Vegetative Yield and its Components in Jew's mallow (*Corchorus olitorius*, L.) as Affected by Sowing Date

Wahba, R.M., S.M. Mansour, and E.A. Hassan
Department of Vegetable Research, Hort. Res. Inst. ARC., Egypt.

ABSTRACT

This study was carried out during the two successive summer seasons of 2001 and 2002 to investigate the effect of three sowing dates, i.e., 1st of April, 1st of May and 1st of June, on yield, vegetative growth and chemical composition of Jew's mallow. Three cuttings were taken from each date. The first cutting gave the lowest yield and vegetative growth, while the third cutting gave the highest yield and highest vegetative growth for the three sowing dates, at both seasons. The third sowing date had higher yield and vegetative growth, which differed significantly when compared with the first and second dates. The first sowing date and the first cutting gave the highest net leaves weight percentage over the other two dates for the two seasons. Mucilage and dry matter had low values at the first cutting and subsequently increased with the second and third cuttings over the three sowing dates. But the third cutting at the third sowing date was characterized by low values of those two contents. Calcium and phosphorus contents gave subsequent higher values with the advances in cuttings, but no significant differences were detected among the three sowing dates. The third cutting gave high significant differences in the three sowing dates for calcium content. Also, the three sowing dates gave significant differences for iron content especially at the third sowing date, except in the second cutting at the second season which did not show any significance. Generally, the third sowing date gave the highest total yield, vegetative growth and chemical constituents, while it gave the lowest net leaves weight percentage. On the contrary, the first sowing date possessed the other extreme of these characters.

INTRODUCTION

Jew's mallow is an important leafy vegetable in the Middle East; Egypt, Sudan and other parts of tropical Africa (Vincent and Yamaguchi, 1997). It is a popular summer vegetable dish with its special delicious taste, which is utilized as fresh or frozen products. Eventhough, the dried leaves could be used as well, although its favourite flavour is lost.

The mucilage of Jew's mallow has acidic polysaccharides with high quantities of ash (El-Mahdy and El-Sebaiy, 1984). Also, it may consider as a good source of calcium, Phosphorus and Iron.

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

The present work was designed to study the plant response to different sowing dates to detect the proper one to produce maximum vegetative yield.

MATERIALS AND METHODS

The investigation was done at the Experimental Farm of El-Sabahia Horticultural Research Station, Ministry of Agriculture during two summer seasons of 2001 and 2002, to determine the effect of sowing dates on vegetative yield components in Jew's mallow.

The seeds were got from a seed trader in Alexandria (Local variety) and sowing was done at three dates on 30 days intervals from the start of April till the beginning of June.

In both seasons, the experiments were laied in a randomized complete block design with three replications, and the experimental unites consisted of 12 lines, each of 3.5 m. in length and 0.25 m. apart, i.e., the unite area was 10.5 m^2. The seeds were drilled within each line.

Three cuttings were taken from each date. The first cutting was done at 45 days after sowing, while the second and the third were taken at 30 days intervals.

In both seasons, the average air temperature degrees and relative humidity from April 1st up to September 30th have been recorded and illustrated in Table (1). All agricultural practices were done as recommended for such crop.

Table 1. The average air temperature degrees (°C) and relative humidity (%) from April 1st to September 30th in 2001 and 2002 seasons. *

Month	Season 2001		Season 2002	
	Air temp. degrees, °C	Relative humidity, %	Air temp. degrees, °C	Relative humidity, %
April	19.4	64.0	19.0	64.5
May	21.9	64.7	21.8	67.0
June	25.7	68.6	24.8	70.0
July	26.9	70.7	28.0	69.3
August	27.7	68.5	28.1	66.7
September	26.8	65.0	26.7	65.7

* Meteorological Authority 2001 and 2002.

The studied characters were as follows:-

I Vegetative growth characters

In each cutting, vegetative measurements were recorded as a mean of the 20 plants from each replicate. These characters were, plant height (cm.) and number of leaves per plant.

II Yield and Its components

1- Yield: fresh yield was recorded in Kg/plot as the total weight of plants for each cutting in each sowing date, and the total yield in Kg/plot was calculated for the three cuttings taken from each sowing date.

2- Net leaves weight percentage: leaves weight of 20 plants / total weight of these plants X 100.

III Chemical constituents

Leaves samples were taken to determine the leaves contents such as dry matter (%), calcium (g/100 d.m), phosphorus (g/100 d.m) and iron (mg/100g d.m) using the methods described in the AOAC (1985). Mucilage (%) was measured as followed by Woolf et al. (1977).

All obtained data were statistically analyzed according to Dospekhov (1984).

RESULTS AND DISCUSSION

I Vegetative growth characters

Plant height possessed significant differences all over the three dates of sowing for all the three cuttings at 2001 and 2002 seasons, respectively (Tables 2, 3). The first sowing date, i.e., 1st April exhibited the shortest plants for all the cuttings, while the third sowing date had the highest plant height. In this regard, the third sowing date tended to exhibit the highly significant increase in plant height in most cases.

The three sowing dates differed significantly among each other for number of leaves/plant. It is true for the three cuttings in 2001, but in the third cutting only in 2002 season, (Tables 2, 3). However, the third sowing date gave the highest number of leaves/plant at both the two seasons of the study.

In general, it is obvious, that the third sowing date predominate the other two sowing dates in most of the studied characters, i.e., yield, plant height and number of leaves/plant. It may be due to the favorite environmental conditions such as temperature and relative humidity that met the well growth of Jew's mallow.

II Yield and Its components

1- Yield: The first cutting gave the lowest yield of Jew's mallow as measured by Kg/plot, while the third cutting gave the highest yield, this is true for the three sowing dates at both of 2001 and 2002 seasons of the study, (Tables 2, 3). In this regard, it is known that shoot removal of Jew's mallow stimulates branching and new shoot growth, which leads to yield increase (Vincent and Yamaguchi, 1997).

Generally, the third sowing date gave the highest yield, while the first date gave the lowest yield over the three cuttings (Tables 2, 3). This increase in yield at the third date did not reach the significance level when compared with the first and the second date at the first cutting either in 2001 or 2002, and in the second cutting in 2002. On the other hand, yield tended to increase significantly in the third date at the second and third cutting in 2001 and in the third cutting in 2002 season.

It worth mentioning, that Jew's mallow grows well at high temperature (25 – 35 °C) as reported by Vincent and Yamaguchi (1997), so, the third sowing date was the most suitable date, which the temperature was 25.7 and 24.8 °C at 2001 and 2002, respectively (Table 1). The temperature tended to increase after that, which accelerate plant growth of Jew's mallow and hence, increase yield.

Total yield increased significantly in the third sowing date when compared with the first and second dates, it was 58.17 and 69.68 Kg/plot at 2001 and 2002 seasons, respectively. This high value of total yield at the third sowing date is a result of the increased values of the three cuttings, when compared with the other values of the other dates.

2- Net leaves weight percentage: No significant differences were detected for net leaves weight percentage except that of the first sowing date at the second cutting in 2001 and the first cutting in 2002 (Tables 2, 3). It worth to mention that the first sowing date gave the highest net leaves weight percentage over the other two dates for the two seasons of the study.

The highest values of net leaves weight percentage at the first sowing date may be traced back to the increased proportions of plant leaves relative to the other vegetative plant parts, i.e., stems weight.

III Chemical constituents

Mucilage tended to give low values at the first sowing date especially at the first cutting and subsequently increased with the second and third cutting, this is true for the second sowing date. But, in the third sowing date, the mucilage percentage tended to decrease at the third cutting, (Table 4, 5). It can be explained from the point of view of temperature effect on mucilage, as it known that increasing temperature degrees accelerates photosynthesis and then increased mucilage as it of composed of polysaccharides (Robert, 1968). The third cutting in the third sowing date was done at the middle of September where the temperature tended to decrease. It was 25.9 and 26.8 °C in 2001 and 2002 seasons, respectively (Table 1). In this respect, the mucilage decreased significantly at the third cutting in the third sowing date at 2001 and 2002 seasons, respectively.

Dry matter content tended to give low values at the first sowing date and increased with increasing sowing dates, i.e., the first of May and the first of June, at both of 2001 and 2002 seasons, respectively (Tables 4, 5). However, dry matter content had significant low value at the third cutting in the third sowing date in 2001 season. In 2002 dry matter content gave also low value at the same date, but without any significant differences. It may notice also the relation of the dry matter content with temperature degrees at the different sowing and cutting dates. Dry matter tended to give high values at the dates that related with high temperature, and decreased with the low temperature's dates. In These cases, the high temperature may play an important roll in

enhancing plant growth and hence increase dry matter and mucilage contents, (Tables 4, 5).

No significant differences were detected for calcium content, except of the third cutting which gave high significant differences among the three sowing dates at both of the two seasons of the study.

Phosphorus content did not possess any significant differences in the different sowing dates, although, it was increased with the advances in cuttings.

Iron content gave subsequent higher values with advances in cuttings and sowing dates. This increase of iron content values were significant especially at the third sowing date, i.e., the first of June at the two seasons of the study, (Tables 4, 5).

Generally, the increase of mineral contents in both of the third sowing date and cutting may be traced back to the positive effect of high temperature degrees, which enhanced plant processes and convert plant nutrients into available forms, (Zayane, 1991).

REFERENCES

Association of Official Analytical Chemists. (1984). Official Methods of Analysis, AOAC Washington D.C., U.S.A.

Dospekhov, B.A. (1984). Field Experimentation, statistical procedures. Mirpublishers, Moscow pp. 349.

El-Mahdy, A.R., and L.A. El-Sebaiy. (1984). Preliminary studies on the mucilage extracted from Okra fruits, Taro tubers, Jew's mallow leaves and Fenugreek seeds. Food Chemistry. 14 (4):237-249.

Meteorological Authority. Cairo 2001 and 2002. Ministry of Transport No. 10-24.

Robert, M.D. (1968). Plant physiology. Reinhold Book Corporation Asubsidiary of Chapman, London, New York.

Vincent, E.R. and M. Yamaguchi. (1997). World vegetables: principles, production, and nutritive values. 2nd ed., Department of vegetables Crops. Uni. Of California, Davis pp. 843.

Woolf, M.L., M.F. Chaplin, and G. Oichere. (1977). Studies on the mucilage extracted from Okra fruits (*Hibiscus esculentus*, L.) and Baobab leave (*Adansonia digitata* L.) J. Sci. Agric., 28:519-529.

Zayan, M.A. (1991). Effect of some mulch materials on growth, leaf mineral contents, fruit sets, preharvest drop yield, and, fruit quality and creasing in "Washington Naval". Alex. J. Agric. Res. 36 (2): 183-198.

Table 2. Yield, net leaves weight percentage, plant height and number of leave of Jew's mallow plants as affected by sowing date in summer season of 2001.

Sowing date	Yield Kg/plot				Net leaves weight percentage			Plant height (cm.)			No. of leaves/plant		
	Cutting No.			Total yield	Cutting No.			Cutting No.			Cutting No.		
	1st	2nd	3rd		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1st April	10.50	16.86	18.03	45.39	34.57	23.73	22.37	25.5	35.1	43.6	6.5	11.8	20.1
1st May	12.23	17.54	20.18	49.95	27.92	20.46	20.53	38.4	47.2	54.1	7.3	13.8	22.8
1st June	15.00	20.45	22.89	58.17	22.87	20.60	17.24	44.2	55.7	59.0	11.2	22.3	29.7
L.S.D 0.05	N.S	1.91	2.80	5.52	N.S	1.88	N.S	7.48	9.66	6.80	3.06	6.52	5.11

Table 3. Yield, net leaves weight percentage, plant height and number of leaves of Jew's mallow plants as affected by sowing date in summer season of 2002.

Sowing date	Yield Kg/plot				Net leaves weight percentage			Plant height (cm.)			No. of leaves/plant		
	Cutting No.			Total yield	Cutting No.			Cutting No.			Cutting No.		
	1st	2nd	3rd		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1st April	15.56	19.94	20.68	56.18	49.48	32.75	30.87	33.8	41.5	45.5	11.4	14.6	24.2
1st May	15.84	20.25	22.88	58.96	35.30	30.30	29.56	41.6	55.1	57.6	12.9	20.9	25.6
1st June	17.18	23.38	29.12	69.68	31.76	32.16	27.56	47.9	58.4	64.4	13.4	24.0	32.1
L.S.D 0.05	N.S	N.S	5.09	6.00	5.00	N.S	N.S	1.58	5.30	4.01	N.S	N.S	1.57

Table 4. Mucilage, dry matter, Calcium, Phosphorus and Iron contents of Jew's mallow leaves as affected by sowing date in summer season of 2001.

Sowing date	Mucilage %			Dry matter %			Calcium g/100g (d.m)			Phosphorus g/100g (d.m)			Iron mg/100g (d.m)		
	Cutting No.			Cutting No.			Cutting No.			Cutting No.			Cutting No.		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1st April	6.2	10.1	12.5	19.0	22.7	22.0	1.917	2.213	2.567	0.407	0.440	0.493	31.767	33.167	37.367
1st May	10.4	12.4	12.2	21.3	21.0	25.1	1.807	1.920	2.147	0.357	0.430	0.540	27.767	30.500	34.667
1st June	11.9	13.3	7.5	22.5	22.5	16.3	1.787	2.000	2.267	0.430	0.507	0.570	46.600	50.667	54.633
L.S.D 0.05	1.72	N.S	3.29	1.03	N.S	3.0	N.S	N.S	0.109	N.S	N.S	N.S	8.205	10.132	8.744

d.m: dry matter.

Table 5. Mucilage, dry matter, Calcium, Phosphorus and Iron contents of Jew's mallow leaves as affected by sowing date in summer season of 2002.

Sowing date	Mucilage %			Dry matter %			Calcium g/100g (d.m)			Phosphorus g/100g (d.m)			Iron mg/100g (d.m)		
	Cutting No.			Cutting No.			Cutting No.			Cutting No.			Cutting No.		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1st April	7.7	10.6	12.8	12.12	19.7	18.0	1.870	2.213	2.520	0.393	0.427	0.503	36.333	39.833	41.500
1st May	10.9	12.4	13.3	0.5	20.4	21.2	1.900	2.000	2.147	0.357	0.420	0.500	26.500	30.167	35.467
1st June	11.3	13.1	8.8	23.9	22.0	15.0	1.820	1.933	2.267	0.397	0.480	0.547	44.800	48.333	52.833
L.S.D 0.05	N.S	N.S	2.76	1.71	N.S	N.S	N.S	N.S	0.102	N.S	N.S	N.S	10.403	N.S	10.205

d.m: dry matter.

الملخص العربي

تأثير ميعاد الزراعة على المحصول الخضري ومكوناته في الملوخية

روحية محمد وهبة – سامي محمد منصور – عماد عبد القادر حسن

قسم بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزراعية – مصر

تمت هذه الدراسة خلال موسمى ٢٠٠١ / ٢٠٠٢ بمزرعة محطة بحوث البساتين بالصبحية – الأسكندرية لمعرفة تأثير ثلاث مواعيد من الزراعة وهى أول أبريل وأول مايو وأول يونيوعلى كمية المحصول والنمو الخضرى ومحتوى الأوراق من بعض المكونات الكيماوية فى الملوخيه ، وقد تم أخذ ثلاث حشات فى كل ميعاد .

وقد أوضحت النتائج أن الحشة الأولى أعطت أقل محصول وأقل نمو خضرى وأقل محتوى من المكونات الكيماوية مع حدوث زيادة فى هذه الصفات مع تقدم الحشات . كما أظهرت النتائج وجود أختلافات معنوية بين مواعيد الزراعة الثلاثة فى كمية المحصول والنمو الخضرى ومحتوى الأوراق من الحديد ولم تظهر أى أختلافات معنوية فى محتواها من الكالسيوم والفوسفور . وبناء على هذه النتائج يكون الميعاد الثالث (أول يونيو) قد أعطى أعلى كمية من المحصول الكلى والنمو الخضرى والمكونات الكيماوية بينما أعطى أقل نسبة تصافى كما أعطى الميعاد الأول (أول أبريل) أقل كمية من المحصول الكلى والنمو الخضرى وأقل محتوى من المكونات الكيماوية وأعلى نسبة تصافى .