

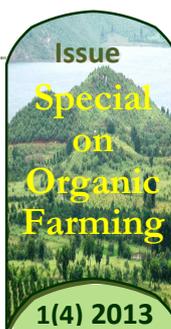


Popular Kheti

Volume -1, Issue-4 (October-December), 2013

Available online at www.popularkheti.info

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Impacts of Organic Agriculture Practices on Soil Health

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Among organic sources of nutrients, effect of FYM and vermicompost with or without fertilizers is well documented. But for pure organic farming, integration of FYM and vermicompost with supplementary sources as *Mataka Khad* and biodynamic preparations of growth enhancing inputs is necessary for getting higher yield. This article describes about some biodynamic preparations and preparation of *Mataka Khad*.

Introduction

Agriculture sector plays vital role in social security and overall economic welfare of the country. It contributes about 14 percent in Indian National GDP. Since Independence, India has witnessed significant increase in production of foodgrains (green revolution), oilseeds (yellow revolution), milk (white revolution), fish (blue evolution), and fruits & vegetables (golden revolution). All these became possible owing to the application of cutting edge technology of science coupled with the positive policy support, and hard work of Indian farmers. Chemical agriculture triggered by widespread use of agro-chemicals in the wake of 'green revolution' of the 1950s-60s came as a 'mixed-blessing' rather a 'curse in disguise' for mankind. It dramatically increased the 'quantity' of the food produced but severely decreased its 'nutritional quality' and also the 'soil fertility' over the years. Problems of green revolution have been witnessed in terms of second generation constraints in enhancing the productivity of food grains in India. Among the problems of second generation, declining factor productivity is the major constraint. In this regard, the strategies of integrated nutrient management, site specific nutrient management and target yield approach have been suggested. Similarly, an alternative approach of organic farming has been advocated to come over the soil health problem and declining factor productivity in long terms. Since 2001, organic farming has gained momentum in India and package of practices for organic production of cereals, pulses and oilseed crops have been developed. However, results of organic management of crop production strategies indicated that nutrient management through organic

sources is one of the major constraints in getting the potential yield of different crops under organic production system leaving away with the availability of organic sources of nutrients.

Aim of Organic Farming Practices

Organic farming practices aim to increase soil humus (and thus encourage increased biological activity within the soil) and in-built systems of 'plant protection' within the farm ecosystem (natural pest control by soil & farm biodiversity) without recourse to agro-chemicals. A shift to organic farming driven sustainable agriculture would require immense patience on the part of farmers during the transition period and till the productivity is restored to original level.

Impacts of Organic Agriculture Practices

Among organic sources of nutrients, effect of FYM and vermicompost with or without fertilizers is well documented. But for pure organic farming, integration of FYM and vermicompost with supplementary sources as *Mataka Khad* and biodynamic preparations of growth enhancing inputs is necessary for getting higher yield.

Crop response to pure organic manuring (FYM /vermicompost) and the extent of response, depends on several factors such as degree of humification and its C/N ratio, soil characteristics, moisture regimes of soil during the growth of crop, time and method of application.

Vermicompost would not only increase organic carbon status of the soil but also increase the soil water holding capacity. Flocculation of soil and availability of all micro and macronutrients, thus making the soil and crop production sustainable one. Since vermicompost helps in enhancing the activity of microorganisms in soils which further enhances solubility of nutrients and their consequent availability to plants, is known to be altered by microorganism by reducing soil pH at micro sites, chelating action of organic acids produced by them and intraphyl mobility in the fungal filaments.

FYM, besides rich sources of micronutrients, also help in improving physical condition of the soil and yield of the crops. FYM is an important primary source of organic matter and nutrients.

Mataka Khad promotes the plant growth. Microbial analysis indicated higher count of microbial population including actinomycetes, azotobactor and phosphate solubilizers which gave significant higher yield. Scientific studies on role of *Mataka Khad* in agriculture are limited.

Use of biodynamic preparations as supplementary and complementary input have been suggested in organic standards for high crop productivity and sustainability. Among biodynamic

preparations, use of BD-500 and BD-501 have shown significant effect on crop growth, yield and disease minimization. BD 500 stimulates micro organisms and inturn increasing the availability of nutrients including trace elements. BD 500 is often equated with humus formation and credited with improving soil structure including water holding capacity. BD 500 is applied directly to soil. BD 501 complements BD 500, but works in atmosphere by enhancing photosynthetic uptake and increasing assimilation of nutrients. BD 501 helps to stave off fungal diseases, increase dry matter content of fruit and fruit flavor, color the post harvest quality.

Use of organics may prove to be helpful in sustaining productivity in situation stated earlier. Organics have been used in improving physico-chemical environment of soils thus they have become the backbone of organic farming. Crop yield during initial phase of transition from conventional to organic agriculture generally decline. However, yields recover in 2-3 years, which substantially improve the economic status eventually and bring in health and quality consciousness.

Method of Preparation and Application of the Biodynamic Preparations (BD-500 and BD-501)

Two biodynamic formulations (BD 500 and BD 501) sourced from the SUPA Biotech (P) Ltd., Nainital, India has been tried. BD 500 (horn manure preparation), the “prime starter of biodynamic,” is prepared by stuffing the dung of a lactating cow into a horn and burried in the soil during the autumn equinox (September-October) and taken out during the spring equinox (March-April). The humified dung from horn is stored in an earthen pot away from sunlight. For preparing the spray solution for one ha, 62.5 g of this material was dissolved in 40 L of warm water (40°C) with continuous stirring for 1hour (alternately in clock wise and anti-clock wise directions). The liquid mixture was sprinkled as big droplets on soil surface in the evening on day before sowing. For the treatments based on biodynamic calendar, BD 500 was applied on i.e. during the lunar descending period, when the effects are supposedly better.

BD 501 is “cow horn silica” and is made from quartz crystals ground to alum power consistency, stuffed into a cow horn, buried during spring equinox, and taken out during autumn equinox. The material stored in glass bottle and exposed to the sun by the windowsill was used to prepare the BD 501 spray solution by dissolving 2.5 g in 40 L of water which was prepared for spray in a similar way as that of BD 500. Within an hour, the mixture was sprayed as a fine mist on the plant foliage (i.e. before 9.00 am). The application dates corresponded to days when moon was opposite to Saturn in the biodynamic calendar.

Benefits of Bio-dynamic Preparations

1. Biodynamically managed fields had greater microbial biomass, respiration and organic matter, and longer wheat roots than conventionally or organically managed fields.
2. Application of biodynamic compost to soil resulted in greater soil C and N, microbial biomass and dehydrogenase to biomass ratio than applications of chemicals fertilizers or non-biodynamic compost.
3. In a study of commercial farms, biodynamic farms maintained better soil quality and were as financially viable as adjacent conventional farms.
4. Biodynamically treated plots improved soil quality, particularly some biological parameters.
5. Biodynamic agriculture is an organic farming system that utilizes fermented herbal and mineral preparations as compost additives and field sprays.

Mataka Khad Preparation

Mataka khad is prepared by thorough mixing of 5 kg of cow dung, 5 L cow urine, 5 L water and 250 g of jiggery and put in a pitcher of 20 L capacity. The pitcher is filled up to $\frac{3}{4}$ level only for effective fermentation. A lid is placed over the pitcher and buried in soil for 7-10 days with its neck outside soil. *Mataka Khad* contains 1.01 per cent N, 0.046 per cent P_2O_5 , 0.225 per cent K_2O , 451 ppm Fe, 76 ppm Mn, 55 ppm Zn, 274 ppm Cu. *Mataka Khad* has been used traditionally by farmers. Scientific studies regarding effect of *Mataka Khad* are few. *Mataka Khad* promoted the plant growth. Microbial analysis indicated higher count of microbial population including actinomycetes, azotobactor and phosphate solubilizers which gave significant higher yield of different crops as Knol-knol, onion, garden pea and frenchbean.

Conclusion

Organic agriculture fosters processes and interactions occurring in natural ecosystems, encouraging internal stability rather than relying on external control measures. Use of organics may prove to be helpful in sustaining productivity in situation stated earlier. Organics have been used in improving physico-chemical environment of soils thus they have become the backbone of organic farming.