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Study on Residual Effect of FYM and Graded Levels of Inorganic Fertilizers Applied to Proceeding Crop of Browntop Millet on Growth and Yield of Succeeding Crop of Field Bean

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ABSTRACT

The present investigation was carried out to evaluatethe residual effect of FYM and graded levels of inorganic fertilizers applied to proceeding crop of browntop millet on growth and yield of succeeding crop of field bean. Immediately after harvesting of browntop millet, field bean was cultivated as succeeding crop without applying any fertilizers and FYM. The study was done as field experiment in a randomized complete block design consisting 14 treatments with three replication. The treatments included two levels of N and P_2O_5 (20 and 30 kg ha^{-1}) and three levels of K_2O (10, 20 and 30 kg ha^{-1}). Farm yard manure was applied at the rate of 6.25 t ha^{-1} to all the treatments except absolute control. The results indicated that growth parameters like plant height, number of branches per plant at 30 DAS, 60 DAS at harvest and yield parameters like number of pods per plant, test weight, seed yield, haulm yield and harvest index were significantly higher in 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} with farm yard manure.

Keywords : Residual effect, Major nutrients, Growth and yield, Field bean

PULSES are second most important group of crops after cereals and field the third most important leguminous plant after soybeans (*Glycine max* L.) and peas (*Pisum sativum* L.) (Singh *et al.*, 2013). According to FAO-Stat data, the biggest field bean producing countries depending on production quantity in 2016 were China, Ethiopia and Australia. Field bean (*Dolichos lablab*) is a multiple crop grown for pulse, grain and forage. The crop is grown for its green seeds, whereas dry seed is used in different preparations of grain foods. This is also grown in the kitchen garden and as a seasonal crop in farm fields. This contains larger amounts of fiber and is one of the main protein sources in the diets of India's southern states. The major production states are Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, West Bengal, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Maharashtra. This can be cultivated in several soil types with pH ranging from 4.4 to 7.8 as a legume, it can remove 170 kg ha^{-1} of ambient nitrogen in addition to having ample seed residues to fill the soil with organic matter. As a pure crop, seed yields are around 12 to 15 q ha^{-1}, whereas in intercrop condition, the yields are around 4-5 q ha^{-1}. In garden types, the green pod yield is 26-45 q ha^{-1}. Its green pods and dry grains are highly nutritive in nature and are rich in carbohydrates (6.7 g), protein (3.8 g), fat (0.7 g), minerals (0.9 g), magnesium (34.0 g), calcium 210 mg), phosphorus (68.0 mg), sodium (55.4 mg), iron (1.7 mg), potassium (74.0 mg), sulphur (40.0 mg), vitamin A (312 I.U), riboflavin (0.06 mg) and vitamin C (9.0 mg) nicotinic acid (0.7 mg) and fibre (1.8 g) per 100 g of edible portion.

Indiseminate use of inorganic fertilizer causes environmental and human health problems. Hence, the farmers have been practices with eco-friendly cultivation and organic manure added to soil increase the supply of plant nutrients. Use of organic manure in effective manner can serve as substitute for chemical fertilizer without detrimentally yield reduction and can serve to stabilize global crop prices. Organic manures are valuable input in crop production and can be used as organic fertilizer which contains major and minor elements needed to plant growth.

In a cropping system, response of the succeeding crop is influenced by the proceeding crop and inputs applied. Organic manure added to soil leaves substantial amount of residual nutrients to succeeding crop beside, it supplying nutrients to the current crop. Some studies have been reported that organic manures have significance residual effects on the soil and succeeding crop. Hence, present investigation was carried out to study the residual effect of FYM and graded levels of inorganic fertilizers applied to proceeding crop of browntop millet on growth and yield of succeeding crop of field bean.

MATERIAL AND METHODS

Experimental Site

In order to study the **r**esidual effect of FYM and graded levels of inorganic fertilizers applied to proceeding crop of browntop millet on growth and yield of succeeding crop of field bean in *Alfisols* of Chikkaballapura district, which comes under Eastern dry zone of Karnataka during 2017-18.

Present field experimentwas conducted at ARS, Baljigapade, Chikkaballapura *Alfisols* (Fig. 1) during rabi 2017-2018 and the field was located at 77.7° East longitude and 13.4° North latitude from the mean sea level. Prior to laying out the experiment, composite soil samples were drawn from a depth of 0-15 cm depth and analyses for physical and chemistry characteristics. The initial properties of the experimental soil are presented in the Table 1. The soil was sandy clay loam in texture, low in organic

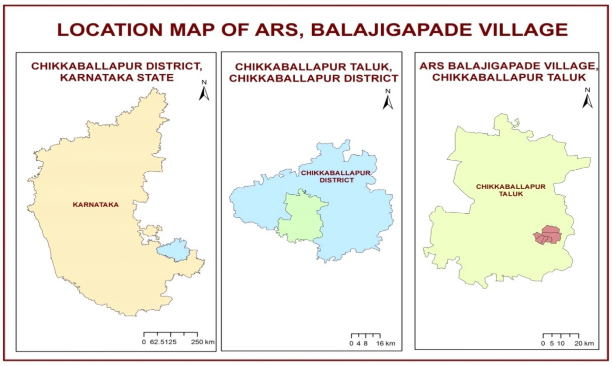

Fig. 1 : Location of the experimental study area at ARS, Baljigapade village, Chikkaballapurtaluk and district of Karnataka

TABLE 1

Initial physico-chemical properties of the experimental soil

Parameter	Value
Physical Properties	
Sand (%)	64.49
Silt (%)	08.95
Clay (%)	25.14
Textural class	Sandy clay loam
Maximum Water Holding Capacity (%)	32.09
Bulk density (g cm^{-3})	1.39
Chemical properties	
$pH_{1:2.5}$	5.62
$EC_{1:2.5}$ (dS m^{-1})	0.34
Organic carbon (%)	0.48
Available N (kg ha^{-1})	125.20
Available P_2O_5 (kg ha^{-1})	11.47
Available K_2O (kg ha^{-1})	138.85
Exchangeable Ca (c mol kg^{-1})	4.17
Exchangeable Mg (c mol kg^{-1})	1.88
Available S (mg kg^{-1})	20.33
DTPA Fe (mg kg^{-1})	14.98
DTPA Zn (mg kg^{-1})	0.47
DTPA Mn (mg kg^{-1})	4.08
DTPA Cu (mg kg^{-1})	0.34
Hot water soluble Boron (mg kg^{-1})	0.39

carbon (0.48 %), available nitrogen (125.20 kg ha^{-1}), phosphorus (11.47 kg ha^{-1}) and potassium (138.85 kg ha^{-1}) with acidic reaction (5.62) .The soil was low in DTPA extractable zinc (0.47 mg kg^{-1}) and boron (0.39 mg kg^{-1}). Olsen's method (Watanabe and Olsen, 1965), Neutral normal ammonium acetate extract using flame photometer (Hanway and Heidel, 1952) and Walkely and Black method (Jackson, 1967) for the determination of available nitrogen (N), phosphorus (P_2O_5) potassium (K_2O) and organic carbon, respectively. The pH of experimental site was determined through 1:2.5 soil and water suspension method (Jackson, 1967). There is no recommendation of NPK and micronutrients for brown top millet according to package of practices of (University of

Agricultural Sciences, Bangalore). In the recent years, research is being conducted, to work out the recommendation of major and micro nutrients for the millets. Hence, the present work was focused to study residual effect of FYM and graded levels of inorganic fertilizers applied to proceeding crop of browntop millet on growth and yield of succeeding crop of field bean.

Treatment Details

The previous field experiment was conducted by using FYM and inorganic fertilizers to the proceeding crop. The experiment was laid out in the randomized complete block design with fourteen treatments and three replications. Farm yard manure (FYM) was applied at the rate of 6.25 t ha^{-1} to all treatments except absolute control. The organic manure (FYM) were also analysed and given in the Table 2. Recommended dose of N, P_2O_5 and K_2O were given in the form of urea, single super phosphate and muriate of potash, respectively as basal dose at the time of sowing and recommended dose of FYM was applied before 15 days of sowing of the crop. Field bean cultivated as a succeeding crop. The residual field bean seeds were sown on 24th December 2018 at the rate of 25 - 30 kg ha^{-1} in the same plots without disturbing the layout to know the residual effect of main treatments on the subsequent crops. The rhizobium and phosphorus solubilizer treated, 2-3 seeds were sown with the spacing of 30 cm between the rows and 10 cm between the plants. Gap filling was done after one week of sowing in places where seeds failed to germinate and where excess seeds were sown thinning was done at 15 DAS to maintain optimum plant population, finally one healthy seedling was maintained. Irrigation was given after sowing of field bean seeds to initiate the optimum germination and subsequently irrigation was given at an interval of 7 - 8 days to maintain moisture for crop growth. The plots were hand weeded twice

TABLE 2

Nutrient content of FYM used in the experiment

Parameters	2018	Methods	References
pH	7.55	Potentiometric method	Jackson, 1973
EC (d S m^{-1})	0.57	Conductometric method	Jackson, 1973
Nitrogen (%)	0.61	Kjeldahl digestion and distillation method	Piper, 1966
Phosphorus (%)	0.20	Diacid digestion and colorimetry using vanadomolybdate reagent	Piper, 1966
Potassium (%)	0.54	Diacid digestion and Flame Photometer method	Piper, 1966
Calcium (%)	0.50	Diacid digestion and Versenate titration	Piper, 1966
Magnesium (%)	0.16	Diacid digestion and Versenate titration	Piper, 1966
Sulphur (%)	0.21	Diacid digestion and Turbidometry	Piper, 1966
Iron (mg kg^{-1})	511.25	Diacid digestion and Atomic Absorption Spectrophotometer method	
Manganese (mg kg^{-1})	164.5	Diacid digestion and Atomic Absorption Spectrophotometer method	Lindsay and Norvell, 1978
Copper (mg kg^{-1})	25.13	Diacid digestion and Atomic Absorption Spectrophotometer method	
Zinc (mg kg^{-1})	19.74	Diacid digestion and Atomic Absorption Spectrophotometer method	
Boron(mg kg^{-1})	6.35	Diacid digestion and colorimetry using Azomethane-H reagent with Continuous flow analyzer	Page *et al.,* 1982

to keep them free from weeds and earthling up after each weeding to loosen the top soil. Since there were no insect and disease incidence, pesticides were not used for plant protection. The crop was harvested by hand picking of pods, when it attained physiological maturity by turning to light yellow colour. The harvested pods were dried, threshed and winnowed to separate the seeds. The seed weight was recorded and haulm weight was also recorded after sun drying. The growth parameters includes plant height and number of branches per plant were recorded at 30, 60 DAS and at harvest, whereas yield and yield parameters includes number of pods per plant, test weight, seed yield and haulm yieldwere recorded at harvest and also harvest index were calculated.

Statistical Analysis

Immediately after harvesting of browntop millet, field bean crop were selected as succeeding crop. Agronomic practices except nutrient management were followed according to the recommendation. The growth observations recorded during the course of investigation were tabulated and analyzed statistically to draw a valid conclusion. The data were analyzed as per the standard procedure for 'Analysis of variance' (ANOVA) as described by Gomez and Gomez (1984). The significance of treatments was tested by RCBD design. Standard error of mean (S.Em±) was computed in all cases. The difference in the treatment mean were tested by using critical difference (CD) or least significant difference (LSD) at five per cent level of probability.

Results and Discussion

Data on the residual effect of different NPK levels on field bean plant height recorded at different growth stages (30 DAS, 60 DAS and harvest) are shown in Table 3 and depicted graphically in Fig. 2.

Significantly higher plant height were recorded with treatment of 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} + 6.25 t ha^{-1} FYM (T_{14}) and plant height of 22.24 cm, 45.64 cm and 58.80 cm was measured at 30 DAS, 60 DAS and at harvest of field bean, respectively.

TABLE 3

Residual effect of different levels of NPK on plant height of field bean in browntop millet-field bean cropping sequence

Treatments	Plant height (cm)		
	30 DAS	60 DAS	At harvest
T_1: Absolute control	19.81	38.14	48.76
T_2: 20 kg N+20 kg P_2O_5 ha^{-1}	20.24	40.43	51.33
T_3: 20 kg N+20 kg P_2O_5+ 10 kg K_2O ha^{-1}	20.52	40.53	54.17
T_4: 20 kg N+20 kg P_2O_5+ 20 kg K_2O ha^{-1}	20.94	42.02	54.27
T_5: 20 kg N+20 kg P_2O_5+ 30 kg K_2O ha^{-1}	21.09	42.59	52.47
T_6: 20 kg N+30 kg P_2O_5+ 10 kg K_2O ha^{-1}	20.64	41.93	54.87
T_7: 20 kg N+30 kg P_2O_5+ 20 kg K_2O ha^{-1}	21.05	42.82	54.93
T_8: 20 kg N+30 kg P_2O_5+ 30 kg K_2O ha^{-1}	21.24	39.57	57.53
T_9: 30 kg N+20 kg P_2O_5+ 10 kg K_2O ha^{-1}	21.26	41.08	57.73
T_{10}: 30 kg N+20 kg P_2O_5+ 20 kg K_2O ha^{-1}	21.30	44.05	57.80
T_{11}: 30 kg N+20 kg P_2O_5+ 30 kg K_2O ha^{-1}	21.56	44.94	58.07
T_{12}: 30 kg N+30 kg P_2O_5+ 10 kg K_2O ha^{-1}	21.40	43.06	54.53
T_{13}: 30 kg N+30 kg P_2O_5+ 20 kg K_2O ha^{-1}	21.36	43.54	52.67
T_{14}: 30 kg N+30 kg P_2O_5+ 30 kg K_2O ha^{-1}	22.24	45.64	58.80
S.Em±	0.35	1.25	2.32
CD @ 5 %	1.00	3.62	6.81

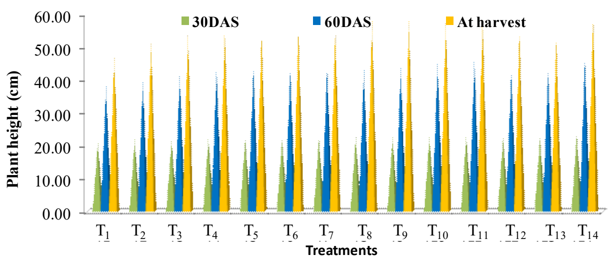

Fig. 2: Residual effect of different levels of NPK on plant height of field bean in browntop millet-field bean cropping system

Which, followed by (T_{11}) 30 kg N + 20 kg P_2O_5 + 30 kg K_2O ha^{-1} + 6.25 t ha^{-1} FYM with the plant height of 21.56 cm (30 DAS), 44.94 cm (60 DAS) and 58.07 cm (at harvest) and both are statistically on par with each other. The least plant height (19.33 cm, 36.88 cm and 47.82 cm at 30 DAS, 60 DAS and at harvest, respectively) was recorded in the absolute control (T_1) without addition of FYM and inorganic source of nutrients.

The plant height increased with an increase in the NPK application rate along with FYM for the earlier crop. The reason for this could be attributed to the presence of relatively higher amounts of NPK in the soil prior to field bean sowing. The residual effect of the fertilizers applied to the previous crop has therefore had a favorable effect on the plant height of the succeeding field bean crop (Gabriel, 2010 and Srinivasa *et al.,* 2019). The improvement of above growth parameters in field bean is associated with increase in NPK in the soil might be due to residual effect of FYM and inorganics application. Better crop growth recorded might be the result of adequate nutrients released by organics as earlier reported by Babaji *et al.* (2011). The residual effect of FYM applied to previous crop of browntop was significant on plant growth of the succeeding crop over no organic manures. Phosphorus is important in root development and translocation of photosynthates, being the constituents of nucleic acid, phytin and phospholipids, its application increased the plant height (Lad *et al.,* 2014). Application of inorganic fertilizers along with organic source (FYM) to previous crop browntop millet increased the nutrient availability to succeeding field bean with increased retention of nutrients by reducing the losses. It is well known fact that, potassium plays a major role in plant metabolism and activates several enzymes which influence the synthesis of carbohydrates and proteins when applied along with nitrogen. Chandrakala *et al.* (2017) reported that increased plant height was due to increased availability of phosphorus near the root system, which contributed to higher nutrient uptake, which increased plant growth by cell division by affecting the synthesis of several growth hormones such as IAA in plants when used with nitrogen, phosphorus and potassium. The similar results were recorded by Fida Hussain *et al.* (2016).

Number of Branches per Plant

The data on number of branches per plant affected by the residual application of different NPK levels are shown in Table 4 and depicted graphically in Fig. 3.

TABLE 4

Residual Effect of different levels of NPK on number of branches per plantof field bean in browntop millet-field bean cropping sequence

Treatments	No. of branches per plant		
	30 DAS	60 DAS	At harvest
T_1: Absolute control	4.33	4.54	5.20
T_2: 20 kg N+20 kg P_2O_5 ha^{-1}	4.94	4.81	5.90
T_3: 20 kg N+20 kg P_2O_5+ 10 kg K_2O ha^{-1}	5.00	5.33	6.04
T_4: 20 kg N+20 kg P_2O_5+ 20 kg K_2O ha^{-1}	5.07	5.53	6.15
T_5: 20 kg N+20 kg P_2O_5+ 30 kg K_2O ha^{-1}	5.34	6.10	6.58
T_6: 20 kg N+30 kg P_2O_5+ 10 kg K_2O ha^{-1}	5.44	5.50	6.78
T_7: 20 kg N+30 kg P_2O_5+ 20 kg K_2O ha^{-1}	5.60	5.80	6.43
T_8: 20 kg N+30 kg P_2O_5+ 30 kg K_2O ha^{-1}	5.94	6.30	6.62
T_9: 30 kg N+20 kg P_2O_5+ 10 kg K_2O ha^{-1}	6.27	6.33	6.88
T_{10}: 30 kg N+20 kg P_2O_5+ 20 kg K_2O ha^{-1}	6.50	6.80	7.02
T_{11}: 30 kg N+20 kg P_2O_5+ 30 kg K_2O ha^{-1}	6.64	7.63	7.69
T_{12}: 30 kg N+30 kg P_2O_5+ 10 kg K_2O ha^{-1}	6.34	6.65	6.83
T_{13}: 30 kg N+30 kg P_2O_5+ 20 kg K_2O ha^{-1}	6.40	7.00	7.60
T_{14}: 30 kg N+30 kg P_2O_5+ 30 kg K_2O ha^{-1}	7.14	7.67	7.84
S.Em±	0.37	0.16	0.29
CD @ 5 %	1.08	0.46	0.84

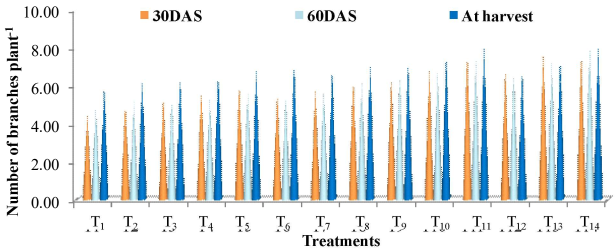

Fig. 3: Residual effect of different levels of NPK on number of branches per plant of field bean in browntop millet-field bean cropping system

Number of branches per plant varied significantly at 30 DAS, 60 DAS and at harvest stage as influenced by application of different levels of NPK. Maximum number of branches of 7.70, 7.98 and 8.15 were recorded in T_{14} (30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} + 6.25 t ha^{-1} FYM) at 30 DAS, 60 DAS and at harvest, respectively and on par with T_{11} (7.67, 7.39, 8.03) and T_{13} (7.63, 7.25, 7.37) at 30 DAS, 60 DAS and at harvest, respectively. Minimum number of branches (4.46, 4.14 and 4.94) were recorded in T_1 where without application of inorganic fertilizers and FYM plot at 30 DAS, 60 DAS and at harvest, respectively. Maximum number of branches per plant was found in T_{14} with the application of 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} due to increased availability of nutrients and it has been amply established that NPK are the major mineral nutrients required for growth and development of plants. Adequate NPK might have helped in harvesting of solar energy as reflected by increased growth of succeeding crop field bean. The application of NPK together with FYM may have contributed to the proper distribution of assimilates in the plant system and the residual nutrients left over after harvesting of foxtail millet may have increased its availability for improved crop growth (Srinivasa *et al*., 2019).

There was a significant effect of NPK on number of pods per plant (Table 5) due to application of NPK along with FYM application. Increasing NPK levels resulted in an increased number of pods per plant, which resulted in a maximum of 17.52 pods per plant for application of 30 kg N + 30 kg P_2O_5 + 30 kg K_2O

TABLE 5

Effect of different levels of NPK on yield and yield components of field bean

Treatments	Number of pods per plant	Test Weight (g)	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Harvest Index
T_1	13.07	16.36	226.81	231.84	0.39
T_2	13.61	16.57	267.97	266.83	0.47
T_3	13.70	16.69	279.66	297.60	0.48
T_4	13.91	16.38	312.77	322.38	0.49
T_5	14.19	16.46	322.37	331.59	0.50
T_6	14.21	16.66	333.56	337.60	0.51
T_7	14.36	16.76	347.17	339.83	0.51
T_8	14.50	15.93	364.52	352.49	0.52
T_9	14.94	16.26	422.43	362.66	0.54
T_{10}	15.71	16.17	440.68	371.60	0.54
T_{11}	16.72	17.61	471.23	377.38	0.56
T_{12}	15.23	15.80	342.35	363.49	0.55
T_{13}	15.75	17.21	418.59	367.94	0.55
T_{14}	17.30	17.90	523.57	404.58	0.56
S.Em±	0.11	0.13	12.54	13.83	0.01
CD @ 5 %	0.35	NS	36.33	40.18	NS

ha^{-1} with 6.25 t ha^{-1} of FYM (T_{14}) followed by 16.93 pods plant^{-1} with the application of 30 kg N + 30 kg P_2O_5 + 10 kg K_2O ha^{-1} with 6.25 t of FYM (T_{11}). Significantly least number of pods per plant (12.85) recorded in absolute control (T_1). Among the yield components, the number of pods per plant was the most important factor determining the yield of the filed bean due to its higher and more consistent correlation with the yield of the field bean. The number of pods plant^{-1} is genetically controlled and is also strongly influenced by management practices such as N, P and K fertilization. Nitrogen plays an important role in the metabolism of plants which enhances vegetative development. Phosphorus acts as an energy transferring agent within the plant play an essential role in physiological and biochemical processes such as photosynthesis and respiration. Potassium also has various important physiological functions contributing to plant growth and seed yield, such as photosynthesis, enzyme activity.

The highest seed yield (527.97 kg ha^{-1}) was obtained from (T_{14}) 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} + 6.25 t ha^{-1} FYM as compared to the absolute control (T_1: 222.41 kg ha^{-1}) without application of fertilizers and FYM (Table 5 and depicted graphically in Fig. 4). Among the NPK levels, the highest seed yield was recorded for the plot treated with the highest NPK level (30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} (T_{14}), followed by T_{10} (475.62 kg ha^{-1}), T_{12} (445.08 kg ha^{-1}) and T_{13} (443.92 kg ha^{-1}) as compared to the T_1 without application of NPK and FYM, which recorded the seed yield of 222.41 kg ha^{-1}. Nutrient availability led to increase in plant height, higher dose of nitrogen, phosphorus and potassium in addition with FYM

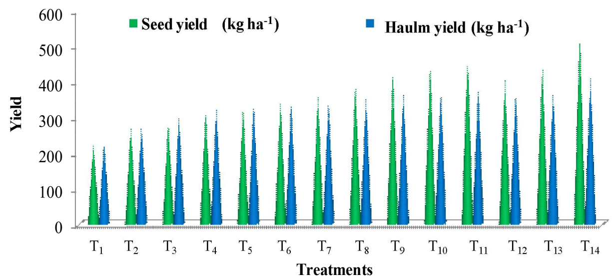

Fig. 4: Residual effect of different levels of NPK on seed and haulm yield of field bean in brown top millet-field bean cropping system

resulting in an increasing in the number of pods. The nitrogen consumption increased resulting in increased plant dry weight and yield. The use of potassium-free nitrogen fertilizer had no effect on vegetative growth and yield parameters. These findings are consistent with Ghallab *et al.* (2014), which found that the highest overall yield of green pods was achieved by the use of both nitrogen and potassium.

Nitrogen, phosphorus and potassium treated plots were recorded significantly higher yields of biomass (T_{14}; 408.01 kg ha^{-1}) than (T_1) absolute control (228.40 kg ha^{-1}) (Table 5 and depicted graphically in Fig. 4). The highest haulm yield (408.01 kg ha^{-1}) was recorded with the application of 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} + 6.25 t ha^{-1} FYM (T_{14}) followed by T_{11} (380.81 kg ha^{-1}) and which was on par with one another. Haulm yield increased with increased NPK levels along with FYM. Increased levels of NPK up to 30 kg ha^{-1}, increased dry matter in field bean. In contrast to browntop millet yield parameters, the residual effect of different NPK fertilizer levels on field bean yield parameters *viz.,* number of pods plant^{-1} and 100 seed weight were higher in T_{14} with the application of 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} and which may be attributed to the slow and steady nutrient releasing capacity of organics which had only 45 to 50 per cent impact on first crop but a good residual effect on the second crop. Whereas, the lowest harvest index (0.41) was recorded in the absolute control (T_1) might be due to no fertilizer and no FYM. Also noted that the application of FYM and poultry manure combined with 50 per cent NPK had a major residual impact on cowpea pod yield over inorganic fertilizer alone. Recorded that on average one ton of organic manure supplied around 5-8 kg of N and K and 2 kg of P. They also stated that about one third of total N, half of total P was available for the first crop and the remaining of N and P is available for the next crop as residual effect.

Non-significant effects of nitrogen, phosphorus and potassium levels were noted on hundred field bean seed weight (Table 5). Owing to the application of graded levels of NPK test weight of field bean (100 seeds) ranges from 16.25 g to 18.44 g, but was found to be negligible. Nitrogen, phosphorus and potassium being a quantity and quality nutrient not influenced the test weight may be due to equal proportion of phosphorus application exhibited the similar effect on cell division. Such results are in line with the Saket *et al*. (2018) findings.

Based on the results obtained, combined application of farm yard manure and inorganic fertilizer, gave significantly positive residual effects on growth parameters *i.e.,* plant height and number of branches and yield component *i.e.,* number of pods per plant and improved seed yield, haulm yield and test weight of field bean than that of the control. Incorporation of farm yard manure and inorganic fertilizer to the previous crop managed to increase field bean yield without additional any fertilizer. Among the treatments applied, the combined application of farm yard manure + 30 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1} (T_{14}) increased field bean yield. In addition, residual FYM and crop residue from the previous crop can improve soil nutrient.

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