www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2021; 10(2): 104-107

www.thepharmajournal.com
Received: 08-12-2020
Accepted: 10-01-2021

Manish Kumar Singh
Research Student, Department of Horticulture, Udai Pratap Collage, Varanasi, Uttar Pradesh, India

DK Singh
Associate Professor, Department of Horticulture, Udai Pratap Collage, Varanasi, Uttar Pradesh, India

Rohit Kumar Singh
Research Student, Department of Horticulture, I.Ag.S (BHU), Varanasi, Uttar Pradesh, India

Sudhir Kumar Mishra
Research Student, Department of Horticulture, National Post Graduate Collage, Barhalganj, Gorakhpur, Uttar Pradesh, India

Corresponding Author:
Manish Kumar Singh
Research Student, Department of Horticulture, Udai Pratap Collage, Varanasi, Uttar Pradesh, India

Integrated effect of biofertilizers and inorganic fertilizers on growth, yield and quality of onion (*Allium cepa* L.)

Manish Kumar Singh, DK Singh, Rohit Kumar Singh and Sudhir Kumar Mishra

Abstract
The research trial was conducted in the *Rabi* season of 2015 at Vegetable Research Farm, Department of Horticulture, Udai Pratap College, Varanasi. The experiment consisted of sixteen treatments *viz*. T1 - N + P + K (100% Recommended Full Does), T2 -75% N + P + K + 25% Azotobacter, T3 -50% N + P + K + 50% Azotobacter, T4 -25% N + P + K + 75% Azotobacter, T5 - N + 75% P + K + 25% PSB, T6 - N + 50% P + K + 50% PSB, T7 - N + 25% P + K + 75% PSB, T8 -75% N + 75% P + K + 25% , T9 - 50% N + 50% P + K + 50% Azotobacter + 50% PSB, T10 -25% N + 25% P + K + 75% Azotobacter + 75% PSB, T11 - 75% N + 50% P + K + 25% Azotobacter + 50% PSB, T12 -50% N + 75% P + K + 50% Azotobacter + 25% PSB, T13 - 25% N + 50% P + K + 75% Azotobacter + 50% PSB, T14 -25% N + P + K + 75% Azotobacter + 25% PSB, T15 - 75% N + 25% P + K + 25% Azotobacter + 75% PSB and T16 - 50% N + 25% P + K + 50% Azotobacter + 25% PSB Azotobacter + 25% PSB which was carried out in randomized block design (RBD) with three replications. The result recorded the significantly higher bulb yield of 303 q/ha with the application of 50:45:100 kg NPK/ha and inoculation of field with 1.25 ± 0.62 kg/ha Azotobacter and PSB.

Keywords: biofertilizers, inorganic fertilizers, yield, quality of onion

Introduction
Onion (*Allium cepa* L.) is one of the most important commercial crops among vegetable, spice and condiments in India. It is an important bulb crop cultivated all over the world on commercial scale both for local consumption and export. It was cultivated in more than 175 countries, on nearly 3 million ha, producing more than 50 million tonnes. India is the second largest producer after China in India producing 20333 MT, an area 1178 million ha and productivity 16.3 MT/ha (NHB Database, 2014-15). Gujarat, Madhya Pradesh, Orissa, Rajasthan Tamilnadu Bihar and Maharashtra, it is state cover of maximum area and production of onion in India. Maharashtra is largest producer of onion in the country with is about 30 lakh MT production from 1.03million ha which is about 25 per cent to the production and 20 per cent to the total area the onion production depend mainly on area cultural practices like nutrition irrigation plant protection measure beside the congenial climatic factors. It is especially rich in protein, carbohydrate and ascorbic acid. About 38 kcal. Calories of energy is obtained from 100g onion. Nutritive value of onion (nutritive value per100 g onion scales) water (89 g) lipids (0.16 g)carbohydrate (8.6 g) fibre (1.8 g) potassium (157 mg) sulphur (70 mg)phosphorus (33gm) calcium (20gm) vitamin C (6.4 gm.) vitamin E (0.26 gm.) vitamin B6 (0.116gm.) folic acid (19mcg.) glutamic acid (0.118g) argentine (0.156g) lysine (0.055g) leucine (0.041g). Biofertilizer have recently gained with momentum for effecting the sustainable increase the crop yield under various agro climate condition role of bio-fertilizer on the crop growth. It is using bio-fertilizer with adding mineral and organic matter led to improve of vegetative growth yield and quality of plant. Mixture of FYM and Neem cake increase the yield of onion and enriched nutrient content of bulb of onion. Thus there is ample scope for increasing production through fertilizer especially, that organic manure and bio-fertilizer in light texture soil. The microorganism involved in P solubilising can enhance plant growth by increasing the efficiency of biological nitrogen fixation, enhancing the availability of other trace element and by production of plant growth promoting substances. Bio–NP fertilizer gave significant increment in yield component of sesame plant Bio-NP ensure better nitrogen consumption. Which is essential to plant growth the Azospirillum bacteria and

"tikbaw" convert the air born nitrogen into ammonia. Ammonia penetrates to the root zone and makes the necessary 50 per cent available needs of the plant available for root consumption. Also, bio NP changes unavailable P to available from in the soil through the activity microorganism Ahmed *et al*., (2015) [1]. Biofertilizer i.e. nitrobeine has greater amount of bacteria which responsible for fixation of nitrogen by atmosphere. Application of nitrobeine achieved the following merits, decreasing the amount of mineral-N by 25 per cent and increasing the availability of various nutrient by plant moreover, the inoculation of legume seed crop with associated N-fixing with adding minerals or organic fertilizer led to improve the vegetative growth yield and quality of onion. Organic material such as farm yard manure, neem cake and bio fertilizer improve soil chemical, physical and biological that are important for plant growth. Organic farming provides several benefits to the growers. It reduces production cost and it is an environmentally friendly method of cultivation. Addition of organic fertilizer improve soil structure and enhances activates of useful soil organisms. Agricultural commodities result from organic cultivation is good for human health. Farmers are currently changing from conventional to organic farming systems which used no synthetic fertilizer and pesticide. Trichoderma is a genus belongs to the filamentous class deuteromycetes. The members are generally found in all soil. The fungus is valuable source for the commercial production of enzyme and helpful in recycling cellulosic waste material while producing useful by product Samuels, (1996) [13]. Trichoderma can function at the same time both as microbial antagonistic and plant symbionts for these reasons, close to 20 fungal bio control preparation abroad are based on Trichoderma. Trichodermaharzianum is a saprophytic fungus which is generally used as a bio control agent against a wide range of economically important aerial and soil plant pathogen and has been extensively studies as potential bio control agents. However, some studies have also shown that it can stimulate the growth of a number of vegetable and bedding plant crops. Various species of Trichoderma were also effective in the promotion of growth and yield of various crops. Trichodermaharzanum and Trichodermavirens promoted growth of cucumber, muskmelon and cotton seedling Kaveh *et al*., (2011) [9]. Application of Trichoderma spp. was not conducive to increase yield on tomato culture for yield and quality characteristic were not enhanced by the application of Trichoderma spp. Trichoderma species can improve plant growth and development. Growth stimulation is evidenced by increase in biomass productivity, stress resistance and increase nutrient absorption. Trichoderma spp. Can also produce metabolites with activates analogous to plant hormones.

Materials and Methods

The present investigation Integrated effect of biofertilizers and inorganic fertilizers on growth, yield and quality of onion (*Allium cepa* L.) was conducted at Vegetable Research Farm, Department of Horticulture, Udai Pratap College, Varanasi during Rabi season of 2015.The soil was sandy loam with pH 6.7, organic carbon 0.49%, available nitrogen 192 kg/ha, phosphorus 26 kg/ha and potassium 130 kg/ha. Onion seed were sown on nursery beds Oct 2015 broadcasting methods on raised bed about 5-6 meter long, one meter width and 10 cm above ground level, was prepared. The seed beds were cover with compost. Mulches and that attached with polythene paper above the bed to protect the young seedling from adverse climate condition 45 days after sowing, bulb lets were ready for transplanting. This healthy bulb let uniform shapes and size was selected and transplanting is prepared. The treatment combinations *viz*. T1 - N + P + K (100% Recommended Full Does), T2 -75% N + P + K + 25% Azotobacter, T3 -50% N + P + K + 50% Azotobacter, T4 - 25% N + P + K + 75% Azotobacter, T5 - N + 75% P + K + 25% PSB, T6 - N + 50% P + K + 50% PSB, T7 - N + 25% P + K + 75% PSB, T8 -75% N + 75% P + K + 25% , T9 - 50% N + 50% P + K + 50% Azotobacter + 50% PSB, T10 - 25% N + 25% P + K + 75% Azotobacter + 75% PSB, T11 - 75% N + 50% P + K + 25% Azotobacter + 50% PSB, T12 - 50% N + 75% P + K + 50% Azotobacter + 25% PSB, T13 - 25% N + 50% P + K + 75% Azotobacter + 50% PSB, T14 - 25% N + P + K + 75% Azotobacter + 25% PSB, T15 - 75% N + 25% P + K + 25% Azotobacter + 75% PSB and T16 - 50% N + 25% P + K + 50% Azotobacter + 25% PSB Azotobacter + 25% PSB which was laid out in Randomised Block Design (RBD) consisting of 16 treatment combinations with three replications; plot size was 3 x 2.6 m. Onion was sown on 30th Nov. 2015 with variety Agri found Light Red of onion and the recommended dose was 100 kg N + 60 kg P2O5 + 100 kg K2-O/ha. Nitrogen was applied as per treatment through urea, half as basal dose and remaining half at 40 days after transplanting. Phosphorus and potassium was applied through single super phosphate and murate of potash respectively just before transplanting. About seven weeks old seedlings having of 10 to 15 cm height were transplanted at 20 x 10 cm spacing. The transplanting was done on 24.01.2016. The other usual common packages of practices were followed time to time and periodical growth observations were recorded. Harvesting was done manually by hand digger at neck fail stage. The harvested bulbs along with tops were weighed and subjected to other observations.

Results and Discussion

Growth characters

Plant height (cm)

The maximum plant height (46.28 cm) was shown constantly by theT12 treatment after 105 DAT, received 50:45:100 kg NPK/ha and application of 1.25 kg/ha Azotobacter and 0.62 kg PSB/ha followed by T3 which received 50:60:100 kg NPK/ha with application of 1.25 Kg/ha Azotobacter/ha and height was recorded 45.28 cm at 105 DAT. Reddy and Reddy (2005) studied the effects of different levels of vermicompost (0, 10, 20 and 30 t ha-1) on growth of onion (cv. N-53).

Length of leaf (cm)

When leaf growth was studied, the leaf length of onion plant was found significantly higher 46.28 cm in the treatment combination of T12 i.e., 50:45:100 Kg NPK/ha + 1.25 kg Azotobacter + 0.62 kg PSB/ha as compared to other treatments followed by Azotobactor which recorded 45.28 cm leaf length at 105 DAT. The significant increase in plant height and leaf length at harvesting stage were observed due to inoculation of Azotohacter and PSB (Table 1), which improved nitrogen status of the soil as it is a free nitrogen fixer and PSB increases the availability of phosphorus in the soil resulting in higher uptake of phosphorus due to increase in the solubility and mobilization of insoluble soil phosphorus. Thus, efficient and healthy strain of Azotobacter and PSB in Rhizosphere have resulted in greater fixation of atmospheric nitrogen, increased the availability of phosphorus

for use by the plant, resulting in vigorous growth of plant. Similar results have been reported by Dibut *et al.,* (1993) [6, 7] and Martinez *et al*., (1994) [6].

Table 1: Integrated effect of biofertilizers and inorganic fertilizers on growth, yield and quality of onion *(Allium cepa* L.)

Treatments	Plant height (cm)	Leaf length (cm)	Equatorial diameter (cm)	Number of scales/bulb	Volume of bulb (cc)	Dry weight (g/100g)	Fresh weight of bulb (g)	bulb yield (q/ha)	TSS 0 brix
1. N + P + K (100% Recommended Full Does)	37.62	37.62	4.31	5.62	43.28	13.38	42.58	204.28	10.62
2.75% N + P + K + 25% Azotobacter	41.95	41.95	5.08	8.28	50.78	15.74	45.98	230.12	11.62
3. 50% N + P + K + 50% Azotobacter)	45.28	45.28	5.13	6.95	53.53	14.31	49.63	248.38	11.62
4. 25% N + P + K + 75% Azotobacter	41.95	45.28	5.33	7.28	55.56	14.77	54.52	272.82	11.12
5. N + 75% P + K + 25% PSB	39.62	37.62	4.96	7.95	51.83	13.53	47.19	236.15	11.45
6. N + 50% P + K + 50% PSB	43.28	43.28	4.92	6.28	53.31	13.88	48.77	243.18	11.78
7. N + 25% P + K + 75% PSB	38.56	38.62	4.35	6.62	43.59	13.59	41.62	222.83	10.78
8. 75% N + 75% P + K + 25% Azotobacter + 25% PSB	42.28	42.28	5.34	6.95	57.26	15.89	54.21	271.28	11.82
9. 50% N + 50% P + K + 50% Azotobacter + 50% PSB	42.95	42.95	5.08	8.28	50.48	14.70	45.58	228.12	11.45
10.25% N + 25% P + K + 75% Azotobacter + 75% PSB	42.28	38.62	4.98	6.28	54.40	13.75	49.38	247.12	11.28
11.75% N + 50% P + K + 25% Azotobacter + 50% PSB	42.62	42.62	4.39	8.28	45.77	15.55	44.52	220.78	11.95
12.50% N + 75% P + K + 50% Azotobacter + 25% PSB	46.28	46.28	5.45	8.62	62.28	16.69	60.46	303.92	12.28
13.25% N + 50% P + K + 75% Azotobacter + 50% PSB	45.28	45.28	5.36	8.28	55.82	14.72	51.18	256.12	11.95
14. 25% N + P + K + 75% Azotobacter + 25% PSB	42.28	42.28	5.09	8.28	54.32	14.85	49.94	250.65	10.95
15.75% N + 25% P + K + 25% Azotobacter + 75% PSB	40.28	40.28	4.99	6.62	53.87	14.34	49.56	248.02	11.78
16.50% N + 25% P + K + 50% Azotobacter + 25% PSB	44.28	44.28	5.21	7.62	55.52	14.80	51.03	255.38	11.28
CD (P = 0.05)	0.03	0.02	0.12	0.02	0.02	0.03	0.02	0.05	0.02

Yield and yield attributes characters

Number of scales

The maximum number of scales was recorded in treatment T12 which received 50:45:100 kg NPK/ha with 1.25 and 0.62 Kg/ha Azotobacter and PSB respectively but statistically at par with treatment T9 with number of scale 8.28which receive 50:30:100 kg NPK/ha + 1.25 Kg/ha Azotobacter and PSB both.

Volume of bulb

The data analysed showed that the maximum bulb volume was 62.28 cc in T12 which received 50:45:100 Kg NPK/ha with 1.25 and 0.62 kg/ha Azotobacter and PSB respectively but statistically at par with T8 in which the inorganic fertilizers were used @ 75: 45:100 Kg NPK/ha and 0.62 Kg/ha Azotobacter and PSB both.

Equatorial diameter (cm)

The equatorial diameter of bulb increased significantly in the treatment T12 (50:45:l00 Kg NPK/ha + 1.25 kg Azotobacter + 0.62 kg PSB/ha) over all other treatments and it was recorded 5.45 cm but it was statistically at par with treatment T13 (25:30:100 kg NPK/ha + 1.87 kg Azotobacter + 1.25 kg PSB/ha) and T4 (25:60:100 kg NPK/ha and Azotobacter @ 1.87 kg/ha) and recorded 5.36 and 5.33 cm equatorial diameter of bulb, respectively.

Dry weight of bulb

When gown through the data of experiment the maximum dry weight was recorded 16.69 g in the treatment combination of T12 which were receiving 50:45:100 kg NPK/ha and inoculated with 1.25 and 0.62 kg/ha Azotobcter and PSB respectively but it was statistically at par with treatment T8 which received 75:45:100 kg NPK/ha' and 0.62 kg/ha Azotobacter and PSB each and recorded 15.89 g dry weight of bulb.

TSS

The highest TSS 12.28 % was recorded in treatment T12 which were treated with 50:45:100 kg NPK/ha, 1.25 kg/ha Azotobacter and 0.62 kg/ha PSB, Followed by treatment combination (T13) which received 25:3 0: 100 kg NPK/ha + 1.87 kg Azotobacter /ha + 1.25 kg PSB/ha? The lowest TSS 10.62 % was noted in controlled condition (T1) where no biofertilizer were used.

Results and Discussion

Growth parameter

The data and result on plant height as presented in table 1 showed that the treatment T12 produced highest fresh weight bulb (60.46 g) over the other treatments which were supplied with 50:45:100 kg NPK/ha with 1.25 kg/ha Azotobacter and 13.62 kg PSB/ha. But it was statistically at par with T4 (25:60:100 kg NPK/ha + 1.87 kg/ha Azotobacter) and T8 (75:45:100 kg NPK/ha + 0.62 kg/ha Azotobacier and PSB both) with 54.52 and 54.21 g fresh weight of bulb, respectively. Whereas data pertaining to yield of bulb (q/ha) showed that the maximum yield 303.92 q/ha attained in T12 which received 50:45:100 kg NPK/ha with 1.25 and 0.62 kg/ha Azotobacter and PSB respectively, followed by T4which received 25:60:100 kg NPK/ha + 1.87 kg/ha Azotobacter and recorded 272.82 q/ha average bulb yield. The well-established fact that Azotobacter is known to produce antifungal, antibiotic substances that inhibit the activities of various type of soil fungi It can also synthesize and secrete thiamin, riboflavin, pyridoxin, cyanocobalamine, nicotinic acid, pentathenic acid, indole acetic acid and gibberellins or gibberellin like substances resulting in vigorous plant growth and dry matter production which in turn resulted in better fertilization, bulb development and ultimately the higher yield. Similar results have also been reported by Dibut (1993) and Bhonde *et al.* (1997) [6, 7].

Soil application method of bio-fertilizer proved most efficient inoculants to increase yield attributes and yield. These results are in close conformity with the findings of Joi and Shende (1977) [12] and Bhonde *et al.* (1997) [3]. The highest TSS 12.28 % was recorded in treatment T12 which were treated with 50:45:100 kg NPK/ha, 1.25 kg/ha Azotobacter and 0.62 kg/ha PSB, Followed by treatment combination (T13) which received 25:3 0: 100 kg NPK/ha + 1.87 kg Azotobacter /ha + 1.25 kg PSB/ha? The lowest TSS 10.62 % was noted in controlled condition (T1) where no biofertilizer were used.

Bio-fertilizer application had non-significant effect in influencing sulphur content and pungency. This might be due to the fact that there was a poor establishment of source to sink mechanism with plant system.

Conclusion

On the basis of result presented it can be concluded that that application of 50:45:100 kg NPK/ha and inoculation of field with 1.25 ± 0.62 kg/ha Azotobacter and PSB significantly recorded the higher bulb yield of 303 q/ha.

References

1. Ahmed HAM, Ahmed NG. Management of white rot of onion using composts and trichodermaharzianum. Current Life Sciences 2015;1(2):63-69.
2. Bahadur, Manohar RK. Response of okra to biofertilizers. Indian Institute of vegetables Research, 1, Gandhi Nagar (Naria), P. O. BHU Varanasi-221005, Uttar Pradesh 2001.
3. Bhonde SR, Sharma SB, Chougule AB. Effect of biofertilizer in combination with nitrogen through organic and inorganic source on yield and quality of onion. News Letters, Na. Hort. Res. Deb. Found 1997;17:1-3.
4. Chadha S, Rana SS, Chaudhary DR. Nutrient management in summer onion (*Allium cepa* L.) under cold desert conditions of North Western Himalayas. Indian J Agric. Sci 2006;76(10):629-631.
5. Chokar PK, Subba Rao NS. Phosphorus solublization by fungi associated with legume rootnodule. Canadian J Microbbio 1967;13:749-753.
6. Dibut B, Martinez R, Gonzalez R. Stimulation of growth and yield of onions by bacterization in red ferralliticsolils. La Habana, Cuba, Instituto Nacional de Investigacioners de la Cana de Azucar (INICA) 1993, P223-225.
7. Martinrz R, Dibut B, Gonzalez R, Acosta C. Effect of the application of biopreparations based on Azotobacterchroococcum on tomato and onion crops in red ferrallitic soils. 90-anos-de-la-Estacion Experimental-Agro-nomica-de-Santiago–de-lasVegas 1994, P167-184.
8. Mohandas S. Bio-fertilizer of horticultural crops. Indian Hort 1999;43(4):32-37.
9. Mazhabi M, Nemati H, Rouhani H, Tehranifar A, Moghadam EM, Kaveh H, Rezaee A. The effect of Trichoderma on polianthes qualitative and quantitative properties. The Journal of Animal & Plant Sciences 2011;21(3):617-621.
10. Ramanathan M. Bio-fertilizer boost species yield. Spice India 1990;2(6):2-3.
11. Reddy KC, Reddy KM. Differential levels of vermicompost and nitrogen on growth and yield in onion (*Allium cepa* L.) - radish (*Raphanus sativus* L.) cropping system. J Res. ANGRAU 2005;33(1):11-17.
12. Shende ST, Apte RG, Singh T. Influence of Azotobactore on germination of rice and cotton seed. Current Science 1977;46:15-18.
13. Samuels GJ. Trichoderma A Review of biology and systematic of the genus. Mycol. Res 1996;100:923-935.