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Performance of Indian Mustard (*Brassica juncia* L.) in Response to Integrated Nutrient Management

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ABSTRACT

A field investigation was carried out during rabi seasons of 2001-02 and 2002-03 at National Research Centre on Rapeseed - Mustard (ICAR), Sewar, Bharatpur, Rajasthan to the effect of three levels of FYM (0, 2.5 & 5.0 t/ha) with two bio-fertilizers (Azotobactor and Azospirillum)at the rate of 4.0 Kg/ha each and three levels of N (0, 40 & 80 kg /ha) on Indian Mustard (Brassica juncia L.), cv. RH-30. The yield attributes and seed as well as stover yield increased significantly with the application of FYM (5.0 t/ha) over control. Seed inoculation with either of the bacteria significantly increased the number of branches, pods/plant, seeds/ pod and yield of seed and stover yield. Application of N showed liner increase of these characters up to 80 kg N/ha. Integrated use of bio fertilizers, FYM with 40 Kg of nitrogen gave seed yield equal to the 80 kg N/ha Alone. Maximum seed yield was obtained in the use of higher doses of N fertilizer in conjunctions with bio fertilizers and FYM in both years.

Keywords : Mustard, Bio-fertilizers, FYM, Organic sources, Nitrogen levels

INTRODUCTION

Nutrient management is one of the most important agronomic factors that affect the yield of Indian mustard (*Brassica juncia* L.). Farm yard manure (FYM) improves the soil physico-chemical properties along with direct release of macro as well as micronutrient; ultimately the crop yields and finally crop yields increase (Bhatia and Shukla, 1982 & Singh and Kumar, 2009). Indian mustard is more responsive to chemical fertilizers especially nitrogen and up to considerable extent to sulfur, for sustainability of mustard production in the view of soil health and ecological balance, in great extent. Escalating prices of chemical fertilizer, there is strong need of hours to search out suitable alternative sources nutrients especially N, alternative source of N, especially. Integration of all possible nutrient sources for common cause is only key to success to meet our growing demand of oil seeds and to reduce the burden on the foreign exchange as oil import bill is increasing at alarming rates. Integration of chemical fertilizers along with FYM and Bio-fertilizers could be serving the purpose, as they are cheep pollution free and renewable. Non-symbiotic bacteria like Azotobactor and Azospirillum are potential bio-fertilizers. These are capable of contributing N to a number of non-legumes by tapping aerial nitrogen. Moreover, activity of bio-fertilizers may be influenced by supply of nutrients like N to the soil. The present investigation was therefore carried out to study the effect of integrated nutrient management on performance of Indian Mustard (Brassica juncia L. czernj & cosson).

MATERIALS & METHODS

The field experiment was conducted at National Research Centre on Rapeseed - Mustard (ICAR), Sewar, Bharatpur (Rajasthan) during the winter season of 2001-02 and 2002-03. The soil was sandy loam containing 171.2 and 173.1 kg/ ha available N, 9.2 and 9.6 kg/ha available P, 217.3 and 219.4 kg/ha available K and 8.1 and 8.2 kg/ha available S during 2001-02 and 2002-03, respectively. The experiment consisting of nine treatments in combination of two bacterial culture (Azotobactor and Azospirillum) with three levels of F.Y.M (0, 2.5

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and 5 t/ha) in main plots and three levels of nitrogen (0, 40 and 80 kg N/ha) in sub plots was laid out in split plot design with three replications. Mustard cv. 'RH 30' was sown in rows, 30 cm apart using 5 kg seed/ha on 26 October 2001 and 20 October 2002. The seeds were inoculated with bacterial culture and dried under shade for half an hour before sowing. The crop was thinned 15 days after sowing (DAS), to maintain a plant to plant spacing of 10 cm. A basal dose of P_2O_5 @ 40 kg/ha (through single super phosphate) was applied uniformly in the whole field. Half of the nitrogen dose was applied basal at the time of sowing and remaining half was top-dressed after 35 days after sowing. FYM were also applied before one month sowing.

through marked variation between them did not exist in respect to any of the attributes studied. The ability of Azotobactor to produce growth substance and antifungal substances in addition to fixed N made available to plants was probably the reason of higher yields. Similarly, Azospirillum is reported to produce indole acetic acid, gibberellins and cytokinin like substances along with N fixation (Tein et al., 1979). The increase in seed yield over the control was up to 14.34-20.19% and 16.61-22.61% during 2001-02 and 2002-03 respectively. This favorable effect of bacterial inoculation could be attributed to increase in N supply in inoculated plots due to N-fixation ability of these bacteria.

Farmyard manure had a significant effect on the

Table 1 : Effect of bacterial inoculation, FYM and nitrogen levels on primary &secondary ranches, number of pods per plant, number of seeds per pods and 1000-seed weight.

Treatments	Primary Branches/ Plant		Secondary Branches/ Plant		No. of Pods/ Plant		1000-Seed wt.(g)		No. of Seeds/ Pods	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Organic Source										
Control	3.64	3.39	11	10.67	175	167.7	5.67	5.68	10.17	9.23
FYM 2.5t/ha	4.96	4.3	12.4	11.89	186	178.7	5.82	5.84	10.93	10.37
FYM 5t/ha	5.36	4.78	12.9	12.46	194	185.7	5.91	5.93	10.85	10.03
FYM 2.5t/ha + Azotobactor	5.34	4.79	13.4	12.6	191	183.3	5.92	5.95	11.67	10.77
FYM 5t/ha + Azotobactor	5.86	5.03	13.8	13.42	201	191.7	5.95	5.97	11.03	10.34
FYM 2.5t/ha + Azospirillum	5.37	4.85	13.5	13.09	193	184.7	5.93	5.95	12.36	11.47
FYM 5t/ha + Azospirillum	6	5.47	13.9	13.51	204	194	5.95	5.96	12.38	11.54
FYM 2.5t/ha+Azoto.+ Azospiri.	5.74	5.22	13.6	12.74	199	189	6.09	6	12.77	11.81
FYM 5t/ha + Azoto. + Azospiri.	6.22	5.83	14.2	13.73	210	199	6.03	6.05	12.9	11.85
CD (P=0.05)	0.17	0.17	0.43	0.32	5.93	7.77	0.1	0.11	0.43	0.84
Inorganic source (Nitrogen levels)										
0 kg/ha	4.93	4.58	12.6	12.13	177	168.4	5.58	5.59	10.63	9.84
40kg/ha	5.37	4.83	13.4	12.78	200	191.3	5.98	5.96	11.93	11.02
80kg/ha	5.87	5.14	13.6	13.13	207	198.1	6.2	6.22	12.4	11.59
CD (P=0.05)	0.13	0.13	0.34	0.25	4.58	5.71	0.08	0.08	0.32	0.42

RESULTS AND DISCUSSION

Response to Organic Source

Seed inoculation with either of the bacterial culture significantly increased yield attributes, viz. number of branches and number of pods per plant, number of seed per pods and 1,000 seed weight (Table1) and Seed and stover yield per hectare and harvest index (Table 2) during both the years. However, both the bacterial strains remained at par with each other. Among two inoculants, the effects were comparatively more pronounced with Azospirillum than Azotobactor,

growth and yield components seed and stover yields, and pods per plant, seed per pods, 1,000 seed weight and harvest index during both the years. Increase growth of plants under organic sources of fertilizers may be attributed to the better availability of nutrients. The increase in crop dry matter with organic sources might be attributed due to considerable increase in plant height, number of branches and effective utilization of nutrient, moisture and light. Similar observations have been made by Sadhu et al., (1996), Mandal and Sinha, (2002). Pooled data indicated that the FYM 2.5 t/ha (11-14.54%) and

5 t/ha FYM (20-22.79%) recorded more yield during 2001-02 and 2002-03 than no FYM application. Significant improvement in seed yield is due to favorable effect of FYM on the growth and yield attributes in plant (Patel and Shelke, 1998). This improvement in yield and quality with increased supply of FYM may be due to enhanced photosynthesis.

Table 2. Effect of bacterial inoculation, FYM and nitrogen levels on seed yield, stover yield and harvest index.

Treatments	Seed yield (q/ha)		Stover yield (q/ha)		Harvest index (%)	
	2002	2003	2002	2003	2002	2003
Organic Source						
Control	11.64	9.99	38.52	34.82	23.01	22.11
FYM 2.5t/ha	13.08	11.69	42.24	39.53	23.51	22.69
FYM 5t/ha	14.55	12.94	46.44	42.55	23.73	23.17
FYM 2.5t/ha + Azotobactor	13.59	11.98	42.92	39.65	23.91	23.08
FYM 5t/ha + Azotobactor	15.38	13.08	47.38	42.57	24.36	23.39
FYM 2.5t/ha + Azospirillum	13.98	12.44	44.02	41.03	23.96	23.12
FYM 5t/ha + Azospirillum	15.79	13.41	48.47	43.37	24.42	23.5
FYM 2.5t/ha + Azotobactor + Azospirillum	14.46	12.91	44.46	41.77	24.36	23.44
FYM 5t/ha + Azotobactor + Azospirillum	15.81	14.3	48.62	45.26	24.61	23.9
CD (P=0.05)	0.68	0.57	2.39	2.33	NS	NS
Inorganic source (Nitrogen levels)						
0 kg/ha	10.16	9.16	34.39	32.48	22.78	21.96
40kg/ha	15.81	13.94	49.1	45.41	24.31	23.45
80kg/ha	16.79	14.47	50.66	46.63	24.87	24.06
CD (P=0.05)	0.45	0.38	1.69	1.63	0.28	0.66

Response to Nitrogen

Number of branches and pods per plant, seeds per pods, 1,000 seed weight, seed yield and stover yield per hectare, and harvest index increased significantly with each successive increment in N level from 0 to 80 kg/ha in both the years. The increase in the level of N was responsible for increased number of leaves causing higher photosynthesis and assimilation rates, metabolic activity and cell division, which were responsible for significant increase in the growth characters, yield attributes and yield of Indian mustard. Gangasaran and Giri (1988), Tripathi and Tripathi (2003) also reported similar findings.

Interaction Effects

Interaction between bio-fertilizers, FYM and N

Table 3. Interaction effect of bacterial inoculation, FYM and nitrogen levels on seed yield.

Organic Source	Nitrogen kg/ha					
	2002			2003		
Bacterial inoculation	0	40	80	0	40	80
Control	8.01	12.84	13.98	7.02	10.93	12.02
FYM 2.5t/ha	9.26	14.13	15.84	8.14	12.94	14.21
FYM 5t/ha	10.82	15.8	17.04	9.85	13.83	15.13
FYM 2.5t/ha + Azotobactor	9.51	15.05	16.23	8.43	13.19	14.05
FYM 5t/ha + Azotobactor	11.47	16.73	17.93	10.3	14.88	14.33
FYM 2.5t/ha + Azospirillum	9.67	15.44	16.83	8.79	13.61	14.13
FYM 5t/ha + Azospirillum	11.49	17.8	18.1	10.42	15.68	14.93
FYM 2.5t/ha + Azotobactor + Azospirillum	9.89	16.43	17.04	9.03	14.53	15.18
FYM 5t/ha + Azotobactor + Azospirillum	11.26	18.04	18.13	10.5	16.1	16.29
CD (P=0.05)	NS			1.15		

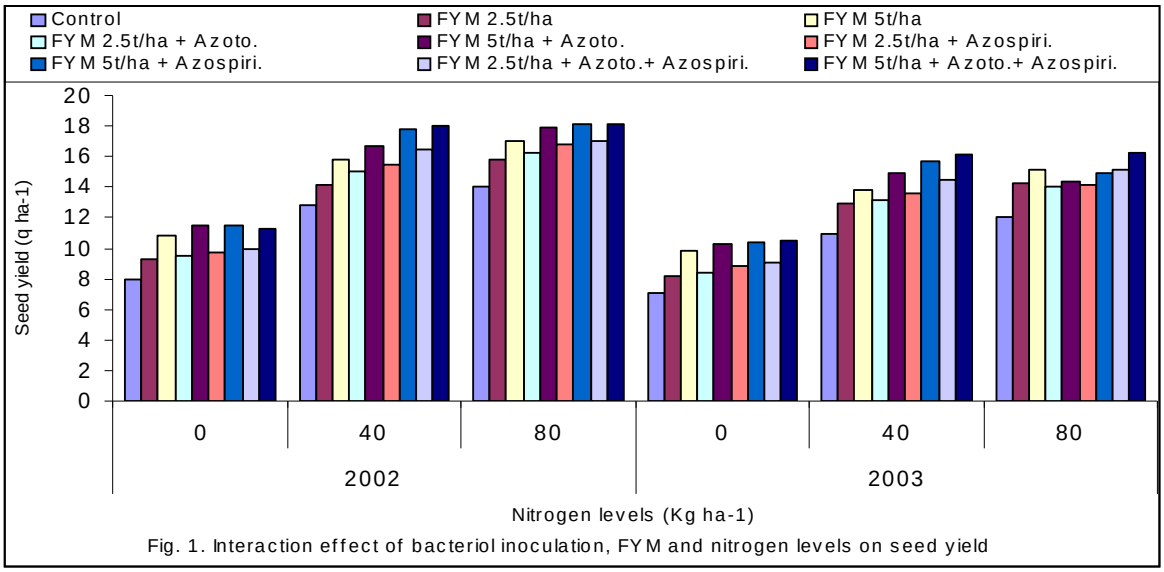

Fig. 1. Interaction effect of bacteriol inoculation, FYM and nitrogen levels on seed yield

levels was found significant during both the years (Table 3 & Fig. 1), which revealed that the inoculated crop receiving moderate levels of fertilizer N (40 kg/ha) gave similar grain yield as the crop receiving higher doses of N (80 kg/ha). Thus clearly showed that fertilizer, N requirement of the crop was reduced when it was inoculated with the bio-fertilizers. These results are in close conformity by Wani (1990).

CONCLUSION

Seed inoculation with either of the bacteria significantly increased the number of branches, pods/plant, seeds/pod and yield of seed and stover yield. Application of N showed liner increase of these characters up to 80 kg N/ha. Integrated use of bio fertilizers, FYM with 40 Kg of nitrogen gave seed yield equal to the 80 kg N/ha alone. Maximum seed yield was obtained while using higher doses of N fertilizer in conjunctions with bio fertilizers and FYM in both years.

REFERENCE

Bhatia KS and Shukla KK. 1982. Effect ofcontinuous application of fertilizer and manure on some physical properties of eroded alluvial soils. *Journal of Indian Society of Soil Science* **30** (1) : 33-36.

Gangasanran and Giri G. 1988. Influences of irrigation and time of nitrogen application on mustard [Brassica jumcea Cass]. *Indian J. Agron.* **33**(1) : 154-158.

Mandal KG and Sinha AC. 2002. Effect of integrated nutrient management on growth, yield, oil content and nutrient uptake of Indian mustard (Brassica juncea) in foothills soils of eastern India. *Indian J. Agron.* **47**(1) : 109-113.

Patel JR and Shelke, VB. 1998. Effect of farmyard manure, phosphorus and sulphur on growth, yield and quality of Indian mustard (Brassica juncea) *Indian J. Agron.* **43** (4) : 713-717.

Sadhu AC, Malavia DD and Mathukia RK. 1996. Effect of irrigation, mulching and fertility levels on mustard (Brassica juncea) and their residual effect on succeeding groundnut (Arachis hupogaea) crop. *Gujrat Agril. Univ. Res. J.* **21** (2) : 1-7.

Singh AK and Kumar P. 2009. Nutrient management in rainfed dryland agro ecosystem in the impending climate change scenario. *Agril. Situ. India.* **66**(5) : 265-270.

Tien TM, Gaskin MH and Hubell DH. 1979. Plant growth substances produced by growth of pearlmillet. *Applied Environmental Microbiology* **37 :** 1012-1024.

Tripathi AK and Tripathi HN. 2003. Influence of nitrogen levels on growth, yield and quality of Indian mustard (Brassica juncea) cultivar 'Varuna'. *Farm Science Journal* **12** : 171-72.

Wani SP. 1990. Inoculation with associated nitrogen fixing bacteria and role in cereal grain production improvement. *Indian Journal of Microbiology* **30**(4) : 363-393.

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