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Research Note

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Use of vermicompost to increase yield and better soil health

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Summary

Maintenance or enhancement of soil quality is important for sustainable agricultural production. A field experiment was conducted in farmers fields of North Kamalnagar village of Teliamura sub-division of Khowai district. Surface soil samples were collected from the fields of farmers treated with vermicompost @ 2.5 tonnes per ha along with recommended dose of NPK taking cabbage as test crop. Comparison was made with control plot where no treatment was made. Mean values of organic carbon (OC) and available NPK were found higher in the treated fields which were low in control. In vermicompost treated soils the yield and weight per head of cabbage was found higher as compared to control plot.

Key words : Vermicompost, Soil health

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Introduction

Fertility status of soil determines the selection of a crop in any area. The nutrients removed by the plants from the soil solution are replaced by the fresh supply of nutrient ions which depends on the rate of their uptake by the plants. The replacement is faster in case of fertile soil. The whole process of uptake and replacement also depends on the soil particle size/texture and acidity of soil/soil reaction. Use of chemicals over years has resulted in impoverishing soils of organic matter and earthworms. It is possible to reclaim degraded lands with simple, eco friendly practices like application of compost and vermicompost, mulching and poly culture cropping. Organic wastes like animal dung, agricultural waste, forestry wastes, city leaf litter, paper, and cotton clothes are commonly used for composting.

Enhancement of soil quality by organic amendment especially vermicomposting is becoming increasingly popular among farmers as a source of soil fertility and also as a source of income generation. Most of the farmers in the plains of West Tripura still practice the mono-crop system where one major crop is grown annually. Ignorance in terms of manure and fertilizer application with respect to the fertility status is one of the major factors leading to the low productivity of the crops. The return, therefore, is not a constant and reliable factor for the farmers resulting in their low financial status. In order to evaluate the requirement of balanced fertilizers to be applied in the field analysis of soil for available nutrients is quite necessary. A front line demonstration was undertaken to find out the effect of vermicompost on soil parameters as well as yield of cabbage after application of vermicompost @ 2.5 tonnes per hectare along with recommended dose of fertilizer during the year 2014-15 in 20 nos of farmers field.

Surface soil samples (0-15 cm depth) were

collected from the fields of 20 farmers of North Kamalnagar village of Teliamura sub-division, Khowai district. Samples were analyzed in the Soil and Water Testing Laboratory, Krishi Vigyan Kendra, West Tripura. Fields considered for the demonstration had been applied with vermicompost @ 2.5 tonne/ha+ RDF. A sample from the control plot where common practices were followed was also collected for comparison. The pH of the soil was determined in a suspension of soil to water ratio of 1: 2.5 using glass electrode (Jackson, 1973). Organic carbon content in the soil was estimated by the procedure given by Walkley and Black (1934), available N by modified Kjeldahls method (Subbiah and Asija, 1956). Available P_2O_5 was analyzed colorimetrically by Brays I method using an extracting solution of 0.03 N NH_4F+0.02 N HCl (Jackson, 1973). Available K_2O was analyzed by equilibrating the soil with an exchanging cation made of solution of neutral normal ammonium acetate in a given soil:solution ratio. K content in the equilibrium solution was estimated flame photometrically (Jackson, 1973) and soil texture was determined by International pipette method.

The soil found to be sandy loam in texture. Organic carbon content in vermicompost treated soils was significantly more than the control plot (increase in oxidizable organic carbon status from 0.59 % to 0.7 %). Available nitrogen content was on an average 349 kg/ha which increased to 370 kg/ha. Vermicompost might also released organic acid and other microbial products during decomposition which solubilizes the insoluble compounds and enhance the nitrogen availability in soil (Bhandari *et al.*, 1992; Hegde and Dwivedi, 1992).

The available P_2O_5 content of soils on an average was very low (7.53 kg/ha) which after treatment increased to 10.5 kg/ha (avg). Incorporation of P in soil through organic sources along with inorganic sources caused such increase in the level of available P. (Powlson and Johnston, 1992; Babhulkar *et al.*, 2000; Bharadwaj and Omanwar, 1994). Mineralization of organic P and release of P from insoluble forms by production of organic acids also resulted in increased level of available P in soils (Patel *et al.*, 1979).

The available K_2O content of the soil increased from 139 kg/ha to 219 kg/ha. Higher level of available K in the treated soil could be a result of increased organic carbon content and subsequent solubilising action of organic acids produced during vermicompost decomposition and also its greater capacity to hold K in the available form (Yaduvanshi, 2001). The K+ ions could leach to lower depth much easily but addition of vermicompost enhances capacity to hold K (Powlson and Johnston, 1992; Mishra and Sharma, 1997).

The yield of cabbage also improved significantly with the adoption of using vermicompost along with recommended dose of NPK. Average yield of 250q/ha was recorded from treated plot with a BCR of 2.30 whereas control plot recorded an yield of 190 q/ha with a BCR of 1.92. There was a difference in weight of per head of cabbage, in case of treated plot average weight of per cabbage found to be 1.22 kg whereas, in case of control plot it was found to be 1.09 kg.

Table 1: Effect of vermicompost on oxidizable organic carbon (O.C)

	Oxidizable organic carbon (%)
Treatment(Vermicompost@2.5 ton/ha)+RDF	0.72
Control	0.59

Table 2 : Effect of vermicompost on available nutrient status of soil

Available status	Treatment(Vermicompost@2.5ton/ha)+RDF	Control
Available nitrogen (kg/ha)	370	349
Available phosphorus (kg/ha)	10.5	7.53
Available potassium (kg/ha)	219	139

Table 3 : Effect of vermicompost on yield of cabbage

	Yield (Q/ha)
Treatment(Vermicompost@2.5 ton/ha)+RDF	250
Control	190

Conclusion :

From the above experiments it can be concluded that the organic amendments like vermicompost can play an active role in improving the soil fertility. Soil character like pH, OC, N, P, K. Earthworm activity counteracts leaching by bringing up nutrients from deep in the soil and depositing them on the soil surface as castings. The burrows of earthworm also allow roots to easily go down deeper into the soil they could not ordinarily reach and get nutrients. Earthworms eat the litter and leave the nutrients in their castings for plants to use as a natural fertilizer that is non-polluting. Earthworms make plant nutrients more available by concentrating minerals in their castings in a form that is easy for plants to absorb. Plant growth stimulants such as auxins are produced in the castings which stimulate root to grow faster and deeper. Worms also neutralize soil pH. Cast analysis shows that the produce coming out of the back end of a worm is closer to neutral than what goes in the front end. Analysis of earthworm castings reveal that they are richer in nutrients than surrounding soil, often 3 times more calcium, several times more nitrogen, phosphorus and potassium. Worms stimulate microbial populations. Nitrogen fixing bacteria in a worm's gut and casts help to destroy harmful chemicals and breakdown organic wastes and higher nitrogenase activity. That means higher rate of nitrogen fixation is found in casts as compared to surrounding soil. The present investigations show encouraging results of using vermicompost in soils as organic amendment as these are safe as against chemical fertilizers.

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