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Effect of different phosphorus levels and bio-fertilizers on growth parameters of garlic (*Allium sativum* L.) cv. G-1 (Yamuna safed)

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Abstract
A present experiment was conducted during Rabi season of the year 2017 at Horticulture Research Farm-II, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar Rae Bareli road, Lucknow 226025 (U.P.) India. **"**Effect of different phosphorus Levels and bio-fertilizers on growth parameters of garlic (*Allium sativum* L.) cv. G-1(Yamuna safed)", revealed that plant height, number of leaves per plant, length of leaves, diameter of stem was maximized when dose was done with phosphorus levels 40,60,80 kg/ha and bio-fertilizers PSB, Azotobacter and PSB+ Azotobacter inoculation.

Keywords: Garlic, phosphorus, bio-fertilizers, PSB, Azotobacter and growth parameter

Introduction
Garlic (*Allium sativum* L.) having diploid chromosome number 2n=2x=16 belongs to the family Amaryllidaceae (Alliaceae); known as Lahsun in Hindi, is one of the important bulb crops grown in India. It has long been recognized as a valuable spice and condiments in India. It is a frost hardy bulbous, erect annual herb with narrow flat leaves and bears small white flowers and bulbils (Janick, 1979) [2]. Garlic is a scapigerous foetid perennial medicinal herb with underground compound bulbs covered by outer white thin scales with simple smooth round stem surrounded by the bottom by tubular leaf sheath. The leaves are simple, long, flat and linear. The flowers are small and white, arranged in round umbels mixed with small bulbils. The entire umbels are enclosed in a tear-drop shaped membranous spathe. Flowers are usually sterile. The seed stalk bears terminal inflorescence, which in terms bear bulbils instead of flowers. The shoot of garlic become flat and finally aborts after the development of bulbils in the inflorescence. (Kothari and Shah, 1974) [3]. A compound bulb consists of smaller bulbils or a segment called "cloves" which are formed from auxiliary bulbs of the young foliage leaves and is surrounded by a thin white or pinkish papery sheath. Garlic is the second most important bulb crop after onion. It is an important spice crop belonging to family Alliaceae and botanically known as (*Allium sativum* L.). Garlic belongs to be central Asia and Southern Europe, especially Mediterranean region (Thompson and Kelly, 1957) [10]. The economic yield is obtained from its underground bulb, which is consisted of bulblets, popularly called as cloves. Garlic is used in flavoring foods, preparing chutneys, pickles, curry powder, tomato ketchup etc. It contains protein (6.3%), phosphorus (0.31%), potash (0.40%), calcium (0.03%), magnesium (0.025%), carbohydrates (29%) and a colourless as well as odourless water soluble amino acid called allicin. On crushing the blub clove, an enzyme allinase acts upon allicin and breaks down to produce allicin. Garlic contains volatile oil known as diallel - disulphide which is the major flavouring component in garlic. Garlic possesses insecticidal action whereby 0.1 per cent garlic extract gives protection against mosquitoes for 8 hours. Extract of garlic along with chilli and ginger has beneficial action against soil nematodes. Beneficial use of garlic extract has been found against many fungi and bacteria (Pandey, 1997) [6]. Allicin present in aqueous extract of garlic reduce blood cholesterol concentration in human blood (Shankaracharya, 1974) [9, 7]. Garlic oil or its juice is recommended to inhale in cases of pulmonary tuberculosis, rheumatism, sterility, impotency, cough and redness of eyes (Pruthi, 1979) [5].

Material and Methods
The experimental material for the present study consisted of one cultivar of garlic obtained from NHRDF, Karnal (Haryana).

The experiment was conducted using Randomized Block Design (RBD) with three replications at Horticultural Research Farm-II of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow during the year 2016-17. Observations were recorded for Plant height, Number of leaves per plant, Length of leaves, Diameter of stem. The data so obtained were analysed statically.

Result and discussion

The results revealed that application of 80 kg/ha phosphorus had significant effect on growth attributes of garlic. All the growth parameters *viz.* plant height, number of leaves per plant, length of leaves and diameter of stem total increased linearly with the corresponding increase in levels of phosphorus up to 80 kg phosphorus per ha. However, 60 kg phosphorus per ha was found statistically at par to it. The results obtained in this investigation are in close conformity with those of Mulatu *et al.* (2014) [4], Bhandari *et al.* (2012) [1] in garlic and Singh *et al.* (2000) [8] in onion, who reported significantly plant height, number of leaves per plant, length of leaves and diameter of stem content.

Cloves inoculation with PSB + Azotobacter significantly increased the plant height (cm), number of leaves per plant, length of leaves (cm) and diameter of stem (mm) over rest of treatments whereas, total chlorophyll content in leaves was recorded significantly higher with PSB + Azotobacter and Azotobacter alone over no inoculation and PSB alone.

The combined inoculation of PSB + Azotobacter proved significantly superior to control, PSB and Azotobacter in terms of growth parameters *viz*., plant height, number of leaves per plant, length of leaves and diameter of stem. PSB + Azotobacter provide avenues for improving P use efficiency. The increase in uptake was more pronounced with respect to PSB and Azotobacter or their combinations.

Table 1: Effect of different phosphorus levels and bio-fertilizers on growth parameters of garlic.

Treatment		Plant Height (cm)			
		30 DAP	60 DAP	90 DAP	120 DAP
Phosphorus Levels					
Control	P_0	16.7	28.3	43.7	49.00
40 kg/ha	P_1	15.8	29.7	42.3	52.78
60 kg/ha	P_2	16.0	31.4	44.7	53.00
80 kg/ha	P_3	15.4	31.1	47.9	55.11
SEm±		0.434	0.495	0.341	0.207
CD(P=0.05)		N/A	1.437	0.990	0.601
Bio-fertilizers					
Control	B_0	15.8	31.9	46.3	54.78
PSB inoculation	B_1	14.9	33.4	46.7	56.44
Azotobacter inoculation	B_2	15.7	32.7	47.3	58.89
PSB+ Azotobacter inoculation	B_3	16.7	32.7	49.4	55.33
SEm±		0.434	0.495	0.341	0.207
CD(P=0.05)		N/A	1.437	0.990	0.601

Table 2: Effect of different phosphorus levels and bio-fertilizers on growth parameters of garlic.

Treatment		Number of leaves per plant			
		30 DAP	60 DAP	90 DAP	120 DAP
Phosphorus Levels					
Control	P_0	5.18	5.61	6.62	7.17
40 kg/ha	P_1	5.41	5.79	6.95	7.65
60 kg/ha	P_2	5.43	5.84	6.90	7.98
80 kg/ha	P_3	5.38	6.05	7.08	8.03
SEm±		0.055	0.099	0.082	0.209
CD(P=0.05)		0.160	0.288	0.239	0.606
Bio-fertilizers					
Control	B_0	5.11	5.57	6.65	7.01
PSB inoculation	B_1	5.51	5.95	6.95	7.73
Azotobacter inoculation	B_2	5.35	5.81	6.78	7.72
PSB+ Azotobacter inoculation	B_3	5.43	5.95	7.17	8.83
SEm±		0.055	0.099	0.082	0.209
CD(P=0.05)		0.160	0.288	0.239	0.606

Table 3: Effect of different phosphorus levels and bio-fertilizers on growth parameters of garlic.

Treatment		Diameter of stem (mm)			
		30 DAP	60 DAP	90 DAP	120 DAP
Phosphorus Levels					
Control	P_0	4.03	7.3	9.47	9.48
40 kg/ha	P_1	4.04	7.73	9.97	9.82
60 kg/ha	P_2	4.08	8.17	9.9	9.92
80 kg/ha	P_3	3.89	8.36	9.7	9.81
SEm±		0.375	0.462	0.004	0.123
CD(P=0.05)		N/A	0.56	0.005	0.357

Bio-fertilizers					
Control	B_0	4.7	8.47	10.1	11.29
PSB inoculation	B_1	4.38	8.31	10.07	11.09
Azotobacter inoculation	B_2	4.43	8.24	10.6	11.3
PSB+ Azotobacter inoculation	B_3	4.66	7.76	10.83	11.3
SEm±		0.375	0.462	0.004	0.123
CD(P=0.05)		N/A	0.56	0.005	0.357

Table 4: Effect of different phosphorus levels and bio-fertilizers on growth parameters of garlic.

Treatment		Diameter of stem (mm)			
		30 DAP	60 DAP	90 DAP	120 DAP
Phosphorus Levels					
Control	P_0	4.03	7.3	9.47	9.48
40 kg/ha	P_1	4.04	7.73	9.97	9.82
60 kg/ha	P_2	4.08	8.17	9.9	9.92
80 kg/ha	P_3	3.89	8.36	9.7	9.81
SEm±		0.375	0.462	0.004	0.123
CD(P=0.05)		N/A	0.56	0.005	0.357
Bio-fertilizer					
Control	B_0	4.7	8.47	10.1	11.29
PSB inoculation	B_1	4.38	8.31	10.07	11.09
Azotobacter inoculation	B_2	4.43	8.24	10.6	11.3
PSB+ Azotobacter inoculation	B_3	4.66	7.76	10.83	11.3
SEm±		0.375	0.462	0.004	0.123
CD(P=0.05)		N/A	0.56	0.005	0.357

Conclusion

On the basis of the results obtained in the present investigation, it may be concluded that application of different phosphorus levels and bio-fertilizers enhanced the growth parameters of garlic except days take bulb initiation in comparison to control.

The application of 80 kg Phosphorus ha^{-1} significantly increased the plant height, number of leaves per plant, length of leaves and diameter of stem at 30, 60, 90 and 120 DAP, over control and 40 and 60 kg Phosphorus ha^{-1}.Among different bio-fertilizer the inoculation of PSB + Azotobacter leads to maximum plant height at 30, 60, 90 and 120 DAP while minimum under control. The maximum number of leaves per plant, length of leaves and diameter of stem was recorded at 30, 60, 90 and 120 DAP respectively with the treatment PSB + Azotobacter over rest of the treatments. It is recommended for higher production of garlic under Lucknow conditions.

References

1. Bhandari SA, Patel KS, Nehete DS. Effect of integrated nutrient management on growth, yield and quality of garlic (*Allium sativum* L.) cv. Gujarat Garlic-3. The Asian Journal of Horticulture. 2012; 7(1):48-51.
2. Janick J. *Horticultural science*, Freeman & Co. San Francisco, 1979.
3. Kothari IL, Shah JJ. Histogenesis of seed - stalk and inflorescence in garlic. Phytomorphol. 1974; 24:42-48.
4. Mulatu A, Tesfaye B, Getachew E. Growth and bulb yield garlic varieties affected by nitrogen and phosphorus application at Mesqan Woreda, South Central Ethiopia. Sky Journal of Agricultural Research. 2014; 3(11):249-255.
5. Pruthi JS. Spices and Condiments (Second ed.), National Book Trust of India, New Delhi, 1979, 87-99.
6. Panday UB. Garlic cultivation in India, National Horticultural Research and Development Foundation Nasik, Tech. Bull. 1997; 7:8-9.
7. Shankaracharya NB. Symposium on Spice industry in India, AFST, CFTRI, Mysore, 1974, 24-36.
8. Singh J, Singh T, Singh SB. Yield response of kharif onion grown through sets as influenced by fertility levels, planting method and weed control treatment National symposium on Onion-garlic production and post-harvest management. Challenges and strategies NHDRF Nasik 19-21st, 1999-2000.
9. Shankaracharya NB. Symposium on Spice industry in India, AFST, CFTRI, Mysore, 1974, 24-36.
10. Thompson HC, Kelly WC. Vegetable crops. Mc Grew Hill Book Co., New York, 1957, 368-370.