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ASSOCIATION OF YIELD AND SOME PHYSIOLOGICAL TRAITS IN SESAME (*Sesamum indicum* L.)

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ABSTRACT

Correlation of yield and some physiological traits in sesame was estimated in six parents and their thirty hybrids which were obtained through a full diallel crossing programme. In general, the genotypic correlations were higher than phenotypic ones. Single plant yield had high positive association with harvest index, number of capsules and days to flowering both at phenotypic and genotypic level. The traits like days to first flowering, plant height, number of capsules and harvest index were mutually correlated with each other.

KEY WORDS : Sesame, physiological traits, harvest index, correlation

The area under sesame increased by 16 per cent steadily from 1978 onwards, but the increase in production has been only six per cent. Mehrota et al (1976) stated that the best prospect in breeding for higher yield in oil seed crops is offered by an insight into the physiological basis of seed yield. For yield improvement in sesame, efforts were concentrated mainly on improvement of morphological traits like plant height, number of primary branches, number of capsules and 1000 seed weight etc. Though physiological traits such as leaf area index, harvest index, stomatal conductance, and transpiration rate are the main components of yield, efforts made to utilise these characters in breeding programme are very limited. Hence in the present study an attempt was made to understand the existing relationship between yield characters and its component along with some physiological characters in sesame.

MATERIALS AND METHODS

The materials for the present study comprised of six parents and their thirty hybrids which were obtained through a full diallel crossing programme. All the 36 genotypes were raised in randomised block design with three replications at Agricultural College & Research Institute, Madurai during June, 1993. Each genotype was raised in two rows of 3m length adopting a spacing of 45 cm x 15 cm. The recommended cultural operations were followed. Data were recorded on ten randomly selected plants from each replication. Data on leaf temperature, transpiration rate and stomatal conductance were recorded at 13.00 to 14.00 hours from the third leaf at the time of 50 per cent flowering using LI 1600 steady state porometer. Leaf area was measured using leaf area meter Model LI 3000. The phenotypic and genotypic correlation co-efficients were computed following the standard statistical procedures (Singh and Chaudhary, 1979 and Deway and Lu. 1959).

RESULTS AND DISCUSSION

The co-efficient of correlation between the characters are presented in Table 1. The genotypic correlation co-efficients were higher than the phenotypic correlation co-efficients in general as reported by Chandrasekara and Ramana Reddy (1993). This indicated that low phenotypic correlations might be due to the masking or modifying effect of the environment in genetic association between characters (Johnson et al., 1955).

Association of single plant yield with other traits

A positive and significant association of seed yield with harvest index, number of capsules, leaf area index, and days to first flowering was observed both at genotypic and phenotypic levels (Table 1). Plant height had positive and significant association with single plant yield at genotypic level only. These findings are in agreement with those of the earlier workers who found a positive association between single plant yield and days to first flowering (Balan, 1994) ; plant height (Osmar and Sheik, 1989) ; number of capsules (Ding et al., 1988) and harvest index (Chandrasekara and Ramana Reddy 1993).

A positive and significant association was exhibited by leaf area index and harvest index with

Table 1. Genotypic and phenotypic correlation coefficient (r) for the association of characters.

Parents		Plant height	No. of primary branches	No. of capsules	Oil percent	Stomatal conduc-tance	Transpira-tion rate	Leaf tempera-ture	Leaf area index	Harvest index	Single plant yield
		2	3	4	5	6	7	8	9	10	11
1	G	0.335*	0.165	0.562**	-0.165	-0.729**	-0.231	-0.738**	0.265	0.463**	0.514*
	P	0.259	0.176	0.491**	-0.150	-0.614**	-0.194	0.618**	0.227	0.403*	0.436*
2	G		-0.128	0.312	-0.183	-0.282	0.194	0.168	-0.031	0.339*	0.350*
	P		0.046	0.284	-0.162	0.255	0.159	0.176	-0.027	0.284	0.294
3	G			0.062	-0.238	0.067	0.026	0.009	0.016	0.319*	0.266
	P			0.026	-0.122	0.022	0.037	0.042	0.003	0.214	0.171
4	G				0.159	-0.302	-0.116	0.305	0.384*	0.502**	0.627*
	P				0.161	-0.292	-0.111	0.284	0.373	0.475**	0.599*
5	G					0.385*	0.094	- 0.228	-0.093	-0.034	0.145
	P					0.376*	0.087	- 0.215	0.091	-0.029	0.143
6	G						0.433**	- 0.627**	-0.087	-0.084	-0.114
	P						0.406*	- 0.578**	-0.078	-0.079	-0.104
7	G							- 0.090	-0.083	0.127	0.180
	P							- 0.102	-0.074	0.122	0.162
8	G								0.103	0.285	0.244
	P								0.082	0.265	0.223
9	G									0.543**	0.508*
	P									0.485**	0.460*
10	G										0.900*
	P										0.858*

* 5% Significance ; ** 1% Significance ; 1 Days to first flowering

yield. This would indicate the significant effect of photosynthesis and translocation from source (Reddy and Haripriya, 1991). This fact immensely helps the breeder to formulate a breeding programmes. Breeding for high leaf area index, increased the photosynthetic rate which inturn enhances the harvest index. Improvement in leaf are index and harvest index finally resulted in high yield per plant. When attention was betowed for increasing the leaf area index, the breeder must take care of the position of leaf in harnessing the solar radiation. Vertically inclined leaves have higher photosynthetic rate because they trap more sunlight when the sun at high elevation during noon hours (Gupta, 1992). Watson and Wits (1959) also observed that varieties which are having more inclined leaves also have high harvest index. Hence to improve harvest index, the vertically inclined leaves were highly indispensible.

Inter relationship among yield and some physiological traits.

Inter relationship was quite interesting to observe. The days to first flowering, plant height, number of capsules and harvest index. Plant height showed a positive and significant association with number of capsules and harvest index. Number of capsules had positive and significant relationship with leaf area index and harvest index. Similar result was observed by Chandrasekara and Ramana Reddy (1993). Therefore improvement in any one of the four character would offer scope for simultaneous improvement in all the four characters in addition to improving the yield.

High harvest index indicates the efficiency of the cultivars in making use of the nutrients and also the physiological capacity to convert the total photosynthate in to economic products (Gupta, 1992). The high correlation of harvest index with major important components of yield like plant height, number of primary branches, number of capsules and leaf area index was observed in the present investigation. Stomatal conductance had positive and significant association with transpiration rate and negative association with leaf temperature. Similar result was obtained by Shaobing peng and Krieg (1992). Buttery et al., (1993) reported that increased transpiration rate is due to increased stomatal conductance.

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GENETIC COMPONENTS OF VARIATION IN UPLAND COTTON (*G. hirsutum* L)

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ABSTRACT

A ten parent diallel cross analysis involving bollworm tolerant donor lines of upland cotton was studied for component of variance analysis for seven traits. Both additive and non-additive gene action were important for all the traits except seed index. However the role of dominance was major for all the traits studied. Dominance was ambidirectional for all the traits studied. Epistasis influenced the performance of number of bolls and seed cotton yield. Narrow sense heritability was high for days to 50 per cent flowering, boll number and seed cotton yield/plant while moderate for boll weight, seed index, lint index and ginning percentage. The number of genes controlling inheritance of the traits were established. Any form of recurrent selection may be followed for exploiting all the three types of gene actions.

KEY WORDS : Diallel analysis, upland cotton, heritability, genetic components, bollworm.

INTRODUCTION :

Though several reports on the nature of gene action involved in the inheritance of yield and its component traits are available in literature, understanding of genetic architecture of every material is essential for planning a sound breeding programme for attaining genetic improvement in cotton. Henjce studies were undertaken to elicit information on the genetics of yield and its attributes in cotton.

MATERIALS AND METHODS

The investigations were carried out at Regional Agricultural Research Station, Lam Farm, Guntur during Kharif 1992-93 and 1993- 94. Ten bollworm tolerant donor lines which were procured from CICR, Nagpur were involved crosses in diallel