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Vinod Kumar Prajapati
Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University), Allahabad, Utter Pradesh, India

Narendra Swaroop
Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University), Allahabad, Utter Pradesh, India

Reena Lakra
Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University), Allahabad, Utter Pradesh, India

Correspondence
Vinod Kumar Prajapati
Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University), Allahabad, Utter Pradesh, India

Short Note

Effect of different levels of NPK and vermicompost on maize [*Zea mays* (L.)]: An economic analysis

Vinod Kumar Prajapati, Narendra Swaroop and Reena Lakra

Abstract
The field experiment was carried out at soil science research farm of Sam Higginbottom institute of Agriculture, Technology and Sciences (deemed- to- be university) Allahabad, during *Kharif* season 2015-16. The design applied was 3x3 factorial randomized block design having three factors with three levels of NPK @ 0%, 50%, and 100 % ha^{-1}, three levels of Vermicompost @ 0% &, 50% and 100% ha^{-1} respectively. The maximum total cost of cultivation (₹ 38784.04 ha^{-1}) and the maximum net return (₹ 41, 64196 ha^{-1}) was computed in T_8 (N:P:K 120:60:60 kg ha^{-1} +Vermicompost 10 t ha^{-1}) while the maximum net return ₹ invested (1:2.55) was recorded in T_6 (N:P:K 120:60:60 + Vermicompost 0 % t ha^{-1}). There should be a chance of better yield and net income, suggested all operations will be performing time for this crop, because time is very important factor and play great role for greater yield and its quality, before time or after time any operations in the field of agriculture production and quality will goes down. It was found to be significant among other treatments in maize cultivation and soil quality improvement. It was also revealed that the application of NPK with Vermicompost were excellent source for fertilization than fertilizers.

Keywords: NPK and Vermicompost, economics analysis content, *etc.*

Introduction
Maize (*Zea mays* L.) belongs to Gramineae family maize is considered as the native to the Central America & Mexico where many diverse types of maize are found Rai (2006) [7]. Maize is one of most important cereal crop in the world agriculture Economy both as food for man and feed for animal. It is a miracle crop. It has very high yield potential. There is no cereal on the earth which has so immense potentiality and that is why it is called "queen of cereals" maize is grown in almost all the states of India.Maize grain contains about 10% protein, 4% oil, 70% carbohydrate 2.3% crude fiber, 10.4% aluminizes, 1.4% ash. Maize protein 'Zein' is in tryptophan and lysine two essential amino acids Singh *et al.*, (2008) [2]. Maize (*Zea mays* L.) rank third after wheat and rice and is grown all over the world in a wide range of climatic conditions. Being highly cross pollinated, maize has become highly polymorphic through the course of natural and domesticated evolution and thus contains enormous variability in which salinity tolerance may exist Paterniani (2009). In addition to meeting the food requirement of human and livestock, maize is put to many industrial uses. It is a well known fact that the yield potential of a crop is mainly dependent upon its genetic makeup as well as the environment in which it is grown. The genetic potential however, can be exploited to the maximum by providing favorable growth environments. The climatic conditions and existing varieties in our country are highly favorable for increasing production of maize. Fertilizer play an important role in increasing the maize yield and their contribution is 40-45 percent. Balanced and optimum use of nitrogen, phosphorus & potassium and Vermicompost fertilizers play pivotal role in increasing the yields of cereals. Though the yield potential of our present varieties is high enough, but it has not been explored fully due to some production constraints. Among the limiting factors; proper level and ratio of nitrogen, phosphorus & potassium and Vermicompost are of prime importance. Moreover the nutritional requirements of approved varieties must also be investigated. Keeping in view the above facts the present study was undertaken to determine the effect of nitrogen, phosphorus & potassium and Vermicompost on growth and yield parameters of maize grown under central Punjab conditions. The application of vermicompost helps to improves and conserves the fertility of soil.

Vermicompost imparts a dark colour of the soil and thereby help to maintain the temperature of soil. Vermicompost is one of the manure used by the farmer in growing crops because of early availability and presence of almost all the nutrients required by plants. The composition of vermicompost is 0.6-1.2% N, 0.13-0.22% P and 0.40-0.75% K Pawar. (2007) [6]. Vermicompost are organic materials broken down by interactions between micro-organism and earthworms in a hemophilic process, to produce fully stabilize organic soil amendments with low C: N ratios Ramasamy *et al.* (2011) [8]. The growth of crop depend mainly on the soil fertility, macro and micro nutrients, like all other crops maize plants, also require at least 17 essential nutrients to grow and produce grain among these nitrogen (N) phosphorus (P) potassium & (K) are the major nutrient. Nitrogen is a most important element for the synthesis of protoplasm, which is responsible for rapid cell division (plant shape and size). It increased the production of grain yield in maize as well as it is important for the quality of produce like increase proteins in grain. It increases utilization of P and K to an appreciable extent Singh *et al. (*2008) [2]. Phosphorus plays a *vital* role in photosynthesis, respiration, energy storage transfer cell division, cell elongation and several other processes in living plants. Phosphorus is also a structural component of the cell constituents and metabolically active compound Ahmad *et al.* (2004) [1]. Potassium maintains the cellular organization by regularity the permeability of cellular membrane and keeping the protoplasm in a proper degree of hydration by stabilizing the emulsion of highly colloidal particles. Thus help in maintaining turgor pressure and eliminates water imbalance in plants Singh *et al.* (2003) [9].

Material and Methods

A field Experiment was conducted on research farm of department of Soil Science, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture**,** Technology & Sciences (Deemed-to-be-University) Allahabad, (U.P.) India. The soil of experimental area falls in order Inceptisol and the experimental field is alluvial in nature. The design applied for statistical analysis was carried out with 3^2 factorial randomized block design having three factors with three levels of NPK @ 0, 50, and 100% ha^{-1}, three levels of Vermicompost@ 0, 50 and 100% ha^{-1}respectively. Treatments were T_0 – (L_0 V_0) @0 % NPK ha^{-1} + 0% Vermicompost ha^{-1}, T_1 – (L_0V_1) @ 0% NPK ha^{-1} + 50% Vermicompost ha^{-1}, T_2 – (L_0 V_2) @ 0% NPK ha^{-1} + 100% Vermicompost ha^{-1}, T_3 – (L_1V_0) @ 50% NPK ha^{-1} + 0% Vermicompost ha^{-1}, T_4- (L_1 V_1) @ 50% NPK ha^{-1} + 50% Vermicompost ha^{-1}, T_5- (L_1 V_2) @50%NPK ha^{-1} +100%Vermicompost ha^{-1}, T_6 – (L_2 V_0) @ 100% NPK ha^{-1} + 0% Vermicompost ha^{-1}, T_7 – (L_2 V_1) @ 100% NPK ha^{-1} + 50% Vermicompost ha^{-1}, T_8- (L_2 V_2) @ 100%NPK ha^{-1}+ 100% Vermicompost ha^{-1}.having the treatments was replicated thrice.The source of inorganic nutrients sources as Urea, SSP, MOP, and organic nutrients sources as Vermicompost respectively. Basal dose of fertilizer was applied in respective plots according to treatment allocation unifurrows opened by about 5cm. depth before sowing seeds in soil at the same time sowing of seeds was shown on well prepared beds in shallow furrows, at the depth of 5cm, row to row distance was maintained at 20cm and plant to plant distance was 25cm, during the course of experiment, observations were recorded as mean values of the data.

Treatment	Grain yield (q/ha)	Straw yield (q/ha)	Gross return (Rs.)	Cost of cultivation (Rs.)	Net return (Rs.)	C:B:R
T_0	25.11	39.5	47,004	25250	24,754	1:1.86
T_1	28.13	42.7	52,192	30,250	21,942	1:1.72
T_2	28.16	49.78	54,358	35,250	19,135	1:1.54
T_3	32.15	54.78	61,444	27,01752	34,42648	1:2.27
T_4	33.84	55.65	64,071	32,01752	32,05348	1:2.00
T_5	33.84	58.69	64,983	28,01752	36,96548	1:2.31
T_6	39.15	62	73,410	28,78504	41,64196	1:2.55
T_7	41.83	65.25	78,137	33,78404	4435296	1:2.31
T_8	42.77	68.5	80,426	38,78404	44,62496	1:2.07

Results and Discussion

Cost of cultivation was worked out on per hectare basis. Economics of different treatment combination was worked out by taking into account the cost of cultivation and sale value of produce. The gross income and cultivation ₹ $^{-1}$ invested were working out as follows for each treatment combination:

- Gross income (₹ ha^{-1}) = cost of maize seed (₹ ha^{-1}) + cost of straw (₹ ha^{-1}).
- Net return (₹ ha^{-1}) = Gross income (₹ ha^{-1}) – Total cost of cultivation (₹ ha^{-1}).
- Net return (₹ ha^{-1}) invested = Net return (₹ ha^{-1}) / Total cost of cultivation (₹ ha^{-1})

Conclusion

It was concluded that the maximum total cost of cultivation (₹ 38784.04 ha^{-1}) and the maximum net return (₹ 41,64196 ha^{-1}) was computed in T_8 (N:P:K 120:60:60 kg ha^{-1} +Vermicompost 10 t ha^{-1}) while the maximum net return ₹ invested (1:2.55) was recorded in T_6 (N:P:K 120:60:60 + Vermicompost 0 % t ha^{-1}).

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