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EFFECT OF CULTIVARS, DATE, IBA AND THEIR INTERACTION ON ROOTING OF SEMI-HARDWOOD OLIVE CUTTING CVS. 'SHAMI ' AND ' QAISI.'

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ABSTRACT

This research was conducted during the growing season. (2016) in Bakrajo Nursery Station/ Sulaimani, Kurdistan Region-Iraq. Uniform and healthy olive (*Olea europaea* L.) Shami and Qaisi cuttings were used four concentrations (0, 1000, 2000, and 3000 ppm), three dates (15/3, 1/4, and 15/4) were used to investigate root growth of semi-hardwood olive cuttings cvs 'Shami' and 'Qaisi'. The following is a summary of the findings: The IBA hormone treatment had a considerable impact on most root growth. On the majority of the root growth, Shami cv. significantly dominated than the Qaisi cvs. Most root growth characteristics were strongly impacted by interactions between date, IBA, and cv. Shami.

KEYWORDS; Olea European Variety 'Shami ' and ' Qaisi'; Indole Butyric Acid; semi-hardwood cuttings

INTRODUCTION

Olive (*Olea europaea* L.) is a member of the Oleaceae family. It is one of the most useful crops with unique perils. Certainly, olive is one of the most ancient crops in Mediterranean regions, mainly in the **(Isfendiyaroðlu and Ozeker, 2009).** Olive trees are widely distributed on all continents in the world. There are approximately (50) million trees in Europe, (90) million in Asia, and the rest of the continents have the remaining trees. It is common to use growth regulators (hormones) for stimulating root formation in mist microsystems.

They usually result in faster and more roots when applied to the bottom of the cuttings. When applied to the cuttings' bottoms, the result in faster and more rooting. However, the application of other hormones, too, has given good results such as indole acetic acid (IAA) and (NAA) **(Isfendiyaroðlu and Ozeker, 2009; Muller *et al*., 2005).**

Olive propagation by cuttings is limited by its low rooting capacity and poor root quality.; As a result, easy-to-root cultivars could be useful for establishing new olive groves. **(Fabbri *et al*.,2004)**. In rooting, internal concentrations of various hormones and carbohydrates are critical. Auxin application from the outside may be a limiting factor in the roots of several olive species. **(Hartman *et al.,* 2002; Kelen and Ozkan, 2003; Negash, 2003)**. Indole butyric acid (IBA) is an essential auxin that aids in the rooting of cuttings. IBA, on the other hand, does not always promote the roots of olive cuttings (**Fabbri *et al*.,2004; Aslmoshtaghi and Shahsavar, 2010)**. Auxins, particularly IBA, have become standard therapy for improving cutting rooting in nurseries. Several attempts, similar to wounding, had been made to improve olive cutting rooting. **(Aslmoshtaghi and Shahsavar , 2014).**

Olive stem cuttings are difficult to root under normal conditions, but studies are underway to create high-value, true-to-type, and disease-free nursery plants. Plant growth regulators can help olive cuttings root. Indole butyric acid is an auxin that is often used to encourage the production of roots in plants and to generate new roots when cuttings are used to clone them. as reported by (**Fabbri *et al*.,2004)** Treatment with indole-3-butyric acid (IBA) ,cultivars but has less of an effect in hard-to-root cultivars. To get more specific findings from that application, the study was carried out to explore the influence of different treatments e soothes ting of olive cuttings.

One of the most essential variables in increasing the rooting ability of many species is the application of Auxin from the outside. **(Hartmann, *et al.*,2001)**. Auxin appears to have the largest impact on the start of adventitious roots and the division of root initials, according to several studies. For roots, growth regulators and hormones are commonly employed. **(Fernandes Serrano *et al.*,2002)** The most frequent substance used to increase the roots of cuttings is IBA. The enzyme monoamine oxidases can progressively degrade this acid, which has a modest impact (MAO).

Olives can be grown from seed with a high germination rate; however, growing from seed is a long process that takes time to mature into a plant suitable for budding, grafting, or fruiting. Therefore **(Pio *et al.*,2005)** Other ways of propagation should be considered to acquire fruits as soon as feasible, according to the suggestion. Cutt is one of the simplest and most rapid ways of propagation, using hardwood semi-hardwood cutting **(Siddiqui and Hussain, 2007)**. At the early phases of development, plants can generate three types of endogenous Auxin for root initiation (**Aini *et al.*,2009; Rashott *et al.*,2003; Simon and Petrasek, 2011)**. Many academics have spent decades trying to figure out what role IAA and IBA play in root initiation and growth.

Khursheed and Abdul (2008)which is considered the best root-promoting ingredient in olive propagation from cuttings, discovered that cuttings of the Cemlik cv. were simple to root and generated greater rooting percent 60-90 percent. IBA is a synthetic root-promoting chemical compound that has been found most reliable in stimulating rooting of cuttings in a large number of plant species and is non-toxic to plants over a wide concentration range **(Maghsudlu *et al* .,2013)**. Olive's low rooting potential can be caused by not selecting the ideal time to remove cuttings from the mother plants (**Maghsudlu *et al* .,2013).** and cultivars **(Fabbri *et al*.,2004)**. Plant growth regulators can help olive cuttings root more effectively. **(Adelson, F. D. 2009)**. However, Indole-3-butyric acid (IBA) and Naphthalene acetic acid (NAA) increase rooting responses of Olive stem cuttings cultivars **(Aslmoshtaghi and Shahsavar, 2010)**. **Rahman *et al.* (2002)** According to the study, using IBA at a dosage of 3000 ppm resulted in 70% rooting. They found that when the cuttings were treated with 3000 ppm IBA, the maximum number of roots was recorded, but the least number of roots was recorded in the control, showing that IBA changes the resistance potential of cellular walls and stimulates cellular division.

IBA treatment appears to enhance cell division in the ray cells between the major bundles on occasion, resulting in better root initiation and uniformity of rooting. Auxins have been shown to stimulate adventitious root development in stem cuttings by promoting the beginning of lateral roots primordia and enhancing glucose transport to the cutting base, both of which are required for root formation. **(Maghsudlu *et al* .,2013).**

Many factors, including cultivars, influence the capacity of olive cuttings to root. **(Turkoglu and Durmus, 2005)**, type of cuttings **(Turkoglu and Durmus, 2005)** and the auxin-like compounds **(Hartmann *et al.*,2002 and Asl Moshtaghi and Shahsavar, 2011)**.

This investigation aimed to:

1-To investigate the effects of different IBA hormone concentrations on olive cutting (Shami and Qaisi) to improve and promote root growth.

2-Determine the ideal time to apply the (IBA hormone) to olive cutting in the Kurdistan climate.

3-Compare the effects of different treatments (IBA hormone and date) on olive cutting.

4-Impact of two new olive cultivars on the root growth of olive cuttings in the region.

MATERIAL AND METHODS

The research was conducted in the Bakrejo station/ Suleimania nursery in 2016. The orchard is located in the Kurdistan region of Iraq, about 15 kilometers from Suleimania city center, above sea level and latitudes 35 o, 55 o, 09 o N and longitudes 45 o, 35 o, 18 o E. Given that olive is one of the most difficult plants to root, the **Restrepo-Diaz *et al.*, (2008)** experiment consisted of IBA at four 0,1000, 2000, and 3000ppm), three Dates (15/3, 1/4, and 15/4) and their interactions, which were treated on April 1st and repeated at the same concentrations on April 2016.

statistical analysis:

Experiments in this study used a Complete Randomized Block Design in a factorial experiment, with 72 treatments and three replicates each, each replicate being presented with ten cuttings.**Al-Rawi and Khalafalla 2000**

The number of cuttings per cultivar for each date (120).

The SAS system was used to tabulate and statistically evaluate the data obtained (1996). The differences between various treatment means were tested with Duncan's multiple range test at (5%) level **(SAS Institute. Inc, 1996).**

The parameters were measured:

The following measurements were recorded on **15th Nove 2016**.

Roots characteristics:

Root length (cm). Using a metric ruler, the length of the root was measured at the root zone that came into contact with a cutting.

Root number/cutting. The number of roots per cutting was estimated for each of the ten cuttings.

Whole root fresh weight (g). By a fine balance, fresh weight was estimated to separate the roots of the region associated with the cutting and weight immediately after the cutting was extracted (sensitivity 0.1 mg).

Whole root dry weight (g). Cuttings were given fresh weights of roots, which were then developed in paper bags and perforated in an electric oven at 65°C for 72 hours while firming up weight, and the dry weights (g) were computed using the delicate balance (sensitivity 0.1 mg).

Percentage of root/cutting (%). The following equation was used to compute the percentage of root per cutting:

$$\text{Root\%} = \frac{\textit{The number of secondary roots over the main roots}}{10} \; x\; 100\ (\%)$$

RESULTS and DISCUSSION

Different hormone concentrations and dates resulted in significant changes in the percentage of rooted cuttings, root number, root length, branch length, root fresh weight, and root dry weight, according to the analysis of variance. Increased IBA levels can impair rooting and shoot growth, and if the concentration of this hormone in the plant rises, it will not only be unable to play an active role in rooting, but it may also lower the number of roots involved in nutrient intake.

1. Root length (cm)

Table (1): noted that the cutting, when treated on the date (15/3), gave the highest value of root length (15.189cm) and the lowest value (5.908) recorded on the date (15/4).

Table (1): **Effect of cultivars, date, and IBA on root length of semi-hardwood olive cutting CVs. 'Shami ' and ' Qaisi'.**

cv.	IBA	Date			cv.* IBA	cv.
		15/3	¼	15/4		
Shami	0	11.083 de	7.253 gh	6.087 hi	8.141 d	13.696 a
	1000	13.880 cd	10.737 ef	8.887 e-h	11.168 c	
	2000	20.427 b	11.410 de	14.840 c	15.559 b	
	3000	25.960 a	24.030 a	9.760 e-g	19.917 a	
Qaisi	0	7.243 gh	6.347 hi	0.000 j	4.530 e	6.323 b
	1000	20.297 b	3.620 i	7.693 gh	10.537 c	
	2000	7.340 gh	0.000 j	0.000 j	2.447 f	
	3000	15.283 c	8.047 f-h	0.000 j	7.777 d	
Date		15.189 a	8.930 b	5.908 c	IBA	
cv.* Date	Shami	17.838 a	13.358 b	9.893 c		
	Qaisi	12.541 b	4.503 d	1.923 e		
IBA* Date.	0	9.163 d	6.800 e-g	3.043 h	6.336 d	
	1000	17.088 b	7.178 d-f	8.290 de	10.852 b	
	2000	13.883 c	5.705 fg	7.420 d-f	9.003 c	
	3000	20.622 a	16.038 b	4.880 gh	13.847 a	

According to Duncan's multiple ranges test at the 5% level, means within a column, row, and their interactions followed by the same letters are not statistically different from each other.

The application of IBA shows that when the cutting treated by 3000ppm IBA gave the highest value (13.847cm) when compared with other concentrations.

Root percentage was significantly influenced by cultivars, Shami cutting had around (13.696cm) that highest than Qaisi cutting cultivar.

Date and IBA show that the cutting, when treated by 3000ppm IBA, gave the highest value (20.622cm) of root length on the date (15/3) when compared with other interactions and the lowest value (3.043cm) was recorded in untreated cutting on the date (15/4).

Results show that the Shami cutting cultivar treated on date (15/3) significantly increased the highest root length (17.838cm) per cutting when compared to the other dates.

Also, the interactions between IBA concentration and cultivar note the 'Shami' cutting gave the highest value (19.917cm) of root length when treated with 3000ppm IBA. However, the treated with 2000ppm IBA Qaisi cutting cultivar gave the lowest value of root length (2.447cm).

Date, IBA, and Cultivar interactions significantly increasing root length per cutting, Shami cutting treated with 3000ppm IBA on the date (15/3) produced the highest number of root length per cutting (25.960cm).

2. Root number/cutting:

Table (2) shows that olive cuttings treated on the date (15/3) gave the highest root number value (8.096) when compared with other dates. While the olive cuttings treated with IBA concentration at level 3000ppm gave the highest value compared with other concentrations.

Table (2): **Effect of cultivars, date, and IBA on root number per cutting of semi-hardwood olive cutting CVs. 'Shami ' and ' Qaisi'.**

cv.	IBA	Date			cv.* IBA	cv.
		15/3	¼	15/4		
Shami	0	8.500 a-c	6.033 f	7.267 de	7.267 c	8.003 a
	1000	8.033 bbe	8.500 a-c	6.000 f	7.511 c	
	2000	8.600 a-c	8.200 a-d	7.600 c-e	8.133 b	
	3000	9.267 a	9.367 a	8.667 a-c	9.100 a	
Qaisi	0	7.067 ef	4.300 g	0.000 h	3.789 e	4.711 b
	1000	9.300 a	3.867 g	8.667 a-c	7.278 c	
	2000	4.833 g	0.000 h	0.000 h	1.611 f	
	3000	9.167 ab	9.333 a	0.000 h	6.167 d	
Date		8.096 a	6.200 b	4.775 c	IBA	
cv.* Date	Shami	8.600 a	8.025 b	7.383 c		
	Qaisi	7.592 bc	4.375 d	2.167 e		
IBA* Date.	0	7.783 b	5.167 e	3.633 f	5.528 b	
	1000	8.667 a	6.183 d	7.333 bc	7.394 a	
	2000	6.717 cd	4.100 f	3.800 f	4.872 c	
	3000	9.217 a	9.350 a	4.333 f	7.633 a	

According to Duncan's multiple ranges test at a 5% level, the means within a column, row, and their interactions followed by the same letters are not substantially different.

Results of cultivars revealed that Shami gave the highest value of root number (8.003) when compared with Qaisi cultivar (4.711).

Results indicated that the combination between Date and IBA concentrations displayed on the date (1/4) and 3000ppm IBA gave the highest root number (9.350).

Results of cultivars and Date concentrations interaction revealed that treated 'Shami' on the date (15/3) gave the highest root number (8.600).

Whereas the interactions between IBA and Cultivar showed that the Shami cultivar when treated with 3000ppm IBA gave the highest value roots number (9.100) per cutting and the lowest value (1.611) was recorded in Qaisi cultiva when treated with 2000ppm IBA.

Date, IBA, and Cultivar interactions significantly increasing root number per cutting, Shami cutting treated with 3000ppm IBA another n date (1/4) produced the highest number of root number per cutting (9367).

3. Whole root fresh weight (g):

Table (3) noted that the cutting, when treated on the date (15/3), gave the highest value of root fresh weight (4.696gm) and the lowest value (1.366gm) recorded on the date (15/4).

Table (3): **Effect of cultivars, date, and IBA on whole root fresh weight (gm) of semi-hardwood olive cutting CVs. 'Shami ' and ' Qaisi'.**

cv.	IBA	Date			cv.* IBA	cv.
		15/3	¼	15/4		
Shami	0	1.803 h	1.370 i	1.280 i	1.484 d	4.176 a
	1000	1.343 i	3.210 f	0.790 j	1.781 c	
	2000	5.630 d	3.233 f	3.317 f	4.060 b	
	3000	11.853 b	12.617 a	3.667 e	9.379 a	
Qaisi	0	1.743 h	0.787 j	0.000 l	0.843 f	1.730 b
	1000	9.697 c	0.487 k	1.873 h	4.019 b	
	2000	2.350 g	0.000 l	0.000 l	0.783 f	
	3000	3.150 f	0.677 jk	0.000 l	1.276 e	
Date		4.696 a	2.798 b	1.366 c	IBA	
cv.* Date	Shami	5.158 a	5.107 a	2.263 c		
	Qaisi	4.235 b	0.488 d	0.468 d		
IBA* Date.	0	1.773 ef	1.078 h	0.640 i	1.164 d	
	1000	5.520 c	1.848 e	1.332 g	2.900 b	
	2000	3.990 d	1.617 f	1.658 f	2.422 c	
	3000	7.502 a	6.647 b	1.833 e	5.327 a	

Means within a column, row, and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple ranges test at 5% level.

Application of IBA at 3000ppm IBA significantly increased root fresh weight (5.327gm) when compared with other concentrations.

Results of cultivars revealed that 'Shami' gave the highest root fresh weight (4.176gm) compared with ' Qaisi' olive cultivar (1.730gm).

Results indicated that the combination between Date and IBA concentrations displayed on the date (15/3) and 3000ppm IBA appeared to be the most potent treatment, as it gave the highest root fresh weight (7.502gm).

Results of cultivars and Date interaction revealed that treated 'Shami' on the date (15/3) gave the highest root fresh weight (5.158gm).

, Also the interactions between IBA concentration and cultivar note the 'Shami' cutting gave the highest value (9.379gm) of root fresh weight when treated with 3000ppm IB. However, the treated Qaisi cultivar with 2000ppm IBA gave the lowest value of root fresh weight (0.783gm).

Date, IBA, and Cultivar interactions significantly increasing root fresh weight, Shami cutting treated with 3000ppm IBA on the date (1/4) produced the highest root fresh weight (12.617gm).

4. Whole root dry weight (g)

These (4) noted that the cutting, when treated on the date (15/3), gave the highest value of whole root dry weight (2.669gm) and the lowest value (1.117gm) recorded in treated cutting on the date (15/4)

Application of IBA 3000ppm significantly increased whole root dry weight (2.770gm) when compared with other treatments.

Results of cultivars revealed that 'Shami' gave the highest whole root dry weight (2.478gm) compared with ' Qaisi' olive cutting cultivar (1.173gm).

Results indicated that the combinations between Date and IBA concentrations displayed on the date (15/3) and 3000ppm IBA appeared to be the most potent treatment, as it gave the highest whole root dry weight (3.773gm).

Results of cultivars and Date interaction revealed that treated 'Shami' cutting the on the date (1/4) gave the highest whole root dry weight (2.974gm).

,Also the interactions between IBA concentration and cultivar note the 'Shami' cutting gave the highest value (4.612gm) of whole root dry weight when treated with 3000pp IBA. However, the untreated Qaisi cutting cultivar gave the lowest value of whole root dry weight (0.437gm).

Table (4): Effect of cultivars, date, and IBA on whole root dry weight of semi-hardwood olive cutting CVs. 'Shami ' and ' Qaisi'.

cv.	IBA	Date			cv.* IBA	cv.
		15/3	¼	15/4		
Shami	0	1.103 i	1.220 i	1.130 i	1.151 e	2.478 a
	1000	0.910 j	2.833 e	0.713 k	1.486 d	
	2000	3.167 d	2.367 fg	2.457 f	2.663 c	
	3000	5.320 c	5.477 b	3.040 d	4.612 a	
Qaisi	0	0.603 kl	0.707 k	0.000 n	0.437 h	1.173 b
	1000	6.383 a	0.360 m	1.593 h	2.779 b	
	2000	1.640 h	0.000 n	0.000 n	0.547 g	
	3000	2.227 g	0.557 l	0.000 n	0.928 f	
Date		2.669 a	1.690 b	1.117 c	IBA	
cv.* Date	Shami	2.625 c	2.974 a	1.835 d		
	Qaisi	2.713 b	0.406 e	0.398 e		
IBA* Date.	0	0.853 h	0.963 g	0.565 i	0.794 d	
	1000	3.647 b	1.597 e	1.153 f	2.132 b	
	2000	2.403 d	1.183 f	1.228 f	1.605 c	
	3000	3.773 a	3.017 c	1.520 e	2.770 a	

Means within a column, row, and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple ranges test at 5% level.

The interactions between Date, IBA, and Cultivar Qaisi cultivar treated with 1000ppm IBA on Date (15/3) gave the highest value (6.383gm).

5. Percentage of root/cutting (%)

Table (5) shows that olive cutting treated on the date (15/3) gave the highest percentage of root per cutting (80.958 %) when compared with other Dates.

While the olive cuttings treated with IBA concentration at level 3000 ppm gave the highest value compared with other concentrations.

Results of cultivars revealed that CVs. Shami significantly increased the percentage of root per cutting (80.028 %) compared with CVs. Qaisi.

Results indicated that the combination between Date and IBA concentrations displayed on the date (1/4) and 3000ppm IBA gave the highest percentage of root per cutting (93.500 %).

Table (5): **Effect of cultivars, date, and IBA on a percentage of root per cutting of semi-hardwood olive cutting CVs. 'Shami ' and ' Qaisi'.**

cv.	IBA	Date			cv.* IBA	cv.
		15/3	¼	15/4		
Shami	0	85.000 a-c	60.333 f	72.667 e	72.667 c	80.028 a
	1000	80.333 be	85.000 a-c	60.000 f	75.111 c	
	2000	86.000 a-c	82.000 a-d	76.000 c-e	81.333 b	
	3000	92.667 a	93.667 a	86.667 a-c	91.000 a	
Qaisi	0	70.667 ef	43.000 g	0.000 h	37.889 e	47.111 b
	1000	93.000 a	38.667 g	86.667 a-c	72.778 c	
	2000	48.333 g	0.000 h	0.000 h	16.111 f	
	3000	91.667 ab	93.333 a	0.000 h	61.667 d	
Date		80.958 a	62.000 b	47.750 c	IBA	
cv.* Date	Shami	86.000 a	80.250 b	73.833 c		
	Qaisi	75.917 bc	43.750 d	21.667 e		
IBA* Date.	0	77.833 b	51.667 e	36.333 f	55.278 b	
	1000	86.667 a	61.833 d	73.333 bc	73.944 a	
	2000	67.167 cd	41.000 f	38.000 f	48.722 c	
	3000	**92.167 a**	**93.500 a**	**43.333 f**	**76.333 a**	

According to Duncan's multiple ranges test at the 5% level, the means within a column, row, and their interactions followed by the same letters are not statistically different from each other.

Results of cultivars and Date's interaction revealed that treated 'Shami' on the date (15/3) gave the highest percentage of root per cutting (86.000 %).

Results of IBA and cultivars interactions revealed that treated CVs. 'Shami' with IBA at level 3000ppm resulted in the highest percentage of root per cutting (91.000 %).

Date, IBA, and Cultivar interactions significantly increasing percentage of root per cutting, Shami cutting treated with 3000ppm IBA on the date (1/4) produced the highest percentage of root per cutting (93.667 %).

It was found that 3000ppm IBA increased the number of roots, the percentage of rooted cuttings, root length, root fresh weight, and root dry weight. the highest effect was observed under the treatment with 3000ppm IBA. But, control treatment had the lowest effect on the traits of rooting in olive cuttings. Cuttings planted in spring on the date (15/3) the highest effect on their evaluated traits (by 10-15%) with a significant difference with other dates.

CONCLUSION

It's clear from this study that

1- Olive cutting, cv. Shami and Qaisi, at high-concentration IBA cutting treatment considerably improved most root growth characteristics.

2- Cutting treatment of IBA with high concentration significantly increased most root growth characteristics for two cultivars of olive cutting cv. Shami and Qaisi..

3-Dates increased the majority of root growth parameters for two olive cutting cultivars, Shami and Qaisi, particularly on the date (15/3).

4-A high-level interaction between dates and IBA treatment, as well as two cultivars, resulted in improved root growth characteristics.

RECOMMENDATIONS

Depending on the conclusions mentioned above, the following points of view can be recommended:

1-Conducting additional research on various cutting cultivars and IBA and Dates treatment at high doses.

2-Using IBA at a higher level to improve cutting root growth.

3-Conducting anatomical studies on the cuttings under study to determine the influence of the substance employed on tissue structure.

4- Examine the impact of the application date to determine the best date for IBA therapy.

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پوختە

ئەم توێژینەوەیە لە نەمامگەی بەکرەجۆ لە شاری سلێمانی \ کوردستانی عێراق ئەنجامدراوە لەوەرزی گەشەی ساڵی (2016.

قەڵەمی زەیتونی هاوشێوە و تەندروست لە پۆلەکانی شامی و قەیسی بەکارهێنران بۆ تاقیکردنەوەی کاریگەری هۆرمۆنی

بە خەستیەکانی (0, 1000, 2000 , 3000) بەش لە ملیۆن بەسێ بەرواری جیاواز (15\3 , 1\4, 15\4 IBA)

لەسەر ڕەگە گەشەی قەلەمی نیمچە ڕەقە تەختیەکانی ئەم پۆلانە.

کاریگەری گەورەی هەبوو لەسەر گەشەی ڕەگی قەڵەمەکان بەشێوەیەکی گشتی , ڕەگە گەشەی قەڵەمی پۆلی شامیIBA هۆرمۆنی

وەک لە پۆلی قەیسی IBA.بەشێوەیەکی واتادار وەڵامدانەوەی باشتربوو بۆ

و بەروار و پۆلی شامی کاریگەرییەکی بەهێزیان هەبوو لەسەر زۆربەی خەسڵەتەکانی ڕەگە گەشەی IBAیەکانگیربونی هەرسێ هۆکاری

قەڵەمەکان.

الخلاصة

أجريت التجربة في مشتل بكرجو في محافظة السليمانية \ كردستان العراق في الموسم الزراعي لسنة 2016.

أجريت تجربة عاملية لدراسة تأثير IBA وبأربعة تراكيز مختلفة على التوالي (0,1000,2000,3000) جزء بالمليون وبثلاث مواعيد مختلفة وهي على التوالي (15\3 , 1\4 , 15\4) على نمو الجذور هرمون النمو للاصناف شامي والقيسي . , وأشباه الصلبةلعقل الزيتون

هرمون IBA كان له تأثير كبير واضح على نمو جذور عقل زيتون الشامي والقيسي .

و النمو الجذري لصنف الشامي كان له استجابة أكثر لهرمونIBA مقارنة بالنمو الجذري لصنف القيسي .

التداخل بين هرمونIBAتأريخ وصنف الشامي كان له تأثير محتوى على أكثر صفات النمو الجذري للعقل.