

## **EFFECT OF PHOSPHORUS FERTILIZATION AND FRUIT THINNING ON SEED PRODUCTION OF SUMMER SQUASH PLANTS**

### **1-VEGETATIVE TRAITS AND LEAVES CHLOROPHYLL CONSTITUENT**

Tartoura, E. A. A<sup>1</sup>.; E. I. El - Gamily<sup>1</sup>; Y. B. A. El - Waraky<sup>2</sup> and Mariam.K.Y. kamel<sup>2</sup>

<sup>1</sup>Veg. and Flori. Dept. Fac. Agric., Mansoura. Univ.

<sup>2</sup>Veg. Res. Dept., Hort. Res. Inst., Agric. Res. Center, Giza. <sup>†</sup>

### **ABSTRACT**

This study was carried out during two summer seasons of 2012 and 2013 at Sakha Horticultural Research Station Farm, Kafr El-Sheikh Governorate, on summer squash (*Cucurbita pepo* L.) Eskandarani cultivar to study the impact of phosphorus fertilizer levels 20, 40, 60 and 80 kg P<sub>2</sub>O<sub>5</sub>/fed. and fruit thinning treatments; i.e., without thinning (control) , thinning the first fruit, thinning all fruits except the first and second ones and thinning the first and second fruit and their interaction on vegetative parameters and leaf chlorophyll contents.

Results indicated that, the highest values of vegetative characters; i.e., stem length, plant fresh and dry weight, leaf area/plant and chlorophyll content in leaves in both seasons were recorded when plants fertilized with 80 kg P<sub>2</sub>O<sub>5</sub>/fed. Number of leaves/plant not affected by phosphorus fertilizer levels, in both seasons. Thinning the first and second fruit produced the highest values of stem length, plant fresh and dry weight , number of leaves/plant, leaf area/plant and chlorophyll content in leaves in both seasons. On the other hand, squash plants fertilized with 80 kg P<sub>2</sub>O<sub>5</sub>/fed. with thinning the first and second fruit produced the highest values of stem length, plant fresh and dry weight , number of leaves/plant, leaf area/plant and chlorophyll content in leaves, while, squash plants fertilized by 20 kg P<sub>2</sub>O<sub>5</sub>/fed. with thinning all fruits except the first and second ones produced the lowest value of each character.

According to the mentioned results, the best results of both vegetative growth parameters and chlorophyll contents in leaves were recorded when squash plants fertilized by 80 kg P<sub>2</sub>O<sub>5</sub>/fed. with thinning the first and second fruit ,therefore, this treatment could be recommended for improving squash plants performance under similar condition of this study.

**Keywords:** *Cucurbita pepo* , phosphorus fertilizer, fruit thinning , vegetative growth and chlorophyll contents .

### **INTRODUCTION**

Summer squash (*Cucurbita pepo* L.), is one of the most important crop of the family cucurbitaceae, and of highly polymorphic vegetable grown during summer in tropical and subtropical condition. Phosphorus is a naturally occurring element that can be found in the earth's crust, water, and all living organisms. Phosphorus is one of 16 elements that are essential for plant growth and genetic material of all cells (DNA and RNA) (Starnes *et al.*, 2008). As well as phosphorus is essential for a number of physiological functions that are involved with energy transformations. Phosphorus is a component of many cell constituents and plays a major role in several key

processes, including photosynthesis, respiration, energy storage and transfer, cell division, and cell enlargement. Adequate phosphorus is needed for the promotion of early root formation and growth, also it improves crop quality and is necessary for seed formation (Mulins, 2009). Research has documented that applying fertilizer phosphorus increases crop growth and yields on soils that are naturally low in phosphorus and in soils that have been depleted through crop removal. Crop fertilization represents the greatest use of phosphorus in agriculture today.

Fruit thinning is defined as the removal of certain flowers or small fruits after fruit set therefore, some growers tend to pick some of early fruit for fresh market and leave the others to improve fruit yield, quality and seed production (Metwally, 1980).

Hence, the objective of this work was to study the effect of phosphorus fertilizers and fruit thinning treatments on vegetative growth parameters and chlorophyll contents in leaves of summer squash plants.

## **MATERIALS AND METHODS**

This work was carried out at Sakha Horticultural Research Station, Farm during two summer seasons of 2012 and 2013, on summer squash (*Cucurbita pepo* L.) Eskandarani cultivar to study the impact of phosphorus fertilizer levels and fruit thinning treatments and their interactions, on vegetative parameters and leaf chlorophyll contents.

Soil samples were taken before sowing from a depth of 0-30 cm in both seasons for mechanical and chemical analysis. Mechanical analysis was determined as follow:

- 1- E.C ( $\text{dS m}^{-1}$ ) and soluble cations and anions (meq/L). They were determined in soil-water extract (1:5) according to Page *et al.*, (1982).
- 2- Soil reaction (pH): It was determined in soil. Water suspension (1:2.5) by compound electrode pH meter PT1-9 according to Cottenie *et al.*, (1982).
- 3- Organic matter (%). It was estimated by the rapid method of titration according to Black (1965)
- 4- Available N, P and K (ppm) were determined according to Jackson (1967).

The obtained soil data are presented in Table (1).

The experimental design was split-plot system in a randomized complete block design with three replicates. Four phosphorus fertilizer levels; i.e., 20, 40, 60 and 80 kg  $\text{P}_2\text{O}_5$  /fed. were assigned to the main plots. Phosphorus fertilizer, in the form of calcium super phosphate (15.5 %  $\text{P}_2\text{O}_5$ ) was applied to the soil as one dose before sowing. The four fruit thinning treatments; i.e., control (without thinning), thinning the first fruit (Th.1), thinning all fruits except the first and second ones (Th.2) and thinning the first and second fruit (Th.3) were assigned as the sub plots. Fruit thinning treatments were carried out in each sub-plot and started from 5<sup>th</sup> May to 11<sup>th</sup> May in both seasons.

This experiment included 16 different treatment combinations, each plot was comprised of four ridges 3.75 m length, 1 m width, the sub plot area was 15 m<sup>2</sup>. Seeds were sown on 11<sup>th</sup> March in both seasons, normal cultural practices for the commercial summer squash production were followed according to the instructions advised by the Ministry of Agricultural.

**Table(1):Mechanical and chemical soil characteristics at the experimental sites during the two growing seasons of 2012 and 2013.**

Soil analysis	2012 season		2013 season	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm
<b>A: Mechanical analysis</b>				
Sand (%)	12.44	5.92	12.44	5.92
Silt (%)	23.95	34.77	23.95	34.77
Clay (%)	60.52	59.48	60.52	59.48
Texture	Clayey	Clayey	Clayey	Clayey
<b>B: Chemical analysis</b>				
Organic matter (%)	1.16	1.03	1.28	1.10
Total N (%)	0.101	0.091	0.105	0.093
Total carbonate (%)	3.95	3.90	4.01	3.98
C.E.C (meq /100 g soil)	32.00	30.00	31.60	29.80
SP (%)	78.00	79.00	77.50	78.30
SAR	3.19	3.51	3.86	3.85
Available (mg/kg soil)	N	28.00	20.00	25.50
	P	8.00	6.00	8.80
	K	288.6	218.4	395.0
Soluble cations (meq/L)	Ca <sup>++</sup>	7.70	6.25	4.29
	Mg <sup>++</sup>	6.13	6.05	3.40
	Na <sup>+</sup>	8.40	8.70	5.60
	K <sup>+</sup>	0.21	0.20	0.32
Soluble anions (meq/L)	CO <sub>3</sub> <sup>--</sup>	-	-	-
	HCO <sub>3</sub> <sup>-</sup>	4.50	3.00	5.94
	Cl <sup>-</sup>	9.12	8.16	3.15
	SO <sub>4</sub> <sup>--</sup>	8.82	10.04	3.52
pH	7.95	8.01	7.82	7.90
E.C (dS/m)	2.24	2.12	1.26	0.93

\* Soil and Water Analysis Institute, Sakha Lab., Agricultural Research Center (ARC).

#### Data recorded:

##### Growth parameters:

A random sample of five plants were taken from each plot at 70 days after sowing in both seasons of the study for measuring the vegetative parameters of summer squash plants, i.e., stem length (cm), plant fresh and dry weight (g), number of leaves/plant, Leaf area/plant (cm<sup>2</sup>) was calculated according to Koller (1972). The leaf pigments (total chlorophyll content) of the fifth leaf from the growing tip of plant were estimated by spectrophotometer as described by Moran and Porath (1982). The concentration of total chlorophyll was calculated by substituting the reading in the following equations:

$$T.Chl. = (7.04 A_{664}) + (20.27 A_{647}).$$

The results of chlorophylls content were expressed in mg/cm<sup>2</sup>.

**Weather data:**

Monthly average maximum (day) and minimum (night) air temperature as well as relative humidity in North Delta area of the two seasons were recorded according to the data of weather station as shown in Table (2) .

**Table 2: \*Maximum and minimum monthly temperature (°C) and relative humidity (%) at the experimental site during the two growing seasons.**

Month	Temperature (°C)				Relative humidity (%)			
	2012		2013		2012		2013	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
March	25.9	15.9	26.6	16.9	85.5	39.7	85.0	41.0
April	30.9	19.4	29.6	18.8	85.6	35.5	85.0	39.0
May	31.2	20.4	31.6	22.4	84.5	42.5	83.4	43.7
June	32.0	22.2	33.4	23.5	82.5	46.5	79.6	50.7
July	33.0	21.4	33.2	25.3	79.5	49.2	84.5	53.2
August	32.5	20.2	34.6	25.0	84.0	50.0	84.9	52.1

\* Source of this data is Ministry of Agriculture and Land Reclamation, Agriculture Research Center (ARC), Central Management of Agriculture Guideline, Bulletin of Agricultural Meteorological Data.

**Statistical analysis:**

Data were tested by analysis of variance according to Gomez and Gomez (1984). Duncan's multiple range test was used for comparison among treatment means (Duncan, 1955).

**RESULTS AND DISCUSSION**

**A-Effect of phosphorus levels on stem length, plant fresh and dry weight**

Data in Table (3) showed that, stem length , plant fresh and dry weight were highly significant affected by phosphorus fertilization in both growing seasons. The highest phosphorus fertilization level gave the tallest plants and the highest plant fresh and dry weight, whereas 20 kg phosphorus rate produced the lowest value of each character. The positive effect of the added P could be related to the important role of phosphorus and its vital contribution to several biochemical processes and turn achieved more seeds yield (Marscher, 1986). These results may be due to lack of phosphorus can inhibit the nitrogen uptake (Wieneke, 1995). In the same tendency, (Masui, 1961) found that increasing the phosphorus level promoted vigorous growth of musk melon plants. Also, Olaniyi and Ajibola (2008) indicated that plant height of corchorus plants was increased with the increment of phosphorus level (30 kg P<sub>2</sub>O<sub>5</sub>/ha). These results are in agreement with that determined by Mady (2009) who clear that phosphorus compound increased plant dry weight of winter squash.

### B-Effect of fruit thinning treatments on plant height, plant fresh and dry weight

Data presented in Table (3) show that thinning of the first and second fruit (Th. 3) produced the highest values of stem length, plant fresh and dry weight. While, thinning all fruits except the first and second ones (Th. 2) produced the lowest values of each character, and the differences were highly significant in both seasons. These findings are in general agreement with those reported by Metwally (1980) on squash, who showed that plant dry weight was increased resulted in flower removal compared to control. Also, Tabasi *et al.*, (2011) on tomato, who found that stem length parameter was visible in the second generation as affected by fruit thinning treatment.

### C-Effect of phosphorus levels and fruit thinning treatments interaction on stem length, plant fresh and dry weight

The effect of the interaction between phosphorus levels and fruit thinning treatments on stem length, plant fresh and dry weight appeared highly significant in both seasons (Table 4). Plants fertilized with 80 kg P<sub>2</sub>O<sub>5</sub>/fed. And thinning the first and second fruit (Th. 3) had the highest values of stem length, plant fresh and dry weight. While, the lowest values were obtained from plants fertilized with 20 kg P<sub>2</sub>O<sub>5</sub> and thinning all fruits except the first and second ones (Th. 2) in both seasons. On the other hand, the effect of interaction between phosphorus rates and fruit thinning treatments on plant fresh weight was not significant in second season.

**Table(3) : Effect of phosphorus fertilizer levels and fruit thinning treatments on stem length, plant fresh and dry weight of summer squash plants during 2012 and 2013 seasons .**

Treatments	Stem length(cm)		Plant fresh weight (g)		Plant dry weight (g)	
	2012	2013	2012	2013	2012	2013
<b>A-Phosphorus levels (P<sub>2</sub>O<sub>5</sub> kg/fed.)</b>						
20	53.0 c	55.9 b	164.0 d	182.6 c	32.2 c	39.4 c
40	56.8 bc	61.0 a	208.2 c	214.1 b	36.1 b	50.0 ab
60	59.1 ab	61.3 a	247.3 b	235.8 a	38.0 ab	48.1 b
80	61.9 a	63.0 a	289.9 a	244.8 a	39.7 a	51.9 a
F. test	**	**	**	**	**	**
<b>B-Fruit thinning</b>						
Control	57.2 c	60.4 c	234.7 a	212.4 c	34.8 c	45.1 c
Th. 1	59.4 b	61.6 b	236.4 a	233.7 b	38.1 b	49.1 b
Th. 2	54.4 d	56.9 d	194.7 b	173.3 d	29.8 d	40.2 d
Th. 3	60.1 a	62.4 a	243.7 a	257.8 a	43.4 a	55.1 a
F. test	**	**	**	**	**	**

Values having the same alphabetical letter within each column are not significantly different at the 5% level, according to Duncan's test

Control (Without thinning), Th.1=Thinning the first fruit, Th.2= Thinning all fruits except the first and second ones and Th.3= Thinning the first and second fruit

**Table(4) :Effect of phosphorus fertilizer levels and fruit thinning treatments interaction on stem length, plant fresh and dry weight of summer squash plants during 2012 and 2013 seasons .**

Treatments		Stem length (cm)		Plant fresh weight (g)		Plant dry weight (g)	
Phosphorus Levels (P <sub>2</sub> O <sub>5</sub> kg /fed)	Fruit thinning	2012	2013	2012	2013	2012	2013
		20	Control	52.6 j	55.6 h	163.3	188.5 n
Th. 1	54.5 h		57.2 g	175.2	192.9 l	34.9 g	42.9 i
Th. 2	49.6 k		52.6 i	131.3	126.2 p	25.3 l	30.2 k
Th. 3	55.3 g		58.3 f	186.4	222.9 i	36.1 f	44.8 g
40	Control	54.3 h	61.2 d	209.1	225.7 h	34.9 g	47.9 ef
	Th. 1	59.2 d	62.3 c	216.2	230.2 g	36.9 e	49.7 d
	Th. 2	53.3 i	57.1 g	183.3	162.1 o	30.3 j	43.6 h
	Th. 3	60.3 c	63.2 b	224.2	238.2 e	42.4 b	58.8 b
60	Control	59.4 d	61.4 d	243.8	231.2 f	38.3 d	47.9 ef
	Th. 1	60.3 c	62.2 c	263.3	244.9 d	38.4 d	48.1 ef
	Th. 2	56.2 f	58.3 f	215.1	215.2 j	35.7 f	47.5 f
	Th. 3	60.6 c	63.6 b	266.9	251.7 c	39.6 c	48.4 e
80	Control	62.3 b	63.3 b	222.7	204.2 k	33.7 h	44.6 g
	Th. 1	63.5 a	64.5 a	290.7	266.9 b	42.2 b	55.2 c
	Th. 2	58.3 e	59.6 e	248.9	189.6 m	27.7 k	39.4 j
	Th. 3	63.6 a	64.6 a	297.4	318.3 a	55.3 a	68.5 a
F. test.		**	**	N.S	**	**	**

Values having the same alphabetical letter within each column are not significantly different at the 5% level, according to Duncan's test.

Control (Without thinning), Th.1=Thinning the first fruit, Th.2= Thinning all fruits except the first and second ones and Th.3= Thinning the first and second fruit

**D-Effect of phosphorus levels on number of leaves, leaf area and total chlorophyll content**

Data in Table (5) showed that, leaf area/plant and total chlorophyll content were highly significant affected by phosphorus fertilization in both growing seasons. The highest phosphorus fertilization rate 80 kg P<sub>2</sub>O<sub>5</sub>/fed. gave the highest leaf area/plant and total chlorophyll content, whereas 20 kg phosphorus rate produced the lowest value of each character. On the other hand ,the effect of phosphorus rates on number of leaves/plant was not significant in both seasons. These results are in harmony with those obtained by Olaniyi and Ajibola(2008) on cochorus plants, they found that number of leaves were increased with increment of phosphorus treatments (0, 10, 20 and 40kg/ha). Similar results were reported by Mady (2009) on winter squash as leaf area and chlorophyll a and b content significantly increased with application of phosphorus treatment compared with control.

**Table(5): Effect of phosphorus fertilizer levels and fruit thinning treatments on number of leaves, leaf area and total chlorophyll content of summer squash plants during 2012 and 2013 seasons .**

Treatments	No. of leaves/plant		Leaf area/ plant (cm <sup>2</sup> )		Total chlorophyll	
	2012	2013	2012	2013	2012	2013
A-Phosphorus levels (P <sub>2</sub> O <sub>5</sub> kg/fed)						
20	18.3	19.2	1237.3 d	1365.5 d	29.2 a	30.1
40	18.7	21.6	1595.5 c	1513.1 c	29.3 a	29.6
60	19.9	22.1	1723.2 b	1854.1 b	30.1 a	30.9
80	21.3	23.2	1955.9 a	2152.4 a	29.7 a	30.9
F. test	N.S	N.S	**	**	*	N.S
B-Fruit thinning						
Control	19.5 c	21.2 c	1497.0 c	1638.4 c	29.4 c	30.1 c
Th. 1	20.0 b	21.8 b	1768.4 b	1821.5 b	30.7 b	31.4 b
Th. 2	18.3 d	20.7 d	1407.8 d	1472.4 d	26.7 d	27.4 d
Th. 3	20.3 a	22.3 a	1838.6 a	1952.7 a	31.4 a	32.7 a
F. test	**	**	**	**	**	**

Values having the same alphabetical letter within each column are not significantly different at the 5% level, according to Duncan's test.

\*\* , \* and N.S indicate significant differences at P<0.01, P<0.05 and not significant, respectively according to F. test.

Control (Without thinning), Th.1=Thinning the first fruit, Th.2= Thinning all fruits except the first and second ones and Th.3= Thinning the first and second fruit

#### **E-Effect of fruit thinning treatments on number of leaves, leaf area and total chlorophyll content**

Data presented in Table (5), showed that thinning the first and second fruit (Th. 3) produced the highest values of number of leaves/plant, leaf area/plant and total chlorophyll content. While, thinning all fruit except the first and second ones (Th. 2) produced the lowest values of each character, and the differences were highly significant in both seasons. These findings are in general agreement with those reported by Stephenson *et al.*, (1988) on squash and El-Keblawy and Lovett-Douset (1996) on cantaloupe, they found that fruit removal increased total number of leaves.

Also, these results are in agreement with that determined by Wien *et al.*, (1973) on beans, who reported that flower removal caused slightly higher of leaf area.

#### **F-Effect of phosphorus levels and fruit thinning treatments interaction on number of leaves, leaf area and total chlorophyll content:**

The effect of the interaction between phosphorus levels and fruit thinning treatments on number of leaves/plant, leaf area/plant and total chlorophyll appeared highly significant in both seasons (Table 6). The treatments thinning the first and second fruit (Th.3) had the highest number of leaves/plant, leaf area/plant and total chlorophyll content when phosphorus rate was 80kg P<sub>2</sub>O<sub>5</sub>/fed. While, the lowest values were obtained from plants fertilized with 20 kg P<sub>2</sub>O<sub>5</sub> and thinning all fruits except the first and second ones (Th.2) in both seasons.

**Table (6): Effect of phosphorus fertilizer levels and fruit thinning treatments interaction on number of leaves, leaf area and total chlorophyll content of summer squash plants during 2012 and 2013 seasons.**

Treatments		No. of leaves/plant		Leaf area/ plant (cm <sup>2</sup> )		Total chlorophyll	
Phosphorus levels (P <sub>2</sub> O <sub>5</sub> kg/fed)	Fruit thinning	2012	2013	2012	2013	2012	2013
		20	Control	18.2 h	19.2 ef	1119.4 m	1264.1 o
Th. 1	18.6 g		19.3 ef	1439.2 k	1396.9 n	30.1 f	31.1 f
Th. 2	17.6 i		18.1 f	948.1 n	1102.6 p	27.1 i	27.5 j
40	Th. 3	18.6 g	20.2 de	1442.3 j	1698.2 h	31.2 c	32.2 c
	Control	18.6 g	20.2 de	1437.5 k	1463.5 k	30.1 f	29.6 h
	Th. 1	19.2 f	22.3 bc	1788.1 g	1566.1 j	30.9 d	31.2 ef
60	Th. 2	17.3 j	21.3 cd	1361.7 l	1404.6 m	24.9 k	25.1 k
	Th. 3	19.6 e	22.4 bc	1794.5 f	1618.1 i	31.2 c	32.5 bc
	Control	19.6 e	22.2 bc	1588.4 h	1784.8 g	29.6 g	30.9 f
80	Th. 1	20.6 c	22.3 bc	1788.5 g	2033.7 e	30.8 e	31.5 de
	Th. 2	18.6 g	21.1 cd	1500.8 i	1444.3 l	28.4 h	28.5 i
	Th. 3	20.6 c	22.6 bc	2014.9 c	2135.7 c	31.5 b	32.7 b
80	Control	21.6 b	23.2 ab	1842.7 d	2041.2 d	29.6 g	30.3 g
	Th. 1	21.6 b	23.3 ab	2057.8 b	2289.3 b	30.9 d	31.6 d
	Th. 2	19.8 d	22.3 bc	1820.5 e	1938.2 f	26.4 j	28.4 i
	Th. 3	22.3 a	24.1 a	2102.5 a	2340.9 a	31.8 a	31.6 a
F. test		**	**	**	**	**	**

Values having the same alphabetical letter within each column are not significantly different at the 5% level, according to Duncan's test.

Control (Without thinning), Th.1=Thinning the first fruit, Th.2= Thinning all fruits except the first and second ones and Th.3= Thinning the first and second fruit.

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## تأثير التسميد الفوسفاتي وخف الثمار على إنتاج تقاوى قرع الكوسة

١ - النمو الخضري ومحتوى الاوراق من الكلوروفيل.  
السيد أحمد أحمد طرطورة<sup>١</sup>، السيد إبراهيم الجميلي<sup>١</sup>، يونس بيومي احمد الورقي<sup>٢</sup> و  
مريم كامل يوسف كامل<sup>٢</sup>

١- قسم الخضر والزينة - كلية الزراعة - جامعة المنصورة

٢- قسم بحوث الخضر - معهد بحوث البساتين - مركز البحوث الزراعية - الجيزة

أجريت هذه الدراسة في مزرعة محطة بحوث البساتين بسخا - محافظة كفر الشيخ خلال الموسمين الصيفيين ٢٠١٢ و ٢٠١٣ م على محصول قرع الكوسة صنف إسكندراني بهدف دراسة تأثير مستويات التسميد الفوسفاتي (٢٠، ٤٠، ٦٠ و ٨٠ كجم فوسفات/فدان) ومعاملات خف الثمار وهي الكنترول (بدون خف)، خف الثمرة الاولى، خف جميع الثمار ماعدا الاولى والثانية وخف الثمرة الاولى والثانية والتفاعل بين مستويات التسميد الفوسفاتي وخف الثمار على النمو الخضري ومحتوى الاوراق من الكلوروفيل لنباتات قرع الكوسة.

ويمكن تلخيص اهم النتائج المتحصل عليها كالآتي:-

أعطت المعاملة ٨٠ كجم فوسفات/فدان أعلى القيم لصفات النمو الخضري والممتلئة في طول الساق والوزن الطازج والجاف للنبات والمساحة الورقية ومحتوى الاوراق من الكلوروفيل في كلا الموسمين، وعلى الجانب الاخر فان عدد الاوراق للنبات لم يتأثر بمستويات التسميد الفوسفاتي في كلا الموسمين. كذلك أعطت معاملة خف الثمرة الاولى والثانية أعلى قيم لطول الساق، الوزن الطازج والجاف للنبات، وعدد الاوراق للنبات والمساحة الورقية ومحتوى الاوراق من الكلوروفيل في كلا الموسمين. كذلك أعطت النباتات التي تم تسميدها ب ٨٠ كجم فوسفات/فدان مع خف الثمرة الاولى والثانية أعلى القيم لقياسات النمو الخضري والتي تتمثل في طول الساق والوزن الطازج والجاف للنبات وعدد الاوراق للنبات والمساحة الورقية للنبات والمحتوى الكلي للكلوروفيل بينما التي تم تسميدها ب ٢٠ كجم فوسفات/فدان و خف جميع الثمار ماعدا الاولى الثانية اعطت اقل القيم. من هذا نستخلص ان افضل النتائج بالنسبة لصفات النمو الخضري ومحتوى الاوراق من الكلوروفيل ناتجة من تسميد نباتات قرع الكوسة بمعدل ٨٠ كجم فوسفات/فدان مع خف الثمرة الاولى والثانية.