Abstract

In this paper the optimization process of household composting is presented, by using different additives (sawdust, zeolite, vermiculite and perlite) at 10% of the initial substrate and an initial C/N ratio at 30/1. More specifically, the effect of different composting additives is investigated both in the evolution of the process of composting and in the improvement of the final product quality. For this study 5 household composting systems were installed at the premises of the University. The feed materials were kitchen household waste, namely foods rich in proteins (legumes), carbohydrate (bread, rice) and cellulosic compounds (vegetables and fruits).

During the monitoring of the experimental composting trials, it was found that the critical operating parameters of temperature (high temperatures that range from 55 to 60^{o}C for 4 days), moisture (for the minerals is about 55%, while for the sawdust is about 63.95%) and oxygen evolved in the desired range as required for the aerobic biological treatment of biowaste. This fact was attributed to the controlled conditions of agitation, ventilation and humidification of the substrate inside the bioreactor. These favorable conditions contributed to the partial consumption of the substrate's total organic carbon (in the case of minerals the consumption was greater (>20%) than in the sawdust (<10%)), resulting in significant organic matter losses especially during the early phase of composting where the microbial activity was more intense. Due to the efficient agitation and aeration processes of the substrate in combination with the presence of bulking agents ammonium is oxidized to nitrates (nitrification) thus confirming the presence of aerobic conditions in the substrate.

The experimental results have shown that the addition of mineral materials such as zeolite and perlite, in several composting trials, was found that improves the composting process in the bioreactor. Particularly in the case of zeolite addition, ammonia and ammonium adsorption was also observed, contributing to the reduction of nitrogen losses. After maturation, the biological characteristics of the produced compost indicate the absence of phytotoxic compounds and the significant germination improvement of the majority of tested seeds. It is concluded that the addition of zeolite, vermiculite or perlite at 10% w/w enhances household biowaste composting and improves the characteristics of the end product compared to composting without mineral additives.