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Response of okra seed production to bio-fertilizers

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Abstract

An experiment was conducted during rainy season of 2013-14, 2014-15 and 2015-16 at Vegetable Research Station, Kalyanpur of C.S.Azad University of Agriculture & Technology, Kanpur. The soil of experimental field was sandy loam with low fertility. There were seven treatments comprised recommended dose of NPK, Azospirillum + recommended dose of NPK, Azospirillum + 75% N + recommended doses of P&K, Azospirillum + 50% N + recommended doses of P&K, PSB + recommended dose of NPK, PSB + 75% P + recommended doses of N&K and PSB + 50%P + recommended doses of N&K. The treatments were evaluated i.e. growth, yield contributing characters and seed yield of okra. The okra variety *Azad Bhindi*-1 was sown with recommended agronomical practices. The highest seed yield of okra by 15.69 q/ha was reaped from Azospirillum + recommended dose of NPK, followed by PSB + recommended dose of NPK (14.57 q/ha). The growth and yield contributing characters were concordant to the seed yield.

Keywords: Azospirillum, Bio-fertilizers, PSB, Okra, Seed

Introduction

It is well known fact that bio fertilizers are the carrier-based preparation containing beneficial micro-organisms in viable state intended for seed or soil application. Now-a-days they have emerged as promising component of integrated nutrient supply system. They are complements or supplements to chemical fertilizers because of high nutrient turnover, exorbitant cost of fertilizers and soil and environment protection. Bio-fertilizers are less expensive, eco-friendly viable and sustainable and improve crop growth, yield and quality of produce (Bahadur and Manohar 2001). In India, okra is grown almost in all the places throughout the year and consumed by many of people. The major okra growing states in India are Andhra Pradesh/Telangana (20%), West Bengal (15%), Bihar (14%), Orissa (11%) and rest in other states (Godambe et al. 2016).

Okra requires heavy fertilization for its potential production of green fingers and seeds. Indiscriminate use of inorganic fertilizers leads to nutrients imbalance in soil causing ill effect on soil health and soil micro-organisms. The green fingers yield as available chemical base, which is also effect the human health. The inorganic base production of seed is also adversely affected by chemical fertilizers in comparison to organic production especially bio-fertilizers. Hence, there is need to reduce the use of chemical fertilization in seed production and encourage the application of bio-fertilizers to the maximum possible levels. The bio-fertilizers play the many role viz., fix appreciable amount of atmospheric nitrogen in soil, enhance plant growth by production of organic acid, growth substances, and make available the complex phosphorus to the plant, which may cause an appreciable reduction in consumption of inorganic fertilizers. Keeping in view the above points, the present study was planned and under taken.

Materials and Methods

The present study was carried out during rainy season from 2013-14 to 2015-16 at Vegetable Research Farm, Kalyanpur, C.S.Azad University of Agriculture and Technology, Kanpur. The main objective was to find out the effect of biofertilizer in the production of okra seed with integration of NPK dose. The experimental site was sandy loam, having pH 7.7, organic carbon 0.38%, total nitrogen 181.6 Kg/ha, available P 16.6 Kg/ha and available K 192 Kg/ha, therefore, the fertility status was low. The pH was determined by electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta et al. 1962). Total nitrogen was analyzed by Kjeldahl's method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method (Olsen et al. 1954) and Flame photometric method (Singh 1971), respectively. The seven treatments i.e.

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recommended dose of NPK (T_1), Azospirillum + recommended dose of NPK (T_2), Azospirillum + 75% N + recommended doses of P&K (T_3), Azospirillum + 50% N + recommended doses of P&K (T_4), PSB + recommended dose of NPK (T_5), PSB + 75% P + recommended doses of N&K (T_6) and PSB + 75% P + recommended doses of N&K (T_7) were tested. The okra cultivar Azad Bhindi-1 was planted 18.07.2013, 27.07.2014 and 21.07.2015 at spacing of 45 x 45 cm. The crop was harvested after complete maturity of fingers. The protective irrigations were given as and when required. The experiment was laid out in RBD with three replications. The recorded data were statistically analyzed with standard method as described by Gomez and Gomez (1984).

Results and Discussion

The findings of the present study as well as relevant discussion have been presented on mean values of three years under following heads×

Effect on growth parameters: The mean values of three years pertaining to germination (%) as influenced by different treatments are given in Table-1. The perusal of the results indicated that there was not mach variation among tested treatments of integrated inorganic fertilizers and bio-fertilizers. The seedling length was found significant among treatments tried. Azospirillum + recommended dose of NPK were significantly superior over control (T_2) in three experimental years as well as pooled results of three years. The similar trends was also noted in seedling dry weight, however, insignificant response was noted in three experimental years as well as pooled results of three years (Table-1). The mean value of seedling vigour index I was noted higher under T_2 treatment in comparison to other tested treatments but the response of different treatments in seedling vigour index II was not found significant in any experimental year as well as pooled value of three years (Table-2).

Effect on yield contributing characters: The seed yield per plant was differed with each other in different treatments (Table-3). Application of Azospirillum + recommended dose of NPK produced maximum yield/ plant by 33.90 gm, closely followed by PSB +

Table 1: Growth parameters as influenced by different treatments.

S. No.	Treatment	Germination %				Seedling length (cm)				Seedling dry weight (g)			
		2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
1	Recommended dose of NPK	83	81	82	82	28.25	28.30	28.30	28.28	0.20	0.19	0.18	0.19
2	Azospirillum + Recommended dose of NPK	80	78	79	79	33.40	33.38	33.73	33.50	0.23	0.22	0.23	0.23
3	Azospirillum + 75% N + Recommended dose of P&K	82	80	80	81	31.10	31.15	31.10	31.12	0.22	0.20	0.21	0.21
4	Azospirillum + 50% N + Recommended dose of P&K	81	79	80	80	27.00	27.80	27.80	27.53	0.20	0.19	0.20	0.20
5	PSB + Recommended doses of NPK	84	82	84	83	31.72	31.75	31.85	31.77	0.21	0.20	0.20	0.20
6	PSB + 75% P + Recommended doses of N&K	83	81	81	82	31.18	31.24	31.35	31.26	0.22	0.20	0.20	0.21
7	PSB + 50% P +Recommended dose of N&K	83	81	83	82	30.00	29.98	30.00	30.00	0.20	0.19	0.19	0.19
	CD 5%	2.16*	3.08	2.47	-	3.38*	0.46	3.24	-	0.02*	NS	0.03	-

Table 2: Seedling vigour index I & II under different treatments.

S. No.	Treatment	Seedling Vigour Index-I				Seedling Vigour Index-II			
		2013	2014	2015	Mean	2013	2014	2015	Mean
1	Recommended dose of NPK	2345.67	2292.00	2321.23	2319.63	16.61	15.38	14.76	15.58
2	Azospirillum + Recommended dose of NPK	2671.83	2603.75	2664.47	2646.77	18.41	17.17	18.16	17.91
3	Azospirillum + 75% N + Recommended dose of P&K	2550.20	2491.98	2487.23	2509.81	18.04	16.00	16.79	16.94
4	Azospirillum + 50% N + Recommended dose of P&K	2186.73	2196.13	2224.00	2202.24	16.20	15.00	16.00	15.73
5	PSB + Recommended doses of NPK	2664.97	2603.52	2675.72	2648.23	17.64	16.40	16.79	16.94
6	PSB + 75% P + Recommended doses of N&K	2588.03	2530.43	2538.00	2552.01	18.27	16.21	16.20	16.89
7	PSB + 50% P + Recommended dose of N&K	2488.00	2428.39	2490.83	2468.94	16.61	15.39	15.75	15.92
	CD 5%	279.11*	83.77	262.56	-	N.S.	NS	NS	-

Table 3: Yield contributing characters and seed yield of okra under different treatments.

S. No.	Treatment	Seed Yield/ Plant (g)				100Seed weight (g)				Seed Yield (q/ha)			
		2013	2014	2015	Mean	2013	2014	2015	Mean	2013	2014	2015	Mean
1	Recommended dose of NPK	28.90	29.05	29.15	29.03	5.45	5.46	5.48	5.46	12.83	12.82	12.70	12.78
2	Azospirillum + Recommended dose of NPK	33.80	33.90	34.00	33.90	6.75	6.51	6.80	6.69	15.85	15.27	15.95	15.69
3	Azospirillum + 75% N + Recommended dose of P&K	31.10	31.25	31.30	31.22	5.90	5.93	5.85	5.89	13.87	13.88	13.80	13.85
4	Azospirillum + 50% N + Recommended dose of P&K	28.75	28.82	28.00	28.52	5.35	5.38	5.40	5.38	12.00	12.32	12.25	12.19
5	PSB + Recommended doses of NPK	33.00	33.10	33.50	33.20	6.20	6.21	6.20	6.20	14.55	14.57	14.60	14.57
6	PSB + 75% P + Recommended doses of N&K	32.00	32.02	31.85	31.96	6.00	5.58	6.00	5.86	14.00	14.05	14.35	14.13
7	PSB + 50% P +Recommended dose of N&K	30.10	30.12	30.15	30.12	5.70	5.71	5.75	5.72	13.20	13.27	13.15	13.21
	CD 5%	2.74*	2.82	NS	-	0.48**	0.57	0.57	-	2.29**	1.50	1.91	-

recommended dose of NPK (33.20 g/plant) and PSB + 75% P + recommended dose of N&K (31.96 g/plant). The significantly highest test weight (6.69 g) was weighed under Azospirillum + recommended dose of NPK, closely followed by T_5 and T_6 (Table-3).

Effect on seed yield (q/ha): The highest average seed yield of okra was obtained with Azospirillum + recommended dose of NPK (T_2) by 15.69 q/ha, but almost atpar with PSB + recommended dose of NPK (14.57 q/ha) and PSB + 75% P + recommended dose of N&K (14.13 q/ha). These treatments of inorganic fertilizers and bio-fertilizers integration was found superior over other tested treatments. This may be due better integration, atmospheric fixation of nitrogen, enhance the availability of P by PSB, favorable soil environment and increase in yield attributes. The improvement in yield attributes could also be because of production of growth substances like IAA and GA_3 by microbial inoculants, which in turn might have increased the availability and uptake of nutrients through plant roots, thus higher yield was realized. Similar observations have also been made by other workers (Deka et al. 1996, Chatto et al. 1997. and Bahadur and Manohar 2001). Hence, seed producers of okra may be advocated for integration of Azospirillum with recommended dose of NPK and PSB with recommended dose of NPK for higher and quality production of okra seed.

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भिण्डी की वर्षाकालीन फसल में वर्ष 2013–14, 2014–15 व 2015–16 में सब्जी अनुसंधान केन्द्र चन्द्रशेखर आजाद कृषि एवं प्रौद्योगिकी विश्वविद्यालय कानपुर में एक परीक्षण किया गया। प्रायोगिक प्रक्षेत्र की मिट्टी बलुई दोमट एवं कम उर्वरता वाली थी। कुल सात शोधन उपचारों में संस्तुत नत्रजन, फास्फोरस, पोटाश, एंजोस्पीरिलम+संस्तुत एन.पी.के., एजोस्पीलियम + 75 प्रतिशत नत्रजन + संस्तुत फास्फोरस एवं पोटाश की मात्रा, एजोस्पिलियम + 50 प्रतिशत नत्रजन + संस्तुत फास्फोरस व पोटाश पी.एस.बी. + संस्तुत एन.पी.के., पी.एस. बी. + 75 प्रतिशत फास्फोरस + संस्तुत नत्रजन व पोटाश की मात्रा तथा पी.एस.बी. + 75 प्रतिशत फास्फोरस + संस्तुत नत्रजन व पोटाश की मात्रा का प्रयोग किया गया। शोधन उपचारों का मूल्यांकन वृद्धि उपज में योगदान देने वाले घटकों तथा बीज उपज के लिए किया गया। भिण्डी की प्रजाति आजाद भिण्डी–1 में संस्तुत कृषि पद्धतियों से उगाया गया। भिण्डी की अधिकतम बीज उपज 15–69 कु./हे. एजोस्पिलियम + एन.पी.के. भी संस्तुत मात्रा में प्राप्त हुई तथा इसके बाद पी.एस.बी.+एन.पी.के. की संस्तुत मात्रा से 14.57 कु./हे. प्राप्त हुई। वृद्धि एवं उपज में योगदान देने वाले घटकों को समानुपाती पाया गया।

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