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Effect of *Azospirillum* inoculation and organic manure on *Brassica juncea* (L.) Czern and Coss

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SUMMARY

The aim of this study was to evaluate the efficiency of biofertilizer *Azospirillum* and oil cake of neem on plant growths and yield parameters of *Brassica juncea* (L.) Czern and Coss. cv. Pusa Bold. Growth and yield was recorded on the basis of plant height, fresh and dry weights of shoot and root and seed yield per plant. *Azospirillum* and neem cake were applied separately and in combication of *Azospirillum* and neem cake both. Application of *Azospirillum*, neem cake and their combination recorded higher plant growth and yield in *Brassica juncea* (L.) Czern and Coss. Neem cake resulted in higher growth and yield in comparison to *Azospirillum* inoculation alone. However, the combination of both treatments proved best in improving plant growth and yield in comparison to *Azospirillum* inoculation and neem cake separately.

Key words : Baby corn, Cob yield, Combining ability, Earliness, Line x tester

Ever increasing fertilizer costs and the increasing demand for food have emphasized the need for full exploitation of biological nitrogen fixation (Reddy *et al.*, 1997). The repeated and excessive application of costly inorganic fertilizers has proved harmful to the plants and environment. Further, the biological equilibrium, soil health and nutrient dynamics also get affected. Application of biofertilizers in recent years has emerged as promising components to nutrient supply system (Pradhan, 1994). *Azospirillum* is known to provide plant nutrients to crops and can supplement the expensive inorganic fertilizers (Navala *et al.*, 2004).

Global consumers are increasingly looking forward to organic food that is considered safe and hazard-free. The demand for organic food is steadily increasing both in developed and developing countries, with annual average growth rate of 20-25%. Worldwide, over 130 countries produce certified organic products in commercial quantities (Kumar, 2008). Organic manures have been time tested materials for improving the fertility and micro nutrients and improve soils physical and biological condition in sustainable crop production. The dependence on the use of inorganic fertilizers can be minimized or avoided by adopting integrated approach through use of organic matter (Gupta and Sharma, 2004).

Application of organic manures has various advantages like water holding capacity and organic carbon content apart from supplying good quality of nutrients (Krogdahi and Dahisgard, 1981). The non-edible oil cake of neem is used as organic manure. It is good, cheap and environment friendly and has shown promising results in inhibiting nitrification in soil, reducing nitrogen losses and increasing fertilizer efficiency.

The present study was aimed to determine the potential of plant growth promoting *Azospirillum* and neem cake alone and in combination of both on growth and yield of *Brassica junea* (L.) Czern and Coss.

MATERIALS AND METHODS

The details of the treatments are given below-

T_0 : Control
T_1 : Neem cake
T_2 : *Azospirillum*
T_3 : Neem cake + *Azospirillum*

For the application of *Azospirillum* 2.5 g jaggery was dissolved in 50 ml water (Mahale *et al;* 2003). Culture of bacterium @ 250 mg/10 g seeds was mixed with jaggery solution. 10 g seeds of *Brassica juncea* (L.) Czern and Coss. cv. Pusa Bold were dipped in the bacterial culture for one hour for coating the bacteria on them. Seeds were then dried under shade for thirty minutes before sowing.

Neem cake was applied directly in soil before 15 days of sowing for quick decomposition adding required amount of water. This organic manure applied in such a way that it should supply 1g nitrogen/kg soil. Neem cake contains 5.6 per cent nitrogen; therefore 17.85 g neem cake was added for 1 kg soil (Chopra and Kanwar, 2005).

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Table 1: Effect of *Azospirillum*, neem cake and their combination on *Brassica juncea* (L.) Czern & Coss

Treatments	Plant length (cm)		Fresh weight (g)		Dry weight (g)		Seed yield (g) per plant
	Shoot	Root	Shoot	Root	Shoot	Root	
Control (T_0)	81.00	15.00	51.33	3.06	19.67	2.00	6.47
Neem cake (T_1)	94.50	22.87	61.13	4.56	23.41	3.05	9.58
Azospirillum (T_2)	89.00	19.33	57.00	3.76	21.75	2.63	7.93
Neem cake + *Azospirillum* (T_3)	98.87	24.97	64.13	5.40	24.80	3.70	10.93
C.D. (P=0.05)	3.53	1.14	2.07	0.29	0.76	0.25	0.40

10 seeds were sown in each clay pot in three replicates. Untreated seeds were also sown in separate pots as control to compare the results. Thinning of the plants was done after 15 days of germination and only three plants were left in each pot. Plant was uprooted from each pot after 120 days after sowing. Different parameters in terms of plant length, fresh and dry weights of shoot and root and seed yield per plant were recorded separately. Plants were then kept in an oven running at 50-60^0 C for a week and then dry weight of their shoots and roots was taken.

All observations were means of three replicates. Data was analyzed statistically and the value of C.D. (Critical Difference) was calculated for the comparison of results.

RESULTS AND DISCUSSION

The results (Table 1) indicate that the seed treated with neem cake and biofertilizers *Azospirillum* and their combination significantly increased growth and yield attributes *viz*. the plant height, fresh and dry weights of shoot and root and seed yield over untreated and uninoculated one.

Shoot and root development, fresh and dry weights of shoot and root and seed yield were significantly affected by treatment T_1 and resulted in an increase of 16.67 per cent and 52.46 per cent in shoot and root, 19.09 per cent and 49.01 per cent in fresh weights of shoot and root, 19.01 per cent and 52.50 per cent in dry weights of shoot and root, respectively and seed yield increased by 48.06 per cent over their control (T_0).

Plants treated by T_2 caused significant increase and resulted in an increase of 9.87 per cent and 28.87 per cent in shoot and root, 11.04 per cent and 22.87 per cent in fresh weights of shoot and root, 10.57 per cent and 31.50 per cent in dry weights of shoot and root, respectively and seed yield was increased by 22.56 per cent over T_0. When T_1 was compared with T_2, T_1 resulted in 6.17 per cent and 18.31 per cent in shoot and root, 7.24 per cent and 21.27 per cent in fresh weights of shoot and root, 7.63 per cent and 15.96 per cent in dry weights of shoot and root, respectively and 20.80 per cent in seed yield over T_2.

The treatment T_3 resulted in 4.62 per cent and 9.18 per cent in shoot and root, 4.90 per cent and 18.42 per cent in fresh weights of shoot and root, 5.93 per cent and 21.31 per cent in dry weights of shoot and root, respectively and seed yield was increased by 14.09 per cent over T_1, while 22.06 per cent and 66.47 per cent in shoot and root, 24.93 per cent and 76.47 per cent in fresh weights of shoot and root, 26.08 per cent and 85.0 per cent in dry weights of shoot and root, respectively and seed yield increased by 68.93 per cent over T_0.

T_3 proved best in improving plant growth and yield in comparison to T_0, T_1 and T_2 on the basis of all parameters studies.

Balasubramaniam and Ravichandran (2005) reported that the application of *Azospirillum* inoculation resulted more biomas built up and higher shoot and root length on *Casuarina equisetifolia, Acacia nilotica* and *Eucalyptus tereticornis*. Jeeva (1988) reported that the *Azopirillum* inoculation enhanced the height and girth of pseudostem, leaf prodution, leaf area and the bunch characters in banana. Gera *et al.* (2003) observed that microbial population and crop productivity are enhanced by use of organic amendment along with biofertilizses.

Azospirillum assimilates atmospheric nitrogen and fix in soil and helps to save nitrogen and also secretes phytohormones in the plant root region, which in turn enhances the root growth (Sharma, 2004). Better growth might be due to improvement of physical, chemical and biological properties of soil because *Azospirillum* helps in releasing 5.2-5.6 per cent N, 1.1 per cent P_2O_5, 1.5 per cent K_2O and 1.4 per cent S which fulfils the mineral requirement of the plants (SEAI, 2005). Neem cake contain high amount of N (5.2 per cent), P (1 per cent) and K (1.4 per cent), which helps in releasing the nutrients quickly and promotes the plant health (Sharma, 2005). Our results also conform the findings of these workers.

The present finding is also in consonance with earlier findings of Patidar and Mali (2004) and Velmurugan *et al.* (2008).

REFERENCES

Balasubramaniam, A. and Ravichandran (2005). Productivity enhancement of few multipurpose tree species using bifertilizers. *Indian J. Agroforestry*, **7** (1): 41-43.

Chopra, S.I. and Kanwar, J.S. (2005). Analysis of fertilizers and manures. *Analytical Agricultural Chemistry*. Kalyani Publishers, Ludhiyana. pp. 121.

Gera, R.; Anand, R.C.; Pathak, D.V. and Sneh Goyal (2003). Effect of different organic manures on crop productivity of wheat cotton cropping system inoculated with *Azospirillum*. *Haryana J. Agron.*, **19** (1): 20-22.

Gupta, R.K. and Sharma, M. (2004). Organic vegetables in nutrition and health security. *Everyman's Sci.*, **39** (20): 105-110.

Jeeva, S.; Kulsekaran, M.; Manmugavelu, K.G. and Obilisavi, G. (1988). Effect of *Azospirillum* on growth and development of banana cv. Poovan. *South Indian. J. Hort.*, **36** (1): 1-4.

Krogdahi, C.R. and Dahisgard, B. (1981). Estimation of nitrogen digestibility in poultry. Content and distribution of major urinary nitrogen compounds in excreta. *Poultry Sci.*, **60**: 2480-85.

Kumar, S. (2008). Towards a second green revolution. *Science Reporter.*, **45** (6): 9-15.

Mahale, B.B.; Nevase, V.B.; Thorate, S.T. and Bhekale, J.S. (2003) Effect on non-symbiotic nitrogen fixers on the forage yield of oat (*Avena sativa* L.). *Ann. Agri. Res. New Series.*, **24** (1): 21-23.

Navala, A.M.; Wani, P.P. and Patil, A.S. (2004). Effect of VAM and *Azospirillum* inoculation to onion (*Allum cepa* L.) cv. B-780 with respect to N, P and micronutrient uptake. *The Orissa J. Hort.*, **32** (1): 83-88.

Patidar M. and Mali, A.L. (2004). Effect of farmyard manure, fertility leaves and biofertilizers on growth, yield and quantity of sorghum (*Sorghum bicolor*). *Indian J. Agron.*, **49** (2): 117-120.

Pradhan, S. (1994). Use of biofertilizers for better crop yield. *Junior Sci. Refresh.* pp. 82-83.

Reddy, P.M., Ladha, J.K., So, R.B., Hernande, R.J., Ramos, M.C., Angeles, O.R., dazzo, F.B. and Bruijn Frans, J.D. (1997). Rhizobial communication with rice roots: Induction phenotypic changes, mode of invasion and of extent of colonization. *Plant & Soil*, **194**: 81-98.

Sharma, A.K. (2005). Biofertilizers for sustainable agriculture. Agrobios (India), Jodhpur. pp. 24-30.

SEAI (2005). Indian oil meals fertilizers from nature. The solvent extractors association of India. www.seaofindia., **50** : 668-672.

Velmurugan, M.; Chezhiyan, N. and Jawaharlal, M. (2008). Influence of organic manures and inorganic fertilizers on cured rhizome yield and quantity of turmeric (*Curcuma longa* L.) cv. BSR-2. *Internat. J. agric. Sci.* **4** (1): 142-145.

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