Wissenschaftliche Auswertung / Scientific Report

Produkt/Product:
penergetic b

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Datum/Date:
2019

Micorbial Stimulation of Penergetic b on Organic Waste Decompostion

Introduction

Concern about maintaining the quality of agricultural ecosystems has encouraged the study of several parameters related to soil system functionality. Understanding of processes such as organic matter decomposition and edaphic community food activity present in a given environment provides insights to the possible or deleterious effects of practices and management that are intended to be investigated. Among the methods available for the evaluation of these biological parameters, the so-called 'integration methods' are well accepted, because they allow the evaluation of the microbial activity as well as the meso and macro organisms activity of the superficial layers of the soil, without differentiation the role played by these different groups.

Among the known scientific methods for determining the decomposition of plant residues, litter bags (THOMAS & ASAKAWA, 1993) is very efficient and allows the evaluation of the mass loss of organic residues (plants or animals) by the activity of soil organisms. The decomposition bags have ben widely used for studies with various species of biological materials.

The objective of this study was to determine the effect of penergetic technology on

- Decomposition velocity of residues from subsurface soil and
- Food activity of soil organisms and microorganisms

Methodology

The rate of residues decomposition was determinated by litter bags method. Three treatments were evaluated: control and two doses of penergetic b applications (500g penergetic b and 1000g penergetic b per hectare).

Fresh sheep manure samples were dried at room temperature and stored in a cool place until use. The experimental units consisted of bags made of voile fabric, with dimensions of 0.20 x 0.10m, filled with approximately 100g of dry sheep manure (Figure 1A)

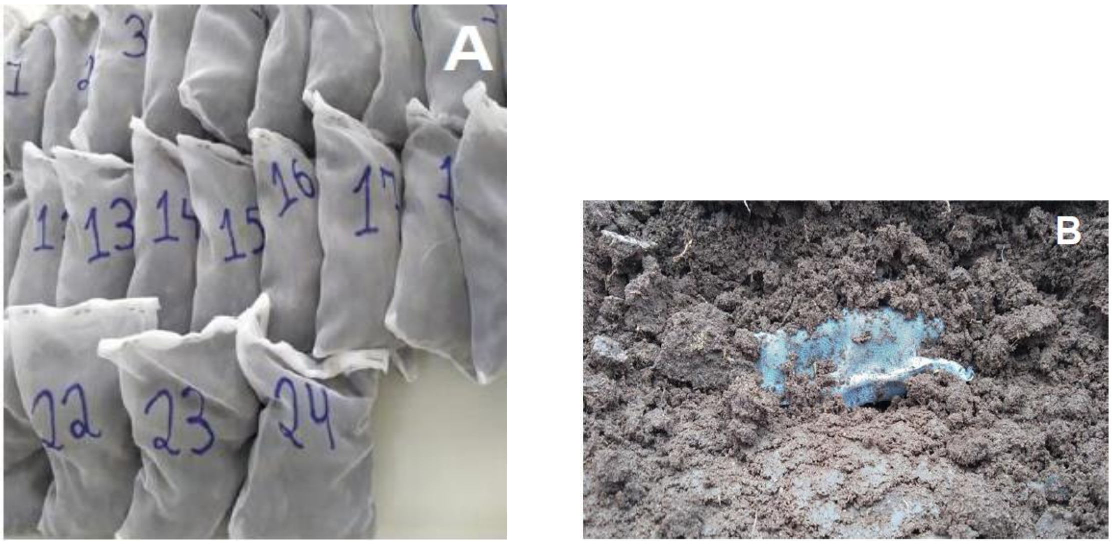

Figure 1: Set of decomposition bags filled with sheep manure samples prior to field distribution (A). Detail of the moment when the experimental bag was put in the internal soil (B)

The choice of the material used to make the decomposition bags aimed to provide the minimum possible interference with the moisture and temperature of the material evaluated, allowing the contact of plant residues with the soil and access to microorganisms. In addition, the fine mesh of the fabric has the function of keeping the organic waste inside the experimental units and avoiding the input of external organomineral materials (APRILE et al., 1999). Prior to the distribution of experimental units in the field, the moisture content of the manure was determined. For this, portion of material were weighed in analytical balance and dried in a forced aeration oven at 64°C for 72 hours. After this period, the residues were again evaluated to determine the percentage of dry matter (DM).
The experimental units remained in the field for 60 days. Every 30days, three bags of each treatment were collected and taken to the laboratory, where they were carefully washed with running water to remove impurities (soil particles and roots) adhered to the outside of the experimental units. When observed the spontaneous growth of plants and roots inside the

bag, the plant materials were removed. Subsequently, the decomposition bags were oven-dried with forced aeration at 65°C until they reached constant weight. They were then fractionated in the set of sieves (Figure 2) and weighed in analytical balance to determine the progressive mass loss of the residues.

Figure 2: Screen set used for separating sheep manure fractions according to particle size (8, 4, 2 and 1mm).

Decomposition results were expressed as a percentage and obtained form equation 1:

$$\%AD = 100 - \frac{Mf \times 100}{Mi}$$

Where Mf = final mass and Mi = internal mass. The cumulative decomposition percentage (%AD) is the direct result of the difference between final and initial mass, expressed as a percentage. Relative decomposition percentage (%RD) refers to the value obtained for a given moment, in this case for a specific month and is obtained through equation 2

$$\%RD_n = \%AD_n - \sum_{i=1}^{n-1} (\%RD)_i$$

The experiment was conducted in Brazil, in Santa Maria municipality, Rio Grande do Sul State, from April to June (Fall) 2019.

Results

The food activity of the community of soil organisms and the rate of decomposition of crop residues deposited in the soil are factors that directly affect the dynamics of nutrient cycling and crop management. The size of the organic residues interferes with its decomposition dynamics. The smaller the size of the residue, the larger the specific surface area available for the access of decomposting microorganisms which, consequently, may contribute to the increase to the decomposition speed and the reduction of the persistence percentage of the residues present in the soil.

It was observed that the food supply (residue supply in the soil) resulted in immediate microbial activity and residue degradation activity could be observed in all evaluated treatments (Figures 3 and 4): In the control treatment, where there was no application of penergetic b, 16.32% of the total waste mass was degraded in the first 30 days of evaluation. From 30 to 60 days, the decomposition rate in the control treatment showed little significant increase.

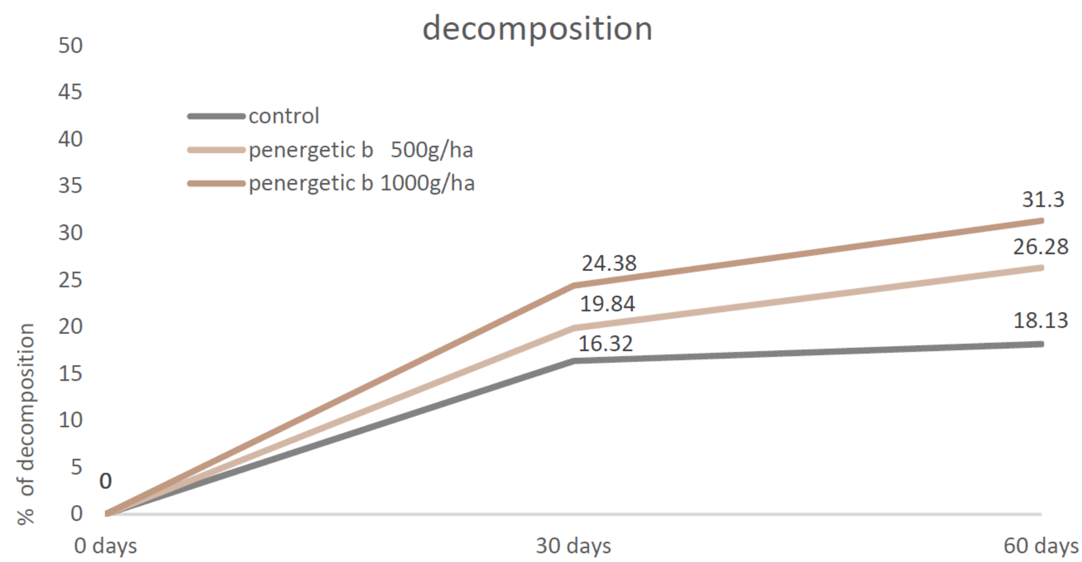

Figure 3: Percentage of decomposition observed at assessment intervals.

The highest decomposition rate was observed between penergetic b soil application (time zero) and 30 days after application. In this period, the application of penergetic b soil at a dosage of 1000 grams per hectare was significantly higher than the others. In treatments with application of penergetic b soil, the decomposition rate between 30 and 60 days after application was similar in both dosages evaluated (500g and 1000g).

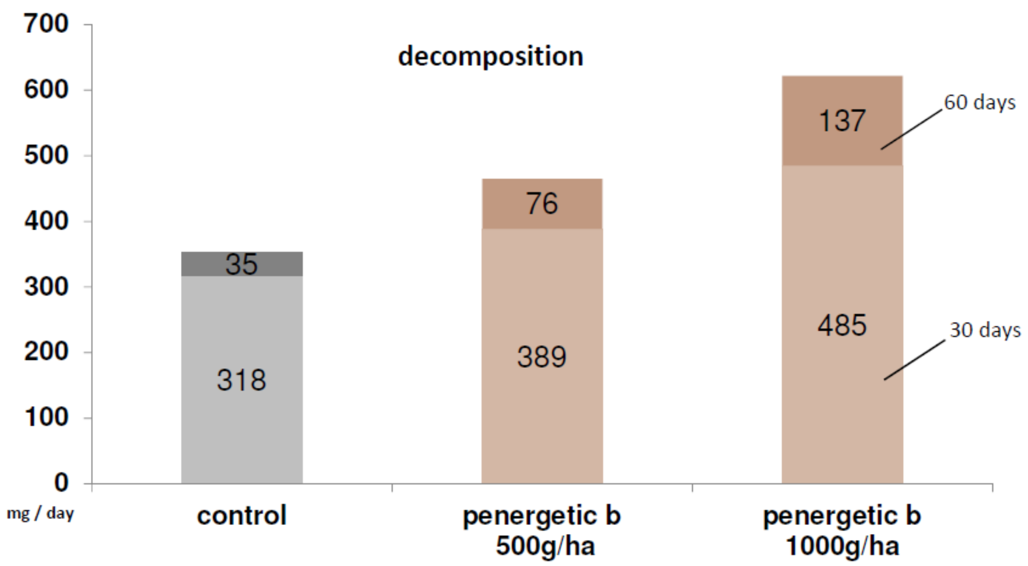

Figure 4: Accumulated decomposition (mg per day) at assessment intervals.

Figure 5 shows the total percentage of waste with a particle size of less than 1mm at the end of 60 days. This result demonstrates the degradation action of the microbial community on a given organic waste.

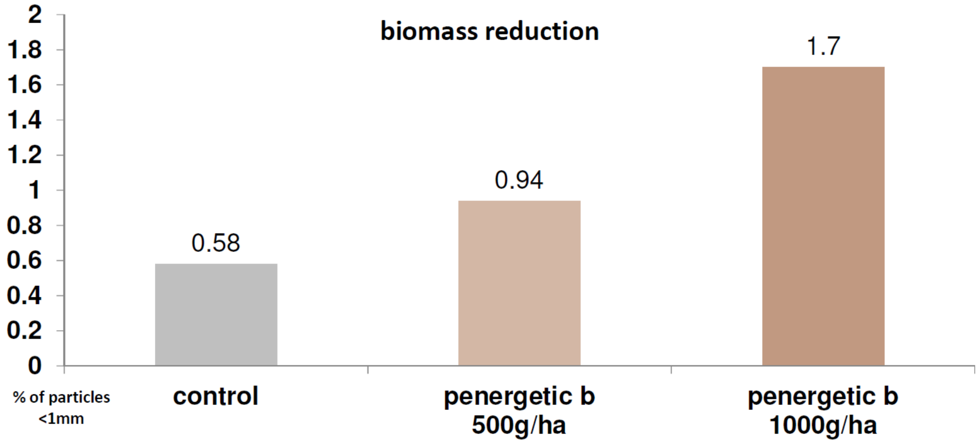

Figure 5: Percentage of particles less than 1mm at the end of 60 days.

Considering that the internal degradation of organic residues is influenced by parameters such as moisture and friction and that the fragmentation of smaller residues are dependent on biological action in soils, we observed that penergetic b soil at a dosage of 1000 grams per hectare resulted in an increase of 193.1% in microbial activity in relation to control treatment and 80.85% increase in microbial activity in relation to the dosage of 500 grams per hectare.

Besides the reduction of biomass inside the bags, it was observed the presence of roots adhered outside the experimental units that received the Penergetic technology (Figure 6). These results are related to the effect of plant and microbial biostimulation promoted by the technology.

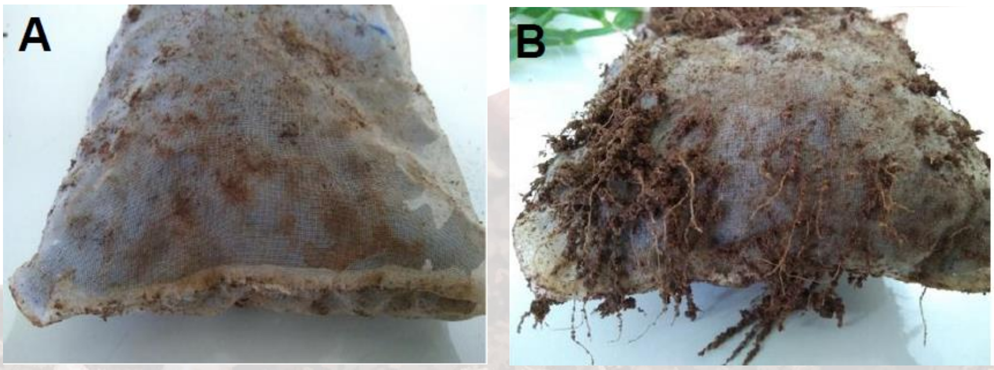

Figure 6: External appearance of decomposition bags after removal after 60 days of incubation, in the absence (A) and presence (B) of penergetic b soil at the dose of 1kg/ha^{-1}.

The result obtained in the evaluations are important for understanding the relationship between the application of penergetic b soil and the soil residues degradation dynamics.

Conclusion

Penergetic b soil application to soil increased biological activity resulting in higher rate of decomposition of residues

The decomposition of residues at the dosage of 1000 grams penergetic b soil per hectare was significantly higher than the dose of 500 grams per hectare