Effect of pruning , Liquid Seaweed and Kinetin on growth and flowering *Solidago Canadensis*

Zainab Ali Fateh ***Janan kassem Hussein***
Department of Engineering and Horticulture / College of Agriculture / Al-Qasim Green University

Abstract :

The experiment was conducted in the certified citrus nursery , Indian Horticultural Station , General Horticultural Department , Ministry of Agriculture during the summer season of 2022. To study the effect of pruning, seaweed extract and kinetin on the growth and flowering of Solidago Canadensis plant, the plants were pruned using two types of pruning, the first at a height of 100 cm and the second at a height of 30 cm, in addition to the control treatment (without pruning). The plants were also sprayed with seaweed extract at concentrations (0, 2, 4 $ml.L^{-1}$) and Kinetin (0, 50, 100 $mg.L^{-1}$). The experiment was coundected as a factorial experiment (3×3×3) according to the Complete Randomized Blocks Design (R.C.B.D) and with three replicates, each replicates containing 27 treatments with 7 plants per experimental unit, and the averages were compared using the Least Significant Difference (L.S.D) test at level 5. %. The results showed the following:

1. Pruning at a height of 100 cm was excelled in some traits, including: number of branches (92.49) $branch.plant^{-1}$, chlorophyll content (40.40), number of inflorescences (101.65) $inflorescencesplant^{-1}$
2. The treatment with seaweed extract $4ml.L^{-1}$ was excelled in traits, number of branches (67.06) $branch.plant^{-1}$, flower stem length (61.46) cm, number of inflorescences (73.18) inflorescences/plant.
3. The treatment with kinetin 100 $mg.L^{-1}$ was excelled in increasing the number of branches (64.80) $branches.plant^{-1}$, the length of the flower stem (60.41) cm, the number of inflorescences (68.59) $inflorescences.plant^{-1}$

introduction :

Solidago canadensis L. belongs to the Asteraceae family and grows as a wild flower in North America, Asia and Europe. It has other names: Tara, Northern Mimosa, Golden Feather, and Goldenrod. It is widely used in landscapes for flowering landscapes.As an excellent cut flower with high durability after harvest and as a dried flower (Osman and Sewedan, 2014), it is considered one of the oldest ornamental plants transmitted from North America to Europe. In England, it has been known there since 1645 (Kowarik, 2003).Because it is an attractive and easy-to-grow species, it has been widely used by gardeners (Weber, 2000). Solidago canadensis can be used to vegetate damaged areas and to reclaim and stabilize the soil.The Solidago canadensis plant needs pruning because of the length of the stems and its branches and the random growth of it, where the plant height reaches 2 meters in some species. The trait of the high height of flowering ornamental plants is undesirable in gardens and parks. Therefore, many Solidago canadensis plant breeders resort to several types of pruning and at different times. according to the environmental conditions in which it is cultivated. The first to refer to the use of seaweed extracts were the Japanese and Chinese, where these extracts were used in human and animal nutrition, and in England these materials were used in agriculture as a fertilizer that improves the soil, but that was on a limited scale, and today its use has spread

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on a large scale and in various aspects of life, it is prepared either in powder or liquid form (Potter, 2005). O'Dell (2003) indicated that seaweed extracts contain essential nutrients For the plant, as it contains macronutrients K.P.N and micronutrients Fe, B, Mg, Zn, Mo, Cu, as well as plant hormones Such as auxins, gibberellins, cytokanins, and these hormones when added To the soil or sprayed on plants, it stimulates root growth Increasing the thickness of the stem and increasing vegetative growth by increasing the efficiency of the photosynthesis process, in addition to protecting the plant from stress conditions such as drought, cold and aging by supporting the plant cell. Cytokinins have 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 branching process in the plant. The first cytokinin compound discovered was Kinetin, which is not found naturally in the plant.Rather, it is one of the products of thermal rotting of adenine, and the discovery of kinetin encouraged the industrial synthesis of hundreds of compounds similar to it. However, kinetin is considered one of the most common materials used in studies of the physiological effects of cytokinins (Wareing and Phillips 1981).Where kinetin inhibits apical dominance, stimulates the growth of lateral buds, transverse expansion of cells, forms the phenotypic shape of the plant, delays aging and maintains green color (Al-Asadi and Al-Khikani, 2019)

1- Materials and methods :

1 Experiment location:

The experiment was conducted in a certified citrus nursery ,Indian Horticultural Station,General Horticultural Department / Ministry of Agriculture during the summer season of 2022 on terraces (the width of the terrace is 75 cm and the distance between one plant and another is 50 cm)Seedlings (produced by seeds at the age of one month) was planted in the land allocated to them in February on 22/2/2022 in the form of a row with three replicates, where each replicate contains 27 treatments with five plants for each experimental unit.

table showing laboratory analyzes of the soil of the experimental field

values	analysis type	
3.4 (DS/m)	electrical conductivity EC	
Nill	Co_3^{-2}	
8.5%	Nacl%	
32.43 mmohm/L	Cl	
13.5mmoh/l	Hco3-	
9.25mmoh/L	Ca++	
18.25 mmohm/L	Mg++	
0.843 mmh/l	K+	
15.48 mmohm/l	Na+1	
8.51	Ph	
2.18 g/L	tds	
12.65 mmohm/L	So4—	
1.6	organic matter	
770 g/kg	sand	soil separator
141 g/kg	silt	
89 g/kg	clay	
sandy loam	textuer	

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Study factors:

1. The first factor is pruning:

Pruning was conducted in September 1/9/2022 after the plant reached more than one meter, and the pruning was of two types: pruning the plant at a height of 1 meter and symbolized by C2, and pruning the plant at a height of 30 cm and symbolized by C1, in addition to the control treatment (without pruning) and symbolized his C0

2. The second factor is spraying with seaweed extract:

Spraying was coundected with seaweed extract on September 9/15/2022 after pruning the plant, and it was of two types: spraying with a concentration of 100 mg/liter, symbolized by the symbol F2, and spraying with a concentration of 50 mg/liter, symbolized by the symbol F1, in addition to control treatment (without spraying) and symbolized by the symbol F0.

3. The third Kinetic factor:

It was sprayed with quinine in September 10/9/2022 after pruning the plant, and it was of two types: spraying with a concentration of 100 mg/liter, symbolized by the symbol K2, and spraying with a concentration of 50 mg/liter, symbolized by the symbol K1, in addition to control treatment (without spraying) and symbolized by the symbol K0

statistical analysis :

The experiment was implemented as a factorial experiment (3 x 3 x 3) according to the Complete Randomized Blocks Design (R.C.B.D) and with three replicates, each replicate containing 27 treatments with 7 plants per experimental unit, and the averages were compared using the Least Significant Difference (L.S.D) test at the level of 5%.

Results :

plant height (cm):

It is evident from the results in Table (1) that there are significant differences between the pruning treatments of Solidago Canadensis. Where no pruning gave the highest plant height of 206.9, excelled pruning plants at a height of 30 cm, which gave the lowest plant height of 86.1. While spraying with seaweed extract did not have any significant differences, spraying with kinetin showed no significant differences. The bi-interactions between pruning and spraying with seaweed extract led to significant differences between the plants, where the C0F2 treatment had the highest plant height of 210.9 compared to the lowest plant height of 76.9 in the C1F0 treatment. The interactions between pruning and spraying with kinetin resulted in significant differences in the rate of plant height, where treatment C0K1 gave the highest rate of 209.6 compared to treatment C1K0, which gave the lowest plant height of 82.3, while the joint effect between spraying seaweed extract and kinetin had no significant effect on plant height.In the triple excelled between the factors of the study, we note that there are significant differences between the treatments, where treatment C0F2K0 gave the highest plant height, reaching 214.8, while treatment C1F0K0 recorded the lowest plant height, amounting to 73.0.

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Table 1 Effect of pruning, seaweed extract and kinetin and their interactions on plant height (cm) Solidago canadensis.

202.6	197.1	210.8	200.0	F0 without spraying	C0 without Pruning
207.3	207.6	205.3	208.9	F1 2ml.L-1	
210.9	205.0	212.8	214.8	F2 4 ml.L-1	
76.9	74.9	82.8	73.0	F0 without spraying	C1 Pruning at a height of 30 cm
87.1	87.3	91.6	82.3	F1 2ml.L-1	
94.4	101.8	89.9	91.4	F2 4 ml.L-1	
129.5	129.7	130.6	128.3	F0 without spraying	C2 Pruning at a height of 100 cm
129.6	126.4	121.1	141.3	F1 2ml.L-1	
126.4	131.6	125.8	121.8	F2 4 ml.L-1	
23.39	40.52			L.S.D 0.05	
F average of seaweed					
136.3	133.9	141.4	133.8	F0 without spraying	interaction F*K
141.3	140.5	139.3	144.2	F1 2ml.L-1	
143.9	146.1	142.8	142.7	F2 4 ml.L-1	
13.51	32.39			L.S.D 0.05	
C pruning average					
206.9	203.2	209.6	207.9	C0 without Pruning	interaction C*K
86.1	88.0	88.1	82.3	C1 Pruning at 30 cm	
128.5	129.2	125.8	130.5	C2 Pruning at 100 cm	
13.51	23.39			L.S.D 0.05	

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	140.1	**141.2**	**140.2**	**Kinetin average**
	13.51			**L.S.D 0.05**

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Number of branches (branch.plant^{-1}):

It is clear from the results in Table (2) that there are significant differences between pruning treatments for Solidago Canadensis plant, where pruning at a height of 100 cm gave the largest number of branches, amounting to 92.49 branches. Plant^{-1} excelled on control plants, and pruning at a height of 30 cm, gave the least number of branches, amounting to 33.79 branches. Plant^{-1},While spraying seaweed extract at a concentration of 4 ml.l-1 increased the number of branches, which amounted to 67.06 branches. Plant^{-1}, with a significant difference from the control plants that gave the least number of branches, amounting to 54.54 branches. Plant^{-1}. As for the effect of spraying with kinetin, the treatment was excelled on 100 mg. .L^{-1} by giving it the largest number of branches, which amounted to 64.80 branches.Plant^{-1}, with a significant difference from the control treatment, gave the least number of branches, which amounted to 27.25 branches. Plant^{-1}.The bi-interactions between pruning and spraying with seaweed extract resulted in significant differences between the plants, where the C2F2 treatment was characterized by the highest number of branches, amounting to 100.96 branches. plant^{-1}, compared to the lowest number of branches, which amounted to 31.48 branches. plant^{-1} when treating C1F1.The interactions between pruning and spraying with kinetin resulted in significant differences in the average number of branches, where treatment C2K2 gave the highest rate of 98.99 branches.plant^{-1}, compared to treatment C1K0, which gave the lowest rate of number of branches, amounting to 27.81 branches.plant^{-1}.The combined effect of spraying with seaweed extract and kinetin had a significant effect on the number of branches, where the F2K2 treatment gave the highest rate of the number of branches, amounting to 73.29 branches. Plant^{-1}, while the FOK0 treatment plants gave the lowest rate of the number of branches, amounting to 47.90 branches. Plant^{-1}.In the triple interaction between the factors of the study, we note that there are significant differences between the treatments, as the treatment C2F2K2 gave the highest values for the average number of branches, reaching 110.77 branches.plant-1, while the treatment C1F0K0 recorded the lowest rate for the number of branches, amounting to 22.00 branches.plant-1.

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Table 2 Effect of pruning, seaweed extract and kinetin and their interactions on the number of branches (branch.plant-1) of Solidago canadensis plant.

interaction C*F	Kinetin K			Seaweed extract F	C Pruning type
	K2 100mg.L-1	K1 50mg.L-1	K0 without spraying		
50.82	57.00	44.00	51.47	F0 without spraying	C0 without Pruning
57.38	52.00	60.47	59.67	F1 2ml.L-1	
63.41	69.23	57.43	63.57	F2 4 ml.L-1	
33.08	36.33	40.90	22.00	F0 without spraying	C1 Pruning at a height of 30 cm
31.48	31.77	34.90	27.77	F1 2ml.L-1	
36.81	39.87	36.90	33.67	F2 4 ml.L-1	
79.73	89.53	79.43	70.23	F0 without spraying	C2 Pruning at a height of 100 cm
96.77	96.67	103.10	90.53	F1 2ml.L-1	
100.96	110.77	95.77	96.33	F2 4 ml.L-1	
4.189	7.255			L.S.D 0.05	
average F					
54.54	60.96	54.78	47.90	F0 without spraying	interaction F*K
61.87	60.14	66.16	59.32	F1 2ml.L-1	
67.06	73.29	63.37	64.52	F2 4 ml.L-1	
2.418	4.189			L.S.D 0.05	
average C					
57.20	59.41	53.97	58.23	C0 without Pruning	interaction C*K
33.79	35.99	37.57	27.81	C1 Pruning at 30 cm	
92.49	98.99	92.77	85.70	C2 Pruning at 100 cm	
2.418	4.189			L.S.D 0.05	

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	64.80	**61.43**	**57.25**	**average K**
	2.418			**L.S.D 0.05**

Leaves content of chlorophyll (spad unit):

It is clear from the results in Table (3) that there are significant differences between pruning treatments of the Solidago Canadensis plant, where pruning at a height of 100 cm gave the largest percentage of chlorophyll amounted to 40.40, excelled on control plants, and pruning at a height of 30 cm gave the lowest percentage of chlorophyll amounted to 30.87.While not spraying with seaweed extract increased the percentage of chlorophyll to 36.30, with a significant difference from the plants that were sprayed, where spraying with seaweed extract 2 ml L^{-1} gave less chlorophyll, as for the effect of spraying with kinetin, there were no significant differences.The bi-interactions between pruning and spraying with seaweed extract led to significant differences between the plants, as the C2F2 treatment had the highest percentage of chlorophyll amounting to 43.30 compared to the lowest percentage of chlorophyll in the treatment C1F1.The interactions between pruning and spraying with kinetin resulted in significant differences in the percentage of chlorophyll, as treatment C2K1 gave the highest percentage of chlorophyll amounting to 42.86 compared to treatment C1K1 which gave the lowest average percentage of chlorophyll amounted to 29.89.

The combined effect of spraying with seaweed extract and kinetin had a significant effect on the percentage of chlorophyll, as treatment F0K2 gave the highest rate of 37.03, while the plants of treatment F1K0 gave the lowest percentage of chlorophyll, amounting to 33.22. In the triple interaction between the factors of the study, we note that there are significant differences between the treatments, as the treatment C2F2K1 gave the highest values in the percentage of chlorophyll in the leaves, reaching 47.83, while the treatment C1F1K2 recorded the lowest percentage of chlorophyll, amounting to 28.43.

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Table (3) Effect of pruning, seaweed extract and chitin and their interactions on the amount of chlorophyll of Solidago Canadensis plant.

interaction C*F	kintein K			Seaweed extract F	C Pruning type
	K2 100mg.L-1	K1 50mg.L-1	K0 without spraying		
38.17	33.77	40.97	39.77	F0 without spraying	C0 without Pruning
33.10	34.83	30.03	34.43	F1 2ml.L-1	
33.63	34.87	33.93	32.10	F2 4 ml.L-1	
32.27	35.10	30.87	30.83	F0 without spraying	C1 Pruning at a height of 30 cm
29.41	28.43	30.17	29.63	F1 2ml.L-1	
30.66	32.40	28.63	30.93	F2 4 ml.L-1	
38.46	42.23	39.13	34.00	F0 without spraying	C2 Pruning at a height of 100 cm
39.46	41.17	41.60	35.60	F1 2ml.L-1	
43.30	39.33	47.83	42.73	F2 4 ml.L-1	
3.926	6.799			L.S.D 0.05	
average F					
36.30	37.03	36.99	34.87	F0 without spraying	interaction F*K
33.99	34.81	33.93	33.22	F1 2ml.L-1	
35.86	35.53	36.80	35.26	F2 4 ml.L-1	
2.266	3.926			L.S.D 0.05	
average C					
34.97	34.49	34.98	35.43	C0 without Pruning	interaction C*K
30.87	31.98	29.89	30.47	C1 Pruning at 30 cm	
40.40	40.91	42.86	37.44	C2 Pruning at 100 cm	
2.266	3.926			L.S.D 0.05	
	35.79	35.91	34.45	average K	
	2.266			L.S.D 0.05	

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vase life(day):

It is clear from the results of Table (4) that there are no significant differences between the pruning treatments of Solidago Canadensis plant, while spraying with seaweed extract had no significant effect on vase life of Solidago Canadensis plant.As for the effect of spraying with kinetin, there were also no significant differences.The bi-interactions between pruning and spraying with seaweed extract led to significant differences between the plants, where the C2F1 treatment had the longest vase life of

7.33 compared to the lowest vase life of 6.22 when the C2F0 treatment.Where the interactions between pruning and spraying with kinetin led to significant differences in the mean vase life of Solidago Canadensis plant, where treatment C0K2 gave the highest vase life of 6.89 compared to treatment C1K1 which gave the lowest vase life of 5.89. The combined effect of spraying with seaweed extract and kinetin had a significant effect on the average vase life of the plant, where treatment F0K2 gave the highest rate of 7.56, while FOK0 treatment plants gave the lowest rate of 6.00.In the triple interaction between the factors of the study, we note that there are significant differences between the treatments, where treatment C0F0K2 gave the highest values for the rate of flowering plant width of 8.02, while treatment C2F0K1 recorded the lowest rate of 5.31.

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Table (4) Effect of pruning, seaweed extract and kinetin and their interactions on vase life (day) of Solidago Canadensis.

interaction C*F	kintein K			Seaweed extract F	C Pruning type
	K2 100mg.L-1	K1 50mg.L-1	K0 without spraying		
6.78	8.02	6.67	5.67	F0 without spraying	C0 without Pruning
6.33	5.67	6.67	6.67	F1 2ml.L-1	
6.67	7.00	7.00	6.00	F2 4 ml.L-1	
6.56	7.33	6.00	6.33	F0 without spraying	C1 Pruning at a height of 30 cm
6.33	6.33	5.33	7.33	F1 2ml.L-1	
6.56	6.67	6.33	6.67	F2 4 ml.L-1	
6.22	7.33	5.31	6.00	F0 without spraying	C2 Pruning at a height of 100 cm
7.33	6.33	8.00	7.67	F1 2ml.L-1	
6.44	6.67	6.33	6.33	F2 4 ml.L-1	
0.77	1.33			L.S.D 0.05	
average F					
6.52	7.56	6.02	6.00	F0 without spraying	interaction F*K
6.67	6.11	6.67	7.22	F1 2ml.L-1	
6.56	6.78	6.56	6.33	F2 4 ml.L-1	
0.44	0.77			L.S.D 0.05	
average C					
6.59	6.89	6.78	6.11	C0 without Pruning	interaction C*K
6.48	6.78	5.89	6.78	C1 Pruning at 30 cm	
6.67	6.78	6.56	6.67	C2 Pruning at 100 cm	
0.44	0.77			L.S.D 0.05	
	6.82	6.41	6.52	average K	
	0.44			L.S.D 0.05	

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flower stem length:

It is clear from the results of Table (5) that there are significant differences between pruning treatments for Solidago Canadensis plant, where no pruning gave the longest flowering stem of 99.79 cm, excelled on the pruned plants, and pruning at a height of 30 cm, which gave the lowest flowering stem length of 33.41 cm.While spraying with seaweed extract at a concentration of 4 $ml.L^{-1}$ increased the flowering stem length, which reached 61.46 cm, with a significant difference from the control plants that gave the lowest flowering stem length, which amounted to 57.00 cm. As for the effect of spraying with kinetin, the treatment 100 $mg.l^{-1}$ was excelled by giving it the longest flowering stem of 60.41 cm, with a significant difference from the control treatment, which gave the least flowering stem length of 57.71 cm.The bi-interactions between pruning and spraying with seaweed extract resulted in significant differences between the plants, as treatment C02F2 was characterized by the longest flowering stem of 106.66 cm, compared to the lowest flowering stem length of 27.57 cm for treatment C1F0.The interactions between pruning and spraying with kinetin resulted in significant differences in the average flowering stem length, where treatment C0K0 gave the highest rate of 102.96 cm compared to treatment C1K0, which gave the lowest average flowering stem length of 30.08 cm.Also, the joint effect between spraying with seaweed extract and kinetin had a significant effect on the flowering stem length, as the F2K2 treatment gave the highest mean flowering stem length of 63.66 cm, while FOK0 plants gave the lowest mean flowering stem length of 54.94 cm. In the triple interaction between the factors of the study, we note that there are significant differences between the treatments, where treatment C0F2K0 gave the highest values for the average flowering stem length of 110.87 cm, while treatment C1F0K0 recorded the lowest average flowering stem length of 20.47 cm.

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Table 5 Effect of pruning, seaweed extract, kinetin and their interactions on flower stem length (cm) of Solidago canadensis.

interaction C*F	kintein K			Seaweed extract F	C Pruning type
	K2 100mg.L-1	K1 50mg.L-1	K0 without spraying		
96.03	97.43	90.33	100.33	F0 without spraying	C0 without Pruning
96.68	105.80	86.57	97.67	F1 2ml.L-1	
106.66	98.87	110.23	110.87	F2 4 ml.L-1	
27.57	32.23	30.00	20.47	F0 without spraying	C1 Pruning at a height of 30 cm
35.60	31.67	35.80	39.33	F1 2ml.L-1	
37.07	46.10	34.67	30.43	F2 4 ml.L-1	
47.41	50.30	47.90	44.03	F0 without spraying	C2 Pruning at a height of 100 cm
41.96	35.33	47.77	42.77	F1 2ml.L-1	
40.64	46.00	42.47	33.47	F2 4 ml.L-1	
2.25	3.90			L.S.D 0.05	
average F					
57.00	59.99	56.08	54.94	F0 without spraying	interaction F*K
58.08	57.60	56.71	59.92	F1 2ml.L-1	
61.46	63.66	62.46	58.26	F2 4 ml.L-1	
1.30	2.25			L.S.D 0.05	
average C					
99.79	100.70	95.71	102.96	C0 without Pruning	interaction C*K
33.41	36.67	33.49	30.08	C1 Pruning at 30 cm	
43.34	43.88	46.04	40.09	C2 Pruning at 100 cm	
1.30	2.25			L.S.D 0.05	
	60.41	58.41	57.71	average K	
	1.30			L.S.D 0.05	

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Number of flowering inflorescences (Inflorescence plant^{-1}):

Table (6) that there are significant differences between pruning treatments of Solidago Canadensis plant, where pruning at a height of 100 cm gave the highest number of inflorescences amounting to 101.65 Inflorescence plant^{-1}, excelled in control plants, and pruning at a height of 30 cm gave the lowest number of inflorescences amounted to 34.01 Inflorescence plant^{-1}.While spraying with seaweed extract at a concentration of 4 ml.L-1 increased the number of inflorescences, amounting to 73.18 Inflorescence plant^{-1}, with a significant difference from the control plants, which gave the lowest number of inflorescences, amounting to 55.70 Inflorescence plant^{-1}.As for the effect of spraying with kinetin, the treatment 100 mg.l^{-1} was excelled by giving it the highest number of inflorescences, which reached 68.59 inflorescences, with a significant difference from the control treatment, which gave the lowest number of inflorescences, which amounted to 58.80 Inflorescence plant^{-1}.The bi-interactions between pruning and spraying with seaweed extract led to significant differences between the plants, where the treatment C2F2 was characterized by the highest number of inflorescences reaching 118.86 inflorescences, compared to the lowest number of inflorescences amounting to 31.67 in the treatment C1F1. Treatment C2K2 gave the highest rate of 110.12 Inflorescence plant^{-1}Compared to treatment C1K0, which gave the lowest average number of inflorescences, which reached 27.98 inflorescences, and the joint effect between spraying seaweed extract and kinetin had a significant effect on the number of branches.The F2K2 treatment gave the highest average number of inflorescences, amounting to 80.78 Inflorescence plant^{-1}, while FOK0 plants gave the lowest average number of inflorescences, amounting to 48.20 Inflorescence plant^{-1}.

In the triple interaction between the factors of the study, we note that there are significant differences between the treatments, where the treatment C2F2K2 gave the highest values for the average number of inflorescences, which amounted to 132.67 flowers, while the treatment C1F0K0 recorded the lowest average number of inflorescences, which amounted to 22.00 flowers

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Table 6 Effect of pruning, Seaweed extract and kintein and their interactions on the number of inflorescences (Inflorescence. Plant-1) Solidago Canadensis.

interaction C*F	kintein K			Seaweed extract F	C Pruning type
	K2 100mg.L-1	K1 50mg.L-1	K0 without spraying		
50.82	57.00	44.00	51.47	F0 without spraying	C0 without Pruning
57.38	52.00	60.47	59.67	F1 2ml.L-1	
63.41	69.23	57.43	63.57	F2 4 ml.L-1	
33.11	36.43	40.90	22.00	F0 without spraying	C1 Pruning at a height of 30 cm
31.67	31.87	35.23	27.90	F1 2ml.L-1	
37.27	40.43	37.33	34.03	F2 4 ml.L-1	
83.16	95.80	82.53	71.13	F0 without spraying	C2 Pruning at a height of 100 cm
102.93	101.90	112.47	94.43	F1 2ml.L-1	
118.86	132.67	118.90	105.00	F2 4 ml.L-1	
3.80	6.59			L.S.D 0.05	
average F					
55.70	63.08	55.81	48.20	F0 without spraying	interaction F*K
63.99	61.92	69.39	60.67	F1 2ml.L-1	
73.18	80.78	71.22	67.53	F2 4 ml.L-1	
2.20	3.80			L.S.D 0.05	
average C					
57.20	59.41	53.97	58.23	C0 without Pruning	interaction C*K
34.01	36.24	37.82	27.98	C1 Pruning at 30 cm	
101.65	110.12	104.63	90.19	C2 Pruning at 100 cm	
2.20	3.80			L.S.D 0.05	
	68.59	65.47	58.80	average K	
	2.20			L.S.D 0.05	

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Discussion :

The previous results show that there is a significant effect of the levels of foliar spraying of the Kinetic Growth Regulator on the studied growth traits.The reason for the significant increase achieved in some traits after spraying with kinetin may be due to its role in increasing the elongation of cells and stimulating them to divide, as well as its role in transporting and distributing solutes towards sources of growth and consumption, or it may be due to its role in stimulating the growth of leaf beginnings by dividing and distinguishing cells In principle, then it was revealed and developed (Yassin, 2001). It can also be explained that kinetin stimulates the growth of lateral buds that are inhibited by the influence of internal auxins, ending apical dominance by stimulating the tissues adjacent to the vascular tissues of the buds and stems, as well as stimulating the formation of woody tissues of the buds and stem that cause the emergence of lateral buds and thus facilitate 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). In addition to its role in increasing the expansion of carrier cells for each of the wood and bark (Abu Zaid, 2000), and the formation of calluses 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). This could be due to what was mentioned by (Devlin et al. 2000) that cytokinin stimulates the formation of flowers, but it is not known exactly how cytokinin affects the development of the reproductive stage, but it is possible that cytokinin is necessary for some of the processes taking place during the reproductive stage, especially the process of cell division. Cytokinins are also considered among the important internal factors of flowering plants to drive their vegetative growth stage to the flowering stage (Abu Zaid, 2000).In addition to the role of cytokinin in increasing carbohydrates, which play an important role in the emergence of flowers, which have an important impact on the formation and development of flower buds, and then early flowering. The previous results show that there is a significant effect of the levels of foliar spraying of the seaweed extract on the studied growth traits, due to what the seaweed extract contains of the elements necessary for the plant such as nitrogen, phosphorus and potassium. It stimulates plant growth and development through its effect on activating physiological processes such as photosynthesis, which is reflected positively in the traits of vegetative growth (Hegab et al. 2005 and Abd EL-Motty et al. 2010). This is in addition to the fact that the marine extract contains micro-nutrients such as zinc, which contributes to the manufacture of the amino acid tryptophan, which is important in the manufacture of the plant hormone auxin (indole acetic acid IAA) necessary in cell division and then accelerating and stimulating the vegetative growth of the plant (Sahhaf 1989)and it contains iron that participates in the construction of chlorophyll, and this marine extract contains many plant hormones such as auxins, gibberellins, and cytokines (Ergum, 2001) and Thirumaran (2009), in addition to vitamins and enzymes (O'Dell, 2003) and (Jensen, 2004), which Together, they work in stimulating plant growth through their role in stimulating cell division, elongation and widening, which led to the improvement of vegetative and flowering traits.

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