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Temporal change in molecular weight distribution of hot-water extractable organic nitrogen from cattle manure compost buried in soil using high-performance size exclusion chromatography with chemiluminescent nitrogen detection

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The application of compost can improve the fertility of the agricultural soils. The compost organic nitrogen is absorbed by plants after degradation and mineralization. To investigate the degradation process of compost organic nitrogen in soil, we conducted soil burial test of compost and observed the molecular weight distribution of hot-water extractable organic nitrogen from the compost. The cattle manure compost (1g) was mixed with soil (25g), put into glass fiber-filter paper bag and buried in 15 cm under surface of the ground for 6 months. The soils used were Andosol, Gray Lowland soil, and Yellow soil without organic matter application for 25 years in Tsukuba, Japan. Organic matter was extracted from the buried sample with 80˚C of water for 16 hours. The molecular weight distribution of the hot-water extractable organic matter (HWEOM) was measured by high-performance size exclusion chromatography and chemiluminescent nitrogen detection (HPSEC/CLND). In this system, N-containing compound eluted from a SEC column was introduced into a furnace at 1050˚C, and N in the compound was oxidized to nitric oxide and then detected using a chemiluminescent reaction with ozone. The N chromatogram showed that N in the HWEOM from the soil with compost had various molecular weights ranging from 0.1 to 100 kDa. A void peak (>100 kDa), a broad peak around 30 kDa, and several sharp peaks less than 30 kDa were observed in the chromatogram. The broad peak (∼ 30kDa) was likely to be derived from the compost, because it was not observed in the chromatogram of HWEOM from soil alone. The N intensities of all peaks decreased with burial time, especially, the broad peak (∼30 kDa) intensity rapidly decreased by 10 – 50 % in only first 2 months. The decreasing rates of the broad peak were higher than that of the sharp peaks, indicating that the organic nitrogen with a larger molecular weight decomposed faster. The broad peak (∼ 30 kDa) had visible (420nm) absorption and less fulvic acid like florescence (Ex340nm, Em440 nm). The several sharp peaks had small visible absorption and intense florescence. Further studies are needed to assign the chemical forms for each peak.