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Nutrition content of spent mushroom compost before and after utilization in vegetable forcing experiments

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Summary: The spent mushroom compost means the remained soil without sporophores after the productive period. The leftover can't be used for mushroom growing again (Győrfi, 2001). Unfortunately spent musnroom compost still has bad judgment, as it would be garbage, but on the contrary it is a significant and valuable material, which is full of organic residue, a perfect soil structure improver, nutrition supplement and propagating medium. In our experiment we took the following mediums: control material with 50% flat moor peat and 50% high moor peat (Novobalt) content, 100% spent compost, 50% spent compost and 50% control medium, 25% spent compost and 75% control medium. On the day of plantation and after the forcing experiment we took sample from the control medium and from all mixtures.

Key words: spent compost, element content

Introduction

The culture medium of champignon is the compost, which is a homogeny base. It contains necessary nutritive for champignon in an absorbable form. From the 17th century horse dung has been the main component of compost, but by now it has lost its impotency because of quality and quantity deterioration (*Győrfi*, 2005).

For substitute, compost factories used a special mixture of straw, poultry dung, gypsum, water and thickening materials. The enzyme-system of mushrooms does not take cellulose apart, thus the materials above can be only used for champignon cultivation after composting.

Wheat straw provides carbon (because of the cellulose, lignin and hemicellulose content), and poultry dung provides nitrogen source.

Gypsum used to be the material for pH calibration in the past, but now it is mainly used for its structure-improve effect.

The exact compound of thickening materials is the secret of producers, but the row material of it, is soy flower.

During champignon cultivation growers usually cover the mushroom compost with a special coverlet. This coverlet is very important during the productive period, because it keeps the water inside for the mycelium and sporophore developing and protects the compost against heat variation, infections and desiccation. This material also inducts the development from vegetative period to generative, without the cover material only few sporophore would grow in the compost.

The compound of cover material is 90% peat and 10% crushed chalk or 5% lime mud from sugar factory.

Compost pH must be between 7.5–7.6 and it must be free from pests and pathogens.

In Hungary the yearly champignon compost formation is approximately 200000 tons. Storage and recycling of this amount has not been solved yet.

We are trying to find solution for this problem.

The spent mushroom compost means the remained soil without sporophores after the productive period. The leftover cannot be used for mushroom growing again (*Győrfi*, 2001). Unfortunately spent mushroom compost still has bad judgment, as it would be garbage, but on the contrary it is a significant and valuable material, which is full of organic residue, a perfect soil structure improver, nutrition supplement and propagating medium.

In spite of this, it is still difficult to extend the consumption of spent champignon compost, because it increases lime content and alkalify the soil.

Even though, it happened when the cover material consisted of 80–90% chalk and 10–20% peat.

But by now producing technologies has changed, and so compost content.

And presently the compost content is 90% peat and 10% crushed lime powder.

Material and method

We transported the spent mushroom compost to the experimental works of Faculty of Horticulture (Corvinus University of Budapest) in Soroksár in February, 2005.

During our experiments we dumped one part of the compost out of the plastic coverlets and we left the other part in the bags and stored them in piles.

On 7th April, 2005 we used the material from the bags for vegetable forcing.

In our experiment we took the following mediums:

1. Control material with 50% flat moor peat and 50% high moor peat (Novobalt) content,
2. 100% spent compost,
3. 50% spent compost and 50% control medium,
4. 25% spent compost and 75% control medium.

We poured 10–10 liters of the different mixtures above to four 12 liters cubic capacity buckets, and we also put two dropping irrigation pipe into them.

We tested Mustang F1 cucumber variety (*Cucumis sativus* L. cv. Mustang), which has early breeding season, week growing vigor, good renewing capacity and medium long, dark green crop (*OMMI*, 2000).

During the forcing experiment we fertigate test plants with the combination below.

Table 1 Frequency and concentration of trickle fertigation (Budapest, 2005)

Period	Frequency	Quantity of nutrition solution (l/day/plant)	Composition of nutrient solution (g/1000 l)				
			N	P_2O_5	K_2O	Mg	Ca
07.04.2005–08.04.2005	daily	0.5	300	600	300	–	–
11.04.2005–19.04.2005	very etwo days	1	432.5	410	260	10	47
20.04.2005–08.06.2005	daily	1	252.5	105	315	10	47
09.06.2005–07.07.2005	daily	1–1.5	442.5	245	280	10	47

*other components (in 1000 l solution): Fe:2,6g; Mn:0,6g; Zn:0,4g; Cu:0,26g; B:0,06g; Mo:0,04g
**other components (in 1000 l solution): Fe:1,95g; Mn:0,45g; Zn:0,3g; Cu:0,195g; B:0,045g; Mo:0,03g

Results and discussion

On the day of plantation we took sample from the control medium and from all mixtures. We analyzed them in the Central Laboratory of Corvinus University, Faculty of Food Industry. *Figure 1* shows our results.

The highest nitrate-nitrogen contents could be measured in the 100% spent mushroom compost, however the highest phosphor amount was found in the control medium, the second highest in the 100% spent mushroom compost and then in the 50% and 25% spent compost we measured proportionally less amount.

During the cultivation experiment we gave fertilizer to the test-plant regularly. Also the average yield and the quality of the crop were examined in the test-plan – these results have been already published.

The forcing experiment was finished in 14th July 2005. In the same day new samples were taken from the control medium, and from the commixtures containing spent mushroom compost. These samples were examined in the Central Laboratory of the Corvinus University, Faculty of Food Industry. The results can be seen in *Figure 2*.

Figure 2 shows significant reduction of the nitrogen, phosphor, ferrous and manganese contents in the control medium compared to the samples before the cultivation. We found interesting that phosphor content increased considerably in the 100% spent champignon compost and in the commixtures after the forcing experiment. All the other elements decreased proportionally similarly to the control medium. We gave extra magnesia as an added nutritive during the fertilization. That is the reason of the higher magnesia contents in all four medium.

The nitrogen, phosphor, potassium and calcium contents were examined in all of the mediums before and after the forcing experiment. The results are shown in *Figure 3*.

The nitrogen contents are decreasing during the cultivation in all four medium. But in case of the 100% spent

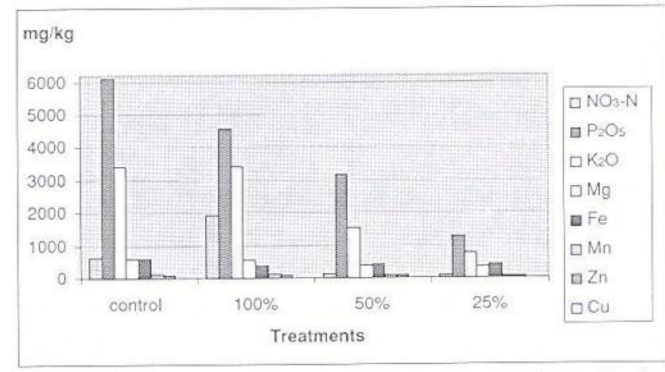

Figure 1 Element content of spent champignon compost before cultivation treatments

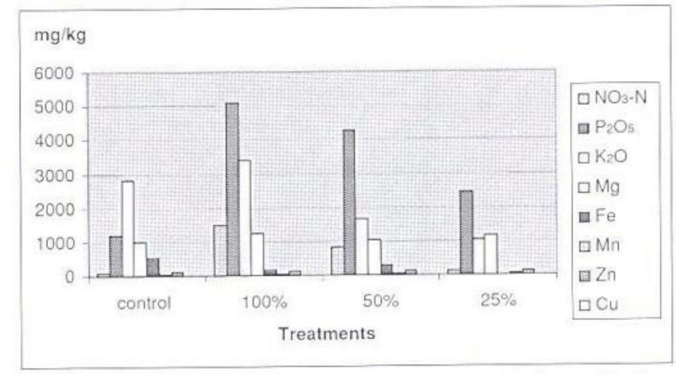

Figure 2 Element content of spent champion compost before cultivation treatments

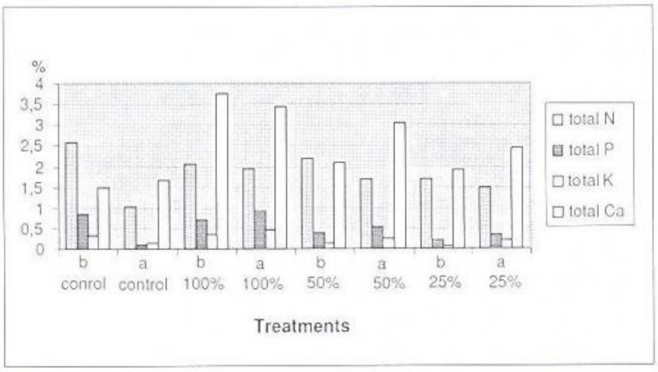

Figure 3 Total N, P, K, Ca content of yielded champion compost before (b) and after (a) cultivation treatments

mushroom compost and the commixtures the reduction is smaller than what we measured in the control medium. Examining the calcium contents, we found that the 100% spent champignon compost contains more calcium before the cultivation than after it. The commixtures had same increasing reactions as the control medium, although the calcium content rose more in the end of the cultivation.

According to *Figures 2* and *3* the 100% spent champignon compost and the commixtures are better root-stabilizing material than the control medium, and it even fixed some of the nutritive during fertilization. Although this character did not have negative effects on the average yield and the quality. We got very good results in both.

There are no sufficient results of the element-structure of the yielded champignon compost.

In comparison with the results of *Beyer* (2001) and *Győrfi* (2004) we got similar results in case of the magnesia, calcium, ferrous, phosphor, organic and total nitrogen. In the case of the potassium, however, we measured a lot less than the previous results. Supposedly this is caused by the quality change in the basic components of the compost (horse-, poultry-dung and straw).

There are no data found in the literature about the element-structure of the spent compost, so we can't compare our results.

Our results about the nutriment content of spent mushroom compost shows so far, that this is an extremely valuable medium, which is high in nutriments, and it can be used for plant cultivation. Because of the quality change of the components of the compost (horse-, poultry-dung and wheat straw), we have to make the experiments several time. This experiment is going to be repeated this year with other tests to get to know more about the horticultural use of spent compost.

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