

Impact of tubificid worms on ecosystem in ricefield with organic farming (Biological Interactions in Arable Land-Grassland-Forest Continuums and their Impact on the Ecosystem Functions, 7th International Symposium on Integrated Field Science)

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Impact of tubificid worms on ecosystem in ricefield with organic farming

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Tubificid worms (aquatic oligochaetes) are one of the major benthos in lake bottom sediments and are well known to influence lake ecosystems through increasing nutrient release to water from the bottom sediments (Fukuhara and Sakamoto, 1987). It is also known that tubificids present at high density in the ricefield with organic farming and increase phytoplankton and zooplankton in the overlaying water of ricefields due to increased release of nitrogen and phosphate from soils (Kikuchi and Kurihara, 1982).

In this study, we investigated the impact of tubificids on ricefield ecosystem on the viewpoint of nutrient change in the soil and surface water of the organically managed ricefield.

Materials and methods

We measured the population density of tubificids and the soil mass perturbed by tubificids in the winter-flooded and organically managed ricefield of Miyagi, Japan. The incubation experiment were conducted under continuous dark and dark/light (12/12 hours) at 30 °C for 4 weeks using 300 mL vials with 7 cm depth of alluvial soil and 5 cm depth of overlaying water. Ammonium and phosphate concentrations were measured in the soil and the overlaying water with and without a kind of tubificid (*Branchiura sowerbyi*) (0-78 g m⁻² on the basis of wet weight).

Results and discussion

The major species of tubificids were *Limnodrilus socialis* and *Branchiura sowerbyi* in the ricefields surveyed. The population densities of tubificids were higher in the four ricefields with organic farming (maximum densities: 15,000-40,000 ind. m⁻²) than those of the control ricefields with application of agrichemicals. Soil mass perturbed by feeding and excretion action of tubificids were estimated to be about 6 cm of thickness from the results of two no-tilled organic ricefields. Concentrations of ammonium nitrogen and available phosphate in the soils significantly increased with the increasing of tubificid densities under continuous dark and dark/light. Amounts of ammonium nitrogen and dissolved inorganic phosphate released into the overlaying water from the soils increased in proportion to the tubificid densities under continuous dark. Tubificids increased bioavailable nutrients in the submerged soil and the overlaying water probably due to accelerating soil organic matter decomposition and nutrient diffusion in the soilwater interface. From the results, tubificids probably increase organism production in the overlaying water of ricefield with organic farming.

References

- Fukuhara and Sakamoto, Oikos, 48: (1987)
- Kikuchi and Kurihara, Hydrobiologia, 97: 203-208 (1982)