

## BITTER MELON (karavela) CONTENTS OF PIGMENTS, VITAMIN C, yield AND MINERALS UNDER EL-MANSOURA CONDITIONS.

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### ABSTRACT

This investigation was aiming of the determination of the east Asian bitter melon plant (*Momordica charantia*) chemical composition including pigments, vitamin C and mineral N, P, K in plant and soil after harvesting, was carried out in open field conditions for two consecutive seasons using two compound fertilizer (20% N, 20% P, 20% K and 19% N, 29% P, 11% K) applied at ambient and control treatment.

The study was completed at the Agriculture College Farm of Mansoura University. The values of plant height, dry / fresh weight percentage, number of leaves / plant, number of flower and fruits / plant, shape index of fruits length and width of fruit, total fruit yield, N, P and K% of bitter melon plant and soil and trace elements(Fe, Cu, Zn and Mn ,and ascorbic acid were evaluated under the different fertilization treatments.

The data showed that using the application of (19% N, 29% P, 11% K) fertilizers significantly increased the vegetative growth and yield of bitter melon plants. The best values for dry / fresh weight percentage, number of leaves / plant, shape index were obtained with using (20% N, 20% P, 20% K) fertilizer, while using (19% N, 29% P, 11% K) fertilizer caused increasing of length and width of fruits, average fruit weight, No. of flower and chorophyll a, b , total chlorophyll and ascorbic acid ,total yield and NPK in plants and soil and trace elements(Fe-Cu-Zn-Mn). Thus, it is implied that types of NPK fertilizers impose different effects on the vegetative growth, yield quantity and quality of bitter melon grown in Mansoura area are possibly obtained when fertilized with either of these NPK fertilizers at the rate of 1 gm / plant daily, yet the 19:29:11 NPK fertilizer is most suggested.

### INTRODUCTION

The east Asian bitter melon plant (*Momordica charantia*), which is similar to the cucurbita crops is one of the newly introduced vegetables crops in Egypt. It has been successfully grown in Mansoura area. This plant was cultivated using two compound fertilizers of (20% N, 20% P, 20% K) and 19% N, 29% P, 11% K). Bitter melon plants (Karavella) are similar to the cucurbita crops especially, weather requirements. Few investigator studied the response of different fertilizer types on melon. AbdEl-Rahman(2000)found that using 90 kg of Phosphorus fertilizer/feddan gaved the highest value of vegetative growth and cantaloupe yield, Shukla and Gupta(1980), founed that incresing the applied P-fertilizer rate to squash plants markedly increased plant height and number of leaves/plant, Mitra(1999)mentioned that the chemical analysis of charantina plant revealed it to contain, phosphorus, potasium and protein .Also he mentioned that the fruits and leaves havelong been used in india as afolk remedy for diabetes mellitus .Almadini et al (2000)

reported that the growth, yield and NPK contents were increased of onion plant after using 18:18:6 N P K fertilizer

Al-Hamdi et al(1994), suggested that the Fe, Mn and Zn% in leaves of broad bean after increasing P and K rate. Hamail (1992) analyzed pea fruits according to the method (AOAC1970). He found pea fruits contents of vitamin C was about 919.85- to 20.95 mg/100g F.W, while he found that the pea leaf contents of Chl a, b, total chl, and chlorophyll a/b were 0.83, 0.70, 1.53 mg/gf.w and 1.17 ratio, respectively.

## **MATERIALS AND METHODS**

Two experiments were carried out during the two seasons of 2003 and 2004 at Agriculture College Farm at Mansoura University. The main properties of the soil in the farm were determined (clay loam texture with pH 7.92 and E. c of 4.15 mmhos/cm). In the current study, two different types of compound fertilizers were tested. The fertilizers were F<sub>1</sub> (20% N, 20% P, 20% K) and F<sub>2</sub> (19% N, 29% P, 11% K). Each one of these fertilizers was applied at 1 gm/plant daily. The control (i.e. zero fertilizer application) was also included in the study. Thus, every experiment consisted of three fertilization treatments.

The design of the experiment was randomized complete plot. The total area of every plot was 24 m<sup>2</sup>, which was divided into 4 rows. Each row was 6 m long and 1 m wide. The plants were grown in a spacing of 1 m apart.

Twenty days old bitter melon seedlings were transplanted 1<sup>st</sup> and 10<sup>th</sup> of April 2003 and 2004, respectively. The fertilizers have been applied every day. During the growing period and after harvesting, some measurements of the plant and soil were done to determine the mineral contents in the leaves and fruits, vitamin C, pigments, trace elements, as affected by the fertilizer. They were completed on representative samples of 10 plants, selected randomly from each plot. Preharvesting to evaluate the chemical composition of plant leaves. The upper five leaves were chosen for this estimation. Chlorophyll a, and b was extracted with acetone 80% and measured colorimetrically according to the method of Arnon (1949). Ascorbic acid was determined in representative sample three fruits /plant (AOAC1970). Plant sample were dried at 70°C, ground by stainless steel grinder and wet digested according to the method described by Champan and Pratt (1961). The Kjeldahi method was used to determine the total nitrogen percent. Phosphorus content in leaves and fruits was determined colorimetrically as introduced by Jackson (1967). Potassium content (%) in leaves and fruits was determined by using the flame photometer according to the method of Knudsen and Pratt (1982). Trace element contents. Fe, Zn, Mg and Mn were estimated in the digest solution by Atomic Absorption spectrophotometer. Protein contents, also determined by according to the improved Kjeldahi method (AOAC1970).

At the end of both experiments, plant height, dry / fresh weight percentage, number of leaves / plant, shape index, length and width of fruits, and total yield / feddan were measured in ten plants randomly chosen from

each plot. The content of nitrogen, phosphorus and potassium were also determined in the soil (Page *et al.*, 1982).

All data obtained were subjected to the proper statistical analysis (Gomez and Gomez, 1984). The least significant differences at the 5% level (LSD 5%) were also calculated.

## RESULTS AND DISCUSSION

### Plant growth and vegetative measurements:

These measurements are presented in Table(1) including the plant height, No. of leaves / plant and percentage of dry / fresh weight, No. of flower. The table shows that using of both NPK fertilizers caused a significant increase in the growth and vegetative parameters in comparison with control.

**Table (1): Effect of different types of mineral fertilizer on growth characters of bitter melon plant.(average of tow seasons)**

Plant characters	Plant height (m)	No. of leaves	% Dry / fresh weight / plant	No. of flowers/plnt
F <sub>1</sub> 20% N + 20% P + 20% K	5.65	65	7.1	50
F <sub>2</sub> 19% N + 29% P + 11% K	5.60	62	8.8	58
Control (Zero NPK)	2.80	30	6.8	32
LSD at 5%	1.06	4.33	0.55	3.45

It is also shown in that the NPK 20:20:20 gave better values of plant height and No. of leaves / plant than the NPK 19:29:11, while the high values of dry / fresh weight % and No. of flowers / plant were obtained with using NPK 19:29:11. This is due to better balanced fertilizer on the growth and vegetative parameters than P and K. The latter nutrients are known to play vital roles in plant physiological characters other than affecting the plant vegetative growth as compared to N (Wild and Jones, 1988). The Table (2) showed that using of both NPK fertilizers caused a significantly increased in the chlorophyll and ascorbic acid ,while the NPK 19:29:11 gave the first rank compared with other treatments

**Table(2):Effect of different types of mineral fertilizer o chlorophyll(leaves) and ascorbic acid(fruit), (average of tow seasons)**

Plant characters	chlorophyll a(mg/g fresh weight	chlorophyll b(mg/g f.w	chlorophyll a/b ratio	chlorophylla+b mg/g f.w	ascorbic acid mg/100g f.w
F <sub>1</sub> 20% N + 20% P + 20% K	0.361	0.327	1.100	0.698	28.0
F <sub>2</sub> 19% N + 29% P + 11% K	0.393	0.365	1.076	0.758	37.0
Control (Zero NPK)	0.313	0.310	1.009	0.623	20.0
LSD at 5%	0.007	0.006	0.227	0.011	2.990

Similar results are observed by other investigators Almadini and Hamaiel(2001)found that the best results for vegetative growth of common bean was obtained after using 19%N,29%P 11%Kfertilizer,Hamaiel et al (1994)mentioned that application of ammonium nitrate at 80kg/fed significantly increased number of leaves/ plant of squash .However ,dry/fresh weight %and shape index of fruit were significantly increased with calcium nitrate at120 kg/fed treatment .AL-Khateeb and Hamail (1999)on strawberry plants

This suggests that the best growth and vegetative value ,yield, pigments and ascorbic acid of fruits of bitter melon plants under Mansoura conditions are possibly achieved using a compound fertilizer(19:29:11 NPK ).

#### Yield and yield quality:

The summary of the yield and yield quality parameters is given in Table(3) which includes the fruit length (cm), fruit width (cm), shape index, fruit weight (g), and total yield (ton/feddan). It was evident that all fertilization treatments resulted in significant differences in the measured parameters of yield and yield quality compared to the control. The data also that the increases in the bitter melon yield and quality parameters were greater using the 19:29:11 NPK fertilizer. This suggests that the former 19:29:11 NPK fertilizer is better balanced fertilizer for the bitter melon under the conditions of the experiment.

**Table (3). Effect of different types of mineral fertilizer on the yield and quality of bitter melon plant(average of tow seasons).**

Plant characters	Fruit length (cm)	Fruit width (cm)	Shape index	Fruit weight (g)	No. of fruits / plant	Total yield (ton/ fed.)
<b>Fertilizer treatments</b>						
F <sub>1</sub> 20% N + 20% P + 20% K	30	3.5	8.57	100	30	12.0
F <sub>2</sub> 19% N + 29% P + 11% K	35	4.0	8.75	110	35	15.4
Control (Zero NPK)	22	2.8	7.85	80	23	6.4
LSD at 5%	3.85	0.55	0.05	8.9	7.0	3.77

Balanced nutrients to growing crops are a major factor for appropriate growth and hence best yield (Mengel and Kirkby, 1982 and Dweikat and Kostewics(1988)on squash, they found that total yield increased as the nitrogen rate increased from 67 to202kg/ha.Allan(1984)on cucumber ,found that fruits weight and total yield were greatest at 300 ppm N .Buwalda and Freeman (1986) found that increasing N application from 30 to 120 kg/ha increased total fruit yield and marketable yield of melon Hamaiel et al (1994)found that application of calcium nitrate at 120 kg/fec' increased significantly ,fruit diameter, average fruit weight ,number of fruit/plant ,total yield /fed of squash .

The results of this study agree with those obtained by other investigators such as Almadini and Hamaiel (2001)mentioned that the highest yield of bean was obtained after using 19%N 29% P11%K fertilizer

**Mineral composition of bitter melon plant and soil:**

The results of the N, P and K contents (%) in the bitter melon leaves, fruits and soil after harvest are shown in Table(4). Data show that N, P and K contents in the plants and the soil increased after the application of both NPK fertilizers. The highest values of N, P and K in the leaves, fruits and soil were obtained after application of 19:29:11 NPK fertilizer, which reflects the greater recovery of nutrients by bitter melon plants under this treatment than others.

**Table (4). Effect of different types of mineral fertilizer on NPK contents in the leaves of bitter melon and soil after harvest(average of tow seasons)**

Plant characters	Leaves contents (%)			Fruit contents (%)			Soil contents (%)		
	N	P	K	N	P	K	N	P	K
F <sub>1</sub> 20% N + 20% P + 20% K	4.40	2.1	1.9	2.4	2.0	2.2	3.00	1.00	2.40
F <sub>2</sub> 19% N + 29% P + 11% K	4.85	2.8	2.1	2.8	2.1	2.3	3.40	1.40	2.80
Control (Zero NPK)	3.05	1.4	1.4	2.5	1.4	1.8	2.55	0.90	2.0
LSD at 5%	0.1	0.04	0.02	0.02	0.01	0.01	0.10	0.01	0.20

This finding corresponds well with the data regarding vegetative growth and yield parameters obtained in this study establishing that the NPK fertilization cause different effects on bitter melon plant. This is on line with the data suggested by different investigators, who also observed that the bitter melon plant contents of the N, P and K increased as a results of increased NPK fertilization

The data shown in Table(4) indicate that using 19:29:11 NPK fertilizer gave the highest concentration of NPK in the soil compared with 20:20:20 NPK fertilizer. Data show that there were significant differences in these values between the fertilized treatments. The differents are more profoud between the fertilized treatments, which might be attributed to the variations in the nutritional components of the fertilizers varying the uptake rates of the nutritions, Mengel and Kirkby,1982, Jones,1998 Hamail et al(1994)mentioned that all fertilization treatments (40,80 and 120kgN/fed ) significantly augmented N, P and K concentration squash leaves .

Date in Table(5)showed that using compound fertilizer(19:29:11NPK) gave the highest concentration of Fe, Cu, Zn and Mn contents of leaves and fruits and vitamin C of bitter melon fruits.The similar results were obtained by AL-Hamadi et al (1994) on broad bean. AL-Khteeband Hamail(1999)on strawberry plants

**Table(5). Effect of different types of mineral fertilizer on trace elements of leaf and fruit(average of tow seasons)**

Plant characters	leaf and fruit contents(%)	leaf and fruit contents(%)	leaf and fruit contents(%)	leafand fruit contents(%)
	Fe	Cu	Zn	Mn
F <sub>1</sub> 20% N + 20% P + 20% K	13.10-18.03-	1.99-2.88-	3.76-3.89-	1.11-1.99-
F <sub>2</sub> 19% N + 29% P + 11% K	15.6-20.8-	2.44-3.19-	4.12-4.87-	2.44-2.89-
Control (Zero NPK)	9.00-10.9	0.88-1.01	2.23-2.77	0.89-1.33
LSD at 5%	0.23-0.33	0.11-0.13	0.10-0.12	0.04-0.14

In conclusion, the above mentioned results and discussion showed that bitter melon plants(karavela), had variable responses to the different types of NPK compound fertilizers. Best response, as observed by the vegetative growth and yield quality parameters of bitter melon, was obtained when fertilized with either of the NPK fertilizers used (20% N, 20% P, 20% K or 19% N, 29% P, 11% K). However, the 19:29:11, which leads us to recommend the former fertilizer for cultivated bitter melon plants under Mansoura conditions.

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## محتوى الشمام المر (كارافيل) من كلاً من الصبغات وفيتامين ج- والعناصر والمحصول تحت ظروف منطقة المنصورة على فتحي حمائل

### قسم الخضار والزينة - كلية الزراعة جامعة المنصورة

اجرى هذا البحث على نبات الشمام المر الذى يزرع لأول مرة فى مصر بمزرعة كلية الزراعة جامعة المنصورة

- يهدف هذا البحث الى تحديد الصفات الخضرية والمحصول وجودة و المكونات الكيميائية فى نبات الشمام المر وموطنه الاصلى وسط اسيا بغرض تحديد كلاً من طول النباتات -الوزن الجاف /الوزن الطازج % -عدد الاوراق /للنبات -عدد الازهار /للنبات -شكل الثمرة - محتوى الثمار والنبات من كلاً من الازوت والفوسفو والبوتاسيوم -الحديد-النحاس-الزنك والمنجنيز-والصبغات النباتية(الكلوروفيلات) وفيتامين ج تحت تاثير نوعين من الاسمدة المركب بالقرارة مع الشاهد (بدون تسميد)

اشارت النتائج الى وجود زيادة معنوية فى الصفات الخضرية والثماري ومحتوى الثمار الكيميائى وفيتامين ج بعد التسميد لكلاً من نوعين السماد بينما اعطى السماد المركب ١٩%٢٩%١١%نتروجين -فوسفور وبوتاسيوم افضل النتائج فى كلاً من طول النبات - عدد الاوراق /للنبات -عدد الازهار /للنبات فيتامين ج وكلاً من الازوت والفوسفور والبوتاسيوم والحديد والنحاس والزنك والمنجنيز-والكلوروفيلات

وعلى ذلك يمكن القول بان هذه النسب السمدية من الازوت والفوسفور والبوتاسيوم اعطت زيادة فى صفات الشمام المر من حيث النمو الخضرى والثمارى والازوت والفوسفور والبوتاسيوم والحديد-النحاس الزنك والمنجنيزوالصبغات النباتية وفيتامين ج ولكن يوصى باستخدام السماد المركب ١٩%-٢٩%١١% نتروجين وفوسفور وبوتاسيوم بمعدل اجم /للنبات يوميا للحصول على افضل النتائج من حيث النمو الخضرى والثمارى والعناصر والصبغات والجودة تحت ظروف منطقة المنصورة