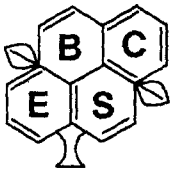

Journal

EFFECT OF TRYPTOPHAN AND METHIONINE ON GROWTH, FLOWERING, BULB PRODUCTIVITY AND CHEMICAL CONSTITUENTS OF *POLIANTHES* TUBEROSA L. PLANT

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ABSTRACT

Polianthes tuberosa l. plants were treated with tryptophan and methionine at different rates during 2006/2007and 2007/2008 seasons in Orman Botanical Garden , Giza, Egypt, in order to improve the production of *Polianthes tuberosa* flower and bulbs of high quality and yields by soaking the bulbs pre-planting or as a foliar spray on vegetative growth in two amino acids (tryptophan and methionine) at the rates 0.0 ,50 and 100ppm.The results showed that using methionine as soaking or spraying at 50ppm significantly increased vegetative growth height and the time required from planting to flowering in both seasons. Spraying tryptophan at the rate of 50ppm significantly increased leaf area , spike stem length, spike stem diameter ,fresh and dry weights of spike , chlorophyll a and b and carotenoids contents .Meanwhile, tryptophan at the rate of 100ppm as spray significantly increased the number of leaves , number of flowers/spike, circumference of bulb, fresh and dry weights of bulb ,number of bulblets/plot, fresh and dry weights of bulblets, and both N percentage , and protein percentage in two seasons. Therefore, it can be recommended to use amino acids (tryptophan) as a foliar sprayed to induced more growth, flowering, bulb productivity and chemical composition.

Key words: *Polianthes tuberosa,* amino acids, tryptophan, methionine, soaking, foliar spray, vegetative growth, flowering, bulb productivity, chemical composition.

INTRODUCTION

Polianthes tuberosa family Agavaceae, occupies a very selective and special position to loving people because of their prettiness, elegance and sweet pleasant fragrance. Tuberose has gained considerable importance and it is cultivated commercially for its varied cases. It can successfully be grown in pots, beds and borders. The flower remains fresh for pretty long time and stands long time and distance transportation and fills useful place in the flower market (Desai, 1957 and Bailey, 1976).

Amino acids are essential for plant growth, they are incorporated or involved in the biosynthesis of the essential plant compounds such as enzymes, co-enzymes, proteins, essential oil and alkaloids as well as the growth regulator substances (auxins).

Tryptophan is the main precursor of the natural plant auxin (indole-3-acetic), and methionine is the precursor of ethylene. Thus, the application of these chemicals may affect the growth, yield and the chemical constituents of the plants.

The role of amino acids (tryptophan) in stimulating the growth and activating plants were studied by Phillips (1971)who stated that ,available evidence suggested that alternative routes of IAA synthesis exist in plants all starting from amino acids. Koriesh(1984)and Harridy(1986)noticed that the highest values of fresh and dry weight, as wall as alkaloids content of *catharanthus roseus* plants were observed when sprayed by tryptophan at 100ppm. Milad (1998) stated that spraying *Mentha viridisL.,M.longifolia L.* and *Ocimum canum*sims plants with tryptophan at 25,50and 100ppm increased plant height, fresh and dry weights of the herb and underground parts, oil%, oil yield chlorophylls ,carotenoids and soluble indoles.So, Shoala (2000) mentined that spraying *lavendula multifida L.* with tryptophan at 0.0 (control) and 100 ppm increased plant height, fresh and dry weights of leaves number of spike/plant, spike oil percentage , chlorophyll a & b and N but K was least at 25 ppm.Zedan (2000) reported that spraying *Carum carvi L.and Coriandrum sativum L.* with tryptophan at 25,50and 100ppm significantly increased plant height and branching and decreased roots weight ,while oil yield,

chlorophylls ,carotenoids increased .,Attoa et al (2002) found that spraying *Iberis amara* L. with tryptophan at75 ppm increased plant height ,number of branches ,leaves fresh and dry weights, number of corymb and corymb fresh weight per plant ,total carbohydrates, nitrogen and phosphorus contents.

Therefore, the present experiment was consummated aiming to find out the effect of either tryptophan or methionine on the growth, flowering, bulb productivity and chemical compositions of *Polianthes tuberosa* plants.

MATERIALS AND METHODS

This investigation was performed throughout two successive seasons 2006/2007 and2007/ 2008 at the Farm of Orman Botanical Garden Gizza. It was intended to find out the effect of two amino acids (tryptophan and methionine) with different concentration and mode of application (soaking the bulbs pre-planting or as foliar spray of vegetative growth) on growth, flowering and bulbs productivity and their chemical compositions.

Locally produced bulbs of 11-12 cm. circumferences were selected in the two seasons.

On April 19th the bulbs were planted at open field condition at 35 cm. distance between each with depth of 7-8cm. and 50 cm. between rows in both seasons. Each treatment was represented by three replicates each containing 21 bulbs.

Table (A): Some physical and chemical properties of the soils in two seasons.

Seasons	Particle size distribution (%)				Soil
	Fine sand%	Coarse sand	Silt%	Clay%	Texture
2007	22.78	7.54	30.55	39.63	Clay
2008	22.50	7.64	30.15	39.71	Clay

Seasons	PH	EC dS/m	S.P	Cations(mg/L)				Anions(mg/L)			
				HCO_3^-	CO_3^-	Cl^-	SO_4^-	Ca^{++}	Mg^{++}	Na^+	K^+
2007	8.05	2.21	55	7.82	2.12	15.4	0.75	6.60	-	8.20	11.29
2008	8.12	2.38	50	7.50	2.20	15.5	0.75	6.78	-	8.02	11.15

Regular agricultural practices such as weeding, watering.....etc were carried out whenever necessary.

Soil of the field was analyzed according to the method of Champan and Pratt (1978) before planting.

The treatments were : Using tryptophan or methionine at the different rates of " 0.0 ,50 and 100ppm" by two ways of application (soaking the bulbs for 2 hour before planting or as a foliar sprays (three times every 21 days)after one month from planting till the solution was run of .

Data were recorded on:

-Vegetative growth height at flowering stage (plant height) cm.
- Number of leaves/plant.
- Leaf area of "cm^2" (the fifth leaves) by CL-203 AREA METER, CID, I were recorded for nine randomly selected plants in each treatment.

Flowering characteristics:

-Number of days from planting to the first flower bud opening.
-Spike stem length (cm.)
- Spike stem diameter (cm.)
-Number of flowers/spike.
-Fresh weight of cut spike (gm.)
-Dry weight of cut spike (gm.)

Bulbs and bulblets productivity:

-Circumference of bulb (cm.)
-Number of bulblets/plot (bulblets yield)
-Fresh weight of bulb (gm.)
Dry weight of of bulb (gm.)
Fresh weight of bulblets (gm.)
-Dry weight of of bulblets (gm.)

The layout of such factorial experiment was a complete randomized block design with three replicates was carried out in the two seasons (Das and Giri, 1986) as each replicate contained seven plants.

-Chemical compositions: In fresh leaf samples taken from the middle parts of the plants, photosynthetic pigments (chlorophyll a, b and caroteroids, mg/g F.W. contents) were determined according to Moran (1982), while in dry samples, the percentages of nitrogen using

micro –Kjeldahle method described by A.O.A.C.(1990) .The crude protein was calculated by multiplying the total organic nitrogen by 6.25 . Data were then tabulated and subjected to analysis of variance according to SAS program (1994) and the New LSD method at 5% level (Mead *et al.,* 1993) was used to detect the significances level among means of the various treatments.

RESULTS AND DISCUSSION

Effect of amino acids on vegetative growth:

Data presented in Table (1) show the effect of treatments on vegetative growth of *polianthes tuberosa* ,results indicated that height ,number of leaves and leaf area significantly increased with using of both amino acids as compared to control in both seasons. The increased was significantly correlated with the increment in both amino acids concentrations. It can be seen that amino acids at 50 ppm concentrations caused a significantly increased in vegetative growth height, number of leaves and leaf area. In addition, using methonine induced more increase in vegetative growth height and number of leaves .While tryptophan significantly increased leaf area as compared with control.

Meanwhile, it is clear from data registered in Table (1) that treating plants with soaking caused more increased in vegetative growth height of *polianthes tuberosa* by both amino acids when compared with spraying treatment. While using amino acids as a foliar spray induced significantly increase in the number of leaves and leaf area compared with soaking. Concerning the interaction, it is evident from tabulated data that receiving the plants methonine at 50 ppm either by soaking or spraying were the best treatments in increasing vegetative growth height in both experimental trial an indicated in Table (1).

However, using 100 ppm of tryptophan as a foliar spray significantly increased the number of leaves in both seasons. While applying tryptophan at 50 ppm as a foliar spray or by soaking significantly increased leaf area in both seasons, respectively. These results were in agreement with the finding of El-Sherbeny and Hassan (1987) on *Datura stramonium* and Mohamed *et al.* (1992) on *Alpinia nutans.* These results may be due to the physiological roles of tryptophan in plant growth, which stimulate cell division in apical

Table (1): Effect of tryptophan and methionine at the different concentrations and methods on the vegetative growth of *Polianthes tuberosa* in 2006/2007 and 2007/2008 seasons.

Treatments	Plant Height (cm.)					
	First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	70.66	70.66	70.66	74	74	74
Tryp. 50ppm.	92.66	88.33	90.49	93.66	93.66	93.66
Tryp.100ppm.	94.66	94	94.33	97.66	90.66	94.16
Meth. 50ppm.	104	98	101	110.66	99.33	105
Meth.100ppm	100.33	99.66	99.99	100.33	93.66	97
Mean	92.46	90.13		95.26	90.26	
L.S.D method		7.878			7.432	
L.S.D. Treatments		11.433			11.221	
L.S.D interaction		15.001			14.357	

Number of leaves

	First season			Second season		
Treatments	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	43.33	43.33	43.33	43.66	43.66	43.66
Tryp. 50ppm.	48.33	67.66	57.99	52.33	87	69.66
Tryp.100ppm.	52.66	70.66	61.66	68	92.66	80.33
Meth. 50ppm.	54.33	59	56.66	84.66	83	83.33
Meth.100ppm	49	56.33	52.66	50.33	80.66	65.49
Mean	49.53	59.39		59.79	77.39	
L.S.D method		3.904			4.671	
L.S.D. Treatments		6.172			9.478	
L.S.D interaction		8.729			12.751	

Leaf area (cm^2)

	First season			Second season		
Treatments	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	56.61	56.61	56.61	64.95	64.95	64.95
Tryp. 50ppm.	87.06	113.37	100.21	96.96	129.21	113.08
Tryp.100ppm.	82.27	95.15	88.71	88.87	110.38	99.63
Meth .50ppm.	75.45	94.88	85.16	81.09	116.13	98.61
Meth.100ppm	69.71	93.85	81.78	73.43	111.77	92.60
Mean	74.02	90.57		81.064	106.491	
L.S.D method		5.83			6.421	
L.S.D. Treatments		9.555			10.884	
L.S.D interaction		14.419			17.235	

meristems, Thimann (1972) reported that tryptophan increased cell wall in a chemical and/ or physical state to allow continued cell elongation.,Vanderhoef (1980)indicated that tryptophan is affecting gene expression for producing the specific macromolecules required for permanent cell elongation. Schneider *et al.* (1972) reported that tryptophan is the major intermediates component convert to IAA.

Flowering parameters:

It is obvious from Tables (2a and b)that using amino acids increased the time required from planting to flowering, spike stem length ,spike stem diameter, number of flower/spike, fresh and dry weights of spike as compared to control in both seasons .It is clear from Tables (2a and b) that spike stem length; spike stem diameter, number of flower/spike, fresh and dry weights of spike showed a clear increment with applying tryptophan treatment comparing with the effect of using methonine in this concern. Whereas using tryptophan at 100 ppm resulted utmost means of of spike stem length, spike stem diameter number of flower/spike and fresh weight of spike .Meanwhile using tryptophan at 50 ppm increased dry weight of spike. Concerning the method of application, data in Tables (2a and b) showed that, using foliar spray as a method of application reveated its superiority in producing in spike stem length, spike stem diameter, number of flower/spike, fresh and dry weights of spike in both seasons. While flowering date not affected with the method of application. From Tables (2a and b) it can be observed that treating with spray with tryptophan at 50 ppm resulted in the maximum spike stem length, spike stem diameter number of flower/spike and fresh weights of spike .While sprayed or soaking with tryptophan at 100 ppm increased number of flower/spike in two seasons. Whereas applying methonine as a foliar spray or by soaking at50 and 100 ppm increased the time required from planting to flowering in both seasons.

Table (2a): Effect of tryptophan and methionine at different concentrations and methods on flowering of *Polianthes tuberosa* in 2006/2007 and 2007/2008 seasons.

Treatments	Flowering date (day)						Spike length (cm.)					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	82.33	82.33	82.33	81.33	81.33	81.33	18.66	18.66	18.66	20.66	20.66	20.66
Tryp 50ppm.	78	95.66	86.83	73.33	92.33	82.83	19.66	28.33	23.99	23.66	30.33	26.99
Tryp 100ppm.	77	97.66	87.33	72.33	93.33	82.83	21.33	28	24.66	25.66	29	27.33
Meth 50ppm.	76.33	103.33	89.83	73.33	97	85.16	22.66	23.33	22.99	25	26.33	24.83
Meth100ppm	76.33	103.33	89.83	73	95.33	84.16	20	19	19.5	24.66	25	25.66
Mean	78	96.467		74.66	91.86		20.46	23.46		23.92	26.26	
L.S.D method		7.408			7.046			1.617			1.701	
L.S.D. Treatments		10.163			9.504			2.298			3.021	
L.S.D interaction		11.353			10.843			3.154			4.117	

	Spike diameter (cm)						Number of flower /Spike					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	7.86	7.86	7.86	9	9	9	45.66	45.66	45.66	64	64	64
Tryp .50ppm.	8.33	9.06	8.69	9.06	10.26	9.66	93.66	95	94.33	106	103.66	104.83
Tryp.100ppm.	8.56	8.75	8.65	9.7	10.03	9.86	105.33	102.33	103.83	115	117.33	116.16
Meth. 50ppm.	8.9	8.83	8.86	9.26	9.73	9.49	92.33	96.66	94.5	107.33	109.66	108.49
Meth.100ppm	8.13	8.36	8.24	9.1	9.3	9.2	82	89	85.5	102	101.33	101.66
Mean	8.35	8.57		9.22	9.66		83.800	85.73		98.86	99.2	
L.S.D method		0 .651			0.715			6.818			7.878	
L.S.D. Treatments		0.954			1.056			10.537			12.136	
L.S.D interaction		1.279			1.406			14.771			16.193	

Table (2 b): Effect of tryptophan and methionine at different concentrations and methods on flowering of *Polianthes tuberosa* in 2006/2007 and 2007/2008 seasons.

Treatments	Fresh weight of Spike (gm)						Dry weight of Spike (gm)					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	75.77	75.77	75.77	80.38	80.38	80.38	8.9	8.9	8.9	8.74	8.74	8.74
Tryp.50ppm.	75.26	104.85	90.05	92.67	113.44	103.05	8.42	10.33	9.38	9.78	12.15	10.91
Tryp.100ppm.	79.01	93.25	86.13	92.26	107.07	99.67	9.04	10.05	9.55	10.05	11.76	10.96
Meth. 50ppm.	82.96	84.13	83.55	90.02	98.26	94.14	9.56	9.33	9.45	9.81	10.77	10.29
Meth.100ppm	84.49	79.68	82.08	93.24	92.91	93.08	9.52	9.02	9.27	10.08	10.13	10.11
Mean	79.49	87.54		89.72	98.42		9.09	9.53		9.69	[illegible]	
L.S.D method		[illegible]			7.026			.711			.756	
L.S.D. Treatments		9.611			10.824			1.083			[illegible]	
L.S.D interaction		12.422			14.356			1.403			1.564	

Bulbs and bulblets productivity:

Data in Table (3a and b) showed the effect of different concentrations method of application with tryptophan and methonine on circumference of bulb, fresh and dry weights of bulbs, number of bulblets/plot, fresh and dry weights of bulblets. It is evident from data that using amino acids increased circumference of bulb, fresh and dry weights of bulbs, number of bulblets/plot, fresh and dry weights of bulblets in both seasons when compared with control.

Concerning the effect of concentrations, tryptophan at 50 ppm increased circumference of bulb, dry weight of bulbs .While tryptophan at 100 ppm increased number of bulblets, fresh and dry weights of bulblets in both seasons when compared with the other concentration used of methonine and control.

As for the method of application ,spraying *polianthes tuberosa* with tryptophan or methonine caused more increase in the circumference of bulb, fresh and dry weights of bulbs , number of bulblets/plot ,fresh and dry weights of bulblets in the two studied seasons. Regarding the interaction between amino acids concentration and method of application applying tryptophan at 100 ppm as a foliar spray increased circumference of bulb, fresh and dry weights of bulbs, number of bulblets, fresh and dry weights of bulblets in both seasons.

Chemical composition:

Data registered in Table (4) show the significantly increment of chlorophyll a, b and carotenoids in leaves as well as ,N percentage and protein percentage by using both type of amino acids and their concentrations when compared with control in the two seasons. On the other hand tryptophan at 50 ppm as a foliar sprayed induced significantly increased chlorophyll a, b and carotenoids in leaves in both seasons .Similarly, applying sprayed tryptophan at 100 ppm significantly increased N percentage and protein in the two experimental seasons.

Table (3a): Effect of tryptophan and methionine at different concentrations and methods on bulb and bulblet productivity of *Polianthes tuberosa* in 2006/2007 and 2007/2008 seasons.

Treatments	Circumference of bulb (cm)						Fresh weight of bulb(gm)					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	4.6	4.6	4.6	5.5	5.5	5.5	19.03	19.03	19.03	21.59	21.59	21.59
Tryp. 50ppm.	5.9	6.3	6.1	6.1	8.23	7.16	28.59	35.56	32.08	25.55	38.1	32.13
Tryp.100ppm.	4.6	6.8	5.7	6.8	7.66	7.25	30.09	34.13	32.115	27.61	36.65	31.82
Meth. 50ppm.	4.83	6.9	5.87	6.2	6.3	6.25	26.95	31.14	29.05	27.63	33.88	30.76
Meth.100ppm	5.06	6.16	5.61	5.53	5.26	5.4	23.93	33.55	28.74	28.26	32.88	30.57
Mean	5.00	6.153		6.027	6.593		25.72	30.68		26.13	32.62	
L.S.D method		.393			.484			2.016			2.084	
L.S.D. Treatments		.654			.662			3.335			3.621	
L.S.D interaction		.946			.875			5.107			5.163	

Treatments	Dry weight of bulb (gm)						Number of bulblets/plot					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	4.59	4.59	4.59	6.9	6.9	6.9	8	8	8	15	15	15
Tryp. 50ppm.	5.31	6.97	6.14	7.67	8.41	8.04	15.66	20	17.83	21	27.33	24.16
Tryp.100ppm.	6.25	6.81	6.53	7.55	9.16	8.36	16.66	22.66	19.66	21.33	32.333	26.83
Meth. 50ppm.	5.41	6.24	5.83	7.26	8.69	7.98	19	23.33	21.16	22.33	29.66	26
Meth.100ppm	5.02	8.39	6.71	7.51	8.34	7.93	16.66	26	21.33	21.33	31.66	26.5
Mean	5.317	6.603		7.38	8.31		15.2	20		20.2	27.2	
L.S.D method		.427			.574			1.232			1.604	
L.S.D. Treatments		.798			.911			2.546			3.101	
L.S.D interaction		1.308			1.261			4.077			4.861	

Table (3b): Effect of tryptophan and methionine at different concentrations and methods on bulb and bulblet productivity of *Polianthes tuberose* in 2006/2007 and 2007/2008 seasons.

Treatments	Fresh weight of bulblets/plot (gm)						Dry weight of bulblets/plot (gm)					
	First season			Second season			First season			Second season		
	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean	Spray	Soaking	Mean
Control	6.2	6.2	6.2	6.14	6.14	6.14	.93	.93	.93	1.22	1.22	1.22
Tryp .50ppm.	5.89	8.64	7.26	7.67	10.67	9.17	.89	1.32	1.11	2.03	2.54	2.28
Tryp.100ppm	5.75	9.32	7.53	7.83	11.83	9.83	.87	1.49	1.18	2.04	3.63	2.84
Meth. 50ppm.	4.91	7.55	6.23	7.93	11.38	9.65	.86	1.47	1.16	1.72	2.69	2.21
Meth.100ppm	5.47	8.399	6.93	6.94	12.08	9.51	.73	.94	.84	1.74	3.61	2.68
Mean	5.645	8.035		7.304	10.424		.857	1.231		1.753	2.74	
L.S.D method		.478			.609			.077			.143	
L.S.D. Treatments		.883			1.182			.121			.319	
L.S.D interaction		1.419			1.911			.188			.561	

Table (4): Effect of tryptophan and methionine at different concentrations and methods on chemical composition of *Polianthes tuberosa* in 2006/2007 and 2007/2008 seasons.

Treatments	Chlorophyll "a" mg/gm.				Chlorophyll "b" mg/gm.				Carotenoids mg/gm.				N%				Protein%			
	First season		Second season		First season		Second season		First season		Second season		First season		Second season		First season		Second season	
	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking	Spray	Soaking
Control	5.2	5.2	6.93	6.93	1.16	1.16	1.23	1.23	2.07	2.07	2.31	2.31	0.437	0.437	0.437	0.437	2.731	2.731	2.731	2.731
Tryp..50ppm	9.15	7.2	10.83	8.35	1.96	1.74	1.98	1.91	3.85	2.93	4.35	3.63	0.874	0.546	0.983	0.655	4.775	3.413	6.144	4.094
Tryp..100ppm.	8.65	7.37	9.36	7.79	1.86	1.98	1.91	2.32	3.65	2.69	3.91	2.95	0.764	0.437	0.874	0.546	5.463	2.731	5.463	3.413
Meth. 50ppm.	13.51	7.09	13.63	7.36	13.83	1.43	3.91	1.94	5.18	2.94	5.67	3.06	0.655	0.437	0.764	0.655	4.094	2.731	4.775	4.094
Meth. 100ppm	9.91	6.54	4.81	7.08	2.33	1.17	2.83	1.83	4.31	2.58	4.81	3.07	0.655	0.437	0.764	0.546	4.094	2.731	4.775	3.413

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تأثير المعاملة بالتربتوفان والميثونين على النمو الخضري والزهري وإنتاج الأبصال والتركيب الكيماوي لنبات التبروز

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أجريت هذه التجربة خلال موسمين متتاليين 2007/2006و2007/ 2008 بهدف محاولة أنتاج أزهار وأبصال عالية الجودة ذات محصول وفير من نبات التبروز وذلك عن طريق نقع الأبصال لمدة ساعتين في التربتوفان والميثونين بتركيز "صفر, 50، 100 جزء في المليون " أو إضافته رشا علي الأوراق و بمتابعة قياسات النمو الخضرى و ا لزهري للنبات و بعد تحليل البيانات أظهرت النتائج مايلي:

أدي الرش أو النقع في الميثونين بتركيز 50 جزء في المليون إلي زيادة ارتفاع النبات ودفع النبات للأزهار مبكرا بينما أدي الرش بالتربتوفان بتركيز 50 جزء في المليون إلي زيادة كل من مساحة الوراقة ،طول و سمك الحامل النورى والوزن الطازج و الجاف للحامل النورى ، ومحتوي الأوراق من كلوروفيل أ،ب،الكاروتين. بينما أدي رش التربتوفان بتركيز100 جزء في المليون إلي زيادة كل من عدد الأوراق ، عدد الإزهار/ حامل نوري ،قطر الأبصال والوزن الطازج و الجاف للأبصال ،عدد البوصيلات ، والوزن الطازج و الجاف للبوصيلات ،والنسبة المئوية للنتروجين والبروتين .

و عليه.. فإنه يوصي باستخدام الأحماض الأمنية المستعملة رشا علي النباتات لزيادة النمو الخضري والزهري والابصال المنتجة لنبات التبروز.