Effect of IBA and ROTEX-3 on some root and vegetative properties of pomegranate cuttings under watering conditions with magnetized water.

Asmahan Shayal Abdul Karim

Prof. Khawla HamzaMuhammad

Abstract

This study was carried out during the growing season 2018-2019 on pomegranate cuttings in order to know the extent of its response to rooting and growth using the growth regulator (IBA) and the Rotex-3 compound and watering with magnetized water The study included the effect of three factors, the first factor three concentrations of growth regulator (IBA) It is (0,1000,2000 mg / 1), and the second factor is three concentrations of the Rooting Rotex-3 compound (0,1000,2000 mg/1). The third factor is the quality of irrigation water where two types of irrigation water were used, normal water and magnetized water. Strongly (1500) causs, with four replications per transaction. The treatment of (1000)mg\L concentration of IBA highest significal Increase in most characterists rooting and vegetative such as (percentage of rooting ratio, length root, number of roots, fresh weight roots, dry weight roots, seedling length, seedling dimension, number of branch) record (70.04%, 15.52 cm, 6.12 root, 13.92 gm, 93.06 gm 72. 58 cm, 8.22 mm, 5.62 branch) respect play while (1000) mg\ L Rootex-3 record highest significal Increase in same characteristic (percentage of rooting ratio, length root, number of roots, fresh and dry weight of root, seedling length, seedling dimension, number of branches) was (84.25%, 4.89cm, 8.76mm, 5.58branch) while (2000) mg/L Rotex-3 recorded highest significant Increase in too characters (number of leaves , area of leaves) was (90.16 leaf\seedling, 7.87cm) and (94.54 leaf\seedling, 7.71 cm) respect ply the treatment of magnetic water recorded highest significal Increase in all rooting and vegetative characteristic and the combination treatment of (1000) mg\L IBA + (1000) mg\L Rootex-3 recorded highest significal Increase of most rooting and vegetative characteristic.

Keywords: Punic a granatum .L, rooting, Growth regulator, Magnetized water, Rootex-3 compound, IBA

Introduction

Vegetative propagation is the production of new plants that are similar to mothers in all phenotypic traits, anatomical structures, and chemical contents. The cuttings-multiplication method is one of the most common and popular methods of vegetative propagation(abu zaid ,2002). The punica granatum .L tree is a deciduous fruit tree, and the pomegranate tree rarely multiplies by the seed method because it is a tiring and not practical method, but most of the cuttings is considered the most used and widespread in the areas of pomegranate cultivation to obtain homogeneous seedlings similar to the mother plant and a greater number and in a short time (Youssef and others, 1980). Prepare the cuttings from mature wood at the age of (1-3) years, length (15-30 cm) and diameter (1.5-3 mm) during a period of dormancy. In order to increase the success rate, root the watering of the pomegranate, accelerate its roots, increase the length of the roots that make up one cuttings, and improve the quality of the roots. The mixture of them in a ratio of (1: 1) for the purpose of obtaining satisfactory results in terms of the large number and strong growth of transverse roots developing on the watering-cuttings bases. Plant growth regulators are synthetic compounds. Valoxins activate leg growth and root formation, reveal lateral shoots and activate cambium cells (Ibrahim and Mohamed, 1991). Aytekin Polat et al (2009) indicated when treating the watering-cuttings of pomegranate of a length (20-25 cm) with indole butyric acid (IBA) in concentrations of 1000,0 mg / l) on the comparison treatment in the rooting ratio. He

found Youssef and others (1991), Al-Safi (1997), and al-Dabbagh and others (2002). The use of toxins leads to improved rooting of the fig cuttings. Youssef and Saadoun (1981) were able to obtain the success rate of rooting the pear pens to form and spread the cultivation in Iraq, where it reached (77%) when treating the solid watering cuttings at a concentration of 3000 mg/liter from (IBA). How much (2010) was found in a study conducted to find out the effect of different concentrations of growth regulator (IBA) and type of rationality in susceptibility to rooting five varieties of pomegranate exceeding the concentration of 9000 mg / l) of IBA registering the highest rooting ratio and the average root length Formed. Notice Taha et al. (2002). The two coefficients (NAA) exceeded the concentration of (100 mg/liter) and (IBA) by concentrations of (200 mg/liter) and gave the highest percentage of Rooting of Sidr Root of 22.22% and 11.11%, respectively, and these two treatments excelled in all root and vegetative characteristics. While the treatment outperformed the (NAA) with a concentration of (2000 mg/liter) on the rest of the transactions and gave an 11.11% rooting rate. Magnetized water is defined as the water that we obtain after passing through a specific magnetic field and this happens by placing a magnetic inside or near water for a period of time, and the water is magnetized by shedding a magnetic field of known intensity on the water for a certain period of time by the manufactured magnetic poles that differ in the fields The magnetism generated by it, and Lam (2004) stated that the factors on which the degree of magnetization depends are the amount of liquid and magnet and the duration of water retaining the acquired characteristics after its magnetization varies with the intensity of the magnetic field used and the field and the duration of its use. Habbas (2006) found that magnetized water helps to break down the hydrogen bonds in salty water, which helps to wash the soil and help the plant absorb water and minerals easily from highly saline soils. Accordingly, the use of magnetized water helps to increase agricultural production in quantity and quality and increases plant

capacity It resists diseases and reduces the use of chemical fertilizers, which has a positive impact on human health and the environment. Al-Ishaqi and Al-Dawoodi (2016) found a significant superiority of treated water magnet in some of the vegetative traits of the pomegranate seedlings in the cuttings, such as the length of the seedlings, the seedling diameter and the number of leaves, which reached 13.05 (cm), 0.70 (mm), and 13,05 (leaves/seedlings) respectively. Al-Ani and others (2008) obtained an increase in the chlorophyll content by (12.99%) when spraving local seedlings orange with magnetized water.

Aim of the study

Given the decline of orchards in fruit trees in general and pomegranate in particular in Basra Governorate due to the harsh environmental conditions, this study was conducted For the purpose of reviving these orchards as well, with the aim of knowing the following:

1) The best focus of the indole butter crock growth regulator (IBA) in pomegranate rooting.

2) Knowing the best concentration of the Rotex-3 rooting compound in pomegranate rooting

3) Knowing the effect of watering magnetically treated water on the cultivated cuttings of pomegranate

Materials and methods

The experiment was carried out at the Agricultural Research Station of the Department of Horticulture and Gardening Engineering At the Faculty of Agriculture \ Basra University for the period (10/12/2018) until (10/7/2019) inside the designed plastic tunnels, with a length of (3) meters and a width of (2) meters These tunnels were installed inside the cooled house covered with saran and nylon. Akl Al-Rumman was prepared from one of the private orchards in the Abu Khaseeb district in Basra Governorate. The experiment included the

study of the effect of three factors, the first factor three concentrations Of the growth regulator (IBA) which is 2000,1000,0 (mg / l),the second factor is three Concentrations of Rotex-3 2000,1000,0 (mg / L). Where the rules of the cuttings were immersed in the solution for a period of (10) seconds before implantation. As for the third factor, it is the quality of irrigation water, where I irrigated the cuttings with two types of irrigation water, which are ordinary water and treated water magnet by passing it to a magnetic magnetizing device with a magnetic induction force of (1500) Gauss according to the parameters from the beginning of an experiment until the end of the experiment (7/10/2019).

Experimental design and statistical analysis:

The experiment was designed according to the design of the complete randomized sectors (CRBD) with three factors, which are three concentrations of the growth regulator (IBA) and three concentrations of the compound Rotex-3 and the third factor the quality of irrigation water by four repeaters (4 * 2 * 3 * 3) thus the number of experimental units The college (72) experimental units randomly distributed the global transactions within each iterator, according to (Al-Rawa and Khalaf Allah, 2000).

Experimental measurements

Vegetative traits: The vegetative traits were measured at the end of the trial season and included the following characteristics: -

1-1- Length of seedlings (cm): - The length of the seedlings was measured at the end of the experiment season and by means of the measuring tape, it started from the crown area to the developing top of the main stem and for all experimental units, and the average for each treatment was found.

1-2- Seedling diameter (mm): - Seedling diameter was measured at the end of the experiment season and using the vernier caliper height (5 cm) from the soil.

1-3- Number of leaves (paper/seedlings): - The average number of seedlings per seed was calculated at the end of the trial season and for all experimental units.

1-4- The number of branches (branch/seedlings): - According to the number of modern vegetable growths formed on the cultivated cuttings at the end of the season, the experiment was the average for each experimental unit.

1-5- The leaf surface area (cm2): - The paper area was calculated by (CL-202LASER AREA METER) device, where the paper area was calculated for three medium-sized papers for each plant and all the experimental units and extracted the rate and multiplied by the number of leaves per plant.

2- Root traits: - Root traits were measured at the end of the season. The experiment included the following: -

2-1- The percentage of rooting: The percentage of rooting was extracted at the end of the percentage season of rooting the experiment (7/10/2019) according to the following formula.

2-2- Number of successfully rooted brains Successful rooted cuttings number

Rooting percentage (%) = _____ x 100

The total number of cultivated cuttings

2-3- Number of roots (root/stem): - According to the average number of roots for experimental units at the end of the experiment season

2-4- Root length ratio (cm): - The general average root length ratio for each experimental unit was calculated at the end of the trial season and using the measuring tape.

2-5- Soft weight and dry weight of the roots (g): - The seedlings were extracted at the end of the experiment season, separating the vegetative group from the root system, then washing the root system with water well to get rid of the residue of the mud suspended by it

and then according to the soft weight of the roots by the scale and for each experimental unit. Then these roots were dried for a period of time for the purpose of calculating their dry weight and then the average dry weight was calculated for all experimental units.

Results and discussion

The results of Table (1) showed a significant effect of the treatment of the pomegranate cuttings with the growth regulator (IBA) in some vegetative traits, especially when treating with a concentration of (1000) mg / 1 as it gave the highest values in the traits (seedlings length, seedling diameter, number of branches (as it reached) 5.625,8.486,72.58) respectively, compared to the comparison treatment that gave the lowest values and reached (4.333,6.983,56.29) respectively as the results of Table (1) showed a significant effect of the treatment of the cuttings in the growth regulator Rotex-3 as it gave the concentration (1000) mg / 1 The highest values in the vegetative traits are the length of the radius, radius, and number of branches, and (5,500,8,850,85.00),reached respectively,

compared to the comparison treatment of (4.500,7.395,46.00). The same table also showed the significant effect of irrigation water, as the treatment of irrigation with magnetic water achieved the highest readings in the previous vegetative traits and reached (5.361,7.786,69.41), while the treatment of irrigation with ordinary water recorded the lowest values and reached (4,417,7.452,59.97) respectively. The results also indicate the effect of the significance of the bilateral interaction between the regulators of growth (IBA) ROTEX-3, as the treatment gave (1000) mg/liter IBA +) 1000) mg / L ROTEX-3 the highest values in the characteristic (length, diameter, number of branches for one seedling) These values were (6,500,9,419,81.87), respectively. Also, the triple interference between the concentration between (1000) mg/liter IBA + - (1000) mg/liter Rotex-3 and watering with magnetized water had a positive effect on the green vegetative qualities if this combination highest values and reached gave the (7.00,10.33,89.25) compared to a treatment Comparison and irrigation with ordinary water amounted to (3,500,5,922,40.75), respectively.

Table No. (1) Effect of irrigation water quality and treatment with growth regulators IBA and ROTEX-3 and their interactions in length and Seedling diameter and number of branches of the pomegranate Cutting.

Branches number (branch\seedling)				Seedling diameter(mm)				Seedling length(cm)				IBA	water quality
water	rootex-3			water rootex-3			water	rootex-3					
quality ×	3	2	1	quality ×	3	2	1	quality ×	3	2	1		
IBA				IBA				IBA					
4.08	4.00	4.75	3.50	7.16	6.59	8.97	5.92	49.75	53.00	55.50	40.75	1	normal
4.83	4.25	6.00	4.25	7.97	8.41	8.50	6.99	66.58	75.25	74.50	50.00	2	
4.33	4.75	5.25	3.00	7.21	6.41	8.96	6.27	63.58	58.50	74.75	57.50	3	
4.58	4.50	5.00	4.25	6.80	6.82	6.98	6.59	62.83	64.50	77.50	46.50	1	magnetized
6.41	6.50	7.00	5.75	8.48	8.55	10.33	6.56	78.58	84.25	89.25	62.25	2	1
5.08	5.25	5.50	4.50	8.07	7.98	8.85	7.39	66.83	69.50	85.00	46.00	3	
1.07	1.86			1.91	3.32			12.38	21.44			LSD 0.05	
	4.87	5.58	4.20		7.46	8.76	6.62		67.50	76.08	50.50	rootex-	3 Effect
Effect	0.76			Effect	1.35		Effect	8.75			rootex-3	LSD 0.05	
water				water				water					
4.41	4.33	5.33	3.58	7.45	7.14	8.81	6.39	59.97	62.25	68.25	49.41	normal	water
5.36	5.41	5.83	4.83	7.78	7.78	8.72	6.84	69.41	72.75	83.91	51.58		quality
												magnetized	rootex-3
0.62	1.07			1.10	1.91			7.15	12.38			LSD 0.05	
Effect				Effect				Effect				•	
IBA				IBA				IBA					
4.33	4.25	4.87	3.87	6.98	6.71	7.98	6.25	56.29	58.75	66.50	43.62	1	IBA
5.62	5.37	6.50	5.00	8.22	8.48	9.41	6.77	72.58	79.75	81.87	56.12	2	×
4.70	5.00	5.37	3.75	7.64	7.19	8.90	6.83	65.20	64.00	79.87	51.75	3	TOOLEA-5
0.76	1.31			1.35	2.35			8.75	15.16			LSD 0.05	

The results of Table (2) show the moral effect of the treatment of the cuttings with growth RTX-3, as regulators (IBA) and the concentration (2000) mg/liter IBA gave the highest values in the average number of leaves and the leaf surface area reached (7.87,90.16) compared to the comparison treatment that gave the lowest The values are (6.18,76.87), respectively. The concentration (2000) mg / l gave ROTEX-3 the highest values in the previous two attributes, reaching (7.71,94.54). It also achieved the bilateral interaction between the concentration between (2000) mg/liter IBA + - (2000) mg/liter Rotex-3, the highest readings in the two papers, and the leaf surface area of (8.34,100.37), respectively.

The magnetized water irrigation treatment recorded the highest values that amounted to (7.34,92.47) compared to the plain water irrigation treatment which gave the lowest values (6.83,75.86), respectively. Also, the triple interference between the concentrations between (2000) mg/liter IBA + - (2000) mg/liter Rotex-3 and watering with magnetized water had a significant effect, as this combination gave the highest values in the two leaves number and leaf surface area and reached (8.72,100.047) on In comparison with the comparison treatment and irrigation with ordinary water that gave the lowest values, it reached (4,865,61.75).

Table No. (2) Effect of irrigation water quality and treatment on growth regulators IBA and ROTEX-3 compound and their interactions between the number of leaves and the leaf surface area of the pomegranate cutting.

Leaf	surface	area (cm) ²	Leaf number (leaf/seedling)				IBA	water	
effect	r	ootex-3	3	effect	rootex-3			1	quality	
water	3 2 1		water	3 2 1		1				
IBA				IBA						
5.72	6.43	5.86	4.86	69.83	81.25	66.50	61.75	1	normal	
7.38	7.52	7.35	7.27	73.08	91.00	66.00	62.25	2		
7.40	7.95	6.45	7.81	84.66	95.25	85.50	73.25	3		
6.65	7.66 6.84 5.46		83.91	89.50	83.25	79.00	1	magnetized		
7.05	7.97	7.44	5.73	95.66	100.05	93.50	88.00	2		
8.33	8.72	8.29	7.98	97.83	100.04	96.25	92.50	3		
1.44	2.50			13.79	23.89			LSD 0.05		
	7.71 7.04 6.52				94.54	81.83	76.12	rootex-	3 effect	
effect	1.02			effect		9.75		rootex-3	LSD 0.05	
water				water						
6.83	7.30	7.30 6.55 6.65		75.86	89.16	72.66	65.75	normal	effect	
7.34	8.12	7.52	6.39	92.47	99.91	91.0	86.50		water	
								magnetized	rootex-3	
0.834		1.445		7.96		13.79		LSD 0.05		
effect				effect				1		
IBA				IBA						
6.18	7.04	6.35	5.16	76.87	85.37	74.87	70.37	1	IBA ×	
7.21	8.34	7.37	7.89	85.45	97.87	81.12	77.37	2	rootex-3	
7.87	7.75	7.40	6.50	90.16	100.37	89.50	80.62	3	1	
1.02		1.77		9.75		16.89		LSD 0.05		

The results of the tables (3) and (4) showed a significant effect of treatment of the cuttings with growth regulators (IBA) and Rotex-3 in

all studied root traits, as the treatment achieved by concentration (1000) mg / L IBA achieved the highest values in the average traits

(percentage of rooting, Root Number, Root Length, Root Weight, Root Dry Weight) (3.068,13.92,15.52,6.125,70.04) reached respectively compared to the comparison treatment that gave the lowest values. The treatment with a concentration of (1000) mg/liter Rotex-3 recorded the highest readings in the average of the previous traits and amounted to (3.367,13.37,13.75,7,0006,81.04), respectively. Also, the treatment of watering with magnetic water gave the highest values in those characteristics. and it reached (2.942,13.79,14.89,5,694,67.50), respectively, compared to the treatment of irrigation with plain water that gave the lowest values. The results of Table (3) (4) showed the positive effect of the bilateral interference between the concentration of (1000) mg/liter IBA + (1000)mg/liter Rotex-3, as this treatment recorded the highest values in the mentioned root traits and reached (4.235,17.86, 17.16,6.875,86.62), respectively. The triple overlap between the concentration was (1000) mg/liter IBA + -(1000) mg/liter Rotex-3 and watering with magnetized water had a positive effect as this combination gave the highest values in the traits (percentage of rooting, number of roots, root length, soft weight Root, the dry weight of root (and reached the (4,625,21.88,16.23,8.250,89.25) respectively compared to the comparison treatment and irrigation with ordinary water that gave the lowest values in those characteristics and reached (1.332, 5.395, 6.860, 3.000, 4.6.50)respectively. The results can be explained on the basis of the role of IBA as well as the Rotex-3 growth regulator in increasing root formation principles, their differentiation and development, elongation in the cuttings and increasing root formation as it increases the polarization of carbohydrates and compounds that contribute to rooting into the sanitary hall leading to root formation (Karakurt et al., 2009). The reasons are also attributed to the role of magnetized water as it increases the solubility and readiness of the nutrients needed by the plant, and this is then reflected in the growth (Kronenberg, 2005)

Table No. (3) Effect of irrigation water quality and treatment on growth regulators IBA and ROTEX-3 compound and their interactions in the percentage, length and number of roots of the pomegranate cutting.

Roots length(cm)				roots number(root/seedling)				Rooting percentage(%)				IBA	effect
effect	rootex-3			effect rootex-3			effect rootex-3			1	water		
water	3	2	1	water	3	2	1	water	3	2	1	1	
TD A				× m									
0 01	12.88	10.00	6.86	1DA 4.08	4 25	5.00	3.00	1DA 55.16	46 50	72 50	46 50	1	normal
12.06	12.00	15.50	12.27	4.00	5.25	5.00	5.00	67.16	40.30	72.50	50.75	1	normai
15.80	15.82	15.50	12.27	5.25	5.25	5.50	5.00	07.10	04.75	84.00	52.75	2	
12.00	11.26	12.80	11.94	3.50	3.25	4.00	3.25	68.41	59.75	78.50	67.00	3	
13.44	13.65	14.75	11.91	4.66	3.75	5.50	4.75	64.91	65.50	77.75	51.50	1	Magnetic
14.86	14.66	16.23	13.68	7.00	7.75	8.25	5.00	72.91	72.00	89.25	57.50	2	
13.52	13.49	13.75	13.33	5.41	6.00	7.00	3.25	64.66	56.50	84.25	53.25	3	
1.310	2.269		1.10	1.91		5.88	10.18			LSD 0.05			
	13.98	14.89	12.91		5.04	5.87	4.04		60.83 81.04 54.75 roote		rootex-	3 effect	
effect		0.92		effect		0.78		effect		4.16		rootex-3	LSD 0.05
water		_		water				water			_		
12.97	12.88	14.47	11.55	4.27	4.25	4.83	3.75	63.58	57.00	78.33	55.41	normal	effect
14.89	15.08	15.31	14.27	5.69	5.83	6.91	4.33	67.50	64.66	83.75	54.08		water
												Magnetic	rootex-3
0.756	1.31			0.639	639 1.107		3.396	5.882			LSD 0.05		
effect				effect				effect					
IBA				IBA				IBA					
11.89	11.67	12.39	11.62	4.37	4.00	5.25	3.87	60.04	56.00	75.12	49.00	1	IBA ×
15.52	15.07	17.16	14.32	6.12	6.50	6.87	5.00	70.04	68.37	86.62	55.12	2	rootex-3
14.37	15.21	15.12	12.78	4.45	4.62	5.50	3.25	66.54	58.12	81.37	60.12	3	
0.92	1.605			0.78	1.35			4.16	7.20			LSD 0.05	

Dry	root w	eight(g	n)	Soft root weight(gm)				IBA	water	
Effect	I	ootex-3	3	water	1	rootex-3	3	1	quality	
water	3 2 1		quality	3	2	1				
2 01	1 70	2 01	1 33	6 28	7.05	6 4 1	5 30	1	normal	
2.01	2.77	2.91	1.35	10.12	0.04	12.95	6.50	1	normar	
2.07	2.11	3.84	1.39	10.12	9.94	15.85	0.59	2		
1.80	1.85	2.20	1.35	8.63	7.33	11.83	6.73	3		
2.14	2.33	2.33 2.77 1.31		9.69	10.00	10.91	8.17	1	magnetized	
3.46	3.38	4.62	2.38	17.73	18.25	21.88	13.05	2		
3.22	3.13	3.84	2.68	13.96	14.43	15.32	12.13	3		
1.08	1.88			2.269	3.93			LSD 0.05		
	2.54	3.36	1.74		11.17	13.37	8.68	rootex-	3 effect	
Effect	0.76			Effect		1.60	1	rootex-3	LSD 0.05	
water				water						
									T 66 (
2.10	2.14	2.98	1.35	8.351	8.11	10.70	0.24	normal	Effect	
2.94	2.95	3.74	2.12	13.79	14.22	16.04	11.12		water	
								magnetized	rootex-3	
0.62	1.08			1.31	2.26			LSD 0.05		
effect				effect				1		
IBA				IBA						
2.07	2.06	2.84	1.32	7.99	8.52	8.66	6.78	1	IBA	
3.06	3.08	4.23	1.88	13.92	14.09	17.86	9.82	2	×	
2.51	2.49	3.02	2.01	11.30	10.88	13.58	9.43	3	100lex-5	
0.76		1.33		1.60		2.77		LSD 0.05		

Table No. (4) Effect of irrigation water quality and treatment on growth regulators IBA and ROTEX-3 compound and their interactions between the number of leaves and the leaf surface area of the pomegranate cutting.

References

- Ibrahim, Atef Mohamed and Mohamed El-Sayed Heikal (1991). Crop nurseries, fruit gardening - flowers - vegetable plants (second edition), Al Maarif facility, Alexandria.
- Abu Zaid , Shahat Nasier (2002) Cultivation and production of ornamental plants . Arab House for Publishing and Distribution
- Al-Ishaqi, Jassem Muhammad Khalaf and Awaz Mahdi Khorshid Al-Dawadi (2016) Response of the pomegranate cuttings to irrigation with magnetized water and growth regulator ((IBA and zinc component in

rooting and growth of some vegetative traits and their content of nutrients Kirkuk University - College) Agriculture - Hawija.

- Al-Dabbagh, Salah Thanoon Younis, Suleiman Muhammad Kaku Al-Zibari and Yassin Muhammad Abdullah (2002). The effect of the date of collection of films and the endol butyric acid on the ability of rooting fig. (Kalmerna), Tikrit Journal of Agricultural Sciences. <(1): 46-56.
- The narrator, Khashi Mahmoud and Abdel Aziz Muhammad Khalaf Allah (2000). Design and analysis of agricultural experiments. Books house for printing and publishing. Mosul University \ Iraq

- Al-Safi, Saleh Abdel-Sattar Abdel-Waheb (1997). The effect of the Sakia and oxygen site on rooting three varieties of figs.
- Al-Taha, Hoda Abdel Karim, Ali Jawad Al-Eidani and Muayad Fadel Abbas (2002), The Effect of Growth Adherents (NAA) and (IBA) on Rooting of the Cuttings Silver and Wood for Sidr Plant Basrah J. Agric-sci. 15 (4) 2002
- ZIZPHUS SPINA –CHRIST (L.) Willd .cv. Fasami
- Al-Ani, Moayad Rajab Aboud, Farouk Rajab Jumaa and Muhammad Jassim Muhammad Kaabi (2008) Response of local orange seedlings to irrigation with magnetized water and sprinkling with some nutrients Iraqi Journal of Agricultural Sciences -39 (3): 63-73.
- Habbas, struggle. 2006. Benefits of magnetic water. The Fourth International Conference on Healthy Water in the Arab World. Cairo, 6/5/2006
- Youssef, Youssef Hanna and Haifa Saadi Saadoun (1981). Pear propagation to form with hard wood pens Technical Journal, 74-69: 38.
- Youssef, Youssef Hanna, Haifa Saadi Saadoun, and Kassab Abu Labad (1991). Breeding of fig kadota with static wood pens Al-Rafidain Agriculture Journal, Volume 2 (16): 41-52.
- Youssef, Youssef Hanna and Jabbar Hassan Al-Nuaimi (1980) Production of citrus fruits. Ministry of Higher Education and Scientific Research. Albasrah university Al-Rafidian Agriculture Journal, Volume 3 <(3): 21-25.

Foreign sources

- *Aytekin polat, O. caliskan (2009) effect of Indole butyric acid (IBA) on rooting of cutting varipous pomegranate genotypes.
- * Kronenberg , K .2005. Magneto hydrodynamics: The effect of magnets on fluids GMX international. E.mail : <u>corporate@gmxinterhatinal.com</u>. Fax:909 -627-4411.
- *Karakurt, H.; R. Aslantas; G. Ozkan and M. Guleryuz (2009) Effect of indole 3-butyric acid (IBA), plant growth promoting rhizobacteria (PGPR) and carbohydrates on rooting of hardwood cutting of MM106 Apple rootstock. African. J . Agriculture Research 4(2) 60-64.
- *Saed .journal .owais (2010).Rooting response of five pomegrate varielies to indole butyric acid concentration and cuttings age pakistam of biological science 13(2):51-58.(2010).
- *saeed, s.F.(2007). Effect of magnetizing water and seed on the production of cucumber (cucumis sativus L .) under cooled plastic tunnels . M.sc.thesis faculty of agricultural engineering Khrtoom. Sudan
- *Singh , T.choudhary ,A.Kumar (2014) . Effect of various concentrations of (IBA) and (NAA) on the rooting of stem cutlings of mulberry (Mours Albal L.)under mist house condition in garhwal hill region . Indian journal of Hill farming , 27(1) : 125-131.

ISHS acta horticulture.