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Influence of some factors on growth characteristics of local Almond ..cultivar (*prunus amygdulus*)

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ABSTRACT

This study was conducted during the growing season (2022), in the nursery of the Horticulture Department, College of Agricultural Engineering Science, University of Duhok, Kurdistan region, Iraq, in the Summel district, situated to the west of Duhok city (8 km from Duhok city centre). The study examined the effect of spray with different concentrations of IBA (0, 1000 and 1500 mg L^{-1}), GA3 (0, 750 and 1500mg L^{-1}) and Nutri green (0 ,4 and 8mL.l) on some vegetative growth characteristics of almond (*Prunus amygdalus*) seedling. The superior results indicated the following: seedling spray with (1000,1500 mgl-1) IBA concentrations significantly gave the best increase length of shoots, leaf area, increase number of shoots, height of seedling, also seedling spray with (750 and 1500mg L-1) GA3 concentrations effect significantly gave the best result of increase length of shoots, leaf area, decrease number of shoots, increase height of seedling, whereas seedling spray with (4,8ml) Nutri green concentrations significantly gave the best result only of increase number of shoots, diameter of stem, leaf area, total chlorophyll, number of leaves, fresh dry Wight.

***Keywords*:** Plant growth regulator IBA, GA3, Nitrogen, Almond seedling.

INTRODUCTION

The deciduous Almond tree (*Prunus amygdalus*) is a member of the subgenus Amygdalus of the genus Prunus, in [1] [2]. Taxonomically, it is related to other fruit species like apricot and peach and belongs to the Rosaceae family, which also contains apples, pears, prunes, and raspberries [3]. One of the world's first commercial nut crops, almonds originated in West and Middle Asia and have since spread to the Middle East, China, the Mediterranean region, and North America [4].

Almonds' lovely white or pale pink blooms allow them to be utilized as ornamental plants in addition to their commercial use as nut crops [5]; [6 [7]. Furthermore, almond rootstock for almonds and plums is one of the significant species of rootstock and their scion pairings. The greatest place to plant them is in the poorest and driest soils since they are resilient, long-lasting, and drought-resistant [8].

Almond kernels have a high proportion of fat, protein, and fiber and are concentrated sources of energy. Saturated fats are rare in nature; instead, oleic and linoleic fatty acids predominate. According to [9], there is no correlation between low blood cholesterol levels and a substantial quantity of micronutrients and saturated fatty acids. Despite having favourable environmental conditions for development and fruiting, Egypt's commercial almond production is still quite small [10].

IBA hormone therapy had a major impact on most vegetative characteristics. During the majority of the vegetative development, Shami cv. significantly outperformed Qaisi CV. [11].

According to [12], IBA promotes rooting more than NAA, with 5,000 ppm IBA showing the greatest rooting. In light of this, additional research has shown that various dosages of IBA or other rooting hormones can produce successful outcomes [13], [14], [15]; [16]; [17]; [18]; [19].

IBA, a plant hormone in the auxin family, is a common component of plant rooting preparations used in commercial horticulture. Due to their capacity to achieve active cambium

IBA induces rooting in stem cuttings and air layers [20] [21] [22] [23] [24] [25] [26] [27] through regeneration, cell division, and cell multiplication.

A class of tetracyclic diterpenes renowned for their effects on fruit development, stem elongation, and leaf expansion is called gibberellins (GA_3) [28]. They are known to improve plants' photosynthetic efficiency through their effects on photosynthetic enzymes, leaf area index, light interception, and improved nutrient use efficiency. They also play a significant role in controlling many processes during plant growth. Gibberellic acid (GA_3)-induced integrated mechanisms boost sink strength and improve source potential through photosynthate redistribution [29].

Many plant developmental processes, including seed germination rate, stem elongation, trichome and leaf expansions, pollen maturation, and blooming stimulation, are influenced by plant hormones, particularly gibberellins (GA_3) [30]. Numerous physiological developments have been identified to include gibberellins [31].

Auxin and GA_3 frequently interact during the main stem elongation process, which is facilitated by hormones working in concert [32].

One of the most significant liquid organic fertilizers is Nutrigreen, which has organic nitrogen that, when absorbed by seedlings, transforms into mineral nitrogen thanks to soil-dwelling microorganisms [33]. It also contains organic carbon, which is incorporated into the synthesis of all organic compounds and makes up half of the dry weight of most plants. It also contains organic matter, which is crucial for enhancing the physical and biological qualities of soil because it breaks down large soil particles and improves their ventilation. It also increases the soil's capacity to hold water. It has 19 amino acids, which boost the activity of numerous amino acids involved in building cell membranes and encouraging the formation of roots and chlorophyll [34], which is reflected in improving the efficiency of photosynthesis [35]. Amino acids also play a role in forming nucleotides, vitamins, growth regulators, and enzymes [36].

Material and method:

The experiment was conducted from December 1, 2022, to December 1, 2023, at the University of Duhok's nursery, which is located in the Summel region and is run by the horticulture department of the College of Agricultural Engineering Sciences. The impact of Nutri Green, GA_3, and indole butyric acid (IBA) spraying on a few vegetative development traits of (*Prunes amygdalus*)(almond) cv. A study was done on local almond seedlings. The study utilized one-year-old seedlings from a Malta nursery. The seedling was placed in pots with a capacity of mixed soil (14 kg of soil), and their growth vigour and size were as close as possible. A Randomized Complete Block Design (RCBD) with a factor. Three factors were induced with all possible interactions. The first factor was foliar spray with three concentrations of Nutri green, (0, 4, and8 ml), duplicated of two equal sprays, first spray was carried out at 30 / 4 /2019 (137 days after transplanting), the second spray was applied after 15 days of the first spray (15/5/2019).

The second factor was foliar application of Gibberellic Acid (GA_3) with three concentrations (0, 750, and 1500 mg l^{-1}) duplicated in two equal sprays, the first spray was applied on 30/4/2019 (147 days after transplanting), the second spray was applied after 15 days from the first spray (15/5/2019). The third factor was foliar spray of indole butyric acid(IBA) with three concentrations (0, 100 and 1500 mg l^{-1}) duplicated of two equal sprays, first spray was in 30/4/2019 (149 days after transplanting), the second spray was applied after 15 days from the first spray (18 /5/2019).

Three actual concentrations of the foliar application treatments were prepared by thoroughly dissolving the chemical material in distilled water. A surfactant agent at two drops (0.025%) (Tween-80) was added to all spray treatment solutions per carrier (2 litres) to reduce the surface tension of the solution. The seedling was sprayed with different treatment solutions to run off point, late in the evening. Consequently, the experiment has consisted of 27 treatment combinations (3 * 3 * 3) with three replications and two seedlings for each experimental unit (81 transplants) [37].

The studied measurements included the increase in shoot length, leaf area, leaf dry matter, stem diameter, number of shoots, height of transplants, root fresh weight, and root dry weight.

Result and Discussion:

1- Increase length of stem (cm):

The results in Table 1 show that spraying almond seedlings with Nutri green levels had no significant effect on increasing the length of the stem.

Table (1) Effect of Nutri green, GA3, (IBA) and their interactions on the increase in length of the stem (cm) of local almond transplants.

Nutrigeen ml L^{-1}	GA_3 mg L^{-1}	IBA mg L^{-1}			Nutrigeen ml L^{-1} * GA_3 mg L^{-1}	Nutrigeen ml L^{-1}
		0	100	1500		
0	0	86.00def	96.00a	80.67ghfi	87.56b	85.78a
	750	80.00ghi	89.00bcd	92.00abc	87.00b	
	1500	84.00dfge	87.67cde	76.67ghi	82.78c	
4	0	74.67j	88.00cde	82.00ghf	81.56c	86.41a
	750	76.00ji	94.67a	87.67cde	86.11b	
	1500	92.00abc	88.67bcd	94.00ab	91.56a	
8	0	92.67abc	80.67ghfi	87.67cde	87.00b	86.56a
	750	92.67abc	82.67fge	84.00dfge	86.44b	
	1500	76.67jhi	88.00cde	94.00ab	86.22b	
Mean of IBA mg L^{-1}		83.85c	88.37a	86.52b		
Nutrigeen ml L^{-1} * IBA mg L^{-1}	0	83.33d	90.89a	83.11	Mean of GA_3 mg L^{-1}	
	4	80.89d	90.44ab	87.89bc		
	8	87.33c	83.78d	88.56abc		
GA_3 mg L^{-1} * IBA mg L^{-1}	0	84.44b	88.22a	83.44b	0	85.37a
	750	82.89b	88.78a	87.89a	750	86.52a
	1500	84.22b	88.11a	88.22a	1500	86.85a

There was no significant effect of the GA_3 interaction on the increase in stem length (Table 1). The most extended stem length was shown to be considerably impacted by the IBA interaction, with the highest mean (88.37 cm) being reported. The interaction between Nutria green and GA_3 substantially impacted the increase in stem length; the combination containing 4% Nutria green and 1500 mg GA_3 L-1 had the best mean (91.56 cm).

The best interaction treatment was Nutria green ml + 100mg IBA l-1, which produced the highest value (90.89 cm). The interaction between Nutria green and IBA was also significant in increasing the length of shoots. The interaction between GA_3 and IBA did not have a substantial impact on the maximum stem length of 88.78 cm.

The interaction between nutrigreen 0ml + 0 mg GA_3 L^{-1} + 100 mg was shown by the interaction between nutrigreen, GA_3, and IBA. Given that it produced the most significant value of increased shoot length (96 cm) and the interaction between 4ml Nutri green + 750 mg GA_3 L^{-1} + 100 mg, IBA L-1 was the most significant and effective treatment. The interaction of 4 Nutri green + 0 mg GA3 L^{-1} + 0 mg IBA L^{-1} produced the lowest result (74.67 cm), while IBA L^{-1} produced the highest value (94.67 cm) (Table 1).

2- Diameter of stem (mm):

Compared to the 0ml Nutri green, the results of Table 2 showed that spraying almond seedlings with 4ml Nutri green significantly increased the stem diameter, reaching 4.31 mm. When compared to the control, foliar spraying of GA_3 at a concentration of 750 mg L^{-1} significantly outperformed it in terms of increasing the stem diameter, yielding the highest value (4.3mm). Spraying seedlings with IBA (1500 mg IBA L^{-1}) substantially impacted the stem diameter, reaching a value of 4.37 mm.

Table (2) effect of Nutri green, GA_3, (IBA) and their interactions on diameter of stem (mm) of local almond transplants.

Nutrigeenml L^{-1}	GA_3 mg L^{-1}	IBA mg L^{-1}			Nutrigeenml L^{-1} * GA_3 mg L^{-1}	Nutrigeenml L^{-1}
		0	100	1500		
0	0	3.89cde	3.88cde	4.20abcde	3.99bc	4.01b
	750	4.26abcde	4.03bcde	4.17bcde	4.16abc	
	1500	3.10f	3.66f	4.86a	3.87c	
4	0	4.30abcde	4.43abc	3.73dede	4.15abc	4.31a
	750	4.31abcde	4.35abcd	4.63ab	4.43a	
	1500	4.30abcde	4.50abc	4.24abcde	4.35ab	
8	0	4.50abc	4.48abc	4.45abc	4.48a	4.24a
	750	4.16bcde	4.13bcde	4.63ab	4.31ab	
	1500	3.70de	3.74de	4.37abcd	3.93c	
Mean of IBA mg L^{-1}		4.06b	4.13b	4.37a		
Nutrigeenml L -1 * IBA	0	3.75c	3.86bc	4.41a	Mean of GA_3 mg L^{-1}	
	4	4.30a	4.43a	4.20ab		
	8	4.12ab	4.12ab	4.48a		
GA_3 mg L^{-1} * IBA mg L^{-1}	0	4.23ab	4.26ab	4.13ab	0	4.21ab
	750	4.24ab	4.17ab	4.48a	750	4.30a
	1500	3.70c	3.97bc	4.49a	1500	4.05b

Stem diameter was significantly impacted by the interaction with Nutri green and GA3, as shown in Table 2. Additionally, the combination of 8ml Nutri green + 0mg GA_3L^{-1} produced the highest stem diameter (4.48mm), while the combination of 8ml Nutri green + 750mg GA_3 L^{-1} produced the highest stem diameter (4.43mm). The largest stem diameter (4.48 mm) was obtained for the interaction between 8ml Nutri green + 1500mg IBA L^{-1}. There were notable impacts on stem diameter regarding the interaction between Nutri Green and IBA. The interaction of (1500mg GA_3 L^{-1} + 1500mg IBA L^{-1}) and (750mg GA_3 L^{-1} + 1500mg IBA L^{-1}) produced the highest value (4.48mm, 4.49mm), indicating that there were substantial impacts of GA_3 and IBA on the leaf area of almond seedlings.

The results of the Nutri green, GA3, and IBA interaction in Table 2 indicated a significant effect on the stem diameter. The interaction among 0ml Nutri green+ 1500mg GA3 L^{-1} + 1500mg IBA L^{-1} was the paramount treatment interaction as it gave the highest leaf area (4.48mm), while the lowest stem diameter (3.10mm) was gotten from the interaction of 0ml Nutri green+ 750mg GA_3 L^{-1} + 0mg IBA L^{-1}.

3- Leaf area (Cm^2):

Nutri green spraying had a significant impact on the highest value (40.97,40.27) from the interaction of 4,8ml Nutri green, and GA_3 had a significant impact on the leaf area value (40.51,40.29) from the interaction of (1500+750mg GA3 l -1), according to Table 3. and IBA also had a substantial impact on leaf area; the most significant value of 100 mg IBA L^{-1} was

attained (42.37). There was a substantial influence on the percentage of leaf area, according to the interaction between Nutri green and GA_3. Furthermore, the 8ml Nutri green+ 750mg GA_3 L^{-1} interaction produced the highest leaf area % (45.61) (Table 3).

Table (3) effect of Nutria green, GA_3, (IBA) and their interactions on leaf area(Cm^2) of local almond transplants.

Nutrigreenml L -1	GA_3 mg L^{-1}	IBA mg L^{-1}			Nutrigeenml L -1 * GA_3 mg L^{-1}	Nutrigreenml L -1
		0	100	1500		
0	0	41.67	31.67j	35.51ghji	36.28f	38.70b
	750	42.90cde	38.71hgef	31.62j	37.74ef	
	1500	37.20ghfi	45.81bc	43.19cde	42.07bc	
4	0	40.00egf	33.92ij	43.27cde	39.06de	41.27a
	750	43.12cde	32.94ij	45.50bcd	40.52cd	
	1500	41.94cdef	49.06ab	41.71cdef	44.24ab	
8	0	43.08cde	35.08hji	39.08efgh	39.08de	40.97a
	750	50.42a	47.96ab	38.44hgef	45.61a	
	1500	40.97def	33.41ij	40.32ef	38.24def	
Mean of IBA mg L^{-1}		38.73b	42.37a	39.85b		
Nutrigeenml L -1 * IBA mg L^{-1}	0	40.59cd	38.73ed	36.78e	Mean of GA_3 mg L^{-1}	
	4	41.68bc	38.64e	43.49ab		
	8	44.82a	38.82ed	39.28cde		
GA_3 mg L^{-1} * IBA mg L^{-1}	0	41.58bc	33.56e	39.29cd	0	38.14b
	750	45.48a	39.87cd	38.52d	750	41.29a
	1500	40.04cd	42.76b	41.74	1500	41.51a

The findings shown in Table 3, a statistically significant interaction between Nutri green and IBA was found in the percentage of leaf area. The most effective combination was 8ml Nutri green + 0mg IBA L^{-1}, which produced the most significant number (44.82). On the other hand, there was a notable impact on leaf area from the interaction of 750 mg GA_3 L^{-1} + 0 mg IBA L^{-1}, which produced the highest value (45.48). The most significant and effective interaction between Nutrigreen, GA_3, and IBA was found to be 8 ml of Nutrigreen with 750 mg of GA_3 L -1 + 0 mg of IBA L^{-1}, as this combination produced the highest leaf area percentage (50.42) (Table 3).

4- Total chlorophyl (Spad unit):

Table 4 shows that the spray investigated factors had a significant impact. The highest number (46.60) was obtained from 8ml Nutri green, GA_3 had a significant impact on total chlorophyll and was obtained at 1500 Ga_3 L^{-1}. IBA also significantly impacted total chlorophyll and was obtained at 100 mg IBA L^{-1} alone, which resulted in the highest value (40.83). Combining Nutri green with GA_3 significantly influenced total chlorophyll rise; the combination of 4 mL Nutri green + 1500mg GA3 L-1 produced the highest total chlorophyll increase (47.44) (Table 4).

Table (4) effect of nutrigreen, GA_3, (IBA) and their interactions on total chlorophyl of local almond seedling.

Nutrigeenml L -1	GA_3 mg L^{-1}	IBA mg L^{-1}			Nutrigeenml L -1 * GA_3 mg L^{-1}	Nutrigeenml L -1
		0	100	1500		
0	0	48.25bcdegf	39.65ljk	31.20m	39.70b	42.22c
	750	45.40giedhf	52.85ab	41.50ijk	46.58a	
	1500	44.80giehf	40.92ijk	35.37lm	40.36b	
4	0	49.80bcde	43.78gijhf	42.13jih	45.24a	44.13b
	750	37.05lk	35.12lm	46.92cdegf	39.69b	
	1500	35.63lm	55.05a	51.65abc	47.44a	
8	0	36.77kl	50.73abc	48.60bcdef	45.37a	46.60a
	750	43.30gijh	50.37bcdefg	48.28bcdefg	47.32a	
	1500	52.23ab	43.98gijhf	45.15eighf	47.12a	
Mean of IBA mg L^{-1}		43.69b	45.83a	43.42b	Mean of GA_3 mg L^{-1}	

Nutrigeenml L -1 * IBA mg L^{-1}	0	46.15abcd	44.47cd	36.02f		
	4	40.83e	44.65bcd	46.90abc		
	8	44.10d	48.36a	47.35ab		
GA_3 mg L^{-1} * IBA mg L^{-1}	0	44.72a	44.94a	40.64c	0	43.44b
	750	41.92bc	46.11a	45.57a	750	44.53ab
	1500	44.22ab	46.65a	44.06ab	1500	44.98a

The results presented in Table (4) demonstrated a substantial interaction between Nutri green and IBA on the percentage of total chlorophyll. The interaction that produced the highest total chlorophyll (48.36) was 8ml Nutri green + 100mg IBAL^{-1}. On the other hand, the total chlorophyll percentage was significantly impacted by the interaction between GA_3 and IBA. The interaction resulting from 0 mg GA_3 L^{-1} + 100 mg IBA L^{-1} produced the highest value of 44.94. The triple interaction between urea, GA_3, and IBA produced the highest overall chlorophyll percentage (55.05), suggesting that 4 ml Nutrigreen + 1500 mgGA_3 L^{-1} + 100 milligrams of IBA L^{-1} was the most significant and effective interaction
(Table 3).

5- Increase Number of branches:

Table 5 shows that the spray of Nutri Green ingredients had no discernible impact. When compared to the control, foliar spraying of GA_3 at a concentration of 750 mg L^{-1} significantly outperformed it in terms of increasing the number of branches, yielding the highest value (11.89). The maximum value of 11.96 was obtained from 1500mg IBA L^{-1}, which had a substantial effect on the number of branches. Demonstrates that applying nutrigreen and GA_3 levels to almond transplants has a significant impact on increasing the number of branches, particularly at levels of 4ml and 0mg GA_3 L^{-1}, respectively.

Table (5) effect of Nutri green, GA_3, (IBA) and their interactions on number of branches of local almond seedling.

Nutrigreenml L -1	GA_3 mg L^{-1}	IBA mg L^{-1} 0	100	1500	Nutrigreenml L -1 * GA_3 mg L^{-1}	Nutrigreenml L -1
0	0	11.67abc	11.00abc	11.67abc	11.44ab	10.70a
	750	10.67abc	10.00abc	12.00abc	10.89bc	
	1500	7.67def	11.00abc	10.67abc	9.78cd	
4	0	11.67abc	13.67a	12.67abc	12.67a	10.52a
	750	10.33abc	10.67abc	12.33abc	11.11abc	
	1500	5.67f	6.00f	11.67abc	7.78e	
8	0	12.33abc	10.67abc	11.67abc	11.56ab	10.00a
	750	6.67f	7.00fe	13.00ab	8.89de	
	1500	7.00ef	9.67cde	12.00abc	9.56cd	
Mean of IBA mg L^{-1}		9.30b	9.96b	11.96a		
Nutrigreenml L -1 * IBA mg L^{-1}	0	10.00bcd	10.67abc	11.44ab	Mean of GA_3 mg L^{-1}	
	4	9.22cd	10.11bcd	12.22a		
	8	8.67d	9.11cd	12.22a		
GA_3 mg L^{-1}* IBA mg L^{-1}	0	11.89a	11.78a	12.00a	0	10.30b
	750	9.22b	9.22b	12.44a	750	11.89a
	1500	6.78c	8.89b	11.44a	1500	9.04c

Additionally, it seemed that tThe combination 4+8ml Nutria green + 1500mg IBA L^{-1} was the most effective interaction treatment since it produced the greatest rise in branches (12.22, 12.22) (Table 5). The same table's results show that the interaction between GA_3 and IBA significantly increased the number of branches, with the most significant increase in shoots occurring at the interaction between 0+750+1500 mg GA3 L-1 and 0+100+1500 mg IBA L-1 (1244,12,11.89, 11.44). The combination of 4ml Nutria green + 0mg GA_3 L^{-1} + 100mg IBA L^{-1} produced the most statistically significant increase in the number of shoots (13.67). The combination of 4ml Nutria green + 1500mg GA_3 L^{-1} + 0mg IBA L^{-1} displayed the lowest increase in shoot count (5.67) (Table 5).

6-Number of leaves

As compared to the control, Table (6) shows that spraying almond seedling with Nutria green levels significantly increases the number of leaves on the seedling essentiality at levels (8ml Nutria green). The same Table also shows that, when compared to control, spraying with GA_3 concentrations dramatically increases the number of leaves of seedling essentiality at two

concentrations (750 and 1500 mg GA_3 L^{-1}). However, spraying seedlings with IBA concentrations (100 mg IBA L^{-1}) greatly increases the number of leaves

Table (6) effect of Nutria green, GA_3 (IBA) and their interactions on number of leaves of local almond seedling.

Nutrigreenml L -1	GA_3 mg L^{-1}	IBA mg L^{-1} 0	100	1500	Nutrigreenml L -1 * GA_3 mg L^{-1}	Nutrigreenml L -1
0	0	64.00l	68.00kl	73.00kij	68.33e	74.15c
	750	51.67m	76.00ihj	83.00efhg	70.22ed	
	1500	86.00def	93.67abc	72.00kj	83.89c	
4	0	80.33gihf	62.00l	78.33gihj	73.56d	82.85b
	750	94.33abc	96.33ab	83.33efhg	91.33ab	
	1500	88.67bcde	90.00bdec	72.33kj	83.67c	
8	0	96.33ab	92.33abcd	74.33kij	87.67bc	90.93a
	750	87.33cdef	99.33a	98.67a	95.11a	
	1500	89.67bcde	85.33defg	95.00abc	90.00b	
Mean of IBA mg L^{-1}		82.04b	84.78a	81.11b		
Nutrigreenml L -1 * IBA mg L^{-1}	0	67.22e	79.22cd	76.00d	Mean of GA_3 mg L^{-1}	
	4	87.78b	82.78c	78.00d		
	8	91.11ab	92.33a	89.33ab		
GA_3 mg L^{-1} * IBA mg L^{-1}	0	80.22b	74.11c	75.22c	0	76.52b
	750	77.78bc	90.56a	88.33	750	85.56a
	1500	88.11a	89.67a	79.78b	1500	85.85a

Combining Nutri green with GA_3 shows that there is a substantial effect on the number of leaves on the seedling; the combination of 8ml Nutri green and 750mg GA_3 L^{-1} produced the highest number of leaves (95.11) (Table 6). Additionally, Nutri Green and IBA together significantly increased the number of seedling vital leaves. The combination that produced the greatest number of seedling leaves was 8 milliliters of Nutri Green with 100 milligrams of IBA L^{-1} (92.33). In a similar vein, the combination of GA_3 and IBA had a substantial impact on the number of important leaves on seedlings at treatment levels of 750+1500 mg GA_3 L^{-1} + 0+ 100 mg IBA L^{-1}, yielding the highest number of leaves on seedlings (90.56,89.67,88.11) (Table 6). In contrast to the lowest value (51.67) from the triple interaction among 0ml Nutri green + 750mg GA_3 L^{-1} + 0mg IBA L^{-1}, the best value of the number of leaves of seedling from the triple interaction among Nutri green + GA_3 + IBA concentrations was shown from the interaction among 8ml Nutri green + 750mg GA_3 L^{-1} + 100+1500mg IBA L^{-1} (Table 6).

Table (7) effect of Nutri green, GA_3,(IBA) and their interactions on root fresh wight of local almond seedling.

Nutrigreenml L -1	GA_3 mg L^{-1}	IBA mg L^{-1} 0	100	1500	Nutrigreenml L -1* GA_3 mg L^{-1}	Nutrigreenml L -1
0	0	10.83abc	10.82abc	8.81hiegf	10.15a	8.26b
	750	8.52hiegf	11.86a	9.23cdehgf	9.87ab	
	1500	6.41kl	9.32cdegf	7.52hikjl	7.75ed	
4	0	6.37kl	7.42ikjl	5.95l	6.58e	9.28a
	750	7.69hikjg	11.15ab	8.71hiegf	9.18abc	
	1500	8.11hijgf	9.04hiedgf	10.11bcde	9.09abc	
8	0	7.65hijkg	9.60bcdef	6.84kjl	8.03cd	8.37b
	750	8.27hijgf	8.20hijgf	8.60hiegf	8.36cd	
	1500	10.53abcd	7.89hikjg	7.79hikjg	8.74bcd	
Nutrigreenml L -1 * IBA mg L^{-1}	0	8.58bc	10.67a	8.52bc		
	4	7.39c	9.20b	8.25bc	GA_3 mg L^{-1}	
	8	8.82bc	8.56bc	7.75bc		
GA_3 mg L^{-1}* IBA mg L^{-1}	0	8.28bc	9.28ab	7.20c	8.25b	
	750	8.16bc	10.40a	8.85b	9.14a	

	1500	8.35bc	8.75bc	8.47bc	8.52b
IBA mg L^{-1}		8.26b	9.48a	8.17b	

7-Root fresh weight (gm):

When almond seedling is sprayed with Nutria green levels, Table (6) shows that the fresh root weight essentiality levels (4ml Nutria green) are much higher than when the control group is sprayed. The root fresh weight essentiality is greatly increased by spraying with GA_3 concentrations at concentrations (750 mg GA_3 L^{-1}) according to the same Table. Applying IBA concentrations of 100 mg IBA L^{-1} to seedlings results in a notable rise in their root fresh weight. The combination of Nutria Green and GA_3 shows a considerable impact on the seedlings' root fresh weight, with the greatest root fresh weight being 10.15. Additionally, a combination of 0 ml Nutria green + 100 mg IBA L^{-1} resulted in the maximum root fresh weight of 10.67 g of seedlings, demonstrating the important effect of urea and IBA in increasing the essentiality of root fresh weight. The greatest root fresh weight of the seedling (10.40g) was obtained at treatment of 750 mg GA_3 L^{-1} + 100 mg IBA L^{-1}, indicating a substantial effect of the combination of GA_3 and IBA in the same direction (Table 7)

Table (8) effect of Nutria green, GA_3, (IBA) and their interactions on root dry Wight of local almond seedling.

Nutrigreen ml L^{-1}	GA_3mg L^{-1}	IBAmg L^{-1} 0	100	1500	Nutrigreen ml L^{-1} ×GA_3mg L-1	Nutrigreen ml L^{-1}
0	0	4.21ab	4.84ab	3.21	4.42a	3.88a
	750	3.58bcdef	4.63abc	4.07abcde	4.09ab	
	1500	2.69f	4.06abcde	2.61f	3.12c	
4	0	3.03fde	2.80fe	3.34cdef	3.06c	3.50b
	750	3.72bcdef	3.50cdef	3.24fde	3.49bc	
	1500	5.88a	3.71bcdef	5.22a	3.94abc	
8	0	3.45cdef	4.08abcde	2.49f	3.34bc	3.35b
	750	3.07fde	3.02fde	3.38cdef	3.15bc	
	1500	4.33abcd	3.70bcdef	2.62f	3.55abc	
Nutrigreen ml L^{-1} *	A1	3.83ab	4.51a	3.30bc		
	A2	3.21bc	3.34bc	3.93ab	GA_3 mg L^{-1}	
	A3	3.61abc	3.60abc	2.83c		
GA_3mg L^{-1} *IBAmg L^{-1}	B1	3.90a	3.91a	3.02a	3.61a	
	B2	3.46a	3.72a	3.56a	3.58a	
	B3	3.30a	3.82a	3.48a	3.54a	
IBA mg L^{-1}		3.55ab	3.82a	3.35b		

8- Root dry Wight (gm):

According to Table (8), there is no discernible difference in the root dry weight percentage between seedlings sprayed with Nutria Green and GA_3. However, applying IBA to seedlings at a dosage of 100 mg IBA L^{-1} has a considerable impact on root dry weight. (The root dry weight dry weight percentage was found to be significantly impacted by the interaction between Nutria Green and GA_3. Additionally, the interaction of 0ml Nutri green + 0mg GA_3 L^{-1} produced the greatest root dry weight percentage (4.42g) (Table 8).

According to Table (8) results, there was a significant interaction between Nutri green and IBA on the percentage of root dry weight. The most potent combination produced the highest root dry weight (4.51g) 0 ml of Nutri green plus 100 mg of IBA L^{-1}. On the other hand, the root dry weight percentage was not significantly impacted by the interaction between GA_3 and IBA. The triple interaction between Nutri Green, GA_3, and IBA produced the greatest root dry weight percentage (5.88g),

suggesting that 4ml of Nutri Green + 1500mg GA_3 L^{-1} + 1500mg IBA L^{-1} was the most significant and effective interaction (Table 8)

Discussion:

The following important nutrigreen features have been studied: leaf area, number of leaves, total chlorophyll, stem diameter, and fresh and dry weight. Were variations in genotype features for root growth as IBA rose significantly in (stem length, stem diameter, leaf area, total chlorophyll, number of branches, number of leaves, fresh dry weight, and root dry weight), Variations in the development features of plants can be explained by the ability to absorb nutrients or hormones, as well as the process of photosynthesis ([38].; [39]) Moreover, the efficacy of a particular hormone or nutrient intake might be influenced by the genetic integrity of the plant species [40]. For the Tait's under study, the increase in gibberellic acid may be explained by its function in promoting cell division and elongation, which in turn increases vegetative growth ([41]; [42]. This increases the root system and boosts photosynthesis efficiency [43] and enhances the growth of plants. According to [44] [45], gibberellic acid enhanced the vegetative growth and leaf area of peach trees. These results corroborated their findings. The outcomes also agreed with Saleh's [46] observation that gibberellic acid lengthened the branches. The significance of Nutrigreen liquid organic fertilizer stems from its organic nitrogen content, which is converted by soil microorganisms into mineral nitrogen that is absorbed by seedlings and increases chlorophyll production [33]. Additionally, Nutrigreen plays a role in enhancing soil properties, increasing the availability of major and minor nutrients, facilitating their absorption by plant roots, and promoting plant growth [47], as well as increasing the dry weight and leaf area of Anna apple.

Conclusion:

The most significant findings from this study are as follows: (1) The spray containing 4 millilitres of Nutrigreen was found to be more effective in increasing the stem's length, diameter, leaf area, and fresh weight of the root. Nutrigreen 8ml concentrations in seedling spray proved more effective in increasing total chlorophyll and leaf count. (2) Spraying GA_3 at 750 mg L^{-1} was more successful in increasing the number of branches, root dry weight, leaf area, and stem diameter. It was preferable to spray GA_3 at 1500 mg L^{-1} to increase total chlorophyll. (3) IBA sprayed at 100 mg L^{-1} effectively stimulated increased stem length, leaf area, total chlorophyll, and leaf count. In general, foliar spraying with IBA outperformed transplants sprayed with urea and GA_3 in most metrics examined. Both fresh and dried weight roots are affected. IBA spray at a concentration of 1500 mg L^{-1} affects the stem's diameter and increases the number of branches. In most of the parameters examined, foliar spray with IBA was generally outperformed by seedling spray with nutrigreen and GA_3.

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تأثير بعض العوامل على خصائص نمو صنف اللوز المحلي (*Prunus Amygdulus*).

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لخلاصة

أجريت هذه الدراسة خلال موسم النمو (2022)، في مشتل قسم البستنة، كلية علوم الهندسة الزراعية، جامعة دهوك ، إقليم كردستان ، العراق ، في قضاء سوميل ، الواقع غرب مدينة دهوك (8 كم من مركز مدينة دهوك). تناولت الدراسة من تأثير الرش بتراكيز مختلفة من اندول بايوتريك أسيد (0,1000,1500 ملغم\التر) وجبريلين(0,750,1500ملغم\التر) نيتروجرين (0,4,8مل\التر) على بعض خصائص النمو الخضري في شتلات اللوزالبذرية (*Prunus amygdulus*). أشارت النتائج المتفوقة الى مايلي رش شتلات البذرية بتراكيز (1000,1500, ملغم\التر) اندول بايوتريك أسيد. أعطى أفضل نتيجة معنوية في زيادة طول الأفرع و المساحة الورقية وزيادة عدد الافرع وارتفاع الشتلات كما أعطى رش شتلات بتراكيز (750,1500,ملغم\التر) جبريلين أفضل نتيجة معنوية في زيادة طول الافرع,المساحة الورقية و انخفاض عدد الافرع وزيادة ارتفاع الشتلات ,بينما رش الشتلات بتراكيز نيتروجرين أعطى أفضل نتيجة,في زيادة قطرالساق,مساحة الورقية ,مجموع كاوروفيل,عدد الاوراق,وزن الجاف للاوراق.

الكلمات المفتاحية : *GC–MS* :، منظمات النمو *IBA,GA3* ,نيتروجين ,شتلات اللوز البذرية.