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COMBINING ABILITY ANALYSIS FOR STRAW, SEED YIELDS AND THEIR COMPONENTS IN FLAX.

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ABSTRACT

This study was conducted with the objective of estimating combining ability and gene action for straw and seed yields and their components in flax. This was achieved via evaluating six parents {P_1(Giza 7), P_2(Giza 8), P_3(S.329/2/23/6), P_4(S.402/3/3/10), P_5 (S.421/43/14/10) and P_6 (Ariane)}and their 15 F_1's in a randomized complete block design with four replications at Giza Res. Station of the ARC. The collected data indicated that the non-additive effects were more important than additive effects for straw yield per plant whereas, the additive effects were more important than non-additive effects for both plant height and technical length. $P_1$and P_6 for plant height and technical length exhibited significantly positive GCA effects, indicating the possibility of using these parents for improving plant height and technical stem length. One cross (P_4xP_6) exhibited significant and positive SCA effects for straw yield and its two components viz., plant height and technical length. The ratio of GCA/SCA for seed yield, number of seeds per capsule and 1000-seed weight. revealed that the inheritance of these traits were mainly controlled by additive effects of genes. These genotypes *i.e.*P_2,P_3 and P_4 showed significant and positive GCA effects for seed yield, number of capsules per plant and 1000-seed weight. Whereas, P_3 and P_6 were good combiners for number of seeds per capsule. In general, P_3 proved to be a good combiners for seed yield and its all components. One cross (P_1xP_4) showed significant positive SCA values for both seed yield and number of seeds per capsule and two crosses (P_2xP_6 and P_3xP_5) for number of capsules per plant and 1000-seed weight. Phenotypic and genotypic correlation coefficients among eight traits indicated that, straw yield per plant was significantly positively correlated with number of basal branches. Also, the significant positive correlation between plant height and technical length was present. Moreover, seed yield exhibited significantly positive correlated with two components viz., number of capsules per plant and 1000-seed weight. Also, number of capsules per plant showed positive correlation with 1000-seed weight.

Keywords: *Flax, Diallel analysis, Combining ability, Gene action.*

INTRODUCTION

An important task for the breeder is to choose parents, which will combine to give superior progeny. Several guidelines for parental choice have been used with some success in developing cultivars superior for highly heritable traits. However, if the trait to be improved is not highly heritable, methods of choosing superior parents have been at best only moderately successful. Two general criteria used for yield are, high mean yield and diversity in pedigree between parents. The lack of precise methods for choosing parents is one reason why few crosses ever result in the release of a new cultivar. If prediction of superior crosses could be based on some parental information, development of pure line cultivars could be much more efficient than is now possible.

The diallel cross technique proposed by Griffing (1956) has been widely used for evaluation general combining ability (GCA) due to additive gene action and specific combining ability (SCA) due to non-additive gene effects.

Several workers studied the use of diallel analysis for evaluating the potentiality of parents for producing desirable recombination's in flax. The additive genetic variance had more important role in the inheritance of straw yield, plant height, technical length, seed index as reported by Singh *et al.* (1987), Thakur *et al.* (1987), Sharma *et al.* (1986), Gaafar *et al.* (1992), Patil *et al..* (1997), Foster *et al..* (1998), Abo-Kaied (1999), Singh (2000) and Abo-Kaied (2002). ON the contrary, non-additive variance had an important role in the inheritance of No. of basal branches/plant, seed yield per plant and capsules/plant as reported by Murty and Anand (1966), Badwal and Gupta (1970), Shehata and Comstock (1971), Badwal *et al.* (1972), Patil and Chopde (1983), Singh *et al.* (1983), Roa and Singh (1987), Thakur and Rana (1987) and Mishra and Rai (1996).

It is well known, seed and straw yields are complex characters due to their high interaction with environmental conditions. Furthermore, these complex characters depend on other several attributes, which differed in their relative importance to seed and straw yields. Momtaz *et al.* (1977) found that the number of capsules per plant seems to be the simplest character for any flax breeder if selection is for high seed yield. Different associations between seed, straw yields and their component traits have been reported by Momtaz, 1965;El-Shimy, 1975; Mourad *et al.*, 1987; Sabh, 1989; and Abo-Kaied, 1992.

This investigation aimed to estimate the combining ability of six parents and the type of gene action for yield and yield components with an ultimate goal of selecting suitable parents and the superior crosses which can be used in breeding program as well as estimating phenotypic and genotypic correlation coefficients between seed, straw yields and related characters.

MATERIALS AND METHODS

The materials used for the present study consisted of 6 parents {two commercial varieties viz., P_1 (Giza 7) and P_2 (Giza 8) and four promising strains of flax: P_3 (S.329/2/23/6), P_4 (S.402/3/3/10), P_5 (S.421/43/14/10) and P_6 (Ariane)}. In 2001/02 season, the six parents were crossed in a diallel mating design excluding reciprocals to obtain 15 F_1 crosses. In 2002/03 season, the parents and their 15 F_1's seeds were evaluated in the breeding nursery of Fiber Crops Res. Section, ARC at Giza.

The experiment was laid out in a randomized complete block design with four replications with restricted randomization where each plot consisted of single F_1 row, which were guarded by their two respective parents of the cross. Rows were 3 m long, spaced 20 cm apart. Single seeds were hand drilled in 5 cm spacing within rows. At harvest, individual guarded plants were taken at random from each row; 10 plants for both of parent and F_1 per each replication. These plants were used for recording: straw yield / plant, plant height, technical stem length, No. of basal branches, seed yield / plant, 1000-seed weight, No. of capsules / plant, and No. of seeds / capsule.

Statistical analysis

Plot means were used for statistical analysis. Combining abilities, general (GCA) and specific (SCA) were calculated according to Griffing's method 2 (parents and one set of F_1's are included) assuming, model 1 (fixed effects).

Phenotypic (r_p) and genotypic (r_g) correlation coefficients were calculated according to the formula suggested by Al-Jibouri *et al.* (1958).

RESULTS AND DISCUSSION

Straw yield and its components:

Analysis of variances:

Mean squares due to 21 genotypes (6 parents and 15 crosses) were significant for straw yield and its components viz., plant height, technical length and number of basal branches per plant (Table1). Also, general (GCA) and specific (SCA) combining ability variances for these traits were significant, indicating the presence of both additive and non-additive type of genetic variance.

Table 1.Mean squares for 21 genotypes (parents and crosses), general (GCA) and specific (SCA) combining ability for straw and seed yields and their components in flax

		Straw yield and its components				Seed yield and its components			
S.O.V.	**df**	Straw yield / plant (g)	Plant height (cm)	Technical length (cm)	No. of basal branches	Seed yield/ plant (g)	No. of capsules/plant	No. of seeds/capsule	1000-seed weight
Replications	3	0.280	44.550	27.020	0.180	0.050	67.990	0.360	0.480
Genotypes	20	5.000**	509.480**	229.720**	1.060**	1.220**	319.100**	2.820**	6.820**
crosses(C)	14	6.432**	461.377**	163.068**	1.351**	0.850**	346.816**	2.575**	5.104**
parents (P)	5	1.919	648.566**	397.700**	0.301*	2.277**	211.263**	3.362**	12.534**
P.*vs*.C	1	0.328	487.543**	323.008**	0.684*	1.069**	470.193**	3.556**	2.230**
GCA	5	0.829*	353.219**	136.661**	0.440**	0.898**	123.243**	1.586**	5.952**
SCA	15	1.390**	52.088**	31.021**	0.205**	0.107**	65.284**	0.412**	0.289**
Error	60	1.110	23.290	11.140	0.110	0.100	41.140	0.420	0.200
GCA/SCA %		0.596	6.781**	4.405*	2.146	8.393**	1.888	3.850*	20.595**

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

The ratio of general to specific combining ability variances for straw yield per plant showed that the non-additive effects were more important than additive effects. Although SCA mean squares were significant for plant height and technical length, the magnitude of GCA mean squares were several times greater than SCA mean squares for these two important components of straw yield. Therefore, the magnitude of additive genetic effects must be of considerable value for each character. Consequently, effective selection should be possible within these F_2 and subsequent populations for these two traits. Similar results were reported by Singh *et al.* (1987), Thakur *et al.* (1987), Sharma *et al.* (1986), Gaafar *et al.* (1992), Patil *et al.* (1997), Foster *et al.* (1998), Abo-Kaied (1999), Singh (2000) and Abo-Kaied (2002).

GCA effects:

The estimates of GCA effects are presented in Table 2. Two parents *i.e* P_1 (Giza7) and P_6 (Ariane) showed high general combining ability for plant height and technical length. The next high combiner was P_1(Giza7) for straw yield per plant, suggesting the importance of these two parents (P_1 and P_6) for increasing plant height and technical length as well as P_1(Giza7) for improvement straw yield per plant in flax breeding programs. Also, P_2(Giza8) and P_3(339/2/23/6) showed highly significant and positive GCA effects for basal branches per plant. Whereas, P_4 and P_5 for straw yield, P_2, P_3 and P_5 for plant height, P_3 and P_5 for technical length and P_4 and P_6 for number of basal branches per plant exhibited significant and negative GCA effects.

Table 2. Estimation of general combining ability effects ($\hat{g}_i$) and mean performance ($\bar{x}$) for straw and seed yields and their components for 6-parents diallel cross in flax .

Parents	Straw yield and its components							
	Straw yield / plant(g)		Plant height (cm)		Technical length (cm)		No. of basal branches	
	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$
P1=Giza7	10.81 a	0.304 *	102.80 b	1.590 *	70.20 a	2.179 **	2.27 a-c	0.06
P2=Giza8	10.52 ab	0.159	85.07 d	-4.972 **	57.40 c	-2.565 **	2.33 ab	0.27 **
P3=329/2/23/6	10.41 ab	0.133	80.21 d	-6.061 **	50.22 d	-3.342 **	2.54 a	0.148 **
P4=402/3/3/10	9.22 b	-0.412 *	86.28 d	-0.664	51.48 d	-2.823	1.84 c	-0.28 **
P5=421/43/14/10	9.23 b	-0.405 *	93.27 c	-2.202 **	64.20 b	-0.817 **	2.13 a-c	0.10
P6=Ariane	10.40 ab	0.220	114.10 a	12.308 **	74.53 a	7.368 **	1.87 bc	-0.30 **
Mean	10.10		93.62		61.34		2.16	
LSD (g_i-g_i) 5%	0.531		2.438		1.886		0.170	
1%	0.711		3.262		2.256		0.227	
r	**0.99 ****		**0.94 ****		**0.92****		**0.89****	

Parents	Seed yield and its component							
	Seed yield/plant (g)		No. of capsules/plant		No. of seeds/capsule		1000-seed weight	
	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$	$\bar{x}$	$\hat{g}_i$
P1=Giza7	3.48 c	-0.068	67.35 a	-4.750 **	6.44 d	-0.499 **	8.34 b	-0.118
P2=Giza8	4.51 a	0.265 **	70.19 a	3.253 **	7.07 b-d	-0.138	9.66 a	0.481 **
P3=329/2/23/6	4.51 a	0.360 **	68.80 a	3.466 **	7.92 b	0.212 *	10.06 a	0.731 **
P4=402/3/3/10	3.94 b	0.184 **	70.42 a	2.286 *	6.96 cd	-0.074	9.61 a	0.699 **
P5=421/43/14/10	3.30 c	-0.215 **	69.75 a	0.839 **	7.58 bc	-0.274 *	7.86 b	-0.246 **
P6=Ariane	2.57 d	-0.526 **	51.71 b	-5.093	9.05 a	0.773 **	5.30 c	-1.546 **
Mean	3.72		66.37		7.50		8.47	
LSD (g_i-g_i) 5%	0.160		3.241		0.328		0.224	
1%	0.214		4.336		0.439		0.299	
r	**0.98 ****		**0.72**		**0.93 ****		**0.99 ****	

*,** Significant at 0.05 and 0.01 levels of probability, respectively.
r : Simple correlation coefficients between GAC values and parental means .
The values identified by the same letter are not significantly different at 5 % level of probability .

The simple correlation between GCA Values and parental means for straw yield per plant and its components were significantly positive. Similar findings were reported by Abo-Kaied 2002 in flax. These results indicated that the parents showing higher mean performance proved to be the highest general combiners for these traits. Therefore, high mean performance of the parents could be transferred to hybrids in such cases.

SCA effects:

Table (3) shows specific combining ability effects for straw yield per plant and its components. Out of the 15 F_1 crosses, only three crosses: $P_1 \times P_2$, $P_3 \times P_5$ and $P_4 \times P_6$ showed highly significant positive SCA effects for straw yield per plant. P_4xP_6 also, showed high SCA effects in the desirable direction for both plant height and technical length. Four crosses ($P_1 \times P_2$, $P_2 \times P_5$,$P_2 \times P_6$ and $P_3 \times P_5$) indicated high SCA effects for number of basal branches per plant.

stimation of specific combining ability effects($\hat{s}_{ij}$) and mean performance ($\bar{x}$)for straw yield and its components for 15 F_1 flax crosses.

Crosses	Straw yield / plant(g)		Plant height (cm)		Technical length (cm)		No of basal branches	
	$\bar{x}$	$\hat{s}_{ij}$	$\bar{x}$	$\hat{s}_{ij}$	$\bar{x}$	$\hat{s}_{ij}$	$\bar{x}$	$\hat{s}_{ij}$
P_1xP_2	12.51 a	**1.852** **	86.60 b-e	**0.171**	57.33 cd	**-0.519**	3.24 ab	**0.597** **
P_1xP_3	11.48 a-c	**0.841**	85.43 b-e	**0.093**	58.83 c	**1.757**	2.78 bc	**0.259**
P_1xP_4	9.79 ef	**-0.299**	89.87 bc	**-0.869**	57.00 cd	**-0.594**	2.07 e-g	**-0.018**
P_1xP_5	8.47 f	**-1.632** **	67.56 g	**-21.637** **	43.20 f	**-16.400** **	1.96 fg	**-0.503** **
P_1xP_6	9.95 d-f	**-0.777**	106.33 a	**2.624**	68.33 a	**0.548**	2.07 e-g	**-0.006**
P_2xP_3	8.76 f	**-1.729** **	76.13 f	**-2.645**	52.93 de	**0.601**	2.47 c-e	**-0.255**
P_2xP_4	10.38 c-e	**0.437**	82.47 d-f	**-1.707**	51.13 e	**-1.718**	2.20 d-f	**-0.091**
P_2xP_5	9.47 ef	**-0.481**	81.50 ef	**-1.140**	50.35 e	**-4.506** **	3.12 ab	**0.451** **
P_2xP_6	10.49 c-e	**-0.089**	92.07 b	**-5.079** *	60.60 bc	**-2.441**	2.60 cd	**0.320** *
P_3xP_4	9.43 ef	**-0.485**	82.73 d-f	**-0.353**	52.93 de	**0.859**	1.80 fg	**-0.370** *
P_3xP_5	12.29 ab	**2.365** **	84.33 c-e	**2.785**	56.45 cd	**2.366**	3.56 a	**1.008** **
P_3xP_6	9.67 ef	**-0.882**	91.14 bc	**-4.915** *	59.36 bc	**-2.907**	1.64 g	**-0.515** **
P_4xP_5	8.62 f	**-0.757**	88.73 b-d	**1.788**	57.27 cd	**2.669**	2.20 d-f	**0.082**
P_4xP_6	11.41 a-d	**1.403** **	107.00 a	**5.546** *	63.79 ab	**1.004** *	1.93 fg	**0.203**
P_5xP_6	10.84 b-e	**0.825**	102.40 a	**2.483**	65.47 a	**0.679**	1.80 fg	**-0.307** *
Mean	**10.24**		**88.29**		**57.00**		**2.36**	
LSD(S_{ij}-S_{ik}) 5%		1.406		6.451		4.461		0.449
1%		1.881		8.631		5.969		0.600
r		**0.953 ****		**0.680 ****		**0.640 ****		**0.889 ****

P1=Giza7 P2=Giza8 P3=329/2/23/6 P4=402/3/3/10 P5=421/43/14/10 P6=Ariane
r : Simple correlation coefficients between SCA values and means of crosses.
The values identified by the same letter are not significantly different at 5 % level of probability .

In general, one cross (P_4 x P_6) exhibited significant and positive SCA effects for straw yield and its two components viz., plant height and technical length. This cross (P_4xP_6) involved high x low general combiners for these traits (straw yield, plant height and technical length). Therefore, the cross

P_4xP_6 is likely to give good segregates for these traits if the allelic genetic systems are present in good combination and epistatic effects present in the crosses act in the same direction as to maximize the desirable characteristics. Therefore, the cross P_1xP_6 may prove useful for simultaneous improvement of these traits. The importance of epistatic effects in the genetic control of these traits. The correlation between cross means and their SCA values was significant and positive indicating that high performing crosses were high specific combinations. Therefore, the choice of promising cross combination would be based on SCA effects.

Seed yield and its components:

Analysis of variances:

Analysis of variances combining ability showed highly significant mean squares for both general and specific combining ability (Table1), revealing the important role of both additive and non-additive effects in the expression of seed yield and its components. A very high ratio of GCA/SCA were also detected for seed yield (8.39), number of seeds per capsule (3.85) and 1000-seed weight (20.60). these results revealed that the inheritance of these traits were mainly controlled by additive effects of genes. Murty and Anand,1966; Badwal and Gupta,1970; Shehata and Comstock,1971; Badwal *et al...*,1972; Patil and Chopde,1983; Singh *et al...*,1983; Roa and Singh,1987; Thakur and Rana 1987 and Mishra and Rai,1996 reported similar results in combining ability for these traits in flax.

GCA effects:

Estimates of GCA effects for each parents and their mean performance are presented in Table 2. The data indicated that P_2 (Giza8), P_3 (329/2/23/6) and P_4 (402/3/3/10) showed significant and positive GCA effects for seed yield and two components viz., number of capsules per plant and 1000-seed weight. Whereas, P_3(329/2/23/6) and P_6 (Ariane) were good combiners for number of seeds per capsule. In general, P_3(329/2/23/6) proved to be good combiner for all traits. Using such parents in varietal important programs my result in isolating desirable segregates for these trait owing to the breeders desire. the correlation coefficient between GCA Values and parental means for seed yield per plant, number of seeds per capsule and 1000-seed weight were significantly positive. Similar findings were reported by Abo-Kaied 2002 in flax. These results indicated that the superiority of a parent in cross combinations could be directly predicted its *per se* performance.

SCA effects:

Specific combining ability effects calculated for each cross and their mean performance are presented in Table (4). The data showed that two crosses($P_1\times P_4$ and $P_5\times P_6$) exhibited significant positive SCA values for seed yield per plant, three crosses ($P_2\times P_4$, $P_2\times P_6$ and $P_3\times P_5$) for number of capsules per plant, one cross (P_1xP_4) for number of seeds per capsule and four crosses ($P_1\times P_6$, $P_2\times P_6$, $P_3\times P_5$ and $P_4\times P_5$) for 1000-seed weight exhibited significant positive SCA values. In general one cross (P_1xP_4) showed significant positive SCA values for both seed yield/plant and number of seeds per capsule and two crosses (P_2xP_6 and P_3xP_5) for number of capsules per plant and 1000-seed weight. The correlation between cross means and their SCA values was significant and positive for both of number of capsules per plant and number of seeds per capsule, indicating that high performing crosses were high specific combinations for these traits. Therefore, the choice of promising cross combination would be used on SCA effects.

stimation of specific combining ability effects($\hat{s}_{ij}$) and mean performance ($\bar{X}$) for seed yield and its components for 15 F_1 flax crosses.

Crosses	Seed yield/plant (g)		No. of capsules/plant		No. of seeds/capsule		1000-seed weight	
	$\bar{X}$	$\hat{S}_{ij}$	$\bar{X}$	$\hat{S}_{ij}$	$\bar{X}$	$\hat{S}_{ij}$	$\bar{X}$	$\hat{S}_{ij}$
P_1xP_2	3.62 b-e	**-0.118**	62.15 d-f	**-6.460** *	6.93 c-e	**0.392**	9.38 de	**0.287**
P_1xP_3	3.93 b	**0.094**	73.63 bc	**4.807**	6.77 de	**-0.118**	9.30 de	**-0.039**
P_1xP_4	4.32 a	**0.665** **	66.13 c-e	**-1.513**	7.67 a-d	**1.068** **	9.52 c-e	**0.211**
P_1xP_5	2.67 h	**-0.583** **	54.28 f	**-11.916** **	5.32 g	**-1.082** **	7.58 f	**-0.789** **
P_1xP_6	2.73 gh	**-0.212**	61.87 ef	**1.601**	6.67 ef	**-0.780** **	7.71 f	**0.644** **
P_2xP_3	3.90 bc	**-0.268**	73.47 bc	**-3.361**	7.64 a-d	**0.389**	9.06 e	**-0.883** **
P_2xP_4	3.73 b-d	**-0.262**	88.87 a	**13.218** **	6.58 ef	**-0.386**	10.10 a-c	**0.192**
P_2xP_5	3.48 c-f	**-0.110**	77.49 b	**3.291**	5.77 fg	**-0.998** **	8.96 e	**-0.003**
P_2xP_6	3.16 e-g	**-0.117**	74.43 bc	**6.163** *	8.08 a	**0.270**	8.13 f	**0.467** *
P_3xP_4	3.83 bc	**-0.250**	73.07 bc	**-2.794**	6.91 c-e	**-0.403**	10.46 a	**0.304**
P_3xP_5	3.78 b-d	**0.094**	89.67 a	**15.253** **	7.07 b-e	**-0.048**	10.25 ab	**1.036** **
P_3xP_6	3.20 ef	**-0.175**	71.07 b-d	**2.587**	7.70 a-c	**-0.463**	7.76 f	**-0.153**
P_4xP_5	3.34 d-f	**-0.165**	68.73 b-e	**-4.503**	6.72 e	**-0.110**	9.75 b-d	**0.564** **
P_4xP_6	3.15 fg	**-0.049**	71.43 bc	**4.127**	7.86 ab	**-0.020**	7.64 f	**-0.243**
P_5xP_6	3.18 ef	**0.385** **	67.80 c-e	**1.944**	8.01 a	**0.336**	6.89 g	**-0.049**
Mean	3.47		71.61		7.05		8.83	
LSD(S_{ij}-S_{ik})								
5%		0.423		8.574		0.868		0.592
1%		0.566		11.472		1.161		0.792
r		**0.512**		**0.871** **		**0.749** **		**0.411**

P1=Giza7 P2=Giza8 P3=329/2/23/6 P4=402/3/3/10 P5=421/43/14/10 P6=Ariane
r : Simple correlation coefficients between SCA values and means of crosses.
The values identified by the same letter are not significantly different at 5 % level of probability .

Covariability:

Phenotypic (r_p) and genotypic (r_g) correlation coefficients among eight traits in flax are shown in Table 5. Straw yield /plant was significantly positively correlated with number of basal branches. Also, the significant positive correlation between plant height and technical length was present, indicating that maximization of straw yield may be obtained by selection for this trait. Moreover, seed yield was significantly positively correlated with two components viz., number of capsules per plant and 1000-seed weight. Also, number of capsules per plant showed positive correlation with 1000-seed weight. These results are in harmony with those reported by Momtaz,1965; El-Shimy,1975; Momtaz *et al.*,1977; Mourad *et al.*,1987; Sabh,1989; and Abo-Kaied, 1992. These results indicated that number of capsules per plant and 1000-seed weight are the main component for seed yield per plant.

In general, these results indicate that the flax breeder must give priority to selection for increased number of basal branches to increase straw yield per plant, and both of number of capsules and 1000-seed weight to improve seed yield per plant in flax.

Table 5. Phenotypic (r_p) and genotypic (r_g) correlation coefficients among eight traits for 21 (6 parents and 15 crosses) flax genotypes.

		Plant height (cm)	Technical length (cm)	No. of basal branches	Seed yield/ plant (g)	No. of seeds/ capsule	No. of capsules/ plant	1000-seed weight
Straw yield / plant(g)	r_p	0.315	0.339	0.528*	0.139	0.233	0.225	0.052
	r_g	0.442	0.421	0.502	-0.101	0.271	-0.203	-0.109
Plant height (cm)	r_p		0.941**	-0.330	-0.464*	-0.304	0.552**	-0.645**
	r_g		0.874	0.221	-0.307	-0.045	-0.101	0.037
Technical length (cm)	r_p			-0.214	-0.427	-0.306	0.545*	-0.634**
	r_g			0.204	-0.201	-0.231	0.437	-0.241
No. of basal branches	r_p				0.298	0.429	-0.243	0.427
	r_g				0.345	0.451	0.107	0.411
Seed yield/plant (g)	r_p					0.440*	-0.008	0.797**
	r_g					0.502	-0.021	0.551
No. of capsules/plant	r_p						-0.137	0.621**
	r_g						-0.257	0.486
No. of seeds/capsule	r_p							-0.390
	r_g							-0.447

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

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القدرة علي الائتلاف والفعل الجيني لمحصولي القش والبذرة ومكوناتهما في الكتان

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أجريت هذه الدراسة بهدف تقدير القدرة علي الائتلاف والفعل الجيني لمحصولي القش والبذرة ومكوناتهما في الكتان من خلال تقييم 15 هجين ناتجة من التهجين بين ستة أباء(1=جيزة7، 2= جيـــــزة 8 ، 3= س 6/23/2/329 ، 4= س 10/3/3/402 ، 5= س14/43/421/ 10، 6= اريانا) باستعمال نظام التزاوج النصف دائري . في موسم 2002 /2003 تم تقييم الآباء والهجن في الجيل الأول في حقل تربية الكتان بمركز البحوث الزراعية بالجيزة في تجربة قطاعات كاملة العشوائية ذات أربعة مكررات.

وتشير النتائج إلى أن تأثير العوامل الوراثية غير المضيفة أكبر من المضيفة في توريث صفة محصول القش/نبات، بينما العوامل الوراثية المضيفة كانت أكثر أهمية في توريث صفتي الطول الكلي والطول الفعال ، كما تشير النتائج إلى أن الأبويين جيزة 7، واريانا أظهرا قدرة عامة عالية علي الائتلاف لصفتي الطول الكلى والطول الفعال. كما تشير النتائج إلى أن هجين واحد فقط (جيزة7x س10/3/3/402) أظهر تفوقاً في القدرة الخاصة علي الائتلاف لصفات محصول القش/نبات واثنين من مكوناته هما الطول الكلي/نبات والطول الفعال، كما تشير النتائج الخاصة بمحصول البذرة ووزن الألف بذرة وعدد البذور/كبسولة إلى أن العوامل الوراثية المضيفة كانت أكثر أهمية من غير المضيفة في توريثها ، كما تشير تقديرات القدرة العامة علي الائتلاف الي أن الأباء (جيزة 8 ، س 6/23/2/329 ، س1/3/3/402) لها قدرة عالية علي الائتلاف لصفات محصول البذرة ووزن الألف بذرة وعدد الكبسولات/نبات بينما الأبوين س 6/23/2/329 ، اريانا أظهرا قدرة عالية علي الائتلاف لصفة عدد البذور/كبسولة. وبصفة عامة الأب س 6/23/2/329 والذي أظهر قدرة عالية علي الائتلاف لصفات محصول البذرة ومكوناته، كما تشير النتائج إلى أن الهجين جيزة 7 x س 10/3/3/402 أظهر قدرة خاصة علي الائتلاف لصفتي عدد الكبسولات/ نبات ووزن الألف بذرة

كما تشير نتائج الارتباط الظاهري والوراثي بين الـ8 صفات المدروسة أن هناك ارتباط موجب ومعنوي بين محصول القش وعدد الأفرع القاعدية كذلك هناك ارتباط موجب بين كل من الطول الكلى والطول الفعال، بينما اظهر محصول البذور/ نبات أظهر ارتباطاً معنوياً وموجباً بين أثنين من مكوناته هما عدد الكبسولات/نبات ووزن الألف بذرة، كذلك كان هناك ارتباط موجب ومعنوي بين عدد الكبسولات/ نبات ووزن الألف بذرة .