Impact of home made composts application

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Abstract

Because of the insufficiency of traditional organic fertilizers during the last years it is necessary to search for new sources of organic matter.

One of the most accessible and really realizable forms of the domestic wastes use is their transformation into compost, a process, known as home (family) composting.

The aim of this work was: to make a comparatively study of the effect of composts, produced by home composting and other organic manures on the maize growth and weeds appearance. The vegetation experiment was carried out in vessels from 2 kg, with soil – luvic phaeozem/FAO, culture –maize and different organic fertilizers: cattle, poultry and sheep manure and composts, made with suitable agrochemical indices from different organic domestic wastes. Phenological observations and measuring were periodically made.

The study shows, that using of home made composts is equivalent to that of manures, regarding to their effect on the vegetative behaviour of maize. Using of composts leads to decrease of weeds, because of the thermophilic (sanitation) phase during the composting process.

The organic matter from home made composts, added to the soil, has the potential to control many soil-borne plant pathogens. The highest quality composts, which are contaminant free, are ideal for maize cultivation.

Keywords: composting, home made composts, organic manures, fertilization, maize cultivation

Introduction

In most of the member states drastic measures will become necessary to comply the required limit values of biodegradable wastes in landfills within the given time frame (2006 - 2016) according to the EU directive. The creation of compost from organic household waste helps the government achieve its target of recycling 33% of all domestic waste by 2015. Individual households can help reach this target by either making their own compost or by participating in a centralised community scheme. The success of both home composting and centralised schemes is dependent upon the separation of organic (putrescible) waste from other waste.

Composting of domestic wastes decreases their collecting on depot and reduces hazards and emissions from landfill sites. The high-quality composts have positive effects on plant growth and health. They influence plant development by an improved soil structure and an elevated soil humus content as well as by supplying macro- and micronutrients (Zebarth et al., 1999; Fuchs, 2000). Although numerous reports concerning application and environmental impact of composts, little is known about the influence of home made composts application. The objective of the present work was to study the potential of home made composts application at maize cultivation and to compare them with other organic manures.

Materials and methods

The experiment was carried out in vessels from 2 kg, with soil – luvic phaeozem/FAO, culture –maize (hybrid Kneja 530) and different organic fertilizers: cattle, poultry and sheep manure and composts - produced during composting of the organic fraction of source separated household wastes (i.e. vegetables, fruits and garden wastes, coffee sludge, egg shells). Two different bins were used for composting – closed (200 l) and open (600 l), which were filled in the same way. The initial C/N ratio of the mixtures was 25. The bins were not regularly fed with fresh wastes.

During peak heating, the temperatures increased to 65°C in the closed and to 60°C - in the open bin, depending on the position in the bin. According to Golueke (1991) the necessary temperature for sanitation of the composts is 55°C maintained for 3-day long period.

Temperatures in the closed bin were several degrees higher than in the open one because of less heat losses and less influence of meteorological conditions, but in both bins the sanitation phase was completed. Thermophilic temperatures in the bins have been kept for 10 days. The piles were turned regularly to achieve thorough heating of all parts of the waste which is efficient enough to eradicate plant pathogens. The moisture content was 55-60%. Germination tests with radish and cress seeds were made in 200-ml plastic pots, after 120 days of composting. Both composts (produced in closed and open bins) had germination rate higher than 80%. Before starting the experiment, agrochemical analysis of the soil and the organic manures were made. The trial was carried out in 7 variants (with 5 replicates):

1. Control (only soil);
2. Control 2 (soil + mineral fertilizers: N-200 mg/kg, P_2O_5-150 mg/kg, K_2O-150 mg/kg, like NH_4NO_3, CaH_2PO_4 and K_2SO_4);
3. Soil + cattle manure;
4. Soil + poultry manure;
5. Soil + sheep manure;
6. Soil + compost 1 (produced in the closed bin);
7. Soil + compost 2 (produced in the open bin).

The amounts of organic manures were equalized in their total nitrogen content (200 mg N/kg). After sowing of maize seeds, observations and measuring were periodically made. In all variants, the substratum moisture was 60%. The trial was done to phase 10-12 leaf. The statistical program Statgraph was used for results treatment.

Results and discussion

The differences between the variants are statistically proved. Control 1 (only soil) and control 2 (soil + mineral fertilizers) contain a lot of weeds. The figure 1 shows that the total number of weeds is the smallest in the variants with composts. Eradication of pathogens from household organic wastes during composting may be due to (1) heat generated during the thermophilic phase of the composting process, (2) toxic compounds (i.e. organic acids, ammonia, etc.) released during or after the self-heating process, (3) enzymatic degradation, (4) microbial antagonism (i.e. parasitism, antibiotics, etc.) and (5) competition for nutrients in the sublethal outer temperature zones of the pile or later during maturation (Bollen, 1985; Ryckeboer, 2001). But the most important reason for eradication of pathogens is the heat generated during thermophilic phase of composting (Hoitink and Fahy, 1986).

The variant with compost, produced in closed bin contains less weeds than the other one, probably because of the higher temperature in the closed bin.

Figure 1. Total number of weeds in the different variants

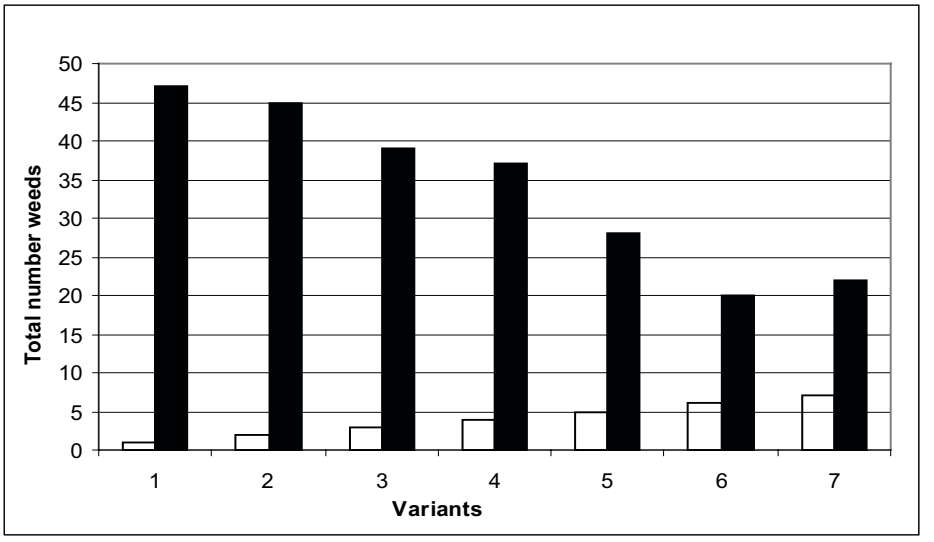

Table 1. Values of the biometrical measuring and yield

Variants	Height of the plants (two weeks after sowing) cm	Height of the plants (a month after sowing) cm	Yield (phase 10 -12 leaf) g dry mass
1.	24 bc	50 a	9,86 a
2.	25 d	84 fg	28,85 l
3.	24 cd	73 bc	16,38 ef
4.	24 cd	85 fd	22,28 hi
5.	23 bcd	78 de	19,08 g
6.	24 cd	80 ef	23,45 ik
7.	23 bcd	91 h	25,68 k

* The least significant differences (LSD) are symbolized with different letters at 95% confidential level

The plant height was measured twice – two weeks and a month after sowing. The results from measuring and the yield are presented at the table 1. Initially (two weeks after sowing) the control 2 (with mineral fertilizers) was with the highest plants. At the second date (a month after sowing) the variants with composts and other organic manures do not differ from control 2 in plant height. The reason for that is probably slower and gradual mineralization of organic substances.

The highest yield is measured in the two variants with composts (6 and 7) and control 2 (with mineral fertilizers). The reason may be better influence of composts on the soil structure and its physical properties.

Conclusions

The utilization of home made composts is equivalent to that of manures, regarding to their effect on the vegetative behaviour of maize. One of the major benefits from composting is

the destruction of weed seeds and pathogens through elevated temperature. During the thermophilic phase pathogenic microorganisms die. Home made composts can improve soil fertility and suppress plant diseases. The composts addition leads to an improvement of soils nutritious status as a result of the slower and gradual mineralization of organic substances.

The composts from household organic wastes are contaminant free and are suitable for maize cultivation.

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