

Chemical Control of Brown Leaf Blight in *Alisma plantago* Double Cropping after Early Rice

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ABSTRACT: This study was conducted to evaluate the control effect of fungicides on control of brown leaf blight, growth characteristics, and dry root yield in the cultivation of *Alisma plantago* after early maturing rice cropping. All fungicides treated had no effect on the growth and flowering rate of *Alisma plantago*. The major fungicides were mancozeb Wp, 75%, chlorothalonil Wp, 75%, dithianon Wp, 43%, difenoconazole Wp, 10%, benomyl Wp, 50%, and propineb Wp, 70%. Dry root of yield were increased largely with chlorothalonil Wp, 75% (33 g/20), fungicide than the other fungicides and control. All fungicides had no injury with standard dosage. On the other hand all fungicides had slight injury in the double dosage level for the *Alisma plantago*.

Keywords: chemical control, brown leaf blight, *Alisma plantago*, fungicide

The Increase of crop productivity means the increase of production per unit area, which is achieved by the cultivation of high yielding varieties, the improvement of cultivation methods, and the prevention of damages from diseases and insect pests, but for the stability of productivity among these, the prevention of damage from diseases and insect pests is important (RDA, 1991 a, b, c, d, e), (Shin *et al.*, 2000).

Brown leaf blight of the *Alisma plantago* is found in leaf and leafstalk, it forms circular or insect proof large focus and also it has ashy brown in its middle and dark brown in its edge. As its lesion is severe, several lesion are mixed and it is extended to irregular lesions, blighted and then productivity is decreased. Therefore this study reports the results of applying some fungicide for preventing Brown leaf blight, the severe disease of the *Alisma plantago*.

MATERIALS AND METHODS

This experiment was conducted at farmer's field located at

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Yongjun-ri, Haeryong-myon, Sunchon City, Chonnam, Korea where is the major production area of the *Alisma plantago* from July to December, 1999. Three *Alisma plantago* cultivars, Sunwol local and Gusang local and Yongjun local were used in this study.

Screening test of fungicides applied in cultivating *Alisma plantago* as second crop

The selected crop damage is Brown leaf blight and its attack is enough to decide the efficacy of fungicide as 13% of attack by non-treatment.

A fungicide was mancozeb Wp [75%(40 g/20 l)], chlorothalonil Wp [75% (33 g/20 l)], dithianon Wp[43%(20 ml/20 l)], difenoconazole Wp [10%(10 g/20 l)], benomyl Wp [50%(13 g/20 l)], propineb Wp[70%(40 g/20 l)] and the spraying date of fungicides was September 11, 1999, and the observation of infected plant rate of 142 plants per experimental plot was performed on September 16, 1999.

Experimental plot was arranged with split-plot design with three repetitions, experimental area per plot was 10 m², transplantation was done with 20 × 15 cm on August 30, the amount of fertilizer applied (1 kg/10a) was 2,000 kg with the actual quantity of compost and 25 kg of urea was applied at the beginning and end of October and the mid-October by three times respectively after applying 100 kg of basal fertilization by the whole quantities with compound fertilizer (21-17-17). The other cultural management was carried out in accordance with the conventional culture method of the Yongjun district in South of Korea.

Experiment of harmful effects of fungicides by treated dosages in cultivating *Alisma plantago* as second crop

The fungicides on the growth of *Alisma plantago* are compared by a broad outlook (0-9) by three times after 3 days (Sep. 14), 5 days (Sep. 16) and 10 days (Sep. 21) of mancozeb Wp[75%(40 g/20 l)], chlorothalonil Wp[75% (33 g/20 l)], dithianon Wp[43%(20 ml/20 l)], difenoconazole

Wp[10%(10 g/20 l), benomyl Wp[50%(13 g/20 l)], propineb Wp[70%(40 g/20 l)] of standard plots design and mancozeb Wp[75%(80 g/20 l)], chlorothalonil Wp[75%(66 g/20 l)], dithianon Wp[43%(40/20)], difenoconazole Wp[10%(20 g/20 l), benomyl Wp[50%(26 g/20 l)], propineb Wp[70%(80 g/20 l)] of double plots design treatment. Experimental plot was arranged with split-plot design with three replications and experimental area and cultivation method per plot are the same as the above.

RESULTS AND DISCUSSION

Screening test of fungicides applied in cultivating *Alisma plantago* as second crop

Preventive effects of brown leaf blight by fungicide treatment

The results of examining the preventive effects of Brown leaf blight by treating five kinds of fungicide including man-

Table 1. The Control effect of fungicides on brown leaf blight in *Alisma plantago* varieties.

Fungicides	Infected plant(%)				Significant difference (DMRT)	Control value (%)
	Sunwol	Gusang	Yongjun	Mean \pm SD		
Mancozeb Wp, 75% (40 g/20 l)	1.0	1.3	1.7	1.3 \pm 0.3	a	89.7
Chlorothalonil Wp, 75% (33 g/20 l)	1.1	1.3	1.3	1.2 \pm 0.2	a	90.5
Dithianon-Wp, 43% (20 ml/20 l)	1.5	1.9	1.9	1.1 \pm 0.1	a	86.4
Difenoconazole-Wp, 10% (10 g/20 l)	1.6	2.0	2.1	1.9 \pm 0.8	a	85.3
Benomyl-Wp, 50% (13 g/20 l)	1.2	1.3	1.4	1.3 \pm 0.3	a	90.0
Propineb-Wp, 70% (40 g/20 l)	2.3	2.5	2.7	2.5 \pm 1.3	a	80.7
Control	12.5	13.0	13.3	12.9 \pm 3.5	b	-

Table 2. Comparison of growth characters and yield of *Alisma plantago* varieties treated with fungicides.

Fungicides	Plant height (cm)	No.of leaves	Aphides (0-5)	Spodoptera exigua (0-5)	Dry yield of root (kg/10a)	Index
Mancozeb-Wp, 75% (40 g/20 l)	S [†] 60	21	1	1	333	132
	G 58	19	1	1	325	129
	Y 58	18	1	1	318	126
Chlorothalonil-Wp, 75% (33 g/20 l)	S 64	24	1	1	342	136
	G 62	22	1	1	335	133
	Y 61	21	1	1	332	132
Dithianon-Wp, 43% (20 ml/20 l)	S 59	22	1	1	315	125
	G 57	20	1	1	311	123
	Y 56	19	1	1	307	122
Difenoconazole-Wp,10% (10 g/20 l)	S 57	20	1	1	312	124
	G 55	19	1	1	304	121
	Y 54	17	1	1	296	117
Benomyl-Wp, 50% (13 g/20 l)	S 62	22	1	1	330	131
	G 59	21	1	1	327	130
	Y 59	20	1	1	324	129
Propineb-Wp, 70% (40 g/20 l)	S 57	19	1	1	298	118
	G 54	17	1	1	286	113
	Y 53	16	1	1	282	112
Control	S 53	18	1	1	251	100
	G 51	16	1	1	244	97
	Y 50	15	1	1	240	96
LSD(0.05)	6.20	3.92	-	-	49.71	-

[†]S : Sunwol Local G : Gusang Local Y : Yongjun Local.

cozeb Wp[75%(40 g/20 l)] on September 11, when its infection rate reaches 13.3% after 3 days of non-treatment plots which were enough to judge the efficacy of fungicide on the *Alisma plantago* experimental field are shown in Table 1.

There was no effect by rainwater after the treatment of disinfectants and according to the examination on September 16, 5 days after applying fungicide for three varieties such as 'Sunwol local', 'Gusang local' and 'Yongjun local' at 142 plants per plot, Sunwol local was 12.5%, Gusang local 13.0%, and Yongjun local 13.3% at non-treated plot show high rate of infected plant with 12.9%, but the plots treated with mancozeb Wp[75%(40 g/20 l)] shows low rate of infected plant as 1.3% and control value was high as 89.7%. Plot treated with chlorothalonil Wp[75%(33 g/20 l)] has low rate of infected plant as 1.2% and its control value was high as 90.5% and the plot treated with dithianon Wp[43%(20 ml/20 l)] has 1.1% of infected plant rate and its control value was 86.4%. And the plot treated with difenoconazole Wp [10%(10 g/20 l)] has 1.9% of infected plant rate and its control value was 85.3% the plot treated with benomyl Wp[50%(13 g/20 l)] has low rate of infected plant rate as 1.3% and its control value was high as 90.0% and the plot treated with propineb Wp[70%(40 g/20 l)] has 2.5% of

infected plant rate, its control value was 80.7% and all fungicide show the control value over 80.7%.

Effects of fungicides treatment on growth and yield

The effects of fungicide treatment on growth and yield of *Alisma plantago* are shown in Table 2. The plant height of Sunwol local, Gusang local and Yongjun local at non-treated plot were short with 53, 51, 50 cm, but all treatments of chemical spraying were long those of the plots treated with mancozeb Wp [75%(40 g/20 l)] were 58, 58 cm, those of the plots treated with chlorothalonil Wp [75%(33 g/20 l)] were 64, 62, 61 cm, those of the plots treated with dithianon Wp[43%(20 ml/20 l)] were 59, 57, 56 cm, those of the plots treated with difenoconazole Wp[10%(10 g/20 l)] were 57, 55, 54 cm and those of the plots treated with benomyl Wp[50%(13 g/20 l)] were 62, 59, 59 cm and the plant height of the plot treated with propineb Wp[70% (40 g/20 l)] were 57, 54, 53 cm.

The number of leaves shows the same tendency as the plant height and Sunwol local, Gusang local, Yongjun local had 18, 16, 15 leaves at non-treated plot, the plot treated with mancozeb Wp[75%(40 g/20 l)] had 21, 19, 18, that treated with chlorothalonil Wp[75% (33 g/20 l)] had 24, 22, 21, that treated with dithianon Wp[43%(20 ml/20 l)] had 22,

Table 3. Chemical injury of *Alisma plantago* varieties of applied fungicides.

Fungicides	Standard dosage			Double dosage		
	10 [†]	20	30	10	20	30
Mancozeb-Wp, 75% (40 g/20 l)	S [‡] 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Chlorothalonil-Wp, 75% (33 g/20 l)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Dithianon-Wp, 43% (20 ml/20 l)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Difenoconazole-Wp, 10% (10 g/20 l)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Benomyl-Wp, 50% (13 g/20 l)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Propineb-Wp, 70% (40 g/20 l)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1

[†]Days after the applying fungicides

[‡]S : Sunwol Local, G : Gusang Local, Y : Yongjun Local

Plant injury : 0 (No injury) – 1 (Soft chemical injury)

20, 19, that treated with difenoconazole Wp[10%(10 g/20 l)] had 20, 19, 17, that treated with benomyl Wp[50%(13 g/20 l)] had 22, 21, 20, and that treated with propineb Wp [70%(40 g/20 l)] had 19, 17, 16.

On the insect pest of aphid and *Spodoptera exigua*, plots treated with all fungicides and non-treated plots at a broad outlook were slight as 1 and in the Dry root of yield per 10a, Sunwol local was 251 kg, Gusang local was 244 kg and Yongjun local was 240 kg at non-treated plot, but plot treated with mancozeb Wp[75%(40 g/20 l)] were 333, 325, 318kg, which showed yield increase of 132, 129, 126% respectively, plot treated with chlorothalonil Wp[75%(33 g/20 l)] were 342, 335, 332 kg, which showed yield increase of 36, 33, 32% respectively, plot treated with dithianon Wp[43%(20 ml/20 l)] were 315, 311, 307 kg which showed yield increase of 125, 123, 122%, plot treated with difenoconazole Wp[10%(10 g/20 l)] were 312, 304, 296 kg, which showed yield increase of 124, 121, 117%, plot treated with benomyl Wp[50%(13 g/20 l)] were 330, 327, 324 kg, which showed yield increase of 131, 130, 129% and plot treated with propineb Wp[70%(40 g/20 l)] were 298, 286, 282 kg, which showed yield increase of 118, 113, 112% and it is considered that all fungicide show yield increase, there is no reduction in yield and these are ideal fungicide.

Experiment of harmful effects of fungicides by treated dosages in cultivating *Alisma plantago* as second crop

The examination of the amount of fungicide for brown leaf blight and its harmful effects on the *Alisma plantago* are shown in Table 3.

There is no symptom of harmful effect of fungicide and double dosage used shows slight symptom of it.

Accordingly, it is thought that for prevention of brown leaf blight of the *Alisma plantago*, its yield can be increased by reducing the period of competition between brown leaf blight and the *Alisma plantago*, the dry yield of root per 10a at the plot treated with chlorothalonil Wp[75%(33 g/20 l)] showed 342 kg at Sunwol local, 335 kg at Gusang local and 332 kg at Yongjun local and it is excellent fungicide, but the residue of agricultural chemicals after using fungicide and the change of effective components should be continuously examined.

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