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GENETIC ANALYSIS TO IDENTIFY SUITABLE PARENTS FOR DEVOLEPMENT AND RELASE OF NEW TOMATO HYBRIDS COMBINATIONS (*Lycopersicom esculantum* Mill)

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ABSTRACT

A study was conducted on a 7x 7 diallel set of tomato excluding reciprocals to identify desired parents and its cross combinations which appears high productivity and high quality under conditions in Egypt as well as to gather information on genetic behavior of some traits .The results revealed that both general and specific combining abilities were highly significant for all studied traits .therefore, both additive and non additive gene action were important in the expression of these traits .The magnitudes of additive genetic variances were larger than those of the non – additive variances for plant height ,number of branches / plant ,average fruit weight and TSS % .However ,for other traits ,the dominance gene effects play the major role in the inheritance of these traits. Degree of dominance $(O^2 D/ O^2 A)^{1/2}$ revealing the importance of partial dominance and that the additive effects played the major role in the inheritance of the plant height ,number of branches / plant ,average fruit weight, fruit shape index and TSS %.Whereas revealing the importance of over dominance in the genetic control of other traits .In addition both broad and narrow sense heritability values were high for all studied traits ,indicating that all traits were highly heritable .

Heterosis over mid parents or better parents was present in most of crosses for the studied traits. LHT24 and CLN2498D were good combiner for vegetative traits. Peto 86 was the best combiner for number fruits/ plant and total yield/plant .Marglobe is consider good combiner for average fruit weight and fruit shape index .Advantage -2 was best combiner for TSS.

Considering mean performances, SCA effects and hererosis, three hybrids LHT24 X Advantage -2, LHT24 X Floradade and Peto 86 X Advantage -2 may be recommended for heterosis breeding after further evaluation.

INTRODUCTION

Tomato (*Lycopersicom esculantum* Mill) is the most important vegetable crops in Egypt as well as all over the world .The area of production increase from year to another to meet the demand increment of consumers. According to ministry of agriculture static's (2007) was 537,208 feddan that produced about 863,924 ton. Commercial seed companies are in full control for their hybrid seed production. Therefore, seeds of superior hybrids are usually very expensive .Though hybrid tomato pay-off their cost in terms of high ,good quality and disease resistant crops ,they are imported and paid for by hard currency .The production of competitive ,local ,high yielding and good quality tomato hybrids is the only practical solution to this problem . In order to produce tomato hybrids adapted to local conditions ,this study was conducted to obtain some local tomato hybrids through intervarietal crosses ,comparing these hybrids with their parents in order to choose the most promising ones to be replaced in cultivation instead of the true breeding tomato cultivars and imported hybrids .Genetic analysis provides a guide line for the assessment of relative breeding potential of the parents or identify the best good combiner in crops crosses (Khattak *et al*., 2004 ; Weera Singh *et* *al*., 2004 ; Sulodhani Devi *et al* .,2005)Which could be utilized either to exploit heterosis in F1 or the accumulation of fixable genes to evolve variety .

Hybrid vigor in tomato was the first observed by Hedric &Booth,(1907) Since then a number of workers have reported heterosis in tomato(Bhatt *s*., 1998 , Bhatt *et al*.,2001). In this study effort have been made to identify parents suitable for tomato hybrid seed production.

MATERIAL AND METHODS.

A set of 7 X 7 diallel cross of tomato without reciprocals along with parents viz LHT24 (P_1) , CLN2498D (P_2), CLN2498E (P_3), Marglobe (P_4), Peto 86 (P_5), Floradade (P_6) and Advantage -2 (P_7) all of them inbred lines and are belonging to species *Lycopersicom esculantum* Mill were evaluated in a randomized complete blocks design with three replications. Each replication contained 28 experimental plots .Each experimental plot consisted of two trellis of 4.5 meter long and 1 meter wide .The plants were spaced at 30 cm apart on one side trellis .The plot of each genotype contained 30 plants .The study was conducted during 2008-2009 at El-Baramoon Horticulture Research Farm , Dakahlia Governorate .Standard fertilization ,standard pesticides, fungicides, control and culture practices for tomato production were used according to the recommendations of Ministry of agriculture .Measurements for hybrids and their parents were recorded on plant height ,number of branches per plant , number of fruits per plant ,total yield per plant, average fruit weight ,fruit shape index ,number of locules per fruit ,flesh thickness and total soluble solids (TSS) .

Genotypes means were used for the analysis of variance (Stell and Torrie1980) .Analysis of combining ability by method 2 ,model 1 of Griffing (1956) and other genetic parameters was performed according to Hayman (1954) .Heritability values were categorized low (< 0.3),moderate (0.3-0.6) and high (> 0.6)as given by Johanson *et al* .,(1955).The distribution of crosses in relation to general combining ability (GCA) and specific combing ability (SCA) effects was worked out by taking combining ability effects as significant positive (high = h) ,non significant (average = a) and significant negative (low = L).

RESULTS AND DISCUSSION

The analysis of variance based on mean squares (Table 1) showed the existence of significant variation for all studied traits ,indicating a wide range of variability among the genotypes .It is clear from the table 1 that GCA variances were higher than those for SCA variances for each of plant height, number of branches per plant ,average fruit weight , flesh thickness and total soluble solids (TSS) indicating that the additive gene effects appeared to be relatively more important than non-additive gene effects for those traits .Concerning another traits, it was found that non-additive gene effects appeared to play important roles than additive effects for these traits ,as reflected on the high estimates of SCA variances than GCA variances .As the results the ratio of O^2 GCA / O^2 GCA was also greater than one for plant height ,number of branches per plant ,average fruit weight ,flesh thickness and TSS % but less one for the rest of the traits .Both σ^2 A and σ^2 D were found to be positive for all studied traits except the number of locules per fruit, the σ^2 A was negative .These observations indicated the importance of both additive and non-additive gene actions in controlling the inheritance of most studied traits .These could be verified by the degree of dominance (σ^2 D / σ^2 A)$^{1/2}$ which were less than one ,revealing the importance of partial dominance and that the additive effects played the major role in the inheritance of these traits .Whereas the traits which the degree of dominance were higher than one, revealing the importance over dominance in the genetic control of these traits .Similar trend was observed by Omar *et al*.,(1988) ,Metwally *et al*., (2004) ,Hannan *et al*.,(2007) and Saleem *et al*.,(2009).

Table (1): Analysis of variance based on mean squares and estimates of genetic parameters in tomato.

Source	d.f	Plant height (cm)	No. branches / plant	No. fruits / plant	Total yield/plant (Kg)	Average fruit weight (g)	Fruit shape index (L/D)	No. locules /fruit	Flesh thickness (cm)	T.SS %
Replication	2	2.3	0.4	346.3**	3.4**	744.5**	.0003	0.2	0.026**	1.857
Genotypes	27	323.2**	24.00**	3998.7**	1.3**	293.3**	0.026**	1.5*	0.012*	1.307
Error	54	3.7	0.9	35.5	0.4	136.1	0.010	0.8	0.007	0.302
σ^2 gca		38.031	28.512	26.63	0.014	21.67	0.003	0.0547	0.004	0.173
σ^2 sca		30.618	2.166	68.16	0.267	9.05	.004	0.5800	.00196	0.086
σ^2 gca / σ^2 sca		1.242	13.163	0.391	0.052	2.394	0.75	0.094	2.041	2.011
σ^2 A		76.062	5.854	53.26	0.028	43.34	0.006	-1.094	0.0088	0.346
σ^2 D		30.618	2.161	68.16	0.267	9.05	0.004	0.580	0.00196	0.086
(σ^2 D/ σ^2 A)$^{1/2}$		0.634	0.608	1.131	3.087	0.457	0.816	-0.728	1.422	0.499
H^2 (bs)%		0.98	0.99	47.37	86.63	77.60	90.00	99.59	98.60	99.56
H^2 (ns)%		0.70	0.72	21.05	8.23	64.21	54.10	60.86	30.55	79.74

Concerning heritability percentage, it is likely to mention that broad sense heritability (h^2_b%) was high and exceeded 90 % for the most studied traits. The narrow sense heritability (h^2_n%) was low for number of fruits per plant and total yield per plant but moderate for fruit shape index and flesh thickness whereas high for plant height ,number of branches ,average fruit weight, number of locules per fruit and TSS% .These suggested that all traits were highly heritable. Estimates of general combining ability effects (gi)for each parental line of all studied traits are given in Table 2 .The obtain high positive values would be of interest in all studied traits .As for as GCA effects for plant height is concerned , CLN2498D surpassed it is rivals by attaining value of 17.075 followed by LHT24 (14.543), Advantage -2 (6.986) ,CLN2498E (6.708), Marglobe (4.541) and Floradade(2.186), respectively. In case of number of branches per plant ,the parent LHT24 expressed its superiority with GCA value of 2.406 followed by Advantage -2 (2.151) and CLN2498D (0.662) .As regarded the number of fruits per plant ,the parent Peto 86 gave higher magnitude of GCA (8.98) followed by CLN2498D (3.61) and CLN2498E (2.98), respectively. Only one parent Peto 86 could show desirable and significant GCA value of 0.34 for total yield per plant. Marglobe was at the top with 6.24 GCA value among parents for average fruit weight .For fruit shape index ,the parent CLN2498D produced higher magnitude of GCA (0.07) followed by Marglobe (0.06) and Floradade (0.05) for number locules per fruit ,the parent LHT24 appeared the highest value of GCA 0.114 value followed by CLN2498E (0.092) and Advantage -2(0.059). All studied parents appeared none significant GCA effects for flesh thickness.

About the TSS % the estimation of GCA effects show that all parents were exhibited high and significant positive values and the parent Advantage -2 had the greatest GCA effects (1.535) ,while the Peto 86 was the lowest GCA effect (0.0523) .In confirmation to the finding of Srivastara *et al*., (1998) and Dhaliwal *et al*.,(2003) ,none the parent was the best general combiner for all the traits .The high GCA effect are attributed to additive gene effects or additive X additive interaction effects and represent a fixable portion of genetic variation (Sarma *et al*., 2004) .However none of the parents was best general combiner for all the traits indicating differences in genetic variability for different characters among the parents. Estimates of specific combining ability effects of the hybrids are presented in Table2 for plant height P_1XP_5 showed maximum SCA effects (14.88) followed by P_2XP_6 (11.78) , P_1XP_4 (7.302) , P_3XP_6 (3.146), P_2XP_7 (2.68) and P_4XP_5(2.636).The cross P_2XP_4,P_2XP_7,P_1XP_5,P_3XP_4, P_2XP_6 and P_1XP_7 displayed highly significant effects (2.314,1.570,1.481,1.459,1.159 and 1.225 respectively)for number of branches per plant .Seven crosses displayed high value and its highly significant SCA values for number of fruit per plant ; the hybrid P_1XP_3 was at the highest SCA value of 27.63 .For yield per plant; the SCA effect of hybrid P_1XP_7 was the most highest(1.36) as concerns P_6XP_7 (0.99) , P_5XP_6 (0.85) and P_1XP_6 (0.78) .None of the crosses indicated positive significant value of SCA effects for average fruit weight .In case of shape index of fruit only the hybrid P_5XP_7 could show positive and significant SCA effect value of 0.21.Twelve crosses displayed highly significant SCA value for number of locules per fruit ; the hybrid P_1XP_3 was at the top with highest SCA value of 0.873 .For the flesh thickness of fruit none of the crosses exhibited positive significant value of SCA effects. For TSS%, the SCA effect of hybrid P_4XP_5 was the highest (0.55) followed by P_2XP_6 (0.428), P_5XP_6 (0.317), P_3XP_7 (0.294), P_3XP_6 (0.205), P_2XP_4 (0.161) and P_1XP_7 (0.150).

P_1XP_3 was at the highest SCA value of 27.63 .For yield per plant; the SCA effect of hybrid P_1XP_7 was the most highest(1.36) as concerns P_6XP_7 (0.99) , P_5XP_6 (0.85) and P_1XP_6 (0.78) .None of the crosses indicated positive significant value of SCA effects for average fruit weight .In case of shape index of fruit only the hybrid P_5XP_7 could show positive and significant SCA effect value of 0.21.Twelve crosses displayed highly significant SCA value for number of locules per fruit ; the hybrid P_1XP_3 was at the top with highest SCA value of 0.873 .For the flesh thickness of fruit none of the crosses exhibited positive significant value of SCA effects. For TSS%, the SCA effect of hybrid P_4XP_5 was the highest (0.55) followed by P_2XP_6 (0.428), P_5XP_6 (0.317), P_3XP_7 (0.294), P_3XP_6 (0.205), P_2XP_4 (0.161) and P_1XP_7 (0.150).

Table (2): Estimates of GCA and SCA effects for nine studied traits of seven tomato parents and their F_1 hybrids

Traits / Genetic populations	Plant height (cm)	No. Bran-ches / plant	No. fruits/ plant	Total yield /plant (Kg)	Average fruit weight (g)	Fruit shape index (L/D)	No. locules /fruit	Flesh thick-ness (cm)	T.SS %
								Parents	GCA
LHI24(P1)	14.543**	2.406**	-0.46	0.02	0.23	-0.02	0.114**	-0.033	1.379
CLN2498D(P2)	17.075**	0.662**	3.61**	-0.18	-9.26**	0.07**	-0.186**	0.011	1.412
CLN2498E(P3)	6.708**	-0.483**	2.98**	0.23	1.45	0.02	0.092**	-0.001	1.235
Marglobe(P4)	4.541**	-1.894**	-9.69**	-0.38**	6.24**	0.06**	0.003	-0.001	0.690
Peto86(p5)	-1.436**	-1.805**	8.98**	0.34**	-4.90**	0.02	-0.041	0.043	0.0523
Floredade(P6)	2.186**	-1.038**	-3.65**	-0.06	-3.66	0.05**	-0.041	0.021	0.623
Advanlage-2(P7)	6.986**	2.151**	-1.76	0.03	2.97	0.02	0.059**	-0.012	1.535
S.E(gi)	0.319	0.0204	1.06	0.12	2.08	0.02	0.022	0.025	0.0126
								Crosses	SCA
P1 X P2	0.370	0.714	-9.00**	-0.16	8.32	0.05	-7.806**	0.061	-4.806
P1 X P3	-0.264	0.449	27.63**	-0.22	-6.22	0.004	0.873**	0.072	-0.150
P1 X P4	7.302**	0.270	5.63*	-0.10	-11.81**	0.06	0.662**	-0.028	0.392
P1 X P5	14.880**	1.481**	-6.04*	-0.86**	-11.20*	0.03	0.758**	-0.072	-0.139
P1 X P6	-1.720	0.714	9.26**	0.78	4.30	0.02	0.006	-0.005	0.061
P1 X P7	0.858	1.225**	17.37**	1.36**	6.07	0.02	0.306**	0.048	0.150
P2 X P3	1.558	-0.097	16.23**	0.27	-10.10	0.05	-0.127**	-0.072	-0.183
P2 X P4	-1.875*	2.314**	-4.44	0.12	7.17	0.01	-0.038	0.028	0.161
P2 X P5	-0.898	0.225	0.89	0.03	1.25	0.08	0.006	0.017	-0.472
P2 X P6	11.780**	1.159**	-3.15	-0.43	-8.97	-0.06	0.006	0.006	0.428
P2X P7	2.68**	1.570**	8.30	0.44	0.72	-0.12**	0.206**	-0.061	0.028
P3 X P4	-1.209	1.459**	-8.82	-2.44**	-0.56	0.05	-0.016	-0.061	-0.139
P3X P5	2.469**	0.370	0.52	0.37	4.67	0.03	0.728**	0.094	-0.295
P3 X P6	3.147**	0.630	-5.18	-0.03	7.14	0.03	0.728**	-0.083	0.205
P3X P7	1.347	-2.086	-1.07	0.35	10.27	0.01	0.628**	-0.51	0.294
P4X P5	2.636**	-0.219	-0.95	0.30	3.82	-0.13	0.817**	0.094	0.550
P4 X P6	-0.386	0.014	2.48	-0.03	-4.85	0.01	0.417**	0.016	-0.450
P4 X P7	-5.186**	-2.175**	8.59**	0.57	0.89	0.03	0.017	-0.05	-0.161
P5 X P6	-0.753**	-0.375	13.15**	0.85**	0.90	0.01	0.162**	-0.028	0.317
P5X P7	-4.809**	-0.264	2.26	0.48	0.21	0.21*	0.362**	0.006	0.005
P6 X P7	1.569	-8.522**	-12.11**	0.99**	0.05	0.05	-0.383**	-0.006	-0.395
S.E(ij)	0.845	0.162	2.63	0.29	5.19	0.05	0.077	0.064	0.0333

GCA = general combining ability
SCA= specific combining ability.

The distribution of crosses in relation to GCA effects of parental combinations (h x h, h x a, h x L, L x h, L x a, L x L, a x h, a x a and a x L) showed that almost all types of SCA effects were obtained from any kind of GCA effects and hence performance of hybrids was independent of parents .High SCA effects manifested by crosses where both the parents were good general combiner might be attributed to sizeable additive X additive gene action .The high X low combination ,besides expressing the favorable additive effect of the high parent ,manifested some complementary gene interaction effects with a higher SCA .However major part of the heterosis displayed by such crosses may be due to additive X dominance type of gene action and be non fixable .An appreciable amount of the heterosis expressed by low X low crosses might be ascribed to dominance X dominance type of non allelic gene action producing over dominance and are non fixable .Thus it appears that the superior performances of most hybrids may be largely due to epistatic interaction .Similar results were reported in earlier studied (Batt *et al*.,2004; Thakur *et al*.,2004;Haripasma *et al*.,2006). The best crosses involved at least one parent with high GCA effects can be used as a selection criteria for the identification of superior genotypes .Parents with high GCA did not necessary produced hybrid with high SCA (Sharma et al., 1999),but combination of parents with average or low GCA usually produced hybrids with high SCA. In our results, the best crosses viz; P_1XP_5 for plant height, P_2XP_4 for number of branches per plant, P_1XP_3 for number of fruits per plant, P_1XP_7 for total yield per plant, P_5XP_7 for fruit shape index , P_1XP_3 for number of locules per fruit and P_4XP_5 for TSS % had h x L, h x L, L x h, L x a, a x a, h x L and h x h GCA parental combinations respectively .

Range, mean values of parents ,F_1 hybrids and heterosis over their mid-parental (MP) and bitter parent with the best for hybrids are presented in Table (3) .For plant height ,parents varied widely in plant height ranging from 40.3 to 78.3 cm while F_{1S} was ranged from 50.0 to 81.3 cm and heterosis estimates ranged from -1.84 to 32.83 % and from -19.52 to 12.02 % over MP and B.P, respectively .The hybrids P_1XP_5, P_2XP_6 , P_1XP_4 and P_4XP_5 were taller than their mid-parental values by 16.4 to 32.83 % while the hybrids P_1XP_5 , P_1XP_4 and P_1XP_2 were taller than their respective tallest parent by 3.83 to 12.02 %.For the character number of branches per plant, the mean performances of parents ranged from 6.3 to 15.7 % while F1S ranged from 7.0 to 16.7 and the estimates heterosis ranged from -18.18 to 53.84 % and from -42.68 to 29.3 % over MP and BP ,respectively .Heterosis over MP in the best four hybrids (P_2XP_4, P_2XP_6 , P_3XP_6 and $P_3XP_{4)}$ ranged from 33.33 % for the cross P_3XP_4 to 53.84 % for the P_2XP_4 while the estimated values over the BP ranged from 25.56 % for the cross P_1XP_7 to 29.03 % for the cross P_2XP_4 .For the number of fruits per plant, the results in table 3 showed that ,parents varied widely ranging from 19.7 (P_4) to 53.3 (P_5) ,while range was observed in the F_{1S} from 23.00 P_6XP_7 to 63.3 (P_2XP_3) and heterosis estimates ranged from -23.08 to 98.82% and from -44.85 to 81.51 % over MP and BP respectively .The cross P_1XP_7 had the highest heterosis (98.82 %) over the mid-parent and also the best parent.

Concerning the total yield per plant ,the results in table 3 showed the values of mean performances ranged from 1.350 to 1.750 for parents and 1.370 to 3.800 for F_{1S} while heterosis estimates ranged from -22.6 to 83.8 % and from -38.91 to 87.19 % over mid-parents and bitter parents respectively .Heterosis over MP for the best four hybrids ranged from 50.43 % for the cross P_5XP_6 to 83.8 % for the cross P_4XP_7 .Heterosis over BP for the best four cross ranged from 41.37 % for the cross P_5XP_6 to 87.91% for the cross P_1XP_7.Concerning fruit characteristics, data in table 3 showed that the performance of parents and their F_1 hybrids for the trait average fruit weight ,parents ranged 42.6 (P_1) to 75.1(P_4) while F_{1S} ranged from 44.1 (P_1XP_3) to 74(P_3XP_7).

Table(3): Range, mean values of parents,F1 hybrid and heterosis over MP and BP with the best four hybrids among the evaluated in tomato crosses.

Characters	Range				The best four hybrids (heterosis) over	
	Mean performance		Heterosis		M.P	B.P
	Parents	F_{1s}	M.P	B.P		
Plant height(cm)	40.3-787.3	50.0-81.3	-1.84-32.83	-19.52-12.02	P_1XP_5 (32.83) ,P_2XP_6(22.86) P_1XP_4(21.41), P_4XP_5 (16.4)	P_1XP_5 (12.02) ,P_1XP_4(9.71) P_1XP_6(3.91), P_1XP_2 (3.83)
No. of branches/ plant	6.3-15.7	7.0-16.7	-18.18-53.84	-42.68-29.3	P_2XP_4 (53.84) ,P_2XP_6(46.25)P_3XP_6(37.5), P_3XP_4(33.33)	P_2XP_4(29.03) ,P_3XP_6(26.43) P_2XP_6(25.81), P_1XP_7 (25.56)
No. fruits/plant	19.7-53.3	23.0-63.3	-23.08-98.82	-44.85-81.51	P_1XP_7 (98.82) ,P_4XP_7(67.42) P_1XP_6(48.09), P_2XP_7 (47.60)	P_1XP_7 (81.51) ,P_1XP_6(47.32) P_2XP_3(39.71), P_4XP_7 (21.51)
Total yield/plant(kg)	1.350-2.750	1.370-3.800	-22.6-83.8	-38.91-87.19	P_4XP_7 (83.8) ,P_2XP_7(64.81) P_5XP_7(58.75), P_5XP_6 (50.43)	P_1XP_7(87.19) ,P_4XP_7(76.35) P_1XP_6(42.92), P_5XP_6 (41.37)
Average fruit weight (g)	42.6-75.1	44.1-74.0	-22.43-28.64	-35.82-22.91	P_3XP_7 (28.64) ,P_5XP_7(28.29) P_3XP_5(14.61), P_1XP_7 (13.84)	P_3XP_7(22.91) ,P_5XP_7(18.59) P_1XP_7(4.48), P_3XP (1.89)
Fruit shape index	0.9-1.3	0.9-1.3	-14.14-23.3	-24.60-23.13	P_5XP_7 (23.3) ,P_1XP_5(5.0) P_3XP_5(4.76), P_1XP_4 (4.17)	P_5XP_7 (23.1) ,P_1XP_4(4.17) P_3XP_5(2.80), P_1XP_5 (1.94)
No. of locules/fruit	3.3-4.3	4.7-6.0	11.9-54.05	9.3-54.05	P_1XP_5 (54.05) ,P_4XP_5(54.1) P_1XP_3(53.85), P_3XP_6 (50.0)	P_3XP_5 (54.05) ,P_4XP_5(52.5) P_3XP_6(42.5), P_1XP_3 (39.53)
Flesh thickness(cm)	0.3-0.5	0.4-0.6	-20.0-42.85	-20.0-25.0	$P_1X P_2$(42.85) ,P_1XP_7(42.85) P_4XP_5(33.3), P_1XP_3 (25.0)	P_1XP_2 (25) ,P_1XP_7(25.00) P_2XP_4(25.00), P_4XP_7 (25.00)
TSS %	4.3-6.3	4.7-6.3	-11.3-16.28	-17.54-16.28	P_4XP_5(16.28) ,P_1XP_4(14.0) P_2XP_6(10.67), P_1XP_2 (7.69)	P_4XP_5 (16.28) ,P_5XP_6(9.3) P_1XP_7(10.53), P_1XP_2 (5.00)

MP= Mid-Parent.
Bp=Best-Parent.
F1's= First hybrids.

Heterosis estimates over MP that ranged from -22.64 % ;while those over BP ranged from -35.82 to 22.91 % .Heterosis MP for the best four crosses ranged from 13.84 % for the cross P_1XP_7 to 28.64 % (P_3XP_7). Heterosis over BP for the best four crosses ranged from 1.89 for the cross P_3XP_6 to 22.91 % for the cross P_3XP_7 .In fruit shape index character, data show that the mean performance values for parents and their F1 hybrids ranged from 0.9 to 1.3 ,while the detected heterosis ranged from -14.14 to 23.3 % and from -24.6 to 23.3 % over MP and BP respectively .Heterosis over MP for best four crosses ranged from 4.17 for the cross (P_1XP_4) to 23.3 % for the cross (P_5XP_7) ,while heterosis over the BP in the best four crosses ranged from 1.94 for cross (P_1XP_5) to 23.3 % for the cross (P_5XP_7) .For number of locules per fruit ,the data in table 3 showed that the mean values ranged from 3.3 to 4.3 for parents and 4.7 to 6.0 for their F_1 hybrids . Heterosis estimates ranged from 11.9 to 54.05 % and from 9.3 to 54.0 % over their MP and BP respectively .All crosses (21) showed high significant and positive heterosis over MP and BP .In the best four crosses ,heterosis estimates ranged from 50.0 to 54.05 % and from 39.53 to 54.05 % over MP and BP respectively .Concerning flesh thickness data in table 3 show that values of general performance ranged from 0.3 to 0.5 cm and from 0.4 to 0.6 cm for parents and their F_1 hybrids ,respectively Heterosis estimates ranged from-20.0 to 42.85 %. and from -20.0 to 25 % over MP and BP ,respectively .In the best four crosses ,heterosis estimates ranged from 25.0 to 42.85 % over MP and 25 for BP .

For TSS % the calculated values of mean performance for both parents and their F_1 hybrids were ranged from 4.3 to 6.3 % and from 4.7 to 6.3 % respectively .While ranged from -11.3 to 16.28 % and from -17.54 to 16.28 over MP and BP, respectively. In the best four crosses, heterosis estimates ranged from 7.69 to 16.28 % and from 5.0 to 16.28 % over MP and BP, respectively. In our results four crosses viz P_1XP_7, P_4XP_7 , P_5XP_7 and P_1XP_6 displayed high heterosis of 87.19 ,83.8,76.35 and 42.92 % with mean performance of 3.8,2.61,3.240 and 3.13 kg respectively for yield .These hybrids were emerged from L X a,h X L GCA parental combination and had higher value of mean performance and SCA effects .Durick (1999) reported that high degree of heterosis did not essentially correlate to SCA effects ,therefore ,genotype X environment interaction might be conducted as suggested by Fox *et al*.,(1997) and Bakhsh *et al*.,(2006).

Out of the present study, keeping in view mean performances SCA effects and their heterosis. The hybrids LHT24 (P_1) X Advantage -2,LHT24 (P_1) X Floradade (P_6), Peto 86(P_5), X Advantage -2 may be recommended for heterosis breeding after further evaluation.

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التحليل الوراثي لتحديد أباء مناسبة لإنتاج بعض الهجن الجديدة من الطماطم

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أجريت هذه الدراسة بغرض تحديد آباء وكذلك الاتحادات الوراثية الجديدة التي تظهر كفاءة إنتاجيه عاليه تحت الظروف المصرية علاوة على ذلك معرفه السلوك الوراثي لبعض الصفات المكونة لمحصول من خلال برنامج التهجين بنظام التزاوج النصف دائري لسبعه آباء من الطماطم شامله تراكيب وراثية محليه وأخرى مستورده وقيمت الآباء والهجن الناتجة منها في العروة الصيفي موسم ٢٠٠٩ وأوضحت النتائج الاتى:-

- كانت كلا من القدرة العامة والخاصة على التآلف عاليه المعنوية لكل الصفات التي درست وهذا يدل على أهميه كلا من التأثير المضيف والسيادي في وراثة هذه الصفات .
- كانت قيمه التباين الاضافى اكبر من قيمه التباين السيادي لصفات طول النبات – عدد الأفرع/ نبات – متوسط وزن الثمرة – المواد الصلبة الذائبة , بينما باقي الصفات فقد كان الفعل السيادي له الدور الرئيسي في وراثتها.

- أظهرت النتائج بصوره عامه أن القيم المقدرة للقدرة العامة والخاصة على التآلف معنوية لمعظم الصفات المدروسة.
- قوه الهجين عند حسابها سواء بالنسبة لمتوسط الأبوين أو الأب الأفضل كانت معنوية لمعظم الهجن في الصفات المدروسة ماعدا صفه سمك اللحم.
- أشارت النتائج أن الآباء LHT24 وCLN2498E أظهرت قدره عامه على التآلف بالنسبة للصفات الخضرية طول النبات وعدد الأفرع بينما كان الأب Peto 86 كان أحسن الآباء قدره على التالف بالنسبة لعدد الثمار على النبات والمحصول الكلى للنبات وسمك اللحم والصنف Marglobe يعتبر أعلى قدره على التآلف بالنسبة لوزن الثمرة ودليل شكل الثمرة والصنف Advantage -2 كان أعلى الآباء قدره على التآلف بالنسبة للمواد الصلبة الذائبة .
- أشارت النتائج إلى أن أفضل ثلاثة هجن يمكن أن يوصى بها بعد التقييم فيما بعد هي: LHT24(P_1) X Advantage -2, LHT24 (P_1) X Floradade (P_6), Peto 86(P_5), X Advantage -2

قام بتحكيم البحث

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