Recovery of soil microbial activity after biodegradation of LDPE/TPS/Chitosan polymeric films

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Introduction

The use of microbiological measures to indicate the quality of the soil has been researched because the microorganisms have an intimate relationship with chemical properties and physical soil and also because they are responsible for many biological and biochemical processes, and therefore sensitive to changes in natural and anthropogenic sources in the soil (1). In addition, it can be verified that soil resilience is due to microbial diversity and its constant biological and ecological processes (2). Biodegradation is specific polymers which contain functional groups capable of being attacked by enzymes and microorganisms such as bacteria and fungi and occurs from the time when it is used as a nutrient for a given set of microorganisms (bacteria, fungi, actinomycetes) that exist in the environment where it will be degraded. For this colony of microorganisms is developed by using the material as a nutrient, it must be produced suitable enzymes to break down some of the existing chemical bonds in the polymer backbone. Furthermore, it is essential to have favorable environmental conditions such as temperature, humidity, pH and oxygen availability. The microbial growth rate will determine the rate at which material is being consumed (3, 4). In this study soil pure collected in UFRRJ and soil + humus were underwent biodegradation of polymeric films formed from low density polyethylene (LDPE), thermoplastic starch (TPS) and chitosan (01 – 0%; 02 - 7,5% and 03 - 15,0% w/w of chitosan) for 130 days to verify the resilience of these soils from the concentration of C-microbial biomass.

Results and Discussion

Figures 1 and 2 present the variation of concentration of C-microbial biomass and mass loss of films of LDPE/TPS/chitosan in the soil pure and soil + húmus, respectively. Can be seen that It can be seen that the composition of the polymer films is the variable that has the most influence on soil microbial recovery rate. The composition of the soil and the biodegradation time show the same trend of decreasing microbial activity around 40 days of testing and recovery thereof from the seventieth day of rehearsal, but the soil composition (pure soil and soil + humus) has different influence on the recovery of microbial activity.

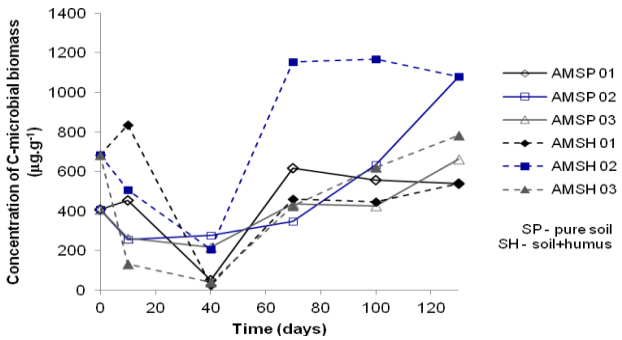

Figure 1. Variation of concentration of C-microbial biomass of pure soil and soil +húmus in the biodegradation of LDPE/TPS/chitosan polymeric films.

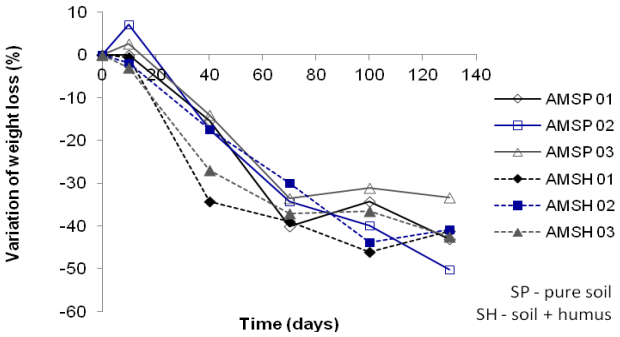

Figure 2. Variation of weight loss of the LDPE/TPS/Chitosan polymeric films in the biodegradation in the diferent soil compositions.

Conclusion

The mass loss of the LDPE/TPS/chitosan polymeric films show the dependence of the composition of the films with the biodegradation of the samples and hence with the recovery of bioactivity of the soil._____

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