Journal

J. Biol. Chem. Environ. Sci., 2010, Vol. 5(4):25-38
www.acepsag.org

RESPONSE OF *VINCA ROSEA* CV. MAJOR PLANT TO CHEMICAL AND BIOFERTILIZATION TREATMENTS

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ABSTRACT

Two field experiments were consummated under full sun at the nursery of Hort. Res. Inst., ARC, Giza, Egypt during 2009 and 2010 seasons to study the individual effects of both nitrobien and phosphorene biofertilizers at the rates of 0, 5 and 10 g/plant, and NPK mixture at 0, 2 and 4 g/plant, as well as their interactions on growth, flowering and chemical composition of *Vinca rosea*, L. cv. Major plants cultivated in a clayey soil at a distance of 20x20 cm, when applied as soil drench, three times during the active growing period with two months interval.

The obtained results indicated that all vegetative and root growth parameters were markedly improved in response to the various fertilization treatments used in this study, with significant differences in most cases of both seasons. However, nitrobien treatments at either 5 or 10g/plant gave better results than phosphorene ones at the same levels, with a few exceptions in the two seasons. A progressive increment was also observed in the means of number of inflorescences/plant, number of florets/inflorescence and stalk length as the rate of either NPK mixture or biofertilizers was increased. Furthermore, dressing with either NPK mixture or biofertilizers resulted marked increase in the leaf content of chlorophylls a and b, carotenoids, total carbohydrates, nitrogen, phosphorus and potassium. The combining between biofertilization and chemical fertilization with NPK mixture caused an additional improvement in all previous parameters, but the supermacy was for the combination between nitrobien at 5g/plant and NPK mixture at 4g/plant, which gave the best results in most instances of both seasons.

Hence, it could be recommended to fertilize *Vinca rosea,* L. cv. Major plants grown in the clayey soil under full sun with a combination of nitrobien biofertilizer at 5g/plant and NPK mixture at 4g/plant as a soil drench, three times with two months interval for obtaining good growth, flowering of a high quality and active constituents of the leaves.

INTRODUCTION

Vinca rosea, L. (*Catharanthus roseus* (Linn) G. Don), periwinkle (Apocynaceae) is a summer flowering perennial herbaceous plant that gives violet, rose, white or white with a red eye flowers for a long period of the year. It is widely used in different areas of the world for beds, banks or bared places under trees, and also as a pot plant in many places. It will grow in almost any soil under sun or in shade (Huxley *et al.,* 1992). About 90 alkaloids have been isolated from different species of this plant, some of them are used as carcinogenic treatment (Kulkarni *et al.,* 1999).

Fertilizer application of any type was found to had a significant effect on growth, flowering and chemical composition of periwinkle plant. This true was emphasized by Ata and Sadowska (1996) who indicated that the highest yield of leaves and roots in *Catharanthus roseus* was obtained at 200 mg N/dm, while alkaloids content in the dry matter of leaves was increased as N rate increased up to 300 mg/dm. The highest N rate (450 mg/dm) reduced most of the studied parameters. Likewise, Tebet *et al.,* (1996) revealed that cultivation of *Catharanthus roseus* under full sun with 4 g ammonium sulfate/plant promoted vegetative and root growth. Nitrogen application gave the highest leaf vincristine concentration compared to both P and K. On Impatiens, Petunia, Salvia and Vinca, Iersel *et al.,* (1998) postulated that seedling growth of these species is mainly determined by N application, while P or K concentration in the nutrient solution had a little or no effect on their growth. Furthermore, the same authors (1999) concluded that Salvia and Vinca seedlings can benefit from high concentrations of N (up to 32 mM) in the fertilizer, while only low concentrations of P and K (0.25 mM) are needed.

Similar observations were also noticed on marigold (*Tagetes erecta*) by Chandrikapure *et al.,* (1999), Sengupta *et al.,* (2005), Syamal *et al.,* (2006) and Bushkar *et al.,* (2008) who stated that the

application of chemical fertilizer (200 kgN + 80 kg P+ 80 kg K) and biofertilizer (VAM at 10 kg/ha) recorded the maximum values of growth characters, viz. plant height, diameter of main stem, spread of plant along and across the row, No. branches/plant, length of the longest branch, No. leaves/plant, fresh and dry weights of the aerial parts and roots, No. flower heads/plant, yield of flower heads/ha and size of the flower head in first and last picking. On *Dianthus caryophyllus,* Bhatia and Gupta (2007) reported that application of vesicular arbuscular mycorrhiza (VAM), *Azospirillum* and phosphate-solubilizing microorganism (PSM) in combination with 100 ppm N and 140 ppm K (as a water-soluble fertilizer) resulted in the greatest plant height, flower diameter and No. flowers/m^2, and the lowest number of days to initial flowering.

This trial was done to detect the role of NPK mixture in enhancing the beneficial effects of either nitrobien or phosphorene biofertilizers on growth, flowering and quality of periwinkle plant.

MATERIALS AND METHODS

Two field experiments were carried out under full sun at the nursery of Hort. Res. Inst., ARC, Giza, Egypt throughout the two successive seasons of 2009 and 2010 to examine the effect of NPK fertilizer, alone or in combination with either nitrobien or phosphorene biofertilizers, on growth, flowering and active constituents in tissues of periwinkle plant.

So, five-months-old transplants of *Vinca rosea* L. cv. Major (fls. are blue purple or violet, about 10 ± 1 cm height with 8 ± 1 leaves) were planted on March, 15th for both seasons in beds (1x1 m) at 20 x 20 cm apart, as every bed contained 25 transplants. Before planting, a sample of soil was taken from beds and subjected to physical and chemical analysis according to the standard methods described by Richards (1954) and illustrated in Table (a).

Table (a): Some physical and chemical properties of the soil in the two seasons.

Season	Particle size distribution (%)				Texture	S.P.	E.C. (ds/m)	pH	Cations (meq/l)				Anions (meq/l)		
	Coarse sand	Fine sand	Silt	clay					Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}
2009	10.18	46.17	19.53	24.12	Clayey	33.17	3.48	8.10	17.50	9.42	20.00	0.79	3.80	10.00	33.91
2010	10.30	45.50	18.88	25.32	Clayey	35.00	3.31	7..96	18.00	8.95	20.50	0.85	3.65	10.20	34.45

E.C. and soluble ions were determined in the soil paste extract.

After two weeks from planting (on April, 1st), the following fertilization treatments were applied as a soil drench, three times with two months interval:

1- Chemical fertilization with a mixture of NPK (2:1:1) at the rates of 0, 2 and 4g/plant. Ammonium sulphate (20.5%N), calcium superphosphate (15.5% P_2O_5) and potassium sulphate (48.5% K_2O) fertilizers were used to obtain the required ratio.

2- Biofertilization with either nitrobien (a commercial product which contains a specific strain of *Azotobacter chroococcum* bacteria, conc. 10^6 cells/ml) or phosphorene (a commercial product which contains a special clone of bacteria which changes the unavailable triphosphate to available monophosphate) at the rates of 0, 5 and 10 g/plant for each.

3- Each level of NPK mixture was combined with each one of both nitrobien and phosphorene to form fifteen interaction treatments.

During the course of this study, transplants received the regular agricultural practices recommended for such plantation whenever needed, and they were set out in a split plot design during the two seasons (Mead *et al.,* 1993), as the main plot was specified to biofertilization treatments with either nitrobien or phosphorene, while the sub plot was devoted to NPK mixture treatments, with three replicates as each bed contained 25 transplants expressed one replicate.

At the end of each season (on October, 1st), the following data were recorded: plant height (cm), number of branches and leaves/plant, leaf area (cm^2), the longest root length (cm) and aerial parts and roots fresh and dry weights (g). During flowering, number of

inflorescences/plant, number of florets/inflorescence and stalk length (cm) were determined. In fresh leaf samples taken from the middle parts of the plants, photosynthetic pigments (chlorophyll a, b and carotenoids, mg/g F.W.) were measured according to method of Moran (1982), while in dry ones, the percentages of total carbohydrates (Herbert *et al.,* 1971), nitrogen (N) using micro-Kjeldahle method as described by Pregl (1945), phosphorus (P) colorimetrically as the method explained by Luatanab and Olsen (1965) and potassium (K) using Flame-photometer set (Jakson, 1973) were evaluated.

Data were then tabulated and only the morphological and flowering ones were statistically analyzed according to SAS program (1994) using Duncan's Multiple Range Test (1955) for detecting the significancy level among the means of the different treatments.

RESULTS AND DISCUSSION

Effect of fertilization treatments on:

1. Vegetative and root growth:

It is clear from data in Tables (1 and 2) that all biofertilization treatments used in this study significantly improved all vegetative and root growth parameters comparing with control treatment in the two seasons. However, nitrobien treatments at either 5 or 10 g/plant gave better results than phosphorene ones at the same levels in most cases of both seasons with a few exceptions, but nitrobien at 10g/plant recorded the highest means when compared to the other individual treatments of biofertilizers. Regarding NPK mixture, data showed that means of all vegetative and root growth traits were progressively increased with increasing NPK rate to reach the maximum with the level of 4g/plant in the two seasons. On the other hand, combining between biofertilization treatments and NPK mixture ones caused an additional improvement in vegetative and root growth of the treated plants. The superiority, however was for the combination of nitrobien at 5g/plant+NPK mixture at 4 g/plant, which gave the highest means in the two seasons compared to the other individual and combined treatments, with the exception of a combination between 10g nitrobien/plant and 4g NPK/plant that recorded means closely near to those of the superior combination mentioned before with non-significant differences among them in most instances of both seasons.

Table (1): Effect of NPK mixture, nitrobien, phosphorene and their interactions on some vegetative growth parameters and root length of *Vinca rosea* L. cv. Major plant during 2009 and 2010 seasons.

NPK mixture rate (g/plant) / Nit. & Phos. rate (g/plant)	Plant height (cm)				No. branches/plant				No. leaves/plant				Leaf area (cm^2)				Root length (cm)			
	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean
	First season: 2009																			
00.00 g	20.67f	26.00e	34.63bc	27.10c	1.33e	2.33d	4.67b	2.78c	12.33g	17.10f	32.00c	20.48d	9.00d	11.33c	13.71ab	11.35b	14.96f	20.28de	24.30c	19.85c
Nit. 5 g	25.33e	29.33cd	41.50a	32.05a	2.40d	3.58c	5.78ab	3.92b	16.71f	22.40e	46.00a	28.37ab	9.76d	12.79bc	15.23a	12.59a	19.33ed	23.67cd	31.78a	24.93ab
Nit. 10 g	28.49cd	34.36bc	38.73ab	33.88a	4.29bc	5.00b	6.67a	5.32a	25.33de	26.67d	38.79b	30.26a	10.90cd	13.33b	14.98a	13.07a	22.56d	27.83b	29.33ab	26.57a
Phos. 5 g	21.00f	27.81d	39.00ab	29.27b	3.00d	4.00c	4.50b	3.83b	16.00f	25.33de	33.56c	24.96b	9.56d	11.98c	13.26b	11.60b	16.51ef	22.00d	27.61b	22.04bc
Phos. 10 g	24.76ef	30.33c	36.70b	30.60b	2.33d	3.33cd	4.00c	3.22bc	14.33g	23.00e	31.67cd	23.00c	11.43c	12.10bc	13.00b	12.18ab	18.36e	24.17c	27.00b	23.18b
Mean	24.05c	29.57b	38.12a		2.67c	3.65b	5.12a		16.94c	22.90b	36.40a		10.13b	12.31ab	14.04a		18.34c	23.59b	28.00a	
	Second season: 2010																			
00.00 g	18.96f	24.10de	32.67c	25.24c	1.33e	3.00d	5.00b	3.11c	14.27f	23.00d	31.50b	22.92c	9.33e	11.89cd	12.87cb	11.36b	12.87f	18.11e	25.00c	18.66d
Nit. 5 g	23.67de	28.51cd	39.28a	30.49a	2.67de	4.00c	5.33b	4.00b	17.33e	25.80c	43.79a	28.97a	10.25ed	13.44b	16.31a	13.33a	18.50e	22.81d	32.63a	24.65b
Nit. 10 g	26.31d	32.00c	37.39ab	31.90a	4.00c	5.33b	7.00a	5.44a	23.96cd	25.33c	39.21ab	29.50a	11.46d	14.00b	15.10ab	13.52a	213.10cd	28.33b	30.25ab	27.23a
Phos. 5 g	19.56ef	24.33de	34.47b	26.12c	3.68c	4.00c	5.00b	4.23b	16.91e	24.78cd	32.63b	24.77b	10.00e	12.58c	13.50b	12.03ab	17.89ef	23.48cd	27.00b	22.79c
Phos. 10 g	21.80e	28.00cd	35.00b	28.27n	3.00d	3.00d	3.67c	3.22c	17.00e	21.67ed	30.10cb	22.92c	11.89cd	12.33c	12.97bc	12.40ab	18.33e	24.26c	28.13b	23..57bc
Mean	22.06c	27.39b	35.76a		2.94c	3.87b	5.20a		17.89c	24.12b	35.45a		10.59b	12.85ab	14.15a		18.14e	23.40b	28.60a	

- Nit.: Nitrobien, and Phos.: Phosphorene
- Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (2): Effect of NPK mixture, nitrobien, phosphorene and their interactions on aerial parts and roots fresh and dry weights of *Vinca rosea* L. cv. Major plant during 2009 and 2010 seasons.

NPK mixture rate (g/plant) / Nit. & Phos. rate (g/plant)	Aerial parts f.w. (g)				Aerial parts d.w. (g)				Roots f.w. (g)				Roots d.w. (g)			
	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean
	First season: 2009															
00.00 g	9.00f	11.32e	15.00d	11.77d	3.68d	4.63d	6.12cd	4.81d	3.50e	4.39d	6.10bc	4.66b	1.76d	2.21cd	3.23b	2.40b
Nit. 5 g	14.75d	17.08cd	24.21a	18.68c	7.48c	8.67bc	12.10a	9.42b	4.48d	5.20cd	8.35a	6.01a	1.93cd	2.45c	4.57a	2.98a
Nit. 10 g	19.59bc	23.61a	23.90a	22.37a	9.70b	10.98ab	10.94ab	10.54a	5.10cd	6.18bc	7.43ab	6.24a	2.36c	2.87bc	4.00a	3.08a
Phos. 5 g	16.28cd	21.58b	23.29a	20.38b	7.20c	9.36b	9.36b	8.64b	4.68dc	5.33c	7.00b	5.67ab	2.04cd	2.18cd	3.25b	2.49b
Phos. 10 g	14.37d	17.59c	20.55b	17.50c	6.43cd	7.81c	9.32b	7.85c	5.00cd	6.00c	6.21bc	5.74ab	1.88d	2.36c	2.93bc	2.39b
Mean	19.80b	18.24ab	21.39a		6.90b	8.29ab	9.57a		4.55b	5.42ab	7.02a		2.00b	2.41b	3.60a	
	Second season: 2010															
00.00 g	8.27g	10.50f	14.23de	11.00c	3.52e	4.21de	5.60d	4.44d	3.22d	3.91cd	5.67b	4.27b	1.58e	2.01cd	2.91b	2.17b
Nit. 5 g	13.33e	16.11d	23.16a	17.53b	7.00c	7.90bc	11.33a	8.74b	4.13c	5.10bc	7.70a	5.64a	1.76d	2.23c	4.50a	2.83a
Nit. 10 g	17.50cd	20.68b	23.00a	20.39a	8.96b	10.11a	10.00a	9.69a	4.68cb	5.71b	6.81ab	5.73a	2.11c	2.61cb	3.76ab	2.83a
Phos. 5 g	15.68d	18.63c	21.76ab	18.69ab	7.00c	8.53b	8.51b	8.01b	4.30c	4.87cb	6.32b	5.16a	1.88cd	2.00cd	2.99b	2.29b
Phos. 10 g	13.16e	16.95cd	20.00b	16.70bc	6.15cd	7.16c	8.55b	7.29c	3.96cd	5.12bc	5.73b	4.94ab	1.71d	2.16c	2.73bc	2.20b
Mean	13.59c	16.57b	20.43a		6.53b	7.58ab	8.80a		4.06b	4.94ab	6.45a		1.81b	2.20b	3.38a	

- Nit.: Nitrobien, and Phos.: Phosphorene
- Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

This may indicate the role of both NPK fertilizer in providing the plants with the main elements necessary for healthy growth, and nitrobien which may fix more atmospheric N and secrete more vitamins and growth promoting substances required for the best growth (Darwish, 2002). In addition, Subba Rao (1993) affirmed that *Azotobacter chroococcum* bacteria synthesize antifungal antibiotics which gave a special advantage for the use in field of production.

These results are in parallel with those postulated by Ata and Sadowska (1996) and Tebet *et al.,* (1996) on *Catharanthus roseus*, Iersel *et al.,* (1998) on impatiens, petunia, salvia and vinca, Syamal *et al.,* (2006) on marigold and Bhatia and Gupta (2007) on carnation.

2. Flowering:

Data in Table (3) exhibit that the individual treatments of NPK mixture, nitrobien and phosphorene caused a gradual increment in the means of No. inflorescences/plant, No. florets/inflorescence and flowering stalk length (cm) as the level of each was increased in the two seasons, except for phosphorene treatments in which increasing the rate of application to 10g/plant did not give a progressive increase in No. inflorescences/plant, as well as nitrobien treatments, in which raising the rate of application to 10g/plant did not cause a gradual increase in flowering stalk length. However, the combination between NPK treatments and biofertilization ones induced a cumulative increment in all previous characters to reach the maximum values with the combinations of 10 g nitrobien/plant+4g NPK/plant, and 10g phosphorene/plant + 4g NPK/plant, as the former combination gave the highest No. inflorescences/plant, while the later one scored the highest No. florets/inflorescence and the tallest flowering stalk in the two seasons. This may confirm the fact that fertilization with NPK mixture helps biofertilizers to give better results, as both of them cooperate to supply the plants with nutrients and growth promoting substances necessary for good growth, which reflects afterwards on flowering characteristics (Bushkar *et al.,* 2008).

The previous findings are in a good accordance with those revealed by Iersel *et al.,* (1999) on vinca and salvia , Chandrikapure *et al.,* (1999) and Sengupta *et al.,* (2005) on marigold, and Bhatia and Gupta (2007) on *Dianthus caryophyllus.*

Table (3): Effect of NPK mixture, nitrobien, phosphorene and their interactions on some flowering parameters of *Vinca rosea* L. cv. Major plant during 2009 and 2010 seasons.

NPK mixture rate (g/plant) / Nit. & Phos. rate (g/plant)	No. inflorescences per plant				No. florets/inflorescence				Flowering stalk length (cm)			
	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean
	First season: 2009											
00.00 g	1.00d	1.76cd	3.30b	2.02c	1.26d	2.00bc	2.58b	1.95b	2.35bc	2.41bc	2.50b	2.42a
Nit. 5 g	1.50cd	2.33c	4.28a	2.70b	1.53c	2.17bc	3.33a	2.34ab	2.35bc	2.50b	2.68ab	2.51a
Nit. 10 g	3.00bc	3.86ab	4.36a	3.74a	1.88c	2.56b	3.21ab	2.55ab	2.26c	2.47b	2.70ab	2.48a
Phos. 5 g	2.33c	3.00bc	3.50b	2.94ab	2.00bc	3.00ab	3.36a	2.79ab	2.41bc	2.56ba	2.86a	2.61a
Phos. 10 g	2.00c	3.00bc	3.33b	2.78b	2.26bc	3.00ab	4.00a	3.10a	2.47b	2.73a	2.93a	2.71a
Mean	1.97b	2.79ab	3.76a		1.79b	2.55ab	3.30a		2.37a	2.53a	2.74a	
	Second season: 2010											
00.00 g	1.00d	2.00c	3.51b	2.17c	1.35d	2.09bc	2.47b	1.97b	2.26bc	2.29bc	2.53ab	2.36a
Nit. 5 g	1.76cd	3.00bc	3.78b	2.85b	1.67cd	2.30bc	3.00ab	2.32b	2.23bc	2.38b	2.70a	2.47a
Nit. 10 g	2.78cb	3.90b	5.30a	3.99a	2.00c	2.69b	3.00ab	2.56ab	2.18c	2.33b	2.68a	2.40a
Phos. 5 g	2.65cb	3.00bc	4.33ab	3.33ab	1.998c	3.00ab	3.67a	2.88ab	2.30bc	2.60ab	2.73a	2.54a
Phos. 10 g	2.00c	2.43c	3.50b	2.64b	2.33bc	3.33ab	4.00a	3.22a	2.36b	2.71a	2.80a	2.62a
Mean	2.04b	2.87b	4.08a		1.87b	2.68ab	3.23a		2.27a	2.46a	2.69a	

- Nit.: Nitrobien, and Phos.: Phosphorene
- Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

3. Active constituents:

From data presented in Table (4) and (5), it could be concluded that dressing with either NPK mixture or biofertilizers individually resulted a marked elevating in the leaf content of chlorophyll a, b and carotenoids (mg/g f.w.). The prevalence, was however for the combined reatments, especially that one consistes of nitrobien at 5g/plant+ NPK mixture at 4 g/plant, which gave the highest pigments content in the leaves of fertilized plants. Similarly, were those results of total carbohydrates, N, P and K percentages, as they were greatly increased in the leaves of dressed plants, with the mastery of the previously mentioned combination, except for P content, that was raised to the utmost high means by the combination of phosphorene at either 5 or 10g/plant+NPK mixture at 4g/plant (0.36% P for both).

Table (4): Effect of NPK mixture, nitrobien, phosphorene and their interactions on photosynthetic pigments in the leaves of *Vinca rosea* L. cv. Major plant during 2010 season.

NPK mixture rate (g/plant) / Nit. & Phos. rate (g/plant)	Chlorophyll a (mg/g f.w.)				Chlorophyll b (mg/g f.w.)				Carotenoids (mg/g f.w.)			
	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean
00.00 g	1.18	1.30	1.48	1.32	0.65	0.73	0.81	0.73	0.88	0.96	1.13	0.99
Nit. 5 g	1.39	1.53	1.79	1.57	0.76	0.82	0.93	0.84	0.91	1.03	1.83	1.27
Nit. 10 g	1.58	1.71	1.80	1.70	0.89	0.86	0.91	0.89	0.98	1.09	1.49	1.19
Phos. 5 g	1.27	1.39	1.50	1.39	0.70	0.76	0.77	0.74	0.89	0.97	1.33	1.06
Phos. 10 g	1.46	1.50	1.63	1.53	0.75	0.78	0.71	0.75	0.90	0.99	1.27	1.05
Mean	1.38	1.49	1.64		0.75	0.79	0.83		0.91	1.01	1.41	

- Nit.: Nitrobien, and Phos.: Phosphorene

This may attributed to the role of biofertilizers in fixing atmospheric N and mobilizing phosphate and other nutrients to be available for plants (Quoreshi, 2003).

Analogus observations were also noticed by Ata and Sadowska (1996) and Tebet *et al.,* (1996) on periwinkle, and Syamal *et al.,* (2006) on *Tagetes erecta.*

From the aforementioned results, it could be recommended to fertilize *Vinca rosea* L. cv. Major plants grown in a clayey soil under full sun with a combination of nitrobien biofertilizer at 5g/plant plus NPK mixture at 4g/plant as a soil drench, three times with two months interval for good growth, and flowering of a high quality.

Table (5): Effect of NPK mixture, nitrobien, phosphorene and their interactions on total carbohydrates, N, P and K parameters in the leaves of *Vinca rosea* L. cv. Major plant during 2010 season.

NPK mixture rate (g/plant) / Nit. & Phos. rate (g/plant)	Total carbohydrates (%)				N (%)				P (%)				K (%)			
	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean	0.0	2.0	4.0	Mean
00.00 g	24.01	25.80	28.33	26.05	1.20	1.36	1.50	1.35	0.07	0.11	0.16	0.11	1.26	1.40	1.58	1.41
Nit. 5 g	28.51	33.10	46.71	36.11	1.38	1.56	2.17	1.70	0.07	0.18	0.24	0.16	1.33	1.45	1.69	1.49
Nit. 10 g	37.56	40.60	41.50	39.89	1.49	1.83	2.00	1.77	0.09	0.21	0.24	0.18	1.40	1.53	1.67	1.53
Phos. 5 g	26.18	30.41	33.27	29.95	1.26	1.38	1.50	1.38	0.18	0.29	0.36	0.28	1.37	1.48	1.50	1.45
Phos. 10 g	28.86	32.00	34.67	31.84	1.31	1.33	1.43	1.36	0.26	0.33	0.36	0.32	1.35	1.50	1.50	1.45
Mean	29.03	32.38	36.90		1.33	1.49	1.72		0.13	0.23	0.27		1.34	1.47	1.59	

- Nit.: Nitrobien, and Phos.: Phosphorene

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استجابة الونكا صنف ميجور لمعاملات التسميد الكيماوي و الحيوي

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أجريت تجربتان حقليتان تحت الشمس الساطعة بمشتل معهد بحوث البساتين، الجيزة، مصر خلال موسمي ٢٠٠٩، ٢٠١٠ و ذلك لدراسة التأثير الفردي للسمادين الحيويين: نيتروبين و فوسفورين عند اضافة كل منهما بمعدل : صفر، ٥، ١٠ جم/نبات، و مخلوط الـ NPK بمعدل: صفر، ٢، ٤ جم/نبات، و كذلك التفاعلات بينها على النمو، الازهار و التركيب الكيماوي لنباتات الونكا (*Vinca rosea* L.) صنف ميجور (cv. Major) المنزرعة في تربة طينية على مسافات ٢٠ × ٢٠ سم، عند اضافتها تكبيشاً للتربة، ثلاث مرات خلال موسم النشاط و بفاصل شهرين بين كل مرتين متتاليتين.

و لقد أوضحت النتائج المتحصل عليها ان جميع قياسات النمو الخضري و الجذري قد تحسنت بشكل ملحوظ استجابة لجميع معاملات التسميد التي طبقت بهذه الدراسة و بفروق معنوية مختلفة في معظم الحالات لكلا الموسمين. الا أن معاملات النيتروبين عند مستوى ٥ أو ١٠ جم/نبات قد أعطت نتائجاً أفضل من معاملات الفوسفورين عند نفس المستوى، مع بعض الاستثناءات البسيطة في كلا الموسمين. و لقد حدثت زيادة تدريجية في متوسط عدد النورات/نبات، عدد الزهيرات/نورة و طول الحامل الزهري كلما زاد معدل اضافة الأسمدة موضع الدراسة. علاوة على ذلك، فقد حدثت زيادة ملحوظة في محتوى الأوراق من كلوروفيللي أ، ب، الكاروتينويدات، و النسبة المئوية لكلاً من الكربوهيدرات الكلية، النيتروجين، الفوسفور و البوتاسيوم نتيجة للتسميد بالأسمدة الحيوية أو مخلوط الـ NPK. و لقد أدى الجمع بين معاملات التسميد الحيوي و التسميد الكيماوي بمخلوط الـ NPK الى حدوث زيادة اضافية في جميع القياسات السابقة، لكن السيادة كانت للتوليفة المكونة من النيتروبين بمعدل ٥جم/نبات + مخلوط الـ NPKبمعدل ٤ جم/نبات و التي أعطت أفضل النتائج في معظم القياسات لكلا الموسمين.

و عليه، فإنه طبقاً لنتائج هذه الدراسة يمكن التوصية بتسميد نباتات الونكا صنف ميجور المنزرعة في تربة طينية بالعراء (تحت الشمس الساطعة) بالتوليفة السمادية المكونة من النيتروبين (بمعدل ٥ جم/نبات) و مخلوط الـ NPK (بمعدل ٤جم/نبات)، على أن تضاف تكبيشاً للتربة، ثلاث مرات خلال موسم النشاط و بفاصل شهرين بين كل مرتين متتاليتين للحصول على أفضل نمو خضري و صفات تزهير و محتويات كيماوية بأوراق النبات.