【Workshop 4】Biodiversity and Agro-ecosystem in Rice Paddy Landscape in Monsoon Asia

The function of the earthworms and enchytraeids (Oligochaeta) feeding activity in the nutrient cycling in agro-ecosystem

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The biodiversity in the paddy field have been reassessed recently. Earthworms and enchytraeids of the soil biota are recognized as important and beneficial components in agro-ecosystem, since their activities, especially feeding activity, enhance decomposition and mineralization of organic matter which results in a high soil fertility and good health. Organic matter and soil ingested by earthworms are affected chemically by many enzymes during the passage through the gut of earthworms. However, digestive enzymes of earthworms and enchytraeids have been scarcely investigated in Asia. In this study, we assessed the digestive enzyme activities of seven pheretimoid and one lumbricid earthworms (Megadrilids) and enchytraeids (Microdrilids) living in Japan.

All enzymes activities in the gut contents of earthworms, *Pheretima hilgendorfi*, *P. hupeiensis* and *Eisenia fetida*, were higher than in the surrounding soil and in the casts. The enzyme activity levels of the gut varied among earthworm species, in which earthworms (e.g. *P. hilgendorfi*) living in litter and the surface layer of soil had lower cellulase and alkaline phosphatase activities than earthworms (e.g. *P. heteropoda* and *P. hupeiensis*) living in the soil. On the other hand, enchytraeids had high level of amylase activities. In the zymogram analysis, many protease-active bands were observed in the gut tissue and content of the earthworms. Moreover, the electrophoretic patterns of protease activity differed among earthworm species. These results suggested that the ingested organic matter and soil by earthworms are affected by many enzymes during the passage though their gut, which might contribute to the carbon, nitrogen and phosphate nutrient cycling in paddy fields. Hence, it is considered that earthworms play an important role in the decomposition of rice stubble after grain harvest. Thus, the diversity of earthworms and enchytraeids species in the paddy field should be conserved since they have various functions in the agro-ecosystem that differ among species by species-specific enzyme activities and isozymes in the gut.