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Influence of Planting Date and Growth Stimulants on Growth and Chemical Compositions of *Euphorbia milii* Plant

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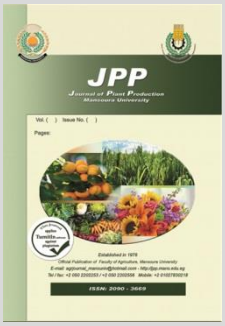

ABSTRACT

Euphorbia milii (Christ- thorn) is a flowering succulent plant of the family Euphorbiaceae, native to Madagascar. The experiment was conducted in the flower cultivation farm, Department of Horticulture, Faculty of Agriculture, Benha University, over two consecutive years 2018/2019 and 2019/2020 to examine the effect of planting date and spraying rooted cuttings of *Euphorbia milii* with some growth regulators and microelements to improve vegetative growth, branching, flowering period and quality. Flower, root growth and some chemical constituents of the *Euphorbia milii* plant The results showed that the highest values of vegetative and flowering growth, root parameters, and chemical compositions were obtained by using the combined treatment between planting date (autumn) and T4 100 ppm GA_3, then followed by the combined treatment between planting date (autumn) and T7 150 ppm 6-BAP in descending order. On the other hand, the lowest values of these parameters were recorded by planting date (spring) and T1 (tap water control) in both seasons. Conclusively, it was found that the combined treatment between planting date (autumn) and T4 100 ppm GA3 gave the best vegetative growth, flowering and chemical composition of *Euphorbia milii.*

***Keywords*: *Euphorbia milii* , GA3 , BAP , Zinc , Boron and growth**

INTRODUCTION

Euphorbia milii (Crown of thorns, Christ plant, Christ-thorn) is a species of flowering succulent plant in the Euphorbiaceae family, native to Madagascar. It has beautiful inflorescences that resemble flowers, so it finds great interest. But, it is a plant with slow growth and limited branching. Also, It is a succulent plant with a height of 5 to 6 feet. It has woody, gray-brown, branching stems that contain many prominent gray thorns. The leaves are thick, arranged in a spiral, and are bright green to dark green to gray, oval with a smooth edge, and the flowers appear beautiful, but they are inflorescences, each one consists of a structure known as the cyathium. It consists of a flower resembling a cup and inside it is one very small female flower surrounded by three male flowers reduced to single stamens. This type is desirable for the beauty of the flowers, the continuation of their blooms and the strength of the plants. It can be grown throughout the year in dry areas with high temperatures and high solar radiation in potted, bedding, or garden plants (Jankalski, 2000).

Plant growth regulators are chemicals compound that are produced to regulate and improve the plant growth, and when used in low concentrations they can inhibit or modify the physiological process of plants (Atiyah and Wadduwa, 1999). Gibberellins are a family of plant hormones that control many aspects of plant growth and development. Gibberellic acid (GA_3) has been used to increase the length or height of plants as well as increase the number of flowers and improve flowering (Taiz and Zeiger, 2004). Also, it can be seen that the efficiency of the application of GA_3 in the field of flower quality. In addition, cytokinins are phytohormones of great importance in regulating the endogenous processes of plant growth and development. Moreover, it had a wide role in helping plant growth (Kieber and Schaller, 2018), as well as their roles in preventing aging, and helping the plants to regulate biotic and abiotic stress tolerance (Argueso et al., 2009; Cortleven et al., 2019).

On the other side, zinc (Zn) is one of the 17 essential elements and is essential for the normal growth and development of plants. It is considered among the eight most essential micronutrients for plants. Zinc is an essential micronutrient that plays important roles in crops resist drought stress by regulating various physiological and molecular mechanisms. During the drought stress, zinc application improves seed germination, plant water relations, cell membrane stability, osmolality accumulation, stomata movement regulation, water use efficiency, and photosynthesis, resulting in significantly improved plant performance (Umair et al., 2020). During adverse conditions, foliar application of zinc enhances plant growth and development (zafar et al., 2017), including alleviation of salt stress (Parker et al., 1992), accompanied by improvements in plant growth by increasing chlorophyll and thus improving photosynthesis (Sharma et al., 1994). Also, it is protects membranes from oxidative and peroxide damage by stabilizing membrane integrity and permeability (Bettger and O'Dell, 1981). Furthermore, it acts as a vital component of several important enzymes, and a stabilizer of proteins including DNA-binding proteins (Vallee and Auld, 1990; Aravind and Prasad, 2004).

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In the same way, boron (B) is a micronutrient that is effective in the growth and health of all crops. This element plays a major role in the many diverse functions of the plants. Boron is also one of the essential elements for plant growth, as it helps in the process of pollination, fertilization, and germination of plant fruits. Boron also helps in the formation of ATP and acts as a compound that accelerates the movement of sugars when they are transported to the active areas during growth through the stages of plant reproduction (Shaaban, 2010). Also, it plays a very important role in many physiological functions, which in turn improve plant production. In addition, boron has a major role in the absorption of proteins, carbohydrates and nucleic acids, and its deficiency leads to a slowdown. Growth, low production, and poor quality (Singh, 1998). The aim of this work is to examine the importance of applying some growth regulators and micronutrients to improve the vegetative growth, flowering, and chemical components of *Euphorbia milii*.

MATERIALS AND METHODS

The experiment was conducted at the Research Station of Floriculture Farm, Department of Horticulture, Faculty of Agriculture, Benha University, Qalyubia Governorate, Egypt, during 2018/2019 and 2019/2020 seasons to investigate the impact of agriculture date and spraying rooted cuttings of *Euphorbia milii* with GA_3, 6-BAP and some microelements (Zn and B) to improve flowering period, flower quality and branching. Well-rooted *Euphorbia milii* cuttings planted in the fourth week of November (2018), the second week of May (2019) in the first season and the first week of December (2019), and the fourth week of May (2020) in the second season up Pots (25 cm in diameter) filled with a mixture of sand + clay + peat moss (1: 1: 1 v: v: v). The pots were transferred to a sunny area in the ornamental nursery of the Faculty of Agriculture, Benha University, Qalyubia, Egypt.

Experimental layout:

This experiment was laid as a factorial experiment in a randomized complete block design (RCBD) with two, the first factor is the date of cultivation and the second is 10 concentrations of some growth regulator and microelements for each treatment. All 10 treatments were repeated three times, each repeat containing 5 pots. The plants received normal agricultural practices as often as needed.

Well-rooted cuttings were selected to be uniform in shape and subjected to all gardening practices including irrigation, fertilizing, and recommended pest management. After two weeks, pots were arranged and received a foliar application from the following treatments

T_1 Control was sprayed with tap water
T_2 Sprayed with 50 ppm GA_3
T_3 Sprayed with 75 ppm GA
T_4 Sprayed with 100ppm GA_3
T_5 Sprayed with 50 ppm 6-BAP
T_6 Sprayed with 100 ppm 6-BAP
T_7 Sprayed with 150 ppm 6-BAP
T_8 Sprayed. with 50 mg/l of each Zn and B
T_9 Sprayed with 100 mg/l of each Zn and B
T_{10} Sprayed. with 150 mg/l of each Zn and B

The terminal well rooted cuttings were sprayed early morning with the pervious concentrations till the runoff by using normal automizer sprayer. Experiment was end at the second week of November (2019), the fourth week of May (2020) in the first season and at the first week of December (2020), the second week of May (2021) in the second season.

The Data Recorded at the end of each season including :

1. **Vegetative growth parameters:** Plant height (cm), number leaves /plant., number branches/plant., leaf area (cm), fresh weight of leaves/plant. (g), dry weight of leaves. / plant (g) and stem diameter of plant (cm).
2. **Rooting parameters:** Number of Roots / plant, root length (cm), fresh weight. of root (g) and dry weight. of root (g).
3. **Flowering parameters:** Number of inflorescences/ plant, fresh weight of inflorescences (g), dry weight of inflorescences (g), duration of the inflorescence on the plant , duration of flowering bud(day), beginning of flowering (days) and number of days to flowering .
4. **Chemical composition measurements:** Leaf samples were taken at the end of each season from application of the last treatment for all experiments. The samples were collected and sent directly to the laboratory. All samples were also wrapped in a damp cloth, and then rinsed with distilled water to remove any residue. The leaf parts were dried in an oven at 70°C until constant weight. Then the dry matter was determined and 2.0 g of dry matter was taken to estimate the N, P, K and total carbohydrate content. Also, chlorophyll (a and b) were determined by caloric method in *Euphorbia* leaves according to the method described in (A.O.A.C, 1990).and calculated as mg/100g fresh weight.

Statistical analysis

The means of all obtained data from the studied factors were subjected to analyses of variance (ANOVA) as factorial experiments in a complete randomized block design). The differences between the mean values of various treatments were compared by using the least significant differences (L. S. D.) at 0.05 %, as given by Snedecor and Cochran (1989).. using MSTAT-C statistical software package.

RESULTS AND DISCUSSION

Results

Effect of planting date, growth stimulants treatments and their combination on vegetative growth parameters on *Euphorbia milii* plant:

Data presented in Tables (1, 2, 3, and 4) showed all vegetative growth coefficients as plant height (cm), number of branches/plant, number of leaves/plant, leaf area (cm), fresh weight of leaves/plant (g), leaf/plant dry weight (g) and stem diameter (cm) of *Euphorbia milii.* All these parameters were increased in response to the planting date (autumn and spring) especially planting in autumn with non-significant differences between them in most of cases in both seasons. On the other hand, T4 100 ppm GA_3 gave the maximum values for these parameters mentioned above, except for the number of branches/plant, and the number of leaves recorded the highest values by T7150 ppm BAP in both seasons. Moreover, the highest values for vegetative growth parameters were recorded using the combined treatment between the planting date (autumn) and T4, then followed descendingly by the combined treatment between the planting date (autumn) and T7. On the contrary, the lowest values for this treatment were recorded between the planting date (spring) and T1 (tap water control) in both seasons. The

above-mentioned results may be due to the role of gibberellins in controlling many stages of plant growth and development. Also, gibberellic acid (GA_3) has been used to help increase the length or height of plants, as well as increase the number of flowers and induce flowering (Taiz and Zeiger, 2004). Furthermore, cytokinins are trace plant hormones that are important in regulating the endocytic processes of plant growth and development. Cytokinins are well known for their broad role in aiding plant growth (Kieber and Schaller, 2018), and as they have a role in preventing senescence, they also help regulate plant tolerance to biotic and abiotic stress (Argueso et al., 2009; Cortleven et. al., 2019).

Table 1. Effect of planting date , some growth stimulants and their combination on plant height (cm) and No. of leaves/plant on *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Plant height (cm)						Number of leaves /plant					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	32.00	27.33	29.68	30.33	29.67	30.00	17.67	16.00	16.83	16.00	17.00	16.50
T_2	31.67	34.67	33.17	31.67	32.00	31.83	20.67	20.00	20.33	20.00	21.00	20.50
T_3	36.67	41.00	38.83	37.00	37.67	37.33	23.67	24.00	23.83	23.00	23.33	23.16
T_4	42.67	42.33	42.50	43.67	43.67	43.67	26.67	26.67	26.67	25.00	26.33	25.67
T_5	32.00	31.33	31.67	31.67	31.00	31.33	23.67	22.00	22.83	24.00	23.00	23.50
T_6	34.67	35.00	34.83	35.67	35.00	35.33	25.33	25.67	25.50	25.33	25.00	25.17
T_7	38.33	38.00	38.17	38.33	38.33	38.33	28.67	29.00	28.67	27.67	28.00	27.83
T_8	29.00	27.00	28.00	28.67	29.67	29.17	18.33	18.00	18.16	19.00	18.00	18.50
T_9	36.67	34.00	35.33	34.33	33.67	34.00	21.67	21.00	21.33	22.00	20.33	21.17
T_{10}	37.67	38.00	37.83	36.00	35.67	35.83	23.00	24.00	23.50	24.00	23.00	23.50
Mean of (A)	35.13	34.87		34.73	34.63		22.93	22.63		22.60	22.50	
L.S.D. at 0.05 ~~for~~	A= N.S. B=2.133 AXB=3.016			A= N.S. B= 1.512 AXB=2.138			A= N.S. B=1.167 AXB=1.650			A= N.S. B=1.093 AXB=1.546		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 2. Effect of planting date , some growth stimulants and their combination on No. of branches/plant and leaf area (cm) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Number of branches/plant						Leaf area (cm)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	4.67	5.67	5.17	4.67	4.33	4.50	32.33	30.63	31.48	32.13	29.87	31.00
T_2	7.00	6.67	6.83	6.67	5.67	6.17	56.30	49.07	52.68	58.13	57.47	57.80
T_3	8.33	7.33	7.83	7.00	6.67	6.83	59.98	54.93	57.45	62.17	58.10	60.13
T_4	9.33	8.33	8.83	9.00	9.00	9.00	63.48	66.17	64.82	64.57	65.13	64.85
T_5	8.33	9.00	8.67	8.67	8.00	8.33	45.60	45.00	45.30	44.60	48.43	46.67
T_6	11.33	10.33	10.83	10.00	9.33	9.67	49.93	48.63	49.28	48.80	48.93	48.87
T_7	12.33	12.00	12.17	12.67	12.00	12.33	51.13	54.20	52.66	51.70	51.57	51.63
T_8	5.33	6.33	5.83	5.00	4.33	4.67	35.60	33.23	34.42	34.60	39.00	36.80
T_9	6.67	7.00	6.83	6.33	5.33	5.83	44.13	44.73	44.33	40.37	44.87	42.62
T_{10}	8.67	8.33	8.50	8.00	8.00	8.00	54.17	53.03	53.60	51.60	58.33	54.97
Mean of (A)	8.20	8.10		7.80	7.27		49.26	47.96		48.90	50.17	
L.S.D. at 0.05	A= N.S. B=1.048 AXB=1.482			A= 0.521 B= 1.164 AXB=1.646			A= N.S. B= 3.320 AXB=4.695			A= N.S. B= 3.104 AXB=4.389		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 3. Effect of planting date , some growth stimulants and their combination on fresh and dry weights of leaves (g) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Fresh weight of leaves/plant (g)						Dry weight of leaves/plant (g)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants(B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	1.57	1.36	1.46	1.66	1.53	1.60	0.19	0.18	0.18	0.20	0.21	0.21
T_2	2.50	2.43	2.47	2.50	2.20	2.35	0.35	0.35	0.35	0.33	0.34	0.34
T_3	2.97	2.43	2.70	3.10	2.77	2.93	0.54	0.44	0.49	0.40	0.39	0.40
T_4	3.20	3.46	3.33	3.97	3.47	3.71	0.63	0.52	0.57	0.54	0.54	0.54
T_5	2.03	2.00	2.02	2.26	2.07	2.16	0.33	0.27	0.30	0.32	0.32	0.32
T_6	2.57	2.33	2.45	2.70	2.53	2.61	0.37	0.34	0.36	0.37	0.37	0.37
T_7	2.57	2.67	2.62	3.13	2.80	2.97	0.41	0.40	0.41	0.42	0.41	0.42
T_8	1.63	1.53	1.58	1.80	1.87	1.83	0.20	0.24	0.22	0.22	0.22	0.22
T_9	2.03	1.93	1.98	2.50	2.27	2.38	0.27	0.31	0.28	0.26	0.29	0.28
T_{10}	2.23	2.27	2.25	2.80	2.43	2.61	0.32	0.32	0.32	0.34	0.31	0.33
Mean of (A)	2.33	2.24		2.64	2.39		0.36	0.34		0.34	0.34	
L.S.D. at 0.05	A= N.S. B=0.353 AXB=0.499			A= 0.157 B= 0.351 AXB=0.496			A= 0.066 B= 0.037 AXB=0.052			A= 0.066 B= 0.037 AXB=0.052		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 4. Effect of planting date , some growth stimulants and their combination on stem diameter of plant (cm) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Stem diameter of plant (cm)					
Rooted cutting	1st season			2nd season		
Planting date (A)	Planting date (A)					
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	1.50	1.63	1.57	1.60	1.63	1.62
T_2	1.67	1.80	1.73	1.80	1.87	1.83
T_3	2.07	2.13	2.10	1.97	2.03	2.00
T_4	2.13	2.20	2.16	2.13	2.13	2.13
T_5	1.77	1.80	1.78	173	1.73	1.73
T_6	1.90	1.90	1.90	1.83	1.90	1.87
T_7	2.00	2.00	2.00	1.93	1.93	1.93
T_8	1.60	1.67	1.63	1.77	1.60	1.77
T_9	1.83	1.93	1.88	1.80	1.87	1.80
T_{10}	2.00	2.07	2.03	2.07	2.07	2.07
Mean of (A)	1.85	1.91		1.86	1.88	
L.S.D. at 0.05	A= 0.066 B=0.148 AXB=0.209			A= N.S. B= 0.123 AXB=0.143		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

The effects of gibberellic acid on plants are numerous. Sharifuzzaman et al., (2011) on *chrysanthemum* plants, Dorajeerao et al., (2012) on *Chrysanthemum corarium*, Osman and Sewedan (2014) on *Solidago canadensis* (Tara), Mahananda et al., (2015) *on Chrysanthemum Coronarium L.*, El-Saadawy and Abdelmoniem (2015) on *Euphorbia milii var. longifolia.* They also indicated that GA_3 at 100 ppm helped produce the heaviest dry stems, and that GA_3 at 300 ppm achieved the longest leaves. Elsadek et al., (2020) on *Codiaeum Variegatum*, Lima et al. (2020) on *Aloe vera*, Hoque et al., (2021) on *Gladiolus hybridus L*, Khalafalla et al., (2022) on *Gladiolus hybridus L.* and Schriner and Klett (2022) on *Lavandula angustifolia* since they found that the foliar applications of gibberellins at a rate of 100 (ppm) caused an increase in vegetative growth parameters.

Effect of planting date, growth stimulants and their combination on flowering parameters on *Euphorbia milii* plant:

Data presented in Tables (5, 6 , 7, and 8) indicate that planting *Euphorbia milii* in autumn led to increases in all flowering parameters as number of inflorescences/plant, fresh weight of inflorescences (g), dry weight of inflorescences (g), The duration of the inflorescence on the plant (days), duration of flowering bud (days), beginning of flowering (days) and number of flowering days/ year compared to spring with non-significant differences between them in the most cases during both seasons. On the other hand, T7(BAP at 150 ppm) ranked the first of These parameters are mentioned above, followed by T4 (GA3 at 100 ppm) in most of cases during both seasons. In addition, the highest values for these parameters were recorded using the combination between the planting date (autumn) and T4 or T7 in both season. The combined treatment was recorded between the planting date (autumn) and T5 or T8 increases in the above criteria in both seasons.

In this concern, Sainath et al., (2014) On *chrysanthemum wreath L*, Gupta et al. (2015) On China *aster*, Bergmann et al. (2016) On *Euphorbia pulcherrima*, Gad et al. (2016) on *Ixora coccinea.* Gaurav, et al. (2016) in *Dendranthema grandiflora*, Kudmate, et al. (2016) on *chrysanthemum* plants, Mohamed (2017) on an *aster* plant *(Symphyotrichum novi-belgii L.)* and Bahmanyar (2020) on *African marigold* found that application of gibberellic acid at a concentration of 100 mg/L improved the vegetative and roots growth.

El-Kinany et al. (2019) on three *Gaillardia* cultivars, Thakur and Kumar (2020) in the Rosa *damascena mill.* and Abu El-Ghait, et al., (2020) on *Jasminum sambac* showed that the heaviest flower weight/plant was recorded by BA at 60 ppm + mineral fertilization at 6 g/pot on both seasons. Patokar, et al. (2017) on *Tagetes erecta L.*, Vanlalruati et al. (2019) on *Chrysanthemum morifolium*, Mohana, et al. (2021) on *Tagetes erecta L.*, Kurbah and Fatmi (2022) on *Dianthus caryophyllus L.*, Thakur et al. (2022) on the *chrysanthemum morifolium*, Sultana, et al. (2022) on *Lisianthus*, *Kalantara* Ahmadi and Danishian (2023) on *Brassica napus L*.

Table 5. Effect of planting date , some growth stimulants and their combination on number of inflorescences /plant of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Number of inflorescences /plant					
Rooted cutting	1st season			2nd season		
Planting date (A)	Planting date (A)					
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	6.00	5.00	5.50	5.67	5.00	5.33
T_2	7.00	5.67	6.33	6.00	5.00	5.50
T_3	8.00	7.33	7.67	7.00	5.67	6.33
T_4	9.33	9.00	9.17	10.00	9.00	9.50
T_5	8.33	8.33	8.33	8.00	7.00	7.50
T_6	9.00	9.67	9.33	10.67	8.67	9.67
T_7	12.33	12.00	12.16	13.00	10.33	11.67
T_8	6.00	5.67	5..83	5.33	4.33	4.83
T_9	6.67	7.00	6.83	6.33	6.33	6.33
T_{10}	7.67	8.00	7.83	8.33	7.33	7.83
Mean of (A)	8.03	7.77		8.03	6.87	
L.S.D. at 0.05	A=N.S. B= 1.299 AXB=1.838			A= 0.424 B= 0.949 AXB=1.342		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 6. Effect of planting date , some growth stimulants and their combination on fresh weight of inflorescences (g)and dry weight of inflorescences (g) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Fresh weight of inflorescences (g)						Dry weight of inflorescences (g)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants(B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	2.70	2.27	2.48	2.77	2.70	2.73	0.27	0.27	0.27	0.25	0.25	0.25
T_2	3.23	3.03	3.13	3.40	3.67	3.53	0.37	0.37	0.37	0.46	0.7	0.46
T_3	4.20	3.23	3.72	4.53	4.30	4.42	0.46	0.44	0.45	0.54	0.53	0.54
T_4	4.57	4.37	4.47	5.13	5.33	5.23	0.56	0.57	0.57	0.64	0.66	0.65
T_5	3.33	3.30	3.32	3.30	3.20	3.25	0.36	0.34	0.35	0.42	0.43	0.43
T_6	2.93	3.20	3.07	3.30	3.53	3.42	0.45	0.46	0.46	0.44	0.44	0.44
T_7	3.87	4.20	4.03	4.32	4.20	4.22	0.48	0.50	0.49	0.52	0.51	0.52
T_8	3.13	2.47	2.80	2.87	3.07	2.97	0.30	0.28	0.29	0.63	0.37	0.37
T_9	3.67	3.13	3.40	3.20	3.33	3.27	0.40	0.38	0.39	0.40	0.43	0.42
T_{10}	3.93	4.13	4.03	3.93	3.87	3.90	0.44	0.44	0.44	0.45	0.49	0.47
Mean of (A)	3.56	3.33		3.66	3.72		0.41	0.41		0.45	0.46	
L.S.D. at 0.05	A= N.S. B=0.590 AXB=0.835			A= N.S. B=0.381 AXB=0.538			A= 0.016 B= 0.037 AXB=0.052			A= 0.016 B= 0.037 AXB=0.052		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 7. Effect of planting date , some growth stimulants and their combination on the duration of the inflorescence on the plant and duration of flowering bud/day of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Duration of the inflorescence on the plant						Duration of flowering bud (days)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date(A)	Planting date (A)											
Growth stimulants(B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	44.67	44.67	44.67	44.67	44.67	44.67	10.33	11.67	11.00	11.00	12.00	11.50
T_2	56.33	56.67	56.50	57.00	56.67	56.83	9.33	9.33	9.33	10.00	9.67	9.83
T_3	65.33	54.00	59.67	61.00	60.33	60.67	8.67	8.33	8.50	8.67	9.33	9.00
T_4	66.00	63.33	64.67	65.67	67.33	65.50	6.00	5.33	5.67	6.67	7.00	6.83
T_5	52.67	53.33	53.00	54.00	53.33	53.67	10.33	9.67	10.00	10.33	10.67	10.50
T_6	58.00	56.67	57.33	58.00	56.67	57.33	9.00	8.33	8.67	9.33	9.00	9.16
T_7	59.67	59.33	59.50	59.67	59.33	59.50	7.33	7.67	7.50	7.67	8.33	8.00
T_8	51.67	53.67	52.67	51.67	50.67	51.17	10.67	11.67	11.17	10.67	11.33	11.00
T_9	54.00	55.67	54.83	53.67	55.67	54.67	9.33	10.00	9.67	10.33	9.67	10.00
T_{10}	57.00	58.33	57.67	57.00	58.33	57.67	8.33	8.00	8.17	8.67	8.67	8.67
Mean of (A)	56.53	55.57		56.23	56.30		8.93	9.00		9.33	9.56	
L.S.D. at 0.05	A= N.S. B=2.441 AXB=3.452			A=N.S. B= 1.729 AXB=2.531			A=N.S. B= 0.967 AXB=1.368			A= N.S. B= 0.887 AXB=1.254		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 8. Effect of planting date, some growth stimulants and their combination on the beginning of flowering (day) and number of days to flowering of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Beginning of flowering (days)						Number of flowering days / year					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	44.00	43.33	43.67	47.67	48.67	48.17	135.00	136.67	135.83	141.67	138.33	140.00
T_2	36.33	38.67	37.50	37.00	37.00	37.00	152.67	155.00	153.83	153.33	153.67	153.50
T_3	32.67	31.00	31.83	34.00	34.67	34.33	176.67	186.67	181.67	176.67	175.00	175.83
T_4	27.67	27.00	27.33	30.33	30.33	30.33	198.33	200.67	199.50	196.66	193.33	195.00
T_5	40.33	43.67	42.00	41.00	40.33	40.67	141.67	148.33	145.00	148.33	150.00	149.17
T_6	37.67	37.67	37.67	37.33	37.00	37.17	165.00	175.00	170.00	170.00	175.00	172.50
T_7	31.67	31.67	31.67	32.33	33.00	32.67	185.00	183.33	184.17	176.67	178.33	177.50
T_8	43.00	44.33	43.67	43.00	45.33	44.17	148.33	148.33	148.33	146.67	151.67	149.17
T_9	40.00	40.33	40.17	40.00	38.67	39.33	156.67	160.00	158.33	165.00	165.00	165.00
T_{10}	36.33	37.00	36.67	35.33	43.33	34.83	174.67	171.67	173.17	171.67	176.67	174.17
Mean of (A)	36.97	37.47		37.80	37.93		163.40	166.57		164.67	165.70	
L.S.D. at 0.05	A= N.S. B=1.876 AXB=2.653			A= N.S. B= 1.344 AXB=1.901			A=2.457 B= 5.494 AXB=7.770			A= N.S. B= 4.541 AXB=6.422		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Effect of planting date, growth stimulants and their combination on root parameters of *Euphorbia milii* plant:

The data presented in Tables (9 and 10) indicate that planting *Euphorbia milii* in autumn led to increases in all root parameters (root length (cm), number of roots/plant, fresh root weight (g) and root dry weight (g) in Comparing it with the spring, with non-significant differences between them in most cases in both seasons. On the other hand, T7 (150 ppm 6-BAP) came first of these parameters mentioned above, except for root length. The highest values were recorded by T4 100 ppm GA_3 in both seasons. In addition, the highest values of these parameters were recorded using the co-treatment

between planting date (autumn) and T7 and then followed decreasingly by the combined treatment between planting date (autumn) and T4. On contrary, the lowest values for these parameters were recorded by planting date (spring) and T1 (tap water control) in both seasons.

Table 9. Effect of planting date , some growth stimulants and their combination on number of roots /plant and root length (cm) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Number of Roots /plant						Root length (cm)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	8.00	7.00	7.50	7.33	7.00	7.17	24.67	22.00	23.33	26.67	25.67	26.17
T_2	7.67	7.67	7.67	7.00	7.67	7.33	30.00	32.33	31.17	27.67	30.00	28.83
T_3	8.33	9.67	9.00	9.33	9.00	9.17	38.33	39.67	39.00	36.33	34.00	35.17
T_4	11.00	10.67	10.83	10.67	10.33	10.50	45.00	42.67	43.83	43.33	41.33	42.33
T_5	11.00	9.33	10.17	10.00	10.00	10.00	28.67	28.33	28.50	26.00	28.00	27.00
T_6	12.33	10.33	11.33	10.33	11.00	10.67	35.33	36.67	36.00	36.33	34.67	35.50
T_7	14.00	12.00	13.00	12.33	12.00	12.17	40.00	39.67	39.83	40.00	39.33	39.67
T_8	8.00	8.67	8.33	8.00	7.33	7.67	26.33	25.67	26.00	30.67	28.33	29.50
T_9	8.67	9.67	9.17	9.67	9.33	9.50	31.00	34.33	32.67	34.33	34.67	34.50
T_{10}	10.33	10.67	10.50	10.00	10.67	10.33	35.33	38.00	36.67	38.33	38.00	38.17
Mean of (A)	9.93	9.57		9.47	9.43		33.47	33.93		33.97	33.40	
L.S.D. at 0.05	A= N.S. B= 1.244 AXB=1.759			A= N.S. B= 1.073 AXB=1.518			A= N.S. B=2.195 AXB=3.104			A= N.S. B= 2.164 AXB=3.061		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 10. Effect of planting date , some growth stimulants and their combination on fresh weight of root (g)and dry weight of root (g) of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Fresh weight of root (g)						Dry weight of root (g)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	21.67	21.73	21.50	21.07	21.97	21.51	6.20	5.67	5.93	6.53	7.40	6.97
T_2	28.83	28.07	28.45	28.17	27.00	27.58	8.13	6.87	7.50	8.47	8.67	8.57
T_3	35.57	32.07	33.81	29.47	32.13	30.80	11.60	8.83	10.21	10.60	11.23	10.92
T_4	37.13	36.40	36.77	37.30	37.73	37.52	13.13	10.53	11.83	12.80	13.93	13.37
T_5	30.337	27.70	29.03	31.17	27.77	29.47	9.93	8.90	9.42	10.67	9.10	9.88
T_6	37.03	30.97	34.00	34.03	31.77	32.90	12.63	10.77	11.70	13.17	11.30	12.23
T_7	42.60	38.77	40.68	41.40	39.30	40.35	16.37	13.03	14.70	15.90	13.93	14.77
T_8	23.57	21.77	22.67	25.13	26.03	25.58	7.30	5.23	6.27	8.27	8.47	8.37
T_9	28.50	27.97	28.23	27.40	32.80	30.10	10.13	7.57	8.85	8.83	10.70	9.77
T_{10}	32.27	33.40	32.83	31.13	31.50	31.31	11.70	9.73	10.72	10.60	12.03	11.32
Mean of (A)	31.71	29.88		30.63	30.80		10.71	8.71		10.58	10.65	
L.S.D. at 0.05	A= 1.074 B=2.401 AXB=3.396			A= N.S. B= 2.410 AXB=3.408			A= 0.594. B=1.328 AXB=1.878			A=N.S. B=1.175 AXB=1.661		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Effect of planting date, growth stimulants and their combination on chemical compositions of *Euphorbia milii* plant:

The data presented in Tables (11, 12, 13 and 14) revealed that planting *Euphorbia milii* in autumn resulted in increases in all chemical compositions (chlorophyll a, b and carotenoids and NPK and total carbohydrates%) compared to spring in the two seasons.

Table 11. Effect of planting date , some growth stimulants and their combination on total carbohydrates %and N %of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Total carbohydrates %						N %					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	13.80	14.77	14.29	14.17	14.98	14.57	1.49	1.54	1.52	1.49	1.54	1.52
T_2	21.48	22.82	22.15	21.50	23.03	22.26	1.72	1.78	1.75	1.68	1.73	1.71
T_3	25.35	26.88	26.12	25.27	27.08	26.17	2.07	2.13	2.09	2.12	2.15	2.14
T_4	27.37	28.92	28.15	26.76	29.02	27.89	1.90	1.96	1.93	1.91	1.96	1.93
T_5	20.43	21.66	21.04	19.85	21.39	20.62	1.77	1.84	1.81	1.78	1.84	1.81
T_6	21.57	22.95	22.26	21.16	22.91	22.03	1.87	1.93	1.90	1.88	1.94	1.91
T_7	25.49	26.91	26.20	25.34	27.15	26.25	1.88	1.94	1.91	1.87	1.93	1.90
T_8	13.75	14.64	14.19	14.21	15.34	14.78	1.58	1.63	1.61	1.58	1.64	1.61
T_9	17.17	18.52	17.85	17.65	19.22	18.44	1.65	1.69	1.67	1.64	1.69	1.67
T_{10}	19.23	20.41	19.82	19.13	20.36	19.75	1.79	1.84	1.81	1.79	1.85	1.82
Mean of (A)	20.67	21.85		20.51	22.05		1.77	1.83		1.78	1.83	
L.S.D. at 0.05	A= 0.189 B=0.423 AXB=0.598			A=0.177 B= 0.396 AXB=0.561			A=0.004 B= 0.008 AXB=0.012			A= 0.016 B= 0.037 AXB=0.052		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 12. Effect of planting date , some growth stimulants and their combination on P % and K % of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	P %						K %					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	0.22	0.21	0.21	0.20	0.21	0.21	1.93	1.84	1.88	1.93	1.84	1.89
T_2	0.26	0.26	0.26	0.27	0.26	0.26	2.46	2.33	2.39	2.46	2.33	2.39
T_3	0.34	0.22	0.33	0.33	0.32	0.32	2.74	2.60	2.67	2.77	2.59	2.68
T_4	0.36	0.34	0.35	0.37	0.35	0.36	2.83	2.66	2.74	2.82	2.66	2.74
T_5	0.24	0.25	0.25	0.23	0.25	0.24	2.39	2.26	2.33	2.36	2.26	2.31
T_6	0.31	0.28	0.29	0.32	0.28	0.30	2.63	2.51	2.57	2.67	2.52	2.59
T_7	0.34	0.32	0.33	0.34	0.33	0.34	2.69	2.53	2.61	2.74	2.56	2.65
T_8	0.22	0.21	0.22	0.22	0.21	0.22	2.06	1.94	2.00	2.08	1.93	2.01
T_9	0.24	0.22	0.23	0.23	0.23	0.23	2.24	2.15	2.19	2.24	2.14	2.19
T_{10}	0.27	0.25	0.26	0.27	0.24	0.26	2.33	2.19	2.26	2.33	2.19	2.26
Mean of (A)	0.28	0.27		0.26	0.27		2.43	2.30		2.44	2.30	
L.S.D. at 0.05	A= 0.004 B=0.008 AXB=0.012			A= 0.005 B= 0.010 AXB=0.015			A= 0.004 B= 0.008 AXB=0.012			A= 0.005 B= 0.010 AXB=0.015		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 13. Effect of planting date , some growth stimulants and their combination on chlorophyll a (mg/g f.w.) and chlorophyll b (mg/g f.w.)of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Chlorophyll a (mg/g f.w.)						Chlorophyll b (mg/g f.w.)					
Rooted cutting	1st season			2nd season			1st season			2nd season		
Planting date (A)	Planting date (A)											
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	0.76	0.82	0.79	0.75	0.82	0.78	0.41	0.42	0.42	0.41	0.43	0.42
T_2	0.86	0.96	0.91	0.86	0.97	0.92	0.54	0.57	0.55	0.53	0.57	0.55
T_3	1.06	1.16	1.11	1.06	1.18	1.12	0.55	0.59	0.57	0.55	0.59	0.57
T_4	1.13	1.24	1.86	1.14	1.24	1.19	0.59	0.62	0.61	0.60	0.62	0.61
T_5	0.83	0.94	0.89	0.84	0.94	0.89	0.50	0.52	0.51	0.49	0.52	0.51
T_6	0.98	1.07	1.03	0.97	1.07	1.02	0.54	0.57	0.55	0.54	0.57	0.55
T_7	1.16	1.26	1.21	1.16	1.26	1.21	0.58	0.62	0.59	0.58	0.60	0.69
T_8	0.75	0.83	0.79	0.76	0.84	0.80	0.44	0.45	0.44	0.43	0.45	0.44
T_9	0.79	0.87	0.83	0.79	0.88	0.84	0.46	0.48	0.47	0.46	0.49	0.47
T_{10}	0.85	0.95	0.90	0.85	0.96	0.90	0.49	0.51	0.50	0.49	0.51	0.50
Mean of (A)	0.92	1.01		0.92	1.02		0.51	0.53		0.51	0.53	
L.S.D. at 0.05	A= 0.004 B=0.008 AXB=0.012			A= 0.003 B= 0.007 AXB=0.010			A= 0.005 B= 0.010 AXB=0.012			A= 0.004 B= 0.008 AXB=0.012		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

Table 14. Effect of planting date , some growth stimulants and their combination on carotenoids content (mg/g f.w.)of *Euphorbia milii* plant during 2018 /2019 and 2019 /2020 seasons

Parameters	Carotenoids content (mg/g f.w.)					
Rooted cutting	1st season			2nd season		
Planting date (A)	Planting date (A)					
Growth stimulants (B)	Autumn	Spring	Mean of (B)	Autumn	Spring	Mean of (B)
T_1	0.30	0.32	0.31	0.30	0.32	0.31
T_2	0.36	0.38	0.37	0.36	0.38	0.37
T_3	0.39	0.39	0.39	0.38	0.39	0.39
T_4	0.39	0.41	0.39	0.39	0.41	0.39
T_5	0.35	0.37	0.36	0.35	0.37	0.36
T_6	0.37	0.38	0.37	0.37	0.38	0.38
T_7	0.38	0.40	0.39	0.38	0.40	0.39
T_8	0.32	0.32	0.32	0.31	0.33	0.32
T_9	0.33	0.35	0.34	0.33	0.35	0.34
T_{10}	0.34	0.36	0.35	0.34	0.36	0.35
Mean of (A)	0.35	0.37		0.35	0.37	
L.S.D. at 0.05	A= 0.003 B=0.007 AXB=0.010			A= 0.004 B= 0.008 AXB=0.012		

T_1 control T_2 50ppm GA_3 T_3 75ppmGA_3 T_4 100ppm GA_3 T_5 50ppm 6-BAP T_6 100ppm 6-BAP T_7 150ppm 6-BAP T_8 50mg/l of each Zn, B T_9 100mg/l of each Zn, B T_{10} 150mg/l of each Zn, B

On the other hand, the T4 (100 ppm GA3) ranked first of these above parameters, followed by the T7(150 ppm BAP) in most cases in the two seasons. In addition, the highest values of these parameters were recorded using the co-treatment between planting date (autumn) and T4 in the two seasons.Osman and Sewedan (2014) on *Solidago canadensis*, Sorour and El-Shanhorey (2016) on *Dracaena marginata*., Mohamed (2017) on aster , Elsadek et al. (2020) on *Codiaeum Variegatum L.* , and Abdel-Mola et al. (2022) on *Pelargonium graveolens L.*, Reda *et al*, (2010) on chamomile plant , EL-Nemr (2018) on *Dendranthema grandiflorium* cvs., El-Kinany, *et al.* (2019) on *Gaillardia pulchella* and . Abou El-Ghait, *et al.* (2020) on *Jasminum sambac* plant cleared that the richest leaf nitrogen and phosphorus percentages were obtained by those treated with BA at 60 ppm + mineral fertilization at 6 g/pot in both seasons. . In addition, Iftikhar, et

al (2010) on *Rosa hybrida L.* , Sakr , et al, (2010) on *Magnolia grandiflora L.* , Mehmood, et al. (2021) on *Sunflower Hybrids* and El-Khateeb, et al. (2022) on *Schefflera cv. Gold Capella* results showed that zinc from different sources led to significant increases in chlorophyll content.

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تأثير ميعاد الزراعة و منشطات النمو على النمو والمكونات الكيميائية لنبات الايفوربيا ميلي

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الملخص

الايفوربيا ميلي هو نوع عصاري من النباتات المزهرة يتبع عائلة Euphorbiaceae موطنه في مدغشقر. تم إجراء البحث الحالي في مزرعة الزينة ، قسم البساتين ، كلية الزراعة ، جامعة بنها ، على مدار العامين المتتاليين 2019/2018 و 2020/2019 لمعرفة تأثير ميعاد الزراعة مع رش عقل الايفوربيا ميلي ببعض منشطات النمو لتحسين فترة الإزهار وجودة الأزهار.حيث تم رش عقل الايفوربيا ميلي ب 10 معاملات T_1 (الكنترول-ماء صنبور) و T_2(GA_3عند 50 جزء في المليون) و T_3(GA_3عند75 جزء في المليون) و T_4 (GA_3عند 100 جزء في المليون)و T_5 (6-BAP عند 50جزء في المليون) و T_6 (6-BAP عند 100جزء في المليون) و T_7 (6-BAP عند 150جزء في المليون) و T_8(Zn ,B,عند 50ملجم/لتر) و T_9(Zn ,B عند 100 ملجم/لتر) و T_{10}(Zn ,Bعند150 ملجم/لتر) .أظهرت النتائج أنه تم تسجيل أعلى قيم النمو الخضري ، القراءات الجذرية ، القراءات الزهرية باستخدام معاملة التفاعل بين تاريخ الزراعة (الخريف) و T_4(GA_3عند 100 جزء في المليون) متبوعة تنازلياً معاملة التفاعل بين تاريخ الزراعة (الخريف) و T_7 (6-BAP عند 100جزء في المليون) كذلك التركيب الكيميائى فكانت أعلى نسبة للكربوهيدرات الكلية % و N% و الكلورفيل a و b تم تسجيلها باستخدام معاملة التفاعل بين تاريخ الزراعة (الربيع) و T4(GA3 عند 100 جزء فى المليون) اما اعلى نسبة من P % وk% تم تسجيلها باستخدام معاملة التفاعل بين تاريخ الزراعة (الخريف)و T4(GA3 عند 100 جزء فى المليون)على النقيض من ذلك ، سجلت أدنى قيم لهذه القراءات بين تاريخ الزراعة (الربيع) و T_1 (الكنترول) في الموسمين. بشكل قاطع ، تم الجمع بين المعاملة بين تاريخ الزراعة (الخريف) و T_4 (GA_3عند 100 جزء في المليون) للحصول على أفضل نمو نباتي وزهرى وتركيب كيميائي لنبات الايفوربيا الميلي.