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USE OF BULKY MANURES AND NPK FERTILIZERS FOR INCREASING THE YIELD OF FRENCHBEAN

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Abstract

French bean (*Phaseolus vulgaris* L. *Halics*) is an important short durational, leguminous pod vegetable crop. Manures are substances, which are organic in nature capable of supplying plant nutrients in available form. Most of the bulky manures are obtained from plant and animal waste products. Farm yard manures (FYM), municipal solid waste (MSW) and vermicompost (VC) are different bulky organic manures has shown promising results not only in sustaining the production, but also in maintaining soil health. To study the effect of different bulky manures and NPK fertilizers on French bean, a pot experiment was undertaken at Annamalai University, Annamalainagar. This study was carried out with seven treatments, three replications in completely randomized design (CRD). The treatments were $\mathbf{T_1}$– Control, $\mathbf{T_2}$– 100% RDF, $\mathbf{T_3}$– 75% RDF + *Sesbania rostrata* @ 5.0 t ha^{-1}, $\mathbf{T_4}$– 75% RDF + *Azartica indica* @ 5.0 t ha^{-1}, $\mathbf{T_5}$– 75% RDF + FYM @ 5.0 t ha^{-1}, $\mathbf{T_6}$– 75% RDF + MSW @ 5.0 t ha^{-1} and $\mathbf{T_7}$– 75% RDF + Vermicompost @ 5.0 t ha^{-1}. Frenchbean was grown with recommended cultural practices. The growth and yield parameters were recorded for different treatments. The results revealed that application of 75% recommended dose of NPK fertilizers and vermicompost @ 5.0 t ha^{-1} ($\mathbf{T_7}$) recorded significantly highest number of pod yield (45.19 g pot^{-1}) followed by $\mathbf{T_2}$ (42.73 g pot^{-1}). Whereas, the control ($\mathbf{T_1}$) recorded the least pod yield (25.36 g pot^{-1}). There was a significant influence between the treatments with respect to growth and yield parameters of Frenchbean.

Key words : Bulky manures, fertilizers, growth, yield and frenchbean.

Introduction

Frenchbean (*Phaseolus vulgaris* L. Halics) is a shy nodulation legume, it requires fairly large quantity of nitrogenous fertilizers. It is almost unable to fix atmospheric nitrogen symbiotically, hence responds well to nitrogen application. Bulky organic manures increase the organic matter content and improve the soil physical properties of soils. This is very much effective in arable land and provides food for soil micro-organisms. This increases activity of microbes in turn helps to convert unavailable plant nutrients into available forms. Neem is decomposed slowly, leading to a slower release of nutrients contained in it. In India, FYM is the most common source of organic manure increases the crop yield and cause improvement in soil quality of vertisols (Singh *et al*., 2008). Municipal solid waste (MSW) is a waste from houses, streets and public places, shops, offices and hospitals. Vermicompost is an organic manure produced by earth worm feeding on biological waste materials and plant residues. It is an odourless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth. Vermicompost is a preferred nutrient source for organic farming. It is eco-friendly, non-toxic and recycled biological product. Chemical fertilizers or organic manures alone cannot sustain the desired levels of crop production. Judicious use of manures with chemical fertilizers improves soil physical, chemical and biological properties and improves crop productivity (Singh and Singh, 2012).

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Materials and Methods

To study the effect of different bulky manures and NPK fertilizers on growth and yield of Frenchbean in black soil, a pot experiment was under taken at the Department of Soil Science & Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar (Tamilnadu), India. The surface soil was collected from Experimental Farm, Annamalai University. The soil was air dried, powdered and then used for potculture experiment. The soil belongs to black colour, Kondal series, Vertisols in order and Typic haplusterts

Table 1 : Effect of bulky manures and NPK fertilizers on plant height of Frenchbean.

Treatment No.	Treatment Details	Plant height (cm)		
		20 DAS	40 DAS	At harvest
T_1	Control	9.1	18.8	24.3
T_2	100% RDF	21.2	46.7	53.7
T_3	75% RDF+*Sesbania rostrata* @ 5.0 t ha^{-1}	14.0	38.5	44.8
T_4	75% RDF + *Azartica indica* @ 5.0 t ha^{-1}	11.6	29.7	32.4
T_5	75% RDF + FYM @ 5.0 t ha^{-1}	15.1	36.4	41.6
T_6	75% RDF + MSW @ 5.0 t ha^{-1}	22.5	42.0	50.5
T_7	75% RDF + Vermicompost @ 5.0 t ha^{-1}	24.8	49.5	56.2
	S.Ed	0.93	1.14	0.57
	C.D. (p = 0.05)	1.85	2.30	1.12

Table 2 : Effect of bulky manures and NPK fertilizers on growth attributes of Frenchbean.

Treatment No.	Treatment Details	Growth attributes	
		No. of branches plant^{-1}	No. of pods plant^{-1}
T_1	Control	3.31	2.2
T_2	100% RDF	8.10	12.0
T_3	75% RDF+*Sesbania rostrata* @ 5.0 t ha^{-1}	5.06	9.0
T_4	75% RDF + *Azartica indica* @ 5.0 t ha^{-1}	4.15	6.4
T_5	75% RDF + FYM @ 5.0 t ha^{-1}	4.74	8.1
T_6	75% RDF + MSW @ 5.0 t ha^{-1}	6.83	10.3
T_7	75% RDF + Vermicompost @ 5.0 t ha^{-1}	8.50	12.5
	S.Ed	0.07	0.16
	C.D. (p = 0.05)	0.15	0.32

Table 3 : Effect of bulky manures and NPK fertilizers on number of branches plant^{-1}, number of pods plant^{-1} and number of seeds pod^{-1} of Frenchbean.

Treatment No.	Treatment Details	Yield attributes		
		Pod length (cm)	Pod width (cm)	No. of seeds pods^{-1}
T_1	Control	6.0	1.9	3.0
T_2	100% RDF	10.3	3.5	4.5
T_3	75% RDF+*Sesbania rostrata* @ 5.0 t ha^{-1}	8.2	2.9	3.8
T_4	75% RDF + *Azartica indica* @ 5.0 t ha^{-1}	7.1	2.4	3.5
T_5	75% RDF + FYM @ 5.0 t ha^{-1}	7.9	2.8	3.7
T_6	75% RDF + MSW @ 5.0 t ha^{-1}	8.9	3.0	4.3
T_7	75% RDF + Vermicompost @ 5.0 t ha^{-1}	11.6	3.7	4.6
	S.Ed	0.80	0.15	0.04
	C.D.(p=0.05)	1.57	0.30	0.08

taxonomic class. Frenchbean was grown as a test crop. The design of the experimental was completely randomized block design (CRD) with seven treatments and three replications. The treatments were T_1– Control, T_2– 100% RDF, T_3– 75% RDF + *Sesbania rostrata* @ 5.0 t ha^{-1}, T_4– 75% RDF + *Azartica indica* @ 5.0 t ha^{-1}, T_5– 75% RDF + FYM @ 5.0 t ha^{-1}, T_6– 75% RDF + MSW @ 5.0 t ha^{-1} and T_7– 75% RDF + Vermicompost @ 5.0 t ha^{-1}.

Mud pots filled with 6 kg of the processed soil and applied with recommended dose of N, P_2O_5 and K_2O *i.e.*, 25:50:25 kg ha^{-1}. Fertilizers were added to the pots as urea, SSP and MOP, respectively. Urea was added to respective pots 50% as basal and remaining 50% topdressed on 30 DAT. SSP and MOP were added basally to the respective pots. Calculated quantity of green manure, green leaf manure, farm yard manure, municipal solid waste and vermicompost were applied to the pots as per treatments prior to sowing of French bean. Healthy seeds were selected and treated with captan or thiram @ 2.5 g kg^{-1} to prevent seed borne disease and then used for sowing. The crop was grown up to maturity with proper cultivation practices. At maturity the crop was harvested, pod and stover were separated out and their yields were recorded.

Results and Discussion

A pot experiment was conducted to study the effect of bulky manures and NPK fertilizers on growth and yield of Frenchbean. The results are presented here under. The initial soil used in this experiment belongs to black soil, clay loam in texture, Kondal series, Vertisols in order. The soil pH, EC and organic carbon were 8.4, 0.49 dSm^{-1} and 5.0 g kg^{-1}, respectively. Available N, P and K of an initial soil were 190, 9.6 and 295 kg ha^{-1}, respectively.

Table 4 : Effect of bulky manures and NPK fertilizers on grain and haulm yield (g pot^{-1}) of Frenchbean.

Treatment No.	Treatment Details	Yield (fresh weight)	
		Pod yield (g pot^{-1})	Haulm yield (g pot^{-1})
T_1	Control	15.36	30.89
T_2	100% RDF	32.73	79.15
T_3	75% RDF+ *Sesbania rostrata* @ 5.0 t ha^{-1}	25.80	61.70
T_4	75% RDF + *Azartica indica* @ 5.0 t ha^{-1}	18.51	46.52
T_5	75% RDF + FYM @ 5.0 t ha^{-1}	23.86	57.83
T_6	75% RDF + MSW @ 5.0 t ha^{-1}	30.28	69.04
T_7	75% RDF + Vermicompost @ 5.0 t ha^{-1}	35.19	83.57
	S.Ed	0.91	1.38
	C.D. (p = 0.05)	1.82	2.80

Plant height (cm)

The data on plant height recorded at 20, 40 DAS and at harvest stages are presented in table 1. It could be seen that plant height increased progressively with increase in age of the crop with the application of manures and fertilizers.

Among the treatments, 75% RDF + Vermicompost @ 5.0 t ha^{-1} (T_7) recorded the highest plant height of 24.8, 49.5 and 56.2 cm at 20 DAS, 40 DAS and at harvest stages, respectively. This was on par with 100% RDF (T_2). The least plant height of 9.1, 18.8 and 24.3 cm were found at 20, 40 DAS and at harvest stages, respectively under control (T_1).

At harvest stage, application of 75% RDF + Vermicompost @ 5.0 t ha^{-1} (T_7) registered the highest plant height of 56.2cm. The treatment T_7 was on par with T_2 (53.7 cm). This was followed by T_6 (50.5cm) and T_3 (44.8 cm). The lowest plant height of 24.3 cm was recorded in control. The increase in plant height was due to presence of sufficient amount of nutrients present in manures and fertilizers, which played an important role in rapid cell division and cell elongation in the meristematic regions of the plants (Selva, 2011).

Number of branches and number of pods plant^{-1}

The data pertaining to number branches of plant^{-1} and number of pods plant^{-1} of Frenchbean are given in table 1.

Soil application of 75% RDF + Vermicompost @ 5.0 t ha^{-1} produced highest number of branches plant^{-1} (8.50) than control (T_1) (3.31). The significant increase in number of branches plant^{-1} and number of pods plant^{-1} were due to the presence of nutrients in manures and fertilizers. Vermicompost encourages proliferation of root system and better absorption of nutrients resulted in increased branches and pods. The results of the present study confirms the findings of Suthakar (2000) in blackgram.

Number of pods plant^{-1} differed significantly between treatments. It was ranged from 2.2 to 12.5. Among the treatments, application of 75% RDF + Vermicompost @ 5.0 t ha^{-1} (T_7) registered the highest number of pods per plant (12.5) followed by an application of 100% recommended dose of fertilizer (RDF) registered 12.0.

Pod length, width and number of seeds pod^{-1}

The pod length of Frenchbean recorded under various treatments ranged from 6.0 to 11.6 cm. There was no significant difference between the treatments. The highest pod length of 11.6 cm was noticed in the treatment receiving 75% RDF + Vermicompost @ 5.0 t ha^{-1}. The pod width was low in control (T_1) (1.9), which was increased and attains high (3.7) due to soil application of 75% RDF + Vermicompost @ 5.0 t ha^{-1}. Treatments were on par with each other and there was no significant difference between the treatments.

There was a insignificant difference was observed between the treatments with respect to number of seeds pod^{-1}. The control treatment (T_1) recorded the least number of seeds pod^{-1} (3.0), which was received no manures and fertilizers. However, the highest number of seeds pod^{-1} (4.6) and (4.5) were found with the application of 75% RDF + Vermicompost @ 5.0 t ha^{-1} (T_7) and 100% RDF (T_2), respectively.

The improvement in yield attributes might be due to enhanced synthesis of carbohydrates and proteins and their transport to the sink through efficient physiological activities in plants. This was confirmed with the findings of Sarkar *et al*. (1998) in greengram.

Pod yield and haulm yield

A significant difference in pod yield was noticed due to various treatments. Application of 75% recommended dose of NPK fertilizers and Vermicompost @ 5.0 t ha^{-1} (T_7) recorded significantly highest number of pod yield (35.19 g pot^{-1}). This was followed by T_2 (32.73), T_6 (30.28) and T_3 (25.80). There was a significant differences were observed between T_6 and T_3. The control treatment (T_1) recorded the least pod yield (15.36 g pot^{-1}), which was not supplied with manures and fertilizers. The highest haulm yield of 83.57 g pot^{-1} was

found with T_7, which was given 75% recommended dose of NPK fertilizers and vermicompost @ 5.0 t ha^{-1}. T_2 registered the second highest haulm yield of 79.15 g pot^{-1}. Whereas the control (T_1) registered the lowest haulm yield of 30.89 g pot^{-1}. It could be ascribed overall improvement in plant growth and vigour due to balanced fertilizers in sufficient quantities. These are accordance with the findings of Shakunthala *et al*. (2012). From this investigation, it is concluded that an application of 75% RDF + Vermicompost @ 5.0 t ha^{-1} (T_7) significantly increased the growth and yield parameters. It is also found to be efficient in increasing the seed yield and haulm yield of Frenchbean.

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