

## Effect of pinching, paclobutrazol and kinetin on the growth and flowering of *Cassia Occidentalis*

Nebras Abbas Ali

Jinan Qasim Hussein

Department of Horticulture and Landscape Engineering , College of Agriculture, Al-Qasim Green University

### Abstract

The experiment was conducted in lathhouse of the Agricultural Preparatory School / Abi Ghareq for the spring season 2022\_2023 to study the effect of fencing and spraying with paclobuterol and kinetin and its interaction on the growth and flowering traits of *Cassia Occidentalis*. Where the symbol for pinching is C1 and no edging is C0, the plants were sprayed with three concentrations of paclobetrazole with two concentrations (0, 0.5 and 1 g. L<sup>-1</sup>) and its symbol is (P0, P1, P2), and the plants were sprayed with kinetin at concentrations (0, 50 and 100 mg.L<sup>-1</sup>) and its symbol (K0, K1, K2). It was conducted as a factorial experiment (2\*3\*3) in a split-plot design according to a Complete Randomized Blocks Design (R.C.B.D) with three replicates .Where each replicate contains 18 treatments with five plants per experimental unit (one plant per pot), the pinching represented the main plot and the concentrations of paclobetrazole and kinetin and their interactions represented the sub plot .The averages were compared using the Least Significant Difference L.S.D test at the 5% level, and the results showed excelled of edging on without pinching in the traits of the leaf area (587.75 cm<sup>2</sup>) and the number of flowering inflorescences (3.33 inflorescences.plant<sup>-1</sup>), The treatment of paclobetrazole with a concentration of (1 g.L<sup>-1</sup>) excelled in plant height (17.15 cm), leaf area (346.17 cm<sup>2</sup>), length of internodes (1.94 cm), and number of inflorescences (2.7 inflorescences.plant<sup>-1</sup>). While the treatment of kinetin with a concentration of (100 mg.L<sup>-1</sup>) excelled in length of the internodes (1.66 cm), the diameter of the flower (3.13 cm), while the treatment of Kinetin with a concentration of (50 mg.L<sup>-1</sup>) excelled in leaf area (630.20 cm<sup>2</sup>)

### introduction

The genus *Senna cassia* spp. belongs to the order of Fabales belonging to the Fabaceae family . The genus *Cassia* contains about 500 species, most of which are used for medical purposes or to decorate streets and parks because of their abundant yellow flowers. The *Cassia Occidentalis* is one of the most widespread plants. It is characterized by compound, paired, alternating feathery leaves, and the leaflets are from 4 to 6 pairs of opposite leaflets complete with a sharp edge, and the median veins of the leaflets do not divide them in half completely at the bases of the leaflets. Flowers in large yellow cluster inflorescences tending to brown, Horny fruits. The leaves and fruits of senna contain anthraquinone glycosides and their derivatives, which consist of Aloe- emoidin and Rhein glycosides, both of which are in free or bound form, and together they form

different glycosidic forms. The leaves that are sold commercially contain 2-3% of glycosides A and B together, and 2-4% of the glycoside, which is attributed to the mild colic associated with the action of senna. In general, senna is used as a stimulant for the muscular layer of the intestinal wall, so it is used as a laxative. Senna is one of the preferred laxatives for the treatment of chronic constipation. Senna differs from other plants, such as castor bean and cactus, in its lack of effect on headaches or dullness when used (Al-Amiri et al., 2009). Growth retardants are used when producing flowering potted plants to obtain a plant with specifications of suitable height, size and shape. Growth retardants are non-nutritional organic materials when used on plants that give a compact plant (compact) that hinders elongation but increases the lateral branches and the plant's content of chlorophyll and nutrients. As it works to hinder the action of gibberellins, and among the growth obstacles

are Cycocel, Alar, Paclobetrazole, and others (Sharifuzzaman et al., 2011). Cytokinins play an essential role in stimulating the process of cell division and specialization in association with auxins. It also highlights its importance in many other physiological processes, such as the phenomenon of apical dominance, which affects the process of branching in the plant. The first cytokinin compound discovered was Kinetin, which is not found naturally in the plant, but is one of the products of thermal rotting of adenine. The discovery of kinetin prompted the industrial synthesis of hundreds of compounds similar to it, but kinetin is one of the most common materials used in studies of the physiological effects of cytokines (Wareing and Phillips, 1981).

### Materials and methods:

The experiment was conducted in lathhouse of the Agricultural Preparatory School / Abi Ghareq for the spring season 2022\_2023 to study the effect of pinching, paclobutrazol and kinetin on the growth traits of senna plant.

### Study treatments:

#### The first factor: pinching

After planting the plants in the pots designated for them, and when the seedlings reach 6 pairs of true leaves Half of the plants were pinched and the other half of the experimental plants were left without pinching, and the symbol for un-pinching plants is C1, while the pinching plants are symbolized by the symbol C2.

#### The second factor: spraying with paclobutrazol p

The plants were sprayed 20 days after pinching, with three concentrations, as follows:

- 1-control without spraying paclobetrazole (P0)
- 2-Spraying paclobutrazol at a concentration of 0.5 g/L and the symbol is P1
- 3-Spraying paclobutrazol at a concentration of 1 g/L and symbol P2

#### The third factor: spraying with kinetin k

The treatment was sprayed on the leaves until complete wetness and twice: the first one week after the pinching and the second one month after the treatment with paclobutrazol and as follows:

- 1) control without spraying with kinetin, which is indicated by K0
- 2) Spraying kinetin with a concentration of 50 mg/L and its symbol K1
- 3) Spraying kinetin with a concentration of 100 mg/L and its symbol K2

### Experimental design:

A factorial experiment (2×3×3) was conducted with a split-plot design according to the Complete Randomized Blocks Design (R.C.B.D) with three replicates.

Where each replicate contains 18 treatments with five plants per experimental unit (one plant per pot), the kinetin represented the main plot and the concentrations of paclobetrazole and kinetin and their interactions represented the sub plot. The averages will be compared using the Least Significant Difference L.S.D test at the 5% level.

### Results:

#### plant height (cm)

The results in Table (2) that there were no significant differences between the pinching treatments of *Cassia Occidentalis*, while spraying with paclobutrazol reduced the plant height to 17.15 cm when treated with a concentration of 1 g. L<sup>-1</sup>, with a significant difference from the control treatment, which gave plants the highest height, which reached 68.66 cm. As for the effect of spraying with Kinetin, there were no significant differences between the spraying treatments with Kinetin. The bi-interactions between pinching and spraying with paclobutrazol led to significant differences between the plants,

where the C1P2 treatment was distinguished by giving the lowest height, which amounted to 16.63 cm, compared to the C2P0 treatment, which gave the highest height, which amounted to 69.39 cm. The interactions between fencing and spraying with kinetin led to significant differences in plant height, where treatment C1K2 had the lowest height of 30.30 cm, compared to treatment C1K0, which gave the highest height of 37.04 cm. Also, the joint effect between spraying with paclobutrazol and kinetin had a

significant effect on plant height, as the P2K0 treatment gave the lowest plant height of 15.33 cm, while the P0K0 treatment plants gave the highest plant height of 71.61 cm. In the triple interaction between the factors of the study, we notice that there are significant differences between the treatments. The treatment C1P2K0 gave the lowest values for the average plant height, which was 13.11 cm, while the C1P0K0 treatment recorded the highest plant height of 79.45 cm.

**Table (2) Effect of pinching, paclobetrazole, and kinetin and their interactions on plant height (cm) of Cassia Occidentalis**

P x C	Kinetin spraying (K)			(P) paclobutrazol	(C) pinching
	100 mg.L <sup>-1</sup> (K1)	50 mg.L <sup>-1</sup> (K1)	without spray(0K)		
<b>67.93</b>	<b>53.11</b>	<b>71.22</b>	<b>79.45</b>	without spraying ((P0)	without pinching (C1)
<b>18.85</b>	<b>19.22</b>	<b>18.78</b>	<b>18.56</b>	0.5 g.L <sup>-1</sup> (P1)	
<b>16.63</b>	<b>18.56</b>	<b>18.22</b>	<b>13.11</b>	100 g.L <sup>-1</sup> (P2)	
<b>69.39</b>	<b>72.74</b>	<b>71.67</b>	<b>63.77</b>	without spraying (P0)	(C2) pinching
<b>17.78</b>	<b>17.00</b>	<b>16.67</b>	<b>19.67</b>	0.5 g.L <sup>-1</sup> (P1)	
<b>17.67</b>	<b>17.56</b>	<b>17.89</b>	<b>17.56</b>	100 g.L <sup>-1</sup> (P2)	
<b>4.59</b>	<b>7.94</b>			L.S.D 0.05	
(C) pinching	interaction between pinching and Kinetin spraying				
<b>34.47</b>	<b>30.30</b>	<b>36.07</b>	<b>37.04</b>	without pinching (C1)	
<b>34.94</b>	<b>35.76</b>	<b>35.41</b>	<b>33.66</b>	(C2) pinching	
<b>2.65</b>	<b>4.59</b>			L.S.D 0.05	
(P)paclobutrazol	interaction between paclobutrazol and Kinetin spray				
<b>68.66</b>	<b>62.92</b>	<b>71.44</b>	<b>71.61</b>	(without spraying (P0	
<b>18.31</b>	<b>18.11</b>	<b>17.72</b>	<b>19.11</b>	(g.L-1 (P1 0.5	
<b>17.15</b>	<b>18.06</b>	<b>18.06</b>	<b>15.33</b>	(g.L-1 (P1 1	
<b>3.24</b>	<b>5.62</b>			L.S.D 0.05	
	<b>33.03</b>	<b>35.74</b>	<b>35.36</b>	(K) Kinetin spraying	
	<b>3.24</b>			L.S.D 0.05	

#### leaf area (cm<sup>2</sup>)

It is clear from the results of Table (5) that there are significant differences between the pinching treatments of Cassia Occidentalis plants, where pinching gave a leaf area of

587.75 cm<sup>2</sup>, excelled on the leaf area of plants without pinching which amounted to 489.19 cm<sup>2</sup>. While spraying with paclobutrazol reduced the leaf area to 346.17 cm<sup>2</sup> when treated with a concentration of 1 g. L<sup>-1</sup> and a

significant difference from the control treatment, whose plants gave the largest leaf area of 916.85 cm<sup>2</sup>, As for the effect of spraying with kinetin, the treatment was 50 mg. L<sup>-1</sup> excelled by giving it the largest leaf area of 630.20 cm<sup>2</sup>, with a significant difference from the control treatment, which gave the least leaf area of 474.84 cm<sup>2</sup>. The bi-interactions between pinching and spraying with paclobutrazol led to significant differences between the plants, where the C1P2 treatment was characterized by giving the lowest leaf area, which amounted to 235.97 cm<sup>2</sup>, compared to the treatments C1P0 and C2P0, which gave the highest leaf area, which amounted to 919.95 cm<sup>2</sup> and 913.75 cm<sup>2</sup>. The interactions between pinching and spraying with kinetin led to significant

differences in the average leaf area, where treatment C2K1 gave the highest average of 704.41 cm<sup>2</sup> compared to treatment C1K0, which gave the lowest average of leaf area of 432.66 cm<sup>2</sup>. Also, the effect between spraying with paclobetrazole and kinetin had a significant effect on the leaf area, where the treatment P0K1 gave the highest average leaf area of 1171.29 cm<sup>2</sup>, while P2K0 plants gave the lowest average leaf area of 271.63 cm<sup>2</sup>. In the triple interaction between the factors of the study, we notice that there are significant differences between the treatments, where treatment C1P2K1 gave the lowest average leaf area of 126.10 cm<sup>2</sup>. While treatment C1P0K1 recorded the highest values for the average leaf area, which amounted to 1204.33 cm<sup>2</sup>.

**Table (5) the effect of pinching, paclobetrazole and Kinetin and their interactions on the leaf area (cm<sup>2</sup>) of Cassia Occidentalis Cassia Occidentalis**

P x C	Kinetin spraying) K(			paclobutrazol )P(	pinching) C(
	100mg.L-1 (K1(	50mg.L-1 (K1(	without spray(OK)		
919.95	696.99	1204.33	858.53	without spraying (P0(	without pinching (C1)
311.64	298.85	337.55	298.52	0.5g.L-1 (P1(	
235.97	440.87	126.10	140.94	1 g.L-1 (P1(	
913.75	892.20	1138.238	710.82	without spraying (P0(	pinching) (C2
393.13	321.50	419.97	437.92	0.5g.L-1 (P1(	
456.37	411.77	555.02	402.33	1 g.L-1 (P1(	
70.82	122.65			<b>L.S.D 0.05</b>	
pinching) C(	interaction between pinching and Kinetin spraying				
489.19	478.90	555.99	432.66	without pinching (C1(	
587.75	541.82	704.41	517.02	pinching) C2(	
40.88	70.81			<b>L.S.D 0.05</b>	
paclobutrazol)P(	interaction between paclobutrazol and kinetin spray				
916.85	794.59	1171.29	784.68	without spraying (P0(	
352.38	310.18	378.76	368.22	0.5g.L-1 (P1(	
346.17	426.32	340.56	271.63	1 g.L-1 (P1(	
50.08	86.74			<b>L.S.D 0.05</b>	
	510.36	630.20	474.84	Kinetin spraying) K(	
	50.08			<b>L.S.D 0.05</b>	

**chlorophyll pigment (SPAD)**

It is clear from the results of Table (8) that there are no significant differences between the pinching treatments of senna plant, while spraying with paclobetrazole gave the highest chlorophyll dye when the treatment was at a concentration of 0.5 g. L<sup>-1</sup>, which amounted to 77.39 spad, with a significant difference from the control treatment, whose plants gave the lowest chlorophyll dye, amounting to 60.05 spad. As for the effect of spraying with kinetics, we note that there are no significant differences between the spraying treatments. The interactions between pinching and spraying with paclobetrazole resulted in significant differences between the

plants. Where the C1P1 treatment was distinguished by giving the highest chlorophyll pigment , which amounted to 75.82 spad, compared to the treatment C2P0, which gave the lowest chlorophyll dye, which amounted to 59.06 spad. Also, the joint effect between spraying with paclobetrazole and kinetin had a significant effect on the chlorophyll pigment , where the treatment P1K2 gave the highest chlorophyll dye amounting to 80.42 spad, while the P0K1 treatment plants gave the lowest chlorophyll pigment amounting to 58.93 spad. In the triple interaction between the factors of the study, we notice that there are no significant differences between the spraying treatments.

**Table (8) the effect of pinching, paclobetrazole, and chitin and their interactions on the chlorophyll pigment (SPAD) of senna plant *Cassia Occidentalis***

P x C	(K) Kinetin spraying			(P) paclobutrazol	(C) pinching
	mg.L- 100 (1 (K1	mg.L-1 50 ((K1	without )spray(OK		
61.04	62.18	61.64	59.31	without spraying (P0	without (pinching (C1
75.82	79.41	69.85	78.21	(g.L-1 (P1 0.5	
74.04	67.86	80.22	74.03	(1 g.L-1 (P1	
59.06	56.01	56.22	64.93	without spraying (P0	(C2) pinching
78.95	81.42	77.38	78.09	(g.L-1 (P1 0.5	
76.12	78.13	74.43	75.80	(1 g.L-1 (P1	
7.96	113.79			<b>L.S.D 0.05</b>	
(C) pinching	interaction between pinching and Kinetin spraying				
70.30	69.81	70.57	70.52	(C1) without pinching	
71.38	71.86	69.34	72.94	(C2) pinching	
4.60	7.96			<b>L.S.D 0.05</b>	
(P)paclobutrazol	interaction between paclobutrazol and Kinetin spray				
60.05	59.09	58.93	62.12	(without spraying (P0	
77.39	80.42	73.61	78.15	(g.L-1 (P1 0.5	
75.08	72.99	77.33	74.92	(1 g.L-1 (P1	
5.63	9.75			<b>L.S.D 0.05</b>	
	70.84	69.96	71.73	(K) Kinetin spraying	
	5.63			<b>L.S.D 0.05</b>	

**internodes length (cm)**

The results in Table (9) that there are no significant differences between the pinching treatments of senna plant in the average length of internodes, While spraying with paclobuterol led to significant differences between the spraying treatments, where the concentration 1 g.L<sup>-1</sup>, excelled giving the smallest length of internodes, which amounted to 1.22 cm. While it gave the control treatment of the Internodes length was the longest, which reached 1.94 cm. As for the effect of spraying with kinetin, we noticed that there were significant differences between the spraying treatments, where the treatment with a concentration of 100 mg.L<sup>-1</sup> was excelled on the largest Internodes length which was 1.66 cm. While the control treatment gave the least Internodes length , which amounted to 1.43 cm. The bi-interactions between pinching and spraying with paclobuterol led to the presence of significant differences between the plants, where the C1P2 treatment was distinguished by giving the lowest internode length , which amounted to 1.20 cm. While the C2P0 treatment gave the largest length of the internodes, which reached 2.08 cm, while the interactions between pinching and spraying with kinetin led to the presence of significant differences in the average length of the internodes on the plant. The C2K2 treatment was characterized by giving the largest length of Internodes of 1.78 cm, compared to treatment C2K0, which gave the smallest number of Internodes of 1.40 cm. The effect between spraying with paclobuterol and kinetin had a significant effect on the average length of Internodes of the plant. Where it led to a decrease in the Internodes length. where P2K0 treatment gave the smallest Internodes length of 1.13 cm, with a significant difference from the P0K2 treatment, which gave the largest Internodes length of 2.26 cm. In the case of the triple interaction between the factors of the study, it led to the presence of significant differences between the treatments, where treatment C2P2K1 gave the smallest Internodes length , which amounted to 1.3 cm,

compared to treatment C1P0K1, which gave the largest Internodes length 1.83 cm.

**Number of inflorescences (inflorescence. plant<sup>-1</sup>)**

The results in Table (12) that there are significant differences between the pinching treatments of Cassia Occidentalis in the average number of inflorescences, where pinching gave a number of inflorescences of 3.33 (inflorescences. plant<sup>-1</sup>), excelled on the number of inflorescences of a plant without pinching, which amounted to 2.9 (inflorescences. plant<sup>-1</sup>) While spraying with paclobuterol gave the least number of inflorescences per plant when the treatment was at a concentration of 1 g.L<sup>-1</sup>, which amounted to 2.7 (inflorescence plant<sup>-1</sup>), with a significant difference from the control treatment that gave the highest number of inflorescences per plant, which amounted to 3.39 (inflorescence plant<sup>-1</sup>), As for the effect of spraying with kinetin, we notice that there are no significant differences between the spraying treatments. The bilateral interactions between pinching and spraying with paclobuterol led to significant differences between the plants, where the C2P0 treatment was characterized by giving the most number of inflorescences amounted to 3.81 (inflorescence. plant<sup>-1</sup>) compared to the C1P2 treatment, which gave the least. The number of flower inflorescences per plant, which amounted to 2.41 (inflorescence plant<sup>-1</sup>), The interactions between pinching and spraying with kinetin led to significant differences in the average number of inflorescences, where the treatment C2K0 was distinguished in the number of inflorescences, which amounted to 3.81 (inflorescence. plant<sup>-1</sup>) compared to the treatment C1K0, which gave the lowest number of inflorescences amounted to 2.67. Also, the effect between spraying with paclobuterol and kinetin had a significant effect on the average number of inflorescences, where treatment P0K0 gave

the highest number of flower inflorescences amounted to 3.56 compared to treatment P2K1, which amounted to 2.56 (inflorescence plant<sup>-1</sup>). The triple interaction between the factors of the study led to the existence of significant differences between the treatments,

where the treatment C2P0K0 gave the most inflorescences rate of 4.11 (inflorescence plant<sup>-1</sup>), while the treatment C1P2K0 recorded the lowest number of inflorescences for the plant, which amounted to 2 (inflorescence plant<sup>-1</sup>).

**Table (9) Effect of pinching, paclobutrazol, and chitin and their interactions on the length of the internodes (cm) of *Cassia Occidentalis***

P x C	(K) Kinetin spraying			paclobutrazol (P)	(C) pinching
	mg.L- 100 (1 (K1	mg.L-1 50 ((K1	without )spray(OK		
1.79	1.83	1.81	1.73	without spraying ((P0	without (C1) pinching
1.56	1.54	1.58	1.57	(g.L-1 (P1 0.5	
1.20	1.27	1.25	1.09	(1 g.L-1 (P1	
2.08	2.7	1.91	1.64	without spraying ((P0	(C2) pinching
1.36	1.35	1.35	1.38	(g.L-1 (P1 0.5	
1.23	1.3	1.22	1.17	(1 g.L-1 (P1	
0.24	0.42			<b>L.S.D 0.05</b>	
(C) pinching	interaction between pinching and Kinetin spraying				
1.52	1.54	1.54	1.47	(C1) without pinching	
1.56	1.78	1.49	1.40	(C2) pinching	
0.14	0.24			<b>L.S.D 0.05</b>	
(P)paclobutrazol	interaction between paclobutrazol and Kinetin spray				
1.94	2.26	1.86	1.69	(without spraying (P0	
1.46	1.44	1.46	1.48	(g.L-1 (P1 0.5	
1.22	1.29	1.23	1.13	(1 g.L-1 (P1	
0.17	0.29			<b>L.S.D 0.05</b>	
	1.66	1.52	1.43	(K) Kinetin spraying	
	0.17			<b>L.S.D 0.05</b>	

**Table (12) the effect of pinching, paclobetrazole, and kinetin and their interactions on the number of inflorescence plant<sup>-1</sup> of senna plant *Cassia Occidentalis***

P x C	(K) Kinetin spraying			paclobutrazol (P)	(C) pinching
	mg.L- 100 (1 (K1	mg.L-1 50 ((K1	without )spray(OK		
2.96	2.78	3.11	3	without spraying ((P0	without (C1) pinching
3.37	3.67	3.44	3	(g.L-1 (P1 0.5	
2.41	3	2.22	2	(1 g.L-1 (P1	
3.81	3.67	3.67	4.11	without spraying ((P0	pinching (C2) pinching
3.07	2.78	3	3.44	(P1) 1-غم.لتر 0.5	
3.11	2.56	2.89	3.89	(1 g.L-1 (P1	
0.65	1.12			<b>L.S.D 0.05</b>	
(C) pinching	interaction between pinching and Kinetin spraying				
2.91	3.15	2.93	2.67	(C1) without pinching	
3.33	3.00	3.19	3.81	(C2) pinching	
0.37	0.65			<b>L.S.D 0.05</b>	
(P)paclobutrazol	interaction between paclobutrazol and Kinetin spray				
3.39	3.22	3.39	3.56	(without spraying (P0	
3.22	3.22	3.22	3.22	(g.L-1 (P1 0.5	
2.76	2.78	2.56	2.94	(1 g.L-1 (P1	
0.46	0.79			<b>L.S.D 0.05</b>	
	3.07	3.06	3.24	(K) Kinetin spraying	
	0.46			<b>L.S.D 0.05</b>	

**flower diameter (cm)**

The results in Table (15) that there are no significant differences between the pinching treatments of *Cassia Occidentalis*. Also, spraying with paclobuterol led to no significant differences between the pinching treatments. As for the effect of spraying with kinetin, we note that there are significant differences between the two spraying treatments, where the treatment gave 100 mg.L<sup>-1</sup> the highest inflorescence diameter of 3.13 cm, with a significant difference from the control treatment of 3.08 cm. The bi-interactions between pinching and spraying with paclobuterol led to significant differences between the plants, where treatment C2P1 was

characterized by giving the highest flower diameter of 3.23 cm compared to treatment C1P0, which gave the lowest flower diameter, which amounted to 3.00 cm. The interactions between pinching and spraying with kinetin led to significant differences, where the two treatments, C2K0 and C1K2, were characterized by giving the highest inflorescence diameter, which amounted to 3.16 cm and 3.16 cm, with a significant difference from the control treatment, which was given by giving the lowest inflorescence diameter, which amounted to 3.00 cm. Also, the effect between spraying with paclobuterol and kinetin did not have significant differences between the spraying treatments. In the triple interaction between the factors of the



study, we notice that there are significant differences between the treatments, as treatment C2P1K0 gave the highest values for the average flower diameter, reaching 3.28

cm, while treatment C1P0K0 recorded the lowest average flower diameter, amounting to 2.84 cm.

**Table (15) Effect of pinching, paclobetrazole, and kinetin and their interactions on the flower diameter (cm) of Cassia Occidentalis**

P x C	(K) Kinetin spraying			paclobutrazol (P)	(C) pinching
	mg.L- 100 (1 (K1	mg.L-1 50 ((K1	without )spray(0K		
3.00	3.13	3.01	2.84	without spraying ((P0	without (C1) pinching
3.04	3.09	3.03	3	(g.L-1 (P1 0.5	
3.19	3.26	3.14	3.17	(1 g.L-1 (P1	
3.11	3.07	3.13	3.13	without spraying ((P0	(C2) pinching
3.23	3.17	3.26	3.28	(g.L-1 (P1 0.5	
3.06	3.09	3.04	3.06	(1 g.L-1 (P1	
0.16	0.27			<b>L.S.D 0.05</b>	
(C) pinching	interaction between pinching and Kinetin spraying				
3.08	3.16	3.05	3.00	(C1) without pinching	
3.14	3.11	3.14	3.16	(C2) pinching	
0.9	0.16			<b>L.S.D 0.05</b>	
(P)paclobutrazol	interaction between paclobutrazol and Kinetin spray				
3.05	3.10	3.07	2.99	(without spraying (P0	
3.14	3.13	3.14	3.14	(g.L-1 (P1 0.5	
3.13	3.17	3.09	3.11	(1 g.L-1 (P1	
0.11	0.20			<b>L.S.D 0.05</b>	
	3.13	3.10	3.08	(K) Kinetin spraying	
	0.11			<b>L.S.D 0.05</b>	

## Discussion

The previous results show that there is a significant effect of the levels of foliar spraying of paclobetrazole on the studied growth traits, and this was shown by the results of the statistical analysis, and it can explain the physiological response to the treatment with paclobetrazole. According to Purohit (1986) in his report on the general effect of paclobetrazole, it is possible to

inhibit growth by inhibiting oxidation reactions in the stages of gibberellin synthesis, especially inhibition of oxidation processes that occur in the microsomes of Kaurene, Kaurenol, and Kaurenal, which is one of the actions of a number of Among other growth inhibitors with a different composition, such as anesmidol, as well as paclobetrazole, It was noted that the content of gibberellin-like substances in plants treated with paclobetrazole was lower than that of untreated plants, and

thus cell division processes continue, but new cells will not elongate (Chaney, 2005) (Gopi et al., 2009). This was confirmed by Ball (1987) that the treatment with paclobtrazole compound will affect the plant part that the solution has reached and thus will inhibit the growth of leaves on the plant at the time of treatment by the effect of reducing division and elongation, but the growth of leaves is continuous and is not exposed to growth waves, which leads to the restoration of leaves to grow after the demise of the effect of the compound. However, the indirect and positive effect on leaf area is due to activating bud opening and thus increasing the number of leaves and forming more buds (Rademacher, 2000). The previous results also show that there is a significant effect of the levels of foliar spraying of the growth regulator kinetin on the studied growth characteristics, and this was shown by the results of the statistical analysis. The reason for the significant increase achieved in some traits after spraying with kinetin may go back to its role in increasing cell elongation and stimulating them to divide, as well as its role in transporting and distributing solutes towards sources of growth and consumption or it may go back to its role in stimulating the growth of leafy beginnings by dividing and distinguishing cells initially, then revealing and developing them (Yassin, 2001). It can also be explained that kinetin stimulates the growth of lateral buds that are inhibited by the effect of endogenous auxins, pinching apical dominance by stimulating the tissues adjacent to the vascular tissues of the buds and stems. In addition to stimulating the formation of woody tissues of the buds and stems that cause the emergence of lateral buds, thus facilitating the transfer of water and nutrients that encourage the emergence and development of lateral buds (Devlin et al., 2000). The reason may also be the role of kinetin in increasing cell division in the apical meristems and cambium and in adding new cells to the plant (Mazher et al., 2011). As well as its role in increasing the expansion of cells carrying each of the wood and bark (Abu Zaid, 2000), Callus formation also increases in the presence of cytokines

(Hedden and Thomas, 2006). As well as its role in stimulating cell division and increasing the ability of their walls to stretch, leading as a result to an increase in leaf width (Mok and Mok, 2001). Or it may be due to its role in extending the life of the leaf by delaying its senescence, causing an increase in the leaf area and an increase in processed carbohydrates. In addition to that, the role of kinetin is to create a mechanism to withdraw Sink in the cells of the leaf, which stimulates the speed of nutrient transfer to it, which includes other growth hormones, vitamins and nutritional elements that promote increased growth. The paper and its surface breadth (Taiz and Zeiger, 2010). The growth stimulation can also be due to the effect of cytokines, which increase the effectiveness of the peroxidase enzyme, which removes the toxicity of effective oxygen, super oxide, and controls the level of hydrogen peroxide and the speed of cell division, thus stimulating growth. Increasing the activity of this enzyme is associated with the formation of more branches, accumulation in dry weight, and an increase in the number of open axillary buds (Toteva Machina et al., 2000) or the increase may be due to the main role that kinetin plays in cell division and increasing their size by processes that include building proteins, enzymes, and nucleic acids (DNA and RNA) involved in the synthesis of organic bases such as Purines and Pyrimidines, which in turn are involved in the synthesis of chlorophyll and cytochromes important in the process of photosynthesis, which increases the dry matter in Wareing papers) and Phillips, 1981). As well as its effect on increasing the number of leaves and leaf area in the plant, and the total chlorophyll content of the leaves, which was reflected in the encouragement of photosynthesis and the manufacture of nutrients, which thus improve flowering traits.

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