Combined Use of Azolla and Loach Suppressed Weed Monochoria vaginalis and Increased Organically Farmed Rice Yield

Combined Use of *Azolla* and Loach Suppressed Weed *Monochoria vaginalis* and Increased Organically Farmed Rice Yield

Weiguo Cheng*, Yuka Okamoto, Shuhei Sato, Katsuya Kasahara, Keitaro Tawaraya and Hironori Yasuda

Yamagata University, Japan

Abstract

The primary challenge in organic rice farming is controlling weeds without using herbicides. *Monochoria vaginalis* is one of the most common and troublesome annual broadleaved weeds in rice paddies, where it competes with rice for N uptake. *Azolla* is a genus of floating aquatic ferns, used for many centuries as a green manure in traditional rice production. Loach is a freshwater fish that was once widely spread in Asian rice paddies, but has disappeared in modern conventional rice paddies due to use of synthetic agricultural chemicals. We performed an in situ container experiment to study the effects of individual and combined use of *Azolla filiculoides* and loach (*Misgurnus anguillicaudatus*) to suppress *M. vaginalis* emergence and increase organically farmed rice yield. This study was designed with 4 treatments -control (with neither *Azolla* nor loach), *Azolla* (*Azolla* alone), loach (loach alone), and Az+Lo (combined *Azolla* and loach)- with 3 replications each. The results show that the use of *Azolla* alone and loach alone partially suppressed *M. vaginalis* emergence and improved rice yield due to the effects of both shading and N-fixation by *Azolla*, and aquatic bioturbation by loach. The combined use of *Azolla* and loach had a stronger effect, totally suppressing weed emergence and increasing rice yield to 131% that of control treatment, indicating that combined use of *Azolla* and loach may be a valuable approach in organic rice farming, especially in organically farmed rice paddies with high densities of *M. vaginalis* seeds.