

IMPACT OF BIO-FERTILIZER SEED TREATMENT ON SEED AND SEEDLING PARAMETERS OF MAIZE (*ZEA MAYS* L.)

ANIMESH PATHAK* AND S. K. CHAKRABORTI

Department of Seed Science and Technology,

Bidhan Chandra Krishi Viwsavidyalaya, Mohanpur, Nadia - 741 252, West Bengal, INDIA

e-mail: animeshsst@gmail.com

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*Corresponding
author

ABSTRACT

To study influence of inorganic nitrogen and seed treatment with *Azospirillum* on different seed quality parameters, four local cultivars of maize seed were treated with full inorganic nitrogen (T_1), half inorganic nitrogen with *Azospirillum* (T_2) and *Azospirillum* (T_3). Germination percentage for T_2 exhibited significant increase than T_1 and T_3 . The fresh and dry weight of root and shoot was significantly high for T_2 followed by T_1 and than T_3 . The vigour index was also found to be significantly high in T_2 . When varieties were taken into account with regard to their response towards different treatments, V_3 responded best followed by V_2 and V_1 for the character germination percentage. Increased germination percentage, vigour index by treatment T_2 for different varieties of maize encourage use of low cost, ecofriendly *Azospirillum* seed treatment.

INTRODUCTION

Influence of biofertilizers on different seed quality parameters is highly required for future use of biofertilizers in seed production technology. Changes of food habit of the people and alarming exploded population have led to an increase demand of food consumption. The main role played by nitrogen in improving the yield potentials of newly developed varieties of crop plants can not be underestimated in sustainable agriculture. The newer increasing cost of nitrogen fertilizer often prevents the use of these major inputs required for crop plants in developing countries. A study was conducted during Kharif season by Rout *et al.*, (2001), to assess the effects of biofertilizers on nitrogen fertilizer economy and maize (c.v. Ganga5) yield. Biofertilizers have beneficial effect on yield. The beneficial effects were higher than the biofertilizer cost. A pot experiment was conducted by Mudenoor *et al.*, (2007), to study the effects of seed treatment of micro nutrient supplemented *Azospirillum* biofertilizer on dry mater production and yield of maize at Karnataka and result indicated high shoot and root dry matter with seed treatment of *Azospirillum*. In this context microbial inoculants offered the the most promising supplement if not alternative to chemical fertilizers. Moreover, microbial inoculant does not pose environmental hazards and maintain soil health. *Azospirillum* a bacterial fertilizers assimilates atmospheric nitrogen nitrogen and fix in soil and also secretes phyto-hormones in plant root regions which in turn enhance root growth. Invigoration of low vigour seeds to maintain vigour, viability and productivity in rice may prove beneficial (Basu and Paul, 1979; Pal and Basu, 1988). Present objective was to determine the effect of less expensive, eco-friendly *Azospirillum* as seed treatment on seed quality.

MATERIALS AND METHODS

Four local cultivars namely Duncan 108 (V_1), Duncan 301 (V_2), Duncan 103 (V_3) and Sartaj (V_4) were utilized as experimental materials. Three treatments i.e. a) full recommended dose inorganic nitrogen (T_1), b) half recommended dose inorganic nitrogen with *Azospirillum* seed treatment (T_2) and c) only *Azospirillum* (T_3) seed treatment. The seeds of four varieties were soaked in water for over night and dressed with *Azospirillum* culture @ 20g/kg of seed. The seed parameters like germination percentage and seedlings parameters like root and shoot length, root and shoot fresh and dry weight and vigour index of the seedlings were studied. The laboratory experiment was conducted following CRD (completely randomized design) with three replications.

RESULTS AND DISCUSSION

The freshly harvested produce seeds of treated population were placed in or germination test under square glass technique and germination was considered, T_2 (half inorganic nitrogen + *Azospirillum*) exhibited significant increase (Table 1) than treatment T_1 (full nitrogen) and T_3 (full *Azospirillum*). The fresh and dry weight of roots and shoots was found to be significantly high for T_2 followed by T_1 and then T_3 . The characters root length and shoot length was also found to be significantly high for T_2 than T_1 and T_3 . Similar results were obtained by Martin Diaz-Zorita *et al.* (2008), where wheat seeds were inoculated by *Azospirillum brasilense* INTA Az-39 strain and inoculated crops exhibited more vigorous vegetative growth, both shoot and root dry matter accumulation and inoculation increased grain yield by 6.1%.

Table 1: Impact of *Azospirillum* seed treatment on seed and seedling characters

Treatment	Germination %	Root length (cm)	Shoot length (cm)	Fresh wt. of roots (g)	Fresh wt. of shoots (g)	Dry wt. of roots (g)	Dry wt. of shoots (g)	Vigour Index	
T1	74.00b	26.18b	15.47b	1.23b	2.35b	0.17b	0.20b	3114.70b	
T2	83.00a	29.06a	19.08a	1.36a	2.91a	0.18a	0.26a	4009.11a	
T3	75.50b	26.22b	14.96b	1.11c	2.09c	0.13c	0.17c	3127.47c	
	Variety								
	V1	76.00b	27.82b	15.00c	1.23b	2.50b	0.16b	3287.09b	
	V2	77.56b	26.60c	16.46b	0.99c	2.28c	0.13c	3370.99b	
	V3	85.4a	28.34a	18.29a	1.38a	2.64a	0.19a	4011.78a	
	V4	71.00c	25.84d	16.28d	1.34a	2.38c	0.14d	2998.51c	
Treatment	Varieties								
T1	V1	60.67	24.66	11.91	1.3	2.23	0.17b	2217.6	
T1	V2	84.00cd	26.92c	16.99c	0.84	2.41	0.12	3688.90c	
T1	V3	83.00d	28.68b	16.58c	1.45b	2.54d	0.21a	3757.38c	
T1	V4	68.33	24.47	16.39c	1.32c	2.21	0.16c	2794.9	
T2	V1	76	31.16a	17.73b	1.21d	2.97b	0.16c	3716.08c	
T2	V2	85.3c	27.86b	18.68b	1.08	2.63d	0.16c	3971.07b	
T2	V3	95.3a	28.55b	23.10a	1.65a	3.25a	0.21a	4923.86b	
T2	V4	75.3	28.66b	16.81c	1.48b	2.79c	0.17b	3425.42d	
T3	V1	91.3b	27.65b	15.35	1.17	2.3	0.15d	3927.59b	
T3	V2	63.3	25.03	13.7	1.04	1.79	0.12	2453	
T3	V3	78.00e	27.79b	15.17	1.04	2.14	0.15d	3354.09	
T3	V4	69.33	24.39	15.63	1.20d	2.14	0.1	2775.2	
SEm ±									
Treatment		0.55	0.402	0.163	0.014	0.024	0.002	0.004	62.294
variety		0.785	0.146	0.143	0.015	0.033	0.003	0.003	40.092
interaction		0.554	0.456	0.34	0.027	0.043	0.002	0.006	48.034
CD (0.005)									
Treatment		2.158	1.579	0.638	0.054	0.093	0.009	0.015	244.597
Variety		2.716	0.505	0.494	0.052	0.112	0.009	0.01	138.737
Interaction		1.708	1.404	1.029	0.084	0.132	0.007	0.017	148.009

Notes: Similar alphabets denote homogenous means at 0.005% level of significant

In maize *Azotobacter* treatment along with farm yard manure (FYM) showed more growth and yield attributes than control was also reported by Ashok kumar *et al.* (2010), these findings were in conformity to our findings. The vigour status which is considered by vigour index was also found to be significantly high in T₂ where as T₁ and T₃ recorded almost similar status (Table 1). When varieties were taken into account with regards to their response towards different treatments, V₃ responded best followed by V₂ and V₁ for the character germination percentage. V₄ occupied last position for responding towards this character. V₃ also shows best response towards fresh weight and dry weight of both roots and shoots. When vigour index was considered V₃ exhibited significant response (Table 1) followed by V₂ and V₁ here also V₄ responded least. Considering variety treatment interaction, it is observed that V₃T₂ responded best towards the character germination percentage followed by V₁T₃, V₂T₂, V₂T₁ and V₃T₁. Variety treatment interaction for the character vigour index was recorded best for V₃T₂ followed by V₂T₂ and V₁T₃. Minimum interaction was recorded for V₄T₂.

From the study observing the impact of bio-fertilizer (*Azospirillum*) on freshly harvested seeds which were collected from the plots where half recommended dose of inorganic nitrogen with *Azospirillum* seed inoculation in treatment (T₂) was done, indicated high germination percentage, root and shoot length, fresh and dry seedling weight and finally vigour index. This may be due to increase amylase activity in seeds which were initially treated with *Azospirillum*. Increase amylase activity and gibberellins secretion with *Azospirillum* seed

treatment in rice was reported by Ramamoorthy, Natarajan and Lakshmanan (2000). From the present investigation use of biofertilizer (*Azospirillum*) as seed treatment can be recommended to the farmers because microbial inoculant offered the most promising supplement if not alternative to chemical fertilizers.

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