2 and C-7 x Kanakapura Local. The cross C-7 x Kanakapura Local also exhibited higher variability for number of productive capsules and higher mean and greater variance for seed yield in F_4 compared to other crosses. Ranganatha [5] also reported the better response of the cross C-7 x Kanakapura Local to selection and generation of high proportion of promising progenies than in other hybrids of sesame.

Simple correlation coefficients were estimated for various agronomic characters in F_3 and F_4 generations (Table 2). Seed yield recorded consistently positive association with number of productive capsules in all the crosses and generations. Similar association for seed yield and capsule number was reported in pureline genotypes [6–8] and segregating

Table 2. Phenotypic correlation coefficients (r) between seed yield and its component characters in F_3 and F_4 progenies of three crosses of sesame

Cross	Character	Primary branches		Productive capsules		Oil content		Seed yield per plant	
		F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4
Jordan Early x E-8	Days to maturity	0.31^{**}	0.24^{**}	0.32^{**}	-0.26^{**}	-0.14^{**}	-0.21^{*}	0.29^{**}	-0.23^{**}
	Primary branches			0.58^{**}	0.46^{**}	0.09	0.12	0.49^{**}	0.47^{**}
	Productive capsules					0.01	0.14	0.83^{**}	0.84^{**}
	Oil content							-0.01	0.14
C-7 x Kanakpura Local	Days to maturity	0.44^{**}	0.46^{**}	0.64^{**}	0.24^{**}	-0.14^{*}	0.14	0.59^{**}	0.25^{**}
	Primary branches			0.54^{**}	0.62^{**}	-0.04	0.08	0.51^{**}	0.56^{**}
	Productive capsules					-0.06	0.07	0.90^{**}	0.91^{**}
	Oil content							0.06	0.07
(Jordan Early x Kanakpura Local) x TNAU-2	Days to maturity	0.36^{**}	0.51^{**}	0.33^{**}	0.14	0.10	-0.08	0.22^{**}	0.12
	Primary branches			0.38^{**}	0.56^{**}	0.17^{**}	0.04	0.32^{**}	0.48^{**}
	Productive capsules					0.14^{*}	0.35^{**}	0.73^{**}	0.77^{**}
	Oil content							0.08	0.29^{**}

*,**Significant at 0.05 and 0.01 levels, respectively.

generations [9] of sesame. Highly positive correlation was also observed between primary branches and seed yield in all the crosses which is in conformity with the studies on purelines [10, 11]. Further, positive correlation of primary branches with number of capsules and maturity was also consistent in all crosses over generations.

Days to maturity showed positive association with seed yield (r = 0.29) and capsule number (r = 0.32) in F_3 of the cross Jordan Early x E-8. However, it was negative (r = – 0.23 and – 0.26, respectively) in the F_4 progeny which may be due to elimination of late maturing types due to directed selection for seed yield and diversity of the parents for maturity duration. The parent E-8 is late and agronomically poor while Jordan Early though less adaptable to new agroclimate niches, has higher productivity. Similarly, in the cross (Jordan Early x Kanakapura Local) x TNAU-2, a reduction in the force of association (0.17–0.04) for primary branches with oil content may probably be due to higher levels of recombination. This is supported because it is a three ways cross and had recorded wider range and higher variance values for both the characters in the F_3. The trend for association between maturity and oil content also varied in the cross C-7 x Kanakapura Local and (Jordan Early x Kanakapura Local) x TNAU-2 indicating possibility of minor alterations.

The strength of association remained almost unchanged over the generations for some characters, while it varied in few other cases as the generations were advanced. The level of correlation may have increased due to higher degree of homozygosity in the latter generations [1]. It could also be a result of differences in the volume of material analyzed in different generations. On contrary, the higher correlations recorded in F_3 could also be partly due to environal influence or higher level of heterozygosity in the generation [2, 3]. Thus, the character pairs exhibiting moderate to low association fluctuated in degree and direction generally depending on the nature of segregating progenies. Similar fluctuations in direction and degree of association in segregating generations have been observed in chickpea [3]. The investigation suggests the possibility of guiding different types of character associations in the desired direction in the segregating material. Hence, formulation of selection strategy required careful consideration of the associations over different generations in a sesame improvement program.

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