

Fractions of particulate organic matter in soils depending upon farmyard manure and mineral fertilization

Joachim Raupp, Meike Oltmanns

Institute for Biodynamic Research, Brandschneise 5; D-64295 Darmstadt (Germany)

e-mail: raupp@ibdf.de

Keywords: manure, mineral fertilization, humus quality, soil life, long-term trial

Introduction

The particulate organic matter (POM) in soils is affected by cultivation methods and farming systems (Wander & Traina, 1996; Fließbach & Mäder, 2000). It is obtained by size-density fractionation. The effect of fertilization upon POM levels in topsoil was investigated in a long-term trial after 20 years.

Materials and methods

A long-term trial, started in 1980, is comparing composted cattle manure in 2 treatments with and without application of biodynamic preparations and mineral fertilization, each at 3 levels corresponding to 0.9, 1.4 and 1.8 livestock units per hectare. The site conditions are: latitude 49° N, longitude 8° E; 100 m above sea level, annual averages 9.5°C air temperature and 590 mm precipitation; sandy orthic luvisol with 87% sand, 8% silt and 5% clay in the topsoil. In March 2000 soil samples were taken out 0-25 cm depth before applying fertilizers. In 1999 spring wheat was cultivated on this field. POM was analysed in the sand fraction (>63 µm) with the method of Meijboom et al. (1995). The organic matter was separated with sodium polytungstate (Magid et al., 1996) into a light ($p < 1.13 \text{ g cm}^{-3}$), medium (1.13-1.37 g cm^{-3}) and heavy ($p > 1.37 \text{ g cm}^{-3}$) fraction.

Results and discussion

The manure fertilized plots had lower contents of the light fraction than the mineral treatments (Table 1). This indicates that organic residues are decomposed faster in the manure fertilized soil, in accordance with the higher biological activity found earlier in the organic treatments. The medium fraction showed no significant difference. The heavy fraction showed the same distribution, the C_{org} values being much higher with manure fertilization than with mineral fertilizer.

Table 1: Effect on POM fractions (g kg^{-1} dry matter) of composted manure without (CM) and with application of biodynamic preparations (CMBD) and mineral fertilization (MIN) at 3 levels; mean values of a factor with different letters are significantly different ($p < 0.05$)

	CM	CMBD	MIN	Low level	Medium level	High level
Light fraction	0.87 a	0.93 a	1.26 b	0.96 a	1.05 b	1.04 b
Medium fraction	0.54	0.63	0.65	0.58	0.65	0.6
Heavy fraction	11.34 b	11.81 b	8.01 a	9.46 a	10.66 b	11.03 b

References

- Fließbach, A.; Mäder, P. (2000). Microbial biomass and size-density fractions differ between soils of organic and conventional agricultural systems. *Soil Biology & Biochemistry* 32, 757-768.
- Magid, J.; Giller, K. E. and Gorissen, A. (1996). In search of the elusive "active" fraction of soil organic matter: three size-density fractionation methods for tracing the fate of homogeneously C-labelled plant materials. *Soil Biology & Biochemistry* 28, 89-99.
- Meijboom, F. W.; Hassink, J. and van Noordwijk, M. (1995). Density fractionation of soil macroorganic matter using silica suspensions. *Soil Biology & Biochemistry* 27, 1109-1111.
- Wander, M. M. and Traina, S. J. (1996). Organic matter fractions from organically and conventionally managed soils: I. carbon and nitrogen distribution. *Soil Science Society of America Journal* 60, 1081-1087.