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Compromising with Expensive NPK Fertilizer by Cheapest Farmyard Manure with respect to the Yield Components of Black gram (*Vigna mungo L.*) Hepper

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ABSTRACT

A laboratory experiment was conducted in Jinnah University for women, Karachi to evaluate the manural potential of farmyard manure (FYM), vis-a-vis 25%, 50% and 100% doses of commercial rate NPK (i.e 120:60:30) to find out the most productive cropping system at various strength of chemical fertilizers and organic manures with respect to the growth of black gram (Vigna mungo L.). Experiment comprised NPK @ 120:60:30 kg ha^{-1}, and NPK @ 100:50:50 kg ha^{-1} along with FYM @ 5 t ha^{-1}. NH_4NO_3, $CaHPO_4$. $2H_2O$, KCL were used as sources of N, P_2O_5 and K_2O respectively. All the growth parameters including Shoot length, Root length, Shoot fresh weight, Shoot dry weight, Root fresh weight and Root dry weight of Black gram was recorded highest at 25% NPK (1/4th strength). Application of FYM @ 5 t ha^{-1} was favored at both strength 1/4th and 1/2th NPK and produced significantly higher growth than all the other single treatments. Therefore, it has been realized that the integrated use of organic and inorganic fertilizers could produced sustainability in intensive production system and improve crop yield and productivity.

Keyword: Inorganic fertilizer; farmyard manure; commercial rate NPK.

INTRODUCTION

Now a day an intensive cropping systems and unbalanced fertilization results in severe depletion of soil fertility with continuous removal of nutrients (Ghosh *et al.*, 2004). Most important factors responsible for the low yield are low soil fertility and poor availability of nutrients in soluble form mainly in the arid and semi-arid soil. In addition, high costs of inorganic fertilizers are making it difficult to use them extensively in developing countries. Researches proved that organic matter is an excellent fertilizer containing N, P, K and other nutrients. It improves soil structure, aeration, moisture-holding capacity, water infiltration and supply sufficient nutrients for optimum plant growth (Reddy *et al.* 2002). It has been suggested that organic manure should be used along or in place of chemical fertilizers to avoid long term negative effects of chemical fertilizers on the soil (Parr *et a*l., 1990). The integrated use of organic and inorganic fertilizers can play a vital role to achieve sustainable productive systems, (Ghosh *et al.*, 2004). Ahmed *et al.* (1998) also indicated that wheat yield increased significantly by the combined use of organic and mineral fertilizers. Hati *et al.* (2001) also found that balanced fertilizers rate in combination with organic manure improve soil physical condition and sustain higher crop productivity. Similar results were obtained by Mandal and Sinha (2004). In the given research, the performance of organic fertilizer for compromising with the expensive inorganic fertilizers was studied with respect to the growth of black gram (*Vigna mungo* L.). The policy led to the minimal usage of expensive commercial fertilizer with the output of quality production. Therefore, higher crop

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productivity could be obtained when inorganic fertilizer was combined with organic manures.

TREATMENTS
T0= Control
T1= NPK 100%
T2= NPK 50%
T3= NPK 25%
T4= NPK 50% +FYM
T5= NPK 25%+FYM

Laboratory Experiment: In this experiment, Petri dish method was used to study the effects of different doses of NPK rate (100%, 50% and 25%), alone and along with FYM extract (i.e.5ton/ha) on the growth parameters of black gram. Ten healthy, chemically sterilized seeds of black gram (*Vigna mungo* L.) were placed in Petri dishes with temperature ranging from 21-25^{0}C. Five ml of each treatment was added daily to three replicate of each treatment plate. The experiment was completely randomized. Distilled water was applied to the control level. The growth parameters including germination rate, shoot length, root length, shoot fresh and dry weight and root fresh and dry weight were recorded after six days of growth. Seedling dry weight was determined by drying the material in an oven at 75^{0}C for 48 hours.

Inhibitory Percentage (I): The percentage of inhibitory effect on shoot and root growth (length, fresh weight, dry weight) in comparison to control was calculated by Surendra and Pota, (1978) formula:

I = 100- T/C x 100 Where, 'I' is the percentage of inhibition, 'T' is the treatment reading and 'C' is the control plant reading.

Data Analysis: The data of all the above mentioned parameters were individually subjected to the analysis of variance techniques (Steel *et al.*, 1997) and the analysis of standard deviation statistically to evaluate the treatment effects through Duncan's Multiple Range Test (DMRT)

Result and Discussion: Fertilizers improves the morphological, physiological and biochemical status of the plant. In the given research, all the growth parameters including SL, RL, SFW, SDR, RFW and RDW of Black gram was recorded highest at 25% NPK (1/4th strength). Application of FYM @ 5 t ha^{-1}, to compensate the low strength of NPK, was favored at both 25% and 50% NPK and produced significantly higher growth in gram than all other single treatments. Beneficial effects of combined use of organic and inorganic fertilizer in increasing the crop yields as well as maintaining the soil fertility on long-term basis had also been reported by Mishra *et al*. (1990). Similar findings were also reported by Tiwari & Parihar (1992), Ramesh *et al*., (1999), Gorttappeh *et al*., (2000), and Saeed *et al*., (2002), who also observed that organic manure alone or in combination with synthetic fertilizers significantly increased the crop yield. Similarly, a distinguishable result was also observed by Ghosh *et al.*, 2004 who applied FYM @ 5 t ha^{-1} along with 75% NPK for wheat and soybean crops.

Table: Effects of NPK 120:60:30 (alone or along with FYM) on Black gram

	TREATMENT	Shoot length (cm)	Root length (cm)	Shoot fr.wt (gm)	Root fr.wt (gm)	Shoot dry wt. (gm)	Root dry wt. (gm)
T0	Control	8.83 f** (0)	5.1 f (0)	0.742 d (0)	0.12 c (0)	0.102 d (0)	0.0223 c (0)
T1	100% NPK	10.6 e (+20.04)*	6.1 c (+19.6)	0.67 e (-9.7)	0.11 d (-16.6)	0.1 e (-1.96)	0.0218 d (-2.01)
T2	50% NPK	11.4 d (+29.10)	5.53 e (+8.43)	0.6 f (-19.1)	0.09 f (-25)	0.05 f (-50)	0.0204 f (-8.52)
T3	25% NPK	11.5 c (+30.23)	5.9 d (+15.6)	1.15 b (+54.9)	0.13 b (+8.3)	0.12 b (+17.6)	0.0253 b (+13.4)
T4	50% NPK + FYM	12.5 a (+41.56)	7.2 a (+41.1)	0.97 c (+30.7)	0.10 e (-16.6)	0.11 c (+7.84)	0.0215 e (-3.58)
T5	25% NPK + FYM	11.9 b (+34.76)	6.5 b (+27.4)	1.24 a (+67.1)	0.2 a (+66.6)	0.16 a (+56.8)	0.027 a (+21.97)

*Values in parenthesis indicate percent increase (+) or decrease (-) over control.

**Means followed by different letters show significant result at the level of Standard deviation.

Shoot length (cm): Table-1 showed that the 25% strength of 120:60:30 NPK dose was more effective

(+30.23%) for SL than full i.e. 100% (+20.04%) and half i.e. 50% strength (+29.10%) over control. But the addition of FYM at 25% strength was less supportive (+34.76% over control) than at 50% strengths which gave the maximum SL over all treatments i.e (+41.56%).

Root length(cm): Table-1 showed that, the increase in RL was more at 25% strength (+15.6) than 50% strength (+8.43), although full strength gave the maximum increased (+19.6) over the both low strength. The addition of FYM at both strength improved RL over NPK alone i.e (+41.1 % at ½th strength and +27.4 % at ¼th strength).

Shoot fresh weight (gm): SFW was maximum at 25% strength (i.e 54.9%), which was more than half strength and the effect was probably due to the more water absorption from surrounding dilute solution. The substitution with FYM supported both NPK strengths (table-1), markedly at 25% strength and increased the SFW up to + 67.1%.

Shoot dry weight (gm): SDW was also maximum at 25% strength (i.e 17.6 %) over half & full strength of NPK dose similarly, addition of FYM along with both low strength was beneficial and increased the SDW from +17.6 % to +56.8 % at 25 % strength & +7.84 % at 50% strength over control.

Root fresh weight (gm): The value of RFW at 25% NPK dose (i.e +8.3 % over control) was significantly higher than 50% NPK dose (table-1) which was due to more absorption of water from the surrounding solution with less amount of soluble solute. The addition of FYM was also significant along both strength and enhanced the RFW from + 8.3 5 to + 66.6% at 25 % strength and to reduce the inhibitory effects from -25.5% to -16.6% at 50 % strength.

Root dry weight (gm): Table-1 showed that the 25% strength was again beneficial for root dry weight up to +13.4 % over control and the value was raised to +21.97% with FYM addition. This addition of FYM was also useful at half strength NPK treatment to reduce the decrease in root dry weight from -8.52% over control to -3.58% % over control.

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