

# Can plant composts replace cattle manure?

## Effect of compost extracts on roots

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"In addition to tillage and crop rotation, the greatest influence on the revitalization of the soil is the manure of the respective domestic animals, especially cows, that is cared for and provided with compost preparations" – according to the Demeter production guidelines. The positive effect of stable manure on the humus content and soil life is consistently confirmed by the scientific literature (Oltmanns, LE 4/14). But what alternatives are there if you don't have enough of your own manure or if it's a small gardening business that doesn't have the ability to keep animals?

A field test on this topic was established in Darmstadt in 1997: "Comparison of rotted manure and organic fertilizer of plant origin". The experiment compares stable manure with and without biodynamic preparations, mineral fertilization and organic fertilizer of plant origin (since 2004 field bean meal). The results show that plant-

Organic fertilizer tends to be inferior to stable manure in terms of promoting the humus content (see Table 1).

This experiment cannot clarify what effects plant compost has on soil fertility and ultimately food quality compared to rotted manure. That's why we asked ourselves the question: How can a plant compost be produced that comes close to the special effect of cattle manure, i.e. not only brings yield, but also humus, as well as promotes lively soil flora and fauna and conveys cosmic impulses to the earthly realm ?

How can food plants be harvested that strengthen people's ego through manure, compost and plants?

As early as 1933, Karl Max Schwarz described a method of improving plant compost for small gardening businesses that did not have enough space to keep animals. It becomes similar to making compost extracts

A solution of finished stable manure compost was obtained (a so-called "fertilizer water") and poured several times over the plant compost after the hot phase (König, LE 3/12). In this way, the effect of animal manure should be brought into the gardening business as intensively as possible.

Another trial from the USA (Reeve et al., 2010) reports on the growth-promoting effect of compost extracts. They composted grape pomace 1:1 with stable manure and the biodynamic compost preparations. Aqueous extracts were then produced from the finished composts in order to fertilize wheat seedlings in a container experiment. Variants with and without the addition of inorganic fertilizers were compared. Wheat seedlings that were only treated with a 1% compost extract showed the same root and shoot yields after five weeks as the inorganically fertilized plants, even though the variants with compost extract only received 30% of the nitrogen amount of the inorganically fertilized ones. Hargreaves et al. (2008) found no differences in yield of raspberries in a three-year trial when treated with compost extract or compost.

Humus effect of organic fertilizers variant	% Corg
Rotting manure, 100 kg N per ha	0.79b
ha rotting manure and biol.-dyn. Preparations, 100 kg N per ha	0.78b
per ha of faba bean meal, 100 kg N per ha	0.75 off
ha of faba bean meal and biol.-dyn. Preparations, 100 kg N per ha	0.74 a
rotted manure, 170 kg N per ha	0.86c
ha of rotted manure and biol.-dyn. Preparations, 170 kg N per ha	0.83c
per ha Mineral fertilizer, 100 kg N per ha	0.72 a

Organic carbon content  
(% Corg) in the topsoil  
10 years different

Fertilization; Values  
with different letters  
differ significantly (p<0.05).

## Try using fertilizer water

Inspired by these experiments, we asked ourselves the question: "Can the positive effect of manure compost be transferred to green waste compost using fertilizer water?" As a first tactile test, we carried out a container experiment to investigate the effect of compost extracts and compost on plant roots.

12 fertilization variants were tested in a container test with 5

repetitions. Bush beans, variety Marona, served as test plants.

Only the results of the compost extract variants are presented here in order to draw attention not only to the material differences in the composts, but also to morphological phenomena.

Because we will never be able to produce a compost from commercial fertilizers or green waste with exactly the same physical-biochemical composition

in order to be able to carry out repeated experiments with it.

We therefore first looked at whether typical recurring shapes can be found in the composts depending on their origin (animal species, plant, etc.) and whether these shapes can also be recognized in the root images.

## variants

1. Compost extract from green waste compost,
2. Compost extract from green cut compost treated with fertilizer water,
3. Manure compost extract  
Cattle manure compost treated with the biodynamic compost preparations,
4. Check with water.



1.5 liters of substrate were extracted with 40 liters of tap water in a compost extraction device. The extracts were freshly prepared

before each treatment.

No additional microbial food was added to the water.

The extraction time was 8 hours, after which the extracts were diluted to 1% and the variants were treated as follows.

## Results

The bush beans that had been treated with the compost extract from green waste compost with fertilizer water reacted with stronger root growth, measured as ash-free dry mass of the roots. This variant differed significantly from the control (water) and variant 3 (stable manure compost extract from cattle manure compost with the biodynamic compost preparations).

Variant 1 (compost extract from green waste compost) was between these variants (Figure 3).

However, since the root mass is not sufficient to judge the quality of a fertilizer, we paid particular attention to the shape of the roots.

The roots of the common beans were washed and scanned to describe the root morphology. Furthermore, copper chloride crystallization images were produced from the compost extracts.

The evaluation of the copper chloride crystallization images (Figure 1) shows that the extracts from the pure green waste compost variants are more leaf-like, weaker and less structured. They are therefore classified as less favorable in terms of their potential effect than variant 3 (stable manure compost).

How do animal and plant fertilizers? Pot experiment in the research ring for biodynamic farming

Type of culture	French bean
Number of treatments	4
days after sowing	0; 7; 14; 21
Quantity per treatment	1.9ml
Harvest, days after sowing	24

Table 2: Application plan of the extract variants

# ur research

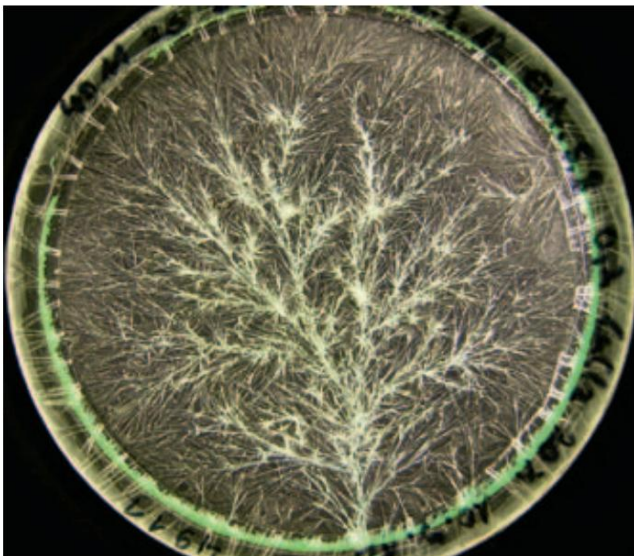
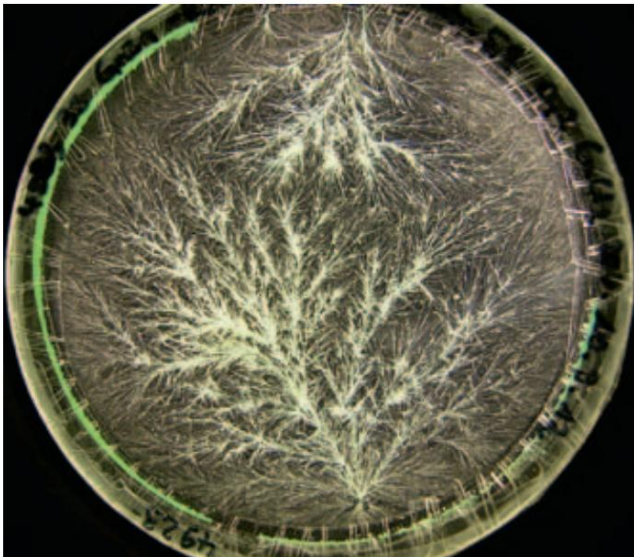
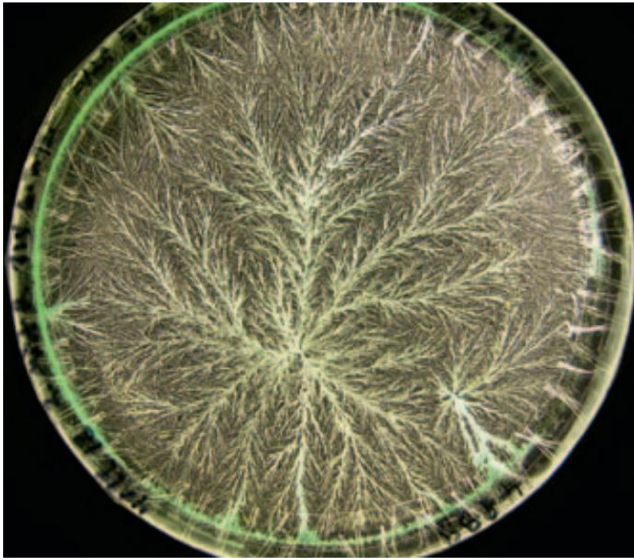


Figure 2 a – c (left):  
Above: Manure compost extract from cattle manure compost: a high substance effect and structuring can be observed here.  
Middle: Compost extract from green waste compost: lowest substance effect, leaf-related, lowest structuring.  
Below: Compost extract from green waste compost treated with fertilizer water: similar substance effects like green waste compost, but better structured and therefore by using stable manure compost extract from cattle manure compost.



Figure 3 a – c (right):  
above: root image of a bush bean ne treated with stable manure post extract  
Middle: root image of a bush bean ne treated with compost extract from green waste compost  
below: root image of a bush bean ne treated with compost extract from green waste compost mixed with fertilizer water

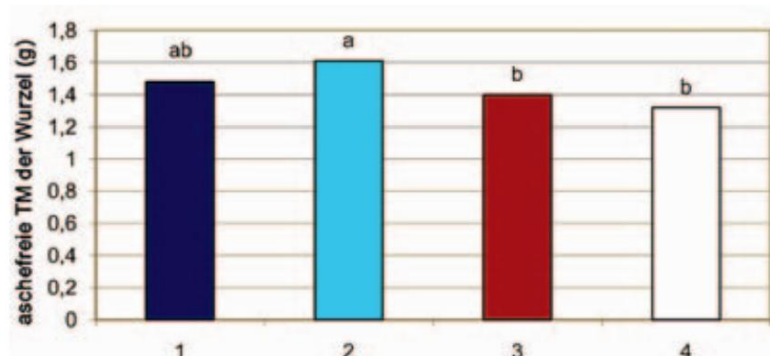


Figure 3: Ash-free dry matter (DM) of the roots in grams (g), mean values with different letters differ significantly ( $p < 0.05$ ).

1 = compost extract from green waste compost;

2 = Compost extract from green waste compost treated with fertilizer water;

3 = Manure compost extract from manure compost with the biodyn. treated with compost preparations;

4 = control; (Water)

Extract). In variant 3, a high substance effect and structuring can be observed. Variant 2 (compost extract from green waste compost treated with fertilizer water) shows a similar substance effect to green waste compost, but is better structured and therefore related to variant 3 (stable manure compost extract).

Similar differences in shape can be found in the root patterns of bush beans. The example images (Figure 2) of the variants can be assigned to the crystallization images. The root pattern of variant 3 (stable manure compost extract) is more structured than that of the other two

ren variants. The root seems to take up more space and is therefore in more contact with its environment in order to absorb nutrients and energy. The root pattern of variant 1 (compost extract from pure green waste compost) appears unstructured and does not take up as much space. The root of variant 2 (compost extract from green waste compost with fertilizer water) showed a somewhat more harmonious growth than the pure green waste.

## Summary and outlook

This experiment shows that green waste compost with fertilizer water

treats the shape of stable manure more closely than pure green waste compost. This is visible in the crystallization image and root morphology.

It is conceivable that a fertilizer with a high substance effect and fine structure means more vital forces for the soil and the plant and can therefore achieve better nutritional quality. The aim of further investigations into the method is to use copper chloride crystallization and root images - in addition to analytical methods - to be able to assess composts for their possible effect on soil life and food quality before they are spread.

Furthermore, practical trials are planned in the near future to test different plant composts (treated with fertilizer water) in comparison to cattle manure compost. These experiments are intended to test the effect of different composts on soil fertility and food quality. Interested farmers (and of course also donors) who would like to try out different composts or who are already doing this on their farm are welcome to contact the research ring. |

## Sources

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