Long term impact of soil fauna conservation practices on the introduced mesofauna and soil chemical properties in rainfed agroecosystem

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INTRODUCTION

A lot of emphases has been made on alfisols to commercialize agriculture through intensive agricultural practices. However, the crops are not responding to these practices due to loss of below-ground biodiversity and that resulted in progressive deterioration of agricultural productivity. Recently, the importance of soil biodiversity is discussed in relevance to the agroecosystem functioning. The quantitative and qualitative composition of soil fauna reflects the quality of the soil. With this background, first, we compared the abundance and diversity of mesofauna within different doses of farmyard manure (FYM) and inorganic fertilizers. Next, we compared the addition of native mesofauna rich soil to the mesofauna abundance and sustainability in the degraded agroecosystem.

MATERIALS AND METHODS

The investigation was carried out at the Zonal Agricultural Research Station, University of Agricultural Sciences, Bengaluru, India during *Kharif* season under rainfed conditions. The topsoil with the textural class of sandy-loam under subtropical semi-arid climate. Bi-modal distribution of rainfall accounting 928mm. This experiment was carried out from 2001-2015. The experiment was started with the initial soil chemical properties of organic Carbon (0.34%), available Nitrogen (168.72kg/ha), available P2O5 (11.69 kg/ha) and available K2O (120.50kg/ha). The experiment was laid out in randomized complete block design with the following treatments viz.,

1. Recommended fertilizers (RF) (25:60:25 Kg NPK/ha) + FYM (10t/ha) + Phorate 10G @ 1kg *a.i./ha* + Pre-emergent application of Lasso 50EC @ 2.5l/ha + seed treatment with Carbendazim 50WP @ 2g/kg; 2. 12.5t FYM/ha+ 75% RF; 3. 15t FYM/ha +50% RF; 4. 17.5t FYM/ha+ 25% RF; 5. 20t FYM/ha; 6. 10t FYM/ha; 7. 10t FYM/ha (partially decomposed); 8. 10t FYM/ha+mulching (Gliricidia 2t/h); 9. RF alone; 10. 5t FYM/ha

FYM was applied about one week before sowing. Chemical fertilizers and insecticide were applied in furrows. Seeds were treated with fungicides before sowing. The soybean was sown after treating with *Rhizobium* culture with a spacing of 30x10cm in 6.0X3.6m subplots. Two hand weeding and one inter-cultivation operation were carried out. One kg of natural grassland soil was spread in each plot as a source of native soil mesofauna from 2005 *kharif* onwards.

Extraction of soil mesofauna - The soil mesofauna was extracted at a fortnightly interval during the cropping season. Soil samples were collected at 45 days after germination for soil organic carbon (SOC), available nitrogen, phosphorus, potassium and microbial biomass C (MBC) analyses.

Statistical analysis - The abundance of mesofauna was recorded and the mean of each season was considered for further analyses. The data was statistically analyzed using SPSS statistics 23.0 software.

RESULTS

Introduction of native mesofauna rich soil in 20t of FYM ha^{-1} applied treatment significantly enhanced the mesofauna abundance, MBC, SOC, available nitrogen, phosphorus, potassium and grain yield (Fig. 1-7) compared to the RF alone. Next best treatment was T4 in all respect. FYM based treatments supported introduced mesofauna survival and MBC resulted in the buildup of SOC. Treatment with partially decomposed FYM or *Gliricidia* leaves mulching supported higher mesofauna than well decomposed FYM alone.

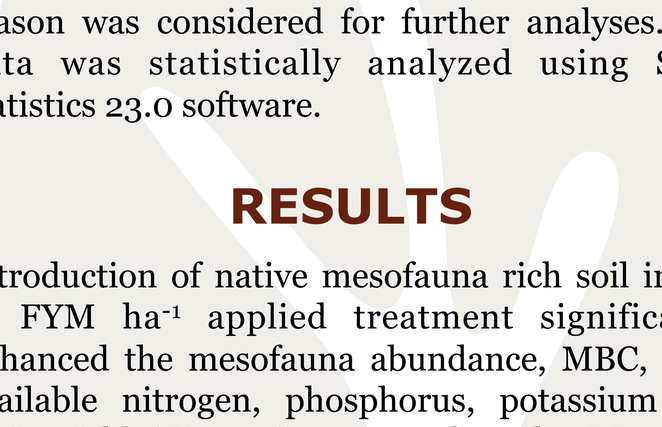
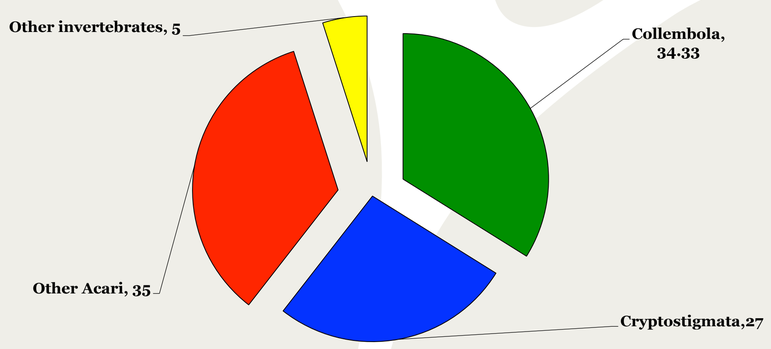
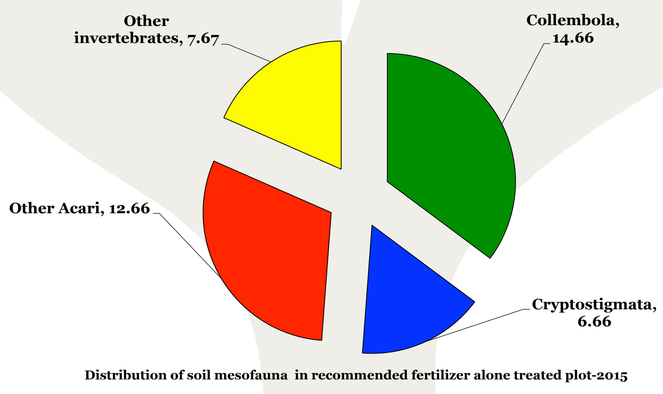


Fig. 1: Experimental plot (Crop: Soybean)



Distribution of soil mesofauna in 20t per hectare Farmyard manure (FYM) treated plot-2015



Distribution of soil mesofauna in recommended fertilizer alone treated plot-2015

Fig. 2-3: Graphs

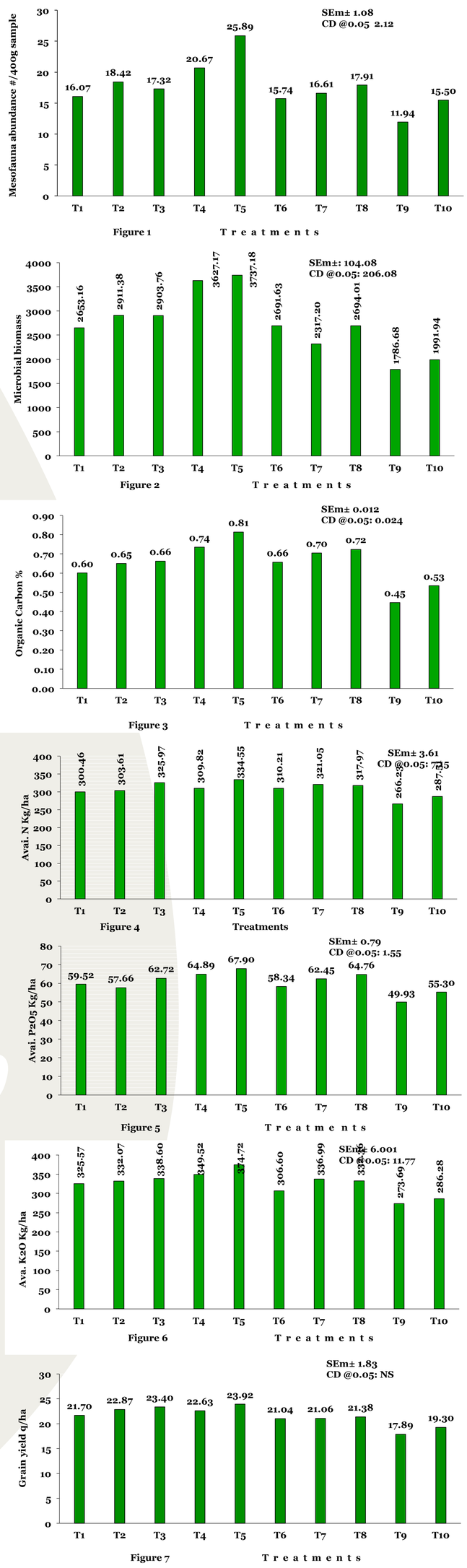


Fig. 4-11: Abundance, MBC, SOC, avai. N, P, K and grain yield

CONCLUSION

Introduction of native mesofauna rich soil to the FYM based treatments survived well compared to the RF alone, also recorded higher MBC, available N, P, K and grain yield.