Effect of rice bran and deep flooding on weed suppression in transplanted rice field

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Objectives

The objectives of this study were to determine the effects of rice bran application and deep flooding on occurrence of weeds in rice fields, and to evaluate the possibility of utilizing rice bran in combination with deep flooding to control weeds in transplanted rice field.

Materials and Methods

This experiment was conducted at Experimental Station, Seoul National University, Suwon, Korea in 2005 with the following treatments: SF, shallow flooding (3-5 cm water depth); DF, deep flooding (8-10 cm water depth); SF × HB, SF + herbicide; DF × LRB, DF + 100 g rice bran m^{-2} DF × HRB, DF + 200 g rice bran m^{-2}. All the treatments were applied only with the manures of 1000 kg/10a. Rice bran and deep flooding were applied at 7 days after transplanting (DAT). Deep flooding maintained for one mouth The weed occurrence was investigated at 40 DAT. The dissolved oxygen (DO) of water and the soil redox potential (Eh) at 2 cm depth were measured every 2 days after deep flooding and rice bran application. Control efficacy (%) of weed was calculated as [(control-treatment)/control]×100.

Results and Discussion

Weed occurrence was shown in Table 1. Occurrence of *Echinochloa crus-galli*, *Cyperus amuricus*, *Aneilma keisak* and *Bidens tripartita* were significantly reduced by DF treatment. *Ludwigia prostrate* were suppressed by DF with rice bran. *Monochoria vaginalis* was not suppressed by DF and RB treatments.

In general, both DF and RB had good effect on suppressing weeds. However, they showed good effect on some weed species but not on others (Table 2). For example, DF did not suppress *Monochoria vaginalis*, but did all other species RB did not suppress significantly *Echinochloa crus-gall* but significantly the others Moreover RB reduced the occurrence of *Cyperus amuricus,* only when treated with the high dose of rice bran

Because of the deep water deterring O_2 diffusion and rice bran decomposition consuming a lot of O2, the DO of DF and DF × RB treatments were lower than SF and SF × HB treatment (Fig. 1). But the Eh of soil varied very similarly except for the first 2 days after rice bran treatment. Therefor, weed suppression by DF and RB treatment would be ascribed mainly to lowered DO.

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Table 1. Occurrence (no./500m^2) of weeds as affected by rice bran application and deep flooding in rice field.

	SF[a]	DF	DF×LRB	DF×HRB	SF×HB
Monochoria vaginalis	15.7 ab (0)[b]	18 a[c] (-14.9)	11 b (29.8)	10.7 b (31.9)	2.0 c (87.2)
Echinochloa crus-galli	8 3 a (0)	1.3 b (84 0)	5.0 b (40)	2.3 b (72.0)	0.5 b (94)
Ludwigia prostrata	16.3 a (0)	14 0ab (14.3)	4.3 c (73.5)	7.0 bc (57 1)	7.0 bc (57.1)
Cyperus amuricus	16.0 a (0)	3.7 b (77.1)	5.0 b (68.6)	4 0 b (75.0)	1.7 b (89.6)
Aneilma keisak	1.0 a (0)	0 b (100)	0 b (100)	0 b (100)	0 b (100)
Bidens tripartita	1.3 a (0)	0 b (100)	0 b (100)	0 b (100)	0 b (100)

[a] SF: shallow flooding, DF: deep flooding, LRB: low dose of rice bran (100 g / m^2), HRB: high dose of rice bran (200 g / m^2), HB: herbicide.

[b] Numbers in parentheses are the control efficacy (%) compared with control (SF treatment).

[c] Values with the same letters in a row are not significantly different at the 0.05 probability level.

Table 2 Effect of flooding depth and rice bran on occurrence of four weed species.

	Monochoria vaginalis	*Echinochloa crus-galli*	*Ludwigia prostrata*	*Cyperus amuricus*
(a) Effect of flooding depth (no /500cm^2)				
SF[a]	15. 7a[b]	8.3a	16.3a	10.7a
DF	13 2a	2.3b	8.4b	4.2b
(b) Effect of rice bran (no /500cm^2)				
Non-RB	16.8a	4.8a	15.2a	7.2a
LRB	11.0b	3.3a	7.0b	5.0ab
HRB	10.7b	2.3a	4.3b	4.0b

[a] SF: shallow flooding, DF: deep flooding, Non-RB: no rice bran, LRB: low dose of rice bran (100 g / m^2), HRB high dose of rice bran (200 g / m^2)

[b] Values with the same letters in a column are not significantly different at the 0.05 probability level.

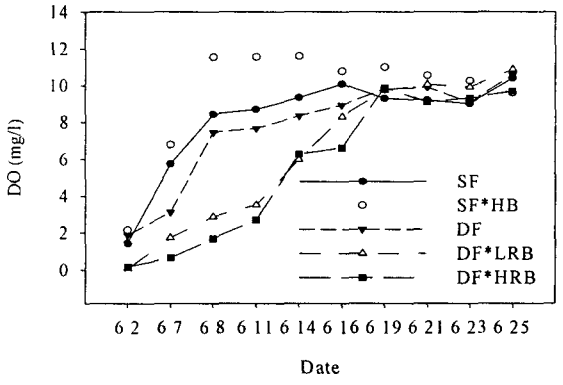

Fig. 1. Temporal changes of dissolved oxygen (DO) in flooded water

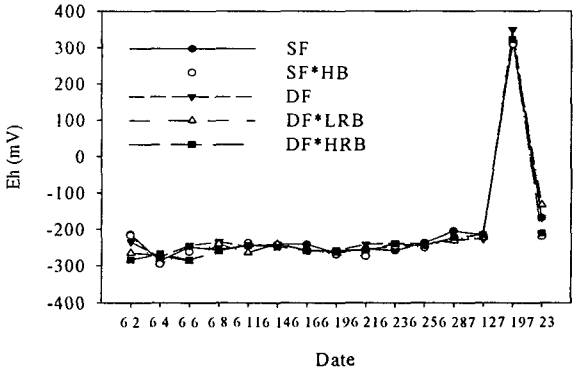

Fig. 2. Temporal changes of soil redox potential (Eh) measured at 2 cm below soil surface.