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# GENERAL AND SPECIFIC COMBINING ABILITY FOR SOME GENOTYPES OF SWEETMELON

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## ABSTRACT

***This study was carried out at El-Kanater Experimental Station, Kallobia Governorate during the period from 2007 to 2009 to estimate general and specific combining ability for yield and its components of five parental lines of sweetmelon using half diallel analysis .The parental lines used were PI 169374 , PI 175673 , Trooper , Kahera 6 and Ananas El- Dokki . Highly significant mean squares due to for general and specific combining ability were existed for all studied traits. . The ratio of GCA/SCA mean squares for early and total yield of fruits ,average fruit weight , net density, flesh thickness and TSS. indicated the predominant role of additive gene action in the expression of these characters . Also, GCA/SCA of the first female flower anthesis revealed that additive and non – additive gene effects were of same magnitude in the inheritance of this character. Estimates of GCA effects revealed that the inbred lines Trooper and Ananas El-Dokki had the highest positive values for yield components, fruit weight, net density and flesh thickness. The line PI175673 and Ananas EL-Dokki showed negative GCA effects for the first female flower anthesis. The crosses PI169374 × Trooper , PI 175673 × Kahera 6 and Trooper ×Ananas El-Dokki showed significant negative SCA values for date of the first female flower anthesis . These crosses were earlier than others having positive SCA in flowering date. Finally, the cross PI169374 × Trooper was the most promising hybrid for most traits under the study.***

Key words: ***GCA, SCA, Gene action, Cucumis melo.***

## INTRODUCTION

Sweetmelon (*Cucumis melo* L.) is one of the important vegetable crops for local consumption and exportation. Melon yield is a complex trait and is an ultimate product of some traits having a complex nature in its inheritance. So, studying these characters well, is of a prime concern for melon breeders to produce new and promising hybrids of melon. Moreover, the optimum use of heterosis would be available if melon breeders evaluated and screened the inbred lines carefully. Also, additive and non- additive genetic effects could be determined from the estimates of general(GCA) and specific(SCA) combining ability variances and effects.

The previous studies concerning inheritance of some melon traits showed evidence of partial dominance for fruit age and weight. Meanwhile, over-dominance was obtained for days to 1st harvested fruit as well as number of fruits and total yield per plant (Abd El-Raheem and El-Mighawry 1991).

Moreover, dominance gene effects were found to controll the economic characters of melon, expect number of fruits/ plant (El-Shimi *et al* 2003).

Analysis of genetic variability indicated that both additive and non-additive gene effects were important for the inheritance of sweetmelon yield and its components (Abd El-Hadi *et al* 2001 and El-Shimi *et al* 2003 ).

On the other hand, XU *et al* (2007) working on muskmelon and noticed that, average fruit weight and sugar content were mainly controlled by additive effect, but flesh thickness was controlled by non- additive effect.

Estimating general and specific combining ability was conducted by many investigators. They indicated the important role of GCA in the inheritance of plant fruit yield. Also, they noticed that, mean squares due to GCA and SCA were highly significant for the total yield per plant of melon (Hatem et al. 1995 and Tomar and Bhalala, 2006). In this respect, Abd El-Hafez *et al* (1997) worked on cucumber noticed that, the ratio of GCA/SCA mean squares for anthesis of the first female flower revealed that additive and additive gene effects were of the same magnitude in the inheritance of this characters. Also they indicated the predominant role of additive gene action in the expressions of yield and its components.

Analysis the variance of GCA was highly significant, positive and greater than SCA variance for early flowering of cucumber (Awny *et al* 1992) as well as for average fruit weight, net density, TSS, sugar content and flesh thickness of muskmelon (Kalb and Davis 1984 a and b; Kim *et al* 1996 and El-Adl *et al* 1996). These results indicated the importance of additive gene effects in the inheritance of these characters. On the contrary, SCA effects were significant and positive for stem length and number of branches of cucumber as well as for T.S.S. and flesh thickness of muskmelon (Awny *et al* 1992 and Tomar and Bhalala 2006).

The objective of this study was to estimate general and specific combining ability for some vegetative traits and yield and its components.

## MATERIALS AND METHODS

Five cultivars and inbred lines of sweetmelon (*Cucumis melo* L.), namely PI 169374, PI 175673 (the two inbred lines introduced from USDA), Trooper (c.v. introduced from Texas), Kahera 6 and Ananas El-Dokki (two cultivars belong to *C. melo* var.agyptiacus) were involved in this study. Selfing for the five parents was done twice to insure high degree of purity of each parent before crossing. Thereafter, all possible cross combinations without reciprocals were made in 2008. The fifteen genotypes, i.e. five parents and the ten single straight $F_1$ crosses between them, were planted in March 1st, 2009 in a randomized complete block design with three replications in the open field at EL-Kanater Experimental Station, Horticulture Research Institute, Agricultural Research Center (ARC). All genotypes were randomly distributed in each replicated, that consisted of 15 plots (5 parents and 10 $F_1$ hybrids).The plot contained one row 5.0 m long and 1.5 m wide ; the distance between hills was 0.5m apart. Therefore, each row contained 10 plants. All cultural practices were made as recommended for melon. A sample of 3 random healthy plants in each plot were marked to determine the following characters:

1 -Plant length (cm): it was estimated at the end of season.

2- Number of branches / plant: it was calculated beginning from the ground to 50 cm length of main stem.

3- Number of days from planting to anthesis of the first female flower.

4- Early yield per plant: weight (kg) and number of mature fruits of the first harvest.

5-Total yield/plant: weight (kg) and number of all harvested mature fruits.

6- Fruit characteristics :five mature fruits were taken randomly from each experimental plot to measure the average fruit weight (kg), flesh thickness (cm), net density as a scale from one to four ( where, 1= without netting ; 2=slightly netted ;3= well netted and 4 = heavy netted) according to Glala (2003) and total soluble solids (TSS) of the mature fruits measured by a handle refract meter.

The analysis of general (GCA) and specific (SCA) combining ability variances and effects was done according to method II, model 1 of Griffing (1956).

## RESULTS AND DISCUSSION

### Mean performance

Means of vegetative growth, flowering, yield components and the fruit characteristics for the five parental lines and 10 single crosses are presented in Tables (1and2). It is clear that the inbred line Ananas El-Dokki had the highest mean for plant length , anthesis of the first female flower and flesh thickness, whereas the inbred line Trooper had the highest mean for early and total yield ( on weight basis ), average fruit weight and net density. On the other hand, the inbred lines Kahera 6 and PI 169374 had the highest mean for TSS and number of branches /plant (Table 1).The ten straight $F_1$ single crosses exhibited a wide range of differences especially for the plant length, anthesis of the first female flower, yield components on a weight basis, net density and TSS It is worthy to report that the superior parent for producing high yield was Trooper cv., while the inbred line PI 169374 produced the lowest yield (Table 2).

**Table1. Mean performance of five sweet melon parental lines for several traits.**

| Parent | Plant length (cm.) | No. of branches | No. of days to anthesis | Early yield/plant | | Total yield/plant | | Average fruit weight(kg) | Net density | T.S.S. | Flesh thickness (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Weight | number | Weight (kg) | number | | | | |
| $P_1$= PI 169374 | 1.74 ab | 4.7 a | 34.00a | 0.07 b | 0.09 c | 1.85 c | 3.1 ab | 0.597 c | 1.00 e | 11.44ab | 1.89 c |
| $P_2$= PI 175673 | 1.61 b | 4.4 b | 30.60b | 0.46 a | 0.60 a | 3.01 a | 3.33 a | 0.903 b | 1.00 c | 10.39 b | 2.22 b |
| $P_3$= Trooper | 1.59 b | 3.7 c | 33.00a | 0.48 a | 0.53 cde | 3.06 a | 3.03 b | 1.012 a | 4.00 a | 10.04 b | 2.89 a |
| $P_4$= Kahera 6 | 1.72 a b | 4.6 ab | 33.67a | 0.24 b | 0.37 b | 2.55 b | 2.97 b | 0.860 b | 1.00 d | 12.50a | 1.83 c |
| $P_5$= Ananas El-Dokki | 1.78a | 4.5 b | 30.3b | 0.46 a | 0.57 a | 2.75 ab | 2.67 c | 1.031 a | 3.00 b | 10.51 b | 3.09 a |
| Mean | 1.69 | 4.4 | 32.33 | 0.34 | 0.43 | 2.64 | 3.02 | 0.881 | 2 | 10.96 | 2.38 |

[*] Means followed by similar letter in same column are not statistically different

**Table 2. Mean performance of 10 $F_1$ crosses of sweet melon for several traits**

| $F_1$ cross | No. of days to anthesis | No. branches | Plant length (cm) | Total yield /plant | | Early yield/plant | | Flesh thickness (cm) | T.S.S. | Net density | Average fruit weight(kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | number | Weight (kg) | number | Weight (kg) | | | | |
| $P_1\times P_2$ | 1.79 e | 9.03g | 1.00 d | 0.647 d | 2.9 cd | 1.872 e | 0.167 d | 0.142 de | 31.7 ab | 4.00 bc | 159.3 c |
| $P_1\times P_3$ | 2.58 b | 11.58ab | 4 .00a | 0.952 a | 3.4 a | 3.233 a | 1.00 a | 0.841 a | 28.00 e | 3.83 b-d | 183.3 ab |
| $P_1\times P_4$ | 1.85 e | 11.12a-c | 1.00 d | 0.601 d | 2.5 e | 1.498 f | 0.067 d | 0.041e | 33.00 a | 3.67 c-e | 181.3ab |
| $P_1\times P_5$ | 2.03 d | 10.35 c-e | 2.2 c | 0.779 c | 2.8 d | 2.182 d | 0.200 d | 0.160 de | 30.3 b-d | 4.17 ab | 171.67 bc |
| $P_2\times P_3$ | 2.4 8 b | 8.37 g | 4.00 a | 0.977 a | 3.0 bc | 2.957 b | 0.233 d | 0.332 c-e | 31.00 bc | 4.43 a | 177.3 ab |
| $P_2\times P_4$ | 2.21 c | 9.67 d-f | 1.00 d | 0.646 d | 3.23 ab | 2.091 de | 0.900 ab | 0.596 a-c | 28.00 e | 3.43 e | 175.3 ab |
| $P_2\times P_5$ | 2.11 cd | 9.32 e-g | 2.2 c | 0.853 bc | 2.7 de | 2.300 d | 0.700 b | 0.512 a-c | 29.00 de | 4.37 a | 173.3 b |
| $P_3\times P_4$ | 2.82 a | 10.53 b-d | 2.9 b | 0.893 ab | 2.5 e | 2.234 d | 0.167d | 0.363 c-e | 32.7 a | 3.533 fg | 180.7 ab |
| $P_3\times P_5$ | 2.83 a | 10.26 c-e | 4.00 a | 0.950 a | 3.3 a | 3.134 ab | 0.867 ab | 0.718ab | 28.00 e | 3.53 de | 187.7 a |
| $P_4\times P_5$ | 2.54 b | 12.27 a | 2.3 c | 0.941 ab | 2.8 d | 2.630 c | 0.467 c | 0.432b-d | 30.00 cd | 3.73 c-e | 171.7 ab |
| Mean | 2.32 | 10.28 | 2.5 | 0.824 | 2.9 | 2.41 | 0.48 | 0.414 | 30.2 | 3.87 | 176.2 |

**Combining ability**

The partitioning of genetic variation among genotypes (Table 3) showed highly significant differences for general (GCA) and specific (SCA) combining ability for all traits under investigation. This indicates the importance of both additive and non-additive variances. However, GCA variance of early and total yield per plant on a weight basis as well as fruit characteristics was about 2 or more times larger than those due to SCA, suggesting the predominant role of additive gene action in the inheritance of these traits. On the other hand, the ratio between GCA and SCA mean squares was about unity for the remaining traits, indicating the importance of both additive and non-additive gene action in the inheritance of these traits. The present results are in agreement with those reported by several investigators who indicated that GCA and SCA were highly significant for all these traits (Kalb and Davis a and b1984, Awny *et al*1992, Hatem et al1995, Kim *et al*1996 , Abd El-Hafez *et al* 1997and El-Shimi *et al* 2003).

General combining ability effects calculated for each parental line are presented in Table (4).These effects compare the average performance of each line in hybrid combinations with other lines and facilitate selection of lines for incorporation in/or initiation of breeding populations for subsequent improvement. The positive values of GCA effects for parental lines under each character in question denote desirable average performance .In the present investigation, it could be seen that the inbred line Trooper ($P_3$) showed highly significant positive GCA effects for yield component, average fruit weight and flesh thickness, while Kahera 6 ($P_4$) contributed highly significant negative GCA for these characters. Regarding anthesis of the female flower, the parental lines Ananas El-Dokki($P_5$) and PI 175673 ($P_2$) showed highly significant negative GCA( favorable) . Meanwhile, the parental line Kahera 6 ($P_4$) produced highly significant positive GCA for anthesis of the first female flower and TSS.

In general, the parental line Trooper showed highly GCA effects for all yield components. This indicates that this parent possesses favourable genes and that improvement in yield can be attained by its use in a hybridization program.

Results in Table (5) revealed highly significant positive values of SCA effects in some crosses. The three hybrid combinations (PI169374 ×Trooper), (PI1175673 ×Trooper) and (Trooper× Ananas El-Dokki) had highly significant negative SCA estimates for the first female flower anthesis. This indicates that these crosses produced flowers earlier than others having positive SCA. Out of the three best combinations, i.e. ($P_1 \times P_3$), ($P_2 \times P_4$) and ($P_3 \times P_5$) judged from SCA effects for yield components, only the third cross ($P_3 \times P_5$) had high SCA effects for early and total yield /plant on a number basis. On the other hand, the first cross ($P_1 \times P_3$) had high positive SCA effects for yield components in addition to fruit

**Table 3. Mean squares for genotypes, general (GCA) and specific (SCA) combining ability from ANOVA of $F_1$'s among five parents of melon.**

| Characters | Genotypes | GCA | SCA | GCA/SCA |
|---|---|---|---|---|
| **1. Vegetative growth** | | | | |
| **a-Plant height (cm)** | 219.87** | 0.0063* | 0.0078** | 0.8 |
| **b-Number of branches** | 0.557** | 0.1825** | 0.1530** | 1.2 |
| **2.Anthesis of the first female flower(day)** | 12.89** | 1.8800** | 4.0030** | 1.2 |
| **3.Yield components** | | | | |
| **a. Early yield /plant** | | | | |
| **a.1.On weight basis (kg)** | 0.161** | 0.0820** | 0.0438** | 1.9 |
| **a.2On number basis** | 0.287** | 0.0880** | 0.0987** | 0.89 |
| **b. Total yield /plant** | | | | |
| **b.1.On weight basis (kg)** | 0.858** | 0.5440** | 0.1830** | 3.0 |
| **b.2.On number basis** | 0.254** | 0.0770** | 0.0870** | 0. 9 |
| **4. Fruit characteristics** | | | | |
| **a.Average fruit weight** | 0.069** | 0.0600** | 0.0080** | 7.5 |
| **b.Net density*** | 4.828** | 4.939** | 0.281** | 17.6 |
| **c.Flesh thickness** | 0.567** | 0.4490** | 0.0675** | 6.6 |
| **d.T.S.S.** | 3.989** | 2.6000** | 0.8210** | 3.2 |

**** = significant at 0.01 probability level**

characteristics. Also, the cross ($P_4 \times P_5$) had high positive SCA effects for average fruit weight, net density as well as TSS In this respect, some previous investigators noticed variations in GCA and SCA effects of the varieties and their crosses. (Kalb and Davis, 1984, Awny *et al*1992; Hatem *et al*1995, Kim *et al* 1996, AbdEl-Hafez *et al*1997and El-Shimi *et al* 2003).

## CONCLUSION

In the present investigation, variances due to both general and specific combining ability and the estimates of GCA and SCA effects for yield components and fruit quality were obtained. Results showed that the parental line (Trooper) was a good general combiner and the cross (PI 169374 ×Trooper) was the best and promising hybrid. No doubt, these genetic information on breeding scheme, practically, the good combining inbreds of the best combinations for yield or any of its components could be used in the production of commercial hybrids after experimenting on large scale.

**Table 4.Estimates of general combining ability effects (gi) of five sweet melon parents for several traits.**

| parents | Plant length (cm) | No.of branches | Anthesis of the first female flower | Early yield /plant | | Total yield/plant | | Average Fruit weight (kg) | Net density | Flesh thickness | TSS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Weight (kg) | number | Weight (kg) | number | | | | |
| $P_1$ | 0.001 | 0.12** | 0.81** | -0.15** | -0.17** | -0.35** | 0.01 | -0.13** | 0.27** | -0.29** | 0.29** |
| $P_2$ | -0.05** | 0.11** | -0.63** | 0.02 | 0.06** | 0.04** | 0.12** | -0.02* | -0.83** | -0.15** | -0.83** |
| $P_3$ | 0.01 | -0.23** | 0.06 | 0.13** | 0.87** | 0.39** | 0.08** | 0.11** | -0.30** | 0.35** | -0.30 |
| $P_4$ | 0.02* | -0.09** | 0.8** | -0.06** | 0.73** | -0.20** | -0.10** | -0.04* | 0.80** | -0.14** | 0.80** |
| $P_5$ | 0.03** | 0.11** | -1.04** | 0.06** | 0.88** | 0.12** | -0.11** | 0.08** | 0.04* | 0.23** | 0.04 |
| SE gi | 0.01 | 0.03 | 0.19 | 0.03 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 0.019 | 0.13 |
| SE gi-gj | 0.02 | 0.05 | 0.3 | 0.04 | 0.03 | 0.04 | 0.03 | 0.01 | 0.02 | 0.03 | 0.20 |

*** = significant at 0.05 probability level**

**** = significant at 0.01 probability level**

**Table 5. Estimates of specific combining ability effects (Sij) of $F_1$ crosses among five sweet melon parents for several traits**

| $F_1$ cross | No. of days to anthesis | No. branches | Plant length (cm) | Total yield /plant | | Early yield/plant | | Flesh thickness (cm) | T.S.S. | Net density | Average fruit weight(kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | number | Weight (kg) | number | Weight (kg) | | | | |
| $P_1 \times P_2$ | -0.10$^{*}$ | -0.27$^{**}$ | 0.55$^{**}$ | -0.13$^{**}$ | -0.19$^{**}$ | -0.31$^{**}$ | -0.18$^{*}$ | -0.05$^{*}$ | -0.23$^{**}$ | -0.12$^{*}$ | -0.92$^{**}$ |
| $P_1 \times P_3$ | 0.08$^{*}$ | -0.13$^{**}$ | -3.74$^{**}$ | 0.47$^{**}$ | 0.62$^{**}$ | 0.70$^{**}$ | 0.35$^{**}$ | 0.13$^{**}$ | 0.92$^{**}$ | 0.17$^{**}$ | 1.16$^{**}$ |
| $P_1 \times P_4$ | 0.06$^{**}$ | -0.37$^{**}$ | 0.52$^{**}$ | -0.14$^{**}$ | -0.17$^{**}$ | -0.44$^{**}$ | -0.36$^{**}$ | -0.08$^{**}$ | -0.12$^{**}$ | -0.06$^{*}$ | -0.46$^{**}$ |
| $P_1 \times P_5$ | -0.05$^{**}$ | -0.07 | -0.34$^{**}$ | -0.14$^{**}$ | -0.18$^{**}$ | -0.07$^{*}$ | -0.06$^{*}$ | -0.01 | 0.01 | -0.25$^{**}$ | -0.47$^{**}$ |
| $P_2 \times P_3$ | 0.08$^{**}$ | 0.48$^{**}$ | 0.71$^{**}$ | -0.21$^{*}$ | -0.37$^{**}$ | 0.03 | -0.12$^{*}$ | 0.05$^{*}$ | 0.92$^{**}$ | -0.06 | -0.98$^{**}$ |
| $P_2 \times P_4$ | 0.05$^{**}$ | -0.64$^{**}$ | -3.04$^{**}$ | 0.24$^{**}$ | 0.44$^{**}$ | 0.25$^{**}$ | 0.27$^{**}$ | -0.14$^{**}$ | -0.12$^{**}$ | 0.16$^{*}$ | -0.80$^{**}$ |
| $P_2 \times P_5$ | 0.02 | 0.14$^{**}$ | -0.20 | 0.04 | 0.09$^{*}$ | -0.35$^{**}$ | -0.26$^{**}$ | -0.05$^{*}$ | 0.01 | -0.32$^{**}$ | -0.39$^{**}$ |
| $P_3 \times P_4$ | 0.05$^{**}$ | -0.20$^{**}$ | 0.88$^{**}$ | -0.10$^{**}$ | -0.311 | -0.45$^{**}$ | -0.43$^{**}$ | -0.02 | -0.04 | 0.27$^{**}$ | -0.46$^{**}$ |
| $P_3 \times P_5$ | 0.11$^{**}$ | -0.42$^{**}$ | -1.88$^{**}$ | 0.14$^{**}$ | 0.78$^{**}$ | 0.138$^{*}$ | 0.375$^{**}$ | -0.07$^{*}$ | -0.01 | -0.09$^{*}$ | 0.03 |
| $P_4 \times P_5$ | -0.06$^{**}$ | -0.34$^{**}$ | -0.62$^{**}$ | 0.05 | -0.02 | 0.221$^{*}$ | 0.06$^{*}$ | 0.06$^{*}$ | 0.39$^{**}$ | 0.11$^{*}$ | 0.94$^{**}$ |
| SE Sij | 0.03 | 0.07 | 0.39 | 0.06 | 0.04 | 0.06 | 0.04 | 0.02 | 0.03 | 0.04 | 0.26 |
| SE Sij-Skl | 0.04 | 0.10 | 0.6 | 0.09 | 0.06 | 0.09 | 0.07 | 0.03 | 0.04 | 0.06 | 0.40 |
| SE Sij-Sik | 0.04 | 0.09 | 0.52 | 0.08 | 0.05 | 0.07 | 0.06 | 0.02 | 0.04 | 0.05 | 0.34 |

* = significant at 0.05 probability level

** = significant at 0.01 probability level

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## تقدير القدرة العامة والخاصة على الائتلاف في بعض طرز الشمام

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أجريت الدراسة بمزرعة محطة البساتين بالقناطر الخيرية – محافظة القليوبية خلال الفترة من عام 2007حتى 2009 وذلك بهدف تقدير القدرة العامة والخاصة على الائتلاف لمحصول الشمام ومكوناته . حيث استخدم في هذه الدراسة 5 آباء وأجرى بينهم تهجين نصف دائري وهم PI 169374 Ananas El-Dokki , PI 175673 , Trooper , Kahera 6 and .

أخذت القياسات اللازمة على المحصول وبعد تحليل البيانات المتحصل عليها اتضح أن :-

1- وجود اختلافات عالية المعنوية لكل من القدرة العامة والخاصة على الائتلاف لكل الصفات المدروسة .

2- أظهرت النسبة المحسوبة بين متوسط مربعات الانحرافات للقدرتين العامة والخاصة على الائتلاف أن الفعل المضيف للجينات كان يلعب دورا أكثر أهمية من الفعل غير المضيف في وراثة صفة وزن المحصول المبكر والكلى ، متوسط وزن الثمرة ، كثافة الشبكة ، سمك اللحم ،والسكريات الصلبة الذائبة .

3- أظهرت النسبة المحسوبة بين متوسط مربعات الانحرافات للقدرتين العامة والخاصة على الائتلاف أن الفعل المضيف والغير مضيف للجينات له نفس الأهمية في وراثة صفة ميعاد تفتح أول زهرة مؤنثة.

4- اختلفت الإباء في تأثيرات القدرة العامة على الائتلاف فمثلا Trooper ، Ananas El-Dokkiأعطى قيم عالية لصفة المحصول ومكوناته ووزن الثمرة وكثافة الشبكة وسمك اللحم بينما كان أفضل الإباء في صفة ميعاد تفتح أول زهرة مؤنثة هي PI175673 ، Ananas El-Dokki.

5- أوضحت حسابات تأثيرات القدرة الخاصة على الائتلاف للهجن المختلفة أن أفضل الهجن :- PI169374 × ، PI 175673 × Kahera 6 and Trooper ×Ananas El-Dokki Trooper في ميعاد تفتح أول زهرة حيث أعطيت قيم معنوية سالبة وبالتالي هي أفضل الهجن في التبكير .

6-الهجين Trooper × PI169374 كان أفضل الهجن في معظم الصفات محل الدراسة ويمكن اجراء تجارب موسعة على هذا الهجين قبل التسجيل كهجين تجارى يوزع على المزراعين.