

ABSTRACT

Laboratory experiments were conducted to investigate the effect of winter grasses (foxtail and milk vetch) incorporation to submerged soil on the germination of summer weeds and its contribution as a source of inorganic nitrogen in the organic flooding paddy soil. Soil samples were collected from organic paddy fields located in Tochigi, Japan. Together with an untreated control (0%), foxtail (*Alopecurus aequalis*) and milk vetch (*Astragalus sinicus*) were independently incorporated at 0.25%, 0.5%, 1% and 1.5% rates in four equal replications in plastic PET bottles (16.2 x 18 x 15 cm) filled with 0.7 kg air-dried soil. The PET bottles were placed in a growth chamber (Biotron) set to 27/18°C (day/night), 70/65% (day/night) humidity, and 40,000lx (12h) for 28 days. The total number of weeds and changes in flooding water electrical conductivity (EC) values were investigated throughout the experimental periods. Changes in soil inorganic N was determined at the end of the experiment. Both incorporation of foxtail and milk vetch significantly suppressed the germination of summer weeds at 1% treatment by 56% and 50% compared with control, respectively, and 1.5% treatment by 78% and 77% compared with control, respectively. There was a high and significant positive correlation between the amount of winter grasses incorporation and EC; the degree of growth suppression significantly increased with an increase in EC. Incorporation of foxtail at 0.25% and 0.5% treatments significantly increased inorganic N contents in the sub-layer by 68% on average compared to control, with no significant changes in the top-layer. While incorporation of milk vetch at 1% treatment significantly increased inorganic N contents in both top-layer and sub-layer by 200% and 316% compared to control, respectively. Increasing inorganic N by incorporation of milk vetch was significantly increased with an increase in the rate of incorporation. In conclusion, incorporation of winter grasses, such as foxtail and milk vetch, in flooding organic paddy soil, have both the potential to suppress weeds and act as a source of inorganic N.

Key words: foxtail, milk vetch, incorporation, weed suppression, nitrogen

INTISARI

Penelitian skala laboratorium ini bertujuan untuk mengetahui efek dari penggabungan tumbuhan musim dingin (foxtail dan milk vetch) ke dalam tanah sawah tergenang terhadap pertumbuhan gulma selama budidaya padi pada waktu musim panas dan kontribusinya terhadap nitrogen tersedia tanah. Sampel tanah diambil dari sawah organik yang berlokasi di Tochigi, Jepang. Perlakuan penggabungan foxtail dan milk vetch ke dalam 700 g tanah dilakukan secara terpisah pada takaran 0% (control), 0.25%, 0.50%, 1.00%, dan 1.50% yang dimasukkan ke dalam PET botol (16.2 x 18 x 15) dengan masing-masing empat ulangan. PET botol kemudian dimasukkan ke dalam inkubator (*growth chamber*) selama 28 hari yang diatur pada suhu 27/18°C (siang/malam), kelembaban 70/65% (siang/malam), and sinar matahari 40,000lx. Total gulma yang tumbuh pada setiap perlakuan dan perubahan nilai EC di genangan air tanah sawah dilakukan selama penelitian berlangsung. Analisis N tersedia tanah ($\text{NH}_4^+\text{-N}$ and $\text{NO}_3^-\text{-N}$) dilakukan pada akhir penelitian. Penggabungan masing-masing 1% foxtail dan milk vetch ke dalam tanah dapat menekan pertumbuhan gulma secara signifikan sebesar 56% pada foxtail dan 50% pada milk vetch; dan perlakuan penggabungan 1.5% dapat menekan pertumbuhan gulma secara signifikan sebesar 78% pada foxtail dan 77% pada milk vetch dibandingkan dengan control. Terdapat hubungan korelasi signifikan positif antara jumlah penggabungan tumbuhan musim dingin dengan perubahan EC; laju penekanan gulma meningkat secara signifikan dengan meningkatkan nilai EC tanah. Penggabungan 0.25% dan 0.5% foxtail ke dalam tanah dapat meningkatkan inorganik N di *sub-layer* sebesar 68% dibandingkan control, dan tidak memberikan pengaruh nyata pada *top-layer*. Sementara penggabungan 1% milk vetch dapat secara signifikan meningkatkan inorganik N pada *top-layer* sebesar 200% dan *sub-layer* sebesar 316% dibandingkan dengan control. Dapat disimpulkan bahwa penggabungan tumbuhan musim dingin seperti foxtail dan milk vetch ke dalam tanah memiliki efek positif terhadap penekanan gulma dan dapat berkontribusi sebagai sumber nitrogen ($\text{NH}_4^+\text{-N}$ dan $\text{NO}_3^-\text{-N}$) di sawah organik.

Kata kunci : foxtail, milk vetch, penggabungan, penekanan gulma, nitrogen