INHERITANCE OF SOME ECONOMIC TRAITS IN SQUASH (*Cucurbieta pepo*) AND EVALAUTION OF NEW HYBRID PRODUCED

El-Lithy, Y.T.E.
Veg. Res. Dept., Hort. Res. Inst., A.R.C., Egypt

ABSTRACT

Inheritance studies on cross between two varieties in squash, local variety Eskandrani and Foreign variety Ambassador and evaluation of this hybrid. This studied was carried out in plastic house of Dokki research and farm of sides Experimental Station belonging to the Horticultural Research Institute.

The objective of this work was to determine the mode of inheritance of early and total yield weight and number of fruit, plant habit, average fruit weight, length and diameter of fruit and fruit shape, as well as the evaluation of new hybrid produced compared with parental and some hybrid recommended. The results can be summarized as follows. Over dominance concerning early and total yield weight and number of fruits and plant habit, absence of dominance for average fruit weight, length of fruit and fruit shape, complete dominance of diameter of fruit.

The number of genes controlling in these traits was one pair of genes for every trait. The estimates of heritability of these characters were low value mostly, may be due to the major effect to the environment on the inheritance of these characters, whereas, maximal value recording of broad and narrow sense heritability was 52.3 % and 36.2 % respectively for average fruit weight trait, while was less value of broad and narrow sense heritability 20.64 % and 10.22 % respectively for diameter of fruit.

The expected genetic advance after one generation of selecting the best 5 % of the F_2 would be 13.4 % and 10.8 % of weight and number of early yield and 15.0 % and 8.1 % of total yield respectively, while were 5.8 %, 14.0 %, 4.2 %, 2.7 % and 4.0 % for plant length, average fruit weight, fruit length fruit diameter and fruit shape index respectively.

The evaluation results of this hybrid produced compared with parental and some hybrids recommended was summarize in the distinction of new hybrid on parental and hybrids recommended in early and total yield, whereas, the new hybrid gave 6.7 and 16.6 in season 1997 and 7.3 and 17.0 in season 1998 ton feddan for early and total yield respectively, while was maximal yield form hybrids recommended by Top Kapi hybrid, which gave 5.5 and 15.1 in season 1997, 6.4 and 15.9 in season 1998 ton feddan for early and total yield respectively. The results shown clearly, the good form of fruit for new hybrid compared with hybrids recommended, whence average fruit weight and fruit shape index.

INTRODUCTION

The squash (*Cucurbita pepo*, L.) is an important species of cucurbitaceae family. Many economic characters of this species have been studied for mode of inheritance. This study was conducted on the progeny of the cross between the foreign variety (Ambassador) and local variety (Eskandrani) with the objective of determining the mode of inheritance of some economic characters and to incorporate all desirable characters for foreign markets as well as for local markets into a new hybrid.

Procedure of plant breeding method and developing new hybrids from open pollinated crops were mentioned by many investigators such as

Allard (1960) and Mather (1982). Considerable study has been made of the inheritance of bush habit, since this character is of much economic importance. Shifriss (1947) reported that *C. pepo* plants heterozygous have a bush habit in young plant stage but become vines at maturity. Nath (1963) he showed that a single pair of genes governs the expression of the inheritance of bush habit in *C. pepo*. Denna and Munger (1963), however, reported that the bush gene was incompletely dominant in older plants of *C. pepo* and recessive in *C. maxima* at maturity. Later workers have conclusion that dominance of the gene is changed during development. So that the bush habit is a dominant trait in young plants but is recessive at maturity. Scarchuk (1974) reported a single recessive gene for extreme dwarf habit. For fruit shape Sinnott (1922) reported a single dominant gene that determines disc or scallop fruit shape vs. spherical in *Cucurbita pepo*. Whitaker (1932) reported that the pear shape of a gourd was recessive to the scallop or disc shape of a summer squash due to a single gene. Whitwood (1975) found that, fruit with necks in *C. pepo* was dominant to neckless and monogenic in some crosses, but additional genes appeared to be involved in other crosses. For yield Sachan and Nath (1976) when ten varieties of wide genetic diversity were crossed in all possible combinations. They reported that in promising hybrids, yield increases of 87 % over the yield of the better parent. Amrik *et al.* (1977) reported that the analysis of data from a 7 x 7 diallel revealed that, both additive and dominant genetic variance was important for yield per plant, with additive variance over dominance affected yield. Janossy *et al.* (1994) they found that the several hybrids appeared to be more productive and earlier than traditional varieties. It is suggested that a breeding programme devoted to the production of hybrids appears more promising. Dahiya *et al.* (1990) they found that, significant differences between lines were observed for all characters. Some lines gave highest of total yield per plant and fruit weight and high heritability and genetic advance, which were estimated for plant height, fruit weight and total yield. Hassan *et al.* (1984) in cross between *C. pepo* cv. X *C. moschata*, they found that, gene effects on fruit weight could be explained by an additive-dominance model, while (BSH) and (NSH) for this character was high but affected by environment, short fruit character of *C. pepo* was partially dominant over long fruit in *C. moschata* and (BSH) and (NSH) values for fruit length were 80 % and 51 % respectively additive gene effects were more important than dominance for fruit width but the reverse for fruit shape index. The (BSH) was high, while (NSH) was low for two characters. The number of genes controlling was one for fruit weight and fruit shape and 14 and 6 for fruit length and diameter respectively. Galka (1984) in cross between more types from Italy and France from *C. pepo*, he found that, all F_1 plants were bush type and heritability of the bush habit was high.

MATERIALS AND METHODS

This study was carried out at the plastic house in Dokki research and farm of Side Experimental Station belonging to the Horticultural Research Institute, Agricultural Research Center, Ministry of Agric. During the period from 1996 to 1998.

One parent variety was used in this study namely, Eskandrani (local variety) squash. It is intermediate in fruit length and green white of color and the certified seeds were populated by Vegetable Research Department. The second variety was Ambassador (importation variety) squash. It is long in fruit length and dark green of color, which was obtained ;from U.S.A. production by Peto seed Co.

This study was carried out in two experiments, the first experiment was cross between Eskandrani variety and Ambassador variety and its reciprocal cross in order to test existence of material effects.

The original cross between the parents (Eskandrani X Ambassador) and the reciprocal cross were made in summer season of 1996. The seeds which produce plants of F_1 original and F_1's planting during fall season of 1996 were selfed for obtaining F_2 seeds and backcrossed to both parents to produce BC_1 and BC_2. In March, 1997 seeds of the parents, F_1, F_2, BC_1 and BC_2 generations of this cross were sown in the farm of Side Experimental Station.

Plants were raised in hills at 40 cm apart, ridges 80 cm wide. Twelve plants were sowing in each row. A randomized complete block design of a single row plot with eight replicates for each of the parents and F_1 populations and ten replicates for each of F_2, BC_1 and BC_2 populations. This experiment for study of inheritance of some characters in different populations from this cross.

The second experiment was for evaluation of F_1 hybrid produced from this cross with parental and some importation hybrids recommended.

The seeds of F_1 hybrid, parental and two hybrids recommended their Top Kapi and Obodas hybrids (U.S.A. production) were planting in March of two successive seasons, 1997 and 1998 at the Research Farm of Sides Experimental Station. The experiment design used the randomized complete block with four replicates, each replicate consisted of two rows from each hybrid. The dimension of row were 5.0 m long and 80 cm wide and 40 cm between plants within row.

All the cultural practices, irrigation, chemical fertilization diseases and insect control for squash production were followed.

The following data were recorded :
A. Study of inheritance characteristics :

Data were recorded on individual plants for the different populations in this cross (P_1, P_2, F_1, F_2, BC_1 and BC_2). The characters studied were as follow :

1. Early yield weight and number of fruits per plant.
2. Total yield weight and number of fruits per plant.
3. Length of plant was calculated by main stem length.
4. Fruit weight as an average of all fruits per plant.
5. Fruit length as an average of all fruits per plant.
6. Fruit diameter as an average of all fruits per plant.
7. Shape index was calculated by the ratio of length/ Diameter.

Some of the studied characters behaved as qualitative characters, other were of quantitative nature. The mode of inheritance of each type were used.

The following parameters were calculated to study of these characteristics :

1. Degree and nature of dominance :

The arithmetic mean of F_1, F_2, BC_1 and BC_2 generations were calculated (Powers *et al.*, 1950). The t-test was used to test of significant differences between the observed and the arithmetic means of each population as follows :

$$t = \frac{\text{Observed mean} - \text{Arithmetic mean}}{\text{Standard error of observed mean}}$$

The nature of dominance was evaluated (a) by comparing the observed mean and the arithmetic mean of F_1. (b) by potence ratio "P" which was calculated from the formula :

$$P = \frac{F_1 - M.P.}{\frac{1}{2}(P_2 - P_1)} \quad \text{(Mather and Jinks, 1982)}$$

2. The minimum number of genes controlling different characters which were estimated by Castle-Wright, 1921 and Mather-Jinks, 1982 formula : $N = D^2/98(VF_2 - VF_1)$ (Castle, 1921), $K_1 = (P_1 - P_2)^2/4D$ (Mather, 1982).

3. Heritability, in broad sense (BSH) and in Narrow sense (NSH) which were estimated by using the following equations :

$$BSH = \frac{VF_2 - (VP_1 + VP_2 + VF_1)/3}{VF_2} \times 100 \quad \text{(Allard, 1960)}$$

$$NSH = \frac{2VF_2 - (VBC.P_1 + VBC.P_2)}{VF_2} \times 100 \quad \text{(Warner, 1952)}$$

4. The expected genetic advance resulting from selection in a character (G_5) was calculated by the following formula :

$G_5{}^s = (K)\ (سA)\ (h^2)$ (Allard, 1960)

Where : $G_5{}^s$ = Represents the expected genetic advance due to selection.

سA = The phenotypic standard deviation of F_2.

h^2 = Heritability value in the narrow sense.

K = Selection differential coefficient (its value depends on the selection intensity).

The selection intensity taken in consideration was 5 %, thus the respective (K) value was 2.06 (Allard, 1960).

B. Evaluation of F_1 hybrid produced from this cross.
The data which were recorded for evaluated as follows :
1. Early yield weight and number of fruits per plant (kg).
2. Total yield weight and number of fruits per plant (kg).
3. Average fruit weight (gm).
4. Shape index of fruits.
5. The weight of early and total yield ton per feddan were estimated.
All data were subjected to statistical analysis and means were compared using the L.S.D. according to Steel and Torrie (1984).

RESULTS AND DISCUSSION

The statistical constant and genetic parameters of the parental varieties, F_1, F_2, BC_1 and BC_2 generations were estimated for yield component and fruit characters in cross between two squash cultivars from squash (*Cucurbita pepo* L.) Eskandarani X Ambassador. The inheritance of these characters and evaluated of this new hybrid were studied from obtained data in this cross.

A. Inheritance of characters :
1. Early yield weight and number of fruits per plant :
The data obtained for the weight of early yield per plant was presented in Table (1). The data shown, there was significant different between the observed and the orithmetic mean of F_1 population and exceeded of F_1 mean to the higher parent in weight of early yield. These results suggested over dominance in direction of the high weight of early yield. This conclusion was confirmed by the potence ratio value, which was equal (2.32) viz over dominance of this trait.

Concerning, the number of effective factors conditioning the weight of early yield character was estimated by Mather and Castle Method, 0.022 and 0.0093 respectively. This result indicated that, the minimum number of genes controlling of this character is one pair of genes. From the mentioned results in Table (1), it was clear that, the higher cv., values for segregating population (F_2, BC_1 and BC_2) compared to the non-segregating ones (P_1, P_2 and F_1) indicating the occurrence of genetic diversity beside the environmental difference in the former populations.

Heritability values for weight of early yield was 27.529 and 12.941 for broad and narrow sense respectively. Again of these heritability values was low, this may be due to the major effect of the environment on the inheritance of this trait.

Data shown, the expected genetic advance after one generation of electing the best 5 % of the F_2 population was 0.078 kg or 13.447 % of the F_2 mean.

Concerning, the number of fruits per plant in the early yield as shown in the same table.

El-Lithy, Y.T.E.

1

Data revealed that, the mean of F_1 population exceeded to larger parent, in number of fruits as well as the significant difference between the observed and arithmetic mean of F_1 population, this results indicated the over dominance in direction of the larger number of fruits, this result was confirmed by the value of potency ratio which was exceeded + 1.0 (1.667) viz over dominance for this character.

Data shown, the minimum number of genes controlling of this character was estimated as one pair of genes (0.048 and 0.089 by castle and Mather Method respectively). From the mentioned result in the same table, was clear that the higher cv. values of segregating than non-segregating populations, indicating the occurrence of genetic diversity beside the environmental different in former populations.

Heritability values for number of fruits of early yield were 43.25 % and 15.49 % for broad and narrow sense respectively. The high different between the two values it's clear the major role of environment in the inheritance of this trait.

The expected genetic advance resulting from selection in this character, was calculated at 0.518 fruit or 10.75 % of the F_2 mean.

The results of the present study concerning the inheritance of weight and number of fruits for early yield, indicated that, the over dominance for the larger early yield weight and number. This results were in accordance to Sachan and Nath (1976), Arik *et al.* (1977), Janossy *et al.* (1994) and Dahiya *et al.* (1990).

There was no significant difference between the means of F_1 plants in the original and the reciprocal crosses, indicating no material effect.

2. Total yield weight and number of fruits per plant :

The weight and number of fruits per plant of total yield for the P_1, P_2, F_1, F_2, BC_1 and BC_2 generations is presented in Table (2). Data shown the observed mean of F_1 population was higher than the mean of all other populations in weight (1.564 kg) and number of fruits (12.506 fruits), as well as highly significant different between the observed and the arithmetic mean of F_1 population. These results indicated that hybrid vigor in weight and number of fruits of total yield was manifested in this cross. This results were confirmed by the potence ratio values which were equal 26.055 and 10.262 of weight and number of fruits respectively, which indicated that, the hetaerists in F_1 hybrid and over dominance in direction of high total yield weight and number of fruits.

It was clear from data in the same table, the number of factors controlling in these traits (weight and number) estimated by different method was one pair of genes for each character.

So, the data shown, the higher cv. values for segregating populations compared to non-segregating ones, in both characters, indicating the occurrence of the genetic diversity beside the environmental differences in the former populations. The values of heritability were 34.53 % and 25.32 % in broad and narrow sense respectively for weight of total yield and 20.46 % and 14.35 % in broad and narrow sense respectively for total number of fruits the low values of broad and narrow sense heritability revealed the major effect of environment on the inheritance of both characters.

2

The expected genetic advance after one generation of selecting of F_2 was 0.189 kg or 13.99 % for weight and 0.96 fruit or 8.08 % for number of fruits of F_2 mean.

These results are in accordance with the results reported by Sachan and Nath (1976) Arik *et al.* (1977), Janossy *et al.* (1994) and Dahiya *et al*. (1990) on squash.

There was no significant difference between the original and reciprocal means of F_1 plants.

3. Plant habit :

Considerable study has been mode of the inheritance of bush habit, since this character is of much economic importance.

The mean of plant length for six generations in this cross were presented in Table (3). Data indicated that the observed mean of F_1 population was exceeded that the mean of higher parent and all other populations in plant length, this result suggested of hybrid vigor in plant length was manifested in this cross. This result was confirmed by the potence ratio value (1.633). viz over dominance in direction of plant vigorous.

Data shown, the higher cv. values for F_2, BC_1 and BC_2 (18, 17 and 18 %) compared to P_1, P_2 and F_1 populations (13,14,14%),   this results indicating the occurrence effect of diversity the genetic and environmental on the plant habit of population.

So, the data indicating no clear trend could be detected for gene number that controlled of this character, but we computed the minimum number of effective factor pairs to be one.

The low value of heritability, which was 33.06 % and 15.7 % in broad and narrow sense respectively, revealed the major effect of the environmental on this character.

The data shown, the expected genetic advance after one generation of selecting of the F_2 population was 9.3 cm or 5.8 % of the F_2 mean. The results of the present study concerning the plant length indicated the hybrid vigor and were in accordance to Sifriss (1974), Nath and Hall (1963), Denna and Munger (1963) and Scarchuk (1974) on *Cucurbita pepo.*

There was no significant difference between the original and reciprocal means of F_1 plants.

4. Average fruit weight :

The average fruit weight per plant for six generation (P_1, P_2, F_1, F_2, BC_1 and BC_2) is presented in Table (3). The observed mean of F_1 population was 128.6 $\pm$ 2.05, which approached to mid-parent value (127.9), suggesting absence of dominance, this result was confirmed by the value of potence ratio (0.066) was almost zero, therefore such result asserted the absence of dominance.

The compared to the values of cv. for segregation and non segregation populations, which presented in the same table, its clear the occurrence effect of diversity the genetic and environmental on the former populations.

El-Lithy, Y.T.E.

3

The calculated to number of gene controlled of this trait was 0.291 and 0.259 by Mather and Castle method respectively. This results, viz the minimum number of effective factor pairs to be one.

Data shown, the heritability value was 52.3 % and 36.2 % in broad and narrow sense respectively, which revealed the major effect to environmental on this character. The expected genetic advance after one generation of selecting of the F_2 population was 18.3 gm or 14.02 % of F_2 mean.

From these previous results obtained for inheritance of the average fruit weight, indicated that, the F_1 hybrid from this cross lies between two parents and high value for expected genetic advanced of selecting for this trait. These results are in accordance with the results reported by Dahiya, Pandit and Vashistha (1990) and Hassan *et al*. (1984).

5. Length, diameter and shape index of fruit :

The inheritance of length, diameter and shape index of fruit were studied in this cross, which presented in Table (4). The data shown, there was agreement between the observed and the arithmetic mean of F_1 population as well as not significant different between them, this results were obtained of two characters, length and shape index of fruit, which viz the absence of dominance for this characters, which was confirmed by the values of potence ratio (0.05) and (0.01) for length and shape index of fruit respectively. Which were almost zero, viz absence of dominance in this characters. Concerning, the diameter of fruit trait, the data clear the complete dominance of this character, whereas, the different between the observed and arithmetic mean of F_1 population was significant. While was, not significant differed between the mean of F_1 population and larger parent mean as well as the value of potence ratio for this trait (1.06) was almost one. This results indicated that, the complete dominance of larger diameter.

So, the data shown, the minimum number of genes controlling the difference between the two parental was estimated by Mather and Castle method as one pair genes for every character length, diameter and shape index of fruit.

The heritability values were 31.49 %, 20.64 % and 33.49% in broad sense and 12.14 %, 10.22 % and 23.08 % in narrow sense for length, diameter and shape index of fruit respectively.

These values of broad and narrow sense for this characters were low this may be due to the major effect of the environment on the inheritance of these characters.

The expected genetic advance after one generation of selecting the F_2 population were 0.599 or 4.17 %, 0.098 or 2.65% and 0.164 or 3.95 % of the F_2 mean for length, diameter and shape index of fruit respectively.

B. Evaluation of F1 hybrid :

The data in Table (5) showed that this evaluation of F_1 hybrid produced from this cross compared with the two parental and some hybrid recommended, for the early and total yield weight and number of fruits, average fruit weight and shape index of fruit.

El-Lithy, Y.T.E.

4

4cont

5

The data clear, the F_1 hybrid produced from this cross gave increment in early and total yield for weight and number of fruits than the two parental and the hybrids recommended. This increased were significant relatively F_1 hybrid than the first parent and two hybrid recommended and non-significant than the other parent in both seasons 1997 and 1998 for early yield weight and number of fruits, will this increased were high significant in the weight and number of fruits for total yield than the two parental and two hybrid recommended in both seasons.

The estimated of early and total yield ton per feddan the data shown, F_1 hybrid gave 6.72 and 16.59 ton in season 1997 and 7.25 and 17.01 ton in season 1998 for early and total yield respectively, while was the high weight of early and total yield in the comparative varieties was 5.88 and 6.93 ton for early yield by Ambassador cv. in seasons 1997 and 1998 respectively and 15.12 and 15.96 ton for total yield by Top Kape hybrid in seasons 1997 and 1998 respectively. This results indicated that, the superiority of F1 hybrid for early and total yield weight and number of fruits than the two parental and other hybrid recommended.

Concerning, the average fruit weight the data in the same table shown the average fruit weight of F1 hybrid was moderated between two parental and least than the other hybrid recommended. This result was confirmed by the obtained data of shape index of fruit, which clearly shown, the high value of shape index of fruit than the two hybrids recommended, this increased were significant in both seasons, while was moderated between the two parental.

This result indicated that, the ratio between the length and diameter of fruit was superior for the form of fruits.

REFERENCES

Allard, R.W. (1960). Principles of plant breeding. John Willey and Sons, Inc., New York.

Amrik, S.S.; J.S. Brar and S.P.S. Gill (1977). Mode of inheritance of earliness and quality characters in watermelon (*Citrullus lanatus* Thumb.). J. Res. Punjab Agric. Univ., 14(4) : 423-426. (C.F. Pl. Breed. Abst., 49, 8500, 1979).

Castle, W.E. and S. Wright (1921). An improved method of estimating the number of genetic factors concerned in cases of blending inheritance. Sci., 54 : 233.

Dahiya, M.S.; M.L. Pandit and R.N. Vashistha (1990). Studies on variability and heritability in summer squash. Department of vegetable crop Haryana Agric. Univ., Hisar 125-005, India.

Denna, D.W. and H.M. Munger (1963). Morphology of the bush and vine habits and the allelism of the bush genes in *Cucurbita maxima* and *C. pepo* squash. Proc. Amer. Soc. Hort. Sci., 82 : 370-377.

Galka, A.T. (1984). Inheritance of bush habit in marrow hybridization Ovoshche-bakhchevaya Opythnaya Stantsiya, Dnepropetrovsk, Ukrainian USSR. Kartofel-i-ovoshchi., 2: 36.

El-Lithy, Y.T.E.

Hassan, A.M.; H.S. Sherif; H.R. Nazeem and A.A. Abdel-Migid (1984). Genetic behaviour of some economic characters in squashes. (*Cucurbita* sp.) Dept., Bot., Genet. Branch, Fac. Agric. Moshtohor, Zagazig Univ., Egypt. Annals of Agricultural Science, Moshtohor, 22 : 1, 175-187, 18 ref.

Janossy, A. and F.G.H. Lupton (1994). Heterosis in plant breeding. Proceedings in out-pollinating species, 1976, 219-226,21 ref. Amesterdam Evaluation of hetorosis in *Cucurbita pepo* L. Plant breeding AB. 1994, 0.64-05204, 6C plant Genetic-Resources-AB, 1994 003-01402.

Mather, K. and J.L. Jinks (1982). Biometrical Genetics. Great Britain, Univ., Press, 3rd, Ed., 396 pp.

Nath, P. and C.V. Hall (1963). Inheritance of fruit characteristics in *Cucurbita pepo* L. Indian J. Hort. 20 : 215 − 221.

Powers, L.; F. Locks and J.C. Garrett (1950). Partitioning method of genetic analysis applied to quantitative characters of tomato crosses. U.S.D.A., Tech. Bull, 998.

Sachan, C.P. and P. Nath (1976). Studies on hybrid vigor in watermelon (*Citrullus lanatus*, Thunmb.). Univ. Udaipur, India, 676. (c.f. Pl. Breed. Abst., 46, 9564, 1976).

Scarchuk, J. (1974). Extreme dwarf gourd *Cucubita pepo* var. Ovifera Alef. Hort. Science, 9 : 135.

Shifriss, O. (1947). Developmental reversal of dominance in *Cucurbita pepo*. Proc. Amer. Soc. Hort. Sci., 50 : 330 - 346.

Sinnott, E.W. and G.B. Durham (1922). Inheritance in the summer squash. J. Hered., 13 : 177 − 186.

Steel, R.G. and J.H. Torrie (1984). Principles and procedures of statistics. McGraw-Hill Book Company New York, pp. 194-230.

Warner, J. (1952). A method for estimating heritability. Agron., J. 44 : 427-430.

Whitaker, Thomas, W. (1932). Fertile gourd-pumpkin hybrids. J. Hered., 23 : 427-430.

Whitwood, W.N. (1975). A mutation and a genetic study in *Cucurbita pepo* L. Ph. D. Thesis, Iowa State Univ. Ames.

وراثة بعض الصفات الاقتصادية فى الكوسة وتقييم الهجين الجديد الناتج
يوسف طلعت امام الليثى
مركز البحوث الزراعية – معهد بحوث البساتين – بحوث الخضر

اجرى التهجين بين صنفين من الكوسة احدهما محلى (الاسكندرانى) والاخر امريكى امباسدور) – وقد اجريت هذه الدراسة بالصوبة البلاستيك ببحوث الخضر وبمزرعة محطة بحوث البساتين بسدس فى الفترة من ١٩٩٦ الى ١٩٩٨ .

وكان الغرض الاساسى من هذا العمل دراسة السلوك الوراثى لبعض الصفات الاقتصادية التى تتمثل فى المحصول المبكر والكلى وزن وعدد ثمار وقوة النمو الخضرى ومتوسط وزن الثمرة وطول وعرض الثمرة ومعامل شكل الثمرة – عن طريق دراسة فصل التباين الوراثى للاجيال الانعزالية الى مكونية البيئى والوراثى كذلك تجزئة التباين الوراثى الى تباين تحميض وغير تحميض واستخدام التباين التحميضى فى تقدير مدى التقدم الوراثى المتوقع نتيجة الانتخاب – كما قدرت درجة التوريث بمعناها الواسع والمحدود ودرست عدد العوامل المتحكمة فى توريث الصفات ودرجة السيادة وقوة الهجن لهذه الصفات .

بالاضافة الى تقييم الهجين الناتج ومقارنته بالاباء وبعض الهجن القياسية . وكانت النتائج المتحصل عليها تتلخص فيمايلى :

1- ظهرت قوة الهجين تجاه التبكير فى المحصول والمحصول الكلى المرتفع من حيث الوزن وعدد الثمار كذلك ظهرت فى اتجاه النمو الخضرى القوى .

2- كانت هناك سيادة غائبة بالنسبة لصفات متوسط وزن الثمرة – طول الثمرة – معامل شكل الثمرة بينما كانت هناك سيادة تامة لقطر الثمرة فى اتجاه القطر الكبير .

3- اثبتت النتائج ان التباين الوراثى بمكونة البيئى يلعب دور مهم فى اظهار المكون الوراثى لكل هذه الصفات تحت الدراسة .

4- اظهرت النتائج ان اكبر قيمة لدرة التوريث بمعناه الواسع والمحدود ٥٢,٣ % و ٣٦,٢ % بالنسبة لصفة متوسط وزن الثمرة على التوالى – بينما كانت اقل قيمة لدرجة التوريث ٢٠,٦٤ % و ١٠,٢٢ % لصفة قطر الثمرة .

5- كان مقدار التحسين نتيجة لانتخاب احسن ٥ % من افراد الجيل الثانى كان ١٣,٤ % و ١٠,٨ % بالنسبة لوزن وعدد الثمار للمحصول المبكر و ١٥ % و ٨,١ % بالنسبة للمحصول الكلى وزن وعدد على التوالى – وكان ٥,٨ % و ١٤ % و ٤,٢ % و ٢,٧ % ، ٤ % لكل من طول النبات – متوسط وزن الثمرة – طول الثمرة – قطر الثمرة – معامل شكل الثمرة على التوالى .

6- اظهرت النتائج نتيجة تقييم الهجين الجديد مع الاباء وبعض الهجن القياسية مايلى :

أ) اعطى الهجين تفوق معنوى على كل من الاباء والهجن القياسية فى المحصول المبكر والمحصول الكلى وزن وعدد فى مواسم الاختبار .

ب) اعطى الهجين الجديد محصول مبكر ٦,٧ طن/فدان ومحلى ١٦,٦ طن/فدان فى عام ١٩٩٧ ومحصول مبكر ٧,٢٥ طن ومحلى ١٧ طن/فدان فى موسم ١٩٩٨ بنيما كان اكبر محصول مبكر من اصناف المقارنة ٥,٨ طن/فدان و ٦,٩ طن/فدان فى موسمى ٩٧ ، ٩٨ عن طريق الصنف امباسدور وكان اعلمحصول محلى ١٥,١ طن و ١٩,٩ طن/فدان لموسمى ٩٧ ، ٩٨ عن طريق الهجين القياسى توب كابى .

جـ) اظهرت النتائج ان طول وقطر ثمار الهجين يكون متوسط بين الابوين كذلك اظهر من معاملات شكل الثمرة ان المثار جيدة من حيث الاستقامة والطول والشكل .

Table (1) : Statistical constant and quantitative genetic parameters obtained for early yield weight (kg) and number of fruits per plant in the cross "Eskandarni X Ambassador).

Statistical constant and quantitative genetic parameters	Early yield											
	Weight of fruits per plant (kg)						No. of fruits per plant					
	P₁	P₂	F₁	F₂	BC₁	BC₂	P₁	P₂	F₁	F₂	BC₁	BC₂
No. of observed plants	76	68	85	111	100	104	76	68	85	111	100	104
Observed mean	0.550	0.594	0.624	0.578	0.584	0.610	4.237	4.779	4.960	4.820	4.610	4.490
Arithmetic mean	-	-	0.572	0.598	0.587	0.609	-	-	4.508	4.734	4.598	4.869
SX	±0.029	±0.031	±0.026	±0.022	0.028	±0.028	±0.111	±0.158	±0.148	±0.154	±0.158	±0.152
Variance of S²	0.062	0.064	0.059	0.085	0.077	0.082	0.930	0.158	1.868	2.640	2.483	2.388
Coefficient variation cv.%	45.272	43.025	39.133	50.151	46.028	43.938	22.758	27.258	27.553	33.710	34.179	34.488
Mean difference :												
Parintal different		N.S	*	N.S	N.S	N.S	N.S		**	N.S	N.S	N.S
Observed-Arithmatic		0.044	0.052	-0.02	-0.003	0.001	0.542		0.452	0.086	0.012	-0.319
Quantitative genetic parameters : 1.Potence ratio 2.Number of gene 3.Heritability B.S.H. N.S.H.	2.32 (Mather, 1982) 1. 0.022 (Mather, 1982) 2. 0.0093 (Castle, 1921) 27.529 (Allard, 1960) 12.941 (Warner, 1952)						1.667 (Mather, 1982) 0.089 (Mather, 1982) 0.048 (Castle, 1921) 43.252 (Allard, 1960) 15.491 (Warner, 1952)					
Expected genetic advance when the extreme 5 % of F₂ individuals are Selected : Amount% of F₂ mean	0.078 13.447 %						0.518 10.75 %					

Table (2) : Statistical constant and quantitative genetic parameters obtained for total yield weight and number of fruits in the cross (Eskandarni X Ambassador).

Statistical constant and quantitative genetic parameters	Total yield											
	Weight of fruits per plant (kg)						No. of fruits per plant					
	P_1	P_2	F_1	F_2	BC_1	BC_2	P_1	P_2	F_1	F_2	BC_1	BC_2
No. of observed plants	76	68	85	111	100	104	76	68	85	111	100	104
Observed mean	1.324	1.338	1.564	1.354	1.362	1.410	10.710	11.029	12.506	11.901	11.240	11.481
Arithmetic mean	-	-	1.329	1.446	1.442	1.451	-	-	10.869	11.687	11.608	11.255
SX	±0.033	±0.036	±0.032	±0.035	±0.036	±0.031	±0.332	±0.359	±0.316	±0.311	±0.322	±0.304
Variance of S²	0.081	0.089	0.089	0.132	0.127	0.102	8.395	8.775	8.467	10.744	10.366	9.591
Coefficient variation cv.%	21.564	22.254	19.056	26.791	26.209	22.705	27.073	26.859	23.268	27.543	28.644	26.976
Mean difference : Parintal different	N.S		**	**	*	N.S	N.S		**	N.S	N.S	N.S
Observed-Arithmatic	0.014		0.235	-0.092	-0.08	-0.041	0.319		1.636	0.213	-0.368	0.225
Quantitative genetic parameters : 1.Potence ratio 2.Number of gene 3.Heritability B.S.H. N.S.H.	26.055 (Mather, 1982) 0.0007 (Mather, 1982) 0.00056 (Castle, 1921) 34.53 % (Allard, 1960) 25.32 % (Warner, 1952)						10.262 (Mather, 1982) 0.008 (Mather, 1982) 0.006 (Castle, 1921) 20.46 % (Allard, 1960) 14.251 % (Warner, 1952)					
Expected genetic advance when the extreme 5 % of F_2 individuals are Selected : Amount % of F_2 mean	0.189 13.99 %						0.962 8.085 %					

Table (3) : Statistical constant and quantitative genetic parameters obtained for length of plant and average fruits weight in the cross (Eskandarni X Ambassador).

Statistical constant and quantitative genetic parameters	Plant length per plant (cm)						Average fruit weight per plant (gm.)					
	P_1	P_2	F_1	F_2	BC_1	BC_2	P_1	P_2	F_1	F_2	BC_1	BC_2
No. of observed plants	76	68	85	111	100	104	76	68	85	111	100	104
Observed mean	163.4	157.4	165.3	159.3	159.1	152.1	116.6	139.1	128.6	130.6	126.6	132.4
Arithmetic mean	-	-	160.4	162.9	164.4	161.4	-	-	127.9	128.2	122.6	133.9
SX	±2.59	±2.81	±2.67	±2.73	±2.75	±2.71	±1.76	±1.98	±2.05	±2.33	±2.16	±2.23
Variance of S^2	513.6	536.9	603.8	823.9	753.7	764.4	236.1	267.9	375.5	602.3	467.1	519.4
Coefficient variation cv.%	13.87	14.73	14.87	18.02	17.26	18.18	13.18	11.76	14.70	18.79	13.29	17.21
Mean difference :												
Parintal different	6.0**		N.S	N.S	N.S	**	22.5**		N.S	N.S	N.S	N.S
Observed-Arithmatic	-	-	4.9	-3.6	-5.3	-9.3			0.7	2.4	4.0	1.5
Quantitative genetic parameters : 1.Potence ratio 2.Number of gene 3.Heritability B.S.H. N.S.H.	1.633 (Mather, 1982) 0.035 (Mather, 1982) 0.021 (Castle, 1921) 33.067 % (Allard, 1960) 15.733 % (Warner, 1952)						0.066 (Mather, 1982) 0.291 (Mather, 1982) 0.259 (Castle, 1921) 52.323 % (Allard, 1960) 36.215 % (Warner, 1952)					
Expected genetic advance when the extreme 5 % of F_2 individuals are Selected : Amount % of F_2 mean	9.303 5.84 %						18.309 14.02 %					

Table (4) : Statistical constant and quantitative genetic parameters obtained for fruit length, fruit diameter and shape index in the cross (Eskandarni X Ambassador).

Statistical constant and quantitative genetic parameters	Fruit length						Fruit diameter					
	P_1	P_2	F_1	F_2	BC_1	BC_2	P_1	P_2	F_1	F_2	BC_1	BC_2
No. of observed plants	76	68	85	111	100	104	76	68	85	111	100	104
Observed mean	14.17	15.96	15.11	14.37	14.21	15.34	3.44	3.59	3.60	3.68	3.55	3.66
Arithmetic mean	-	-	15.07	15.09	14.64	15.53	-	-	3.51	3.56	3.52	3.60
SX	±0.199	±0.242	±0.209	±0.217	±0.215	±0.223	±0.045	±0.053	±0.045	±0.044	±0.045	±0.065
Variance of S^2	3.024	3.983	3.715	5.217	4.621	15.157	0.153	0.192	0.169	0.256	0.200	0.209
Coefficient variation cv.%	12.27	12.51	12.76	15.90	15.11	14.81	11.36	12.19	11.41	12.60	12.62	12.49
Mean difference : Parintal different	1.79		N.S	**	*	N.S	0.15		*	**	N.S	N.S
Observed-Arithmatic			0.04	-0.72	-0.43	-0.9			0.09	0.12	0.03	0.06
Quantitative genetic parameters : 1.Potence ratio 2.Number of gene 3.Heritability B.S.H. N.S.H.	0.05 0.602 (Mather, 1982) 0.266 (Castle, 1921) 31.495 % (Allard, 1960) 12.742 % (Warner, 1952)						0.15 0.128 (Mather, 1982) 0.061 (Castle, 1921) 20.646 % (Allard, 1960) 10.219 % (Warner, 1952)					
Expected genetic advance when the extreme 5 % of F_2 individuals are Selected : Amount% of F_2 mean	0.599 4.17 %						0.098 2.65 %					

Table (4) : Con't.

Statistical constant and quantitative genetic parameters	Fruit shape index					
	P_1	P_2	F_1	F_2	BC_1	BC_2
No. of observed plants	76	68	85	111	100	104
Observed mean	4.13	4.38	4.26	4.13	4.15	4.25
Arithmetic mean	-	-	4.25	4.25	4.19	4.32
SX	0.032	0.037	0.028	0.033	0.033	0.031
Variance of S^2	0.076	0.094	0.066	0.118	0.112	0.098
Coefficient variation cv.%	6.67	7.02	6.04	8.32	8.06	7.35
Mean difference :						
Parintal different	0.25		N.S	**	N.S	*
Observed-Arithmatic	-	-	0.01	-0.12	-0.04	-0.07
Quantitative genetic parameters : 1.Potence ratio 2.Number of gene 3.Heritability B.S.H. N.S.H.	0.01 0.273 (Mather, 1982) 0.036 (Castle, 1921) 33.499 % (Allard, 1960) 23.083 % (Warner, 1952)					
Expected genetic advance when the extreme 5 % of F_2 individuals are Selected : Amount % of F_2 mean	0.164 3.95 %					

Table (5) : Evaluation of F_1 hybrid from this cross compared with parental and some hybrids recommended for early and total yield weight and number of fruits, Average fruit weight and shape index during the both summer seasons 1997 and 1998.

Varieties	Early yield per plant			Total yield per plant			Average fruit weight(gm)	Shape index of fruit
	Weight (kg)	No. of fruits	Ton feddan	Weight (kg)	No. of fruits	Ton per feddan		
Season 1997								
Eskandrani	0.51	4.2	5.36	1.27	10.3	13.34	123.5	4.1
Ambassador	0.56	4.8	5.88	1.31	10.1	13.76	129.8	4.4
Top Kapi	0.52	3.8	5.46	1.44	10.6	15.12	135.8	3.9
Obodas	0.46	4.8	4.83	1.37	10.7	14.39	128.5	3.4
F_1 hybrid	0.64	5.2	6.72	1.58	12.6	16.59	125.5	4.3
L.S.D. at 0.05	0.09	0.5	-	0.08	0.8	-	N.S	0.18
0.01	-	0.7	-	0.12	1.2	-		0.25
Season 1998								
Eskandrani	0.59	4.6	6.20	1.33	10.8	13.97	123.5	4.2
Ambassador	0.66	5.1	6.93	1.48	10.6	15.54	139.5	4.5
Top kapi	0.61	4.4	6.41	1.52	11.4	15.96	133.5	3.8
Obodas	0.52	4.1	5.46	1.41	11.2	14.81	126.0	3.4
F_1 hybrid	0.69	5.8	7.25	1.62	12.9	17.01	125.5	4.4
L.S.D. at 0.05	0.06	0.5	-	0.05	0.52	-	6.3	0.22
0.01	0.08	0.7	-	0.07	0.73	-	8.8	0.31