Biological Properties of Soil as Influenced by Different Organic Manures

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Abstract: A field experiment was conducted during December - May (2003-2004) with tomato (*Lycopersicon esculentum* Mill) Var, PKM 1 as a test crop in Agricultural College and Research Institute, Madurai to study the influence of different organic N sources viz, FYM, Vermicompost and coir pith compost with bioferilizers on the soil physical properties, nutrient availability and biological properties. Based on N content of the organic N sources on dry weight basis, the quantity required for the substitution of recommended doses at 50, 75 and 100 per cent level worked out and applied along with 2 kg azospirillum. Application different organics with azospirillum favorably influence the soil physical, chemical and biological environment such as bulk density, water holding capacity, organic carbon, available nitrogen, beneficial bacterial and fungal population over the inorganics alone applied plot. Among the different organic N sources the application 75 per cent Vermicompost with azospirillum was found to be superior in improving soil health over the other treatments. The above finding revealed that organic farming would able to sustain the soil fertility for a longer period by meeting the demands of present and future generation.

Key words: Vermicompost, azospirillum

INTRODUCTION

Organic farming is not a destination to reach, but it is a journey to a mission. It is one among the ways to maintain soil health. The post era of green revolution has led to environmental pollution due to excessive use of agrochemicals and fertilizers and thus threatened the fragile ecosystem. Organic farming conserves soil fertility and contains soil erosion through implementation of appropriate conservation principles. Organic farming leads to live in harmony with nature. Though organic agriculture is the key to a sound development and a sustainable environment. Indian farmers who are basically an organic farmer, has for past 3 decades adopted to the green revolution technology also known as exploit agriculture. Characterized by the use of high yielding varieties, chemical fertilizers and pesticides, which has led to a large increase in yield and has enabled India to become self sufficient in food grains. The increase in productivity also increased the use of chemical fertilizers and chemical pesticides causing serious damage to environment and soil health.

Therefore to make organic farming successful, it is essential that ecofriendly technologies, which can maintain soil health and increase the agricultural productivity, have to be developed and made available to the farmers. Organic farming is a method of farming which avoids or largely excludes the use of harmful chemicals such as chemical fertilizers, pesticides and herbicides and use of natural resources such as organic matter, minerals and microbes to maintain the environment clean, ecological balance and to provide stability to the production level with out polluting soil, water and air. Organic farming system rely on large scale application of animal wastes or FYM, compost, crop rotation, crop residues, green manure, vermicompost, biofertilizers VAM, bio pesticides and biological control.

Materials and methods

A field experiment was laid out during January – May 2004 with tomato PKM (*Lycopersicon esculentum* Mill) as a test crop in Agricultural College and Research Institute orchard, Madurai. The bulk soil sample (0-15 cm) of sandy loam (udic haplустalf) was collected from the experimental area. The soil sample was air-dried and ground to pass through 2mm sieve and used for initial soil sample analysis. The result of initial soil sample was showed in table 1. Organic sources used in this studies are FYM, Coir pith compost, Vermicompost and Azospirillum. Treatments consisted of three types of organic sources with three levels (50,75 and 100 per cent) and azospirillum2 kg ha⁻¹ was included in 50 and 75 per cent level in all combination and absolute control with out
organics and another control with 100 per cent urea. The experiment was conducted by adopting FRBD with three replications. Based on N content of the organic N sources on dry weight basis, the quality required for the substitution of recommended doses of 50, 75 and 100 per cent levels worked out and applied conjoint with and with out 2 kg ha⁻¹ azospirillum.

The soil and plant sample were collected at three stages (30, 60 and 90 DAT respectively). The collected soil samples were used for determination soil physical properties and microbial population and the same soil sample was air-dried and used for estimation of organic carbon, macronutrients, and micronutrients status of soil. The plant samples collected were oven dried at 60° C and ground in a Willy mill using stain less steel grinder, used for chemical analysis. Biometric observations such as plant height and number of branches were measured and the yield of fruits per plant was recorded in five days interval and then this was converted in to hectare field.

Results and Discussion

Application of different organic N sources had significantly influenced the physical properties of soil over the inorganic fertilizers. Among the different organic N sources, application of 100 per cent N through FYM, conspicuously reduced the bulk density (1.26 Mg m⁻³) of 11 per cent over the 100 per cent N as urea (1.42 Mg m⁻³) which was on par with 100 per cent coir pith and vermicompost. Among the different levels, application of 100 per cent N as organic significantly reduced the bulk density due to the improvement of soil aggregation and structure which directly influence the bulk density of the soil[3]. Water holding capacity (48.6%) was favourably increased 36 per cent with the application of 100 per cent N through vermicompost (Tₐ) over inorganic and the control. The highest water holding capacity in the vermicompost applied as 100 per cent N applied plot. It was attributed to their higher pore space, low bulk density and favourable soil structure[2].

Addition of organic sources such as vermicompost, coir pith compost and FYM improved chemical fertility of soil. Application of different organic N sources had significantly increased the nutrient availability. Among the different organic sources, application of 75 per cent vermicompost with azospirillum (Tₐ) recorded maximum organic carbon (0.78%) over the inorganic, which was on par with 75 per cent coir pith compost with azospirillum (Tₐ). It might be due to higher humus content of vermicompost resulted from decomposition besides, azospirillum supply nitrogen during initial period of decomposition to avoid the immobilization caused by microbes[3].

Available N, was significantly increased due to the different organic N sources, application of 75 per cent vermicompost with azospirillum recorded highest available N of 254 kg ha⁻¹ over the 100 per cent N as urea (242 kg ha⁻¹). This could be attributed to the lower C: N ratio of vermicompost, which resulted in faster decomposition and release of nutrients as compared to FYM and coir pith compost. Further, azospirillum 2 kg ha⁻¹ increased the available nitrogen through fixation[4,3].

Generally, the organic manure application had conspicuous increased the microbial population.
Application of different organic N sources had significantly varied in their microbial build of soil; the highest bacterial population was associated with the application of 75 per cent N as Vermicompost with azospirillum (393 CFUg⁻¹). Which was five times higher than the 100 per cent urea (68 CFUg⁻¹) received plot and fungal population also maximum with 75 per cent vermicompost with azospirillum (71 CFUg⁻¹) over the inorganic (26 CFUg⁻¹). This may be attributed to the Vermicompost containing higher amount of growth promoting substances, vitamins, and enzymes, which in turn increased the microbial population and the addition azospirillum increased the root biomass production, which resulted in higher production of root exudates increasing the beneficial bacteria, fungi and actinomycetes population in rhizosphere region[6 & 7].

Considering the salient findings in perspective, organic farming favourably influenced the soil physical, chemical and biological fertility over the inorganic, which in turn paved way for better crop yield and quality.

REFERENCES