EFFECT OF DIFFERENT PLANT LOCATIONS AND SOWING DATES ON SOME JEW'S MALLOW ECOTYPES (*CORCHORUS OLITORIUS* L.)

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Abstract: The present study was carried out during the two successive summer seasons of 2008 and 2009 at three locations in Egypt, i.e.; a) farm of Sabahia, Alexandria governorate, Horticultural Research Station; b) farm of Kaha, Kalyiobia governorate, Horticulture Research Station; and c) farm of Baramoun, Mansoura, Dakahlya governorate, Horticultural Research Station. Sowing was done on three different dates, i.e., a) mid of April, b) mid of May, and c) mid of June. The genetic materials used in this study included six ecotypes of jew's mallow, which were collected from different regions of Egypt in addition to Eskandarany cultivar. This work was designed to study plant response to different sowing dates in different locations to detect the proper one that achieve maximum yield of seed and fresh foliage of the seven Jew's mallow genotypes. It was found that sowing Eskandarany cultivar in Kaha and Mansoura on mid of May gave the highest total fresh leafy yield. Meanwhile, the best seed yield of Eskandarany cultivar was obtained by sowing in Mansoura on mid of May or mid of June and in Alexandria on mid of April. Sowing balady el-esma'aellyia ecotype in Alexandria on mid of June gave the highest fresh leafy yield and seed yield. However, the highest fresh leafy yield of balady bani sweef ecotype was obtained by sowing in Mansoura district on mid of May. But the best seed yield was obtained by sowing in Alexandria on mid of May or mid of June. Sowing balady Sohag ecotype in Kalyiobia on mid of May or mid of June and in Mansoura on mid of May gave the highest total fresh leafy yield. However, the maximum seed yield was obtained by sowing in Alexandria on mid of April or mid of May and in Mansoura on any sowing date. The maximum total fresh leafy yield for siwi and balady sharkeia ecotypes was obtained by sowing in Alexandria on mid of June. The best seed yield values were obtained by sowing both ecotypes in Alexandria and Kalyiobia on any sowing date. Finally, the highest total fresh leafy yield and seed yield of minia ecotype were obtained by sowing in Mansoura on mid of May and mid of April, respectively. [Nature and Science 2010;8 (9):270-283]. (ISSN: 1545-0740).

Key words: Jew's mallow (Molokhia) cultivars, sowing date, different location.

1. INTRODUCTION

Jew's mallow is the most important leafy vegetable in Egypt, which is a popular summer vegetable dish with its special delicious taste. It is utilized as fresh or frozen products. Even though, the dried leaves could be used as well, although its favorite flavor is lost. Since Jew's mallow production is increasing, the surplus of this vegetable needs to be preserved for exportation and/or local consumption (Oomen and Grubben, 1978).

Jew's mallow is a short-day plant. It grows well at high temperature (25 - 35 °C) and high humidity. Its harvesting usually begins 40 —60 days after planting (Vincent and Yamaguchi, 1997). Concerning the plant behavior under low temperature and short days, such conditions tends to slow the vegetative growth in addition to promoting flower formation to be started early at 2-3 leaf stage.

Appropriate sowing time 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, Wahba et al. (2003) reported that sowing Jew's mallow on the 1st of June gave the highest total yield, vegetative growth, and chemical constituents, while it gave the lowest net leaves weight percentage comparing with sowing on 1st of April and 1st of May. In another study, Abd-Allah and Nasr (2005) suggested that the best date in order to grow Jew's mallow for seed and fresh foliage yields, in Alexandria area, might be on mid of May.

Previous work on growth and yield of *Corchorus olitorius* used as a vegetable is not enough, especially in seed yield. Therefore, the present work was designed to study the plant response to different sowing dates in different locations to detect the proper one that produce maximum yield of seed and fresh foliage of seven Jew's mallow genotypes.

2. MATERIALS AND METHODS

The present study was carried out during the two successive summer seasons of 2008 and 2009 at three locations, i.e.; a) farm of Sabahia Horticultural Research Station, Alexandria; b) farm of Kaha (Kalyiobia governorate) Horticulture Research Station; and c) farm of Baramoun Horticultural Research Station, Mansoura, Egypt. Sowing was done on three different dates, i.e., a) mid of April, b) mid of May,

and c) mid of June. The average air temperature degrees and relative humidity from April up to October have been recorded and illustrated for the three locations in Table 1.

Table 1: Locational and climatic characteristics used for stability analysis of jew's mallow ecotypes

Location	**Sabahia farm (Alexandria)**			**Kaha farm (Kalyiobia)**			**Baramoun farm (Mansoura)**		
Soil texture	coarse clay			Clay loamy			Clay loamy		
ph	8.35			8.70			7.75		
Latitude (N)	31.20			30.16			31.00		
Longitude (E)	29.95			31.12			31.45		
Altitude (m)	6			65			4		
Air temp. (ºC) [#]	Aver.	Max	Min	Aver.	Max	Min	Aver.	Max	Min
April	18	24	13	21	28	14	18	27	12
May	21	27	16	25	32	17	22	31	15
June	24	29	20	27	35	20	26	34	19
July	26	30	22	28	35	22	26	35	20
August	27	31	23	28	34	22	26	34	20
September	26	30	21	26	33	20	25	33	19
October	23	28	18	23	30	18	22	30	17

[#] Means of both of 2008 and 2009 seasons

The genetic materials used in this study included six ecotypes of jew's mallow, which were collected from different regions of Egypt in addition to Eskandarany cultivar (Abd-Allah, 2006). These genotypes and their sources are presented in Table 2. These genotypes were improved by two mass selection cycles (Abd-Allah, 2009).

Table 2. Sources and local names of jew's mallow genotypes

Genotype	**Local names**	**Local sources in Egypt**
Cultivar	Eskandarany	Horticultural Research Institute
Ecotype 1	Balady Siwi	Siwa
Ecotype 2	Balady Sharkeia	Sharkeia
Ecotype 3	Balady Sohag	Sohag
Ecotype 4	Balady Minia	Minia
Ecotype 5	Balady Bani sweef	Bani sweef
Ecotype 6	Balady El-esma'aellyia	El-esma'aellyia

Seeds were sown in rows about 20 cm apart and then irrigated. Plants were thinned to 5 or 20 cm between plants for fresh leafy yield or seed yield, respectively. Each experimental unit consisted of 10 rows, each of 4 m in length and 0.20 m apart, i.e., the unit area was 8 m^2. Sowing was done at three dates on mid of April, mid of May and mid of June in 2008 and 2009 summer seasons. A factorial experiment in a randomized complete blocks design of seven genotypes, 3 locations, 2 years, and 3 sowing dates with three replicates was used. Three cuttings were taken from each genotype of jaw's mallow for fresh leafy yield. The first cut was done at 45 days after sowing; meanwhile the second and the third cuts

were taken 30 days intervals. All the agricultural practices were followed according to recommendations.

Recorded data:

1. Fresh foliage yield and its components.

In each cut, vegetative measurements were recorded as a mean of 20 randomly taken plants per entry. These characters were: stem length (cm), plant weight (g), leaves weight (g), and number of leaves/ plant. Fresh foliage yield was recorded in Kg/ plot as the total weight of plants for each cut in each entry and the total yield in kg/ m^2 was calculated for the three cuts taken from each entry. Net leaves weight percentage was calculated as leaves weight of 20 plants/ total weight of these plants × 100. Leaf area (cm^2) per plant was determined at each cut for each sample by the disk method (Bremner and Taha, 1960).

2- Seed yield and its components.

At the end of the season, the following traits were recorded as an average of 20 randomly taken plants; total seed yield (g/plant), plant height (cm), number of branches/ plant, number of pods/ plant, number of seeds/ pod, pod length (cm), and weight of 1000 seeds (g).

Statistical procedures:

The data were combined over years, using fixed-model analysis. Before combined variance analysis, the data were checked for normal distribution and homogeneity of variances by years. Simple statistical analysis of a randomized complete blocks design according to Snedecor and Cochran (1980) was used to find out the significance of the studied characters and to compare between means by Duncan's multiple range at 0.05% level of significance.

3. RESULTS AND DISCUSSION

The performances of fresh leafy yield and its components under different locations and sowing dates indicated that sowing Eskandarany cultivar in Kalyiobia and Mansoura districts on mid of May gave the highest significant values for total fresh leafy yield (8.792 and 8.300 kg/ m^2, respectively) (Table 3a). However, sowing Eskandarany cultivar in Kalyiobia district on mid of May had the highest significant values for stem length, plant weight, and leaf area/ plant; but sowing in Mansoura district on mid of May gave the highest significant values for leaves weight/ pant and net leaves weight. Generally, the highest significant value for total fresh leafy yield and number of leaves/ plant were obtained by sowing in Kalyiobia and Mansoura districts. On the other hand, sowing on mid of May exhibited the highest values for all traits of fresh leafy yield and its components except for net leaves weight. These results may be due to the favorable environmental conditions such as temperature and relative humidity in Kalyiobia and Mansoura, where the soil texture in both of districts are clay loamy (Table 1), that met the well growth of Jew's mallow. In this regard, Abd-Allah and Nasr (2005) reported that sowing Jew's mallow on mid of May predominate sowing on mid of April in all studied characters.

With respect to seed yield and its components of Eskandarany cultivar, data in Table (3b) indicated that sowing in Mansoura on mid of May gave the highest significant values for all the studied traits of seed yield and its components. The performances of seed yield/ plant, number of seeds/ pod, and weight of 1000 seeds which obtained by sowing on mid of June were equal to that obtained by sowing on mid of May in the same district. In addition, sowing in Mansoura on mid of May was equal to sowing in Alexandria on mid of April concerning number of pods/ plant, number of seeds/ pod, pod length, weight of 1000 seeds, and consequently, seed yield/ plant. Generally, the obtained seed yield/ plant and pod length were found to be the highest values by sowing in Alexandria and Mansoura districts. Moreover, the highest significant values regarding number of seeds/ pod and plant height were obtained by sowing in Alexandria and Kalyiobia, respectively. On the other hand, sowing on mid of May gave the highest significant values for seed yield/ plant, number of seeds/ pod, pod length, and weight of 1000 seeds. Sowing on mid of May and June had the same results regarding seed yield/ plant, pod length. Vincent and Yamaguchi (1997) reported that Jew's mallow grows well at high temperature (25 - 35 °C), so sowing on mid of May was the most suitable date. The temperature tented to increase after that, which accelerate plant growth of Jew's mallow and hence, increase yield.

Data in Table (4a) illustrated that sowing balady el-esma'aellyia ecotype in Alexandria district on mid of June gave the highest significant values for all traits of fresh leafy yield and its components. Generally, sowing in Alexandria district had the highest significant values for all traits of fresh leafy yield and its components except leaf area/ plant, which was the highest in Mansoura district. Also, there was no significance difference between Alexandria and Mansoura districts concerning Stem length. With respect to sowing dates, there were no significant differences among them regarding leaves weight/ plant and net leaves weight. Nevertheless,

sowing on mid of June exhibited the highest significant value for total fresh leafy yield. Moreover, sowing on mid of May or June was the same significant regarding stem length, plant weight, leaf area/ plant, and number of leaves/ plant. In this respect, Wahba et al. (2003) reported that sowing Jew's mallow on 1st of June, in Alexandria area, had the highest yield and vegetative growth, which differed significantly when compared with sowing on 1st of May and 1st April.

Means performance of number of pods/ plant and number of seeds/ pod of balady el-esma'aellyia ecotype were the highest significant values by sowing in Alexandria on mid of June, therefore, seed yield/ plant was the highest significant mean value (Table 4b). Although, the obtained number of seeds/ pod by sowing in Alexandria on mid of June and in Kalyiobia on mid of April was the same, they did not have the same seed yield. The highest significant values for number of branches/ plant and weight of 1000 seeds were obtained by sowing in Alexandria on mid of May. Meanwhile, sowing in Kalyiobia on mid of May gave the highest significant values for plant height and pod length. Generally, no significant differences were noticed between sowing in Alexandria and sowing in Kalyiobia concerning seed yield/ plant and number of seeds/ pod. No significant differences were also found between Alexandria and Mansoura sowing location regarding number of pods/ plant. The highest significant number of branches/ plant and plant height were obtained by sowing in Alexandria and Kalyiobia, respectively. With respect to sowing date, the best results were obtained by sowing on mid of May overall. Hossain *et al*. (1999) stated that higher plant stature and higher number of branches/ plant provide enough pod bearing sites, which consequently increased pod settings ultimately to eventuate increased seed yield.

The highest significant values for all traits of fresh leafy yield and its components were obtained by sowing balady bani sweef ecotype in Mansoura district on mid of May (Table 5a). In general, sowing in Mansoura district gave the highest significant values for all traits of fresh leafy yield and its components. On the other hand, the highest significant values for all traits of fresh leafy yield and its components except plant weight and leaves weight/ pant were obtained by sowing on mid of May.

Sowing balady bani sweef ecotype in Alexandria on mid of June gave the highest significant values for all traits of seed yield and its components except plant height (Table 5b). Moreover, there were no significant differences between sowing on mid of May and mid of June in Alexandria concerning seed yield/ plant and studied traits of seed yield and its components as well as number of branches/ plant were obtained. Generally, the highest significant values for most of the previous characters were obtained by sowing in Alexandria. Sowing on mid of May had the highest significant values for number of branches/ plant and plant height. Meanwhile, Sowing on mid of June had the highest significant values for seed yield/ plant, number of seeds/ pod, and weight of 1000 seeds. Rayhan et al. (2008) reported that 15 August planting significantly increased number of branches /plant, number of pods/ plant, number of seeds/ pod and seed yield.

Sowing balady Sohag ecotype in Kalyiobia district on mid of June had the highest significant values for stem length, net leaves weight, and total fresh leafy yield (Table 6a). Moreover, there were no significant differences between sowing on mid of May and mid of June concerning stem length and total fresh leafy yield in Kalyiobia district. Also, sowing on mid of May had the same result in Kalyiobia and Mansoura districts regarding total fresh leafy yield. In general, sowing in Kalyiobia and Mansoura districts exhibited the highest significant values for stem length and leaf area/ plant. On the other hand, the highest significant values for stem length, leaf area/ plant, leaves weight/ pant, and number of leaves/ plant were obtained by sowing on mid of May.

The best seed yield/ plant of balady sohag ecotype was obtained by sowing in Alexandria either on mid of April or on mid of May and in Mansoura on any sowing date (Table 6b). In addition, the highest number of pods/ plant was obtained by sowing in Alexandria on mid of May and in Mansoura either on mid of April or on mid of May. The highest numbers of both seeds/ pod and branches/ plant were obtained by sowing in Alexandria on mid of May. The highest significant mean values for plant height, weight of 1000 seeds, and pod length were obtained by sowing in Mansoura on mid of April, mid of May, and mid of June, respectively. Generally, sowing in Alexandria or Mansoura did not differ significantly regarding seed yield/ plant or number of pods/ plant. Also, the longest pod was obtained by sowing in Alexandria or Kalyiobia. The highest significant values for number of branches/ plant and plant height were obtained by sowing in Alexandria and Kalyiobia, respectively. On the other hand, sowing on mid of May had the highest significant values for number of pods/ plant, plant height, and weight of 1000 seeds. The other traits were not affected by different sowing dates.

The Means performance of fresh leafy yield and its components of siwi ecotype, in Table (7a), illustrated that the best results were obtained by

sowing in Alexandria on mid of June. Generally, sowing in Alexandria gave the highest significant values for all traits of fresh leafy yield and its components. No significant differences were found between sowing in Alexandria and Mansoura concerning plant weight, number of leaves/ plant and total fresh leafy yield. Moreover, sowing on mid of May and June gave the same results regarding stem length, plant weight, and leaves weight/ plant. But total fresh leafy yield had the same significant by sowing in mid of April and June.

Data in Table (7b) suggested that seed yield/ plant of siwi ecotype was not affected by difference of plant locations or sowing dates except sowing on mid of April in both of Kalyiobia and Mansoura districts, where they gave the lowest seed yield/ plant. Generally, the highest significant values for number of branches/ plant and weight of 1000 seeds were obtained by sowing in Alexandria or Mansoura. Meanwhile, sowing in Kalyiobia had the longest plants. Difference of plant locations did not affect the other yield components. On the other hand, different sowing dates affected all traits of seed yield and its components except for number of pods/ plant and number of branches/ plant.

Sowing balady sharkeia ecotype in Alexandria on mid of June gave the best results for fresh leafy yield and its components (Table 8a). Overall, sowing in Alexandria had the highest significant values concerning stem length, plant weight, leaf area/ plant, and total fresh leafy yield. Meanwhile, sowing in Mansoura gave the highest significant mean values regarding the other traits. Sowing on mid of June was found to be the best sowing date for the most traits especially total fresh leafy yield.

Sowing balady sharkeia ecotype in both of Alexandria and Kalyiobia on any sowing date gave the highest significant mean values for seed yield/ plant (Table 8b). The highest significant numbers of both pods and branches per plant were obtained by sowing in Alexandria on mid of June. Sowing in Kalyiobia on mid of May had the highest significant values for number of seeds/ pod and pod length. Generally, sowing in Alexandria and Kalyiobia gave the highest significant values for seed yield/ plant, number of seeds/ pod, and number of branches/ plant. On the other hand, sowing on mid of May gave the highest significant values for number of branches/ plant, plant height, and pod length. However, the highest significant values for seed yield/ plant and number of seeds/ pod were obtained by sowing on mid of June. Jew's mallow is sensitive to photoperiod and a short day plant (Choudhuri and Ali, 1962). It gives stunted growth and flowers early when it is planted to short days less than its critical period. The critical photoperiod is 12.50 hrs for *C. olitorius* (Johansen *et al.* 1985).

Results in Table (9a) indicated that sowing balady minia ecotype in Mansoura on mid of May gave the highest significant values for all traits of fresh leafy yield and its components. Also, sowing on mid of May was equal to sowing on mid of June, in Mansoura, concerning plant weight and leaves weight/ plant. In general, sowing in Mansoura had the best results for all traits of fresh leafy yield and its components. On the other side, sowing on mid of May gave the best results for all traits of fresh leafy yield and its components except for plant weight. Moreover, sowing on mid of May was equal to sowing on mid of June regarding leaves weight/ pant, net leaves weight, and total fresh leafy yield. Data in Table (9b) suggested that the best location that achieves high seed yield/ plant, number of pods/ plant, and number of seeds/ pod of balady minia ecotype was Mansoura by sowing on mid of April. Overall, sowing in Alexandria had the highest number of branches/ plant. Meanwhile, the highest significant values for seed yield/ plant and number of pods/ plant were obtained by sowing in Mansoura. On the other hand, sowing on mid of April gave the highest number of pods/ plant. However, sowing on mid of May had the highest significant mean values for number of seeds/ pod, plant height, and weight of 1000 seeds. Abd-Allah and Nasr (2005) had sown five genotypes of Jew's mallow on mid of April and mid of May in Alexandria. They found that Jew's mallow genotypes gave higher mean performances for all studied traits by sowing on mid of May than that of sowing on mid of April.

Table 3a: Means performance of fresh leafy yield and its components of Escandarani cultivar on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/ plant[y] (cm^2)	Number of leaves/ plant[y]	Stem length[y](cm)
Alexandria	Mid of April	6.195 cd[#]	23.80 g	7.12 e	31.92 d	642.1 h	14.9 h	41.0 e
	Mid of May	6.763 c	27.19 f	7.67 e	28.84 e	691.7 g	16.4 g	43.6 c
	Mid of June	7.383 bc	30.54 e	8.92 d	29.17 e	804.3 c	17.9 f	45.0 b
Kalyiobia	Mid of April	6.683 c	32.63 d	9.11 d	29.41 e	686.9 g	22.4 e	39.0 g
	Mid of May	8.792 a	40.57 a	12.54 c	34.34 c	1110.2 a	34.7 a	47.0 a
	Mid of July	5.350 d	36.41 b	12.65 c	31.19 d	832.9 b	26.6 d	40.1 f
Mansoura	Mid of April	6.598 cd	31.21 e	13.85 b	40.03 b	736.0 f	27.8 c	42.2 d
	Mid of May	8.300 ab	36.64 b	15.27 a	42.98 a	790.4 d	30.0 b	43.7 c
	Mid of June	6.756 c	34.86 c	14.28 b	39.91 b	754.6 e	29.4 b	42.5 d
Locations means								
	Alexandria	6.780 B	27.18 C	7.90 C	29.98 B	712.7 C	16.4 C	43.2 A
	Kalyiobia	6.942 AB	36.54 A	11.43 B	31.65 B	876.7 A	27.9 AB	42.0 B
	Mansoura	7.218 A	34.24 B	14.47 A	40.97 A	760.3 B	29.1 A	42.8 AB
Sowing dates means								
	Mid of April	6.492 B	29.21 C	10.03 B	33.79 A	688.3 C	21.7 C	40.7 C
	Mid of May	7.952 A	34.80 A	11.83 A	35.39 A	864.1 A	27.0 A	44.8 A
	Mid of June	6.496 B	33.94 B	11.95 A	33.42 A	797.3 B	24.6 B	42.5 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 3b: Means performance of seed yield and its components of Escandarani cultivar on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	4.232 ab[#]	32.0 a	224.0 a	4.5 cd	193.4 g	10.0 a	1.713 ab
	Mid of May	4.035 bc	30.2 d	213.8 c	4.5 c	198.1 f	9.5 c	1.701 ab
	Mid of June	3.817 cd	31.3 b	208.2 d	4.8 b	205.8 d	9.8 b	1.606 cd
Kalyiobia	Mid of April	3.867 cd	30.5 c	215.7 b	4.9 b	206.6 c	9.0 d	1.601 d
	Mid of May	3.972 bc	30.7 c	216.3 b	4.2 e	205.8 d	9.9 b	1.606 cd
	Mid of July	3.893 cd	31.2 b	207.2 e	4.5 c	211.2 b	9.8 b	1.614 cd
Mansoura	Mid of April	3.681 d	30.5 c	191.7 f	4.3 de	202.1 e	9.6 c	1.659 bc
	Mid of May	4.456 a	32.0 a	224.5 a	5.2 a	213.6 a	10.0 a	1.743 a
	Mid of June	4.232 ab	30.2 d	224.0 a	4.5 cd	193.4 g	9.8 b	1.692 ab
Locations means								
	Alexandria	4.028 AB	31.2 A	215.3 A	4.6 A	199.1 B	9.8 A	1.673 AB
	Kalyiobia	3.911 B	30.8 A	213.1 B	4.5 A	207.9 A	9.6 B	1.607 B
	Mansoura	4.123 A	30.9 A	213.4 B	4.7 A	203.0 B	9.8 A	1.698 A
Sowing dates means								
	Mid of April	3.927 B	31.0 A	210.5 C	4.6 A	200.7 A	9.5 B	1.658 B
	Mid of May	4.154 A	31.0 A	218.2 A	4.6 A	205.8 A	9.8 A	1.683 A
	Mid of June	3.981 AB	30.9 A	213.1 B	4.6 A	203.5 A	9.8 A	1.637 C

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 4a: Means performance of fresh leafy yield and its components of balady el-esma'aellyia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/ plant[y] (cm^2)	Number of leaves/ plant[y]	Stem length[y](cm)
Alexandria	Mid of April	6.938 cd[#]	36.26 c	14.80 b	37.47 b	611.6 g	29.9 b	41.9 de
	Mid of May	8.533 b	38.30 b	14.94 b	37.61 b	703.6 e	29.9 b	43.7 c
	Mid of June	11.333 a	40.04 a	15.74 a	39.47 a	832.7 a	30.8 a	47.1 a
Kalyiobia	Mid of April	5.033 f	34.80 d	10.28 c	29.60 d	687.6 f	23.6 d	42.2 de
	Mid of May	5.295 ef	26.19 g	8.91 d	34.40 c	811.1 b	28.3 c	43.0 cd
	Mid of July	6.096 de	29.72 f	8.94 d	30.39 d	577.8 h	18.0 f	41.3 e
Mansoura	Mid of April	6.390 cd	30.53 f	6.78 f	22.93 e	779.8 c	18.0 f	42.8 cd
	Mid of May	6.972 c	33.58 e	7.80 e	23.53 e	781.5 c	21.9 e	45.1 b
	Mid of June	6.826 cd	37.78 b	9.23 d	24.09 e	761.6 d	24.2 d	43.6 c
Locations means								
	Alexandria	8.935 A	38.20 A	15.16 A	38.18 A	716.0 B	30.2 A	44.2 A
	Kalyiobia	5.475 C	30.24 C	9.38 B	31.46 B	692.2 C	23.3 B	42.2 B
	Mansoura	6.729 B	33.96 B	7.94 B	23.52 C	774.3 A	21.4 C	43.8 A
Sowing dates means								
	Mid of April	6.652 B	32.69 B	10.62 A	30.00 A	693.0 B	23.8 B	42.3 B
	Mid of May	6.402 B	33.86 AB	10.55 A	31.85 A	765.4 A	26.7 A	43.9 AB
	Mid of June	8.085 A	35.85 A	11.30 A	31.32 A	724.0 AB	24.3 AB	44.0 A

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 4b: Means performance of seed yield and its components of balady el-esma'aellyia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	3.652 d[#]	31.5 f	198.8 f	4.5 d	195.4 g	10.2 b	1.697 c
	Mid of May	4.043 bc	32.0 e	225.8 c	5.5 a	206.1 e	9.9 c	1.876 a
	Mid of June	4.378 a	33.7 a	229.5 a	5.1 b	204.9 f	9.7 d	1.682 c
Kalyiobia	Mid of April	4.051 bc	31.5 f	230.7 a	4.5 d	208.8 d	9.6 de	1.785 b
	Mid of May	4.074 b	31.5 f	228.2 b	4.8 c	220.8 a	10.4 a	1.775 b
	Mid of July	3.984 bc	32.8 d	210.5 d	4.4 d	204.2 f	10.0 c	1.687 c
Mansoura	Mid of April	3.895 c	33.0 c	206.8 e	4.4 d	210.3 c	9.9 c	1.761 b
	Mid of May	3.886 c	33.3 b	206.3 e	4.3 d	217.9 b	9.4 e	1.743 bc
	Mid of June	3.652 d	31.5 f	198.8 f	4.5 d	195.4 g	10.2 b	1.697 c
Locations means								
	Alexandria	4.024 A	32.4 A	218.1 A	5.0 A	202.1 C	9.9 A	1.752 A
	Kalyiobia	4.036 A	31.9 B	223.1 A	4.5 B	211.3 A	10.0 A	1.749 A
	Mansoura	3.811 B	32.6 A	204.0 B	4.4 B	207.8 B	9.9 A	1.734 A
Sowing dates means								
	Mid of April	3.866 B	32.0 B	212.1 B	4.5 B	204.8 B	9.9 A	1.747 B
	Mid of May	4.001 A	32.8 A	220.1 A	4.9 A	214.9 A	9.9 A	1.798 A
	Mid of June	4.004 A	32.1 B	212.9 B	4.6 B	201.5 B	9.9 A	1.688 C

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 5a: Means performance of fresh leafy yield and its components of balady bani sweef ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/ plant[y] (cm^2)	Number of leaves/ plant[y]	Stem length[y](cm)
Alexandria	Mid of April	5.941 e[#]	26.58 i	6.30 g	25.02 d	568.4 h	16.3 f	40.5 e
	Mid of May	6.549 de	30.41 g	7.73 f	24.95 d	697.7 f	17.9 f	43.3 d
	Mid of June	7.430 bcd	36.49 e	8.74 e	23.44 e	788.8 d	25.1 d	45.0 c
Kalyiobia	Mid of April	7.122 cd	38.03 d	12.26 c	32.50 c	929.7 b	26.4 d	43.1 d
	Mid of May	8.300 b	32.50 f	11.10 d	33.13 c	778.8 e	29.3 c	43.7 d
	Mid of July	7.933 bc	28.08 h	12.61 c	36.07 b	670.6 g	20.3 e	38.9 f
Mansoura	Mid of April	7.119 cde	41.73 c	15.96 b	36.57 b	773.1 e	30.0 bc	45.0 c
	Mid of May	10.333 a	45.07 a	17.16 a	42.70 a	1022.8 a	31.8 a	47.4 a
	Mid of June	7.244 cd	43.53 b	16.41 b	36.01 b	838.8 c	30.9 ab	46.1 b
Locations means								
	Alexandria	6.640 C	31.16 C	7.59 C	24.47 B	685.0 C	19.8 C	42.9 B
	Kalyiobia	7.785 B	32.87 B	11.99 B	33.90 A	793.0 B	25.3 B	41.9 B
	Mansoura	8.232 A	43.44 A	16.51 A	38.43 A	878.2 A	30.9 A	46.2 A
Sowing dates means								
	Mid of April	6.727 C	35.45 A	11.51 B	31.36 B	757.1 B	24.2 B	42.9 B
	Mid of May	8.394 A	35.99 A	12.00 B	33.59 A	833.1 A	26.3 A	44.8 A
	Mid of June	7.536 B	36.03 A	12.59 A	31.84 B	766.1 B	25.4 AB	43.3 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 5b: Means performance of seed yield and its **components** of balady bani sweef ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	4.449 b[#]	34.8 e	206.3 e	4.7 c	220.2 d	10.2 bc	1.613 cd
	Mid of May	5.011 a	36.5 b	214.2 c	5.6 a	227.2 b	10.3 b	1.576 d
	Mid of June	5.146 a	37.0 a	241.5 a	5.6 a	212.2 e	10.5 a	1.712 a
Kalyiobia	Mid of April	4.657 b	34.3 f	218.5 b	5.0 b	212.1 e	10.1 c	1.614 cd
	Mid of May	4.100 cd	33.5 g	199.7 f	4.2 d	231.7 a	9.9 d	1.629 c
	Mid of July	4.169 c	33.5 g	211.3 d	4.8 c	211.0 f	10.2 bc	1.680 ab
Mansoura	Mid of April	3.899 d	35.7 d	176.8 h	5.0 b	222.8 c	10.3 b	1.607 cd
	Mid of May	4.003 cd	36.0 c	182.5 g	5.7 a	219.5 d	10.3 b	1.644 bc
	Mid of June	4.449 b	34.8 e	206.3 e	4.7 c	220.2 d	10.2 bc	1.613 cd
Locations means								
	Alexandria	4.869 A	36.1 A	220.7 A	5.3 A	220.8 A	10.3 A	1.641 A
	Kalyiobia	4.309 B	33.8 C	209.8 B	4.7 C	219.8 A	10.0 B	1.633 A
	Mansoura	4.117 C	35.5 B	188.6 C	5.1 B	218.3 A	10.3 A	1.621 B
Sowing dates means								
	Mid of April	4.335 B	34.9 A	200.6 B	4.9 B	218.4 B	10.2 A	1.611 B
	Mid of May	4.371 B	35.3 A	198.8 B	5.2 A	226.1 A	10.2 A	1.616 B
	Mid of June	4.588 A	35.1 A	219.7 A	5.0 B	214.5 C	10.2 A	1.668 A

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 6a: Means performance of fresh leafy yield and its components of balady sohag ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/ plant[y] (cm^2)	Number of leaves/ plant[y]	Stem length[y](cm)
Alexandria	Mid of April	6.957 de[#]	25.49 g	6.12 g	24.96 f	552.2 h	16.1 h	43.0 e
	Mid of May	7.105 de	28.62 f	7.89 f	26.71 e	712.0 f	16.4 h	46.4 b
	Mid of June	6.648 e	33.70 e	9.45 e	26.64 e	853.0 b	18.0 g	40.5 f
Kalyiobia	Mid of April	8.217 cd	36.55 d	10.15 e	44.93 b	788.1 c	23.8 e	43.2 e
	Mid of May	9.671 ab	29.15 f	17.32 a	35.34 d	935.4 a	25.4 d	48.5 a
	Mid of July	10.379 a	25.63 g	13.24 d	48.75 a	642.0 g	19.2 f	48.9 a
Mansoura	Mid of April	9.038 bc	39.77 c	15.46 c	37.18 c	769.8 e	29.9 c	44.5 d
	Mid of May	9.983 ab	43.27 a	16.37 b	35.95 d	782.0 d	31.6 a	46.7 b
	Mid of June	6.203 e	41.75 b	15.88 bc	36.26 cd	773.8 e	30.5 b	45.4 c
Locations means								
	Alexandria	6.903 C	29.27 B	7.82 C	26.10 C	705.7 B	16.8 C	43.3 B
	Kalyiobia	9.422 A	30.44 B	13.57 B	43.01 A	788.5 A	22.8 B	46.9 A
	Mansoura	8.408 B	41.60 A	15.90 A	36.46 B	775.2 A	30.7 A	45.5 AB
Sowing dates means								
	Mid of April	8.071 A	33.94 A	10.58 B	35.69 A	703.4 C	23.3 B	43.6 C
	Mid of May	8.920 A	33.68 A	13.86 A	32.67 B	809.8 A	24.5 A	47.2 A
	Mid of June	7.743 A	33.69 A	12.86 AB	37.22 A	756.3 B	22.6 C	44.9 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 6b: Means performance of seed yield and its components of balady sohag ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	3.769 ab[#]	34.5 b	191.0 c	5.3 b	206.8 g	10.5 b	1.894 a
	Mid of May	3.848 a	35.2 a	197.7 a	5.5 a	220.4 c	10.0 d	1.810 bc
	Mid of June	3.380 cd	33.8 c	193.2 b	4.7 d	210.0 f	10.0 d	1.741 e
Kalyiobia	Mid of April	3.500 bcd	31.8 e	191.8 bc	4.3 e	218.6 e	10.2 c	1.753 de
	Mid of May	3.373 cd	33.5 c	185.5 d	5.0 c	221.1 b	10.5 b	1.837 b
	Mid of July	3.253 d	32.7 d	179.8 e	5.1 bc	218.4 e	10.0 d	1.828 bc
Mansoura	Mid of April	3.603 abc	35.2 a	185.8 d	5.0 c	224.3 a	9.8 e	1.791 cd
	Mid of May	3.612 abc	35.3 a	193.3 b	4.6 d	219.7 d	9.8 e	1.891 a
	Mid of June	3.769 ab	34.5 b	191.0 c	5.3 b	206.8 g	10.6 a	1.741 e
Locations means								
	Alexandria	3.666 A	34.5 A	193.9 A	5.1 A	212.4 C	10.2 A	1.815 A
	Kalyiobia	3.375 B	32.7 B	185.7 A	4.8 B	219.4 A	10.3 A	1.806 A
	Mansoura	3.661 A	35.0 A	190.1 A	4.9 B	216.9 B	10.0 B	1.807 A
Sowing dates means								
	Mid of April	3.624 A	33.8 B	189.6 A	5.0 A	216.6 B	10.2 A	1.761 C
	Mid of May	3.611 A	34.7 A	192.2 A	5.0 A	220.4 A	10.2 A	1.846 A
	Mid of June	3.467 A	33.7 B	188.0 A	4.8 A	211.7 C	10.1 A	1.821 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 7a: Means performance of fresh leafy yield and its components of siwi ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/plant[y] (cm^2)	Number of leaves/ plant[y]	Stem length[y](cm)
Alexandria	Mid of April	5.890 d[#]	25.52 g	13.65 a	48.91 b	865.3 d	23.1 e	40.0 d
	Mid of May	6.820 bc	28.82 c	14.36 a	44.90 c	1053.7 b	22.3 ef	44.2 b
	Mid of June	9.533 a	33.32 a	14.11 a	52.41 a	1267.3 a	32.7 a	45.8 a
Kalyiobia	Mid of April	7.530 b	27.68 de	10.10 c	36.32 h	680.8 g	20.6 g	37.8 e
	Mid of May	3.660 e	26.94 ef	10.08 c	38.25 fg	1040.4 c	22.0 f	34.0 f
	Mid of July	4.500 e	22.86 h	8.66 d	37.72 gh	612.2 h	27.5 bc	34.4 f
Mansoura	Mid of April	6.055 cd	25.91 fg	9.59 c	39.67 ef	768.1 f	25.9 d	37.8 e
	Mid of May	6.241 cd	31.72 b	11.68 b	41.25 d	766.6 f	28.0 b	40.9 c
	Mid of June	6.085 cd	28.17 cd	14.05 a	40.88 de	775.3 e	26.9 c	39.9 d
Locations means								
	Alexandria	7.414 A	29.22 A	14.04 A	48.74 A	1062.1 A	26.0 A	43.3 A
	Kalyiobia	5.230 B	25.83 B	9.61 C	37.43 C	777.8 B	23.4 B	35.4 C
	Mansoura	6.127 AB	28.60 A	11.77 B	40.60 B	770.0 B	26.9 A	39.5 B
Sowing dates means								
	Mid of April	6.492 A	26.37 B	11.11 B	41.63 A	771.4 C	23.2 C	38.5 B
	Mid of May	5.574 B	29.16 A	12.04 A	41.47 A	953.6 A	24.1 B	39.7 A
	Mid of June	6.706 A	28.12 A	12.27 A	43.67 A	884.9 B	29.0 A	40.0 A

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 7b: Means performance of seed yield and its components of siwi ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	3.249 a[#]	28.8 a	191.2 b	4.8 a	168.7 f	9.7 a	1.687 bcd
	Mid of May	3.129 a	27.5 d	187.8 c	4.9 a	194.0 b	9.2 e	1.743 ab
	Mid of June	3.167 a	28.2 b	187.2 c	4.1 d	183.6 e	9.7 a	1.665 cd
Kalyiobia	Mid of April	2.728 b	27.8 c	166.0 e	3.8 e	191.5 c	9.4 c	1.683 bcd
	Mid of May	3.244 a	28.3 b	188.2 c	4.0 de	195.9 a	9.6 b	1.627 d
	Mid of July	3.207 a	27.0 e	197.7 a	4.5 bc	185.2 d	9.3 d	1.653 cd
Mansoura	Mid of April	2.826 b	27.3 d	181.3 d	4.4 c	183.2 e	9.4 c	1.703 bc
	Mid of May	3.158 a	28.7 a	191.3 b	4.7 ab	196.0 a	9.2 de	1.788 a
	Mid of June	3.249 a	28.8 a	191.2 b	4.4 c	168.7 f	9.7 a	1.687 bcd
Locations means								
	Alexandria	3.182 A	28.2 A	188.7 A	4.5 A	182.1 B	9.5 A	1.698 A
	Kalyiobia	3.078 A	27.7 A	183.9 A	4.1 B	190.9 A	9.4 A	1.654 B
	Mansoura	3.060 A	28.3 A	187.9 A	4.6 A	182.6 B	9.4 A	1.726 A
Sowing dates means								
	Mid of April	2.934 B	28.2 A	179.5 B	4.3 A	182.6 B	9.5 A	1.719 A
	Mid of May	3.177 A	28.0 A	189.1 A	4.5 A	193.8 A	9.3 B	1.691 AB
	Mid of June	3.208 A	28.0 A	192.0 A	4.3 A	179.2 C	9.5 A	1.668 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 8a: Means performance of fresh leafy yield and its components of balady sharkeia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/plant[y] (cm^2)	Number of leaves/plant[y]	Stem length[y](cm)
Alexandria	Mid of April	6.465 d[#]	27.10 e	8.42 f	46.99 b	760.1 f	18.5 fg	46.1 c
	Mid of May	7.552 c	30.38 c	9.87 e	48.79 a	890.3 b	21.5 e	48.1 b
	Mid of June	9.750 a	38.35 a	15.06 a	49.17 a	1027.3 a	27.7 a	51.3 a
Kalyiobia	Mid of April	8.678 b	35.47 b	11.39 d	42.75 c	799.9 c	24.3 d	43.3 d
	Mid of May	6.063 d	19.34 f	6.47 g	33.54 d	608.8 g	17.7 g	41.6 e
	Mid of July	8.867 b	26.59 e	8.48 f	32.90 de	572.9 h	19.1 f	37.9 g
Mansoura	Mid of April	5.892 d	27.00 e	13.18 c	31.50 ef	763.4 ef	23.5 d	35.7 i
	Mid of May	6.306 d	29.28 d	14.12 b	32.55 def	779.4 d	26.8 b	38.6 f
	Mid of June	6.138 d	27.16 e	13.65 bc	31.23 f	766.8 e	25.3 c	36.7 h
Locations means								
	Alexandria	7.922 A	31.94 A	11.12 B	48.32 C	892.6 A	22.6 B	48.5 A
	Kalyiobia	6.112 B	27.13 B	8.78 B	36.40 B	660.5 C	20.4 C	40.9 B
	Mansoura	7.869 A	27.81 B	13.65 A	31.76 A	769.9 B	25.2 A	37.0 C
Sowing dates means								
	Mid of April	7.012 B	29.86 A	11.00 B	40.41 A	774.5 A	22.1 B	41.7 B
	Mid of May	6.640 C	26.33 B	10.15 C	38.29 B	759.5 A	22.0 B	42.8 A
	Mid of June	8.252 A	30.70 A	12.40 A	37.77 B	789.0 A	24.0 A	42.0 AB

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 8b: Means performance of seed yield and its components of balady sharkeia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	2.981 ab[#]	25.5 f	200.8 b	3.9 cd	173.7 e	9.3 b	1.802 a
	Mid of May	3.003 ab	26.5 c	189.7 c	4.4 b	185.5 a	9.3 b	1.715 bc
	Mid of June	3.096 a	27.7 a	190.3 c	4.6 a	164.3 g	9.4 b	1.703 bc
Kalyiobia	Mid of April	3.035 ab	27.2 b	184.7 d	4.6 a	168.2 f	8.9 d	1.688 bc
	Mid of May	3.033 ab	25.7 ef	210.0 a	4.4 b	181.4 b	9.6 a	1.693 bc
	Mid of July	2.981 ab	24.0 g	200.5 b	4.1 c	179.5 c	8.7 e	1.708 bc
Mansoura	Mid of April	2.676 c	25.8 de	180.8 e	3.9 cd	177.5 d	9.1 c	1.728 b
	Mid of May	2.303 d	26.0 d	161.3 f	3.9 cd	177.8 d	9.3 bc	1.667 c
	Mid of June	2.935 b	25.5 f	200.8 b	3.8 d	173.7 e	9.3 b	1.667 c
Locations means								
	Alexandria	3.027 A	26.6 A	193.6 A	4.3 A	174.5 A	9.3 A	1.740 A
	Kalyiobia	3.016 A	25.6 B	198.4 A	4.4 A	176.4 A	9.1 B	1.696 B
	Mansoura	2.653 B	25.8 B	181.0 B	3.9 B	176.3 A	9.2 A	1.687 B
Sowing dates means								
	Mid of April	2.897 B	26.2 A	188.8 B	4.1 B	173.1 B	9.1 B	1.739 A
	Mid of May	2.780 C	26.1 A	187.0 B	4.4 A	181.5 A	9.4 A	1.692 B
	Mid of June	3.004 A	25.7 A	197.2 A	3.9 C	172.5 B	9.1 B	1.693 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

Table 9a: Means performance of fresh leafy yield and its components of balady minia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Total fresh leafy yield[z] (kg/m^2)	Plant weight[y](g)	Leaves weight/ plant[y] (g)	Net leaves weight[y] (%)	Leaf area/plant[y] (cm^2)	Number of leaves/plant[y]	Stem length[y](cm)
Alexandria	Mid of April	5.518 d[#]	20.77 g	6.94 e	33.58 d	626.2 h	18.7 d	40.52 e
	Mid of May	6.315 cd	23.91 e	7.77 d	32.19 e	701.1 g	20.2 c	43.94 b
	Mid of June	7.276 b	25.83 d	8.76 c	33.17 de	789.9 c	26.2 b	43.14 c
Kalyiobia	Mid of April	6.648 bc	32.77 c	7.68 de	23.10 f	821.1 b	25.6 b	37.41 g
	Mid of May	6.421 c	21.48 fg	7.63 de	36.07 c	783.9 d	26.2 b	39.33 f
	Mid of July	6.117 cd	22.09 f	7.35 de	33.74 d	524.2 i	20.0 c	33.19 h
Mansoura	Mid of April	6.421 c	33.41 bc	14.20 b	41.52 b	757.9 f	27.9 a	39.98 ef
	Mid of May	8.517 a	34.26 a	14.97 a	43.37 a	872.9 a	28.7 a	45.66 a
	Mid of June	6.606 bc	34.11 ab	14.52 ab	42.14 b	778.7 e	27.9 a	41.68 d
Locations means								
	Alexandria	6.370 B	23.50 C	7.82 B	32.98 B	705.7 B	21.7 C	42.5 A
	Kalyiobia	6.395 B	25.45 B	7.55 B	30.97 C	709.7 B	23.9 B	36.6 B
	Mansoura	7.181 A	33.93 A	14.56 A	42.34 A	803.2 A	28.2 A	42.4 A
Sowing dates means								
	Mid of April	6.196 B	28.98 A	9.61 B	32.73 B	735.1 B	24.1 A	39.3 B
	Mid of May	7.084 A	26.55 B	10.12 A	36.80 A	786.0 A	25.0 A	43.0 A
	Mid of June	6.666 AB	27.34 B	10.21 A	36.76 A	697.6 C	24.7 A	39.3 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.
[z]Data calculated from sum of three cuttings
[y]Data calculated from average of three cuttings

Table 9b: Means performance of seed yield and its components of balady minia ecotype on different sowing dates at different locations, calculated from the combined data over two summer seasons, 2008 and 2009.

Locations	Sowing dates	Seed yield /plant (g)	Number of pods /plant	Number of seeds /pod	Number of branches/ plant	Plant height (cm)	Pod length (cm)	Weight of 1000 seeds (g)
Alexandria	Mid of April	3.795 bc[#]	29.2 e	187.3 f	4.6 c	188.5 e	9.7 b	1.465 e
	Mid of May	3.826 bc	31.0 b	197.5 d	4.9 a	197.6 d	9.3 d	1.554 a
	Mid of June	4.009 b	29.7 d	205.0 b	4.7 bc	210.0 a	9.5 c	1.509 cd
Kalyiobia	Mid of April	3.408 d	28.5 f	180.8 g	4.9 a	204.5 b	9.6 b	1.493 de
	Mid of May	3.780 c	27.8 g	209.2 a	4.1 d	205.1 b	9.8 a	1.508 cd
	Mid of July	3.552 d	27.7 g	193.5 e	4.1 d	185.1 f	9.4 d	1.535 abc
Mansoura	Mid of April	4.584 a	33.8 a	210.7 a	4.2 d	196.9 d	9.8 a	1.517 bcd
	Mid of May	3.900 bc	30.5 c	202.7 c	4.8 ab	202.8 c	9.4 d	1.545 ab
	Mid of June	3.795 bc	29.2 e	187.3 f	4.6 c	188.5 e	9.7 b	1.465 e
Locations means								
	Alexandria	3.877 B	29.9 B	196.6 A	4.7 A	198.7 A	9.5 A	1.509 A
	Kalyiobia	3.580 C	28.0 C	194.5 A	4.4 C	198.2 A	9.6 A	1.512 A
	Mansoura	4.093 A	31.2 A	200.2 A	4.5 B	196.1 A	9.6 A	1.509 A
Sowing dates means								
	Mid of April	3.929 A	30.5 A	192.9 B	4.6 A	196.6 B	9.6 A	1.492 B
	Mid of May	3.835 A	29.8 B	203.1 A	4.6 A	201.8 A	9.6 A	1.536 A
	Mid of June	3.785 A	28.8 C	195.3 B	4.5 A	194.5 B	9.5 A	1.503 B

[#]Duncan's multiple range tests was used to detect the significant differences between treatment means at 5% levels of probability.

References

1. Abd- Allah, S. A. M. and M. A. Nasr 2005. Effect of Sowing Date and Preservation Methods on some Egyptian Moloukhyia Genotypes (*Corchorus olitorius*, L.). *Minufiya J. Agric. Res. Vol. 31 No. 4*: 981-995.
2. Abd-Allah, S. A. M. 2006. Variation and Interrelationships of some Egyptian Moloukhyia Genotypes (*Corchorus olitorius* L.). J. Agric. Sci. Mansoura Univ., 31(4): 2285 – 2296.
3. Abd-Allah, S. A. M. 2009. Improvement Jew's mallow (*Corchorus olitorius* L.) by Two Cycles of Mass Selection. J. Adv. Agric. Res. (Fac. Agric. Saba Bash), 14(3):567-586.
4. Bremner, P. M. and M. A. Taha. 1960. Studies on potato agronomy I. The effect of variety, seed size and spacing on growth, development and yield. J. Agric. Sci., (Canada), 66 : 241-252.
5. Choudhuri, S. D. and M. K. Ali. l962. 'Patbeez Utpadan-O-Bister' (A Bangla Booklet). East Pakistan Govt. Press. Dhaka. p. 15.
6. Hossain, M. A.; A.T.M.M. Alam; S. Ahamed and A.L. Khandaker. 1999. Effect of planting time of jute variety O-9897 on seed production. Bangladesh J. Seed Sic. Tech. 3 (1&2): 43-47.
7. Johansen, C.; M. Waseque and S. Begum. 1985. Effect and interaction of photoperiod, water stress and nitrogen on flowering and growth in jue. Field Crop Res. 12: 397-406.
8. Oomen, H.A.P.C. and G.J.H. Grubben. 1978. Tropical leaf vegetables in human nutrition. Communication 69, Dept. of Agr. Research, Royal Tropical Institute, Amsterdam, Netherlands. Orphan Publishing Co., Willemstad, Curacao.
9. Rayhan, S.M. ; M.d. Ataur Rahman; and M. H. A. Amin 2008. Effect of planting time and magnesium on the growth and yield of jute seed. Bangladesh res. Pub. Jour. Vol. (1) 4:303 – 311.
10. Snedecor, G. W. and W. G. Cochran.1980. Statistical Methods. 7th Ed. Iowa State Univ. Press, Ames, Iowa, USA.
11. Vincent, E.R. and M. Yamaguchi. 1997. World Vegetables: Principles, Production, and Nutritive Values. 2ed., Department of Vegetables Crops. Uni. of California, Davis pp. 843. 849.
12. Wahba, R.M., S.M. Mansour, and E.A. Hassan 2003. Vegetative yield and its components in Jew's mallow *(Corchorus olitorius,* L.) as affected by sowing date. J. Adv. Agric. Res. 8 69-76.

8/8/2010

تأثير إختلاف المواقع ومواعيد الزراعة على بعض الطرز البيئية للملوخية

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الملخص العربى

أجرى هذا البحث خلال الموسمين الصيفيين لعامي 2008 و 2009 على ستة طرز بيئية من الملوخية جمعت من مناطق مختلفة من جمهورية مصر العربية. بالإضافة إلى صنف الإسكندرانى المستنبط بمعهد بحوث البساتين ؛ حيث زرعت هذه التراكيب الوراثية فى ثلاث مواقع مختلفة هى: مزرعة محطة بحوث البساتين بالصبحية (الإسكندرية) ، مزرعة معهد بحوث البساتين بقها (القليوبية) ، مزرعة محطة بحوث البساتين بالبرامون– المنصورة (الدقهليه) . وتمت الزراعة في ثلاث مواعيد هى : منتصف ابريل ومنتصف مايو ومنتصف يونيو. وقد تم تصميم هذا العمل لدراسة إستجابة التراكيب الوراثية المختلفة للملوخية لمواعيد الزراعة المختلفة في مواقع مختلفة بهدف التوصل إلى أفضلها للحصول على أفضل محصول ورقى وبذرى.

ويمكن تلخيص أهم النتائج فيما يلي:

1. **أعطى الصنف اسكندرانى أفضل محصول ورقى عند زراعته فى القليوبية والدقهليه في منتصف مايو . وفي الوقت نفسه أعطى أفضل محصول بذرى عند زراعته في الدقهليه في منتصف مايو و يونيو وفى الإسكندرية في منتصف ابريل .**
2. **أعطى الطراز البيئى بلدى اسماعيلية أعلى محصول ورقى وبذرى في الإسكندرية عند زراعته فى منتصف يونيو.**
3. **تم الحصول على أعلى محصول ورقى من الطراز البيئى بلدى بني سويف عند زراعته في الدقهليه في منتصف مايو, بينما تم الحصول على أفضل محصول بذرى في الإسكندرية في منتصف مايو و منتصف يونيو .**
4. **أعطى الطراز البيئى بلدى سوهاج أعلى محصول ورقى فى القليوبية عند زراعته في منتصف مايو ويونيو وبالدقهليه في منتصف مايو، إلا أنه تم الحصول على الحد الأقصى من المحصول البذرى في الإسكندرية بزراعته فى منتصف أبريل و مايو وبالدقهليه في أي ميعاد زراعة.**
5. **تم الحصول على أقصى محصول ورقى من الطرازين بلدى شرقية والسيوى في الإسكندرية عند الزراعة فى منتصف يونيو . أما أفضل محصول بذرى لكليهما فكان في الإسكندرية والقليوبية في أي ميعاد زراعة.**
6. **وأخيرا ، تم الحصول على أعلى محصول ورقى وأعلى محصول بذرى من الطراز البيئى بلدى المنيا بزراعته بالدقهليه في منتصف مايو ومنتصف أبريل ، على التوالي.**