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EVALUATION OF SOME TOMATO GENOTYPES VIABILITY UNDER RECLAIMED LAND CONDITIONS

Hossny M. H.
Faculty of Agriculture in Sohag, Dept. of Horticulture (vegetable) South Valley University

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ABSTRACT: Six tomato genotypes and their 15 F_1 hybrids were used to study the genetic behavior of some characters under conditions of reclaimed land on El-kouthr Farm, Faculty of Agriculture in Sohag. Genotypes significantly differed in all the studied characters. The results indicated the importance of both additive and non-additive gene action to control the genetic system for the studied characters. Heterosis was observed for all characters except fruit weight, total soluble solids, and ascorbic acid content. Over-dominance effect was found for all traits except acidity content character. Broad sense heretability was greater than narrow sense heretability in all traits. The superior parents were Pritchard for plant height and acidity content, Giza80 for fruit weight and ascorbic acid, T.cercelifollium for percent of fruit set and T.S.S. The superior hybrids were (Castle Rock x Pacessetter502) for plant height, fruit weight and acidity content, hybrid (T.cercelifollium x Giza80) for percent of fruit set and ascorbic acid content, hybrid (Castle Rock x Pritchard) for total yield and hybrid (T.cercelifollium x Pacessetter502) for total soluble solids.

INTRODUCTION

Tomato is one of the major vegetable crops in Egypt, its area exceeded 456.880 fed./year*
On the other had, its area in newly reclaimed soils is about 164.390 fed., which represented about

*Statistics of Ministry of Agriculture, 1999

35.3% of total newly reclaimed areas. The main problems facing newly reclaimed soils include the tomato production under the newly reclaimed soils include the unfavourable conditions which are caused by the nature of these areas and most of these areas were sandy soil and poor in nutrients **Ibrahim *et al.* (2001)**, low water holding capacity and leaching of nutrients. The aim of the present study was to investigate the mode of inheritance of some vegetative and reproductive characters in tomato under the reclaimed land on El-kouthr farm in Sohag.

An analysis of a diallel cross involving six tomto cultivars found a dominance and epistasis involved in the inheritance of fruit weight and early yield (**Trinklein, 1975**). Additive gene action was involved in the inheritance of total yield. Heterosis effects were significant for number of fruits, early yield and total yield. **Trinklein and Lambeth (1975),** using 6x6 diallel in tomato, found that fruit quality traits were mainly controlled by additive effects, but dominance controlled fruit weight. **Hanna *et al.* (1982)** found that tomato hybrids from 7x7 diallel, without reciprocals, were grown under conditions where the day maximum temperature ranged from 32.4 to 36.1°C and the night maximum temperature from 22.6 to 25.3 °C. Additive gene action was more important than non-additive effects for fruit set, flower drop and developed ovaries at high temperatures. Bhutani and **Kalloo (1991)** analysed data of 8-parents diallel cross including 28 F_1 and F_2 for locules number. In both the F_1 and F_2, the additive component highly significant and higher than the non-additive component. Combining ability analysis revealed the importance of additive gene action at the variance and estimated component variance levels. They concluded that a desirable higher locules number could be brought about by simple selection. The genetic system controlling growth and yield characteristics of tomato under heat stress analyzed in a seven parent half-diallel cross grown in the late summer at Assiut province of Upper Egypt was studied by **Sherif and Hussein (1992)**.They found that, heterosis from the higher parent reached 13.7%, -2.25%, 156.68%, 27.92%, 77.77% and 46.55% for plant height, flowering time, fruit number per plant, percentage of fruit setting, fruit weight and fruit yield per plant, respectively. Additive gene effects with partial dominance were operating the

expression of number of fruit/plant and fruit weight, whereas non-additive gene effects with complete to over dominance were involved in the control of plant height, flowering time and total fruit per plant. Narrow-sense heretability estimates were high for number of fruits/plant and fruit weight, moderate for plant height and low for flowering time and total yield per plant. **Reddy and Reddy (1992)** studied phenotypic genotypic variance, phenotypic and genotypic coefficients of variation, heritability and genetic advance using data on 12 yield and quality traits determined in 139 tomato varieties grown at Hyderabad, India. They found considerable variation for yield per plant (217.22-107.29g), early yield per plant (18.89-507.33g), number of fruits/plant (4.0-296.5) and average fruit weight (1.25-158.57g). Respective heritability values for these characters were 97.99, 97.06, 95.96 and 98.46%.

Dod *et al.* (1992) on tomatoes evaluated parents and 66 F1 hybrids from 12x12 diallel cross (excluding reciprocals) for six yield-related traits in field trails. Pronounced heterosis was observed for yield per plant, days to first harvest, number of fruits/plant and plant height; the best specific combination was Hs101xS12. **Hassan *et al.*(1995)** studied the combining ability for yield components in seven tomato cultivars and their 21 F1 hybrids and found that there were highly significant variances among the genotypes for all studied characters. Most of the genetic variances was due to additive gene effect. **Kumar *et al* (1995a and b)** in a study of seven tomato lines, their 21 F1 and three commercial hybrid standerd found greatest heterosis over superior parents for average fruit weight, fruit number, early yield and total yield characters. **Kurain and Peter (1995a)** concluded that, in 64 tomato lines grown between September 1986 and January 1987 there were significant differences for all studied characters. **The same authers (1995b)** recorded the greatest heterosis over superior parents for average fruit weight, number of fruits, early yield and total yield characters. The same results on heterosis were reported by **Roudhav *et al.* (1997)** in ten pure lines of tomato(five heat torelant and five heat sensitive) these plants were crossed in diallel fashion. They found marked hetrosis for fruit number/plant and marketable yield/plant.

MATERIALS AND METHODS

Six tomato genotypes were used in this investigation ; i.e, Castle Rock(P_1) , Pritchard (P_2), Pacessetter 502 (P_3) ,UC90 (P_4), cericelifollium (P_5) and Giza80 (P_6). These genotypes were planted in open field and emasculation and self-pollination have been done for one season. The F_1 hybrids were produced by emasculation and hand pollination during season 2000 on El-Kouthr Farm, Faculty of Agriculture, Sohag. Parents and F_1 hybrids were planted in Randomized Complete Block Design with three replicates in March 2001. Recommended cultural practices of irrigation, fertilization and weed and pest control were followed.

Measurements taken were:-

1.Plant height(cm)
2.Percent of fruit set
3.Fruit weight (gm)
4. Total yield(ton/fed.)
5.Percent of total soluble solids (T.S.S)
6-Ascorbic acid content
7-Acidity content

Means of the 15 entries were subjected to the conventional analysis of variance. After establishing the presence of significant genotypic differences between entries, the data were analyzed using the diallel analysis of variance **Hyman (1954 a ,b).**

RESULTS AND DISCUSSION

The average of the studied characters for 6 parents and their 15 hybrids are given in Table 1. The results indicate that, the average of plant height for parents ranged from 34.33 to 70.67cm while the average for hybrids ranged from 53.67 to 100.67 cm. The highest values of plant height were obtained from parent (2) and hybrid (1x3) while, the lowest values were obtained from parent (1)and hybrid (4x5).The difference between hybrids mean and their parents mean in Table 2 was 20.39 indicating the presence of heterosis.

The average of percent of fruit set in Table 1 showed that, the highest values were obtained from parent (5)and hybrid(1x3). While, the lowest values were obtained from parent (3) and hybrid (2x6). The differences between hybrids mean and their parents mean in Table 2 indicated that, the mean F_1 hybrids surpassed the parental mean by 13.67; indicating the presence of epstatic effects. Parent (6) and hybrid (1x3) gave the highest values for fruit weight in Table 1. Meanwhile, parent (5) and hybrid

(5x6) gave the lowest values in this trait. The difference between hybrids mean and parents mean in this trait which presented in Table 2 was 13.39.The average of total yield for parents ranged from 7.70 to 15.20 (ton/fed). Parent (5) and parent (3) gave the highest and the lowest value, respectively. While, the average of hybrids in this trait ranged from 7.60 to 16.40 (ton/fed).Hybrids (5x6) and (1x2) gave the highest and the lowest values,respectively. The difference between hybrids mean and their parents mean for total yield was 0.79. The average of total soluble solids (T.S.S) in Table 1 showed that, the highest values were obtained from parent (5) and hybrids (3x4) and (3x5), while the lowest values were obtained from parent (1) and hybrid (2x4). The differences between hybrids mean and their parents mean in Table 2 indicate that, the mean F_1 hybrids was less than that of the parental mean by 0.07 .Parent(6) and hybrid (5x6) gave the highest values for the average of ascorbic acid content in Table 1. Meanwhile, parent (3) and hybrid (3x6) gave the lowest values in this trait. The differences between hybrids mean and parents mean in this trait in Table 2 was 3.99.The average of acidity content in Table 1 show that, the highest values were obtained from parent (2) and hybrid (1x3). Meanwhile, the lowest values were obtained from parent (6) and hybrid (3x4).The differences between hybrids mean and their parents mean in Table 2 indicate that, the mean F_1 hybrids was larger than the parental mean by 0.04 indicating the presence of heterosis or epstatic effect .Such results agree with those of **Trinklein(1975), Dod *et al* (1992),Kumar *et al*(1995a,b) and Rouadhav *et al.* (1997)**

Analysis of variance of 6 x 6 half diallel are presented in Table 3. These results show that there were highly significant differences among the tested genotypes under El-Kouthr conditions. Similler results were obtained by **Kurian and Peter (1995a,b) and Hassan *et al.* (1995).** The diallel analysis of variance for the studied characters are presented in Table 4. Means squares due to "a" and "b" items were statistically significant in the F_1 indicating the importance of additive and non-additive genetic effects in the inheritance of these characters. The item "a" was greater than item "b" in characters fruit weight, total yield and total soluble solids. While item "b" was greater than item "a" in characters plant height , percent of fruit set ,

ascorbic acid content and acidity content. The significance of the b_1 item in the F_1 generation indicated that directional dominance was operating. The significance of the b_2 and b_3 items indicated unequal allelic distribution affecting at loci showing dominance and further dominance due to specific combinations and/or epestasis.

The $(H_1/D)^{1/2}$ ratio values were greater than one in all studied characters except acidity content character which confirmed the presence of over-dominance. Broad-sense heretability values were greater than narrow-sense heretability in all studied characters. The obtained results agreement with those of **Trinklein (1975), Trinklein and Lambeth (1975), Hanna *et al.* (1982), Bhutani and Kalloo (1991), Reddy and Reddy (1992, Sherif and Hussein(1992) and Hassan *et al.* (1995)**.

Table 1 :-Average of the studied characters for the six parents (diagonal)and F1 hybrids under El-kouthr conditions.

Genotypes	Plant height (cm)	Percent of fruit set	Fruit weight (gm)	Total yield (ton/fed.)	Total soluble solids (%)	Ascorbic acid content (ml/100g)	Acidity content (ml/100g)
1	34.33	50.33	43.33	9.30	1.01	19.00	0.06
2	70.67	40.67	27.87	12.30	3.27	15.03	0.13
3	40.83	40.47	29.67	15.20	2.40	7.67	0.06
4	58.67	49.50	57.33	12.30	3.33	10.83	0.06
5	51.00	81.17	1.77	7.70	4.67	26.23	0.10
6	49.33	69.67	77.33	9.10	3.17	33.83	0.03
1x2	60.57	79.37	9.83	16.40	3.00	11.25	0.09
1x3	100.67	80.67	54.40	15.20	2.60	18.97	0.22
1x4	83.67	74.43	35.50	12.30	3.40	22.17	0.06
1x5	69.37	81.67	48.67	12.60	2.77	11.67	0.10
1x6	71.67	69.40	13.80	12.70	1.53	11.67	0.06
2x3	58.67	70.67	21.33	11.90	3.33	17.10	0.09
2x4	85.67	66.33	17.77	11.00	1.53	18.97	0.13
2x5	63.33	58.67	15.33	11.80	3.63	15.00	0.13
2x6	96.33	53.33	20.33	9.40	1.60	7.87	0.06
3x4	61.33	66.67	11.33	10.00	5.00	11.47	0.03
3x5	70.67	64.33	18.67	11.20	5.00	18.97	0.10
3x6	65.33	53.33	37.67	8.90	2.44	7.67	0.06
4x5	53.67	57.67	34.33	10.40	2.33	18.97	0.13
4x6	66.33	70.37	43.67	15.20	1.40	11.47	0.10
5x6	60.67	82.67	9.80	7.60	1.53	22.63	0.17

Table 2 :-Means of the studied characters of 6 parents and 15 F_1 hybrids.

	Plant height (cm)	Percent of fruit set	Fruit weight (gm)	Total yield (ton/fed.)	Total soluble solids (%)	Ascorbic acid content (ml/100gm)	Acidity content (ml/100 gm)
Parents mean	60.80	55.30	39.55	10.98	2.80	18.76	0.07
Hybrids mean	71.19	68.97	26.16	11.77	2.73	14.77	0.11

Table 3 :-Analysis of variance for studied characters of the six parents (diagonal) and F1 hybrids under El-kouthr conditions.

Characters	Items	D.f	M.S	F
Plant height	Blocks	2	0.44	0.489
	Genotypes	20	807.81	898.57**
	Bl. X Genotypes	40	0.899	
Percent of fruit set	Blocks	2	0.585	1.344
	Genotypes	20	554.42	1274.5**
	Bl. X Genotypes	40	0.985	
Fruit weight	Blocks	2	1.03	2.324
	Genotypes	20	1093.93	2447.7**
	Bl. X Genotypes	40	0.446	
Total yield	Blocks	2	0.276	1.841
	Genotypes	20	18.76	125.30**
	Bl. X Genotypes	40	0.149	
Total soluble solids	Blocks	2	0.04	3
	Genotypes	20	3.103	232.73**
	Bl. X Genotypes	40	0.558	
Ascorbic acid content	Blocks	2	1.093	5.13
	Genotypes	20	134.82	632.92**
	Bl. X Genotypes	40	0.965	
Acidity content	Blocks	2	7.1E-05	1.577
	Genotypes	20	6.1E-03	134.94**
	Bl. X Genotypes	40	4.5E-05	

** significant at p=0.01

Table 4 :-Means squares of studied characters in F_1 under El-kouthr condition

		Plant height (cm)		Percent of fruit set		Fruit weight (gm)		Total yield (ton/fed.)		Total soluble solids (%)		Ascorbic acid content (ml/100gm)		Acidity content (ml/100gm)	
Items	d.f	MS	F	MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
a	5	508.5	565.6**	779.43	1791.7**	1651.3	3702.6**	42.65	286.2**	12.57	966.9**	171.3	804.2**	5.140000	114.2**
b	15	1521.8	1692.8**	811.57	1865.6**	1554.6	3485.8**	27.68	185.7**	5.98	460.0**	198.7	932.9**	1.40E-02	311.1**
b_1	1	6236.2	6936.9**	2803.4	6444.7**	2688.4	6028.1**	9.36	62.8**	0.08	6.15**	239.1	1122.3**	1.90E-02	422.2**
b_2	5	734.2	816.7**	855.06	1965.6**	1440.1	3228.8**	30.08	201.8**	10.15	780.7**	280.5	1317.1**	4.87E-03	108.2**
b_3	9	1435.6	1596.8**	566.08	1301.33**	1493.3	3346.1**	28.38	190.4**	4.31	331.5**	148.7	698.3**	1.86E-02	413.3**
Error	40	0.899		0.435		0.446				0.013		0.213		4.5E-05	
$(H_1/D)^{1/2}$		2.67		1.63		1.41		1.81		160		141		0.35	
Broad sense hertability		99		99.97		99.87		97.69		82.31		99.95		0.01	
Narrow sense hertability		10		24.18		26.11		33.22		35.44		22.21		0.11	

** significant at p=0.01

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تقييم لبعض التراكيب الوراثية فى الطماطم وتباينها تحت ظروف الأراضي المستصلحة

ماهر حسن حسنى عبد المجيد

كلية الزراعة بسوهاج- قسم البساتين (خضر)جامعة جنوب الوادى

استخدمت فى هذه الدراسة ٦ تراكيب وراثية بالإضافة الى ١٥ هجين وذلك لدراسة السلوك الوراثى لبعض الصفات تحت ظروف الأراضي المستصلحة فى مزرعة الكوثر بكلية الزراعة بسوهاج.وقد اختلفت التراكيب الوراثية فيما بينها فى كل الصفات المدروسة.أظهرت النتائج عن أهمية كل من الجينات المضيفة والغير مضيفة فى تحكمها فى النظام الوراثى للصفات المدروسة ، وظهر أن هناك تفوق للهجن عن الآباء فى كل الصفات المدروسة ماعدا صفات وزن الثمار ونسبة المادة الصلبة الكلية ، وكمية حامض الاسكوربيك.كما ظهر تأثير السيادة الفائقة فى كل الصفات المدروسة ماعدا صفة المحتوى من الحموضة.وكانت درجة التوريث بالمعنى العريض أكبر من درجة التوريث بالمعنى الضيق فى كل الصفات المدروسة، والآباء المتفوقة هى صنف برتشارد لصفتى طول النبات والمحتوى من الحموضة، وصنف جيزه٨٠ لصفتى وزن الثمار والمحتوى من حامض الاسكوربيك، و كيرسيليفوليم لصفتى نسبه العقد ونسبة المادة الصلبة الذائبة الكلية. بينما كانت الهجن المتفوقة فى الصفات المدروسة هى (كاستل روك X باسستر٥٠٢) لصفات طول النبات ووزن الثمرة والمحتوى من الحموضة و الهجين(كيرسيليفوليم X جيزه ٨٠)فى صفتى نسبة العقد والمحتوى من حامض الاسكوربيك و الهجين (كاستل روك X برتشارد) فى صفة المحصول الكلى، والهجين (كيرسيليفوليم X باسستر٥٠٢)فى صفة نسبة المادة الصلبة الذائبة الكلية.