

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.905.232>

Studies on FYM and Vermi-Compost on Soil Health and Economics Profitability of Organic Fertilizer of Maize (*Zea mays* L.)

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ABSTRACT

Keywords

FYM, Vermi-compost, profitability, soil health and Maize

Article Info

Accepted:

15 April 2020

Available Online:

10 May 2020

Studies on response to organic fertilizer and profitability of organic fertilizer use among small-scale maize producers in Madhya Pradesh under Chitrakoot – Satna condition. Was conducted at the research and instructional farm of the Rajaula Agricultural research farm of the Faculty of Agricultural Sciences, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot during *kharif* 2016 to find out the Effect of F.Y.M. and Vermi-compost on soil health and economics profitability of organic fertilizer of the opted treatment. The experiment was laid out in Randomized Block Design (RBD) having 09 treatments comprising of organic manures (farmyard manure and vermi-compost) each replicated three times, making a total of 27 plots. Treatments were randomly arranged in each replication. Benefit Cost ratio was highest for T₈ followed by T₄. Treatment T₈ is superior for Vermi-compost application and T₄ was superior for FYM treatment.

Introduction

Maize (*Zea mays* L.) is one of the most important and a strategic food crop cultivated in the world. Maize was first domesticated in Mexico, from its wild species ancestor, teosinte, about 9000 years ago, but maize landraces are widely found across the continents (Gollar *et al.*, 2016). Landraces (germplasm) evolved conventionally over the time, not only provides basic nutritional requirements as a food security but also in

crop improvement programs very much depend on the availability of a wide and reliable crop genetic diversity (Verma *et al.*, 2017).

In Madhya Pradesh state, maize is the second important crop next to paddy of food grain production. Maize crop is cultivated in Madhya Pradesh 71.75 mha area & production 134.16 mt and its productivity is 1886 kg/ha. Annual rainfall of M.P. in average 1300-1400 mm.

Coupled with 137 per cent cropping intensity (JNKVV, Jabalpur, 2015). In India, maize is grown in an area of 8.17 m. ha with a production around 19.33 m. tons and productivity 2414 kg/ha. It ranks next to rice, wheat, sorghum and pearl millet. It is the main staple food in hilly and sub mountain tracts of northern India and consumed all over the country as a fodder and grains. It is extensively grown in Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar and Karnataka.

Largest area of maize is in Karnataka (1.3 m. ha.) followed by Rajasthan (1.1 m. ha.) while the production is highest in Karnataka (4.4 m. tons) followed by Andhra Pradesh (4 m. tons). Productivity is highest in Andhra Pradesh (5.3 t/ha) followed by Tamil Nadu (4.6 t/ha) and Karnataka (3.5 t/ha). Globally, it is cultivated on more than 160 million hectares area across 166 countries having wider diversity of soil, climate, biodiversity and management practices. Maize contributes the maximum 40% among the cereal food crops in the global food production. USA is the largest maize producer contributing nearly 35 percent to the total maize production, followed by China. Maize is the driver of the US economy, with highest productivity (>10 t/ha) which is double than the global average (5.3 t/ha). The productivity of maize in India is just half of the world average (DMR, 2016). The aim of the present study was to evaluate the effect of different rates of FYM and vermi-compost on the growth and yield of maize in Chitrakoot – Satna (M.P.) India.

Materials and Methods

The experiment was conducted at the research and instructional farm of Rajaula Agricultural research farm of the Faculty of Agricultural Sciences, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot during *kharif* season of 2016. All the facilities

necessary for conducting the experiment, including labour and resources, which were necessary for normal cultivation were readily available in the department. The climate of the region is semi-arid and sub-tropical having extreme winter and summer. During the winter months, the temperature drops down to as low as 1-5°C while in the summer the temperature reaches above 45°C. The experiment was laid out in Randomized Block Design having 09 treatments comprising of organic manures (farmyard manure and vermi-compost) each replicated three times, making a total of 27 plots. Treatments were randomly arranged in each replication. Superstar- 9396 (Hybrid F₁) variety of maize was selected for the experiment. This variety has been developed by Pioneer Overseas Corporation, Karnataka, cob with Grain Colour orange yellow, Ear shape conico cylindrical, Grain Texture semi flint, Disease Tolerant to turicum leaf blight & DM, plant type semi erect, suitable for growing in central India. Plant high 200-220 cm high, Kharif Maturity (days) 90-100 and Special Features Heat tolerant. It is suitable for planting in June–July in plains.

Results and Discussion

Effect of different doses of F.Y.M. and vermi-compost on soil health

Farm Yard Manure and Vermi-compost are the organic manure and are very fruitful for improving the soil health given in Table 1. By evaluating the different doses of FYM and Vermi-compost for various grain yield and quality traits of Maize crop, it can be said that organic manure has positive impact on soil health. Among the 4 treatments of FYM, treatment-4 (T₄) was best for grain yield and other traits which indirectly indicated that this specific treatment is good for improving soil health as well as for increasing the yield and quality traits.

Treatments, T₈, T₄, T₇ and T₃ were found superior for cob yield per plot (kg) and significantly differs from other treatment but not differs from each other therefore any of them can be recommended. For Vermi-compost application, treatment T₈ and T₇ was found significant and superior as compare to other Vermi-compost treatments therefore both of them can be recommended. For FYM application, treatment T₄ and T₃ was found significant and superior as compare to other FYM treatments therefore it can be recommended for further applications.

Farm Yard Manure and Vermi-compost are the organic manure and are very fruitful for improving the soil health. By evaluating the different doses of FYM and Vermi-compost for various grain yield and quality traits of Maize crop, it can be said that organic manure has positive impact on soil health. Among the 4 treatments of FYM, treatment-4 (T₄) was best for grain yield and other traits which indirectly indicated that this specific treatment is good for improving soil health as well as for increasing the yield and quality traits. Similarly, among the 4 treatments of Vermi-compost, treatment-8 (T₈) was best for grain yield and other traits which indirectly indicated that this specific treatment is good for improving soil health as well as for

increasing the yield and quality traits. Overall, treatments, T₄ and T₈ combination could be good for improving the soil health as well as for boosting the yield of Maize crop through organic farming.

Estimation of the economics of the opted treatment

Economics of all the treatments are given in Table 2 which showed that control treatment has lowest output as compare to other treatment. Highest output was recorded by treatment T₈ followed by T₄. Lowest input cost was taken by T₅ followed by T₆ but output of these two treatments was lower than the control treatment. Therefore T₅ and T₆ are not the suitable treatments. Highest input cost was recorded for treatments T₄ followed by T₃. Benefit cost ratio (B:C ratio) was also calculated and presented in Table 1 and 2. B:C ratio was highest for T₈ followed by T₄. Treatment T₈ is superior for Vermi-compost application and T₄ was superior for FYM treatment. These two treatments were significantly differs from other treatments based on CD value for yield per plot. B:C ratio was also higher for these two treatments which showed that per unit input for these two treatment can return lot of output.

Table.1 Effect of different doses of FYM and Vermi-compost on soil health

Sl. No.	Treatment No.	Treatment	Grain Yield
1.	T ₀	0% (control)	2.42
2.	T ₁	25% (F.Y.M.)	3.23
3.	T ₂	50% (F.Y.M.)	3.91
4.	T ₃	75% (F.Y.M.)	4.10
5.	T ₄	100% (F.Y.M.)	4.83
6.	T ₅	25% (Vermi-compost)	2.84
7.	T ₆	50% (Vermi-compost)	3.70
8.	T ₇	75% (Vermi-compost)	4.13
9.	T ₈	100% (Vermi-compost)	4.98

Table.2 Economics of the opted treatments for Maize crop

Treatment	Yield (q/ha)	Yield (kg/ha)	Rate of maize seeds	Total output (Rs.)	Input cost (Rs.)	B:C ratio
T ₀	16.14	16140	120.00/kg	1936800	8340	232.23
T ₁	21.54	21540	120.00/kg	2584800	8236	313.84
T ₂	26.07	26070	120.00/kg	3128400	8452	370.14
T ₃	27.34	27340	120.00/kg	3280800	8668	378.50
T ₄	32.2	32200	120.00/kg	3864000	8884	434.94
T ₅	18.94	18940	120.00/kg	2272800	8127	279.66
T ₆	24.67	24670	120.00/kg	2960400	8236	359.45
T ₇	27.54	27540	120.00/kg	3304800	8344	396.07
T ₈	33.2	33200	120.00/kg	3984000	8451	471.42

Therefore it can be concluded that Treatment T₈ and T₄ were overall best performing treatments for maize crop. Economics of all the treatments showed that control treatment has lowest output as compare to other treatment. Highest output was recorded by treatment T₈ followed by T₄. Lowest input cost was taken by T₅ followed by T₆ but output of these two treatments was lower than the control treatment (Golada *et al.*, 2013). Benefit Cost ratio was highest for T₈ followed by T₄. Treatment T₈ is superior for Vermi-compost application and T₄ was superior for FYM treatment. These two treatments were significantly differs from other treatments based on CD value for yield per plot. B: C ratio was also higher for these two treatments which showed that per unit input for these two treatments can return lot of output (Arvadiya *et al.*, 2017).

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How to cite this article:

Ravindra Kumar, Uday Kumar, Nishchal Chandrakar and Rajiv Kumar. 2020. Studies on FYM and Vermi-Compost on Soil Health and Economics Profitability of Organic Fertilizer of Maize (*Zea mays* L.). *Int.J.Curr.Microbiol.App.Sci.* 9(05): 2038-2041.
doi: <https://doi.org/10.20546/ijcmas.2020.905.232>