



Impact of the moisture of municipal solid wastes on the nitrogen transformation during composting

M. Licznar (1), J. Drozd (1), L. Sajdak (2), K. Walenczak (1), **E. Jamroz (1)**

1. Institute of Soil Science and Environmental Protection, Wrocław University of Environmental and Life Sciences (ejamroz@ozi.ar.wroc.pl)
2. Research Centre for Agricultural and Forest Environment, Polish Academy of Sciences, Poznan, Poland (szajlech@man.poznan.pl)

Re-utilization of organic materials as fertilizers, especially for nitrogen, is necessary throughout the world. Increasing amounts of municipal wastes could therefore be used for this purpose, and help to solve the problem of disposal of house hold waste and sewage sludge. Mostly municipal wastes contain a large amount of organic materials which could be used as an organic soils conditioner after composting. Composting represents biochemical, chemical and biological oxidation processes lead to the conversion, transformation and degradation of organic matter by microorganisms. Direction, mechanism and intensity are depended on the moisture content and C/N ratio. It seems that these two factors play significant function in an oxidation of the organic matter of municipal wastes, and may modified rate of this process.

The aim of the investigation was to study the changes of different forms of nitrogen running during maturity of MSW compost produced acc. MUT-DANO system.

The investigation was carried out in period 5 months in three following treatments:

A - the pile, on polyethylene sheet, moisture content was equal to $0.5 \text{ H}_2\text{O kg}\cdot\text{kg}^{-1}$ of dry mass of compost. It was adjusted in a day of an aeration and ranged from 0.440 to $0.524 \text{ kg}\cdot\text{kg}^{-1}$ of dry mass during entire experiment.

B – a plastic container of the total capacity approximately 1000 l, moisture content was equal $0.5 \text{ H}_2\text{O kg}\cdot\text{kg}^{-1}$ of dry mass of compost. It was adjusted in a day of an aeration

and ranged from 0.462 to 0.534 kg·kg⁻¹ of dry mass during entire experiment.

C – a plastic container of the total capacity approximately 1000 l, moisture content was equal 0.6 H₂O kg·kg⁻¹ of dry mass of compost. It was adjusted in a day of an aeration and ranged from 0.469 to 0.600 kg·kg⁻¹ of dry mass during entire experiment.

As a result of mixing after each 10-15 days an aeration conditions in equilibrium were maintained. The samples were collected from 20 sites for preparing a “mean sample”, which used for the measurements:

- moisture and ash contents,
- N_t- total,
- N_w - water soluble (1:10),
- N-NH₄⁺ and N-NO₃⁻ in water extracts,
- N_{wo} – organic water soluble N, which was calculated from the equation:

$$N_{wo} = N_w - (N-NH_4^+ + N-NO_3^-),$$

The following parameters were calculated:

- lost of nitrogen on the basis of initial (X₁) and final (X₂) ash contents,
- N - lost % = 100 – 100 (X₁·N_{t2}/ X₂ · N_{t1})
- rate of the processes.

Results showed that the content of N_t-total and the transformation of its mineral and organic forms were favored by moisture content in the compost. This factor impacted significantly on the quality of composts that exerted a decisive influence on their fertility.

On the pile at 0,5 H₂O kg·kg⁻¹ final product was characterized by an increase of N_t (about 33%) and N-NO₃⁻ (about 6613%) and decrease of N_w – water soluble (up to 64%), N_{ow} – organic water soluble (up to 9,8%), N-NH₄⁻ (up to 1%) in relation to starting material.

Increase of the moisture content up 0.6 H₂O kg·kg⁻¹ of dry mass of compost resulted the following changes of nitrogen parameters: increase of N_t-total (only about 2%) and N-NO₃⁻ (about 360%) and decrease of N_w - water soluble (up to 5%), N_{wo} - organic water soluble (up to 2%), N-NH₄⁺ (up to 0,5%) in relation to starting material.

It was observed that composting of municipal solid wastes at 0.5 H₂O kg·kg⁻¹ on the pile, limited the lost of nitrogen and reached of compost in N_t-total and N-NO₃⁻.

However, due to high content of moisture (up $0.6 \text{ H}_2\text{O kg}\cdot\text{kg}^{-1}$) and low aeration, the compost was characterized by higher loss of nitrogen, which decrease its fertility. The results of investigations showed that higher content of moisture modified the rate, direction and mechanism of the composting process.