HortFlora Research Spectrum
Vol. 5, Issue 2; 161-164 (June 2016)
www.hortflorajournal.com
ISSN: 2250-2823

EFFECT OF DIFFERENT NITROGEN DOSES, *AZOTOBACTOR*, PSB AND PMB ON PLANT VIGOUR, FLOWERING AND YIELD OF PETUNIA (*Petunia hybrida*) VAR. PICOTEE

Sunita Kumari* and V. M. Prasad

Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences, (Deemed to be University) 211007, (U.P.) India.

**Corresponding Author's E-mail: sunitakumari.sean@gmail.com*

ABSTRACT : The present experiment was conducted to study the effect of bio and chemical fertilizers on plant vigour, flowering and yield of petunia (*Petunia hybrida*) var. Picotee in the Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, (U.P.) during the winter season 2014-2015. The results revealed that treatments T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK) had significant response most of the traits studied. The maximum plant height (29.80 cm), number of leaves/plant (600.60) number of branches/plant (20.00), plant spread (54.30 cm), first flower bud emergence (53.06), diameter of flower/(8.26 cm), number of flowers/plant (76.93), weight of fresh flower (1.05g) and weight of dry flower (0.81g) were produced by the treatment T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK).

Keywords : *Petunia hybrida, PSB, PMB, Azotobactor, bio-fertilizer.*

Petunia (*Petunia hybrida* Vilm) belongs to the family Solanaceae and genus *Petunia* is a popular, easy to grow and versatile annual with showy flowers and has the longest season of bloom of all garden annuals. A wide range of colours and forms have been developed over the years, which are classified on the basis of characteristics of flowers. Petunia plants are perennials but are generally grown as half-hardy annuals in open gardens.

Presently the indiscriminate use of chemical fertilizers and pesticides has caused tremendous harm to the environment as well as human health. The safest answer to this is the use of bio-fertilizer, an environmental friendly bio-fertilizer which is now used in most countries for sustainable horticulture. Bio-fertilizers are micro organisms that enrich the nutrients quality of soil. The main sources of bio-fertilizers are bacteria, fungi and cynobacteria (blue green algae). The most striking relationship that these have with plants is symbiosis, in which the partners derive benefits from each other (Wen *et al.,* 9).

Bio fertilizers are important components of integrated nutrients management. They are cost effective, eco-friendly and renewable source of plant nutrients to supplement chemical fertilizers in sustainable agricultural system.

Role of *Azotobactor* is one of the important and well known non symbiotic nitrogen fixing bacterium. It increases 5-15% crop yield in well manured soil with high organic matter, also it secrets biologically active substance like thiamine, riboflavin, IAA and gibberllic acid.

Article's History:
Received : 03-05-2016 ***Accepted : 12-06-2016***

Phosphate Solubilizing Bacteria (PSB) is a group of beneficial bacteria capable of hydrolyzing organic and inorganic phosphorus from insoluble compounds. Some PSB produce phosphatase like phytase that hydrolyses organic forms of phosphate compounds efficiently. The use of phosphate solubilizing bacteria as inoculants simultaneously increases P uptake by the plant and crop yield. Strains from the genera *Pseudomonas, Bacillus* and *Rhizobium* are among the most powerful phosphate solubilizers. The principal mechanism for mineral phosphate solubilization is the production of organic acids, and acid phosphatases play a major role in the mineralization of organic phosphorous in soil. Several phosphatase-encoding genes have been cloned and characterized and a few genes involved in mineral phosphate solubilization have been isolated. Therefore, genetic manipulation of phosphate-solubilizing bacteria to improve their ability to improve plant growth may include cloning genes involved in both mineral and organic phosphate solubilization, followed by their expression in selected rhizobacterial strains.

Potash mobilizing bacteria (PMB) plays a vital role in the formation of amino acids and proteins from ammonium ions, which are absorbed by roots, from the soil. PMB are also responsible for the transfer of carbohydrates, proteins, etc. from the level to the roots.

It also plays a vital role in the uptakes of other elements particularly nitrogen, phosphorus and calcium, PMB regulates the permeability of the cellular membrane. It activates number of enzymes, e.g. alcohol dehydrogenate and its deficiency decreases photosynthesis. PMB increases the resistance of crops to hot and dry conditions and insect pest and diseases. It improves the quality of flowers.

MATERIALS AND METHODS

The field experiment was conducted at the experimental field of the Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Deemed University,) during the year 2014-2015. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments and replicated thrice. Three bio fertilizers *Azotobactor*, phosphorus solubilising bacteria and potash mobilising bacteria @ 5 Kg/ha and two levels of nitrogen, *i.e.* 60 kg/ha and 120 kg/ha with one control were taken. Seedlings of petunia were raised in the beds of the nursery. The experimental field was prepared well by repeated ploughings followed by planking to a fine tilt.

RESULTS AND DISCUSSION

The present investigation to study the effect of bio and chemical fertilizers on plant vigour, flowering and yield of petunia (*Petunia hybrida*) *var.* Picotee was undertaken under Allahabad agro-climatic conditions.The results of the investigation (Table 1 and 2) revealed that maximum plant height (29.80 cm) was recorded in treatment T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK followed by T_{13} (*Azotobactor* + PSB + PMB + 50 % N + 100% doses of PK) (28.53cm). which was much better than control (25.60cm). The maximum plant height with T_{13} may be attributed due to the presence of non-symbiotic nitrogen fixing bacteria which might have given the boosting effect to the roots of the plant and by stimulating plant growth through synthesis of growth promoting substances. These findings are in conformity with the results of Kathiresan (2), Rajadurai *et al.* (4), Hoda *et al.* (1) and Sarwa *et al.* (5) in Petunia.

The maximum plant spread was recorded in treatment treatment T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK) followed by T_{12} (51.81cm). Minimum plant spread (41.51 cm) was recorded in treatment T_1 control. The ability of *Azotobacter* to synthesize and secrete thiamine, riboflavin, pyridoxine, cyanocobalamin, and indole acetic acid like substances which in turn increased the nutrient absorption from the soil leading to the luxuriant vegetative growth.

Table 1 : Effect of bio and chemical fertilizers on growth parameters of petunia *(Petunia hybrida*).

Treatments	Plant height (cm)	Plant spreading (cm)	No. of branches	No. of leaves
	150th days	150th days	150th days	150th days
T_1	25.60	41.51	13.53	327.40
T_2	27.86	48.49	16.00	414.93
T_3	28.40	50.49	16.33	442.93
T_4	27.20	47.68	13.46	362.60
T_5	28.00	47.83	14.20	372.73
T_6	26.60	46.96	14.00	384.96
T_7	27.46	48.16	15.26	389.96
T_8	27.93	48.34	15.93	507.83
T_9	28.20	49.23	18.33	530.60
T_{10}	27.13	46.83	13.80	456.40
T_{11}	26.06	47.30	14.26	468.90
T_{12}	28.53	51.80	18.86	562.83
T_{13}	29.80	54.30	20.00	600.60
C.D (P=0.05)	1.13	1.50	1.54	43.53

The increased number of branches in bio fertilizer treated plant was observed than control. The maximum number of branches per plant 20.00 was recorded in treatment (*Azotobactor* + PSB +PMB + 100% doses) (20.00). It was followed by treatment T_{12} (18.86 cm). Besides nitrogen fixation in plants, *Azotobacter* was found to be synthesizing various growth promoting substances like IBA, NAA, which help in enhancing the root biomass. Similar results were also reported by Narasimha and Haripriya (3).

The maximum number of leaves per plant (600.60) was recorded in treatment T_{13} (*Azotobactor* + PSB + PMB + 100% doses of NPK) followed by T_{12} (562.83). The minimum number of leaves/plant (327.40) were in control. The increased production of leaves helps to elaborate more photosynthesis and faster the maturity. The promoting effect of bio with chemical and fertilizer in increasing the number of leaves has been reported by Santhi *et al.* (6) and Sarwa *et al.* (5).

Table 2 : Effect of bio and chemical fertilizers on flowering parameters of petunia.

Treatments	No. of days for 1st flower bud emerge	Fresh weight of flower (g)	Dry weight of flower (g)	Diameter of fully opened flower (cm)	No. of flowers/ plant
T_1	68.11	0.79	0.58	5.68	50.33
T_2	66.88	0.85	0.76	6.80	68.53
T_3	67.08	0.87	0.76	7.46	70.66
T_4	60.20	0.88	0.72	7.26	67.43
T_5	57.73	0.90	0.74	7.56	73.40
T_6	62.66	0.82	0.64	6.43	71.40
T_7	63.46	0.84	0.66	6.60	72.40
T_8	62.20	0.90	0.73	6.97	73.86
T_9	63.66	0.92	0.73	7.53	77.20
T_{10}	57.53	0.89	0.68	7.86	69.53
T_{11}	54.86	0.91	0.74	7.93	71.20
T_{12}	54.06	1.01	0.80	7.83	73.20
T_{13}	53.06	1.05	0.81	8.26	76.93
C.D (P=0.05)	1.77	0.035	0.030	8.26	4.34

The bio fertilizer treated plants showed earliness in bud initiation. Minimum (53.06 days) were observed in treatment T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK) followed by treatment T_{12} (54.06 days) and the maximum (68.11) days in control. This may be due to the earlier shift to the flowering phase due to rapid completion of vegetative phase because of availability of more nutrients to the plant by the application of bio-fertilizer and the consequent better vegetative growth. The findings are in conformity with the results of Shubha (7) in African marigold.

The fresh and dry weight of flower (1.07g, 0.81 g) was significantly increased in treatment T_{13} (1.07 g) followed by T_{12} and was minimum in control. (0.79 g and 0.58 g). The fresh and dry weight promotion due to inorganic fertilizer ncreased reported by Swaminathan *et al.* (8).

Similarly bio fertilizers stimulated the increase in flower size. The combined treatment of T_{13} *Azotobactor* + PSB +PMB + 100% doses of NPK gave the best response due to fixation of phosphorus and potash in soil which is mostly unavailable to crops because of its low solubility. The solublising effect of *Azospirillum* is generally due to the production of organic acids, vitamins, growth promoting substances like IAA, IBA which help in better growth of plants.

Biofertilizers stimulated the increase in number of flowers per plant. The treatment of T_{13} (*Azotobactor* + PSB +PMB + 100% doses of NPK) gave the best response due to fixation of phosphorus and potash in soil which is mostly unavailable to crops because of its low solubility. The solublising effect of *Azospirillum* is generally due to the production of organic acids, vitamins, growth promoting substances like IAA, IBA which help in better growth of plants.

CONCLUSION

From present investigation, it is concluded that in respect of cultivation of petunia (Petunia hybrida) under Allahabad condition, the application of *Azotobactor* + PSB +PMB + 100% doses of NPK was effective in enhancing vegetative growth and quality of petunia (*Petunia hybrida*).

REFERENCES

1. Hoda E. E. M. and Mona S. (2014). Effect of bio and chemical fertilizers on growth and flowering of *Petunia hybrida* plants. *American J. Plant Physiol.,* **9** (2) : 69-77.
2. Kathireshan, C. (1999). Effect of biofertilizer with different level of nitrogen and phosphorus on growth, yield and quality of gladiolus (*Gladiolus grandiflorus* Nees). *M.Sc. (Ag.) Thesis,* University of Agricultural Sciences, Bangalore.

3. Narashimha, R. S. and Haripriya, K. (2001). Integarted nutrient management in crossandra (*Crossandra infundibuliformis* L.) cv. Dindigul local. *South Indian Hort.,* **49** : 181-184.
4. Rajadurai, K. R., Manivanna, K., Jawaharalal, N. and Beaurah A. (2000). Effect of *Azospirillum* and VAM on growth character of African marigold (Tagetes erecta L.). *S.I.Hort.,* **48** (1-6): 83-87.
5. Sarwa, P. C., Soni, M., Vaidya, P. P. and Khandekar J. S. (2014). Effect of *Azotobactor, Azospirillum* and different level of inorganic fertilizer on growth and flowering of petunia. *Asian J. Hort.,* **9**(1): 61-63.
6. Santhi, V. P. and Kumar, V. M. (1998). Effect of nitrogen levels and biofertilizer on growth, herbage and essential oil yield of palmarosa. J. *South Indian Hort*. **46** (3&4) : 171-175.
7. Shubha, B.M.(2006). Integrated nutrient management for growth, flowering and xanthophylls yield of marigold (*Tagetes erecta* L.). *M.Sc. (Ag.) Thesis,* University of Agriculture Science, Dharwar.
8. Swaminathanan, V., Ramaswamy, N. and Pillai, A. (1999). Effect of *Azospirillum,* phosphobacteria and inorganic nutrients on the growth and yield of tuberose. *South Indian Hort.,* **47** (1-6): 331-334.
9. Wen X. L. L. B. and You J. (2014). Effect of nitrogen rates and different controlled release fertilizers on growth and ornamental quality of petunia (*Petunia hybrid*a). *South Indian Hort.* **42** : 234-253.

❑

Citation : Kumari S. and Prasad V.M. (2016). Effect of different nitrogen doses, *Azotobactor*, PSB and PMB on plant vigour, flowering and yield of petunia (*Petunia hybrdia*) var. Picotee. *HortFlora Res. Spectrum,* **5**(2) : 161-164