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BREEDING FOR SOME ECONOMIC CHARACTERS IN CHILI PEPPER

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ABSTRACT

The present study was carried out during the period from 2017 to 2020 under unheated greenhouse at the Experimental Farm (Kaha), Horticultural Research Institute ARC, Egypt. Six diverse lines of hot pepper, viz., P1 (C11), P2 (H 2), P3 (R 27), P4 (C4), P5 (H17) and P6 (C6) were produced by the author of the present study via selfing. The six lines were crossed in a half diallel mating to produce 15 F_1 hybrids without reciprocals to estimate combining ability (general and specific) and heterosis percentage relative to both mid and better parents for some characters in pepper . Substantial mid-parent heterosis (MP) and high-parent (Heterobeltiosis) were obtained for the majority of studied characteristics. Mid- parent heterosis gave high and positive heterosis for average fruit weight, while heterobeltiosis was high and negative for fruit length, total soluble solids (TSS) and total yield but for plant height it had low percentage. Among the parents P_3 was good general combiner and could be used to improve these traits in pepper breeding programs by the accumulation of favorable genes. The cross ($P_1 \times P_6$) achieved high (SCA) effects for all studied traits.

Key words: ***Chili pepper, Capsicum annuum, heterosis**, **potence ratio, GCA, SCA.***

INTRODUCTION

Pepper (*Capsicum annuum* L.) is one of the most important crops of the *Solanaceae*, which is widespread due to its high nutrition value and the taste of the fruits. Pepper is cultivated globally for their medicinal, nutritional and ornamental uses (Bosland and Votava, 2012). it is one of the most important vegetable crops in Egypt.. Rajesh and Gulshan (2001) evaluated 28 F_1 hybrids of pepper for fresh fruit yield per plant, number of fruits per plant fruit length and plant height. They found that significant heterosis over MP, better parent (BP) and stander parent (SP) was observed for the number of fruits per plant and fresh fruit yield per plant. Sousa and Maluf (2003) evaluated the combining ability for yield and yield contributing characters in *C. annuum*. They found that (GCA) and (SCA) were significant for most of the characters studied, non-additive genetic effects were greater than additive effects for total yield. Geleta and Labuschagne (2004) reported that mid- parent heterosis (MPH) and standard heterosis (SH) were high and positive for fruit yield, plant height, fruit diameter, fruit weight, pericarp thickness and fruit number per plant. Positive better parent heterosis (HPH) was observed for fruit yield per plant and plant height. Millawithanachchi *et al* (2006) reported that high heterobeltiosis was observed for total yield (113.24%), while heterosis for total number of fruits and average fruit weight percentage was low. Khalil *et al* (2008) found that the effects of specific combining ability (SCA) were positive and significant for all traits and were represented by combine 2 the two errors of MS x 26 and N x 18, except for plant height at flowering.

Soliman and Khafagi (2017) reported that both general combining ability (GCA) and specific combining ability (SCA) effects were significant for all studied traits except SCA effects in fruit shape index suggesting the presence of both additive and non-additive gene effects in the inheritance of studied characters. Soliman *et al* (2019) stated that significant differences among crosses were observed in mean performance for all studied characters and most of the traits exhibited significant hybrid vigor in some of crosses based on the mid - parent (MP) and better - parent (BP). Local pepper varieties have very low yield potential. Hybrid pepper has a significant heterosis, the average yield of hybrids is 30% more than common cultivars and has better fruit quality. The present study was undertaken the possibility of obtaining superior hybrids, as compared to pure-line varieties.

MATERIALS AND METHODS

The present study was carried out from 2017 to 2020 at Kaha Research Farm, Kaliobia Governorate under unheated plastic house (9 m × 50 m). Six diverse lines of hot pepper, viz., P1 (C11), P2 (H 2), P3 (R 27), P4 (C4), P5 (H17) and P6 (C6) were produced by the author of the present study in a breeding program by selfing. Parents were crossed to produce the F_1 hybrids seed in Diallel cross mating design, without reciprocals. Seed of the parental lines and their fifteen F_1 crosses were planted in seedling trays on the last day of June in the two seasons 2019 and 2020.when the seedlings were 45 days old they were transplanted to the unheated plastic house. The experimental design was randomized complete block (RCBD) with three replicates. Each block contained parents and their F_1 hybrids as well as the control (Omega F_1). Each plot consisted of 10 plants for each population spaced 50 cm apart. Five pepper fruits at green maturity were randomly taken two times to determine the fruit characters. The studied characters were total yield as fruit weight (kg/plant), average fruit weight (g), fruit length (cm), fruit diameter (cm), fruit flesh thickness (cm) and total soluble solids (TSS) which was determined by a hand refractometer. Obtained data were statistically analyzed using the conventional two way analysis of variance (Snedecor and Cochran, 1967) and comparisons of means were done using LSD. The analysis of general and specific combining abilities (GCA and SCA) was calculated according to Griffing (1956) method 2 model 1. Average degree of heterosis (ADH%) was estimated as the increase or decrease percent of F_1's performance over the mid-parent (MP) and high parent (HP), (Sinha and Khanna, 1975) as follows:

$$\textbf{MPH (\%)} = \frac{\overline{F_1} - \overline{MP}}{\overline{MP}} \times 100$$

$$\textbf{HPH (\%)} = \frac{\overline{F_1} - \overline{HP}}{\overline{HP}} \times 100$$

RESULTS AND DISCUSSION

Performance of parents and their F_1 hybrids

Mean performances of the six pepper pure lines and their 15 F_1 hybrids for some growth and fruit yield traits are presented in Table (1). These results showed variations for plant height of the evaluated genotypes. The parental lines ranged from 74.33cm (P_2) to 98.67cm (P_3) while the plant height of the hybrids ranged from 76.00cm ($P_1 \times P_5$) to 100.33cm ($P_3 \times P_4$).Among parents, P_3 gave the greatest length meanwhile $P_2$was the shortest. Regarding to crosses, cross ($P_3 \times P_4$) had the longest plants, but ($P_1 \times P_5$) had the shortest plants compared with the control. Results indicated that, the parental lines for average fruit weight was ranged from 7.00g (P_5) to 12.33g (P_6). The average fruit weight of the hybrids ranged from 9.33g ($P_3 \times P_5$) to 13.00g ($P_1 \times P_4$) and ($P_1 \times P_6$). The hybrids ($P_1 \times P_4$) and ($P_1 \times P_6$) had the highest significantly average fruit weight among all evaluated genotypes compared with the control. These results are in partial agreement with those found by Soliman and Khafagi (2017). For fruit length, the parents ranged from 8.00cm (P_5) to 17.06cm (P_3). The fruit length of the hybrids ranged from 10.66cm (P5×P6) to 17.16cm ($P_1 \times P_3$). The parental range of fruit diameter was from 1.17cm (P_3) to 2.10cm (P_2) and hybrids ranged from 1.43cm (P3×P4) to 2.10cm ($P_2 \times P_6$). Table (1) shows that there is narrow range among the parents for flesh thickness where P_2 gave the greatest value while P_3 gave the smallest value with no different with P_1.

Table 1. Mean performance of 15 F_1's and their six parents for plant height, average fruit weight, fruit length, fruit diameter, flesh thickness, TSS, No. of locules and total yield of pepper (combined across 2019 and 2020).

Genotype	Plant height (cm)	Average fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Flesh thickness (cm)	TSS %	No. of locules	Total yield (kg/plant)
(P_1)	76.67	12.00	16.83	1.73	0.18	5.33	2.03	0.94
(P_2)	74.33	10.33	12.33	2.10	0.31	7.67	2.67	1.37
(P_3)	98.67	7.67	17.06	1.17	0.17	6.33	2.67	1.02
(P_4)	93.33	10.67	13.26	1.77	0.20	7.00	2.33	0.85
(P_5)	82.00	7.00	8.00	1.30	0.21	6.00	2.67	0.73
(P_6)	75.00	12.33	10.00	1.90	0.28	6.67	2.33	1.05
$P_1 \times P_2$	83.67	12.00	14.66	2.00	0.31	6.00	2.67	1.07
$P_1 \times P_3$	95.00	10.67	17.16	1.90	0.19	5.00	2.67	1.17
$P_1 \times P_4$	87.00	13.00	15.50	1.77	0.22	6.00	3.03	1.02
$P_1 \times P_5$	76.00	10.67	12.66	1.73	0.21	5.67	2.33	0.98
$P_1 \times P_6$	77.00	13.00	13.00	2.03	0.24	6.00	2.67	1.23
$P_2 \times P_3$	87.67	11.00	15.66	1.57	0.26	5.00	2.67	1.67
$P_2 \times P_4$	94.33	11.33	13.33	1.97	0.24	7.00	2.33	1.15
$P_2 \times P_5$	84.00	11.67	12.33	1.77	0.23	6.00	2.67	1.09
$P_2 \times P_6$	81.00	12.00	12.33	2.10	0.32	5.33	2.97	1.43
$P_3 \times P_4$	100.33	11.00	15.66	1.43	0.23	7.33	2.33	0.95
$P_3 \times P_5$	94.33	9.33	13.33	1.47	0.21	5.67	2.33	0.95
$P_3 \times P_6$	91.33	12.00	15.00	1.80	0.22	7.67	2.33	1.57
$P_4 \times P_5$	96.00	10.00	11.66	1.80	0.39	7.00	2.67	0.91
$P_4 \times P_6$	91.33	12.67	13.00	1.90	0.24	5.33	2.33	0.94
$P_5 \times P_6$	91.67	11.33	10.66	1.83	0.23	6.67	2.67	0.90
Control(Omega)	88.85	11.13	13.53	1.74	0.22	6.55	2.33	1.06
LSD at 5% pure lines	12.35	1.96	2.01	0.26	0.07	1.77	0.83	0.64
Hybrids	14.04	1.61	3.26	0.28	0.15	2.35	0.68	0.28

As well as, the hybrid ($P_4 \times P_5$) gave the greatest value but ($P_1 \times P_3$) gave the smallest value compared with the control. The greatest TSS contents were recorded by the hybrid ($P_3 \times P_6$) and the hybrid ($P_1 \times P_3$) gave the lowest TSS content compared with (control). For number of locules data show that there is narrow range among pure lines for this trait where P_2, P_3 and P_5 gave the greatest value with (2.76) but P_1 gave the smallest value. As well as, the hybrid ($P_1 \times P_4$) gave the greatest number. The total yield trait was very important for breeders and growers, the parent P_2 gave the greatest value over all evaluated parental genotypes, on the contrary P_5 gave the smallest value for this trait. As well as, the hybrid ($P_2 \times P_3$) gave the highest yield. These results are in partial agreement with those found by Soliman and Khafagi (2017).

Analysis of variance and gene action of the studied traits

The results of Table (2) showed significant and highly significant mean squares due to both GCA and SCA in all studied traits except fruit diameter, flesh thickness, number of locules and total yield revealing the importance of additive and non-additive gene effects in the inheritance of these traits.

Table 2. Mean squares of variance for general and specific combining ability (GCA and SCA) and GCA/SCA ratio for some economic traits in half-diallel cross in pepper.

Traits	Mean squares			GCA/SC
	GCA	SCA	Error	
Plant height	629.03^{**}	66.13^{**}	104.34	9.51
Average fruit weight	23.81^{**}	3.37^{**}	1.47	7.07
Fruit length	63.84^{**}	1.43^{*}	4.67	44.64
Fruit diameter	0.59	0.06	0.04	9.83
Flesh thickness	0.01	0.01	0.01	1.00
TSS	2.23^{**}	2.03^{**}	3.29	1.10
No. of locules	0.08	0.21	0.28	0.38
Total yield	0.44	0.08	0.08	5.50

GCA = General combining ability, SCA = Specific combining ability.
***, **: significant, at 5 and 1 % probability levels, respectivelly.**

However, a greater ratio of GCA/SCA than unity was detected for all studied traits except number of locules revealing that the inheritance of these traits was mainly controlled by additive gene effects. While for number of locules the ratio was less than unity which means that non-additive gene effects mainly control the inheritance of this trait. These results are in agreement of the findings with Soliman and Khafagi (2017).

Heterosis over mid-parent (MP- heterosis)

Mid parent heterosis for all studied traits are presented in Table (3). The results show clearly that the crosses (P_1×P_2), (P_2×P_4) and (P_5×P_6) showed highly positive significant MP – heterosis for plant height. For average fruit weight the results show clearly that all crosses showed highly significant and positive heterosis these findings disagree with Khalil and Hatem (2014), who mentioned that most crosses exhibited no dominance for average fruit weight. Regarding fruit length most of crosses showed highly significant heterosis These findings agree with Hatem and Salem (2009) and Sood and Kumar (2010) who reported dominance for fruit length. The results show clearly that all crosses showed highly significant heterosis for fruit diameter, except crosses (P_2×P_3 and P_3×P_4) which showed non-significant and negative heterosis. These findings are similar to those of Khalil and Hatem (2014), who mentioned that insignificant ADH values based on MP were estimated for six crosses, suggesting incomplete dominance, while over dominance for large fruit was observed in one cross. For flesh thickness all crosses showed highly significant heterosis except crosses (P2×P4), (P2×P5), (P3×P6), (P4×P6) and (P5×P6) which showed non-significant negative heterosis .These results are partial agreement with those found by Geleta and Labuschagne (2004) and with Soliman and Khafagi (2017). The results show clearly that the crosses (P3×P4, P3×P6, P4×P5 and P_5×P_6) showed highly significant heterosis for total soluble solids (TSS). The results show clearly that the crosses (P_1×P_2), (P_1×P_3), (P_1×P_4), (P_1×P_6), (P_2×P_6), (P_4×P_5) and (P_5×P_6) showed highly significant heterosis for number of locules. The results show clearly that all crosses showed highly significant heterosis except crosses (P_1×P_2), (P_4×P_6) and (P_5×P_6) which showed non-significant negative heterosis for total yield.

These results are in agreement with those found by Geleta and Labuschagne (2004) and Soliman and Khafagi (2017).

Table 3. Heterosis values (%) over mid-parents (MP) of 15 F_1 hybrids for some pepper characters.

Crosses	plant height	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	TSS	No. of locules	Total yield
$P_1 \times P_2$	10.82**	25.37**	0.57	4.35**	25.68**	-7.69	13.48**	-7.38
$P_1 \times P_3$	8.37	8.47**	1.28	31.03**	5.66**	-14.29	13.48**	19.45**
$P_1 \times P_4$	2.35	14.71**	2.99*	0.95*	12.07**	-2.70	38.93**	13.81**
$P_1 \times P_5$	-4.20	12.28**	2.01	14.29**	5.08**	0.00	-0.71	16.97**
$P_1 \times P_6$	1.54	6.85**	-3.11*	11.93**	2.16**	0.00	22.14**	23.95**
$P_2 \times P_3$	1.35	22.22**	6.58**	-4.08	9.72**	-28.57	-0.06	39.86**
$P_2 \times P_4$	12.52**	7.94**	4.17**	1.72**	-5.19	-4.55	-6.67	3.76**
$P_2 \times P_5$	7.46	34.62**	21.31**	3.92**	-10.26	-12.20	0.00	4.13**
$P_2 \times P_6$	8.48	5.88**	10.45**	5.00**	8.47**	-25.58	18.67**	18.46**
$P_3 \times P_4$	4.51	20.00**	3.30*	-2.27	23.21**	10.00**	-6.67	1.79**
$P_3 \times P_5$	4.43	27.27**	6.38**	18.92**	8.77**	-8.11	-12.57	8.57**
$P_3 \times P_6$	5.18	20.00**	10.84**	17.39**	-3.70	17.95**	-6.67	51.37**
$P_4 \times P_5$	9.51	13.21**	9.72**	17.39**	87.10**	7.69**	6.67**	15.37**
$P_4 \times P_6$	8.51	10.14**	11.75**	3.64**	-2.07	-21.95	0.00	-0.88
$P_5 \times P_6$	16.77**	17.24**	18.52**	14.58**	-4.76	5.26**	6.67**	0.37

***, **significant at 5 and 1 % probability levels, respectively.**

Heterosis over high-parent (HP- heterosis)

High parent (HP) heterosis for all studied traits is presented in Table (4). The results show clearly that all crosses were not significant for plant height. For average fruit weight the results show clearly that all crosses showed highly significant positive heterosis except crosses ($P_1 \times P_3$), ($P_1 \times P_5$), ($P_2 \times P_6$), ($P_3 \times P_6$), ($P_4 \times P_5$), ($P_4 \times P_6$) and ($P_5 \times P_6$) which showed non-significant negative heterosis. Regarding fruit length, only the cross ($P_5 \times P_6$) showed highly significant positive heterosis. The results show clearly that the crosses ($P_1 \times P_3$), ($P_1 \times P_6$) and ($P_3 \times P_5$) showed highly significant heterosis for fruit diameter. For flesh thickness the crosses ($P_1 \times P_3$), ($P_1 \times P_4$), ($P_2 \times P_6$), ($P_3 \times P_4$) and ($P_4 \times P_5$) showed highly significant heterosis.

Table 4. Heterosis values (%) over high-parent (HP) of 15 F_1's hybrids for some pepper characters.

Crosses	plant height	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	TSS	No. of locules	Total yield
$P_1 \times P_2$	9.13	16.67^{**}	-12.87	-4.76	0.00	-21.67	0.25	-22.14
$P_1 \times P_3$	-3.71	-11.11	-2.79	9.62^{**}	1.82^{**}	-21.05	0.00	14.38^{**}
$P_1 \times P_4$	-6.78	8.33^{**}	-7.90	0.38^{*}	6.56^{**}	-14.29	30.19^{**}	8.54^{**}
$P_1 \times P_5$	-7.32	-11.10	-24.74	0.00	-1.59	-5.56	-12.28	4.27^{**}
$P_1 \times P_6$	0.44	5.43^{**}	-22.77	7.02^{**}	-15.48	-10.00	14.45^{**}	17.09^{**}
$P_2 \times P_3$	-11.14	6.45^{**}	-8.17	-25.40	-15.05	-34.73	-0.12	21.65^{**}
$P_2 \times P_4$	1.08	6.32^{**}	0.55	-6.35	-21.51	-8.70	-12.28	-15.85
$P_2 \times P_5$	2.44	12.90^{**}	0.03	-15.87	-24.73	-21.74	0.25	-20.00
$P_2 \times P_6$	8.00	-2.70	0.03	0.00	3.23^{**}	-30.43	11.53^{**}	4.62^{**}
$P_3 \times P_4$	1.69	3.19^{**}	-8.20	-20.37	13.11^{**}	4.76^{**}	-12.28	-6.56
$P_3 \times P_5$	-4.39	21.85^{**}	-21.87	12.82^{**}	-1.59	-10.53	-12.73	-6.56
$P_3 \times P_6$	-7.43	-2.70	-12.11	-5.26	-22.62	15.12^{**}	-12.50	48.73
$P_4 \times P_5$	2.86	-6.19	-12.02	0.00	84.13^{**}	0.00	0.25	7.45^{**}
$P_4 \times P_6$	-2.14	0.05	-1.96	0.00	-15.48	-23.81	-0.28	-10.44
$P_5 \times P_6$	11.79	-8.11	6.67^{**}	-3.51	-16.67	0.00	0.25	-14.87

***, **significant at 5 and 1 % probability levels.**

The results show clearly that the crosses ($P_3 \times P_4$) and $P_3 \times P_6$) showed highly significant heterosis for total soluble solids (TSS). The results show clearly that the crosses ($P_1 \times P_4$), ($P_1 \times P_6$), and ($P_2 \times P_6$) showed highly significant heterosis for number of locules. The results show clearly that all crosses showed highly significant heterosis except crosses ($P_1 \times P_2$), ($P_2 \times P_4$), ($P_2 \times P_5$), ($P_3 \times P_4$), ($P_3 \times P_5$), ($P_3 \times P_6$), ($P_4 \times P_6$) and (P5×P_6) which showed non-significant negative heterosis for total yield.

General and specific combining ability effects

The estimates of GCA effects of individual parental genotypes in the F_1's generation were significant and highly significant for the most studied traits (Table 5). It is well known that GCA is a function of additive gene effect and the additive portions of epistatic variance, while SCA is the function due to dominance gene effects and the remainder of epistatic variance. In the context, P_1 was a good combiner for all studied traits except number of locules and total yield.

Table 5. Estimates of general combining ability (GCA) effects of six pepper pure lines for some characters.

Genotypes	Plant height	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	TSS	No. of locules	Total yield
(P_1)	-14.33**	2.79**	4.56**	0.21**	-0.06*	-1.58**	-0.13	-0.12
(P_2)	-11.58**	1.04**	-0.56	0.47**	0.11**	0.42	0.32	0.56**
(P_3)	20.92**	-3.21**	6.18**	-0.69**	-0.09**	-0.08	-0.05	0.25**
(P_4)	17.04**	0.54	0.45	0.02	0.01	1.17	-0.16	-0.37**
(P_5)	-1.58	-4.08**	-6.69**	-0.43**	0.00	-0.21	0.08	-0.51**
(P_6)	-10.46**	2.92**	-3.94**	0.42**	0.04	0.29	-0.06	0.20*
S.E. (ĝi- ĝj)	٣,٣٤	٠,٣٩	0.70	٠,٠٦	٠,٠٣	0.59	٠,١٧	٠,٠٩

***, **: significant at 5% and 1 % probability levels respectively.**

In addition P2 was good combiner for all studied traits except Fruit length, total soluble solid (TSS) and number of locules. P_3 was good combiner for all studied traits except total soluble solid (TSS) and number of locules. P_4 was good combiner for plant height and total yield. P_5 was good combiner for average fruit weight fruit length, fruit diameter and total yield. P_6 was good combiner for Plant height, average fruit weight, fruit length, fruit diameter and total yield. It is clear that (P_3) exhibited desirable significant GCA effects and proved to be good general combiners. These results were in partial agreement with findings of Khalil, *et al* (2008) and Soliman and Khafagi (2017).

The potentiality of crossing between specific parents was detected by estimating specific combining ability effects (SCA) of each F_1 cross for all studied traits (Table 6). The cross ($P_1 \times P_6$) achieved highly significant (SCA) effects for all traits in this study which means that this cross had one parent with high GCA effects, it seems that both additive and non-additive genetic components are playing an important role the inheritance for the studied traits. This result agrees with the findings of Vandana *et al* (2002), Khalil and Hatem (2014).

Table 6. Estimates of specific combining ability (SCA) effects of 15 F_1 hybrids for some pepper characters.

Crosses	plant height	Average fruit weight	Fruit length	Fruit diameter	Flesh thickness	TSS	No. of locules	Total yield
$P_1 \times P_2$	15.39	4.79^{**}	-0.50	0.03	0.16	0.50	0.19	-0.52^{*}
$P_1 \times P_3$	16.89	-0.96	0.26	0.89^{**}	-0.01	-2.00	0.56	0.09
$P_1 \times P_4$	-3.23	2.29^{*}	0.99	-0.22	-0.02	-0.25	1.77^{**}	0.26
$P_1 \times P_5$	-17.61	-0.09	-0.38	0.13	-0.04	0.13	-0.57	0.28
$P_1 \times P_6$	149.27^{**}	180.91^{**}	228.38^{**}	27.58^{**}	3.32^{**}	84.63^{**}	38.77^{**}	15.83^{**}
$P_2 \times P_3$	-7.86	1.79	0.89	-0.37^{*}	0.05	-4.00^{*}	0.11	0.91^{**}
$P_2 \times P_4$	16.02	-0.96	-0.39	0.12	-0.12	0.75	-0.78	-0.02
$P_2 \times P_5$	3.64	4.66^{**}	3.75^{*}	-0.03	-0.13	-0.88	-0.02	-0.05
$P_2 \times P_6$	3.52	-1.34	1.00	0.12	0.08	-3.38^{*}	1.02	0.27
$P_3 \times P_4$	1.52	2.29^{*}	-0.13	-0.32	0.05	2.25	-0.42	-0.32
$P_3 \times P_5$	2.14	1.91	0.01	0.23	-0.01	-1.38	-0.66	-0.17
$P_3 \times P_6$	2.02	2.91^{*}	2.26	0.38^{*}	-0.02	4.13^{*}	-0.52	0.97^{**}
$P_4 \times P_5$	11.02	0.16	0.74	0.52^{**}	0.43^{**}	1.38	0.46	0.34
$P_4 \times P_6$	5.89	1.16	1.99	-0.03	-0.07	-4.13^{*}	-0.41	-0.28
$P_5 \times P_6$	25.52^{**}	1.79	2.13	0.22	-0.06	1.25	0.36	-0.28
SE (Sij-Sik)	٩,٢٦	١,١٠	١,٩٦	٠,١٨	٠,٠٨	١,٦٤	٠,٤٨	٠,٢٥
SE (Sij-Skl)	٦,٧٥	٠,٨٠	١,٩٠	٠,١٣	٠,٠٦	١,٢٠	٠,٣٥	٠,١٨

NS,*, **: insignificant and significant at 5 and 1 % probability levels respectively.

CONCLUSION

It could be concluded that, parent (P_3) could be considered as the best combiner for breeding to most traits. The cross ($P_1 \times P_6$) achieved highly (SCA) effects for all studied traits.

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التربية في الفلفل الحريف لبعض الصفات الاقتصادية

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أجريت هذه الدراسة فى محطه التجارب الزراعية بقها بمحافظه القليوبيه فى خلال الفتره من2017 حتى ٢٠ 20 فى صوبه بلاستيكية غير مدفأه. ست سلالات متنوعة من الفلفل الحار (C11) ، (H2)، (R 27)، (C4)، (H17) و (C6) تم إنتاجها بواسطة مؤلف الدراسة الحالية في برنامج تربية عن طريق التلقيح الذاتي خلال ثلاثة أجيال. تم عمل الهجن التبادلية بين ست سلالات نقية بطريقة (التهجين الدائري بدون العكس) لإنتاج ١٥ هجين من الجيل الاول بدون تلقيح عكسي لتقدير القدرة على التالف (العامة والخاصة) وقوة الهجين لبعض الصفات في الفلفل الحريف. أظهرت النتائج قوة الهجين (بالنسبة لمتوسط الاباء) ، (بالنسبة للا ب الاعلي) لمعظم الصفات المدروسة. قوة الهجين كانت عاليه وموجبه لمتوسط وزن الثمرة ، بينما كان مرتفعًا وسلبيًا لطول الثمرة ، بينما كانت لصفات المواد الصلبة الذائبة الكلية والمحصول الكلي وصفة طول النبات منخفضة. اختلفت الآباء في تأثيرات القدرة العامة على الائتلاف عالية وعموماً فإن الاب (P_3) كانا أفضل الأباء حيث اعطى قدرة عامة على الائتلاف لجميع الصفات المدروسة ولهذا يمكن الاستفادة به في برامج التربية لتحسين الفلفل. أظهرت حسابات تأثيرات القدرة الخاصة على الائتلاف للهجن المختلفة أن أفضل الهجن للصفات المدروسة كان في الهجين (P_1 × P_6)حيث أظهر تأثيرات معنوية عالية في جميع الصفات المدروسة .

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