

STUDIES ON THE EFFICACY OF GRADED DOSES OF NITROGEN BIOINOCULANT AND FYM ON GROWTH AND YIELD OF FENNEL (*FOENICULUM VULGARE* MILL)

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ABSTRACT

An experiment was conducted at experimental farm of Department of Horticulture, K.A.P.G. College, Allahabad during the year 2000-01 and 2001-02 to study the effect of graded doses of nitrogen, FYM and *Azospirillum* on growth and yield of fennel variety GF1. Among the various treatments, treatment T₁ (100% inorganic nitrogen + 5 tonnes FYM and *Azospirillum*) followed by treatment T₂ (75% inorganic nitrogen + 5 tonnes FYM) gave best and significant responses for all the characters studied under the experiment.

INTRODUCTION

Fennel is one of the important seed spices grown widely in India. Fennel seeds are rich in protein, fat, vitamins, fibre and minerals and are being used in flavouring soups, meat dishes and sauces and in the manufacturing of pickles (Pruthi, 1998). Farmers generally do not apply any kind of fertilizer in the cultivation of fennel, however, in modern agriculture, use of chemical fertilizer have been essential for sustainable yield but these are not eco-friendly. It is, therefore, necessary to restrict their use to certain limit. The current trend is, therefore, to exploit the possibility of supplementing chemical fertilizer with organic manures and have shown promise to improve crop growth and yield. Amongst biofertilizers, *Azospirillum brasilense* is recognized as a very ubiquitous soil organism capable of colonizing effectively not only the roots of a wide variety of plants but also their above ground portions forming apparently an associative symbiosis (Tilak and Murthy, 1981). *Azospirillum* is an associative symbiotic nitrogen fixing bacterium having high potential for nitrogen fixation and produces growth hormones. *Azospirillum* inoculation is known to increase the yield of crop by 5 to 20 per cent (Dart, 1986). Based on the above facts, the present investigation was carried out to study the effect of integrated nutrient management approach on growth and yield of fennel.

MATERIAL AND METHODS

The present study was conducted at Horticulture garden, K.A.P.G. College, Allahabad during the winter season of 2000-01 and 2001-02. The seeds of fennel Var. GF-1 was collected from the Department of vegetable Science, N.D.U.A.&T., Kumarganj Faizabad and one month old seedlings were transplanted in the second fortnight of October during both the years at a spacing of 60 x 30 cm. The experiment was

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laid out in RBD with 8 treatments and three replications. The treatments were comprised of graded doses of inorganic nitrogen i.e., 100%, 75% and 50% of standard dose of inorganic nitrogen i.e., 90 kg/ha along with *Azospirillum brasilense* and FYM alone or in combination. Half dose of inorganic nitrogen with full dose of P_2O_5 and K_2O i.e., 20 kg/ha each were applied at the time of transplanting and remaining half dose of N_2 was applied in two split doses at 30 and 60 days after transplanting were treated with the slurry of *Azospirillum* while FYM was applied at the time of field preparation. Irrigation, weeding and plant protection measures were taken as per the requirement. The observations on plant height (cm), number of primary branches/plant, plant spread across the row (cm), stem girth (cm), number of umbels/plant, size of umbel (cm), number of seeds/umbel and seed yield (q/ha) were recorded at growth stage and calculated and statistically analysed.

RESULT AND DISCUSSION

Perusal of data (Table-1) clearly indicate that all the treatments increased the plant height significantly except T_5 treatment during first year. Treatment T_1 gave maximum plant height (148.57 cm and 163.24 cm) followed by treatment T_2 with the corresponding values of 146.30 cm and 158.61 cm during first and second year, respectively. An examination of data (Table-1) evident that all the treatments brought significant increase in number of primary branches per plant during both the years except treatment T_4 , T_5 and T_7 during first year, however, the values of treatments T_4 , T_5 and T_7 were found to be at par. The maximum number of primary branches per plant i.e., 8.56 and 9.28 were recorded with treatment T_1 followed by 7.98 and 8.18 primary branches per plant with treatment T_2 during different years of experimentation. Data regarding stem girth presented in Table-1 indicated that all the treatments increased the stem girth significantly during both the years. Maximum plant girth i.e., 10.20 cm and 10.93 cm were recorded with T_1 followed by 9.13 cm and 10.29 cm with treatment T_2 during the year 2000-01 and 2001-02, respectively. Data regarding plant spread across the row presented in Table-1 shows that significant variation during both the years, however, the maximum plant spread across the row i.e., 9352.67 cm and 9394.33 cm were recorded with treatment T_1 followed by 8913.67 cm and 9109.00 cm with treatment T_2 during first and second year of experimentation. Data assembled on number of umbels per plant (Table-2) due to various treatments shows significant increase during both the years except treatment T_5 during first year. Maximum number of umbels per plant i.e., 85.31 and 81.59 were recorded with treatment T_1 followed by 7.44 and 80.35 during different years of investigation. Data regarding size of umbel displayed in table-2 varied significantly due to application of different treatments except T_5 during first year and T_5 and T_7 during second year, however, the values recorded with these treatments were found to be at par with other treatment. Maximum size of umbels (351.17 cm and 357.93cm), were recorded with T_1 followed by treatment T_2 (311.00 cm and 333.47 cm) during both the years. Data regarding number of seeds per umbel furnished in Table-2 revealed that number of seeds per plant increased significantly due to increment in each levels of inorganic nitrogen along with 5 tonnes FYM and *Azospirillum*. The maximum number of seeds per umbel i.e., 804.33 and 807.67 were recorded with treatment T_1 followed by 770.33 and 790.00 with treatment T_2 during first and second year of investigation. Perusal of data (Table-2) clearly indicated that all the treatments significantly increased the yield during first year except T_5 during second year, however, the maximum seed yield of 18.99 q and 21.93 q/ha with treatment T_1 followed by 16.83 q and 18.40 q/ha were recorded with T_2 . The present findings are corroborating with the findings of Mishra and Patjoshi (1995). The enhancement in yield with more inorganic

Table-1. Effect of graded doses of nitrogen, bionoculant and FYM on growth attributes

Treatments	Plant height (cm)		Number of primary branches/ plant		Plant spread across the row (cm)		Stem girth (cm)	
	2000-01	2001-02	2000-01	2001-02	2000-01	2001-02	2000-01	2001-02
T ₁ -100% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	148.57	163.24	8.56	9.28	9352.67	9394.33	10.20	10.93
T ₂ -75% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	146.30	158.61	7.98	8.18	8913.67	9109.00	9.13	10.29
T ₃ -50% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	143.17	157.37	7.31	6.53	8557.33	8935.67	8.33	10.06
T ₄ -5 tonnes FYM + Azospirillum	140.50	147.56	6.89	7.18	7816.66	8258.33	7.34	7.70
T ₅ -5 tonnes FYM + Azospirillum	134.40	141.01	6.78	7.06	7546.67	8009.00	6.88	6.96
T ₆ -10 tonnes FYM + Azospirillum	141.53	151.21	7.98	7.44	8327.67	8543.67	7.70	7.77
T ₇ -10 tonnes FYM alone	137.30	145.51	6.89	6.98	7728.33	8132.00	7.17	7.08
T ₈ - Control	121.44	120.66	5.42	5.06	7145.00	6804.67	5.56	5.31
C.D. at 5%	13.43	13.28	1.58	1.31	783.06	1342.64	1.07	0.83

Table-2. Effect of graded doses of nitrogen, bioinoculant and FYM on yield attributes

Treatments	Number of umbels/plant		Size of umbel (cm)		Number of seeds/umbel		Yield (q/ha)	
	2000-01	2001-02	2000-01	2001-02	2000-01	2001-02	2000-01	2001-02
T ₁ -100% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	85.31	81.59	351.17	357.93	804.33	807.67	18.99	21.93
T ₂ -75% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	79.44	80.35	311.00	333.47	770.33	790.00	17.83	20.60
T ₃ -50% Inorganic nitrogen + 5 tonnes FYM + Azospirillum	78.42	79.09	282.67	305.77	741.33	751.00	15.86	16.70
T ₄ -5 tonnes FYM + Azospirillum	69.22	73.82	274.50	287.23	677.67	704.33	15.22	15.02
T ₅ -5 tonnes FYM + Azospirillum	64.31	69.70	190.00	216.67	483.33	517.33	11.93	12.18
T ₆ -10 tonnes FYM + Azospirillum	74.86	73.99	281.50	263.73	708.67	721.00	15.51	15.52
T ₇ -10 tonnes FYM alone	73.44	70.12	250.67	222.73	560.67	593.33	13.89	13.37
T ₈ - Control	56.84	51.90	180.89	202.57	446.33	484.67	9.45	9.28
C.D. at 5%	10.77	8.84	27.28	45.12	71.40	109.70	2.02	3.15

nitrogen alongwith organic manure and *Azospirillum* under present study may be due to more vegetative growth which in turn increased the yield. The improvement in yield attributes could also be because of production of growth substances like IAA and GA₃ by *Azospirillum* which in turn might have higher yields were realized. Similar observations have also been made by other workers (Deka *et al.*, 1996; Anant Bahadur and Manohar, 2001 and Raj and Geetha Kumari, 2001).

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