

# EFFECT OF A NEW HERBICIDE, R-3552, ON THE CONTROL OF BARNYARD GRASS IN THE RICE NURSERY

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## INTRODUCTION

Barnyard grass (*Echinochloa crusgalli*) has been an important weed of paddy rice in Taiwan for many years. Most of the barnyard grass, however, is believed to be transplanted to the paddy field from rice nursery with rice seedlings because of their close similarity in appearance. Thus, if barnyard grass can be controlled at the nursery stage, the population of barnyard grass in the paddy field can be greatly reduced that will prevent the loss of rice yield caused by weed competition and also result in the great saving of labors and money needed in hand weeding (Chang, 1965). Glenbar, the only herbicide recommended for controlling barnyard grass in the nursery in Taiwan at the present time (PDAF, 1967), has been proved to be unsatisfactory due to its severe phytotoxicity to rice seedlings under certain environmental conditions. It is imperative, therefore, that new chemicals that can control barnyard grass effectively without causing any serious injury to rice seedlings in the nursery should be available at the earliest possible date. The objective of this experiment was to evaluate the performance of R-3552 in the rice nursery.

## MATERIALS AND METHODS

The chemical R-3552 (4-Chlorobenzenesulfono-2-toluidide), an experimental herbicide developed by Stauffer Chemical Company, USA, formulated in 50% wettable powder, was evaluated for its effect on 3 biotypes of barnyard grass sown with rice seeds on 3 types of seed beds at 2 dates of application. Three morphologically different types of *Echinochloa crusgalli* (L.) Beauv. used in this experiment were upright tillering with green stem, upright tillering with purplish-red stem, and open tillering with purplish-red stem. Dry, wet, and flooded seed beds were prepared on lead flats and seeds of japonica rice variety, Chianung 242 was sown on Augst 22, 1968. The chemical was applied both as pre-emergence treatment at 3 days after sowing and as post-emergence treatment at 7 days after sowing when barnyard grass was at 2-leaf stage. The rate of application was 3 kg per ha of active ingredient for both applications. Weed control rating was made at 18 days after sowing when the seedlings were ready for transplanting.

## RESULTS AND DISCUSSION

### *Phytotoxicity to Rice.*

Germination and growth of rice seedlings in both the pre-emergence and post-emergence treatments were apparently the same as those in the check treatment (Table 1),

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showing that R-3552 did not prevent the germination of rice seeds and was also non-toxic to the growth of rice seedlings. Since phytotoxicity of a herbicide to rice may vary with changes in environmental conditions, it appears necessary that the phytotoxicity of this chemical should be carefully determined under various conditions in the future.

Table 1. Effect of R-3552 on the growth of rice seedlings.

Type of nursery	Time of application (days after sowing)	Biotypes of barnyard grass					
		Upright-green		Upright-purplish-red		Open-purplish-red	
		Seedling height (cm)	leaf number	Seedling height (cm)	leaf number	Seedling height (cm)	leaf number
Dry	CK	20.2	3.5	19.7	3.3	19.8	3.3
	3	22.7	3.3	20.0	3.3	18.7	3.0
	7	20.2	3.3	19.6	3.2	18.9	3.2
Wet	CK	25.6	4.3	25.3	4.3	21.8	3.9
	3	26.1	4.4	25.4	4.7	26.6	3.8
	7	25.0	4.3	26.7	4.4	27.1	3.8
Flooded	CK	23.3	4.1	23.3	4.0	23.1	4.0
	3	24.8	4.8	24.5	4.2	20.1	4.3
	7	25.8	4.8	23.3	4.6	23.7	4.1

#### Control of Barnyard Grass.

Good control of barnyard grass was obtained by R-3552 in both pre- and post-emergence applications. The effect of R-3552 did not change greatly with types of rice nursery, but there was an indication of better control of barnyard grass by R-3552 in the flooded nursery (Table 2), suggesting that water condition of rice nursery may be an important factor affecting the effect of R-3552. No difference was also detected among the three biotypes of *Echinochloa crusgalli* used in this test, although there has been an indication that the effect of R-3552 differs with lines of barnyard grass species (Shikoku Agr. Exp. Sta., 1964). It seems important that all biotypes, lines or varieties of barnyard grass existed in rice nursery and paddy field of Taiwan should be tested for their responses to R-3552 in the future.

Table 2. Response of barnyard grass to the application of R-3552.

(Unit : plants/m<sup>2</sup>)

Type of nursery	Time of application (days after sowing)	Biotypes of barnyard grass								
		Upright-green			Upright-purplish-red			Open-purplish-red		
		Less severely affected	Severely affected	Total	Less severely affected	Severely affected	Total	Less severely affected	Severely affected	Total
Dry	CK	—	—	2,924	—	—	1,836	—	—	2,584

Wet	3	255 (13.8)*	1,598 (86.2)*	1,853	408 (14.6)	2,380 (85.4)	2,788	612 (16.4)	3,128 (83.6)	3,740
	7	612 (16.7)	3,060 (83.3)	3,672	340 (16.1)	1,768 (83.9)	2,108	476 (13.3)	3,060 (86.7)	3,586
	CK	—	—	476	—	—	2,040	—	—	3,060
Flooded	3	136 (6.3)	2,040 (93.7)	2,176	476 (20.0)	1,904 (80.0)	2,380	272 (6.6)	3,876 (93.4)	4,148
	7	68 (3.9)	1,700 (96.1)	1,768	408 (25.0)	1,224 (75.0)	1,632	544 (10.1)	4,828 (89.9)	5,372
	CK	—	—	2,176	—	—	1,020	—	—	2,584
	3	0	2,244 (100)	2,244	0	1,496 (100)	1,496	0	1,972 (100)	1,972
	7	0	748 (100)	748	0	952 (100)	952	0	2,652 (100)	2,652

\* Numbers in the parentheses are percentages of the total.

In the pre-emergence treatment, barnyard grass was found to germinate and grow normally until 4 days after the application or 7 days after the sowing when barnyard grass seedlings began to show symptoms of the chemical effect. At this time, the barnyard grass seedlings were about at 2-leaf stage, and they stopped growing after this stage. The leaves of the grass became yellowish-green and leaf blade started to droop. At 6 days after the spraying or 9 days after the sowing, grass seedlings became severely chlorotic and their leaves turned yellowish-white. At this time, some wilting of the grass seedlings was evident. The barnyard grass seedlings started to die at 11 days after the spraying or 14 days after the sowing.

In the post-emergence treatment, grass seedlings were affected at 2 days after the spraying. The symptoms of chemical effect were similar to those of the pre-emergence treatment. The barnyard grass began to show wilting at 5 days after the spraying or 12 days after the sowing, and at 10 days after the spraying or 17 days after the sowing, some complete kill of grass seedlings was visible. Based on the results of this experiment, R-3552 applied as post-emergence treatment at 5 to 7 days after the sowing or 1.5 to 2 leaf-stage of barnyard grass appears more desirable in the second crop.

It was observed that the effect of R-3552 varied slightly with individual grasses. As shown in Table 2, about 10 to 20% of the total grasses were less severely affected except in the flooded nursery where all grasses were found to be severely affected. The seedling height of less severely affected plants was shorter than that of the check treatment, but it was apparently taller than that of the severely affected ones (Table 3). The less severely affected grass was found to have almost the same number of leaves per plant as check treatment but it had more leaves per plant than severely affected one (Table 4). The exact reason for differential inhibition effect of R-3552 to individual grasses of a biotype is still not clearly understood, but their physical properties may probably be responsible.

Table 3. Effect of R-3552 on the seedling height of barnyard grass.

(Unit : cm)

Type of nursery	Time of application (days after sowing)	Biotypes of barnyard grass					
		Upright-green		Upright-purplish-red		Open-purplish-red	
		Less severely affected	Severely affected	Less severely affected	Severely affected	Less severely affected	Severely affected
Dry	CK	16.4*	—	11.4	—	15.5	—
	3	9.3	5.7	8.3	3.4	7.4	6.1
	7	8.4	4.7	6.1	3.4	9.3	5.8
Wet	CK	21.2	—	19.9	—	18.3	—
	3	14.5	5.4	16.3	4.9	12.4	5.3
	7	11.5	5.9	16.0	5.3	14.6	5.9
Flooded	CK	21.0	—	17.2	—	16.0	—
	3	—	6.1	—	5.0	—	4.9
	7	—	4.1	—	2.7	—	3.6

\* Barnyard grasses in the check treatments are not affected.

Table 4. Effect of R-3552 on the leaf number of barnyard grass seedlings.

Type of nursery	Time of application (days after sowing)	Biotypes of barnyard grass					
		Upright-green		Upright-purplish-red		Open-purplish-red	
		Less severely affected	Severely affected	Less severely affected	Severely affected	Less severely affected	Severely affected
Dry	CK	3.5*	—	4.5	—	4.1	—
	3	4.0	2.2	4.0	2.1	4.0	3.1
	7	4.3	2.2	4.4	2.1	4.0	3.3
Wet	CK	4.2	—	4.2	—	3.9	—
	3	5.0	2.7	4.3	2.8	4.1	3.0
	7	3.9	3.1	3.6	2.7	3.9	3.1
Flooded	CK	4.1	—	3.8	—	3.5	—
	3	—	3.6	—	2.7	—	3.0
	7	—	2.5	—	2.1	—	2.3

\* Barnyard grasses in the check treatments are not affected.

R-3552 did not control broadleaved weeds and sedges in rice nursery. It was also reported that only barnyard grass and hairy crabgrass were controlled in the United States (Stauffer, 1963). As broadleaved weeds, sedges, and other grasses are relatively

easier to be distinguished from rice seedlings in the nursery, these weeds are less likely to be transplanted to paddy field with rice seedlings. Thus, R-3552 still appears promising as a potential herbicide for rice nursery regardless of its limited spectrum in the control of weeds. When combined with other chemicals, R-3552 can also be used for controlling weeds in paddy field. A good control of weeds with R-3552+MCPA in transplanted rice has already been reported in Japan (Shikoku Agr. Exp. Sta., 1964). Further investigation with R-3552 appears worthwhile.

### SUMMARY

The effect of R-3552 on the control of barnyard grass in rice nursery evaluated in the second crop of 1968 was briefly summarized. R-3552 was found to be highly effective in controlling three biotypes of *Echinochloa crusgalli* at dry, wet, and flooded nurseries in both pre- and post-emergence applications. No phytotoxicity of R-3552 to rice seedlings was detected.

### LITERATURE CITED

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## 新殺草劑 R-3552 在秧田之治稗效果

張 萬 來

摘 要

R-3552經於民國57年第2期作試驗結果，發現在旱秧田、飽水秧田、及浸水秧田，無論在稗草發芽前或發芽後使用，對三種形態不同之稗草均具良好防治效果，且對秧苗未具藥害作用。