Effect of sowing dates and plant spacing on growth and yield of some Jew's mallow ecotypes (*corchorus olitorius* L.) under South Valley condition.

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**Abstract**

A field experiment was conducted at the Experimental Farm, Faculty of Agriculture, South Valley University, during two growing summer seasons 2009 and 2010 to study the effect of sowing dates (Feb, 25 and April, 25 and three plant spacing, 10 and 15 cm between plants) on growth and yield of some Jew's mallow ecotypes (*corchorus olitorius* L.). The genetic materials used in this study included fifteen ecotypes of Jew's mallow, which were collected from different regions of Egypt. Results of the experiment revealed that there were significant differences among ecotypes for all studied traits in both seasons. Ecotype El-Behera gave the highest value of fresh leaf weight and plant height in both seasons, ecotype Beni Suef for dry leaf yield, ecotype Sohag for total fresh yield and Alexandria for number of branches per plant in both seasons. Sowing on April 25 gave significantly higher total fresh yield, number of branches/plant, green and dry fresh yield and longest plant height compared with early sowing Feb. 25 in both seasons. Plant spacing had a significant effect on all studied traits in both seasons. The closest spacing 5 and 10 cm between plants gave higher value for total fresh yield, green and dry leaf yield and plant height compared with spacing 15 cm between plants in both seasons. The wide spacing 15 cm gave the higher number of branches per plants compared with the other tow spacing used in this study in both seasons.

**Key Words:** Jew's mallow, ecotypes, sowing dates, plant spacing, green dry leaf yield, total fresh yield.

**Introduction**

Jew's mallow, *corchorus olitorius*, is one of the popular leafy vegetable crops in Egypt. It has a good place in the Egyptian diet. It is consumed either fresh or dried. Jew's mallow grown nearly all year round, but particularly as a summer crop (Hassan 1994). The total cultivated area of this crop in Egypt was estimated at 6318 Feddan for fresh yield in the summer season of 2008 with a mean of 9.35 ton/feddan. Also, the estimated area was 2017 feddan for fresh yield in the fall season with a mean 6.71 ton/feddan*.

Ali (1996) found that Jew's mallow is classified as a facultative short day plant in summer.
planting (April 11-13) and day – neutral in both early summer (Feb. 1-5) and autumn plantings (Oct. 1-3). Jews mallow grows well at high temperature (25-35°C) and high humidity. Its harvesting usually begins 40-60 days after planting. Appropriate sowing date of various vegetable crops results in higher economic yield without involving extra cost as it helps genotypes to express their full growth potential. In Egypt, Abd-Allah (2010) studied plant spacing and sowing dates on some Jew's mallow ecotypes. He found that the highest total fresh leafy yield obtained from sowing on mid May and mid April. On the other hand, yield potential of Jew's mallow can be substantially improved via optimizing cultural practices including plant densities (Hamdy et al., 1973 and Ali 1996). Nevertheless, only little or no information is available on prices planting dates and densities in production of Jew’s mallow under condition of different regions of southern Egypt.

The present work was carried out to study the effect of fifteen Jew's mallow ecotypes collected from different regions of Egypt, planting date and plant density on growth and yield.


**Material and Methods**

This work was conducted in the Experimental Farm of South Valley University, to study the effect of ecotypes, planting date and spacing on growth and yield of Jew's mallow *corchorus olitorius* L. The experiment was carried out during 2009 and 2010 summer seasons. Treatments included 15 ecotypes, two sowing dates (Feb. 25 (D1) and April 25 (D2) and three planting distances between plants, 5, 10 and 15 cm. 

Fifteen ecotypes of Jew’s mallow, were collected from different governorate regions of Egypt, and their serial numbers, and source from which they were obtained are presented in Table (1).
Table (1): Serial Nos, source of Jew's mallow (Melokhia) ecotypes:

<table>
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<tr>
<th>Ecotypes</th>
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<td>E.A.O</td>
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<tr>
<td>11</td>
<td>El-Minia</td>
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<tr>
<td>12</td>
<td>Alexandria</td>
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<tr>
<td>13</td>
<td>Domuiat</td>
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<td>14</td>
<td>El-Mansoura</td>
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<td>15</td>
<td>New Valley</td>
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</tbody>
</table>

* E.A.O.= Egyptian Agricultural organization.

A randomized complete block design in split, split plot system with three replications was used. The ecotypes were arranged in the main plots, sowing dates in the sub-plot, and plant densities the sub-sub plots. Each plot was 4×3 m. The soil types were clay loam. Seeds were sown in rows about 20 cm apart and then irrigated. As seedlings were established plot were thinned to the required distances namely, 5, 10 and 20 cm between plants. Weeds were controlled by hand hoeing. All plots received ammonium nitrate (33.5% N) at rate of 300 Kg/feddan and calcium superphosphate (15.5% P2O5) at 250 Kg/feddan.

The recorded data:

1. Foliage fresh yield (weight of whole plants of 0.25 m²) and then transferred into (ton/ feddan).

2. Plant height (cm): Average plants height per in 0.25 m².

3. Number of branches per plant: Average number of branches per plant in 0.25 m².

4. Green leaf yield (weight of picked leaves per 0.25 m² and then transferred into (ton/ feddan).

5. Dry leaf yield (ton/ feddan).

**Statistical Analysis:**

All data were statistically analyzed (Gomez and Gomez 1984) following the appropriate procedures the appropriate procedures of analysis of variance (ANOVA) for the experimental model and design used in the present study.

**Results**

1- Foliate fresh yield (ton/ feddan):

Effect of ecotypes (E), planting dates (D) and spacing (S) on foliage fresh yield (ton/ feddan)
in the two summer seasons are presented in Tables 2 and 3. Significant differences were found among ecotypes. Ecotype Sohag gave the highest fresh yield (8.289 ton/fed.) followed by ecotype El-Behera 8.254 ton/fed. In the first season and ecotype El-Behera followed by ecotype Sohage in the second season, furthermore ecotype Domuiat gave the lowest value in both seasons. Planting dates have a significant effect on fresh foliage yield. Planting at April 25 gave significantly higher yield than early planting date (Feb. 25) in both summer seasons. Plant density had a significant effect on fresh foliage yield. The close spacing gave higher yield compared with the other tow spacing (10 and 15 cm) between plants in both summer seasons. A significant interaction (EXD) was found for this trait. Data in tables (2 and 3) illustrated that sowing ecotype Sohage in April 25 gave the highest value in both summer seasons, while the ecotype no. 13 gave the lowest value in the first season and ecotype New Valley in the second season. Interaction among (E×D×S) were recorded for this trait. The highest significant value for Foliage fresh yield were obtained by sowing Ecotype no. 9 (17.6 ton/feddan) in April 25 under close spacing (52 cm) between plants followed by ecotypes no. 8 (16.906 ton/feddan) compared with other tow spacing (10 and 15 cm), while the ecotype no. 12 gave the lowest value (1.705 and 1.955 ton/feddan) in both summer seasons, respectively.

2- Plant height (cm):

As shown in tables (4 and 5) ecotypes significantly differed in respect of plant height ecotype El-Behera gave the highest plants, followed by ecotypes Qena and Domuiat in both seasons, while plants of ecotype no. 10 was the shortest in the first season and ecotype New Valley in the second seasons. According to tables (4 and 5) sowing dates showed significant effect on plant height in both seasons. The tallest plants were obtained when the ecotypes were planted on April 25 than Feb. 25 planting. Spacing between plants had a significant effect on plant height. The close spacing gave the longer plants compared with wide spacing in both seasons.

Ecotype El-Esmalia Planted on April 25 gave the longest plant in both seasons, while the ecotype no. 12 gave the shortest plant in the first season and ecotype no. 10 in the second season. Planting ecotype no.4 on Feb. 25, gave the tallest plant in the first season and ecotype no. 5 gave the shortest value in the second season, moreover the ecotype no. 12 gave the shortest plant in both seasons. Generally, ecotype no.5 when planted on April 25 under close spacing (5cm) between plants gave the tallest plant in both seasons. The shortest plants were obtained from ecotype no. 12 when the crop was planted on Feb. 25 under wide spacing in both seasons.
3- Number of branches/plant:

Data for this character are shown in tables 6 and 7. Branching ability significantly varied among ecotypes. Ecotype no. 12 gave the highest branching ability followed by ecotype no. 11, while ecotype no. 8 gave the lowest value in both seasons. Planting dates had significant effect on this trait. The highest value obtained from the sowing on April 25 than Feb. 25 in both seasons. Population density has a significant effect on branching ability. The wide spacing gave the higher number of branches compared with two other spacing in both seasons. EXD interaction effect was significant on number of branches/plant. Results in table 6 and 7 indicated that sowing ecotype no. 12 on April 25 and Feb. 25 gave the highest significant values, while the ecotype no. 9 gave the lowest value in both season.

The interactions among ecotypes × dates × spacing was significant. Planting on April 25, ecotype no. 12 under wide spacing (15 cm) between plants followed by 7 ecotype no. 11 gave the highest value in both seasons, while the ecotype no. 6 under close spacing (5 cm) between plants gave the lowest value in the first season and ecotype no. 5 in the second season. Sowing on Feb. 25, ecotype no. 12 followed by ecotype no. 7 under wide spacing (15 cm) gave the highest value in the first season, and ecotype no. 7 followed by ecotype no. 12 in the second season.

Generally, sowing ecotype no. 12 on April under wide spacing (15 cm) between plant gave the highest value in both seasons, moreover, sowing ecotype no. 15 on Feb. 25 under close spacing (5 cm) between plants gave the lowest value in both seasons.

4- Green leaf yield (ton/fed.):

As shown in table 8 and 9 ecotypes significantly differed in their green leaf yield. Ecotype no. 7 followed by ecotype no. 10 and 5 gave the highest green leaf yield, while ecotype no. 3 gave the lowest value in both seasons 2009 and 2010. Planting data had a significant effect on green leaf yield. Showing on April 25 was higher in green leaf yield than the sowing on Feb. 25 in both seasons. Spacing between plants had a significant effect on green leaf yield. The close spacing gave the higher value compared with two other spacing. There were a significant interaction between ecotypes and planting date. Ecotype no. 7 followed by no. 3, 4 and 15 under sowing Feb. 25 gave the highest green leaf yield in both seasons, while ecotype no. 8 gave the lowest value in the first season 2009 and ecotype no. 12 in the second season 2010. moreover, ecotype no. 10 followed by ecotype no. 15, 12, 9 and 8 under sowing on April 25 gave the highest value, while the ecotype no. 3 gave the lowest value in both seasons. A significant ecotypes × plant spacing interactions was recorded for this character. Ecotype no. 7 under the close spacing followed by ecotype no.
15 and 10 gave the highest green leaf yield, while the ecotype no. 3 gave the lowest value in both seasons.

Planting on April 25, ecotype no. 10 followed by no. 15, 8 and 9 under close spacing between plants (5 cm) gave the highest value in both seasons. Moreover, ecotype no. 3 under wide spacing gave the lowest value in both seasons. Planting on Feb. 25 ecotype no. 7 and 13 under close spacing between plants gave the highest value in both seasons. However, ecotype no. 15 under wide spacing gave the lowest value in both seasons.

5- Dry leaf yield (ton /fed.)

Data for this character are presented in Tables 10 and 11. Significant differences were found among ecotypes, sowing dates and plant spacing. Ecotype no. 6 followed by ecotypes no. 5, 4, 10, 12 and 15 gave the highest value, while the ecotype no. 3 gave the lowest value in both seasons. The interaction of ecotypes and planting dates was significant. Ecotype no. 4 gave the highest value when the plant was sowing on Feb. 23 followed by ecotype no. 5, 4, 10, 12 and 15, while the lowest value obtained from ecotype no. 9 in both seasons.

Moreover, ecotype no. 6 gave the highest value when the plant was sowing on April 25 followed by ecotype no. 5, 12 and 9, while the lowest value obtained from ecotype no. 11 in both seasons. Significant ecotype × plant spacing was found for dry leaf yield. Ecotype no. 6 under high density produced the highest values dry leaf yield followed by ecotype no. 4, 5 and 12, while ecotype no. 2 under low density gave the lowest value in both seasons. Sowing on April 25, ecotype no. 6 followed by ecotype no. 12, 8 and 5 gave the highest value under high density (5 cm) between plants in both seasons. Sowing on Feb. 25, ecotype no. 9 under wide spacing gave the lowest value in both seasons.
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Discussion

The study was carried out in the vegetable farm of South Valley University to study the effect of ecotypes, planting date and spacing on some yield traits of Jew's mallow (Corchorus olitorius, L.). The seeds were sown in two planting dates i.e., Feb, 20th and April 20th during the 2009 and 2010 seasons. The experiment included 15 ecotype collected from diverse regions of Egypt, three distances (5, 10 and 15 cm between plants).

Total yield is the most important character to be looked at, since it expresses the crop economic value. This character has many inputs through the other yield component characters i.e., number of branches/plant, plant height, leaf yield… etc. in this study 15 ecotypes were tested in two planting dates and three spacing. There were significant differences among 15 ecotypes in both seasons. Ecotype no. 9 (Balady Sohag) and no. 5 (Balady El-Behera) gave the highest total yield in both seasons.

Ecotype no. 12 (Balady Alexandria) and ecotype no. 11 (Balady El-Menia) for number of branches/plant. Ecotype no. 5 (Balady el-Behera) gave the highest fresh leaf yield, dry leaf yield and longest palt in both seasons. Ecotype No. 8 (Balady Qena) for plant height and ecotype No. 6 (Balady Beni Suef) for leaf dry yield in both seasons. This results was similar to differences among ecotypes (as different genotypes) were reported by several investigators in many vegetable crops under Upper Egypt condition. Similar findings were reported by Abdel-Naser (1996) for Okra local ecotypes. In Jew's mallow, Kheraba (1980), in Egypt found differences between ecotypes. Similar results were reported by Khandakar et al., (1988), Chakraborty et al., (1991) and Bokaria and Sasnal (1994).

Planting date is major affecting Jew's mallow production, Muesey and El-Muraba (1960). The presented data in this study suggested that all ecotypes consistently had increases in number of branches per plant, plant height, total fresh yield, green leaf yield and dry leaf yield when they were grown on planting date (April 25) compared with Feb, 25 in both seasons.

Similar results were reported by Ali (1996). In Alexandria, Abd-Allah and Naser (2010) suggested that the best date in order to grow Jew's mallow for fresh foliage yield might be on mid of May. In another study, Wahba et al. (2003) reported that sowing Jew's mallow n the 1st of June gave the highest total fresh yield and vegetative growth. Ecotype No. 9 gave the highest total fresh yield followed by ecotype No. 5 when they were grown on April 25 in both seasons, ecotypes No. 12 followed by ecotype No. 11 for number of branches/plant, ecotype No. 10 for green leaf yield and ecotype no. 6 followed by ecotype No. 5 for dry leaf yield in both seasons. Plant-
ing on Feb. 25, ecotype No. 4 gave the highest total fresh yield and dry leaf yield in both seasons, ecotype No. 12 for number of branches/plant and ecotype No. 13 for green leaf yield in both seasons. Spacing had a significant effect on all studied traits in both seasons. Close spacing 5 and 10 cm between plants (high density) gave highest value for total fresh yield, green and dry leaf yield and plant height in the two of study. Abd El- Aal (1973) in Sudan, obtained higher yield of Jew's mallow when the seed rate was increased from 1-4 grams per meter square. Also, similar results were reported by Hamdy et al. (1973), Idem (1988) and Bandyopodhyay et al. (1991). Wide spacing (low density). On the other hand, gave the highest values for number of branches/plant in both seasons. A significant interaction of ecotype × planting date × spacing was recorded for total fresh yield, plant height, number of branches/plant, green and dry leaf yield in both seasons.

Planting on April 25, ecotype no. 9 (Balady Sohag) and 8 (Balady Qena) under close spacing (5 cm between plants) gave the highest total fresh yield, while the ecotype No. 3 (Balady Assuit) gave the lowest value in both seasons. Ecotype No. 5 (Balady El-Behera) gave the longest plant under spacing 5 and 10 cm between plants, while the ecotype No. 12 (Balady Alexandria) gave the shortest plant under spacing (15 cm) in both seasons, ecotype No. 12 under spacing (15 and 10 cm) for number of branches/plant in both seasons, ecotype No. 10 (wazary) and 15 (New Valley) under spacing (5 and 10 cm between plants) for green fresh yield in both seasons and ecotype No. 6 (Balady Beni Suef) and No. 12 under spacing (5 and 10 cm) on both seasons.

Planting on Feb. 25, ecotype no. 4 (Balady Ismalia) under spacing (5 cm between plants) gave the highest total fresh yield, while the ecotype No. 12 gave the lowest value in both seasons, ecotype No. 14 under spacing (5 cm) followed by ecotype No. 4 under spacing (10 cm) gave the longest plant in both seasons, ecotype No. 12 followed by ecotype No. 7 gave the highest number of branches/plant under spacing (15 and 10 cm), while ecotype No. 15 gave the lowest value under spacing 5 cm in both seasons.

For green fresh yield, ecotype No. 7 followed by ecotype no. 15 under spacing (5 and 10 cm) gave the highest value, while the ecotype no. 12 gave the lowest value in both seasons, ecotype no. 4 under close spacing (5 cm) gave the highest dry leaf yield in both seasons. These results were in agreement with mentioned by Mursy and El-Murabaa (1960), Also, Ahmed (1996) found that sowing ecotype (balady Khargha) on early summer Feb. (1-5) under close spacing gave highest recorded total fresh yield, while ecotype (Balady El-Monera) under close spacing (5 cm) gave the
highest value in autumn planting October 1-3). Moreover, summer planting (April 11-13) ecotype (Balady Nag Hammady and balady Kattara) under close (5 cm) gave the highest total fresh yield in both seasons.

**Conclusions**

1- There were significant differences among ecotypes for all studied traits. Ecotype no. 5 (Balady El-Behera) gave the highest value of fresh leaf yield (ton/fed) and plant height, ecotype no. 6 (Balady Beni Suef) for dry leaf yield (ton/fed.) and ecotype no. 9 (Balady Sohag) for total fresh yield (ton/fed.) in both seasons.

2- Sowing on April 25, gave significantly high total fresh yield, green and dry leaf yield, plant height and number of branches/plant compared with early sowing Feb. 25 in both seasons.

3- The close spacing (5 and 10 cm between plants) gave the high value for total fresh yield, green and dry leaf yield and plant height traits compared with 15 cm spacing in both seasons. The wide spacing 15 cm gave higher number of branches/plant as compared with the two other spacing in both seasons.

4- Ecotypes no. 12 (Balady Alexandria) under two sowing dates (D1 and D2) and wide spacing (15 and 10 cm between plants) gave the highest number of branches/plant in both seasons.

**References**


تأثر ميعد ومياسة الزراعة على النمو والمتحمل في بعض طرز الملونية تحت ظروف جنوب الوادي

أيمن محمد عبد النبي بشوان
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أجرت هذه الدراسة بمزرعة كلية الزراعة بقنا - جامعة جنوب الوادي خلال عام 2009، وذلك بهدف دراسة تأثير ميعد ومياسة الزراعة على النمو والمتحمل في بعض طرز الملونية تحت ظروف جنوب الوادي.

 حيث تم تجميع عدد 15 طراز بنياً من الملونية من مناطق مختلفة من مصر، ثم زرع في ميعدين زراعة (في فبراير) و (في أبريل) في كل موسم زراعي في كلا الموسمين، وزعت البذور في سطور المسافة بينها 20 سم، وبدأت الإنبات ثم خف النباتات على ثلاث مساحات، كل 5 ك.م، 15 ك.م بين النباتات داخل السطر.

 وكانت النتائج المتحصل عليها على النحو التالي:
 1- توجد خلافات جوهرية بين الطرازات المعروفة في جميع الصفات تقليد الدراسة، ولقد أعطى الطراز رقم (9) بلدي سوهاج والطراز رقم (5) بلدي البحرية أعلى محصول كلي طازج في كلا الميعد مياس الرعي، بينما أعطى الطراز رقم (11) بلدي الإسكندرية يليه الطراز رقم (10) بلدي المنيا أعلى عدد الفروع للنبات في كلا الموسمين، كما أعطى الطراز رقم (5) بلدي البحرية يليه الطراز رقم (8) بلدي المنيا أعلى ارتفاع للنبات في كلا الموسمين، كذلك أعطى الطراز رقم (15) بلدي الوادي الجديد يليه الطراز رقم (16) أسوان أعلى محصول أوراق طازج في كلا الموسمين، والطراز رقم (7) بلدي بني سويف يليه الطراز رقم (5) يلي بحرية أعلى محصول أوراق جافة في كلا الموسمين، كما سجل الطراز رقم (3) بلدي أسوان أقل محصول جافة وكذلك محصول أوراق طازجة في كلا الموسمين، وكذلك الطراز رقم (13) دمياط أقل محصول في كل طازج في كلا الموسمين.
 2- أدت الزراعة في 12 أبريل (ميعد ثاني) مقارنة بالزراعة في 20 فبراير ميعد أول إلى زيادة معوية في جميع الصفات كمية المحصول الكلي، وطول النبات، وعدد الفروع، ومحصول الأوراق الأخضر، والجاف، وطول النبات، وجميع الأوراق الأخرى، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأوراق، وطول النبات، وطول الأورا...
والطراز رقم (6) يليه الطراز رقم (13) في صفة محصول الأوراق الطازج في كلما الموسمين.

5- كانت الطراز رقم (7) بلدي أسوان، (15) بلدي الوادي الجديد تحت الكثافة النباتية العالية 5 سم أفضل الطراز في محصول الأوراق الطازج يليهم الطراز رقم (14) تحت نفس الكثافة ، بينما الطراز رقم (3) أسفل وأقل الطراز تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين. كذلك أعطى الطراز رقم (4) تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين. وفي الطراز رقم (9) تحت الكثافة النباتية العالية 5 سم أعلى محصول على طازج في الموسم الأول والطراز رقم (5) يليه الطراز رقم (8) في الموسم الثاني يليهم الطراز رقم (7) في الطريقة العالية 7 سم وكذلك تحت الكثافة النباتية 10 سم في كلما الموسمين، بينما أعطى الطراز رقم (3) أقل محصول تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين.

وفي صفة عدد الأفرع أعطي الطراز رقم (12) أكبر عدد من الأفرع تحت الكثافة النباتية المنخفضة 15 سم، 10 سم يليه الطراز رقم 11 في موسمي الدراسة، بينما الطراز رقم (9) تحت الكثافة النباتية العالية 5 سم أقل عدد من الأفرع في الموسم الأول والطراز رقم (6) في الموسم الثاني، وفي صفة المحصول الأوراق الجافة أعطي محصول أوراق جافة تحت كثافة الزراعة العالية هكذا وكذلك تحت الكثافة النباتية 10 سم في كلما الموسمين، بينما أعطى الطراز رقم (3) أقل محصول تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين.

6- أعطى الطراز رقم (9)، (6) عند زراعته في 20 أبريل وتحت الكثافة النباتية العالية 5 سم أعلى محصول على طازج، بينما أعطى الطراز رقم (3) أقل محصول على طازج تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين، وفي صفة عد الأفرع أعطى الطراز رقم 4 أعلى محصول على طازج تحت الكثافة النباتية العالية 10 سم، 5 سم أعلى محصول على طازج تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين.

7- وفي ميعاد الزراعة الأول 02 فبراير، أعطى الطراز رقم (4) أعطى محصول على طازج تحت الكثافة النباتية العالية 5 سم، بينما أعطى الطراز رقم (13) أقل محصول تحت الكثافة النباتية المنخفضة 15 سم في كلما الموسمين. كما أعطى الطراز رقم (14) تحت الكثافة النباتية 5 سم يليه الطراز رقم (4) تحت
الكثافة النباتية 10 سم أعلى ارتفاع لطول النبات، بينما أعطي الطرز رقم (12) أقل ارتفاع لطول النبات في كل الموسمين، وفي صفة عدد الأفرع أعطي الطرز رقم (12). (7) أعلى عدد للأفرع تحت الكثافة النباتية 10 سم، بينما أعطي الطرز رقم (15) تحت الكثافة 5 سم أقل عدد من الأفرع في الموسمين.

وفي صفة محصول الأوراق الأخضر، أعطي الطرز رقم (7) في الطرز رقم (10). أعلى محصول أوراق خضراء طازجة تحت الكثافة النباتية 5 سم، 10 سم، بينما سجل الطرز رقم (12) تحت الكثافة النباتية أقل كمية محصول أوراق خضراء في كل المواسم. أعطي الطرز رقم (4) في الطرز رقم (7) والطرز رقم (14) أعلى محصول أوراق جافة تحت الكثافة النباتية العالية 5 سم، بينما أعطي الطرز رقم (9) أقل كمية محصول أوراق جافة في العامين.