MATURITY OF COMPOSTS IN CHEMICAL AND BIOLOGICAL APPROACHES

Erika Sulyok , Lili Mézes, János Tamás

University of Debrecen, Centre of Agricultural and Applied Economic Sciences, Faculty of Agricultural and Food Sciences and Environmental Management, Institute of Water and Environmental Management
H-4032 Debrecen, Böszörményi str. 138.
E-mail: sulyokerika@agr.unideb.hu

Abstract

In our days, perhaps the most enviromental problem is the imcreasing amounts of waste including sewage, municipal as well and industrial sewage treatment problems. In our country, from 150 to 160 thousands tons of sludge is produced each year. The inactivation and in an enviromentally soundway and utilization of this sewage must be solved. A lot of experimental results proved the usefullness of sewage sludge and compost made of it for use as crop nutrient supply. The fertilization may prove useful as a material for compost maturity, however, the appropriate level of harmful compounds also occur in the sludge. Setting the goal of the experiments was that such a difference in maturity of compost extracts ecotoxicological effects observed.

Key words: maturity of the composts, C/N-rate, phytotoxicity

INTRODUCTION

Composting of agricultural waste is considered particularly important important from the point-of-view of environmental protection. Degradation of organic substance results in a significant reduction of waste volume. The end product of the composting process, mature compost, can be used as soil coverage against excess loss of wastes, for mulching, for organic mature etc. The problem of composting has come into limelight in environmental studies and in agriculture. The quality of the mature compost is determined by physical, chemical and biological parameters of the composting process which, in turn, depend on initial composition of the raw materials, the technology, e.g. regular mixing and moistening and on environmental factors. Quality is the key topic in compost use. (Dienes, 2003). Composting is a biotechnologiecal process where the substrate is in a mainly consistant estate, its surface is covered by watercoat and in the coat, there are organyzms that in aerob condition digest the organic materials with extracellular enzymes. (Benedek et al., 1990). The organic materila can be a substrate for microba and it is use for probably cellular materials and enery. The substrat, which is needed for the composting processs, can comes from different original organic sewages as fresh vegetal materials, dung, sewage

dross, sewage of settlements. Willy et al (1955) described the aerob composting process with the following chemical equation:

organic material	oxygen consumption	compost	evaporated water	produced water	produced CO_2

One of the main criterion of the compost quaility is the stability and maturity of the compost. The quality is adequate if it doesen't contain easily decomposing organic materials, stabil and later, it's use doesen't cause awkward odour effect and doesen't cause nitrogen abstraction or fitotoxical effects in the soil. Last ones are important in agricultural use. A very few nitrogen that is comelated to the carbon can cause nitrogen depression when the dissolving organizms abstract the nitrogen for its body-building from plants. The compost hat is not adequtely mature, contains organic acids causeing toxix effects (Epstein 1997). The description of stability and maturity is examined by several scientists, but there wasn't any process being accepted. There is no standard process (Brewer et al 2001). And the literature on this topic is not uniform, it offers different solutions. The following process can be use, it is in the 1. table.(Epstein 1997)

Table 1.

Methods for testing the stability and maturity (Epstein, 1997)

Chemical methods	***Physical methods***	***Plant tests***	***Microbiological tests***
1. C/N ratio 2. Nitrogen forms 3. pH 4. Organic chemical compounds 5. Acetic acid 6. Humification characteristics	1. Temperature 2. Color, Odor, Density	1. Cress seeds 2. Wheat and ryegrass seed testing 3. Root discoloration	1. Oxygen consumption 2. CO_2 production 3. Microbiological changes, fungus etc.. 4. Enzyme activity

Compost stability of the described methods are different kinds of raw materials during composting of the C / N ratio and the applicability of test plants phytotoxicological, respectively our aim was to compare the results.

MATERIAL AND METHOD

And the literature on this topic is not uniform, it offers different solutions. The following process can be use, it is in the 1. table.(Epstein 1997) The materilas for the composting experiment is from the park of the AKSD Kft. During the experiment we set two compost pryzms. The one contained 5 v/v % communal sewage dross and 50 v/v % wood parcels, the

other one contained 25 v/v % industrial 25 v/v % commnal sewage dross and 50 v/v % wood particels.

We mixed the components with manual effort and we watered it anti it reached the optimal 45-50 % humidity.

We took the composts into covered composting places where we made 1 m heidh, each one is 1 m3 opened, triangle shaped pryzm. During th experiment we rounded the material every week, and measured the temperature every day. We took samples when we set the experiment, so the following days: 0-15-30-45-60, and then we examined the C/N rate for the germination in labour condition. The 2 sewage dross for the base of the composting experiment have different parameters, the parameters can be read in the 2. table.

Table. 2

The parameters investigated sludges

	Communal sludge	Industrial sludge
pH	6,51	6,82
All water-soluble salt w / w %	7,40	2,61
All organic matter w / w %	78,18	63,99
Dry matter content, m / m %	19,6	19,3
C / N ratio m / m%	6,51	5,89
Total N w / w %	3,38	5,16
TotalC w / w %	24,98	30,44

The standard of the drosses' elements is determinated that the drosses are right for it, but for composting just in condition it can be useful be care the industrial sudge dross' high contents of protein causes hard composting, thus it needs to be mixed with communal dross. During our experiment the MSZ 21976-17 standard helped us, wich drafted seed test alternatives from consistent wastages. During our work, we used the standard in a modifical way, so we didn't make a formule but air-dry compost samples.

Rootgrowing and inhibition' examined: we made a dilution array from the samples with control soil (quartz sand) in Petri-cups. The measures in the mixed soils: 2.5g ; 1,25g ; 0.6g ; 0.3g , then we completed it with with control soil until 5g, then we gave water to every sample as it fits the balanced saturated humidity. After the homogenizm, we took 20-20 barely seeds in equable composition. We took these readed samples into diffused sunlight and we measured the mass of the green plants after 7 days. The approsial of this experiment detected that the quality of the compost is right

when the plants don't show necrosis or chlorosis, or the 50 % of the compost mixture reach 90 % of the contorol. C/N detection: MSZ 6830-4:1981 standard Elementar VARIO EL Universal analyzer.

RESULTS AND DISCUSSIONS

Each compost can be said that the composting was in the right conditions, it means that the termophyl period approached 55 Celsius that is enogh to desolate patogen organizms. The tmperature monitoring of the composting staples was deserving to measure till 60 days, because both staple mixture showed the enviromental values. During the experiment we allocated the samples' C/N rate and we made fitotoxical test on these days. Based on national literaturethe stability of the compost is in the 3. table.

Table 3.

Compost stability of the C / N ratio. (Mathus, 1991)

C/N ratio	**Rate stability**
30:1 – 20:1	I. grade crude organic material
20:1 – 10:1	II. grade medium-speed stability
10:1 – 7:1	III. grade mature, stable compost

The comunal and the running of the industrial sewage dross compost totted C/N rate and with this factor, the classification is in the 4. table, where on the 45. day excels whn it mainly decreased. This tendency can be allocated with theorganic binding carbon material in the energy winning process of the microorganizms' use and the high number of the bacteria, so these can explane it.

Table 4.

Determination of the degree of maturity of different sewage sludges C / N data

Municipal sewage sludge compost				Industrial sewage sludge compost			
Maturity period	C/N ratio	Temperature C°	Degree of maturity	Maturity period	C/N ratio	Temperature C°	Degree of maturity
SZI-0 (1-14. day)	30,7	50	I.	IKI-0 (1-14. day)	28,6	52	I.
SZI-15 (15. day)	25,3	31	I.	IKI-15 (15. day)	22,9	43	II.
SZI-30 (30. day)	21,1	26	II.	IKI-30 (30. day)	18,4	37	II.
SZI-45 (45. day)	15,6	23	II.	IKI-45 (45. day)	15,1	31	II.
SZI-60 (60. day)	9,5	18	III.	IKI-60 (60. day)	14,5	28	II.

During the combination of the compost the measured C/N rate was 30,7 and that was enough to start the maturing process, and after the end of the process it deccreased below 20. Eventually, in the mature compost the C/N rate was 9,5 that is equal with the standard, but the industrial sawage, aged 60 days (IKI-60) didn't reach the adequate C/N rate, thus it is in a middle stablie category based on the measured results.
The different matured compost samples' fitotoxical examination's summation can be read in the 5. table. On the 0. and 15. days of the composting the sample represented the most seed decreasing effect because several number of seeds didn't come up, and the reason of the fitotoxical effect is the short carbon chains fat acids presenting in the compost.

Table 5.
Determination of the degree of maturity of different sewage sludge production based on biomass

Municipal sewage sludge compost				Industrial sewage sludge compost			
Maturity period	Biomass weight compared to control	Temperature C°	Degree of maturity	Maturity period	Biomass weight compared to control	Temparature C°	Degree of maturity
SZI-0 (1-14. day)	6,8 %	50	I.	IKI-0 (1-14. day)	9,5 %	52	I.
SZI-15 (15. day)	36 %	31	I.	IKI-15 (15. day)	41 %	43	I.
SZI-30 (30. day)	48 %	26	II.	IKI-30 (30. day)	56 %	37	II.
SZI-45 (45. day)	69 %	23	II.	IKI-45 (45. day)	71 %	31	II.
SZI-60 (60. day)	87 %	18	III.	IKI-60 (60. day)	91 %	28	III.

Based on the biotest, it can be allocate that the unattended sewage dross (SZI-0) and the industrial sewage (IKI-0) and the sewages attended in 15 days (SZI-15, IKI-15), the assertive organic material, the sawages handled in 30 days (SZI-30, IKI-30) are part of the middle stabile category, and the sewage dross handled in 40 and 60 days (SZI-45, SZI-60) are part of the stbile category based on the producted biomass correlately the control sample. Comparing the C/N values we can determinate that the sewages based on its composition don't show main difference. Based on the 5. table, it can be said that the composting process' measured parameters (temperature, C/N rate, plant biotest), are in a close coherence, so the use of the single experimental methods likely conclude other parameters beyond the maturity of the compost.

CONCLUSIONS

The quality of the compost is decisively determined its usefulness. With our experiment we used the biological and chemical methods of maturity comparing analyzing. The C/N values comparing the literature's standards were good for presenting the maturity period, because in this time

it decreased beyond 20:1. This was confirmed the positive effect for the plant growing too. From the C/N results we detected that the industrial sewage from the examined components didn't reach the stablie state, not even on the day 60., which can be accelerated with the rate's changing of the mixture. Finally, it can be allocated that booth compost reached the stabile state, based on the plan tests exceed the ones of the contorol samples so the composts are said to be mature.

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