EVALUATION OF HOME COMPOSTING THROUGH SANITIZATION AND STABILITY INDICES: THE CASE STUDY OF AN INTERVENTION IN THE MUNICIPALITY OF AGHIOS DIMITRIOS (ATHENS, GREECE)

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ABSTRACT

In the case of biowaste treatment, home composting could be placed within the most feasible options, granted that its end-product (the compost) fulfills certain quality criteria. The potential advantages of home composting regard the avoidance of biowaste collection and transportation, the waste volume reduction and the production of a soil amendment with many different uses.

On the contrary composting process and compost application might pose a range of negative impacts on environment and human health. Environmental risks concern odour nuisance, contamination of groundwater through leaching of pollutants and soil contamination with heavy metals and xenobiotics, while health ones are related to ingestion of soils enriched with compost (by children), contamination through food (produced by crops in soils amended with unstabilised composts), dispersion of dust of compost contaminated with pathogens and toxicants. Although the composting process in vessels and heaps has received a lot of research attention, studies about home composting and the quality of the produced compost are few.

This study reports on the assessment of home composting through the sanitization and stability indices. It was conducted within the framework of a home composting intervention project in the Municipality of Aghios Dimitrios (prefecture of Attica, Greece), during 2013-2014. Written guideline as well as a mechanism of on-line help were provided to all (290) participated households. After a few weeks of composting (from 4 – 16), samples were taken from 20 households and were analyzed with regard to abiotic factors, respiration activity, microbial counts of total coliforms and Escherichia coli. Although the initial mixture constituted only of vegetable waste (garden and kitchen), in some cases total coliforms and Escherichia coli were detected mainly due to the marginal achievement and short duration of the thermophilic stage. The respiration activity reflected well the process evolution.

The results are expected to contribute to the improvement of the home composting management, the minimization of any potential risk for the households and the improvement of our understanding of the stabilisation process.

Keywords: biodegradable municipal waste, home composting, stability.

1. Introduction

In the case of biowaste treatment, home composting (HC) as an alternative or supplement to centralised composting, could be placed among the most feasible options, granted that its end-product (the compost) fulfils certain quality criteria. The potential advantages of HC concern the avoidance of biowaste collection and transportation, the waste volume reduction and the production of a soil amendment with many different uses, directly used by the waste producer (Colón *et al*. 2010; Martínez-Blanco *et al*. 2010). Smith and Jasim (2009) claimed that “HC could potentially divert 20% of the biodegradable household waste stream, if 20% the community were actively engaged”. Despite of the benefits, the home composting process and

compost application might pose a range of negative impacts on environment and human health. Environmental risks concern odour nuisance, contamination of groundwater through leaching of pollutants and soil contamination with heavy metals and xenobiotics, while potential health risks are related to ingestion of soils enriched with compost (especially by children), contamination through food (produced by crops in soils amended with unstabilised composts), dispersion of compost dust contaminated with pathogens and toxicants (Peigné and Girardin 2004, Amlinger *et al*., 2008, Lasaridi *et al*. 2010).

The last decade, in Greece, HC has been adopted by an increasing number of local authorities, usually in the framework of demonstration and/or research EU-funded projects (Papadopoulos *et al*. 2009). The common practice is that composting bins are given free-of-charge in randomly selected families, which are interested in participating in such projects. The provision of free-of-charge compost bins is seen as an incentive throughout Europe for the householders to participate in HC pilot schemes (European Commission 2000). Besides this, home composting systems are commercially available, according to the report by Papadopoulos *et al*. (2009) who mentioned that 33 types of household composting systems were available in the Greek market. Papadopoulos *et al*. (2009) estimated that a household in Greece can generate up to 175 kg of compost annually. Although the HC process in vessels and heaps has received a lot of research attention, studies about HC and the quality of the produced compost, especially in Greece, are few. This study reports on the assessment of HC through the sanitisation and stability indices.

2. Methodology

This case study was conducted within the framework of a home composting intervention project in the Municipality of Aghios Dimitrios (prefecture of Attica, Greece), during 2013-2014. The Municipality provided 290 free-of-charge compost bins to an equal number of households, within its boundaries. The bins were distributed in two intervals (periods A and B). Written guidelines, as well as a mechanism of personalised help (through e-mail and telephone contacts) were provided to all (290) participating households. After a few weeks of composting (from 4 – 16), a data survey (questionnaire) and a study of the composts / composting material were conducted in order to record the local situation and assess compost stability. Samples were taken from 21 households and were analysed with regard to non-biotic factors, respiration activity, microbial counts of total coliforms and *Escherichia coli*. Compost stability was determined in duplicates using a modification of the SOUR test, run at 30 ˚C (Lasaridi & Stentiford, 1998a, b). Moisture content (% ww), VS (% dw), EC and the pH values were measured according to FCQAO, 1994. Total coliforms and *Escherichia coli* were isolated on Chromocult agar (Merck, 24h, 37˚C).

3. Results

The data survey demonstrated that 80% of the participating households embodied home composting in their daily routine, as an alternative biowaste management method. The rest 20% of the participants stated that they gave up because it was time-consuming, or they had not enough green waste. Approximately 38% of the actively engaged participants stated that they had faced deterrent issues (e.g. flies, problems on controlling the moisture content etc.). However, they did successfully resolve them, with the support of the personalised help mechanism and the relevant training/information material provided with the bin.

Regarding the quality assessment of the composts, the values of the main non-biotic parameters are presented in Table 1. Although the initial mixture constituted only of vegetable waste (garden and kitchen), low populations of total coliforms and *Escherichia coli* were detected to some of the samples of Period A, due to: (1) the marginal achievement and short duration of the thermophilic stage, or (2) Recent feed with fresh materials. Although samples from the Period B compost bins were not stable, the population of *Escherichia coli* was under the detection limit. The respiration activity reflected well the process evolution.

Table 1: Average values of the abiotic parameters of 21 compost samples

Number of samples	pH	Electrical Conductivity (mS/cm)	Moisture Content (%)	SOUR –test ($mgO_2/gVS/d$)
17 (Period A)	8.2	1.5	48 (±10)	1.7
4 (Period B)	9.0	2.8	60 (±4)	3.5

4. Conclusions

The results will contribute to the improvement of the home composting management, the minimisation of any potential risk for the households and the improvement of our understanding of the stabilisation process.

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