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Positive Effects of Tubificid Worms on Rice Growth and Yield in Organic Farming System

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Introduction

Tubificid worms are one of the important groups in benthic fauna of paddy field, and their population density increases in the paddy fields managed organically (Ito *et al.*, 2011). Tubificid worms disturb soil layer with feeding and excreting soil on ground surface. The action of tubificid inhibits weed germination by burying seeds and promotes mineralization of soil organic nitrogen (Kikuchi and Kurihara, 1977). However, these effects have been investigated by small size experiments using beaker or cultivation pot and effects of tubificid worms in paddy fields are still unclear. We investigated the effects of tubificid worms on rice growth and soil nutrient change (nitrogen and phosphorus) in a paddy field managed organically.

Materials and Methods

We buried plastic frames with area of 0.11 m² to the depth of 0.15 m under the ground in the paddy field in FSC of Tohoku University, Japan. Two rice seedlings were planted in each frame. Organic fertilizer and rice bran were applied to each frame at the rate of 7 g/m² as the total nitrogen. We prepared four treatments with three replications in combination with tubificid worm addition and weed removal by hand: adding tubificid worms with weeding (T+W+), adding tubificid worms without weeding (T+W-), no tubificid worms with weeding (T-W+), no tubificid worms without weeding (T-W-). We added tubificid worms of 2178 ind. to each frame (20,000 ind./m²) for the T+ treatment. Rice yields and ammonium-N and available phosphorus (P) extracted by Bray 2 method in the soils during rice growth period were measured.

Results

Brown rice yields significantly increased by 33 % and 55 % in T+W+ and T+W- treatments relative to the corresponding treatments (T-W+, T-W-), respectively. Numbers of grains per panicle and total numbers of panicle significantly increased with the addition of tubificid. Soil ammonium N and available P in soils tended to increase and N uptake of rice significantly increased with the addition of tubificid. Rice growth and yield increased probably due to the enhancement of soil N mineralization, which may be promoted by soil turbation with tubificid worms.

