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EFFECT OF FOLIAR SPRAYS WITH POTASSEIN(N , B) ON VEGETATIVE GROWTH, FLOWERING AND CHEMICAL COMPOSITION OF *Euphorbia splendes* PLANTS.

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ABSTRACT

A study was conducted at the experimental Orman farm Botanical Garden , Giza, Egypt ,during 2005/2006 and 2006/2007 seasons to study the effect of potassein N (K-N) and potassein P (K-P) as a foliar spray with a different rates on growth, flowering and chemical composition of *Euphorbia splendes* plants grown in pots.

The obtained results indicated that plant height, number of branches and number of leaves/plant, root length, fresh and dry weights of leaves, stem and roots as well as flower date ,flower diameter , chlorophyll a and b, carotenoids contents and the percentages of N, P and K in the plants.

All these characteristics were significantly increased in response to the various treatments used in the study when compared to the control. The opposite was the right concerning number of days from planting to opening first flower significantly produced early flowering plants.

So it is recommended to spray the foliage of *Euphorbia splendes* transplants grown in 20-cm-diameter pots with a combination 6 ml/L, K-N plus 6 ml/L K-P which gave attractive specimens of such plant.

Keywords: *Euphorbia splendes*, Potassein N (K-N), Potassein P (K-P), vegetative growth ,flowering,chemical composition.

INTRODUCTION

Euphorbia splendes belongs to family Euphorbiaceae is one of the most important succulent plants often used as indoor plant and garden .Height and sprceat 12-24 in. inflorescences are branching cymes borne on long stalks from the upper parts of the stem two kidney-shaped crimson bracts extend beneath the flowers .This plant may flower at any time but most freely during winter.(Bailey,1976) .

Foliar fertilization with macro and micro-nutrients leads usually to considerable growth and development responses. This is mainly due to the fact that foliar nutrients application easily overcomes limiting soil physiochemical conditions for root nutrient uptake and because nutrients are directly applied to foliage at times when demand is particularly high and rapid responses may be desired (Alexander, 1987). Potassium is very effective macroelement on growth, development, flowering and yield of different plants, it is a well known factor affecting many functions of plants as stomatal movement, flowering and yield of different plants potassein N also potassein P had a great effect of regulating photosynthesis respiratory rates and activating many enzymes involved in plant growth, it also enhances translocation of sugars and carbohydrates through plant organs, increases proteins synthesis and different metabolic processes as well as reducing respiration hence energy losses (Csizinskey, 1999).

Potassium is a foliar fertilizer available in two forms:- one fortified with nitrogen (Potassein-N) and the other with phosphorus (Potassein-P). many investigators as , Nerd and Mizrahi (1991) , Abou-Dahab (1992), Larson (1992), EL-Fouly (1994), and Ibarhim (1998) on *Opunita ficus –indica* EL-Maghraby *et al*., (1998), EL-Shafai (2001) and Ismail *et al.,* (2002) scored a significant stimulation on growth, root sugars and yield of sugar-beet plants fertilized with either forms of Potassein .Likewise ,Naguib (2002) on thyme and Mohamed and Naguib (2002) on fenugreek indicated that plant height, number of branches/plant, fresh and dry weights of herb ,chlorophylls ,carbohydrates and minerals content in the leaves were significantly improved as a result of spraying with K-P or K-N potassein at the rates 3 or 6 L./fed . Ahmed (2002) on *Gasteria vessucosa* and , *Haworthia fasciata*) found that fertilizing with kristalon at rate of 2 g/pot plant produced the growth when plants gave that improved vegetative growth and the best result increased significantly the plant height, number of leaves /plant, fresh and dry weight roots, chlorophyll a, b and carotenoides mg/gm and total carbohydrates content of foliage plant and roots D.W% and N, P, K, Shahin *et al*. (2007) noticed that on *Hibiscus rosa- sinensis* L. potassein P (K-P, K-N) the growth of plant was and chlorophyll a and b, cartenoids N, P and K were significantly increased by the application of potassein K-N, potassein K-P treatments.

The objective of this study was to investigate the effect of two forms of potassein (K-N and K-P) as a foliar spray on vegetative growth, flowering and chemical composition of *Euphorbia splendes*.

MATERIAL AND METHODS

A trial was carried out in the experimental farm of Orman Botanical Garden at Giza Egypt throughout the two successive seasons (2006/2007and 2007/2008) to examine the beneficial effects of potassein foliar spray on growth, flowering and chemical composition of *Euphorbia splendes* plants as well as, determination of synergistic effect of both potassein forms in combination on growth behaviour of such ornamental plant.

Plant materials:-

Seedlings of *Euphorbia splendes* (10-20 cm height) were transplanted in pots filled with mixture of fine sand, clay and peat moss at the rate of (2:1:1 v/v/v), 1st March in both seasons. The seedlings were placed in a sunny area in the nursery. After one month the plants were sprayed there time with one month interval just to cover plant foliage completely till drip will either potassein (K-N) liquid fertilizer contains 30% K_2O, and 8%N or potassein (K-P) contains 30% K_2O & 10% P_2O_5) at the two levels of 3 or 6 ml/L and combination between.

Physical properties of the used mixture were analyzed according to A.O.A.C. (1985) and the results are shown in Table (1).

Chemical properties of the used mixture were analyzed according to Jackson (1985) and the results are shown in Table (2).

Table (1): Physical properties of the used soil.

Soil	Soil particle size distribution %				Textural class	O.M.	S.P.	E.C.
	Coarse sand	Fine sand	Silt	Clay				
Clay	4.5	13.5	28.5	53.5	Clay	1.5	66.0	2.8
Sand	75.3	19.5	2.9	2.3	Sandy	0.2	21.0	1.3

O.M. : Organic Matter.
S.P. : Saturation percentage.
E.C. : Electrical conductivity (mmhos/cm^3).

Table (2): Chemical properties of the used soil.

Soil	Soluble anions meq./L			Soluble anions meq. /L				Available element ppm			pH
	HCO_3^-	CL^-	SO_4^-	Ca^{++}	Mg++	Na^+	K^+	N	P_2O_5	K_2O	
Clay	2.9	4.4	3.7	4.3	3.6	8.1	4.3	220.2	90.3	265.3	7.7
Sand	0.9	0.92	1.87	0.97	0.39	3.6	0.45	50.6	6.5	20.3	7.1

The treatments were: The plants were treated with the following foliar spray potassein treatment:

- No fertilization, referred to as control.
-Potassein N 3 ml/L (KN).
-Potassein N 6 ml/L (KN).
-Potassein P 3 ml/L (KP).
-Potassein P 6 ml/L (KP).
-K-N 3ml/L + K-P 3ml/L.
-K-N 6ml/L + K-P 3ml/L.
-K-N 3ml/L + K-P 6ml/L.
-K-N 6ml/L + K-P 6ml/L.

However, all transplants under the different treatments were irrigated once every two days with 200 ml of fresh water/pot, while the other routine agricultural practices were carried out as recommended for such plantation. The layout of the experiment in the two seasons was a complete randomized design (Mead *et al.,* 1993) with three replicates, as each replicate contained five plants.

Data recorded:

The Data on vegetative growth and flowering were recorded on 1st of October in both seasons such as: plant height (cm), stem diameter (cm),number of branches /plant, number of leaves/plant, root length(cm), fresh and dry weights (g) of leaves, stem, and roots , flowering date (number of days from planting to the first flower bud opening (days)) ,number of flower/plant, flower fresh and dry weights(g).

The chemical analysis in fresh leaf samples taken from the middle parts of the plants, photosynthetic pigments (chlorophyll a, b and carotenoids, mg/g F.W.) were determined according to Moran (1982). While in dry leaves samples, the content of total carbohydrates as mg/g D.W. (Herbert *et al.,* 1971)while the percentages of phosphorus calorimetrically by Cottenie *et al.*, (1982) and potassium% using flamephotometer set(Jackson, 1973), and nitrogen% using micro-kjeldale method described by Jackson (1973) were measured**.**

Data were then tabulated and subjected to analysis of variance according to SAS program (1994)using Duncan, Multiple range test (1955) to verify the significance level among means of various treatments**.**

RESULT AND DISCUSSION

Effect of potassein(K-N and K-P) as a foliar spray on vegetative growth:

Data present in (Tables 1 and 2) showed that plant height (cm) number of branches or leaves /plant, stem diameter and root length, leaves, stem and roots fresh and dry weight (g) were significant and increased in response to the different treatments used in the study in both seasons with the superiority of the combined treatment between K-N 6 ml/L+ K-P 6 ml/L, which gave the highest recorded data when compared to control and other treatments means in the two seasons. The increment in vegetative and root growth of Euphorbia due to potasseins application might be attributed to function of potassium on cell division and elongation ,carbohydrates and protein synthesis, activating translocation of sugars and starch in plant organs, as well as its role as a Co-factor for about 60 enzymes involved in plant. Ismial *et al.,* (2002) scored a significant stimulation on growth, root sugars and yield of sugar-beet plants fertilized with either forms of potassein Likewise, Naguib (2002) on thyme and Mohamed and Naguib (2002) on Fenugreek indicated that plant height, number of branches/plant, fresh and dry weights of herb, chlorophylls pigments, carbohydrates and minerals content in the leaves were significantly improved as a result of spraying with K-P or K-N potassein at the rates of 3 or 6 L/fed.(Csizinskey, 1999) which were reflected in taller plants bearing more leaves and branches containing more metabolites and food reserves and consequently heavier plant weight such improvement of potassein forms on plant growth trails was also observed by Ahmed (2002) on *Haworthia fasciata* In addition to the great contribution of N plant materials as it is a main constituent of all proteins and nucleic acids as well as of both structural and non-structural components of plant cells besides involving P in energy transfer process and is building of phospholipids and nucleic acids.

Effect of potassein (K-N and K-P) as a foliar spray on flowering:

Data in Table (3) exhibit that the two forms of potasseins at both rates as well as the combined treatment significantly enhanced flowering of Euphorbia plant in the two seasons that means that potasseins applications leads to stimulation vegetative growth and forcing plant to flowering. That behavior my be reasonable to obtain healthy growth suitable for best flowering. In this regard with the flowering date ,number of flowering, fresh and dry weights of flowers with the superiority of the combined one(K-N 6ml/L+K-P 6ml/L), comparing with control and either of potasseins added alone this may indicate the stimulatory effect of the flower buds and encouraging metabolism tissues of the flowers buds and encouraging in this cells. However, such findings are in accordance with those of Shahin *et al*. (2007) on *Hibiscus rosa- sinensis* L .

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Effect of potassein (K-N and K-P)as a foliar spray on chemical composition:

According to data presented in Table (4) it could be concluded that chlorophyll a, b carotenoids, N, P and K contents were greatly increased in the leaves of treated plants with significant differences in most cases of both seasons compared to control plant in two seasons may be due to the combined treatment that generally gave the highest averages of all pervious constituents. These results come in response to the role played by N in chlorophylls and amino acids synthesis and P which contributes in regulating the opening and closing of stomata and possible membrane turgar that effect chlorophyll properties since phosphorus would activate various metabolic processes and it is involved in energy transfer process during building of phospholipids and nucleic acid .Moreover P provides plant metabolic process with phosphate bond which are necessary for building pigments and other constituents Ahmed (2002) and Shahin *et al*. (2007) on *Hibiscus rosa-sinensis* L .

From the previously stated results it could be recommended to spray the foliage of *Euphorbia splendes* (Milli) transplants grown is 20 cm diameter pots thrice with a combination of 6 ml/L potassein N + 6 ml/L potassein P with one month interval to get growth and flowering.

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تـأثير الـرش الـورقي بالبوتاسين(فو,ن) علـى النمـو الخضـرى والتزهيـر والتركيـب الكيماوي لنبات ايفوربيا سبدلنس

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اجريت هذه التجربة تحت ظروف الشمس الساطعة بحديقة الاورمان بالجيزة- خلال موسمين ٢٠٠٧/٢٠٠٦ و ٢٠٠٨/٢٠٠٧ متتاليين بهدف التعرف على التاثيرات الهامة او المفيدة لرش المجموع الخضرى لشتلات الايفوربيا *Euphorbia splendes* عمر ٨ اشهر والمنزرعة فى اصص بلاستيك قطرها ٢٠ سم بنوعين من المغذى الورقى بوتاسين احداهما يحتوى على النتروجين(بو- ن) والاخر على الفوسفور (بو- فو) بمعدلات صفر ، ٣ ، ٦ ميللتر وكذلك المعاملات المشتركة وتاثيرها على النمو الخضري والزهري والتركيب الكيماوي لهذا النبات .

وقد اوضحت النتائج المتحصل عليها:-

- حدوث زيادة معنوية فى ارتفاع النبات وقطر الساق وعدد الأفرع وعدد الأوراق وطول الجذر والوزن الطازج والجاف لكل من الأوراق والسيقان والجذور وكذلك موعد الأزهار(تاريخ تفتح أول زهرة) وعدد الأزهار والوزن الطازج والجاف للأزهار لكل نبات وكذلك محتوى الاوراق من كلوروفيل ا، ب والكاروتينات والنسبة المؤية لكل من NPK ، والكربوهيدرات الكلية .
- نتيجة لرش مختلف المعاملات التى طبقت لهذه الدراسة فى كلا الموسمين وجد أن المعاملات المشتركة أعطت بصفة عامة اعلى المتوسطات فى جميع القياسات المذكورة سابقا عند مقارنتها بالكنترول والمعاملات الأخرى في حين وجد أن كل المعاملات أحدثت زيادة معنوية فى تبكير موعد الأزهار لكلا الموسمين وعلى ذلك فأنة يفضل رش المجموع الورقى (الخضرى) لشتلات الايفوربيا المنزرعة فى اصص بلاستيك قطرها ٢٠ سم بتوليفة من ٦ميللى/لتر بوتاسين (بو-ن) – ٦ميللى/ لتر بو- فو

Table (1): Effect of potassein as a foliar spray on vegetative growth of *Euphorbia splendes* in the two seasons(2005/2006 and 2006/2007).

Treatments	Plant height (cm)		Stem diameter (cm)		Number of leaves/plant		Number of branches/plant		Root length (cm)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	27.70g	29.96g	1.13e	1.23d	108.0d	128.0d	6.33 e	7.33d	10.83d	13.33 e
Potassein N at 3 ml/L	30.27f	33.96f	1.30d	1.40c	138.7c	145.0c	7.67de	9.33e	12.00c	16.27 d
Potassein N at 6 ml/L	31.56e	36.46e	1.37cd	1.40c	140.7c	150.7c	8.33cd	9.67e	12.43c	16.20 d
Potassein P at 3 ml/L	32.03de	37.46de	1.47abc	1.47bc	140.3c	153.3c	9.00cd	9.67bc	14.63b	18.13 c
Potassein P at 6 ml/L	33.23d	39.46d	1.50abc	1.43c	140.7c	153.3c	9.33bc	10.33bc	15.20ab	18.13 c
K-N 3ml/L+K-P3 ml/L	34.70c	40.46a	1.37cd	1.47bc	148.0c	153.3c	9.33bc	10.33bc	15.47ab	18.33 c
K-N 6ml/L+K-P 3ml/L	36.60b	40.33a	1.40bcd	1.50abc	150.3c	170.0b	11.00a	12.00a	15.33ab	19.75 b
K-N 3ml/L+K-P 6ml/L	36.00b	41.36a	1.53ab	1.57 ab	165.3b	178.0b	10.67ab	11.67ab	15.93a	20.43 ab
K-N 6ml/L+K-P 6ml/L	37.26a	42.93a	1.56a	1.60a	182.7a	192.7a	11.33a	12.67a	16.03a	21.33 a

Table (2): Effect of potassein as a foliar spray on fresh and dry weight of vegetative growth of *Euphorbia splendes* in the two seasons(2005/2006 and 2006/2007).

Treatments	Fresh weight of leaves(g)		Dry weight of leaves(g)		Fresh weight of stem(g)		Dry weight of stem(g)		Fresh weigh t of roots(g)		Dry weight of roots(g)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	16.19g	20.47g	6.61g	6.95f	76.14d	78.14f	12.49e	12.21d	15.04d	16.78e	7.11e	8.25e
Potassein N at 3 ml/L	19.46f	22.42f	9.16f	8.90e	83.56d	98.68e	16.38d	15.63c	27.78c	30.25d	13.15d	15.84d
Potassein N at 6 ml/L	20.48ef	25.40e	10.31e	9.91de	108.1c	115.9d	17.30cd	15.79c	31.99bc	35.84c	14.64cd	17.63cd
Potassein P at 3ml/L	21.53df	25.64e	10.96de	10.74d	109.1c	121.2cd	18.87bc	16.10c	32.11bc	38.39bc	15.96bc	18.86c
Potassein P at 6 ml/L	22.23de	28.10d	11.16d	10.67d	114.7c	124.7d	19.04bc	16.83c	33.76bc	38.29bc	16.12bc	19.77c
K-N3ml/L+K-P3 ml/L	23.04cd	29.76d	11.60cd	12.31c	115.2c	127.8cd	20.29b	16.64c	35.21b	39.71b	17.43b	19.45c
K-N 6ml/L+K-P3ml/L	24.72c	32.14c	12.30c	13.99b	138.3b	138.6c	24.24a	18.64bc	41.71a	44.28bc	17.90b	22.08b
K-N 3ml/L+K-P6ml/L	28.32b	35.50b	13.30b	14.68b	160.1a	156.2b	24.32a	20.70ab	43.32a	44.94a	22.66a	23.17b
K-N 6ml/L+K-P ml/L	31.40a	37.59a	14.92a	16.19a	170.5a	173.6a	25.54a	22.46a	43.95a	46.66a	23.37a	25.54a

Table (3): Effect of potassein as a foliar spray on flowering of *Euphorbia splendes* in the two seasons(2005/2006 and 2006/2007).

Treatments	Flowering date (days)		Number of flower/plant		Fresh weight of flower(g)		Dry weight of flower(g)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	56.67 a	54.00 a	15.67 d	23.33 d	3.08 c	3.37 d	1.05 c	1.59 d
Potassein N at 3 ml/L	46.67 e	48.00 bc	29.67 c	38.67 c	5.22 b	5.65 c	2.20 b	3.18 c
Potassein N at 6 ml/L	46.00 e	49.33 b	31.33 c	39.00 c	5.66 ab	5.91 b	3.87 a	3.86 ab
Potassein P at 3 ml/L	47.33 de	47.33 b	32.67 bc	42.33 bc	5.62 ab	5.73 c	3.70 a	4.55 ab
Potassein P at 6 ml/L	49.33 cd	48.33 bc	33.00 bc	43.00 bc	5.22 b	5.48 c	3.77 a	4.42 bc
K-N 3ml/L+K-P3 ml/L	50.67 bc	49.00 b	33.67 bc	42.33 bc	5.29 b	6.27 b	3.31 a	4.27 ab
K-N 6ml/L+K-P 3ml/L	51.67 bc	49.33 b	38.00 b	43.00 bc	6.29 a	6.07 b	4.12 a	4.26 ab
K-N 3ml/L+K-P 6ml/L	52.00 b	50.00 b	38.00 b	46.67 b	6.21 a	6.13 b	4.07 a	4.95 a
K-N 6ml/L+K-P 6ml/L	46.00 e	45.00 c	47.67 a	55.67 a	6.32 a	7.30 a	4.08 a	5.11 a

Table (4): Effect of potassein as a foliar spray on chemical composition of *Euphorbia splendes* in the two seasons(2005/2006 and 2006/2007).

Treatments	Chlorophyll a(mg/g F.W.)		Chlorophyll b(mg/g F.W.)		Carotenoides (mg/g F.W.)		N %		P%		K%		Total carbohydrates%	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	8.41	8.71	3.15	3.58	4.44	4.56	0.983	1.10	0.357	0.353	0.806	0.831	6.475	7.831
Potassein N at 3 ml/L	12.67	12.96	4.83	5.61	4.66	4.86	1.201	1.30	0.418	0.513	2.356	2.456	10.995	11.312
Potassein N at 6 ml/L	13.65	14.83	4.87	5.31	4.90	5.31	1.638	1.71	0.507	0.513	0.892	0.896	10.983	11.613
Potassein P at 3ml/L	13.96	14.03	5.50	5.71	5.19	5.30	1.092	1.12	0.740	0.750	0.806	0.831	11.272	11.781
Potassein P at 6 ml/L	13.69	13.99	5.67	5.78	5.38	5.48	1.092	1.13	0.816	0.911	0.806	0.821	17.062	18.312
K-N3ml/L+K-P3 ml/L	14.02	14.93	6.36	6.91	5.71	5.31	1.310	1.41	0.859	0.913	1.725	1.823	20.034	20.913
K-N 6ml/L+K-P3ml/L	14.57	15.71	6.98	7.03	5.57	5.60	1.638	1.73	0.752	0.831	2.155	2.131	21.482	21.531
K-N 3ml/L+K-P6ml/L	15.87	15.96	8.12	8.63	5.84	5.91	2.148	2.16	0.816	0.873	2.356	2.456	23.081	24.535
K-N 6ml/L+K-P ml/L	16.86	16.93	8.64	8.91	5.78	5.96	2.730	2.71	1.211	1.231	3.017	3.020	35.323	36.731