EFFECT OF GROWTH REGULATORS ON SEEDLINGS GROWTH OF APRICOT (*PRUNUS ARMENIACA* L.)

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ABSTRACT

This study was conducted during the growing season of 2021 and 2022 in horticulture station located at Akre city center Duhok Iraqi Kurdistan region, the study was aimed to investigate the effect of growth regulators on seedling growth of apricot and determined the best concentration of Gibberellin, Benzyl adenine and Kinetin to improve vegetative growth of seedling of apricot . so it consisted of three concentration of GA_3 (0, 250 and 500 mg.L^{-1}), BA (0,150 and 300 mg.L^{-1}), KIN (0,150 and 300 mg.L^{-1}) on some vegetative growth characteristics of apricot seedlings (*Prunus armeniaca* L.).The best results include the following. apricot seedlings sprayed with different concentrations of GA_3 significantly affected and gave the seedling height, number of leaves, dry weight, single leaf area and total chlorophyll. Also, seedling sprayed with different BA concentration effected significantly and gave the highest seedling diameter, number of leaves, single leaf area, and dry weight. Whereas seedling spray with different KIN concentrations significantly affected on seedling diameter and total chlorophyll. Generally, interaction between GA_3 and KIN and interaction between GA_3 and BA and the interaction between BA and KIN was effected significantly on most growth parameters. The best result was in the treatment (GA_3 500 mg.L^{-1} + BA 300 mg.L^{-1} + KIN 150 mg.L^{-1}) which significantly affected on all growth parameters (seedling height, seedling diameter, single leaf area, total chlorophyll, number of leaves and dry weight).

KEYWORDS: GA_3, BA, KIN, Seedling growth, Apricot.

INTRODUCTION

Apricot (*Prunus armeniaca* L.) is a member of the genus Prunus, which also includes cherry, peach, nectarine, plum, and almond. Apricot is originated in China and was cultivated extensively in the Mediterranean prior to being brought to North America. One of fruits from the Rosaceae family that can be found in temperate climates is the apricot. Apricot is of high economic importance for Iraqi Kurdistan Region and its culture is continuously developing. Regrettably, the quality and supply of apricots are still subpar and do not satisfy local demand. Around the world, apricot is mostly farmed in Algeria, Armenia, Afghanistan, Iran, Italy, Turkey, Morocco, France, China, and Uzbekistan (Bal, 2005). Climate is the primary factor determining the suitability of a site for apricot production. Apricots require about (400-600) chilling hours to ensure adequate bud production and can tolerate low winter temperatures but grow best in areas with a low risk of spring frost (Norton and Coates, 2012).

Stratification is the pre-treatment of seeds to mimic the natural circumstances that they would encounter in the soil throughout the winter. Seeds that have been pre-treated are better able to "break dormancy" and begin the germination process. Hard seed coats, underdeveloped embryos, primitive embryos, and inhibitory compounds can all contribute to seed dormancy (**Hartmann *et al*., 2014)**. For better survival and establishment of seedlings in the field, **Garca-Gusano *et al*., 2004** discovered two separate dormancies in stone fruit seeds: a physical (external) and embryo (interior) dormancy. Due to them we need the stratification or cold treatments, the seeds of temperate fruit species take a long time to germinate.

The Plant Growth Regulators (PGRs) are divided into five general groups of compounds based on their chemical structures and effects on plants. The groups are auxins, gibberellins, cytokinins, ethylene, and a group called

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inhibitors, which includes abscisic acid, phenolics, and alkaloids. Some new PGRs do not fit neatly into these classifications but are described as having effects that resemble those for known PGRs.

Exogenous growth regulator treatments – gibberellins (usually gibberellic acid GA_3 and GA_4+7) and cytokinin (usually kinetin, benzyl adenine)-have been shown to break dormancy in many seed species. Commercially the most common gibberellin is GA_3, and it is used to increase the length of the plant or to enhance plant yield **(Kumlay and Eryigit, 2011)**. Gibberellins improved the germination of peach and apple seeds. Gibberellins have also been shown to improve seed germination in a number of species and to break the physical dormancy of embryo-dormant seeds (**Hartmann *et al*., 2014)**. **Obaid *et al*., (2010)** found that the treatment plant of apricot with gibberellin acid increases plant height and leaf number was (2000 ppm) treatments and increase leaf area and total chlorophyll with for (1500 ppm) treatment.

The term cytokinin refers to a class of naturally occurring chemicals that are known to encourage cell division. It has been shown to postpone senescence. Synthetic benzyl adenine and kinetin are the two cytokines that are produced in the greatest quantities. Cell division, lateral bud growth, postponing senescence, shoot or organogenesis creation, and other processes are all facilitated by cytokinin in plants. Low auxin and high cytokines may encourage the development of shoot buds **(Letham in 1963). Aygun and Dumanoglu (2006)** Reported that application of gibberellin acid (GA_3) cytokinins effect on cell division, cell enlargement, dormancy, delay senescence of plant, flowering and fruiting in agricultural application this translates new plants in the nursery, breaking seed dormancy, or delaying senescence. **Peleg and Blum Wald (2011)** reported that cytokinin plays very important role as antagonistic during stress conditions. **Kako *et al*., (2015)** discovered that the peach (Dixired cultivar) treated with Kinetin (6 and 12 $mg.L^{-1}$) concentration gave the best content of chlorophyll (36.60) SPAD unit when budding at the first date and the buds treated with the first level of kinetin, compared the second level of kinetin 12 mg.L-1 and control treatment.

MATERIAL AND METHOD

This study was performed during the growing season of 2021 and 2022 in horticulture stations of Akre / Duhok / Iraqi Kurdistan region, during the period from 1st December 2021 to 1st July 2022, to study the effect of three concentration of GA_3 (0, 250 and 500 $mg.L^{-1}$), BA (0, 150 and 300 $mg.L^{-1}$) and KIN (0,150 and 300 $mg.L^{-1}$) on some vegetative growth characteristics of apricot seedlings (*Prunus armeniaca* L.). Seed of apricot like other temperate zone fruit trees need to be stratified in order to break their dormant period and improve seed germination. Seed is collected when the mature fruit is harvested, the fruit removed, seed cleaned and placed in a cool, dry place to prevent rotting or early germination. At first step seeds were kept in a moist substrate and placed in refrigerators for (90) day to provide uniform germination, better regular growing, and to end the embryo's period of dormant. At temperature (5±c) (Polat, 2007).Throughout, the stratification process started on 1st Dec. 2021 until 1st Mar. 2022 ,and before the stratification process the seeds were treated with the fungicide to get rid of the attached them. Moreover, they were planted on 1st Mar 2022 at depth 2 cm in polyethylene bag (15x30 cm.) were filled by 3.5 kg of river soil. After one month of seed germination processes the seedlings were sprayed twice by foliar application with three growth regulators concentrations of GA_3 (0, 250 and 500) $mg.L^{-1}$, Kinetin (0, 150 and 300) $mg.L^{-1}$ and BA (0, 150 and 300) $mg.L^{-1}$. The studies measurements included: Seedling height (cm) and stem diameter (mm), number of leaves ($leaves.branch^{-1}$), Single leaf area (cm^2), dry weight of vegetative system (g) and total chlorophyll (SPAD unit). This experiment was carried out according to the Randomized Complete Block Design (RCBD). Therefore, the experiment consisted of (27) treatments combination with three replication and ten seedlings for each experiment unit (3x3x3x3x10), total seedling (810 seedlings), the data were analysis by use SAS program and the difference between various treatments means are tested with Duncan Multiple range test at 5% level (SAS, 2013).

RESULTS AND DISCUSSION

1. Seedling height (cm).

Results in Table (1) show that sprayed apricot seedling with GA_3 was effective in increased the

seedling height significantly especially at concentration ($GA_3$500 mg.L^{-1}) which records the highest value reached (73.25 cm) which was differ significantly than the control treatment which record least value (50.21cm).While the kinetin (KIN) and benzyl adenine (BA) did not caused any significant influences on seedlings height as in control treatment.

Interaction between gibberellin and kinetin showed significant effect on the seedlings height trait and the best interaction was (GA_3 500 mg.L^{-1} + KIN 300 mg.L^{-1}) which scored the highest significant value (74.22 cm). Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (75.11) cm was for combination of (GA_3 500 mg.L^{-1} + BA 300 mg.L^{-1}). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment did not have any significant influences on seedling height as in control treatment. The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (76) cm when treated with ($GA_3$500 mg.L^{-1}+ BA 300 mg.L^{-1} + KIN 0 mg.L^{-1}) compared with control treatment which gave the least value on seedling height (47.53 cm) in (GA_3 0 mg.L^{-1} + BA 300 mg.L^{-1} + KIN 0 mg.L^{-1}) treatment.

Table (1): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on seedling height (cm) of Apricot.

GA_3 mg.L^{-1}	KIN mg.L^{-1}	BA mg. L^{-1} 0	150	300	GA_3 × KIN	GA_3 effect
0	0	50.67 c d	50.73 c d	47.53 d	49.64 b	50.21 c
	150	49.07 d	51.00 c d	49.33 d	49.80 b	
	300	49.60 d	51.67 c d	52.27 c d	51.18 b	
250	0	67.13 a b	65.93 a-c	67.47 a b	66.84 a	67.01 b
	150	68.27 a	67.87 a b	65.33 a-c	67.16 a	
	300	66.73 a-c	68.67 a	65.67 a-c	67.02 a	
500	0	71.00 a	71.67 a	76.00 a	72.89 a	73.25 a
	150	72.20 a	71.27 a	74.47 a	72.64 a	
	300	73.27 a	74.53 a	74.87 a	74.22 a	
GA_3 × BA	GA_3 0	49.78 b	51.13 b	49.71 b	KIN effect	
	GA_3 250	67.38 a	67.49 a	66.16 a		
	GA_3 500	72.16 a	72.49 a	75.11 a		
KIN × BA	KIN 0	62.93 a	62.78 a	63.67 a	63.13 a	
	KIN 150	63.18 a	63.38 a	63.04 a	63.20 a	
	KIN 300	63.20 a	64.96 a	64.27 a	64.14 a	
BA effect		63.10 a	63.70 a	63.66 a		

The same letters in means of each was not significantly different from each other according to Duncan's multiple ranges test at 5% level.

2. Seedling stem diameter (mm).

The data in Table (2) indicated there was no-significant difference between gibberellin concentrations on the seedlings stem diameter. Moreover, benzyl adenine treatment caused significant influence, the higher stem diameter (5.80 mm) in (BA 150 $mg.L^{-1}$) treatment, while the lowest value reached (4.45 mm) in (BA 0 $mg.L^{-1}$)treatment. Also, kinetin treatment caused significantly influence, the higher stem diameter (5.86 mm) in(KIN 300 $mg.L^{-1}$) treatment, the lowest value reached (4.51mm) in (KIN 0 $mg.L^{-1}$)treatment.

Interaction between gibberellin and kinetin showed significant effect on the seedlings diameter trait and the best interaction was (GA_3 500 $mg.L^{-1}$ + KIN 300 $mg.L^{-1}$) which scored the highest significant value (6.73) mm. Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (6.81) mm was for combination of (GA_3 500 $mg.L^{-1}$ + BA 150 $mg.L^{-1}$). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment caused significantly effect and the highest value (6.18)mm was for combination of (KIN 300 $mg.L^{-1}$ + BA 300 $mg.L^{-1}$). The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (6.05) mm when treated with (GA_3 0 $mg.L^{-1}$+ BA 300 $mg.L^{-1}$ + KIN 300 $mg.L^{-1}$) compared with control treatment which gave the least value on seedling diameter (3.30 cm) in (GA_3 250 $mg.L^{-1}$ + BA 0 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) treatment.

Table (2): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on seedling diameter (mm) of Apricot.

GA_3 $mg.L^{-1}$	KIN $mg.L^{-1}$	BA $mg.L^{-1}$			GA3 × KIN	GA_3 effect
		0	**150**	**300**		
0	**0**	3.66 a	4.82 a	5.80 a	4.76 a b	4.97 a
	150	3.57 a	5.37 a	5.54 a	4.82 a b	
	300	4.66 a	5.25 a	6.05 a	5.32 a b	
250	**0**	3.30 a	4.78 a	4.61 a	4.23 b	4.83 a
	150	4.57 a	5.71 a	3.96 a	4.75 a b	
	300	4.72 a	5.84 a	6.01 a	5.52 a b	
500	**0**	3.53 a	5.66 a	4.39 a	4.53 a b	5`.96 a
	150	5.72 a	7.34 a	6.83 a	6.63 a	
	300	6.30 a	7.43 a	6.47 a	6.73 a	
GA3 × BA	**GA_3 0**	3.96 b	5.15 a b	5.80 a b	**KIN effect**	
	GA_3 250	4.20 b	5.44 a b	4.86 a b		
	GA_3 500	5.19 a b	6.81 a	5.90 a b		
KIN × BA	**KIN 0**	3.50 b	5.09 a b	4.94 a b	4.51 b	
	KIN 150	4.62 a b	6.14 a	5.44 a b	5.40 a b	
	KIN 300	5.23 a b	6.17 a	6.18 a	**5.86 a**	
BA effect		4.45 b	**5.80 a**	5.52 a b		

The same letters in means of each was not significantly different from each other according to Duncan's multiple ranges test at 5% level.

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3. Number of leaves (leaves.seedling^{-1}).

Data In the Table (3) indicate that the higher number of leaves number was (35.07) leaves per seedlings when treated with (GA_3 500 mg.L^{-1}), and the least number was (21.01) leaves in control treatments. Forth more, benzyl adenine treatment caused a significant influence, the higher leaves number was (28.91) leaves in (BA 300 mg.L^{-1}) treatment. And the least number was (24.53) leaves in control treatments. While, the Kinetin did not impact on leaves number per seedlings.

Interaction between gibberellin and kinetin showed significant effect on number of leaves trait and the best interaction was (GA_3 500 mg.L^{-1} + KIN 300 mg.L^{-1}) which scored the highest significant value (38.44) leave. Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (37.80) leave was for combination of (GA_3 500 mg.L^{-1} + BA 300 mg.L^{-1}). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment caused significantly effect and the highest value (30.98) leave was for combination of (KIN 300 mg.L^{-1} + BA 300 mg.L^{-1}). The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (42.93) leaves when treated with (GA_3 500 mg.L^{-1}+ BA 300 mg.L^{-1} + KIN 300 mg.L^{-1}) compared with control treatment which gave the least value on seedling diameter (15.73) leaves in (GA_3 0 mg.L^{-1} + BA 0 mg.L^{-1} + KIN 300 mg.L^{-1}) treatment.

Table (3): Table (1): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on number of leaves (leaves.seedling-1) of Apricot.

GA_3 mg.L^{-1}	KIN mg.L^{-1}	BA mg.L^{-1}			GA_3 × KIN	GA_3 effect
		0	**150**	**300**		
0	**0**	17.27 k-l	23.60 e-l	22.33 g-l	21.07 c	21.01 b
	150	16.67 l	21.07 g-l	27.67 c-k	21.80 c	
	300	15.73 l	18.80 k-l	26.00 e-k	20.18 c	
250	**0**	24.40 e-l	25.13 e-l	23.13 f-l	24.22 c	24.01 b
	150	21.93 h-l	25.20 e-l	23.67 f-l	23.60 c	
	300	26.20 d-k	22.47 f-l	24.00 e-l	24.22 c	
500	**0**	31.27 b-i	32.80 b-g	32.20 b-g	32.09 b	**35.07 a**
	150	33.07 b-g	32.73 b-g	38.27 a b	34.69 b	
	300	34.27 b-e	38.13 a b	**42.93 a**	**38.44 a**	
GA3 × BA	**GA_3 0**	16.56 c	21.16 b	25.33 b	**KIN effect**	
	GA_3 250	24.18 b	24.27 b	23.60 b		
	GA_3 500	32.87 a	34.56 a	37.80 a		
KIN × BA	**KIN 0**	24.31 b c	27.18 a-c	25.89 b c	25.79 a	
	KIN 150	23.89 c	26.33 a-c	29.87 a	26.70 a	
	KIN 500	25.40 c	26.47 a-c	30.98 a	27.61 a	
BA effect		24.53 b	26.66 a b	**28.91 a**		

The same letters in means of each was not significantly different from each other according to Duncan's multiple ranges test at 5% level.

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4. Dry weight of vegetative system (g).

Table (4) indicated there was a significant deference in its data in dry weight of shoots, the highest weight (5.54 g) obtained in (GA_3 500 $mg.L^{-1}$) treatment, and lowest weight (3.04 g) in control treatments. The effect BA plant growth regulator was significantly increased the highest weight (4.27 g) in (BA 300 $mg.L^{-1}$) treatment. And the lowest weight was (3.64 g) in control treatment. While the KIN did not influence significantly on increasing of dry weight of vegetative system.

Interaction between gibberellin and kinetin showed significant effect on the dry weight trait and the best interaction was (GA_3 500 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) which scored the highest significant value (5.57) g. Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (5.98) g was for combination of (GA_3 500 $mg.L^{-1}$ + BA 300 $mg.L^{-1}$). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment caused significantly effect and the highest value (4.61) g was for combination of (KIN 150 $mg.L^{-1}$ + BA 300 $mg.L^{-1}$). The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (6.44) g when treated with (GA_3 500 $mg.L^{-1}$+ BA 300 $mg.L^{-1}$ + KIN 150 $mg.L^{-1}$) compared with control treatment which gave the least value on seedling diameter (2.29) g in (GA_3 250 $mg.L^{-1}$ + BA 0 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) treatment.

Table (4): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on dry weight of vegetative system (g) of Apricot.

GA_3 $mg.L^{-1}$	KIN $mg.L^{-1}$	BA $mg.L^{-1}$			GA_3 × KIN	GA_3 effect
		0	**150**	**300**		
0	**0**	2.69 g-i	3.02 g-i	2.81 g-i	2.84 c	3.04 b
	150	2.62 g-i	2.37 h i	3.81 e-h	2.94 b c	
	300	4.06 d-g	2.86 g-i	3.12 g-i	3.34 b c	
250	0	2.29 h i	3.44 f-i	3.53 f-h	3.09 b c	3.22 b
	150	2.66 g-i	3.66 f-h	3.58 f-h	3.30 b c	
	300	2.50 h i	3.65 e-h	3.66 e-h	3.27 b c	
500	0	5.67 a-c	5.12 a-c	5.93 a b	5.57 a	5.54 a
	150	4.97 c-e	5.27 b-d	6.44 a	5.56 a	
	300	5.30 b-d	5.59 b-d	5.56 a-d	5.48 a	
GA_3 × BA	GA_3 0	3.13 c	2.75 d	3.24 c	KIN effect	
	GA_3 250	2.48 d	3.58 c	3.59 c		
	GA_3 500	5.31 b	5.33 b	5.98 a		
KIN × BA	**KIN 0**	3.55 b	3.86 b	4.09 a b	3.83 a	
	KIN 150	3.42 b	3.77 b	4.61 a	3.93 a	
	KIN 300	3.96 a b	4.03 a b	4.11 a b	4.03 a	
BA effect		3.64 b	3.89 a b	**4.27 a**		

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5. Total chlorophyll (SPAD Unit).

Table (5) show that the plant growth regulator had effect in promoting the total chlorophyll content in leaves of apricot seedlings, the gibberellin (GA_3) concentrations had significant effect on total chlorophyll content, the highest total chlorophyll content in leaves (22.73) SPAD unit was at (GA_3 500 $mg.L^{-1}$) treatment but the lowest total chlorophyll content in leaves was (11.82) SPAD unit in control treatment. Moreover, the benzyl adenine effected significantly on total chlorophyll content in leaves , the highest value (19.25) SPAD unit was recorded at (BA 150 $mg.L^{-1}$) treatment , but the lowest total chlorophyll content in leaves was (17.75) SPAD unit in control treatment.. While the KIN had significant influence on total chlorophyll content in leaves and the highest chlorophyll content in leaves (18.75) SPAD unit was at (KIN 300 $mg.L^{-1}$) treatment ,and the lowest total chlorophyll content in leaves was (18.45) SPAD unit in control treatment.

Table (5): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on seedling Total chlorophyll (SPAD unit) of Apricot.

GA_3 $mg.L^{-1}$	KIN $mg.L^{-1}$	BA $mg.L^{-1}$			GA_3 × KIN	GA_3 effect
		0	**150**	**300**		
0	**0**	10.72 h	12.82 g	10.86 h	11.47 e	11.82 c
	150	11.47 h	13.12 g	11.65 h	12.08 d	
	300	11.06 h	13.71 f	10.93 h	11.90 d e	
250	**0**	19.10 e	23.01 a-c	21.53 c d	21.21 c	21.12 b
	150	19.22 e	20.79 e	22.58 a-d	20.86 c	
	300	22.17 b-d	21.26 c d	20.44 e	21.29 b c	
500	**0**	21.56 c d	23.34 a b	23.11 a b	22.67 a	**22.73 a**
	150	21.60 b-d	22.60 a-d	23.22 a b	22.47 a	
	300	22.89 a-d	22.61 a-d	**23.67 a**	23.06 a	
GA_3 × BA	**GA_3 0**	11.08 e	13.22 a-d	11.15 e	**KIN effect.**	
	GA_3 250	20.16 c	21.69 d	21.52 b		
	GA_3 500	22.01 b	22.85 b	23.33 a		
KIN × BA	**KIN 0**	17.12 b	19.73 a	18.50 a	18.45 b	
	KIN 150	17.43 b	18.84 a	19.15 a	18.47 a b	
	KIN 300	18.71 a	19.19 a	18.35 b	**18.75 a**	
BA effect.		17.75 c	**19.25 a**	18.67 b		

Interaction between gibberellin and kinetin showed significant effect on the total chlorophyll content in leaves trait and the best interaction was (GA_3 500 $mg.L^{-1}$ + KIN 300 $mg.L^{-1}$) which scored the highest significant value (23.06) SPAD unit. Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (23.33)

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SPAD unit was for combination of (GA_3 500 $mg.L^{-1}$ + BA 300 $mg.L^{-1}$). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment caused significantly effect and the highest value (19.73) SPAD unit was for combination of (KIN 0 $mg.L^{-1}$ + BA 150 $mg.L^{-1}$). The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (23.01) SPAD unit when treated with (GA_3 250 $mg.L^{-1}$+ BA 150 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) compared with control treatment which gave the least value on total chlorophyll (10.72) SPAD unit in (GA_3 0 $mg.L^{-1}$ + BA 0 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) treatment.

6. Single leaf area (cm^2):

Table (6) indicated their was meaningful significant difference between gibberellin concentrations on single leaf area, and recorded the highest single leaf area (9.60 cm^2) at (GA_3 500 $mg.L^{-1}$) treatment, and the lowest value (5.13 cm^2) in (GA_3 0 $mg.L^{-1}$) treatment. Also, benzyl adenine application had positive effect on this character when apricot seedling treated with BA (300$mg.L^{-1}$) was (7.79 cm^2) was recorded and not different with (BA 150 $mg.L^{-1}$) which record (7.72cm^2) and had meaningful significant difference with (BA 0 $mg.L^{-1}$) treatment was recorded (6.67 cm^2). While, the kinetin treatments had no significant difference in this character.

Interaction between gibberellin and kinetin showed significant effect on the single leaf area trait and the best interaction was (GA_3 500 $mg.L^{-1}$ + KIN 150 $mg.L^{-1}$) which scored the highest significant value (9.90) cm^2. Also, the second duel interaction between gibberellin and benzyl adenine caused significantly effect and the highest value (10.00) cm^2 was for combination of (GA_3 500 $mg.L^{-1}$ + BA 150 $mg.L^{-1}$). In same table, the interaction between the kinetin and benzyl adenine of plant growth regulators treatment had no significant difference. The triple interaction among all plant growth regulators gibberellin, kinetin and benzyl adenine caused significantly increased reached (10.79) cm^2 when treated with (GA_3 500 $mg.L^{-1}$+ BA 150 $mg.L^{-1}$ + KIN 150 $mg.L^{-1}$) compared with control treatment which gave the least value on single leaf area (3.91) cm^2 in (GA_3 0 $mg.L^{-1}$ + BA 0 $mg.L^{-1}$ + KIN 0 $mg.L^{-1}$) treatment

Table (6): Effect of plant growth regulators (GA_3, KIN and BA) at different concentrations on seedling Single leaf area (cm^2) of Apricot.

GA_3 $mg.L^{-1}$	KIN $mg.L^{-1}$	BA $mg.L^{-1}$			GA_3 × KIN	GA_3 effect
		0	**150**	**300**		
0	**0**	3.91 i	5.75 f-i	5.89 f-i	5.18 c d	5.13 c
	150	4.33 h i	5.06 g-i	5.21 f-i	4.87 d	
	300	4.64 g-i	5.21 f-i	6.17 e-i	5.34 c d	
250	**0**	4.72 g-i	7.99 a-i	7.99 a-i	6.90 c d	7.45 b
	150	8.23 a-h	8.15 a-g	9.14 a-f	8.51 b	
	300	7.03 b-g	7.34 b-i	6.43 e-i	6.94 b c	
500	**0**	9.32 a-f	10.57 a-e	9.21 a-g	9.70 a	**9.60 a**
	150	8.97 a-g	**10.79 a-d**	9.95 a-e	**9.90 a**	
	300	8.87 a-g	8.64 a-h	10.11 a-f	9.21 a	
GA_3 × BA	**GA_3 0**	4.29 e	5.34 d	5.76 d e	**KIN effect**	
	GA_3 250	6.66 d	7.83 c d	7.85 c d		

	GA_3 500	9.05 a b	10.00 a b	9.76 a b	
KIN × BA	**KIN 0**	5.98 a	8.10 a	7.70 a	7.26 a
	KIN 150	7.18 a	8.00 a	8.10 a	7.76 a
	KIN 300	6.85 a	7.06 a	7.57 a	7.16 a
BA effect		6.67 b	7.72 a	**7.79 a**	

The same letters in means of each was not significantly different from each other according to Duncan's multiple ranges test at 5% level.

The data indicate that Gibberellin, Kinetin and Benzyl adenine had significant effect on vegetative growth of apricot seedling As shown in Table (1,3,4,5,6) the seedling height, number of leaves, single leaf area, dry weight of vegetative system, total chlorophyll, were affected significantly when sprayed with GA_3 concentrations. This results were agreements with of **AL-Imam and AL Jbori 2011** in apricot at concentration of (GA_3 1000 mg.L^{-1}) increase the number of leaves, leaf surface area, and total chlorophyll. **Kumar and Shahnaz, 2013** in wild apricot at concentration of GA_3 500 ppm treatment which increases vegetative growth character compared with control treatment**.** Concerning the spray of apricot seedling with different BA concentration seedling diameter, number of leaves, dry weight, total chlorophyll, single leaf area was increases significantly in high BA concentration as shows in Table (2, 3, 4, 5, 6). This increase may be attributed to the role of the treatment in stimulating cell division and increasing their size and extension through the vital role of gibberellins and cytokinins in the production of proteins and nucleic acids **(Wasfi in 1998).** These results are in accordance with those obtained by **Çagler and Ilgin, 2009** on apple**.** the function of benzyl adenines as the first generation synthetic cytokinin that affects plant growth and development, affecting cell division and shoot formation, delaying tissue aging process, and serving as an official catalyst for the transformation of auxin inside plant tissues could be the cause of this result **(Hartman *et al*., 2014).** it was noticed from the table (2 and 5), that the KIN concentration increased significantly only seedling diameter and total chlorophyll of apricot seedling, similar results were obtained with 9 mg.L^{-1} kinetin in budded mulberry plant **(Kako, 2012),** and the result of **(Obaid *et al.*, 2012)** with kinetin of kiwifruit of variety Bruno.

CONCLUSION

according to the results that were obtained: (1) It can be concluded that the spray apricot seedlings with (GA_3 500 mg.L^{-1}) was more effective in increase seedling high, and enhancing single leaf area, number of leaves, dry weight of vegetative system and total chlorophyll (SPAD unit). (2) Spray with (BA 300 mg.L^{-1}) was more effective in improving increase seedling diameter, number of leaves and dry weight of vegetative system and increase single leaf area. Spray with (BA 150 mg L^{-1}) was the best in enhancing increases total chlorophyll (SPAD unit). (3) Spray with KIN at concentration (150 mg L^{-1}) was effective in stimulating only seedling diameter and total chlorophyll and (300 mg.L^{-1}) was more effective in improving number of leaves, dry weight, and single leaf area. Generally seedling foliar spray with GA_3 and BA was surpassed on foliar spray with KIN in most studied parameters.

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