**Effect of surface soil disturbance by hand weeding on organic rice cultivation in a new constructed rice paddy during three consecutive growing seasons**

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Weeding is an essential and important managemental practice of organic rice cultivation. Unlike conventional rice cultivation, where herbicides are applied. Soil surface of the paddy field is disturbed by the weeding practices and changed the surface physical, chemical and biological conditions. It was said that disturbance of paddy surface by weeding would promote nitrogen fixation in soil surface and improve rice growth. Therefore, in order to investigate the effect of soil surface disturbance by weeding on organic rice cultivation, we carried out a three consecutive years (2019-2021) experiment in a new constructed rice paddy located on Tsuruoka campus, Yamagata University, Japan.

Rice cultivar, Haenuki, was transplanted to both weeding and no weeding plots on June early and harvest on September later every year. In the weeding plots, manual weeding with soil surface disturbing was carried out 5~7 times weekly from middle of June to end of July. Rice growth parameters such as shoot height, maximum tiller numbers, leaf greenness were investigated weekly, rice and weeds biomass, N uptake were measured heading and grain-filling stages, rice yield and its components were measured after harvest.



 Fig. 1. Comparisons of plant height (above), tiller number (middle), and leaf color measured in SPAD values (bottom) of rice plants between weeding and no weeding during 3 years.

The results showed that there were no significant differences in rice growth parameters, N uptake and rice yield between weeding (soil surface disturbing) and no weeding treatments in the first year since there was no there was no any paddy weed appearance in the new constructed field. The rice grain yields were 515.0 and 579.0 g/m2 in weeding (soil surface disturbing) and no weeding plots, respectively. From the second year, large amount weed of *Monochoria vaginalis* (Burm. f.) was occurring in the no weeding plots, rice growth and yields were significant differences between weeding (soil surface disturbing) and no weeding treatments. The grain yields were 587.0 and 425.8 g/m2 in weeding and no weeding plots, respectively. the yields were decreased in third year to 477.0 in weeding plots and 175.0 g/m2 in no weeding plots. The weeds biomass of no weeding plots in 2021 was higher than that in 2020. The 3-year results suggest that it is very important for organic rice cultivation to remove weeds that compete with rice for nutrient absorption. Disturbing the soil surface only did not affect rice growth and maintaining soil fertility in continuous rice cultivation is necessary.



Fig. 2. Grain yield (a) and its components: panicles per m2 (b), spikelet per panicle (c), individual grain weight (d) and percentage of filled spikelet (e) between weeding and no weeding treatments during 3 years.

**Keywords:** Hand weeding, Organic farming, rice, soil surface disturbance, Yield components.

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