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Effect of Farmyard Manure and Bio-Digester Liquid Manure on Growth, Yield and Protein Content of Field Bean (*Dolichos lablab* L.)

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ABSTRACT

Field experiments were conducted from 2010-11 to 2011-12, Mandya, to study the effect of farmyard manure and bio-digester liquid manure on the performance of field bean. Soil was red sandy loam in texture, low in organic carbon (0.38 %) and available nitrogen (215.5 kg ha^{-1}), medium in available P_2O_5 (26.2 kg ha^{-1}) and K_2O (162.3 kg ha^{-1}). Treatment consisted of three levels of FYM (5.0, 7.5 and 10.0 t ha^{-1}) and four levels of bio-digester liquid manure equivalent (BDLME) to (20, 25, 30 and 35 kg N ha^{-1}) and compared with recommended practice (FYM 7.5 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}) and control. It was laid out in Randomized Complete Block Design with three replications. Significantly superior growth components viz., plant height (62.9 cm), number of branches per plant (7.1), leaves per plant (18.5), LAI (4.75) and total dry matter production per plant (52.5 g) were produced by the application of FYM 10 t + BDLME to 35 kg N ha^{-1} and was on par with FYM 10 t + BDLME to 30 kg N ha^{-1} and recommended practice. Similarly, seed and haulm yields (1088 and 3683 kg ha^{-1}, respectively) produced by the application of FYM 10 t + BDLME to 35 kg N ha^{-1}, FYM 10 t + BDLME to 30 kg N ha^{-1} (1045 and 3619 kg ha^{-1}, respectively) and recommended practice (1137 and 3798 kg ha^{-1}, respectively) were on par with each other.

Keywords Farm yard manure, Bio-digester liquid, Field bean.

INTRODUCTION

Field bean (*Dolichos lablab* L.) is one of the most ancient crops among cultivated plants. It is a multipurpose crop grown for pulse, vegetable and forage purposes. It is one of the major sources of protein (20-28 %) in southern states of India and mostly confined to the peninsular region. Karnataka state records a production of 18,000 tonnes from an area of 85,000 hectares which accounts for nearly 90% in terms of both area and production in the country (*Anon* 2012). Now, the agricultural research is focused on evolving ecologically sound, biologically sustainable and socio-economically viable technologies. There is need for a fresh look to exploit the

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organic farming approaches using the local manurial and bio-pesticide sources for growing organic crops. Organic farming minimizes environmental pollution and maintains sustainability of soil by maintaining high soil organic matter.

MATERIALS AND METHODS

Field experiments were conducted during *rabi* 2010 and 2011 at Zonal Agricultural Research Station, Mandya of the University of Agricultural Sciences, Bangalore. The experimental site is situated between 11^0 30' to 13^0 05' North latitude and 76^0 05' to 77^0 45' East longitude and an altitude of 695 meters above mean sea level. Soil of the experimental site was red sandy loam in texture, low in organic carbon (0.38 %) and available nitrogen (215.5 kg ha^{-1}), medium in available P_2O_5 (26.2 kg ha^{-1}) and K_2O (162.3 kg ha^{-1}). Treatment consisted of three levels of FYM (5.0, 7.5 and 10.0 t ha^{-1}) and four levels of bio-digester liquid manure equivalent (BDLME) to (20, 25, 30 and 35 kg N ha^{-1}) and compared with recommended practice (FYM 7.5 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}) and control. It was laid out in Randomized Complete Block Design with three replications. Hebbal Avare - 4 variety was used for experimentation.

Well decomposed farmyard manure was analyzed for its nutrient composition and applied as per the treatment specifications two weeks before sowing of the crop and mixed thoroughly with soil. Bio-digester liquid manure was analyzed for nitrogen a day before application and required quantity for different treatments was estimated based on N content and then applied by opening furrows near to the crop rows and later on covered with soil to avoid evaporation loss. Total quantity of nitrogen of different treatments was top dressed through BDLM in two splits at 20 and 40 days after sowing.

Nitrogen content in the seeds of field bean was estimated by Kjeldhal's method (Jackson 1973). The protein per cent in the seeds was calculated by multiplying the nitrogen content by a factor of 6.25.

Protein content (%) = Nitrogen content in seeds (%) X 6.25

Protein yield per hectare was worked out on the basis of seed protein content and seed yield of field bean.

$$\text{Protein yield (kg ha}^{-1}\text{)} = \frac{\text{Seed protein content}}{100} \text{ X Seed yield (kg ha}^{-1}\text{)}$$

RESULTS AND DISCUSSION

Growth parameters and total dry matter production

Pooled results of the present study revealed that, significantly taller plants (62.9 cm), more number of branches per plant (7.1), leaves per plant (18.5), LAI (4.75) and total dry matter production per plant (52.5 g) were produced by the application of FYM 10 t + BDLME to 35 kg N ha^{-1} which was on par with FYM 10 t + BDLME to 30 kg N ha^{-1} and recommended practice (FYM 10 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}). However, all these three were superior in the above growth parameters when compared to other organic treatment combinations (Tables 1 and 2). The superiority of the above growth parameters could be due to greater availability of macro and micronutrients from organic sources which inturn might have helped in acceleration of various metabolic processes. Conjunctive use of liquid manure and FYM might have played their potent roles on enhanced cell division and elongation of leaves resulting in higher biomass.

Further, the improvement in dry matter production with organic manures might be ascribed to the increase in plant size (as indicated by plant height, number of leaves, leaf area and LAI) and cumulative effect of all these parameters. Judicious use of farmyard manure in combination with liquid manure improves the soil fertility status mainly due to mineralization of organically bound nutrients and exchange reactions contributing towards better availability of nutrient elements present in the soil as suggested by Palaniappan and Natarajan (1993). The results are in conformity with the findings of Ravi Kumar (2009) who reported higher growth parameters with FYM (7.5 t ha^{-1}) + *Rhizobium* + PSB + 3% Panchagavya equivalent to 25 kg N ha^{-1} than FYM alone in groundnut.

Table 1. Growth parameters of field bean as influenced by FYM and bio-digester liquid manure.

Treatments	Plant height (cm)			No. of branches plant^{-1}			No. of leaves plant^{-1}			LAI		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
T_1	46.2	47.1	46.6	3.7	4.2	3.9	9.6	10.3	10.0	2.71	2.92	2.82
T_2	47.4	48.5	48.0	3.9	4.4	4.1	10.3	11.1	10.7	2.87	3.19	3.03
T_3	51.6	53.0	52.3	4.6	5.3	4.9	12.8	14.2	13.5	3.77	4.08	3.92
T_4	52.4	53.8	53.1	4.7	5.7	5.2	13.5	14.7	14.1	3.85	4.19	4.02
T_5	48.5	50.0	49.2	3.9	4.5	4.2	11.0	12.3	11.7	3.26	3.59	3.42
T_6	48.9	50.7	49.8	4.1	4.8	4.5	11.3	12.5	11.9	3.34	3.68	3.51
T_7	53.2	55.2	54.2	4.9	5.9	5.4	14.1	15.3	14.7	4.06	4.32	4.19
T_8	54.5	55.8	55.1	5.1	6.4	5.7	14.5	16.0	15.3	4.11	4.41	4.26
T_9	50.2	51.2	50.7	4.2	5.1	4.6	11.7	13.0	12.4	3.43	3.80	3.62
T_{10}	50.6	51.6	51.1	4.3	5.2	4.8	12.1	13.2	12.7	3.58	3.93	3.75
T_{11}	59.0	60.5	59.8	6.3	7.2	6.7	16.1	18.1	17.1	4.55	4.69	4.62
T_{12}	60.8	64.9	62.9	6.6	7.5	7.1	17.4	19.6	18.5	4.63	4.88	4.75
T_{13}	64.0	66.5	65.3	7.1	8.0	7.5	18.3	20.3	19.3	4.67	4.96	4.81
T14	35.0	33.6	34.3	3.3	3.0	3.2	7.4	6.6	7.0	1.67	1.56	1.61
SEm±	2.1	2.6	2.4	0.3	0.3	0.3	0.9	1.0	1.0	0.14	0.16	0.15
CD at 5%	6.2	7.6	6.7	1.0	0.9	0.9	2.7	3.0	2.7	0.41	0.47	0.43

T_1 : FYM 5 t + BDLME to 20 kg N ha^{-1}
T_2 : FYM 5 t + BDLME to 25 kg N ha^{-1}
T_3 : FYM 5 t + BDLME to 30 kg N ha^{-1}
T_4 : FYM 5 t + BDLME to 35 kg N ha^{-1}
T_5 : FYM 7.5 t + BDLME to 20 kg N ha^{-1}
T_6 : FYM 7.5 t + BDLME to 25 kg N ha^{-1}
T_7 : FYM 7.5 t + BDLME to 30 kg N ha^{-1}
T_8 : FYM 7.5 t + BDLME to 35 kg N ha^{-1}
T_9 : FYM 10 t + BDLME to 20 kg N ha^{-1}
T_{10} : FYM 10 t + BDLME to 25 kg N ha^{-1}
T_{11} : FYM 10 t + BDLME to 30 kg N ha^{-1}
T_{12} : FYM 10 t + BDLME to 35 kg N ha^{-1}
T_{13} : FYM 7.5 t + 25:50:25 kg N:P_2O_5:K_2O ha^{-1}
T_{14} : Absolute control
BDLME - Bio-digester liquid manure equivalent
FYM - Farmyard manure
DAS - Days after sowing

Table 2. Total dry matter production (g plant^{-1}) at different growth stages of field bean as influenced by FYM and bio-digester liquid manure.

Treatments	30 DAS			60 DAS			At harvest		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
T_1	1.15	1.40	1.28	18.1	19.9	19.0	30.0	33.2	31.6
T_2	1.18	1.48	1.33	18.5	20.5	19.5	32.8	35.8	34.3
T_3	1.53	2.27	1.90	23.1	23.1	23.1	38.5	44.2	41.3
T_4	1.60	2.32	1.96	23.7	26.4	25.1	40.2	45.3	42.8
T_5	1.23	1.56	1.39	19.5	22.2	20.9	35.0	38.0	36.5
T_6	1.23	1.67	1.45	20.0	23.3	21.7	35.7	38.7	37.2
T_7	1.67	2.43	2.05	23.9	26.9	25.4	41.2	48.5	44.9
T_8	1.73	2.57	2.15	25.0	28.4	26.7	42.6	49.7	46.2
T_9	1.30	1.80	1.55	20.7	24.2	22.4	37.1	40.5	38.8
T_{10}	1.45	2.08	1.77	21.9	24.7	23.3	37.3	41.5	39.4
T_{11}	1.82	2.80	2.31	27.7	30.4	29.1	46.2	53.8	50.0
T_{12}	2.20	3.02	2.61	28.9	32.8	30.8	48.1	56.9	52.5
T_{13}	3.30	3.92	3.61	30.1	33.5	31.8	50.8	58.5	54.7
T_{14}	1.07	0.82	0.94	11.3	10.5	10.9	19.5	17.5	18.5
SEm±	0.14	0.20	0.18	0.9	1.6	1.29	2.1	2.0	2.05
CD at 5%	0.41	0.59	0.51	2.8	4.7	3.67	6.1	5.8	5.81

T_1 : FYM 5 t + BDLME to 20 kg N ha^{-1}
T_2 : FYM 5 t + BDLME to 25 kg N ha^{-1}
T_3 : FYM 5 t + BDLME to 30 kg N ha^{-1}
T_4 : FYM 5 t + BDLME to 35 kg N ha^{-1}
T_5 : FYM 7.5 t + BDLME to 20 kg N ha^{-1}
T_6 : FYM 7.5 t + BDLME to 25 kg N ha^{-1}
T_7 : FYM 7.5 t + BDLME to 30 kg N ha^{-1}
T_8 : FYM 7.5 t + BDLME to 35 kg N ha^{-1}
T_9 : FYM 10 t + BDLME to 20 kg N ha^{-1}
T_{10} : FYM 10 t + BDLME to 25 kg N ha^{-1}
T_{11} : FYM 10 t + BDLME to 30 kg N ha^{-1}
T_{12} : FYM 10 t + BDLME to 35 kg N ha^{-1}
T_{13} : FYM 7.5 t + 25:50:25 kg N:P_2O_5:K_2O ha^{-1}
T_{14} : Absolute control
BDLME - Bio-digester liquid manure equiv alent
FYM - Farmyard manure
DAS - Days after sowing

Yield and yield parameters

Seed and haulm yields of field bean were significantly influenced by the combinations of farmyard manure and bio-digester liquid manure. Pooled data indicated that seed and haulm yields produced by the application of FYM 10 t + BDLME to 35 kg N ha^{-1} (1088 and 3683 kg ha^{-1}, respectively), FYM 10 t + BDLME to 30 kg N ha^{-1} (1045 and 3619 kg ha^{-1}, respectively) and recommended practice (FYM 7.5 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}) (1137 and 3798 kg ha^{-1}, respectively) were on par with each other (Table 3). Higher yields obtained with FYM 10 t + BDLME to 35 kg N ha^{-1} could be attributed to significantly superior growth components viz. plant height (62.9 cm), number of branches per plant (7.1), leaves per plant (18.5), LAI (4.75) and total dry matter production per plant (52.5 g) as compared to other combinations of FYM and BDLM. These could have resulted in significantly higher yield components like number of pods per plant (18.0) and number of seeds per pod (3.7) than other treatments. However, these yield parameters were on par with FYM 10 t + BDLME to 30 kg N ha^{-1} (17.4 and 3.5 respectively) and recommended practice (FYM 7.5 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}) (19.2 and 3.8) yield parameters (Table 4). Perhaps, high uptake of nutrients like N, P and K (92.3, 15.45 and 83.8 kg ha^{-1}, respectively) might have promoted the growth as well as yield components. Further, improvement in yield might be due to abundant supply of nutrients with the application of higher doses of FYM and BDLM. Besides, the increased microbial population might have increased the nutrient availability. Not only the amount of nutrients present in the soil but also their availability in rhythm with the pattern of crop growth is important, which inturn could influence the crop growth and yield.

These results are in conformity with the findings of Jayaram Reddy and Reddy (2011) who reported that field bean gave 10 q ha^{-1} of seed yield with FYM 10 t + BDLM equivalent to 30 kg N ha^{-1}. Devakumar *et al*. (2011) revealed that combinations of compost + poultry manure + pressmud (1:1:1 by weight equivalent to 7.5 t of FYM + 25 kg N ha^{-1}) produced higher seed yield of field bean (12.8 q ha^{-1}) which was on par with that of compost + poultry manure

Table 3. Seed yield, haulm yield and harvest index of field bean as influenced by FYM and bio-digester liquid manure.

Treatments	Seed yield (kg ha^{-1})			Haulm yield (kg ha^{-1})			Harvest Index		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
T_1	710	762	736	2239	2365	2302	0.242	0.247	0.244
T_2	722	795	759	2328	2468	2398	0.237	0.245	0.241
T_3	797	921	859	2753	2937	2845	0.230	0.244	0.237
T_4	810	943	877	2817	3000	2908	0.227	0.243	0.235
T_5	748	844	796	2472	2667	2569	0.237	0.244	0.241
T_6	774	825	800	2550	2750	2650	0.236	0.234	0.235
T_7	825	976	900	2883	3083	2983	0.227	0.246	0.237
T_8	825	1020	923	2931	3097	3014	0.221	0.249	0.235
T_9	788	883	836	2682	2855	2768	0.228	0.238	0.233
T_{10}	794	898	846	2682	2872	2777	0.229	0.239	0.234
T_{11}	955	1172	1045	3533	3705	3619	0.213	0.242	0.228
T_{12}	972	1187	1088	3617	3748	3683	0.213	0.241	0.227
T_{13}	1055	1218	1137	3753	3843	3798	0.220	0.241	0.230
T_{14}	371	338	355	1129	1034	1082	0.250	0.249	0.250
SEm±	49	35	45	182	242	212	0.170	0.179	0.018
CD at 5%	144	101	128	529	703	600	NS	NS	NS

T_1 : FYM 5 t + BDLME to 20 kg N ha^{-1}
T_2 : FYM 5 t + BDLME to 25 kg N ha^{-1}
T_3 : FYM 5 t + BDLME to 30 kg N ha^{-1}
T_4 : FYM 5 t + BDLME to 35 kg N ha^{-1}
T_5 : FYM 7.5 t + BDLME to 20 kg N ha^{-1}
FYM - Farmyard manure
T_6 : FYM 7.5 t + BDLME to 25 kg N ha^{-1}
T_7 : FYM 7.5 t + BDLME to 30 kg N ha^{-1}
T_8 : FYM 7.5 t + BDLME to 35 kg N ha^{-1}
T_9 : FYM 10 t + BDLME to 20 kg N ha^{-1}
T_{10} : FYM 10 t + BDLME to 25 kg N ha^{-1}
NS – Non-significant
T_{11} : FYM 10 t + BDLME to 30 kg N ha^{-1}
T_{12} : FYM 10 t + BDLME to 35 kg N ha^{-1}
T_{13} : FYM 7.5 t + 25:50:25 kg N:P_2O_5:K_2O ha^{-1}
T_{14} : Absolute control
BDLME - Bio-digester liquid manure equivalent

Table 4. Yield parameters of field bean as influenced by FYM and bio-digester liquid manure.

Treatments	No. of pods plant^{-1}			No. of seeds pod^{-1}			100 seed weight (g)		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
T_1	10.5	11.3	10.9	2.6	2.7	2.7	17.1	17.2	17.2
T_2	11.1	12.0	11.6	2.7	2.8	2.8	17.0	17.3	17.2
T_3	13.2	14.5	13.9	3.0	3.1	3.1	17.7	17.7	17.7
T_4	13.5	14.9	14.2	3.0	3.3	3.2	17.9	17.9	17.9
T_5	11.7	12.3	12.0	2.8	2.9	2.9	17.1	17.4	17.3
T_6	11.9	12.8	12.4	2.9	3.0	2.9	17.2	17.7	17.5
T_7	13.7	15.1	14.4	3.0	3.3	3.2	17.9	18.2	18.1
T_8	14.3	15.6	15.0	3.1	3.4	3.2	17.9	18.4	18.2
T_9	12.1	13.4	12.7	2.9	3.1	3.0	17.4	17.8	17.6
T_{10}	13.0	14.1	13.6	3.0	3.1	3.1	17.6	18.0	17.8
T_{11}	16.8	17.9	17.4	3.4	3.6	3.5	18.1	18.7	18.4
T_{12}	17.0	19.1	18.0	3.5	3.8	3.7	18.2	18.8	18.5
T_{13}	18.5	19.8	19.2	3.7	3.9	3.8	18.5	19.1	18.8
T_{14}	6.8	5.8	6.3	2.3	2.1	2.2	17.1	17.0	17.0
SEm±	0.7	0.8	0.8	0.1	0.2	0.15	0.4	0.5	0.46
CD at 5%	2.1	2.3	2.2	0.4	0.5	0.40	NS	NS	NS

T_1 : FYM 5 t + BDLME to 20 kg N ha^{-1}
T_2 : FYM 5 t + BDLME to 25 kg N ha^{-1}
T_3 : FYM 5 t + BDLME to 30 kg N ha^{-1}
T_4 : FYM 5 t + BDLME to 35 kg N ha^{-1}
T_5 : FYM 7.5 t + BDLME to 20 kg N ha^{-1}
T_6 : FYM 7.5 t + BDLME to 25 kg N ha^{-1}
T_7 : FYM 7.5 t + BDLME to 30 kg N ha^{-1}
T_8 : FYM 7.5 t + BDLME to 35 kg N ha^{-1}
T_9 : FYM 10 t + BDLME to 20 kg N ha^{-1}
T_{10} : FYM 10 t + BDLME to 25 kg N ha^{-1}
T_{11} : FYM 10 t + BDLME to 30 kg N ha^{-1}
T_{12} : FYM 10 t + BDLME to 35 kg N ha^{-1}
T_{13} : FYM 7.5 t + 25:50:25 kg N:P_2O_5:K_2O ha^{-1}
T_{14} : Absolute control
BDLME - Bio-digester liquid manure equivalent
FYM - Farmyard manure
NS – Non-significant

(1:1) (12.2 q ha^{-1}).

Similar results have also been reported in groundnut by Ravi Kumar (2009) who found that pod and haulm yields were significantly higher (2304 kg ha^{-1} and 2695 kg ha^{-1}, respectively) with FYM (7.5 t ha^{-1}) + *Rhizobium* + PSB + 3% Panchagavya equivalent to 25 kg N ha^{-1} than FYM alone. Anand (2003) also reported higher pod yield (2445 kg ha^{-1}) and haulm yield (3625 kg ha^{-1}) of groundnut with FYM 10 t + 25:75:37.5 N:P_2O_5:K_2O kg ha^{-1}. Reddy *et al.* (2011) found that application of FYM 10 t ha^{-1} + bio-digester liquid manure (equivalent to 30 kg N ha^{-1}) in two splits produced significantly maximum yield of groundnut, red gram and soybean (1362, 2035 and 881 kg ha^{-1}, respectively) at Balajigapade. Shete *et al.* (2011) obtained higher seed yield (964.3 kg ha^{-1}) and haulm yield (2229.7 kg ha^{-1}) of greengram with FYM at 5 t ha^{-1} over control. Further, 30 years long term field trial at Rodale institute, Kutztown, USA revealed that organic system gave higher or equal yields of soybean when compared with that of inorganic system (*Anon* 2011).

Protein content and protein yield

Grain protein is important in human and animal nutrition. Protein content of field bean seed was not significantly influenced by the combinations of farmyard manure and bio-digester liquid manure. Whereas, protein yield of field bean differed significantly. Higher protein yields (289.6 and 275.3 kg ha^{-1}) were obtained by the application of recommended practice (FYM 7.5 t + 25:50:25 N:P_2O_5:K_2O kg ha^{-1}) and FYM 10 t + BDLME to 35 kg N ha^{-1}, respectively as compared to other treatment combinations (Table 5). The increased protein yield could be attributed to higher seed yield, besides the vital role played by micronutrients present in organic manures in the synthesis of plant hormones, chlorophyll formation and carbohydrate and in auxin metabolism. Further, the beneficial effect exhibited by FYM when it was applied in conjunction with liquid organic manures could possibly be due to synergistic role of FYM in increasing the nutrient availability, physical structure of soil, microbial environment and sustaining it over a period of time as compared to chemical fertilizer

Table 5. Protein content and protein yield of field bean as influenced by FYM and bio-digester liquid manure.

Treatments	Protein content (%)			Protein yield (kg ha^{-1})		
	2010	2011	Pooled	2010	2011	Pooled
T_1	22.1	23.6	22.8	156.9	179.8	168.0
T_2	23.6	23.9	23.7	171.3	190.0	180.6
T_3	22.8	23.1	22.9	180.4	212.7	196.5
T_4	23.3	23.5	23.4	190.1	221.9	206.0
T_5	23.8	24.0	23.9	177.6	202.6	190.1
T_6	23.6	24.0	23.8	181.0	197.5	189.3
T_7	24.2	24.6	24.4	199.2	238.9	219.0
T_8	23.9	24.4	24.1	196.4	247.6	222.0
T_9	24.1	24.5	24.3	191.1	216.0	203.6
T_{10}	24.1	24.7	24.4	192.4	221.3	206.9
T_{11}	24.1	24.8	24.4	231.1	289.3	260.2
T_{12}	25.0	25.2	25.4	242.8	307.8	275.3
T_{13}	25.4	25.5	25.5	268.7	310.6	289.6
T_{14}	23.1	22.8	22.9	73.7	80.9	77.3
SEm±	1.17	0.99	1.07	10.9	10.4	11.2
CD at 5%	NS	NS	NS	31.6	30.2	31.8

T_1 : FYM 5 t + BDLME to 20 kg N ha^{-1} T_6 : FYM 7.5 t + BDLME to 25 kg N ha^{-1} T_{11} : FYM 10 t + BDLME to 30 kg N ha^{-1}
T_2 : FYM 5 t + BDLME to 25 kg N ha^{-1} T_7 : FYM 7.5 t + BDLME to 30 kg N ha^{-1} T_{12} : FYM 10 t + BDLME to 35 kg N ha^{-1}
T_3 : FYM 5 t + BDLME to 30 kg N ha^{-1} T_8 : FYM 7.5 t + BDLME to 35 kg N ha^{-1} T_{13} : FYM 7.5 t + 25:50:25 kg N:P_2O_5:K_2O ha^{-1}
T_4 : FYM 5 t + BDLME to 35 kg N ha^{-1} T_9 : FYM 10 t + BDLME to 20 kg N ha^{-1} T_{14} : Absolute control
T_5 : FYM 7.5 t + BDLME to 20 kg N ha^{-1} T_{10} : FYM 10 t + BDLME to 25 kg N ha^{-1} BDLME - Bio-digester liquid manure equivalent
FYM - Farmyard manure NS – Non-significant

alone.

These results are in concordance with the findings of Sharma and Mishra (1997) and Singh *et al.* (2003). Further, Jayaram Reddy and Reddy (2011) analyzed the organically grown seed samples of field bean (HA-4) at Balajigapade for its quality parameters and found that seed contains protein, fat, fibre, ash, Ca and Fe to the tune of 25.2, 0.57, 8.97, 3.2, 49.7 and 1.62 g per 100 g of seed, respectively. While, Anand (2003) reported that quality parameters of groundnut *viz*. oil percentage, oil yield, protein content and protein yield were higher (48 %, 777 kg ha^{-1}, 23.4 % and 378 kg ha^{-1}, respectively) with the application of FYM 10 t + 25:75:37.5 N:P_2O_5:K_2O kg ha^{-1}.

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