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Screening of Seed Disinfectant for Controlling Brown Leaf Blight in *Alisma plantago* Double Cropping after Early Rice

Dong Young Shin, Byung Sun Kwon*, June Taeg Lim, Kyu Hwan Hyun, Jung Mook Lim and Young Nam Seo

Dept. of Resource Plant Development, Sunchon Nat'l Univ. Sunchon 540-742, Korea

Abstract - This study was conducted to evaluate the effect of seed disinfectant, in control of brown leaf blight, growth characteristics, and dry root yield in the cultivation of *Alisma plantago* after early maturing rice cropping. Experimental plot was laid out in split plots design with three replications. The major seed disinfectants were benomyl Wp, 20%, Captan Wp, 50%, Triferine Ec, 17%, Etridia zole Ec, 25%, and Thioplant-mythyl Wp, 50%. Even though seed disinfectant treated had no effect on the growth and flowering date of *Alisma plantago,* dry root yield was increased largely with benomyl Wp, 20%, in seed disinfectant than in the other seed disinfectants and contorl. All seed disinfectants had no injury with standard dosage. But all seed disinfectants had slight injury in the double dosage level for the *Alisma plantago.* On the basis of yield, vegetative and disease paramerer, benomyl Wp (20%) (100g/20ℓ) had shown superior performance, however, all the seed disinfectants are effective as compare to without treatment.

Key words - Chemical control, Brown leaf blight, *Alisma plantago,* Seed disinfectant

Introduction

Alisma plantago is perennial herb grown in pond or water as medicinal crop used for diuresis, vomit and dizziness. It's rootstock is short, and fibrous, grows dense and petiole is long and oval. In Korea 100 ha *Alisma plantago* has been cultivating in Sunchon and it occupies 76% of the national cultivation area 130 ha. *Alisma plantago* is double cropping after early cultivation of rice, and is transplnated to the main rice field in the 30th of August, that blooms in the 20th of September and then farmhouse eliminates the rachis, the nutrients required for seeding are delivered to root and the growth of root is fostered.

There were many researches for increasing *Alisma plantago* productivity and preventing damages from diseases and inset pests (Kwon *et al.*, 2001a, 2001b ; Dept. of plant pathology, Agr. Sci. Institute, RDA. 1991a, 1991b, 1991c, 1991d, 1991e ; Kim 1998a, 1998b ; Lim *et al.*, 2000 ; Park, 1997 ; Park *et al.*, 1997).

But there was no any research work on the effects and the screening of seed disinfectant for controlling brown leaf blight, yield and major agronomic characteristics in *Alisma plantago* done. Experiment was to investigate the effect of seed disinfectant for controlling of brown leaf blight of *Alisma plantago* and to identify the proper one.

*Corresponding author. E-mail : kbs@sunchon.ac.kr

Materials and Methods

This experiment was conducted at farmer's field located at Yongjun-ri, Haeryong-myon, Sunchon City, Chonnam, Korea that is the major production area of the *Alisma plantago* from July to December, 2003. Three *Alisma plantago* cultivars, Sunwol local, Gusang local, and Yongjun local were used in this study. Physicochemical composition of arable soil layer had pH 5.2 and rich contents of organic matters and phosphate, but contents of K, Ca and Mg were low as shown in Table 1.

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

Seed disinfectants were benomyl Wp [20% (100g/20ℓ)], captan Wp [50% (40g/20ℓ)], triforine Ec [17% (20ml/20ℓ)], etridiazole Ec [25% (10ml/20ℓ)], thioplanat-mythyl Wp [50% (20ℓ/20ℓ)] and the spraying date of seed disinfectant was September 11, 2003. Observation of infected plant at the rate of 142 plants per experimental plot was performed on September 16, 2003.

Experimental plot was arranged with split-plot design with three repetitions. Experimental area per plot was $10m^2$, where transplantation was done with 20×15cm spacing on August 30. The amount of fertilizer applied (1kg/10a) was 2,000kg of compost,

whereas 25kg of urea was applied at the beginning and end of October and the mid-October by three times respectively after applying 100kg of basal fertilization 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 on harmful effects of seed disinfectant by treated dosages in cultivating *Alisma plantago* as second crop

The effect of seed disinfectant on the growth of *Alisma plantago* was 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 benomyl Wp [20% (100g/20ℓ)], captan Wp [50% (40g/20ℓ)], triforine Ec [17% (20ml/20ℓ)], etridiazole Ec [25% (10ml/20ℓ)], thioplanat-mythyl Wp [50% (20ℓ/20ℓ)] of standard plots design and benomyl Wp [20% (100g/20ℓ)], captan Wp [50% (40g/20ℓ)], triforine Ec [17% (20ml/20ℓ)], etridiazole Ec [25% (10ml/20ℓ)], and thioplanat-mythyl Wp [50% (20ℓ/20ℓ)] of double plots design treatment. Experimental plot was arranged with split-plots design with three replications and experimental area and cultivation method per plot were the same as the above.

Results and Discussion

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

Preventive effects of brown leaf blight by seed disinfectant treatment

The results of examining the preventive effects of Brown leaf blight by treating five kinds of seed disinfectant including benomyl Wp [20%(100g/20ℓ)] showed that 3 days after spraying, its infection rate reached 14.8% in non-treated plots which were enough to judge the efficacy of seed disinfectant on the *Alisma plantago* experimental field were shown in Table 2.

There was no any effect of rainwater after the treatment of disinfectants. According to the examination on September 16, (5 days after applying seed disinfectant) on three varieties such as 'Sunwol local', 'Gusang local' and 'Yongjun local' at 142 plants per plot, Sunwol local was 13.5%, Gusang local 14.2%, and Yongjun local 14.8%, infected at non-treated plot and showed high rate of infected plants an average with 14.2%, but the plots treated with benomyl Wp [20% (100g/20ℓ)] showed low rate of infected plants as 1.2% and control value was high as 91.5%. Plot treated with capton Wp [50% (40g/20ℓ)] had low rate of infected plant as 1.3% and its control vlue was high as 90.1% and the plot treated with triforine Ec [17% (20ml/20ℓ)] had 1.6% of infected plant rate and its control value was 88.4%. Likewise the plot treated with etridiazole Ec [25% (10ml/20ℓ)] had 1.5% of infected plant rate and its control value was 86.7%, and the plot treated with thioplanat-mythyl Wp [50% (20ℓ/20ℓ)] had higher rate of infected plant rate as 1.7% and its control value was low as 85.4%.

Table 1. Soil properties of the experimental plot at the beginning of experiment

pH(H_2O) 1:5	EC (ds/m)	OM (g/kg)	T-N (mg/kg)	Av.P_2O_5	Ex.cation(molt/kg)			
					K	Ca	Mg	SiO_2
5.2	0.093	20.7	0.34	952	0.66	3.74	0.98	40

Table 2. The control effect of seed disinfectant on brown leaf blight in *Alisma plantago* varieties

Seed disinfectant	Infected plant (%)				Siginficant difference (DMRT)	Control value (%)
	Sunwol	Gusang	Youngjun	Mean±SD		
Benomyl Wp^+. 20% (100g/20ℓ)	1.1	1.3	1.2	1.2±0.3	a	91.5
Captan Wp. 50% (40g/20ℓ)	1.2	1.3	1.3	1.3±0.3	a	90.1
Triferine Ec. 17% (20ml/20ℓ)	1.5	1.7	1.6	1.6±0.6	a	88.4
Etridiazole $Ec^{\neq}$. 25% (10ml/20ℓ)	1.4	1.6	1.5	1.5±0.6	a	86.7
Thioplanat-mythyl Wp. 50% (20ℓ/20ℓ)	1.6	1.7	1.7	1.7±0.4	a	85.4
Control	13.5	14.2	14.8	14.2±0.5	b	-

Wp^+: wettable powder, $Ec^{\neq}$: emulsifiable concentrate

Effects of seed disinfectant treatment on growth and yield

The effects of seed disinfectant treatment on growth and yield of *Alisma plantago* were shown in Table 3, and the results from analysis of variance for the characteristics are in Table 4. The plant height of Sunwol local, Gusang local and Yongjun local at non-treated plot were short with 55, 50 and 52cm, respectively but all treatments of chemical spraying had taller plants. In the plots treated with benomyl Wp [20%(100g/20ℓ)] were 63, 55, 57cm, those of the plots treated with captan Wp [50%(40g/20ℓ)] were 61, 54, 56cm, those of the plots treated with triferine Ec [17%(20ml/20ℓ)] were 59, 53, 55cm, thoes of the plots treated with etridiazole Ec [25%(10ml/20ℓ)] were 57, 53 and 55cm and those of the plots treated with thioplanat-mythyl Wp [50%(20ℓ/20ℓ)] were 57, 52 and 54cm respectively.

The number of leaves showed the similar tendency to the plant height and Sunwol local, Gusang local and Yongjun local had 18, 16 and 17 pisces of leaves at non-treated plot, and the plot treated with benomyl Wp [20%(100g/20ℓ)] had 23, 21, 22 pisces of leaves, that treated with captan Wp [50%(40g/20ℓ)] had 22, 20, 21 pisces of leaves, that treated with triferine Ec [17%(20ml/20ℓ)] had 21, 20, 21 pisces of leaves, that treated with etridiazole Ec [25%(10ml/20ℓ)] had 21, 19, 20 pisces of leaves, that treated with thioplanat-mythyl Wp [50%(20ℓ/20ℓ)] had 21, 19, 20 respectively.

Table 3. Comparison of growth characteristics and yield of *Alisma plantago* treated with seed disinfectants

Seed disinfectant	Plant height (cm)	No. of leaves	Dry root yield (kg/10a)	Yield index
Benomyl Wp+. 20% (100g/20ℓ)	S+63	23	327	126
	G 55	21	286	111
	Y 57	22	315	122
Captan Wp. 50% (40g/20ℓ)	S 61	22	313	121
	G 54	20	272	105
	Y 56	21	296	114
Triferine Ec. 17% (20ml/20ℓ)	S 59	21	307	118
	G 53	20	265	102
	Y 55	21	285	110
Etridiazole Ec≠. 25% (10ml/20ℓ)	S 57	21	286	110
	G 53	19	263	101
	Y 55	20	277	107
Thioplanat-mythyl Wp. 50% (20ℓ/20ℓ)	S 57	21	280	108
	G 52	19	263	101
	Y 54	20	270	104
Control	S 55	18	264	102
	G 50	16	256	99
	Y 52	17	258	100

S+ : Sunwol Local, G : Gusang Local, Y : Yongjun Local

Table 4. Analysis of variance for agronomic characteristics of *Alisma plantago* varieties under different seed disinfectant

SV	Plant height (cm)	No. of leaves	Dry root yield (kg/10a)
Seed disinfectant	S+8.49	4.53	28.73
	G 7.87	4.27	26.54
	Y 6.66	3.95	24.42
Error	S 0.18	0.01	0.28
	G 0.19	0.04	0.32
	Y 0.21	0.06	0.37
CV(%)	S 1.85	0.25	0.61
	G 1.93	0.27	0.74
	Y 1.99	0.33	0.79
LSD(0.05)	S 0.52	0.86	0.31
	G 0.57	0.95	0.35
	Y 0.63	0.99	0.42

S+ : Sunwol Local, G : Gusang Local, Y : Yongjun Local

Dry root yield per 10a, in Sunwol local was 264kg, in Gusang local was 256kg and in Yongjun local was 258kg at non-treated plot, but in plot treated with benomyl Wp [20%(100g/20ℓ)] were 327, 286, 315kg, which showed yileld increase of 126, 111, 122 % respectively, plot treated with captan Wp [50%(40g/20ℓ)] were 313, 272, 296kg, which showed yield increase of 121, 105, 114 % respectively, plot treated with triferine Ec [17%(20ml/20ℓ)] were 307, 265, 285kg which showed yield increase of 118, 102, 110 %, plot treated with etridiazole Ec [25%(10ml/20ℓ)] were 286, 263, 277kg, which showed yield increase of 110, 101, 107 %, plot treated with thioplanat-mythyl Wp [50%(20ℓ/20ℓ)] were 280, 263, 270kg, which showed yield increase of 108, 101, 104% and it is considered that all seed disinfectant show yield increase, there is no reduction in yield and these are ideal seed disinfectant.

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

The examination of the amount of seed disinfectant for brown leaf blight and its harmful effects of the *Alisma plantago* were shown in Table 5.

There is no any symptom of harmful effect of seed disinfectant with standard dose but in double dosage of disinfectant slightly harmful symptom was noticed on the foliage of plants.

Therefore, it was concluded that by minimizing the incidence of brown leaf blight of the *Alisma plantago,* its yield could be increased. Among the tested seed disinfectants, the dry yield of root per 10a at the plot treated with benomyl Wp [20%(100g/20ℓ)] showed 327kg at Sunwol local, 286kg at Gusang local and 315kg, at Yongjun local and it was found excellent seed disinfectant. However, the residue of agricultural chemicals after used seed disinfectant and the change of effective components should be continuously examined.

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Table 5. Plant injury of *Alisma plantago* by application of seed disinfectants.

Seed disinfectant		Standard dosage			Double dosage	
	10[+]	20	30	10	20	30
Benomyl Wp[+]. 20% (100g/20ℓ)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Captan Wp. 50% (40g/20ℓ)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Triferine Ec. 17% (20ml/20ℓ)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Etridiazole Ec[≠]. 25% (10ml/20ℓ)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Thioplanat-mythyl Wp. 50% (20ℓ/20ℓ)	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1
Control	S 0	0	0	1	1	1
	G 0	0	0	1	1	1
	Y 0	0	0	1	1	1

[+] Days after apply seed disinfectant
[≠] S: Sunwol Local, G: Gusang Local, Y: Yongjun Local
Plant injury: 0 (No injury),
: 1 (Soft chemical injury)

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