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Efficacy of Cyhalofop-butyl Against Weeds in Rice Nursery

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ABSTRACT

Cyhalofop-butyl applied at different doses (60 to 150 g ha^{-1}) at 14 DAS significantly decreased the density and dry matter of *Echinochloa crusgalli* (barnyard grass) and increased crop biomass over its application at 8 DAS and weedy check which were at par with pretilachlor with safener (sofit). Only pretilachlor with safener controlled broadleaf weeds. Cyhalofop did not have any effect on the broadleaf weeds.

INTRODUCTION

Currently, there is a limited choice for post-emergence grass weed control in rice. Cyhalofop-butyl 10 EC (2-[4-(4-cyano-2-fluorophenoxy) phenoxy] propanoic acid, butyl ester, a new aryloxyphenoxy propionate herbicide has been developed for post-emergence control of grass weeds in water and dry-seeded rice. Cyhalofop-butyl is a phloem mobile, systemic herbicide that inhibits the enzyme Acetyl-CoA carboxylase (ACCase). In susceptible grasses, cyhalofop efficacy is due to metabolism to the herbicidally active monoacid metabolite. In tolerant plant like rice it quickly metabolized to the inactive diacid. Broadleaf plants are completely tolerant to cyhalofop-butyl.

In India, rice is sown as transplanted on large scale and healthy rice seedlings play a great role in increasing its yield. Weeds are the major constraints in raising healthy nursery of rice. Because of similar morphology of *Echinochloa crusgalli* and rice plants at the early stage, some weeds from nursery beds are also transplanted in the main field alongwith the rice plants. Pre-emergence application of butachlor, anilofos and pretilachlor causes phytotoxicity to the emerging rice seedlings. Therefore, the present study was undertaken to evaluate the performance of a new herbicide cyhalofop-butyl applied as post-emergence in rice nursery as a tool to control *Echinochloa crusgalli* and its effect on rice seedling.

MATERIALS AND METHODS

A field experiment was conducted at CCS Haryana Agricultural University Regional Research Station, Karnal during **kharif** 2002 and 2003. The soil of the experimental field was sandy clay loam in texture having pH 8.1 and 0.35% organic matter. Twelve treatments comprising cyhalofop-butyl at 60, 90, 120 and 150 g ha^{-1} each applied 8 and 14 days after sowing (DAS), pretilachlor with safener at 450 g ha^{-1} applied 3 DAS and butachlor at 1500 g ha^{-1} applied 8 DAS, weedy check and hand weeding twice were arranged in randomized block design with three replications (Table 1). Pre-germinated seeds of rice variety IR-64 were sown on June 7, 2002 and June 6, 2003 by broadcasting method in well prepared dry beds of 3.0 m x 2.3 m size at 25 g m^{-2} and the nursery was maintained as per package of practices of CCSHAU, Hisar. Herbicides were applied after mixing with sand in standing water (2-3 cm) as per treatment. Water was withheld for 1-2 days and again irrigation was applied frequently as and when required to keep the soil saturated. The rice nursery was harvested at 30 days after sowing of seeds and the crop biomass of oven-dried samples was recorded.

RESULTS AND DISCUSSION

The experimental field was heavily infested with *Echinochloa crusgalli* and *E. colona, Cyperus iria, Fimbristyllis miliacea, Lindernia procumbens*

Table 1. Effect of cyhalofop-butyl on weed density in rice nursery

Treatment	Dose (g a. i. ha^{-1})	Stage of application (DAS)	Weed density (No. m^{-2})				Weed dry weight (g m^{-2})			
			Grasses		Broadleaf		Grasses		Broadleaf	
			2002	2003	2002	2003	2002	2003	2002	2003
Cyhalofop-butyl	60	8	7.8 (67)	4.3 (18)	4.5 (19)	4.5 (19)	4.8	4.7	4.7	3.7
Cyhalofop-butyl	90	8	4.3 (18)	4.3 (18)	4.4 (18)	4.4 (18)	2.2	2.1	3.7	3.5
Cyhalofop-butyl	120	8	4.2 (17)	4.2 (17)	4.3 (18)	4.3 (18)	2.2	2.1	3.9	3.7
Cyhalofop-butyl	150	8	4.1 (17)	4.0 (15)	4.1 (16)	4.1 (16)	2.2	2.1	3.8	2.9
Cyhalofop-butyl	60	14	7.3 (54)	4.1 (16)	4.2 (16)	4.2 (16)	4.3	4.4	4.2	3.5
Cyhalofop-butyl	90	14	3.0 (8)	4.2 (17)	4.5 (19)	4.5 (19)	1.3	1.2	3.8	3.8
Cyhalofop-butyl	120	14	2.7 (6)	4.2 (17)	4.2 (16)	4.2 (16)	1.3	1.2	4.9	3.9
Cyhalofop-butyl	150	14	2.0 (3)	4.2 (17)	4.4 (18)	4.4 (18)	1.2	1.2	4.3	3.8
Pretilachlor+safener	450	3	1.4 (1)	2.0 (3)	2.0 (3)	2.0 (3)	0.4	0.4	0.9	0.9
Butachlor	1500	8	3.0 (8)	1.9 (3)	3.9 (14)	3.9 (14)	1.8	1.4	3.5	3.5
Hand weeding	2	-	1.0 (0)	1.4 (1)	1.4 (1)	1.4 (1)	0.0	0.0	0.0	0.0
Weedy check	-	-	12 (133)	3.5 (12)	4.0 (15)	4.0 (15)	12.1	8.1	5.1	5.0
LSD (P=0.05)	-	-	0.3	0.3	0.2	0.2	2.7	1.1	1.9	1.0

Transformed values ($\sqrt{x+1}$). Original values are given in parentheses.
DAS–Days after sowing.

Table 2. Effect of cyhalofop-butyl on biomass of rice nursery

Treatment	Dose (g a.i. ha^{-1})	Stage of application (DAS)	Seedling height (cm) 2002	Seedling height (cm) 2003	Crop biomass ($g\ m^{-2}$) 2002	Crop biomass ($g\ m^{-2}$) 2003
Cyhalofop-butyl	60	8	26.9	25.9	137.0	142.0
Cyhalofop-butyl	90	8	26.1	26.3	142.4	140.4
Cyhalofop-butyl	120	8	27.5	26.5	149.4	143.4
Cyhalofop-butyl	150	8	26.9	26.7	150.4	149.4
Cyhalofop-butyl	60	14	26.5	26.5	147.1	146.1
Cyhalofop-butyl	90	14	25.6	25.6	151.0	148.0
Cyhalofop-butyl	120	14	25.3	25.8	158.4	155.4
Cyhalofop-butyl	150	14	26.1	26.4	159.7	149.7
Pretilachlor+safener	450	3	26.5	26.6	164.8	161.8
Butachlor	1500	8	27.0	26.9	162.0	159.0
Hand weeding	2	-	26.6	26.6	164.7	162.7
Weedy check	-	-	24.1	24.1	118.8	119.7
LSD (P=0.05)			1.9	1.9	24.4	23.6

were also present but at very low intensity. In general, grassy weed population in the year 2003 was less than the previous year. The density of *Echinochloa* spp. was drastically reduced over weedy check under all the treatments (Table 1). Cyhalofop-butyl applied at different doses (60 to 150 g ha^{-1}) 14 DAS significantly decreased the weed density and dry weight (Table 1) of grassy weeds over 8 DAS application and weedy check and were at par with pretilachlor with safener (sofit) and butachlor application. Only pretilachlor with safener controlled broadleaf weeds. Cyhalofop did not have any effect on the broadleaf weeds. Similarly, observations on the effect of cyhalofop-butyl for the control of *Echinochloa* and broadleaf weeds were recorded by Buehring *et al.* (2000) and also by Ohmes *et al.* (2000). Singh *et al.* (1997) reported that cyhalofop-butyl was significantly superior to pre-emergence application of butachlor and anilofos in minimizing the weed population and dry matter accumulation by *Echinochloa colona.*

There was no significant difference in the seedling height due to various treatments (Table 2). Cyhalofop-butyl at 90-150 g ha^{-1} applied 14 DAS, pretilachlor with safener at 3 DAS and butachlor applied at 8 DAS provided maximum crop biomass which was at par with hand weeding twice (Table 2). However, crop biomass was higher in all treatments than weedy check. The broadleaf weeds were not controlled by cyhalofop or butachlor application but due to very young stage their presence did not affect the crop biomass at 30 to 35 days of nursery. Among the cyhalofop rates used, 90 g ha^{-1} was optimum for use to control *Echinochloa* in rice nursery.

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