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Short communication

Effect of different biofertilizers and nitrogen levels on yield and yield attributes of maize (*Zea mays* L)

RAJIV PARIHAR, OP PRAJAPAT and PARKASH KUMAR

Department of Agronomy, Allahabad School of Agriculture
Sam Higginbottom Institute of Agriculture, Technology and Sciences
Allahabad 211007 Uttar Pradesh, India
Email for correspondence: rparihar54@gmail.com

ABSTRACT

A field experiment was conducted during the Kharif season 2013 at the Crop Research Farm, Department of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad, UP to evaluate the response of different biofertilizers and nitrogen levels on yield of maize (*Zea mays* L). The experiment consisted of 12 treatments laid out in randomized block design with three replications. The treatments consisted of soil and seed inoculation of two biofertilizers viz *Azotobacter* and *Azospirillum* and three levels of nitrogen (100, 120 and 140 kg/ha) along with phosphorus and potash each at 60 kg/ha. NPK (140 + 60 + 60 kg/ha) + *Azospirillum* (soil inoculation) recorded maximum yield attributes namely number of cobs/plant (2.33), weight of cob (88.65 g), harvest index (41.27) and seed yield (2973.33 kg/ha) while NPK (140 + 60 + 60 kg/ha) + *Azospirillum* (seed inoculation) recorded maximum number of grains per row (36.00) and seed index (28.75) as compared to control. Nitrogen (140 kg/ha), phosphorus and potash (60 kg/ha each) along with seed/soil treatment with *Azospirillum* recorded higher plant growth parameters and yield attributes.

Keyword: *Azotobacter*; *Azospirillum*; nitrogen; maize; yield

INTRODUCTION

Maize (*Zea mays* L) is the most versatile crop with wider adaptability in varied agro-ecologies. It has highest genetic yield potential among the food grain crops. Globally it is cultivated on nearly 150 million hectares in about 160 countries having wider diversity of soil, climate, biodiversity and management practices that contribute nearly 37 per cent (782 million tonnes) in the global grain production. The United States of America (USA) has the highest harvest of maize in the world that contributes nearly 20 per cent of the total production in the world and is the driver of the US economy (Anon 2012). In India maize is the third most important food crop after rice and wheat. It is cultivated throughout the year in different parts of the country for various purposes including grain, fodder, green cobs, sweet corn, baby corn, pop corn etc. Its productivity increases through physiological approaches by considering

plant processes. The use of an alternative source of effective, eco-friendly and economical biofertilizers has become imperative due to excessive use of chemical fertilizers (Suke et al 2011).

MATERIAL and METHODS

The experiment was carried out during Kharif season 2013 at Crop Research Farm, Department of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad, UP. The soil was sandy loam and pH of soil was 7.4 with 0.72 per cent organic carbon (Jackson 1973) having available N, P and K 114.8, 17.14 and 256.2 kg/ha respectively with Kanchan sown on July 2013 (Olson et al 1954). The sowing was done at a spacing of 60 x 25 cm. The experiment was laid out in a randomized block design with 12 treatments replicated thrice. Application of three nitrogen levels (100, 120 and 140 kg/ha) and two biofertilizers (*Azotobacter* and *Azospirillum)* along with phosphorus and potash each at 60 kg/ha was made. *Azotobacter* and *Azospirillum* were applied as seed treatment and soil application.

RESULTS and DISCUSSION

Varying levels of nitrogen (100, 120 and 140 kg/ha), phosphorus and potash each at 60 kg/ha along with soil and seed inoculation with *Azospirillum* increased the number of cobs per plant, weight of cob, number of grains per row in cob, seed index and harvest index (main yield contributing characters) of maize (Table 1). The maximum number of cobs per plant, weight of cob and harvest index was maximum in T12 which was found to be statistically at par with T10. Hassanein et al (2007) reported that the increase of nitrogen level increased number of cobs per plant, weight of cob and the highest grain yield was found after application of 150 kg N per hectare which was statistically at par with 130 kg N/ha.

Khatun et al (2012) reported that harvest index was influenced significantly by different plant spacing with different nitrogen levels. Application of nitrogen 150 kg/ha gave the maximum harvest index.

Significantly higher seed index was recorded in T11 which was found to be statistically at par with T10 and T12 and grains per row of cob were recorded maximum in T11 which was at par with T10. Same results were reported by Mahmood et al (2001) who reported that nitrogen being an essential plant nutrient has a direct bearing effect on the final maize yield. Besides its role in protein synthesis and nucleic acid it is a structural component of chlorophyll.

It is concluded that application of nitrogen at the rate of 140 kg/ha, phosphorus and potash each at the rate of 60 kg/ha along with seed/soil treatment with

Table 1. Effect of different biofertilizers and nitrogen levels on maize

Treatment	Weight of cob (g)	# cobs/ plant	# grains/ row of cob	Seed index (g)	Grain yield (kg/ha)	Harvest index (g)
T1: NPK (100 + 60 + 60 kg/ha) + *Azotobacter* (seed treatment)	72.73	1.16	24.33	23.43	2083.33	36.59
T2: NPK (100 + 60 + 60 kg/ha) + *Azotobacter* (soil inoculation)	68.23	1.00	26.33	25.06	1726.66	31.86
T3: NPK (120 + 60 + 60 kg/ha) + *Azotobacter* (seed treatment)	73.28	1.50	23.83	26.38	2216.66	30.71
T4: NPK (120 + 60 + 60 kg/ha) + *Azotobacter* (soil inoculation)	74.13	1.16	30.66	23.48	2156.66	31.76
T5: NPK (140 + 60 + 60 kg/ha) + *Azotobacter* (seed treatment)	75.98	1.50	32.33	25.23	2333.33	36.00
T6: NPK (140 + 60 + 60 kg/ha) + *Azotobacter* (soil inoculation)	80.25	1.00	32.33	26.70	2370.00	31.38
T7: NPK (100 + 60 + 60 kg/ha) + *Azospirillum* (seed treatment)	81.56	1.50	26.16	27.81	2660.00	37.57
T8: NPK (100 + 60 + 60 kg/ha) + *Azospirillum* (soil inoculation)	78.38	1.66	23.00	26.68	2130.00	36.89
T9: NPK (120 + 60 + 60 kg/ha) + *Azospirillum* (seed treatment)	75.58	1.33	33.00	26.40	2576.66	36.60
T10: NPK (120 + 60 + 60 kg/ha) + *Azospirillum* (soil inoculation)	83.16	1.83	34.66	28.33	2936.66	36.19
T11: NPK (140 + 60 + 60 kg/ha) + *Azospirillum* (seed treatment)	86.28	1.66	36.00	28.75	2813.33	41.12
T12: NPK (140 + 60 + 60 kg/ha) + *Azospirillum* (soil inoculation)	88.65	2.33	24.33	28.40	2973.33	41.27
SEd±	5.09	0.27	1.04	1.46	34.58	40.37
$CD_{0.05}$	10.55	0.56	2.16	3.09	71.72	82.02

Azospirillum recorded higher plant growth parameters and yield attributes.

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