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STUDIES ON THE POTENTIAL OF INTEGRATED NUTRIENT MANAGEMENT FOR IMPROVING THE VEGETATIVE AND REPRODUCTIVE PERFORMANCE OF BERSEEM CROP

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SUMMARY

The effects of FYM, chemical fertilizers and biofertilizers on the vegetative and reproductive performance of berseem fodder crop were studied by cultivating the crop during **rabi** season of 2011-12 at experimental plots of the D. E. I., Department of Botany at Agra. Seven treatments and five replications were chosen in the RCBD. The treatment consisting of farm yard manure+*Rhizobium*+phosphate solubilizing bacteria+*Azospirillium* resulted in maximum plant height (13.1 cm at 35 DAS), fresh forage yield (16780 kg/ha), maximum length of head (2.7 cm), maximum number of flowers per head (83 flowers/ head) and maximum seed yield (387.2 kg/ha). On the contrary, the values for the above traits in the control plots were as follows : 10.6 cm, 15980 kg/ha, 1.8 cm, 60.6 flowers and 260 kg/ha for plant height, fresh forage yield, length of head, number of flowers per head and seed yield, respectively. So, it was concluded that berseem showed better performance when treated with FYM+biofertilizers.

Key words : Berseem, biofertilizers, vegetative and reproductive performance

Due to ever increasing human population pressure, arable land mainly used for food and fodder production is limited only to 4.60 per cent of the total cultivable land. At present, the country faces a net deficit of 61 per cent green fodder, 21.9 per cent dry crop residues and 64 per cent feeds (Planning Commission of India, 2007; Handbook of Agriculture, 2009). Berseem (*Trifolium alexandrinum* L.) is one of the most important **rabi** fodder crops of the North-Western region of the country. It is considered as a most potential crop from productivity as well as maintenance of soil fertility. It contains about 20-24 per cent protein at green stages (Barik and Tiwari, 1998). This nutritious, succulent and palatable fodder is available for fairly long period during winter, spring and early summer (Chaterjee and Das, 1989).

The soils are becoming deficient in macro- as well as micro-nutrients due to intensive cropping system. Biofertilizer has emerged as an effective component of Integrated Nutrient Management system. This assumes special significance, particularly with multi-cut fodder species that require periodical supplementation of essential nutrients (Harendra Kumar *et al.*, 2007). Therefore, the present study was conducted to find out the influence of INM using FYM, *Rhizobium,* PSB and *Azospirillium* biofertilizers and chemical fertilizers on vegetative and reproductive performance of berseem fodder crop.

MATERIALS AND METHODS

Berseem (*Trifolium alexandrinum*) fodder variety BL 10 was selected for sowing on 16 October 2011. The soil analysis of the samples collected from the experimental site was carried out using the standard procedures for estimating the macro-nutrients given in Manual on Soil, Plant and Water Analysis (Dhyan Singh *et al*., 2005). The bacterial strains were obtained from MTCC, Chandigarh, and the scaling-up, quality testing and packaging of the respective bacterial biofertilizers were undertaken in the Biofertilizer lab of the Department.

The experiment was laid down in randomized block design with seven treatments and five replications. The treatments consisted of control, farm yard manure,

farm yard manure+chemical fertilizers, farm yard manure+*Rhizobium*, farm yard manure+*Rhizobium*+ phosphate solubilizing bacteria, farm yard manure+ *Rhizobium*+Phosphate solubilizing bacteria+*Azospirillium* and farm yard manure+chemical fertilizers+biofertilizers. Their application rate was, farm yard manure (5 t/ha), chemical fertilizers i. e. di ammonium phosphate (20 kg/ ha) and urea (15 kg/ha), and biofertilizers (seed treatment). The first irrigation was applied at the time of sowing, for best establishment of seedlings. Data were recorded on vegetative traits like emergence, plant height (cm), fresh forage yield (kg/ha) and reproductive traits like length of inflorescence (cm), flowers per inflorescence and seed yield (kg/ha). The data were statistically analysed (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The soil of the experimental field was clay loam in texture, low in organic carbon (0.4%), potassium (115.86 kg/ha) and medium in phosphorus (40 kg/ha) and nitrogen (362.8 kg/ha) with pH 7.9.

A. Vegetative Growth and Development

Germination and emergence of the cultivar BL 10 was not affected by the treatments. Similar observations were reported for other cultivars in Pakistan by Saeed *et al.* (2011). However, significant differences were observed for plant height and fresh forage yield at 35 DAS as a result of different treatments. Maximum mean plant height (13.1 cm) and fresh forage yield (16780 kg/ha) were observed in plots treated with FYM + R + P + A and minimum values of 10.6 cm and 15980 kg/ha for plant height and fresh forage yield, respectively, were observed in control plots (Table 1). Contrary results were given by Saeed *et al.* (2011) who reported that plant height was not affected by P and K.

B. Reproductive Performance

The demand for forage seeds is increasing and the availability is very low, meeting only 15-20 per cent of the requirement. Timely availability of quality seeds is also a major constraint (Planning Commission of India, 2007). Berseem flowers are yellowish white, self-sterile and clustered in dense elliptical heads. In the present study, the applied treatments had significant effect on the length of the head, average number of flowers per head and mean seed yield in kg/ha. Maximum length of the head (2.7 cm), flowers per head (83 flowers/head) and seed yield (387.2 kg/ha) were observed in plots treated with FYM + R + P + A and minimum values of 1.8 cm, 60.6 flowers and 260 kg/ha for length of head, flowers per head and seed yield, respectively, were observed in control plots (Table 1). Patel (1998) studied significant increase in seed yield of berseem when treated with nitrogen and phosphorus fertilizers.

CONCLUSION

Berseem responded better to integrated nutrient management practices in terms of both forage and seed yields. Non-availability of seed is also one of the major constraints for expanding the area under fodder crop production. The present study indicates the potential of

TABLE 1

Average mean plant height, fresh forage yield, Length of head, number of flowers/head and seed yield in berseem under different treatments

S. No.	Treatments	Shoots/ m^2 (emergence)	Mean Plant height (cm)	Mean fresh forage yield	Length of head (cm)	Flowers/head	Seed yield (kg/ha)
1.	Control	134.0	10.6	15980	1.8	60.6	260.0
2.	Farm yard manure (FYM)	135.4	11.3	16210	2.1	71.8	293.0
3.	FYM+Chemical fertilizers (C.F)	135.4	12.8	16440	2.5	78.0	327.0
4.	FYM+*Rhizobium* (R)	138.0	12.7	16330	2.6	77.2	339.2
5.	FYM+R+PSB	141.0	12.5	16700	2.5	78.6	363.2
6.	FYM+R+PSB+*Azotobacter*	143.8	13.1	16780	2.7	83.0	387.2
7.	FYM+C. F.+Biofertilizers	141.2	12.3	16590	2.3	73.8	304.3
	C. D. (P=0.05	NS	1.0	15.7	0.3	10.3	57.5

NS–Non-significant.

INM in overcoming the problems of fodder and seed yields in a sustainable manner.

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