

Original Research Article

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Response of Nitrogen and Azospirillum Inoculation on Growth and Yield of Onion (*Allium cepa* L.) cv. Pusa Red

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ABSTRACT

Keywords

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The present investigation was carried out at main horticulture research farm of Post Graduate College Ghazipur, U.P. during the winter season of year 2015-16. The application of nitrogen along with *Azospirillum* increased the growth and yield of onion. Two biofertilizer treatments (B₀=control and B₁= Azospirillum) was treated at four different levels of nitrogen (N₀= no nitrogen, N₁= 80kg ha⁻¹, N₂= 100kg ha⁻¹, N₃= 120kg ha⁻¹) on onion cv. Pusa Red. The experiment was conducted in randomized block design with 3 replications. The maximum plant height 49.10 cm, leaf length 44.93 cm, number of leaves per plant 9.32, diameter of bulb 4.75 cm, weight of bulb 38.10 g, bulb yield (8.37q ha⁻¹) was found by applying 120 kg ha⁻¹ along with (B₁N₃) *Azospirillum*. However, the maximum yield was recorded (279.22 q h⁻¹) with rest doses of nitrogen and *Azospirillum*.

Introduction

Onion (*Allium cepa* L.) is an important underground vegetable bulb crop of tropical and subtropical part of the world. Onion is considered to be the second most important vegetable crop grown in the world after tomatoes. It is an indispensable item in every kitchen used as vegetable and condiment used to flavor many of the food stuffs. Therefore, onion is popularly referred to the 'Queen of the kitchen'. In addition, onion is used as salad and pickle. Recently, onion is being employed by processing industry to a greater extent for preparing dehydrated onion forms

like powder and flakes. In the world, India stands first in area and ranks second in production after China; the total area in India under onion production during 2018-19 was 23.62 million tonne. Maharashtra, Uttar Pradesh, Orissa, Karnataka and Rajasthan are the major onion producing states in India. Presently the major export markets for Indian onions are Middle East and Gulf countries, Singapore, Malaysia, Sri Lanka, Bangladesh, and Japan. Onion gives higher yield per unit area. India is gifted with a wide range of agro-climatic conditions, which enables the production of vegetables throughout the year in one part of the country or the other and also

maintaining continuous supply of fresh vegetables. In Karnataka, onion is produced throughout the year. During *kharif* - 2006-07 the area cultivated with onion was 1.31 lakh ha with the production of 7.56 lakh tonne (Joshi, 2005) which illustrates the poor productivity and the shelf life of onions produced during *kharif* has been found to be poor. Several factors *viz.*, lack of suitable variety (ies), poor nutrient management practices and improper storage techniques, have been identified as major cause for poor productivity, quality and storability of *kharif* onion. Onion being semi perishable crop gets deteriorated during storage, transportation and marketing. Due to excessive use of chemical (especially nitrogenous) fertilizers onion gets spoiled very soon in storage (NHRDF, 2012). In this regard, it becomes essential to study the influence of different (both organic and inorganic) sources of nitrogen on productivity and storability of the onion during *kharif* season. Onion (*Allium cepa* L.) is an important member of the genus *Allium* of family Amaryllidaceae. Onion and Garlic are most important bulb crops grown in India. Bio-fertilizers are the culture of bacteria which benefit the plants by providing nitrogen used mostly to release plant nutrients available from rhizosphere and stimulate plant growth and is therefore known as biological-nitrogen fixation (Singh and Pandey, 2006). It is fixed in soil by chemically fixed nitrogen and biologically fixed nitrogen both.

Materials and Methods

The experiment was conducted in the Vegetable Research Farm, Department of Horticulture, Post Graduate College, Ghazipur during the Rabi season of 2015-16. The experimental field is situated in Gora Bazar area of Ghazipur city. All the facilities necessary for conducting the experiment, including labour and resources, which are necessary for normal cultivation were readily

available. The present investigation entitled "Response of Nitrogen and Azospirillum inoculation on growth and yield of onion (*Allium cepa* L.)" was conducted during the winter (Rabi) season of 2015-16 at vegetable research farm, Department of Horticulture, P.G. College, Ghazipur (U.P.). Two biofertilizer treatments (B_0 =control and B_1 =Azospirillum) was treated at four different levels of nitrogen (N_0 = no nitrogen, N_1 = 80kg ha⁻¹, N_2 = 100kg ha⁻¹, N_3 = 120kg ha⁻¹) on onion cv. Pusa Red. The experiment was laid out in Randomized Block Design with 8 treatments. The treatments were replicated three times. A normal size of nursery bed (3.0m x 1.0m) was prepared in the departmental nursery in the month of December 2015. The soil of nursery bed was prepared thoroughly and than a mixture consisting of five parts of clean garden soil, two parts of FYM and one part of clean sand was used as a 2-3cm thick bedding before the seeds were sown in lines at 5 cm apart in the bed. Then the seeds were covered with a thin layer of above mixture and water was sprinkled. Thereafter, whenever water was required, irrigation was provided in the nursery bed. The experimental field was prepared by ploughing with a Tractor drawn disc plough followed by two cross harrowing and planking. The field was thoroughly leveled by a leveler before it was laid out. Manure and fertilizer were applied according to recommended doses for onion i.e. 25-30 t/ha. FYM or compost along with fertilizer N: P: K @ 80-125: 50-75:80-125 kg per ha⁻¹. FYM was well incorporated in plots at least 20 days before transplanting. Apply 50% nitrogen and entire dose of P₂O₅ and K₂O before transplanting or set sowing and remaining half nitrogen is top dressed 5-6 week after transplanting. Seven week old seedlings were transplanted in the experimental plots after allotting entries randomly in each replication. Before transplanting, healthy and uniform seedlings

were selected and the selected seedlings were dip the roots in the solution of Bavistin @ 2g/liter to save the crop from pink rot diseases. On the day of transplanting, the field was irrigated and seedlings were transplanted. Gap filling was done seven days after transplanting. Hand weeding was done five times at 20, 40, 65, 90 and DAT.

Results and Discussion

The results obtained from the present investigation are summarized below:

Growth attributes of onion

Plant height, leaf length and number of leaves were significantly increased with increasing level of nitrogen 120 kg ha⁻¹. The contribution of *Azospirillum* inoculation in increasing the growth characters such as plant height, leaf length and number of leaves was significant as compared to no inoculation (control).

The maximum growth in term of plant height 49.10 cm was obtained with application of 120 kg ha⁻¹ nitrogen along with (B₁ N₃) *Azospirillum* inoculation. Followed by B₁N₂ (48.90 cm) 120 kg ha⁻¹ nitrogen along with *Azospirillum* inoculation. However minimum plant height was recorded B₀N₀ in control (48.22 cm).

The maximum leaf length 44.93 cm was obtained with application of 120 kg ha⁻¹ nitrogen along with (B₁ N₃) *Azospirillum* inoculation.

Followed by B₁N₂ (44.76 cm) 120 kg ha⁻¹ nitrogen along with *Azospirillum* inoculation. However minimum leaf length was recorded in B₀N₀ control (44.09 cm).

The maximum number of leaves per plant 9.32, was obtained with application of 120 kg ha⁻¹ nitrogen along with (B₁ N₃)

Azospirillum inoculation. Followed by B₁N₂ (9.11) 120 kg ha⁻¹ nitrogen along with *Azospirillum* inoculation. While minimum number of leaves per plant was under B₀N₀ control (8.37).

This finding has been supported by several workers Kumar and Kumar (2001), (Neeraja *et al.*, 2001) Singh *et al.*, (2004), Nasreen *et al.*, (2007), Farooqui *et al.*, (2009) and Dudhat *et al.*, (2010) have reported similar findings by applying different doses of nitrogen in different climatic conditions of onion cultivation.

Yield attributes of onion

The contribution of *Azospirillum* inoculation in increasing the yield characters such as diameter of bulb, weight of bulb and yield was significant as compared to no inoculation (control). The attributing character viz. bulb diameter and weight of bulb was found to be significant by application of maximum dose of nitrogen along with *Azospirillum* inoculation.

The maximum bulb yield (279.22 q ha⁻¹) was found by applying 120 kg ha⁻¹ along with (B₁N₃) *Azospirillum*. However, the minimum bulb yield was recorded (252.22 q ha⁻¹) with rest doses of nitrogen and *Azospirillum*. Application of nitrogen significantly enhanced the bulb diameter and weight of bulb. The maximum value for this character was obtained at 120 kg ha⁻¹. The total bulb yield significantly increased and the maximum yield 270.55 q ha⁻¹ as compared to rest doses of nitrogen (Table 1).

The interaction of *Azospirillum* and nitrogen level significantly increased yield attributes except diameter of bulb (cm) and bulb weight in (g). Similarly, finding had also been reported by Sanjay *et al.*, (2011) and Hussain *et al.*, (2000).

Table.1 Effect of Nitrogen and Azospirillum inoculation on growth and yield of onion

Treatments	Plant height (cm)	Leaf length (cm)	Number of leaf	Diameter of bulb (cm)	Weight of bulb (g)	Bulb yield /plot (kg)	Bulb yield ha ⁻¹ (Qt.)
B₀N₀	48.22	44.09	8.37	4.35	36.54	7.57	252.44
B₁N₀	48.49	44.18	8.56	4.34	36.53	7.56	252.22
B₀N₁	48.54	44.27	8.69	4.43	36.74	7.59	253.00
B₁N₁	48.74	44.43	8.84	4.56	36.85	7.69	256.33
B₀N₂	48.69	44.40	8.80	4.55	36.87	7.64	254.77
B₁N₂	48.90	44.76	9.11	4.66	37.63	7.97	265.89
B₀N₃	48.81	44.54	8.91	4.65	37.25	7.85	261.89
B₁N₃	49.10	44.93	9.32	4.75	38.10	8.37	279.22
S.E.+	03.950	01.489	01.077	02.138	01.014	0.021	0.267
C.D. at 5%	07.746	1.148	2.859	2.384	1.185	0.052	1.457

On the basis of overall findings of the present research study it was concluded that the application of nitrogen along with *Azospirillum* increased the growth and yield of onion.

The maximum plant height 49.10 cm, leaf length 44.93 cm, number of leaves per plant 9.32, diameter of bulb 4.75 cm, weight of bulb 38.10 g, bulb yield (8.37q ha⁻¹) was found by applying 120 kg ha⁻¹ along with (B₁N₃) *Azospirillum*.

However, the maximum yield was recorded (279.22 q h⁻¹) with rest doses of nitrogen and *Azospirillum*. Hence we can recommend that the application of with *Azospirillum* along with 120 kg ha⁻¹ nitrogen is a promising approach to increase the growth and and yield of onion.

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