



Radial paper chromatography at rotting and humidification processes 1995

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1. Summary

The method of radial paper chromatography is a good instrument for "first-hand information" on the course of the rotting process and for assessing the quality of the final product. Chromatography is executable without requiring much work in laboratories and without being costly. It yields quick results, which can be interpreted and implemented by the operator of a composting facility very rapidly and safely. Provided there are further research activities, paper chromatography may even become an important instrument for assessing other humidification processes and their products. Still another field of research would be the review of a possible use of paper chromatography in agriculture as a means to quickly gather information on the soil condition.



2. Starting Position

Radial paper chromatography has been used as a practice oriented relatively simple method for assessing the soil and for assessing the quality of composts for decades.



3. Goals

Based upon the experience gained from composts made of mixed waste, the "Institut für Umwelttechnik Leoben" ("Institute for Environmental Technology Leoben") adapted the method of radial paper chromatography to the changed conditions for composting biogenous waste. Then the method is to be used for six different Styrian composting facilities so that the rotting progress can be assessed.

Furthermore, the suitability of radial paper chromatography for assessing the progress of humidification processes was reviewed by taking the example of a facility for sewage sludge humidification in cooperation with the "Institut für Umweltgeologie und Ökosystemforschung von Joanneum Research" ("Institute for Environmental Geology and Eco-System Research of Joanneum Research").



4. Procedure

An important aspect of the project was the specification according to which radial paper chromatography was to be done in the course of composting and in correlation to the routine of the operation of the facility. For this reason, a required prerequisite was to make sure test rotting would be done by the operators in a committed way and by implementing Operating Instructions and utilising experience gained in the operation up to then as well as possible. For the basic assessment of the input materials, the water content, the ignition loss, the content of total nitrogen, the content of carbon and the C/N ratio were acquired. In parallel to radial paper chromatography, the rotting progress was tracked by studying the parameters pH value, water content, ammonium-nitrogen, organic acids, ignition loss, total nitrogen, carbon, C/N ratio, respiratory activity, respiratory intensity as well as the content of humic matter for samples of later rotting stages.

After the extraction of a representative sample of the rotting material with sodium hydroxide and sodium oxalate

or with de-ionised water, the extracts will be subjected to radial paper chromatography on a filter paper prepared with silver nitrate solution.

The resulting circular chromatographs from the aqueous or alkaline extract have certain structural features that are typical for the instantaneous state of the rotting material and will then be assessed according to defined criteria.



5. Result / Benefits

Paper chromatography has proved to be a simple, rapid and cost efficient method for gathering first information on the rotting progress for all composting and humidification processes and thus allows the personnel of the facility to identify process errors and to intervene rapidly.

The chromatographs describe the instantaneous state of the rotting material and process. This description correlates to the chemical and physical analysing parameters very well. An exception is formed by the correlation to respiratory activity and humic matter because these do not correspond to the experience gained at composting of mixed waste in several cases.

If the water content and ignition loss in the rotting material and the temperature development in the rotting body are determined in addition to chromatographs to gather "first information", these data will almost always make it possible to identify the reason for the malfunction in the rotting process (lack of air, lack of water, bad process cooling or too much ventilation).

Furthermore, the study gave a survey of the state of composting technology in Styria. Even though the facilities could not be directly compared because of the different input materials, the following statements could be made:

- The shortest rotting period in intensive and subsequent rotting was achieved at composting in stacks. The studied processes could not prove that mechanical ventilation at intensive rotting would help to save the overall rotting period.
- At all facilities, the material qualities were neither achieved in subsequent rotting nor in post-maturing. This showed once again that these process phases would not run "autonomously" but would definitely require active process management.
- Intensive rotting systems that are ventilated mechanically and computer aided induce the personnel of the facility to deal with this process phase too much. Nevertheless, the net loss of water was too high in all the cases of intensive rotting systems ventilated mechanically, which meant that at least the first phase of subsequent rotting would have unfavourable conditions. One reason for this might be the fact that the computer programme defined by the plant erector was not adapted to the input material actually produced.

