Effect of grafting Nubian watermelon on its growth, flowering, yield and fruit quality.

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ABSTRACT

Two field experiments were carried out on Nubian watermelon (*Citrullus lanatus* var. *Colocynthoide*) during the summer season of 2009 and 2010 in the farm of Sakha Research Station in Kafr El-Sheikh Governorate. The main objective of the study was comparison of non-grafted watermelon plants with four rootstocks: bottle gourd (*Lagenaria siceraria*), pumpkin (*Cucurbita moschata*), luffa (*Luffa cylindrical*) and fig leaf gourd (*Cucurbita ficifolia*) to improve Nubian watermelon production by using grafting technique. The study included measurement of vegetative growth parameters, flowering, fruit and seed yield and fruit characteristics.

The results indicated that grafting Nubian watermelon onto bottle gourd and pumpkin rootstocks was the best grafting compared to the control.

Grafting onto bottle gourd rootstock significantly increased number of hermaphrodite flower while, the lowest numbers were obtained from non-grafted plants and those grafted onto luffa.

Grafting onto bottle gourd significantly increased both number of fruit/plant, seeds/ fruit and fruit weight, while non-grafting plants and grafting onto fig leaf gourd led to lowest values of them. Grafting onto bottle gourd followed by pumpkin significantly increased fruit yield per m^2, seed yield per m^2, both weights of fruit yield (ton/fed.) and seed yield (ton/fed) in comparison with non-grafting plants and grafting onto luffa.

Plants grafting onto bottle gourd rootstock had the highest dry weight of 100 seeds, net weight of seed kernel values, the highest fruit length, fruit diameter and fruit shape values.

The main objective of this investigation was chosen suitable rootstock for grafting and studying its effect on growth and yield of Nubian watermelon plant.

Keywords: Nubian watermelon, grafting, bottle gourd, pumpkin, luffa, fig leaf gourd, flowering, fruit yield and seed yield.

INTRODUCTION

Nubian Watermelon is one species of the Cucurbitaceae family. It is an ancestor type of the cultivated watermelon **(Ziyada and Elhussien, 2008)**. Egypt is the fifth country worldwide in the production of cucurbits while China is the first **(FAO, 2008)**. Nubian Watermelon was cultivated from early times in Egypt, possibly from the Ancient Egypt **(Manniche, 1989)**. It is known as gurma watermelon **(El-Shabrawy and Hatem, 2008)**. Green parts of the plant are used as animal feeds, the seeds are used as snacks, and the residues are used as a source of heat energy for cooking **(Mariod *et al.*, 2009)**. Nubian watermelon occupied about 174447 feddans in summer season of 2009, which yielded 101013 tons with an average yield of 0.58 ton/fed. according to statistical data of the Ministry of Agriculture of Egypt. Kafr El-Sheikh is one of the most important producing regions for such crop in Delta, since its percentage of the cultivated area and the productivity of Nubian watermelon reach more than the quarter **(Statistical data of the Ministry of Agriculture, 2009)**.

Within the last years Nubian Watermelon has become an important crop and exported by large quantities of gurma watermelon to the Arab countries **(El-Shabrawy and Hatem, 2008)**. Also **Ibrahim *et al.* (2002)** suggested that Nubian Watermelon can be used as a source of protein supplement to ruminant animals. Moreover, **Ziyada and Elhussien (2008)** cleared that Nubian Watermelon was investigated as a new source of vegetable oil.

Grafting has many benefits to plants grown in the open field or greenhouse; such as **Yamasaki *et al.* (1994)** indicated that watermelon plants grafted onto squash showed more vigorous growth than watermelon plants grafted onto bottle gourd and non-grafted ones. Also **Yamasaki *et al.* (1994)** found that plants grafted onto bottle gourd had lower node number of the first pistillate flower, compared to plants grafted onto squash or non-grafted plants. Moreover, **Karaca *et al.* (2012)** cleared that grafted watermelon onto bottle gourd produced significantly more yield than non-grafted plants. The average fruit weight, fruit diameter, rind thickness and fruit volume were higher in fruits of plants grafted onto *Cucurbita maxima*, var. Awam, than in fruits of those plants grafted onto *Cucurbita moschata* var. Asli, and non-grafted ones **Mounir (1965).**

Materials and Methods

Tow field experiment were carried out in the Experimental Farm of Sakha Research Station in Kafr El-Sheikh

Governorate during the summer season of 2009 and 2010, for studying the effect of grafting Nubian watermelon by using grafting technique onto four rootstocks [bottle gourd (*Lagenaria siceraria*), pumpkin (*Cucurbita moschata*), luffa (*Luffa cylindrical*) and fig leaf gourd (*Cucurbita ficifolia*)] comparison with non-grafted plants (control) to improve Nubian watermelon production by using cut grafting method according to **Lee (1994)** and **Oda (1995).** The steps of this method were conducted timely as follows:

- Day (1) Rootstock seeds were sown into seedling foam trays.
- Day (7) Nubian watermelon seeds were sown into seedling foam trays.
- Day (17-21): Grafting was performed as rootstock and scion seedlings were taken off from the seedling trays. The apical meristem of the rootstock is removed and a hole about 2 mm in diameter is made at the rootstock hypocotyl with a razar blade. A wedge-shaped hypocotyl of the scion as then firmly inserted into the hole of the rootstock. To avoid wilting of the graft, at the same day and a day later, a plastic covers with a net screen were spread on the grafted plants to give more humidity and shade.
- Day (21-25): The plants were exposed to sunlight.

Day (32-33): The usual nursing method was applied

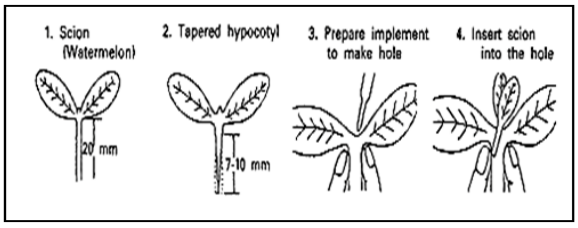

Figure 1: Schematic diagram of cut grafting for Nubian watermelon plant.

On one side of the ridge (10 meters length and 2 meters width) at a spacing of 25 cm between hills within the raw as plant density were 4 plants / square meter. Surface irrigation methods were used. The recommended N, P and K were added according to the recommendation of Ministry of Agriculture. The other cultural practices were done similarly as practiced by the local growers.

The properties of soil are shown in Table (1). The experimental plot contained 10 meters length and 2 meters width, and transplanted on one side of the ridge. The recommended N, P and K were added according to the recommendation of ministry of Agriculture. The other cultural practices were done similarly as practiced by the local growers. The design used was randomized complete blocks design with 4 replicates in both seasons. Obtained data were tested by analysis of variance (**Little and Hill, 1972**).

Data recorded:

Vegetative growth parameters measurements:

Samples of 7 plants were randomly chosen and clipped from each experimental plot to measure leaves number, stem length (cm) and branches number at two vegetative stages (30 and 60 days after transplanting).Leaf area (cm^2), leaf and leaves fresh weight and leaf and leaves dry weight were recorded after 60 days from transplanting.

Leaf area was measured in the fifth leaf from the growing tip by portable leaf area meter (model 3100).

Flowering measurements:

Random five plants from each plot were selected and signed at flowering stage. The numbers of hermaphrodite and male flowers were calculated daily.

Table 1: Physical and chemical properties of the experimental uses soils during 2009 and 2010 seasons

Soil parameters	Seasons	
	2009	2010
Physical parameters:		
Clay (%)	53.21	49.17
Silt (%)	25.14	26.11
Sand (%)	21.65	24.72
Texture	Clay	Clay
Chemical analysis:		
pH (1:2.5 soil: water suspension)	8.05	8.2
EC dS m^{-1} (soil paste extract)	2.1	2.4
Organic matter	1.70	1.6
Available N mg Kg^{-1} (1 M KCl extracts)	36	28
Available P mg Kg^{-1} (0.5 $NaHCO_3$ extracts)	6.1	5.8
Available K mg Kg^{-1} (ammonium acetate extracts)	280	214

Fruit characteristics:

Three fruits were randomly taken from each plot of both seasons to study the fruit length (cm), fruit diameter (cm) and fruit shape (L/D ratio). It was calculated by dividing fruit length on fruit diameter.

Fruit yield:

Productivity of fruit stage was measured as number of seeds per fruit, number of fruits per plant, fruit weight (g), dry weight of 100 seeds (g), net weight of seed kernel (g), fruit yield per m^2 (kg), seed yield per m^2 (g), weight of fruit yield (ton per fed.) and weight of seed yield (ton per fed.).

RESULTS And Discussion

1- Vegetative growth:

Data presented in Table (2) show that No. of leaves per plant, stem length and number of branches per plant were significantly influenced by grafting treatments, plants grafted onto bottle gourd had the highest value of leaves number during both growth stages (30 and 60 days after transplanting) followed by those grafted onto pumpkin. On other hand, the lowest values were obtained for plants which grafted onto fig leaf gourd and luffa in both seasons.

Concerning stem length, grafting onto pumpkin led to the most increasing effect on the plant length during the two growth periods of both seasons followed by grafting onto bottle gourd. On the other hand, the lowest values were recorded in most cases in plants grafted onto luffa.

Data presented in Table 2 also, demonstrated that plants which were grafted onto bottle gourd had higher values of number of branches at both growth periods in both seasons except at 30

days after transplanting of the first season. In contrast, the lowest values were obtained from plants grafted onto luffa and fig leaf gourd during both periods of vegetative growth and seasons.

Table 2: Effect of grafting Nubian watermelon onto different rootstocks on number of leaves, stem length (Cm) and number of branches per plant after 30 & 60 days after transplanting during 2009 and 2010 seasons.

Rootstocks	No. of Leaves/plant		Stem length (cm)		No. of branches/plant	
	days after transplanting					
	30	60	30	60	30	60
2009 season						
Control	19.00 b	153.33 c	44.83 b	199.44 e	3.33 b	6.83 c
Bottle gourd	28.50 a	251.33 a	77.83 a	256.50 b	3.66 b	13.66 a
Pumpkin	27.83 a	220.66 b	79.17 a	319.00 a	4.03 a	10.73 b
Luffa	13.00 d	117.50 d	26.44 d	213.66 d	2.13 c	6.50 c
Fig leaf gourd	15.67 c	105.33 e	35.33 c	230.00 c	2.07 c	6.00 c
F. Test	**	**	**	**	*	*
2010 season						
Control	31.00 c	176.33 c	104.66 c	296.17 b	4.50 b	13.66 c
Bottle gourd	46.55 a	248.33 a	137.65 b	303.66 b	5.66 a	17.66 a
Pumpkin	34.33 b	198.66 b	151.66 a	320.66 a	4.33 b	15.33 b
Luffa	15.33 d	116.00 d	40.50 e	199.67 d	2.17 c	10.50 d
Fig leaf gourd	17.00 d	103.00 e	90.00 d	266.67 c	2.33 c	9.50 d
F. test	**	**	**	**	*	*

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

Data presented in Table (3) showed that the largest leaf area and leaves area per plant were significantly influenced by grafting treatments, the largest leaf area values were obtained from grafting Nubian watermelon onto bottle gourd in both seasons followed by those grafted onto pumpkin and luffa in the first season, while it was followed by those grafted onto pumpkin in the second season. But the lowest values were obtained from grafting onto fig leaf gourd and control in the first season and from fig leaf gourd in the second season.

Concerning leaves area per plant data in Table 3 indicated that plants which were grafted onto bottle gourd had the highest values of leaves area per plant followed by those grafted onto pumpkin, while the lowest value was obtained from grafting onto fig leaf gourd at both seasons.

Table 3: Effect of grafting Nubian watermelon onto different rootstocks on leaf area (cm2) and leaves area (cm2) / plant after 60 days after transplanting during 2009 and 2010 seasons.

Rootstocks	Leaf area (cm^2)		Leaves area / plant (m^2)	
	2009	2010	2009	2010
Control	16.50 c	19.48 b	25.29 c	34.36 c
Bottle gourd	24.16 a	30.35 a	60.71 a	75.36 a
Pumpkin	19.47 b	20.75 b	42.96 b	41.22 b
Luffa	19.48 b	19.18 c	22.89 c	22.25 d
Fig leaf gourd	16.24 c	16.50 c	17.11 d	17.00 d
F. test	**	**	**	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

Data presented in Table (4) cleared that leaf fresh weight, leaves fresh weight per plant, leaf dry weight and leaves dry weight per plant were significantly influenced by grafting treatments. Grafting onto different rootstocks promoted leaf fresh weight as compared with control (without grafting) of both seasons. Moreover, grafting onto bottle gourd had the highest values in both seasons.

Concerning leaves fresh weight per plant, data in Table 4 showed that plants which were grafted onto bottle gourd had the highest values followed by those grafted onto pumpkin. While the lowest values were obtained from grafting Nubian watermelon onto luffa and fig leaf gourd followed by Nubian watermelon without grafting.

Plants which were grafted onto bottle gourd had the highest values of leaf dry weight followed by those grafted onto fig leaf gourd and luffa in the first season and luffa in the second one, while non-grafted plants had the lowest values.

Leaves dry weight per plant, data in (Table 4) cleared that the highest value of leaves dry weight per plant was obtained from grafting Nubian watermelon onto bottle gourd followed by those grafted onto pumpkin in comparison with the other treatments.

Table 4: Effect of grafting Nubian watermelon onto different rootstocks on leaf and leaves fresh weight per plant (g) and leaf and leaves dry weight per plant (g) after 60 days after transplanting during 2009 and 2010 seasons.

Rootstocks	Leaf fresh weight (g)		Leaves fresh weight / plant (g)		Leaf dry weight (g)		Leaves dry weight / plant (g)	
	2009	2010	2009	2010	2009	2010	2009	2010
Control	0.640 b	0.617 d	97.41 c	108.70 c	0.095 d	0.085 e	14.62 c	15.05 c
Bottle gourd	0.770 a	0.739 a	191.68 a	180.27 a	0.131 a	0.126 a	32. 84 a	31.29 a
Pumpkin	0.760 a	0.692 c	167.70 b	137.54 b	0.123 c	0.106 d	27. 21 b	21.12 b
Luffa	0.720 a	0.690 b	84.60 d	80.08 d	0.127 b	0.111 b	14.88 c	13.22 d
Fig leaf gourd	0.740 a	0.697 b	77.59 d	71.76 d	0.126 b	0.113 c	13.34 c	11.67 e
F. test	*	*	**	**	*	*	**	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

It is cleared from the previous data that grafting Nubian watermelon mostly had positive effect on vegetative growth parameters compared to the control. This may due to that grafted plants can absorb more water and nutrients than non-grafted plants (Rivero et al., 2003), whereas the rootstocks mostly had very strong root system (Huh et al., 2007) as there were a positive correlation between the root mass and vegetative growth (Zijlstra et al., 1994). Moreover, grafted seedlings had higher photosynthetic ability than non-grafted ones (Nie et al., 2010). Also grafted plants can grow better than non-grafted plants under high soil salinity (Liebig, 1984 and Mastsabara 1989), low soil temperature (Nijs et al., 1983) or soil born disease existence (Oda, 1995 and Yilmas et al., 2011).

It is evident from the previous results that bottle gourd rootstocks surpassed all other rootstocks in stimulating most vegetative growth. This may be due to the root system of bottle gourd is much pronounced which facilitate the uptake of more nutrient led to better growth of the grafted plants onto bottle gourd (Salam et al., 2002).

2- Flowering:

Hermaphrodite flowers:

According to data in Table 5 and Figure 2 the highest number of hermaphrodite flowers was recorded from grafting plants onto bottle gourd, followed by plants which grafted onto fig leaf gourd in both seasons, while the lowest values were obtained from non-grafted plants in the first season and from grafting onto luffa and non-grafted plants in the second one. The obtained differences were significant in both seasons.

Table 5: Effect of grafting Nubian watermelon onto different rootstocks on hermaphrodite and male flowers per plant during 2009 and 2010 seasons of plant growth.

Rootstocks	Hermaphrodite flower		Male flower	
	2009	2010	2009	2010
Control	3.00 c	4.17 cd	27.00 c	53.33 a
Bottle gourd	6.33 a	8.33 a	37.00 a	56.33 a
Pumpkin	5.50 ab	5.30 c	30.00 b	50.00 a
Luffa	5.00 b	3.33 d	12.00 e	15.33 c
Fig leaf gourd	6.16 a	7.00 b	24.00 d	34.00 b
F. test	*	*	**	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

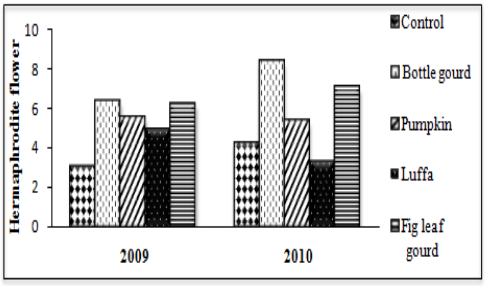

Figure 2: Effect of grafting Nubian watermelon onto different rootstocks on hermaphrodite flowers per plant during 2009 and 2010 seasons of plant growth.

The highest number of hermaphrodite flowers per plant which were obtained from grafting Nubian watermelon onto bottle gourd rootstock may be due to the rootstock surpass Nubian watermelon in size of the root system and a significant amount of xylem sap could be trans located by the rootstock; it is known to contain fairly high concentrations of minerals, organic substances and plant hormones such as cytokinins and gibberellins which may control sex expression (Masuda and Gomi, 1982 and Lee, 1994). Also, grafting onto bottle gourd increased vegetative growth bottle gourd increased vegetative growth parameters at different growth stages (tables 2, 3 and 4) that may be affected flowering positively.

3- Fruit yield:

Number of fruits per plant:

Data in Table 6 indicated that grafting plants onto bottle gourd led to significantly the highest number of fruits per plant, followed by those grafted onto luffa, while the lowest values were obtained from non-grafted and grafting plants onto fig leaf gourd. The differences were significant in both seasons.

Number of seeds per fruit:

Data in Table 6 showed that the highest values of number of seeds per fruit were obtained from grafting plants onto bottle gourd in both seasons, followed by those grafted onto luffa, while the lowest values were obtained from non-grafted and grafting plants onto fig leaf gourd. The differences were significant in both seasons.

Fruit weight:

Data of Table 6 cleared that the highest values of fruit weights were obtained from grafting plants onto bottle gourd, followed by those grafted onto pumpkin in both seasons, while the lowest values were obtained from non-grafted plants followed by those grafted onto fig leaf gourd. The differences were significant in both seasons.

Table 6: Effect of grafting Nubian watermelon onto different rootstocks on seed characteristics during 2009 and 2010 seasons.

Rootstocks	No. of seeds / fruit		No. of fruits / plant		Fruit weight (g)	
	2009	2010	2009	2010	2009	2010
Control	183.25 d	192.83 d	1.19 d	1.23 d	523.00 e	752.00 e
Bottle gourd	271.75 a	296.16 a	1.90 a	2.00 a	1180 a	1161.33 a
Pumpkin	227.00 c	264.50 c	1.30 c	1.40 bc	939.67 b	1015.00 b
Luffa	234.83 b	270.27 b	1.50 b	1.51 b	822.00 c	867.83 c
Fig leaf gourd	183.74 d	193.67 d	1.17	1.27 cd	574.00 d	760.00 d
F. test	**	**	**	**	**	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

Dry weight of 100 seeds:

Data of Table 7 indicated that plants were grafted onto bottle gourd rootstock had significantly higher dry weight of 100 seeds values compared to the other treatments in both seasons. It was followed by those grafted onto luffa while plants grafted onto fig leaf gourd had the lowest values.

Net weight of seed kernel:

Data of Table 7 indicated that plants grafted onto bottle gourd and fig leaf gourd had the highest values of net weight of seed kernel followed by those grafted onto luffa, while the lowest values were obtained from non-grafted plants. The differences were significant only in the second season.

Table 7: Effect of grafting Nubian watermelon onto different rootstocks on fruit characteristics during 2009 and 2010 seasons.

Rootstocks	Dry wt. of 100 seeds (g)		Net wt. of seed kernel (%)	
	2009	2010	2009	2010
Control	14.24 b	13.28 bc	51.43	51.47 d
Bottle gourd	16.55 a	14.15 a	53.73	53.60 a
Pumpkin	14.01 b	13.12 c	52.81	52.50 c
Luffa	16.26 a	13.41 b	53.04	52.90 b
Fig leaf gourd	13.60 b	12.70 d	53.50	53.40 a
F. test	*	**	N.S.	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

Fruit yield per m^2:

Data in Table 8 indicated that grafting plants onto bottle gourd was significantly increased fruit yield as comparing with other treatments followed by those grafted onto pumpkin, while the lowest values were obtained from non-grafted plants and from grafting plants onto luffa. The differences were significant in both seasons.

Seed yield per m^2 (g):

Data presented in Table 8 cleared that Nubian watermelon grafted onto bottle gourd had the highest values of seed yield per m2 in both seasons, followed by those grafted onto pumpkin. On the other hand the lowest values were obtained from non-grafted plants followed by those grafted onto luffa. The differences were significant in both seasons.

Fruit yield weight (ton per feddan):

Data in Table 8 and Figure 3 showed that the highest values of fruit yield were obtained from grafting plants onto bottle gourd followed by those grafted onto pumpkin in both seasons. On the other hand the lowest values obtained from non-grafted plants and from grafting plants onto luffa. The differences were significant in both seasons and grafted plants.

Seed yield weight (ton per feddan):

Presented data in (Table 8 and Figure 4) showed that Nubian watermelon grafted onto bottle gourd had the highest values of weight of seed yield (ton/fed) followed by those grafted onto luffa, while the lowest values were obtained from non-grafted plants and grafting onto luffa. The differences were significant in both seasons.

Table 8: Effect of grafting Nubian watermelon onto different rootstocks on fruit and seed yield per m2 and feddan during 2009 and 2010 seasons

Rootstocks	Fruit yield / m^2 (kg)		Seed yield / m^2 (g)		Weight of fruit yield (Ton / fed.)		Weight of seed yield (Ton / fed.)	
	2009	2010	2009	2010	2009	2010	2009	2010
Control	2.24 c	3.51 d	111.79e	119.69d	8.51 c	13.35 d	0.43 c	0.46 b
Bottle gourd	7.56 a	9.29 a	288.18a	301.73a	28.73 a	35. 30 a	1.09 a	1.14 a
Pumpkin	4.38 b	5.00 b	148.32b	171.02b	16.64 b	19.01 b	0.56 b	0.65 b
Luffa	2.48 c	2.75 e	114.55d	120.39d	9.42 c	10.45 e	0.44 c	0.46 b
Fig leaf gourd	2.55 c	3.86 c	116.95c	124.75c	9.69 c	14.67 c	0.44 c	0.48 b
F. test	**	**	**	**	**	**	**	**

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

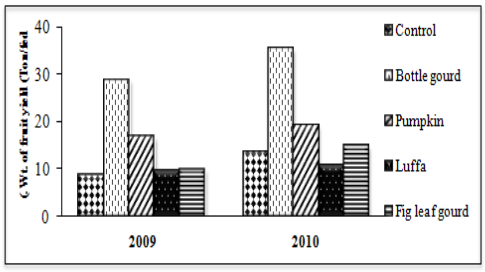

Figure 3: Effect of grafting Nubian watermelon onto different rootstocks on weight of fruit yield (ton per fed.) during 2009 and 2010 seasons.

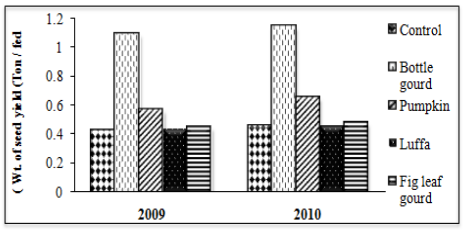

Figure 4: Effect of grafting Nubian watermelon onto different rootstocks on weight of seed yield (ton per fed.) during 2009 and 2010 seasons.

It is clear from the above mentioned data that plants grafted onto all rootstocks had higher values for most fruit yield parameters compared to control, whereas grafting promoted plant yield (Echebarria et al. 2002 and El-Nemr, 2006), where the plants grafted onto bottle gourd rootstock had the higher values for all parameters, this is may be due to the improvement of their vegetative growth. Also, the root system of the rootstocks which mostly had very strong root system and often capable of absorbing water and nutrients more efficiently than non-grafted plant roots (Huh et al. 2007). In addition, it may serves as a good supplier of endogenous plant hormones (Leoni, 1990 and Lee, 1994), which may resulted in vigorous growth and more hermaphrodite flowers (Table 5).

4- Fruit characteristics:

Fruit length:

According to Table 9 it is cleared that there are significantly differences in the fruit length at first seasons as the highest values of fruit length were recorded for grafting plants onto bottle gourd and pumpkin followed by those grafted onto luffa. On the other hand the lowest values were obtained from non-grafted plants. In the second season, there are no significantly differences between treatments. However, the highest values were obtained from grafting plants onto bottle gourd followed by those grafted onto pumpkin, while the lowest values were obtained from grafting plants onto fig leaf gourd.

Fruit diameter:

Data in Table 9 showed that fruit diameter was not significantly affected by grafting onto different rootstocks. However, grafting plants onto bottle gourd and pumpkin led to largest fruit diameter in both seasons.

Fruit shape (L/D ratio):

Data of Table 9 indicated that fruit shape was not significantly affected by the treatments in both seasons. However, there were no constant trend was observed within all treatments.

The enhancement in fruit characteristics with different rootstocks may be due to the differences in the effectiveness of their root systems or in the interaction between root and shoot (Nijs, 1980 and Zijlstra et al. 1994), hence, that may lead to variable ability of mineral uptake.

Table 9: Effect of grafting Nubian watermelon onto different rootstocks on fruit characteristics during 2009 and 2010 seasons.

Rootstocks	Fruit length(L) (cm)		Fruit diameter(D) (cm)		Fruit shape (L/D)	
	2009	2010	2009	2010	2009	2010
Control	10.43 c	11.27	11.02	11.41	0.95	1.00
Bottle gourd	13.09 a	12.29	12.80	12.49	1.03	0.98
Pumpkin	12.30 a	11.90	12.19	11.98	1.00	0.96
Luffa	11.88 ab	10.90	11.75	10.39	1.01	1.00
Fig leaf gourd	10.80 bc	10.10	10.96	11.20	0.99	0.90
F. test	*	N.S.	N.S.	N.S.	N.S.	N.S.

Values marked with the same alphabetical letter (s) are not significantly different, using Duncan's test at 0.05 levels.

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الملخص العربى

تأثير تطعيم بطيخ اللب على نموه الخضري وانتاجيتة وجودة ثماره.

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أجريت تجربه على بطيخ اللب في مزرعة محطة بحوث سخا بمحافظة كفر الشيخ خلال موسم الصيف لعامى ٢٠٠٩ و ٢٠١٠ م. وقد كان الهدف الرئيسي هو المقارنة بين النباتات المطعمة على أربعة أصول مختلفة (اليقطين و القرع العسلى و اللوف و الفيسفوليا) و النباتات الغير المطعمة بهدف زيادة انتاجية النبات. شملت الدراسة قياس معدلات النمو و عدد الأزهار و محصول الثمار و البذور و خصائص الثمار. أشارت النتائج الى ان نمو بطيخ اللب المطعم على اليقطين و القرع العسلى كانت به زيادة فى عدد الأوراق و طول الساق و عدد الافرع مقارنة بالنباتات المطعمة على اللوف و الفيسفوليا. أدى التطعيم على اليقطين الى زيادة مساحة الورقة ومساحة اوراق النبات الواحد و الوزن الطازج و الجاف لاوراق النبات الواحد مقارنة بالنباتات المطعمة على الفيسفوليا و قد ادى التطعيم على اليقطين الى زيادة الوزن الطازج والجاف للورقة مقارنة بالنباتات غير المطعمة. تبين من تطعيم بطيخ اللب على اليقطين زيادة عدد الأزهار الخنثى و المذكرة مقارنة بالكنترول. ادى تطعيم نبات بطيخ اللب على اليقطين الى زيادة عدد بذور الثمرة و عدد ثمار النبات الواحد وزن الثمار مقارنة بالنباتات غير المطعمة. كما أدى التطعيم على اليقطين و القرع العسلى الى زيادة ملحوظة فى محصول الثمار لكل م^{٢} و محصول البذرة لكل م^{٢} و محصول الثمار (طن لكل فدان) و محصول البذرة (طن لكل فدان) مقارنة بالكنترول. لوحظ أن أعلى وزن جاف لمائة بذرة و الوزن الصافى للب البذرة من تطعيم النباتات على اليقطين. بالنسبة لخصائص الثمار نجد انه تم الحصول على أعلى زياده لطول و عرض الثمرة من تطعيم النباتات على اليقطين.