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EFFECT OF DIFFERNT ROOTSTOCKS AND GRAFTING DATES ON OM-EL FAHM ALMOND, CULTIVAR AS PROPAGATED ON SANDY SOILS

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ABSTRACT

This research was carried out during 2009 and 2010 growing seasons on Om-El fahm almond transplants at the South of Tahrir Research station Aly; Mubarak farm, to study the effect of grafting dates (Mid- July, Mid- August and Mid- September) and on different rootstocks (Bitter almond, Okinawa peach and Nemagaurd peach) on the growth aspects; scion survival percentage (final take) scion length ,scion girth, root length, No. of main roots/ plant, top dry weight, root dry weight and budding dry weight and leaf mineral nutrient concentrations . The obtained results clarified that grafting survival percentages, scion lengths, stem girth (10 cm above union zone), top dry weight and buded dry weight significantly increased when it grafted on July followed by August and then September through the two growing seasons. On contrast stem girth (10cm below union zone), total root length, No-of main roots/ plant and root dry weight significantly increased when it grafted on September followed by August and then July during two growing seasons. Using of bitter almond as a rootstock for Om-El fahm cultivar almond significantly increased grafting survival percentages compared with the other two studied rootstocks through the study.. On the other hand, using Nemagaurd peach rootstock recorded significantly the highest values of the other growth parameters followed by Okinawa peach and finely Bitter almond through both growing seasons. Data also showed that grafting of Om-El fahm almond generally had the highest significant value of mineral leaf nutrient elements when it grafted in July during the two growing seasons.

Using Nemagaurd peach as a rootstock for Om-El fahm almond significantly increased leaf nitrogen content compared with the other two studied rootstocks throughout the two growing seasons. On the other hand, grafting of Om-El fahm almond on bitter almond rootstock generally had a high significant values of leaf P, K, Ca and Mg mineral concentration nutrient elements compared to the other studied rootstocks during the two growing seasons.

As a conclusion; from the data conclude that the best time for grafting of Om-Elfahm almond cultivar were mid-July. The best rootstocks for Om-El fahm almond cultivar were Nemaguard peach to obtain vigours vegetative growth and bitter almond for heightest survival percentage.

INTRODUCTION

The cultivated almond *(Prunus amygdalus,L.)* apparently originated from one or more of the many wild species that evolved in the deserts and lower mountain slopes of central and southwest Asia (Kester and Ross, 1996). Almond propagation have been used seedlings in almond production for many centuries (Edstrom and Viveros, 1996), which was scattered on different regions that have different ecological conditions around the world. With the change of agricultural techniques of different countries, a lot of different almond populations, varieties or local types were formed. Up to now,

almond production has been done by seeds. In Turkey, using of budding or grafting techniques is very low in almond production

Almond is tolerant to limestone and to certain lime soiladverse condition such as drought and salinity because of its rootsmay penetrate deep layer of soil; it is also more resistant than peach to Na and Bo. (Kester and Ross, 1996) The bibliographic reference regarding this species based on, vegetative propagation is very scar.

The almond *(Prunus amygdalus)* has long been recognized in the front rank among edible nuts. The kernel contains about 55% lipids, 21% proteins and 17.3% carbohydrates. It is also a good source of vitamins specially niacin, riboflavin and thiamine (Chandler, 1958).

According to FAO (2009) the almond world productions were 1.7 million tones [USA 1162200, Spain 276100, Syria 97002, Turkey 54844, Algeraria 47393 and China 35000 tones]. Almond production in Egypt is very little compared to the world production.

Almond trees in Egypt are mainly budded on bitter almond rootstocks which requires deep and well drained soils. Accordingly, almond production in Egypt is limited to areas where the soil is porous and the water table is deep. However, most of these soils are marginal because they lack fertility and sometimes poor in their quality.

Furthermore, bitter almond roots are susceptible to nematode infection especially in well-drained soils. Moreover, peach seedlings are resistant to root knot nematode (Hartmann& Kester, 1975). For this reasons it requires the selection of new rootstocks for almond that are adapted to different soil types and conditions.

Depending on the aforementioned results, we propose for this work to study the feasibility of using rootstocks other than bitter almond (Okinawa peach and Nemaguard peach) that are more adapted to the different soil types and adverse conditions.

MATERIALS AND METHODS

The preset study was carried out during 2009 and 2010 growing seasons to evaluate the effect of grafting Om-El fahm almond on three rootstocks (bitter almond, Okinawa peach and Nemaguard peach by shield budding a the South of Tahrir region to increase their tolerance to unfavorable environmental conditions .

The work includes the following two parameters:

Germination of rootstocks seeds.

About 1000 seeds from every rootstock dropped on tap water and on GA3 solution at 500 ppm on Mid-January during the two seasons and left for 24 hours then removed and placed in cold room 12^{o}c-4^{o}c to reach to germinate (maximum Number-of seeds). Nnumber-of days until germination period calculated and recorded in Table (1).

Table (1): Effect of tap water and GA_3 immersions dip on the seed germination of almond rootstocks during 2009& 2010 seasons:

Treatments	Bitter Almond				Okinawa				Nemaguard			
	No-of days		Germination %		No-of days		Germination %		No-of days		Germination %	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Water	7	7	93	92	35	37	57	52	63	65	37	33
GA3-500PPM	3	3	97	95	21	21	88	83	29	30	92	89

Budding procedure:

Three rootstocks seedlings i.e. bitter almond, Okinawa peach and Nemaguard peach were planted in the nursery at distances 70 cm between rows and 20 cm between seedlings under drip irrigation (about 300 seeds for each rootstock which treated with GA_3 after seed germination for every rootstock (180 seedlings for every rootstock), shield budded of Om-El fahm almond grafting on three previous rootstocks seedlings in three dates: mid-July, mid- August and mid- September (60 for every month) during the two growing seasons. All seedlings were grown in a sandy soil

The experiment was set in a complete randomized block design with three replicate per each treatment and 20 plants monthly for each replicate

The following parameters were recorded:

Morphological parameters:

- Survival budding percentages were recorded after two months from grafting,
- The length of scion was measured at cm at the end of the growing season (mid-December)
- Stem girth (mm) was measured at10 cm. below and above bud-union.

Moreover, survived budding were generally removed then washed with tap water and subjected to the following measurements:

- Total root length in cm.
- Number of roots per plant.

In the same time, roots and shoots were separated and dried at 70^{o}C till a constant weight then shoots and roots dry weights were recorded.

Leaf minerals analysis:

Leaf samples were collected on mid- June from the middle part of shoots of scions. The leaves were washed with tap water then with distilled water and rinsed by 0.1% HCL to remove any residues and finally washed water. The leaves were dried at 70^{o} C till constant weight, for the determination of N, P, K, Ca and Mg using the following procedures:

1-Total nitrogen was estimated by the modified microkjeldahl methods as recommended by Pregel (1945).

2-Total phosphorus was determined according to Chapman and Paratt (1978).

3-Potassium was determined by Flame photometer using the method recommended by Brown and Lilleland (1964).

4-Calcium estimated by titration against according toA.O.A.C. (1970) method

5-Magnesium was estimated by titration against according to A.O.A.C. (1970) method.

Statistical analysis:

The experiment included in this study followed a complete randomized design in factorial experiment. The obtained data was subjected to analysis of variance (ANOVA) according to Snedecor and Cochrian (1980).

RESULTS AND DISCUSSION

Morphological studies:

Growth of Om-El fahm almond budding as affected by the time of budding during 2009& 2010 growing seasons, present in Table (2) It is interesting to noticed that grafting om el fahm almond budding on three rootstocks in Mid- July gave the highest significantly, grafting survival percentage (78.23, 81.23&71.58, 73.12&72.35, 74.57), scion length (32.45, 37.48&41.25, 43.28&51.48, 57.16) stem girth (10 cm above union zone) (8.18, 9.24&11.58, 12.45&14.26, 16.57) top dry weight(32.47, 34.19 &37.18, 39.15& 44.48, 43.39) and seedlings dry weight(76.85 , 80.46 & 88.45, 92.34 & 99.94, 98.63) compared with that it grafted in Mid- August and Mid-September throw the two growing seasons in three rootstocks respectively On the other hand, grafting Om- El fahm almond in Mid- September gave the highest significant values of stem girth(10 cm below union zone)(10.42, 11.57&13.49, 14.31&18.36, 19.33), root length (36.48, 37.28 & 39.24, 41.38 & 43.49, 45.28),No- of main roots/ plant(19.29, 21.45&26.17, 28.47 & 31.28, 32.48) and root dry weight (44.38, 46.27&51.27, 53.19&55.35, 55.24) respectively compared with the other grafting dates on the three used rootstocks throw the two growing seasons. These results are coincide with Norton et l (1963), Felipe (1970), Gretsinger and Gortanova (1971), Monastra and trada(1974) and Sinha *et al*(1976). They all reported that rootstocks and time of budding had a significant effect on the grafting propagation of almond and peach.

Concerning of the growth of Om-El fahm almond budlings as affected by the different used rootstocks during 2009& 2010 growing seasons, present in Table (3) . It is obvious that, grafting survival percentage, significantly increased when it grafted on Bitter almond rootstock (68.62, 71.96) compared to the two others rootstocks Okenawa peach, Nemaguard peach (63.45, 65.83&62.64, 64.98) respectively throw the two growing seasons. On the other hand, grafting Om- El fahm almond on Nemagurd peach rootstock significantly increased all the other parameters compared to the two others rootstocks throw the two growing seasons. Okenawa peach rootstock recorded the intermediate results and finely Bitter almond gave the lowest values in these parameters throw the two growing seasons. These results are coincide with Norton et l (1963), Felipe (1970) , Gretsinger and Gortanova (1971), Monastra and trada(1974) and Sinha *et al* (1976). They all reported that using different rootstocks had a significant effect on the grafting propagation of almond and peach.

2-3

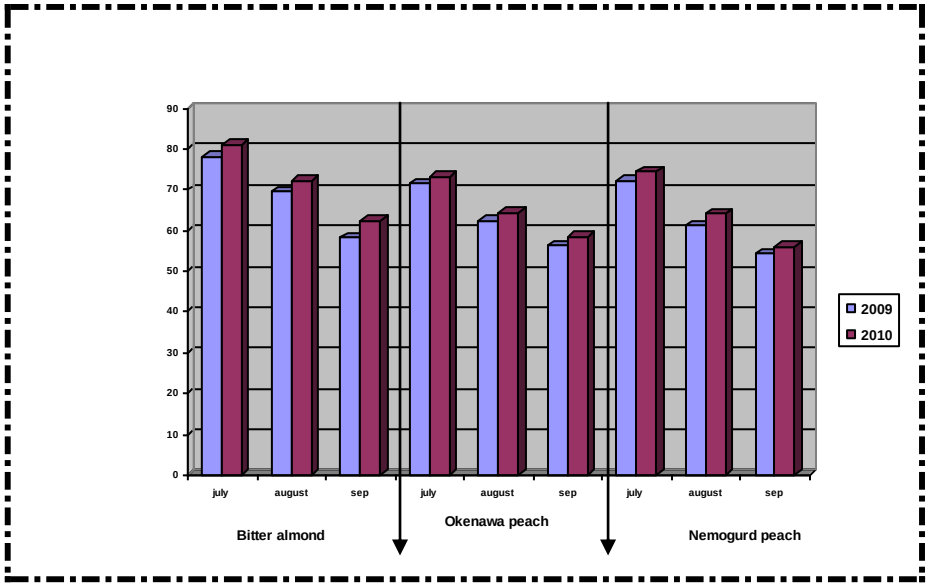

Fig. (1): Survival percentage of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

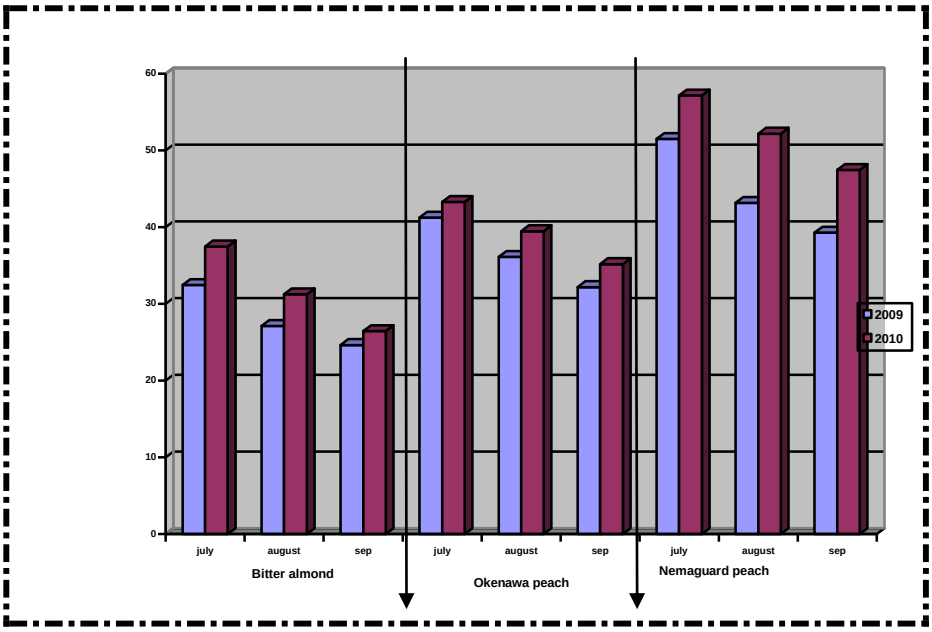

Fig. (2): Scion length of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

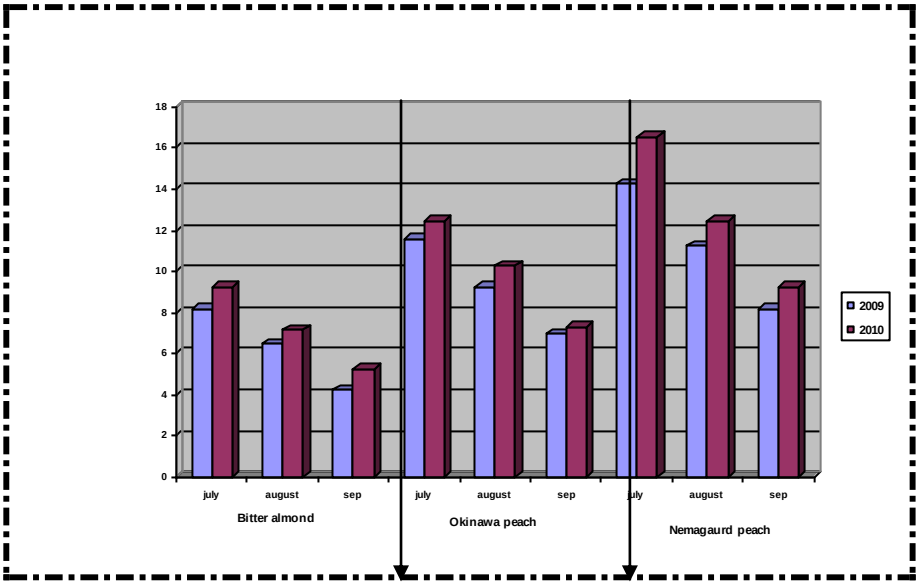

Fig. (3): Stem girth 10 cm above union zone of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 And 2010 seasons.

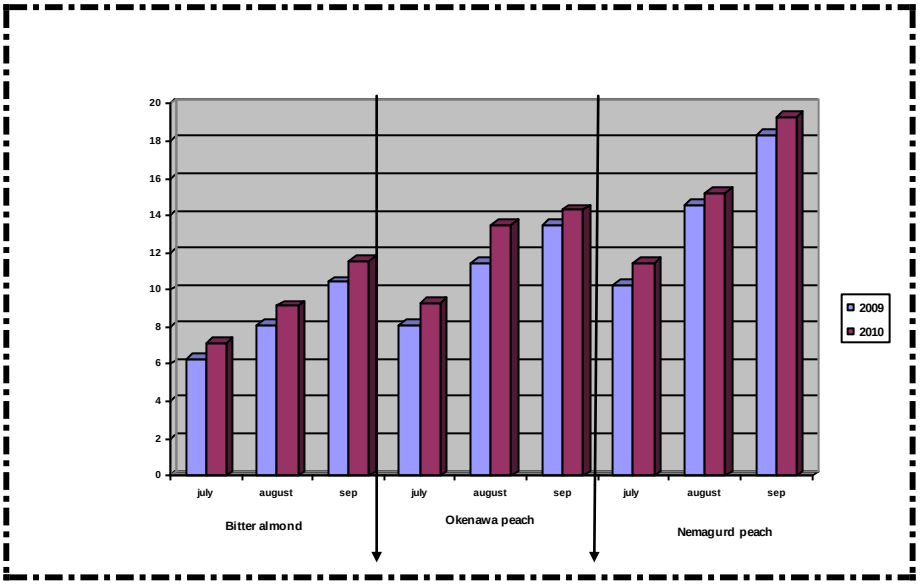

Fig. (4) : Stem girth 10 cm below union zone of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 And 2010 seasons.

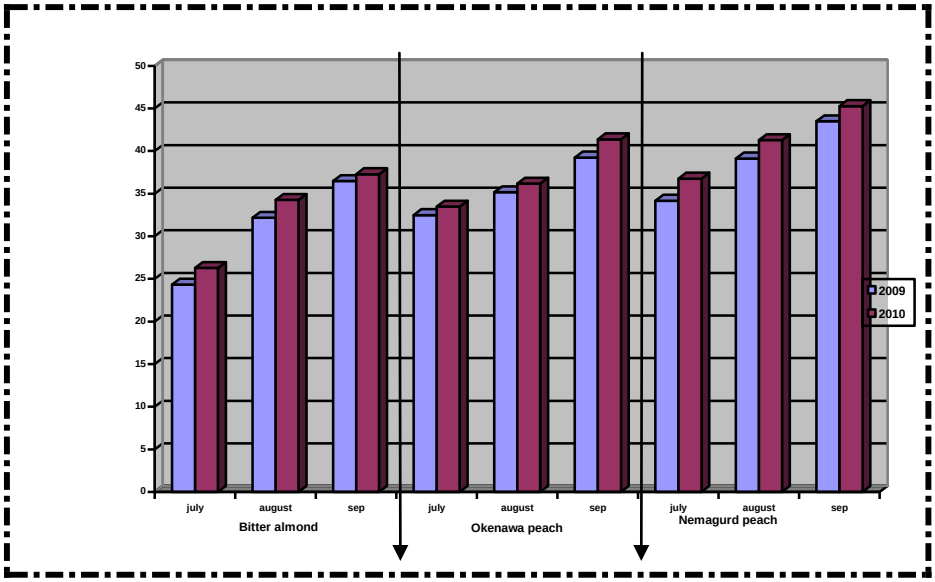

Fig. (5) : Total root length of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

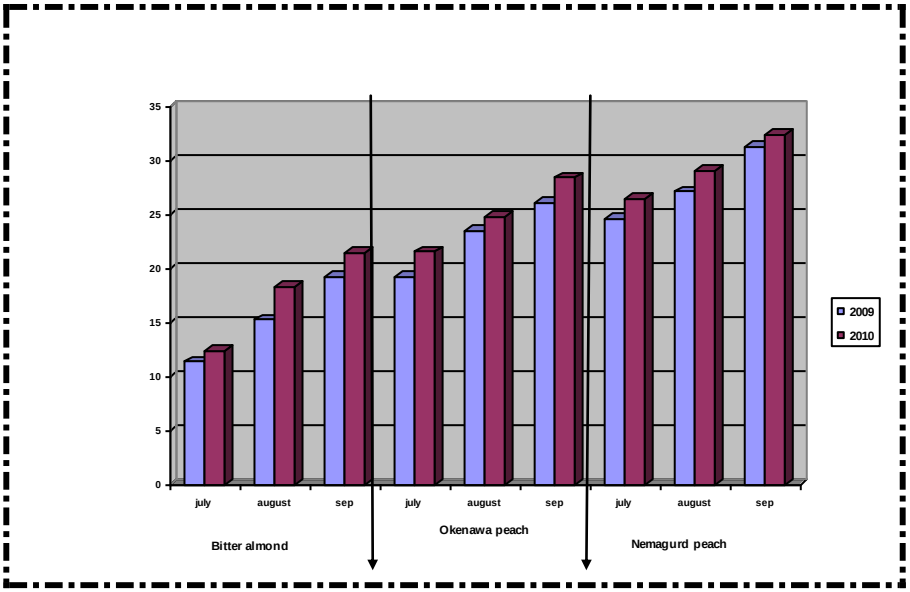

Fig. (6): No. of main roots/ plant of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

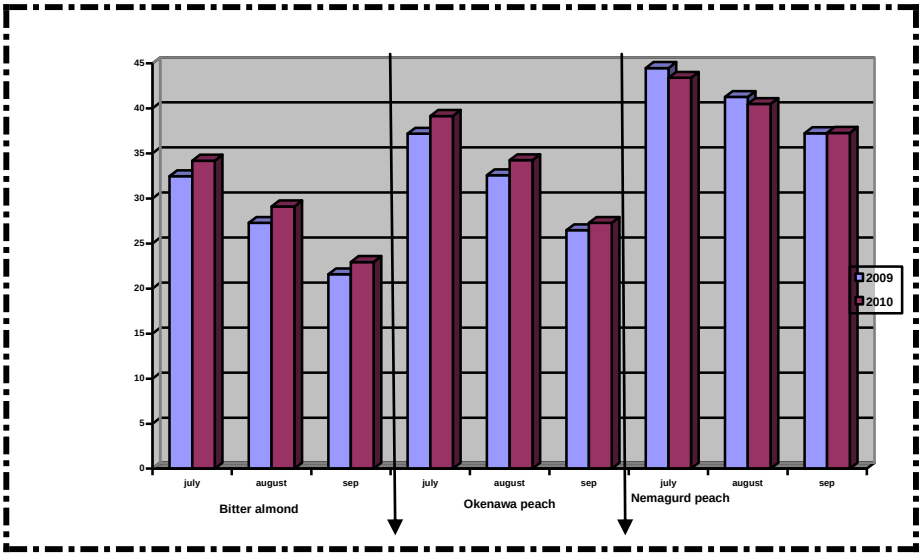

Fig. (7): Top dry weight of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

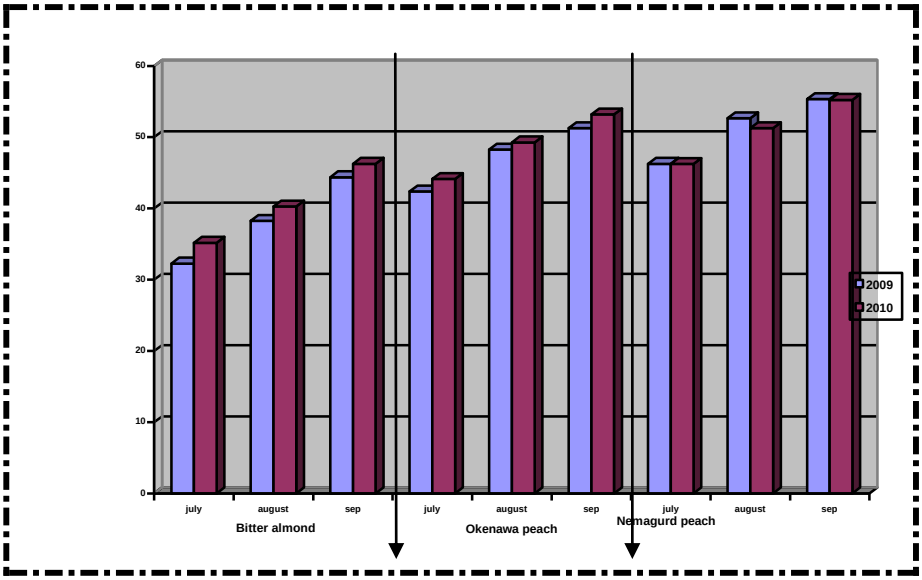

Fig. (8) : Root dry weight of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

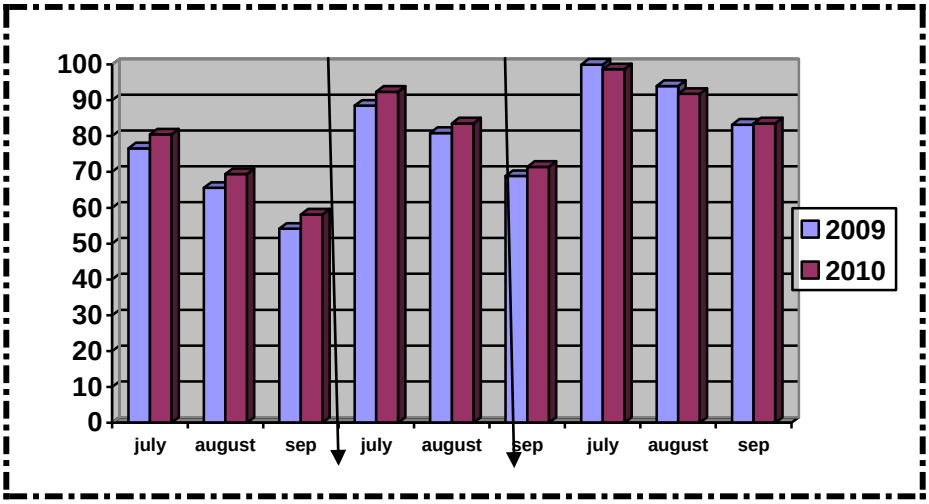

Fig. (9): Budding dry weight of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

Leaf nutrient elements content:

Concerning of the leaf mineral nutrient element content of Om-El fahm almond budding as affected by the time of budding during 2009& 2010 growing seasons, present in Table (4). It is obvious that, N, P, K, Ca and Mg percentages in dry leaves significantly increased when it grafted in Mid- July compared with that it grafted on Mid- August and Mid- September with the three used rootstocks throw the two growing seasons.

Concerning of the leaf nutrient element content of Om-El fahm almond budding as affected by the different using rootstocks during 2009& 2010 growing seasons, present in Table (5). It is obvious that, N percentages in leaves significantly increased when used Nemagurd peach rootstock compared with that it grafted on Okinawa peach and Bitter almond rootstocks throw the two growing seasons. On contrast, using bitter almond as a rootstock for Om -El fahm almond significantly increased P, K, Ca and Mg percentages in leaves compared to the others studied rootstocks the two growing seasons. These results were in the agreement with that reported in the findings of Molanov (1968), Mitasov *et al* (1973), Vitanova (1982), Syrbu & Stoyanov (1984) and Marwad (1989). They all reported that, N, P, K, Ca and Mg percentages in scion leaves were affected by the using of different rootstocks in almond, peach, cherry, plum and apricot.

Table (4): Leaf nutrient: elements content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

Time of budding	Element percentages in dry leaves									
	N		P		K		Ca		Mg	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Bitter almond										
Mid-July	1.69	1.73	0.32	0.35	1.36	1.41	3.21	3.26	0.21	0.23
Mid-August	1.34	1.37	0.24	0.26	1.24	1.34	3.15	2.19	0.18	0.20
Mid-September	1.18	1.20	0.19	0.21	1.17	1.22	3.09	2.11	0.15	0.17
L.S.D at 0.05	0.04	0.04	0.03	0.03	0.03	0.04	0.05	0.06	0.02	0.02
Okenawa peach										
Mid-July	1.95	2.13	0.28	0.29	1.29	1.32	2.97	3.09	0.19	0.19
Mid-August	1.76	1.84	0.22	0.24	1.21	1.25	2.79	2.86	0.14	0.15
Mid-September	1.61	1.71	0.14	0.18	1.17	1.19	2.61	2.71	0.11	0.13
L.S.D at 0.05	0.05	0.06	0.02	0.03	0.02	0.02	0.04	0.05	0.02	0.02
Nemagurd peach										
Mid-July	2.21	2.31	0.22	0.24	1.22	1.19	2.74	2.83	0.17	0.16
Mid-August	2.04	2.09	0.18	0.19	1.17	1.16	2.61	2.71	0.12	0.13
Mid-September	1.87	1.92	0.12	0.13	1.13	1.12	2.49	2.63	0.08	0.11
L.S.D at 0.05	0.06	0.06	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02

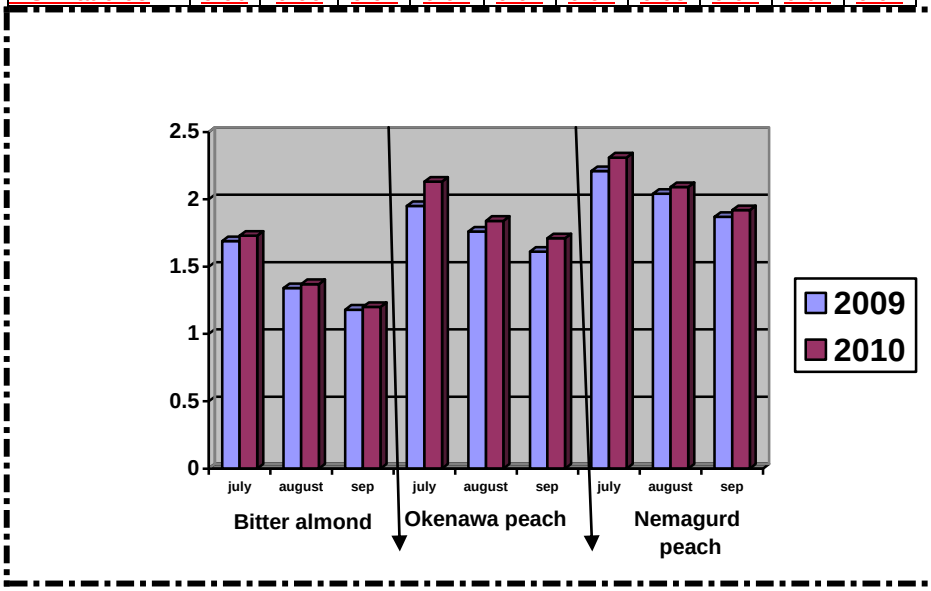

Fig. (10): Leaf nitrogen content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

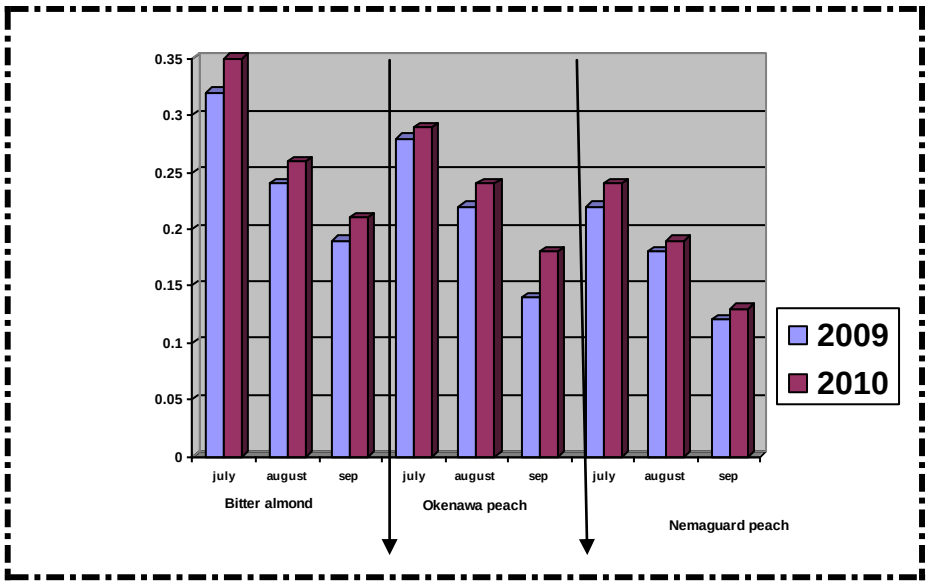

Fig. (11) : Leaf phosphor content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

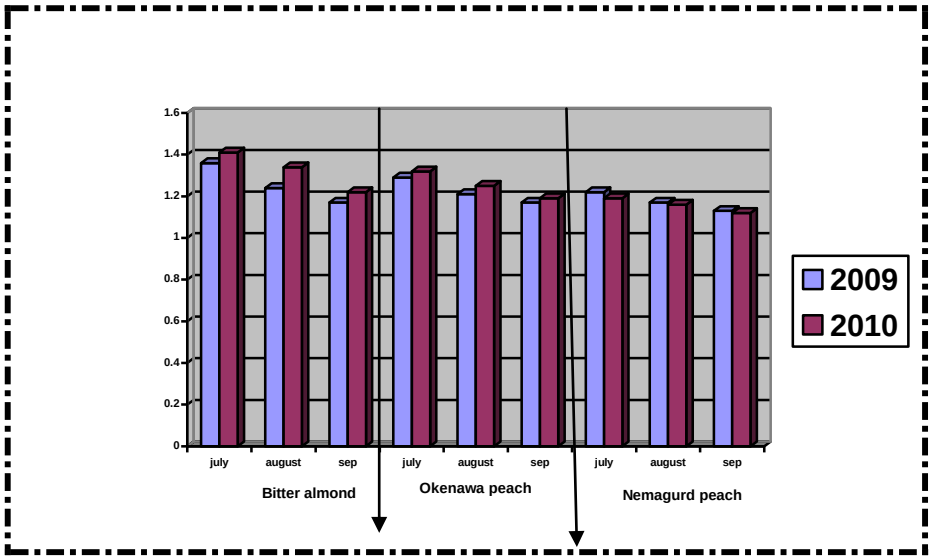

Fig. (12) : Leaf potassium content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

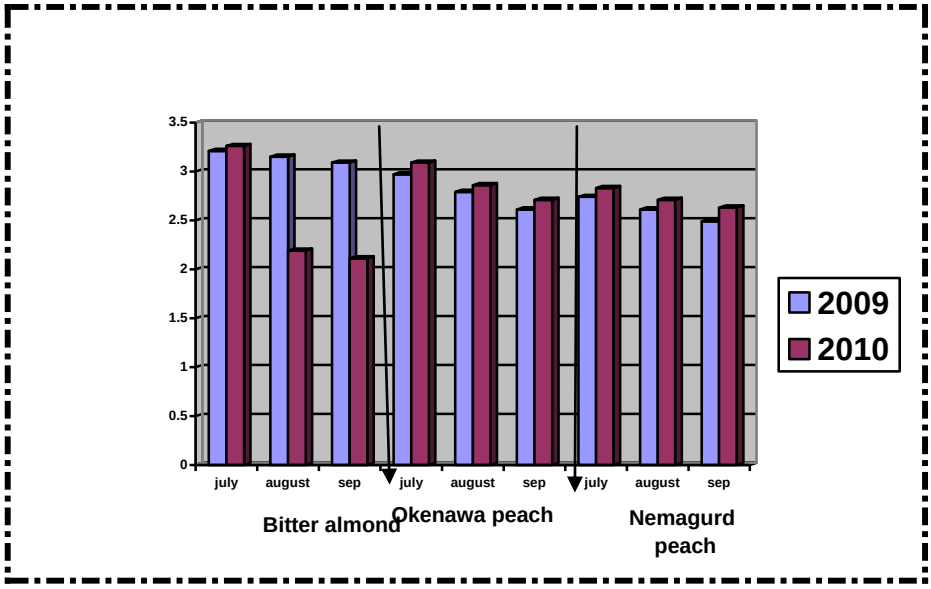

Fig. (13) : Leaf calcium content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

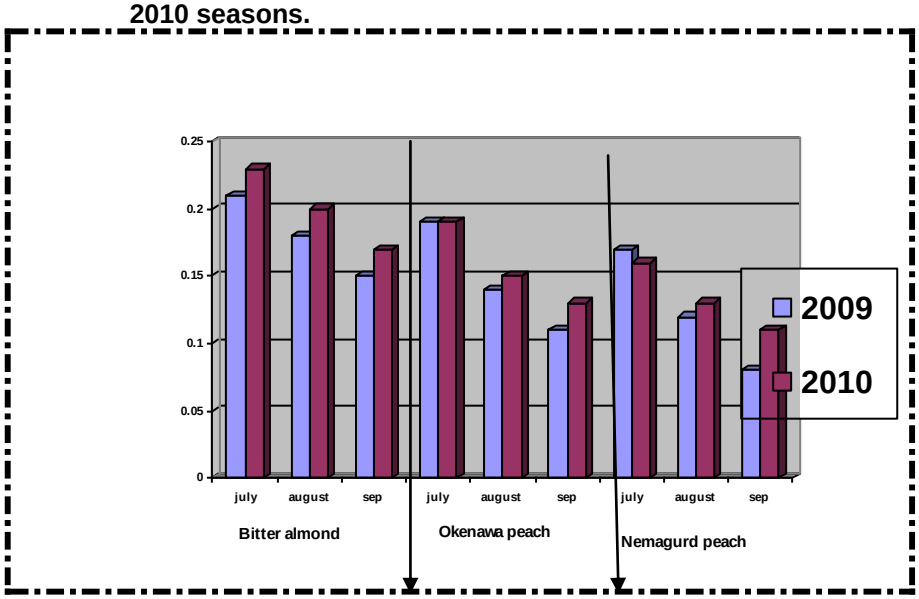

Fig. (14): Leaf magnesium content of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

Table (5): Leaf nutrient elements content of Om E l fahm almond budding as affected by using different rootstocks during 2009 and 2010 seasons.

Rootstdocks	Element percentages in dry leaves									
	N		P		K		Ca		Mg	
	2009	1010	2009	2010	2009	2010	2009	2010	2009	2010
Bitter almond	1.40	1.43	0.25	0.27	1.26	1.32	3.15	3.19	0.18	0.20
Okenawa peach	1.77	1.89	0.21	0.24	1.22	1.25	2.79	2.89	0.15	0.16
Nemagurd peach	2.04	2.11	0.17	0.19	1.17	1.16	2.61	2.72	0.12	0.13
L.S.D at 0.05	0.06	0.07	0.02	0.03	0.03	0.04	0.05	0.07	0.02	0.02

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تـأثير اسـتخدام أصـول مختلفـة و مواعيـدالتطعيم علـى اكثـار اللـوز أم الفحـم فـى الأراضى الرملية

كمال بشير عيسى

قسم بحوث الزيتون و فاكهة المناطق شبه الجافة- معهد بحوث البساتين- مركز البحوث الزراعية- الجيزة- مصر.

أجرى هذا البحث أثناء موسمي التجربة ٢٠٠٩-٢٠١٠ على اكثار اللوز صنف أم الفحم فى منطقة جنوب االتحرير(تربة رملية) بمزرعة على مبارك لدراسة أفضل ميعاد للتطعيم (منتصف يوليو- منتصف أغسطس- منتصف سبتمبر) و كذلك أفضل أصل للتطعيم علية (اللوز المر- الخوخ أوكيناوا- الخوخ نيماجارد).

و أظهرت النتائج ما يلى :-

- زاد معدل كل من نسبة نجاح التطعيم و طول الشتلة وسمك الشتلة فوق منطقة التطعيم ب ١٠ سم و الوزن الجاف لكل من النمو الخضرى و الشجرة عند التطعيم فى منتصف يوليو مقارنة بالتطعيم فى منتصف أغسطس أو منتصف سبتمبر خلال موسمى التجربة.
- زاد معدل كل من سمك الشتلة تحت منطقة التطعيم ب ١٠ سم و طول المجموع الجذرى وعدد الجذور الأصلية على النبات و الوزن الجاف للجذور عند التطعيم فى منتصف سبتمبر مقارنة بالتطعيم فى منتصف أغسطس أو منتصف يوليو خلال موسمى التجربة.

- عند أستخدام اللوز المر كأصل للوز أم الفحم زادت نسبة نجاح التطعيم مقارنة بباقى الأصول المستخدمة تحت الدراسة بينما زاد معدل كل من طول الشتلة و سمك الشتلة (فوق وتحت منطقة التطعيم ب ١٠ سم) والوزن الجاف للشتلة (النمو الخضرى و المجموع الجذرى) و عدد الجذور الأصلية على النبات عند أستخدام أصل الخوخ نيماجارد مقارنة بالأصول الأخرىتحت الدراسة خلال موسمى التجربة.
- زاد محتوى الأوراق من العناصر الغذائية عموما عند التطعيم فى منتصف يوليومقارنة بالتطعيم فى منتصف كل من أغسطس و سبتمبر خلال موسمى التجربة.
- زاد محتوى الأوراق من النتروجين فى أشجار اللوز أم الفحم اللتى تم تطعيمها على أصل الخوخ نيماجارد مقارنة بلأصول الأخرى تحت الدراسة خلال موسمى التجربة.
- زاد محتوى الأوراق من عناصر الفوسفور و البوتاسيوم و الكالسيوم و المغنسيوم فى أشجار اللوز أم الفحم اللتى تم تطعيمها على أصل اللوز المر مقارنة بالأصول الأخرى تحت الدراسة خلال موسمى التجربة.

من هذه الدراسة يمكن القول عموما أن أفضل ميعاد لتطعيم اللوز أم الفحم هو منتصف يوليو و أن أفضل أصل للتطعيم علية هو أصل الخوخ نيماجارد للحصول على أشجار زات نمو قوى بينما يمكن أستخدام أصل اللوز المر للحصول على أعلى نسبة نجاح تطعيم.

قام بتحكيم البحث

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Table (2): Growth of Om El fahm almond budding as affected by rootstocks and time of budding during 2009 and 2010 seasons.

Time. of budding	Survival (%)		Scion length (cm)		Stem girth (mm)				Total root length (cm)		No. of main Roots/plant		Top dry weight (gm)		Root dry Weight (gm)		Budlings dry weight (gm)	
					10cm above union zone		10cm below Union zone											
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Bitter almond																		
Mid-July	78.23	81.23	32.45	37.48	8.18	9.24	6.27	7.16	24.32	26.27	11.36	12.37	32.47	34.19	32.27	35.194	76.85	80.46
Mid-August	69.45	72.16	27.12	31.25	6.45	7.15	8.13	9.14	32.17	34.27	15.24	18.29	27.28	29.12	38.27	0.27	65.55	69.39
Mid-September	58.17	62.48	24.65	26.47	4.24	5.27	10.42	11.57	36.48	37.28	19.29	21.45	21.57	22.94	44.38	46.27	54.14	58.13
L.S.D at 0.05	2.21	2.65	1.24	2.13	.0.53	0.57	0.62	0.71	1.97	2.16	0.96	1.02	1.26	1.65	1.73	1.95	3.14	3.6
Okinawa peach																		
Mid-July	71.58	73.12	41.25	43.28	11.58	12.45	8.13	9.28	32.48	33.48	19.24	21.57	37.18	39.15	42.38	44.12	88.45	92.34
Mid-August	62.45	64.48	36.14	39.48	9.24	10.28	11.42	13.47	35.17	36.17	23.48	24.78	32.57	34.25	48.27	49.27	80.84	83.52
Mid-September	56.32	58.54	32.19	35.19	6.97	7.28	13.49	14.31	39.24	41.38	26.17	28.47	26.48	27.28	51.27	53.19	68.86	71.40
L.S.D at 0.05	2.91	3.12	2.15	2.47	0.62	0.76.	0.79	0.82	2.13	2.39	1.13	1.46	1.65	1.74	1.95	2.05	3.44	3.56
Nemaguard peach																		
Mid-July	72.35	74.57	51.48	57.16	14.26	16.57	10.27	11.47	34.18	36.75	24.63	26.47	44.48	43.39	46.27	46.24	99.94	98.63
Mid-August	61.21	64.24	43.18	52.18	11.25	12.47	14.58	15.24	39.12	41.28	27.16	29.14	41.27	40.49	52.67	51.27	93.94	91.76
Mid-September	54.36	56.14	39.28	47.45	8.16	9.27	18.36	19.33	43.49	45.28	31.28	32.48	37.24	37.27	55.35	55.24	83.51	83.51
L.S.D at 0.05	2.47	2.94	2.97	3.14	0.84	0.91	0.98	0.99	2.67	2.94	1.47	1.57	1.97	2.03	2.07	2.13	3.21	3.17

Table (3): Growth of Om El fahm almond budding as affected by different rootstocks during 2009 and 2010 seasons.

Rootstocks	Survival (%)		Scion length (%)		Stem girth(m. m)				Total root Length (cm)		No. of main roots/plant		Top dry weight (gm)		Root dry weight (gm)		Budlings Dry weight (gm)	
					10cm above union zone		10cm below union zone											
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Bitter almond	68.62	71.96	28.07	31.73	6.35	7.22	8.21	9.29	30.99	32.61	15.30	17.49	27.11	28.75	38.41	40.58	65.52	69.33
Okinawa peach	63.45	65.83	36.53	39.32	9.26	10.00	11.01	12.35	35.63	37.01	22.96	24.94	32.08	33.56	47.31	48.86	79.39	82.42
Nemaguard peach	62.64	64.98	44.65	52.26	11.22	12.77	14.40	15.35	38.93	41.10	27.69	29.36	41.00	40.38	51.43	50.92	92.43	91.30
L.S.D at 0.05	0.9	1.3	3.15	3.84	1.65	1.93	2.34	2.48	2.16	2.94	3.45	3.84	3.45	3.76	2.84	1.97	3.78	3.58