Korean J. Plant Res. 19(3) : 392~396 (2006)

Chemical Control of Sclerotinia rot in Rapeseed Double Cropping after Rice

Kwon Byung Sun*, June Taeg Lim, Dong Soo Jung[1] and Jong Sup Shin[2]
Dept. of Resources Plant Development, Sunchon, Nat'l Univ. Sunchon 540-742, Korea
[1]Mokpo Experiment Station, Nat'l Institute of Crop Science, RDA, Muan 534-830, Korea
[2]Sunchonsi Agricultural Techniques Center, Sunchon 540-801, Korea

Abstract - This study was conducted to evaluate the control effect of fungicides of sclerotinia rot control, growth characteristics, and seed yield in the cultivation of rapeseed. All fungicides treated had no effect on the growth of rapeseed. The major fungicides were mancozeb 75% WP, chlorothalonil 75% WP, dithianon 43% WP, difenoconazole 10% WP, benomyl 50% WP, and propineb 70% WP. Dry seed yield and control were increased largely with chlorothalonil 75% WP (33g/20ℓ), fungicide than the other fungicides Sclerotinia rot. All fungicides had no injury with standard dosage. On the other hand all fungicides had slight injury in the double dosage level for the rapeseed.

Key words - Sclerotinia rot, Rapeseed, Fungicide

Introduction

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 disease and insect pests is important (RDA, 1991a, b, c, d, e), (Ahn *et al.*, 1992a, b), (Kwon *et al.* 1988a, b, 1990, 1992, 1993).

Sclerotinia rot of the rapeseed is found in stem and leafstalk, it forms oval 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 decreased. Therefore this study reports the results of applying some fungicide for preventing sclerotinia rot the severe disease of the rapeseed (Kae *et al.*, 1994; Kwon 1994a, b; Kwon *et al.*, 1984; Bang *et al.*, 1994; Hwang *et al.*, 1993; Lee *et al.*, 1994; Lee *et al.*, 1974; Kae *et al.*, 1971; Kwon *et al.*, 1972; Lee *et al.*, 1972a; Lee *et al.*, 1972b; Kim *et al.*, 1984a; Kim *et al.*, 1984b).

Materials and Methods

This experiment was conducted at farmer's field located at Yongjun-ri, Haeryong-myon, Sunchon city, Chonnam, Korea where is the production area of the rapeseed cultivars, Yudal and Naehan and Youngsan were used in this study.

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

Three recommended varieties of rapeseed listed in Table 1, 2, 3 were used in this trial. The complete randomized block design with variety as treatment was used and treatment was randomized in each of three blocks.

Each experimental unit was 12.5m^2 (2.5m×5m). 15kg/10a seeds were sown at upland soil with 120cm ridge width and 30cm seeding width on Oct. 20. Fertilizer was applied at the rate of 15-8-8kg/10a of N-P_2O_5-K_2O. One third of the tatal N, total P_2O_5 and K_2O and manure of 1MT/10a were incorporated into the soil before sowing and the rest of N fertilizer was applied in late-February.

Screening test of fungicides applied in cultivating rapeseed

The selected crop damage is sclerotinia rpt and its attack is enough to decide the efficacy of fungicide as 15% of attack by non-treatment.

A fungicide was mancozeb WP [75%(40g/20ℓ)], chlorothalonil WP [75%(33g/20ℓ)], dithianon WP [43%(20㎖/20ℓ)], difenoconazole WP [10%(10g/20ℓ)], benomyl WP [50%(13g/20ℓ)], propineb WP [70%(40g/20ℓ)] and the spraying date of fungicides was May 5, 2000, and the observation of infected plant rate of 150 plants per experimental plot was performed on May 5, 2000.

Experimental plot was arranged with split-plot design with three replication, experimental area per plot was 10m^2, direct seeding was done with 50×15cm on Sep. 30, the amount of fertilizer applied (1kg/10a) was 1,000kg with the actual quantity of compost and N-P_2O_5-K_2O=10-8-8 kg/10a was applied at the plots. The other cul-

Table 1. The control effect of fungicides on sclerotinia rot in rapeseed

Fungicides (dosage/10a)	Infected plant (%)				Significant difference (DMRT)	Control value (%)
	Yudal	Naehan	Youngsan	Mean±SD		
Mancozeb 75% WP (40g/20ℓ)	1.2	1.3	1.5	1.3±0.2	a	91.6
Chlorothalonil 75% WP (33g/20ℓ)	1.3	1.3	1.5	1.4±0.1	a	92.5
Dithianon 43% WP (20㎖/20ℓ)	1.6	1.7	1.8	1.5±0.2	a	88.4
Difenoconazole 10% WP (10g/20ℓ)	1.3	1.9	1.8	1.9±0.7	a	87.3
Benomyl 50% WP (13g/20ℓ)	1.3	1.3	1.4	1.3±0.2	a	92.2
Propineb 70% WP (40g/20ℓ)	2.4	2.4	2.4	2.4±1.3	a	82.5
Control	15.2	15.0	15.2	15.2±2.2	b	-

tural 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 rapeseed

The fungicides on the growth of rapeseed are compared by a broad outlook (0-9) by three times after 3 days (May 4), 5 days (May 6) and 10 days (May 11) of mancozeb WP [75%(40g/20ℓ)], chlorothalonil WP [75%(33g/20ℓ)], dithianon WP [43%(20㎖/20ℓ)], difenoconazole WP [10%(10g/20ℓ)], benomyl WP [50%(13g/20ℓ)], propineb WP [70%(40g/20ℓ)] of standard plots design and mancozeb WP [75%(80g/20ℓ)], chlorothalonil WP [75%(66g/20ℓ)], dithianon WP [43%(40g/20ℓ)], difenoconazole WP [10%(20g/20ℓ)], benomyl WP [50%(26g/20ℓ)], propineb WP [70%(80g/20ℓ)] of double plots design treatment. Experimental plot was arranged with split-plot design with three replications and experimental area and cultivation method per pot are the same as the above.

Results and Discussion

Screening test of fungicides applied control effects of sclerotinia rot by fungicide treatment in cultivating rapeseed

The results of examining the preventive effects of sclerotinia rot by treating six kinds of fungicide including mancozeb WP [75%(40g/20ℓ)] on May 5, when its infection rate reaches 15.2% after 3 days of non-treatment plots which were enough to judge the efficacy of fungicide on the rapeseed experimental field are shown in Table 1.

There was no effect by rainwater after the treatment of disinfectants and according to the examination on May 11, 5 days after applying fungicide for three varieties such as 'Yudal', 'Naehan' and 'Youngsan' at 150 plants per plot, Yudal was 15.2%, Naehan 15.0%, and Youngsan 15.2% at non-treated plot show high rate of infected plant with 15.2%, but the plots treated with mancozeb WP [75%(40g/20ℓ)] shows low rate of infected plant as 1.3% and control value was high as 91.6%. Plot treated with chlorothalonil WP [75%(33g/20ℓ)] has low rate of infected plant as 1.4% and its control value was high as 92.5% and the plot treated with dithianon WP [43%(20㎖/20ℓ)] has 1.5% of infected plant rate and its control value was 88.4%. And the plot treated with difenoconazole WP [10%(10g/20ℓ)] has 1.9% of infected plant rate and its control value was 87.3% the plot treated with benomyl WP [50%(13g/20ℓ)] has low rate of infected plant rate as 1.3% and its control value was high as 92.2% and the plot treated with propineb WP [70%(40g/20ℓ)] has 2.4% of infected plant rate, its control rate, its control value was 82.5% and all fungicide show the control value over 82.5%.

Effects of fungicides treatment on growth and yield

The effect of fungicide treatment on growth and yield of rapeseed are shown in Table 2.

The plant height of Yudal, Naehan and Youngsan at non-treated plot were short with 107, 105, 112cm, but all treatments of chemical spraying were long those of the plots treated with mancozeb WP [75%(40g/20ℓ)] were 146, 144, 148cm, those of the plots treated with clorothalonil WP [75%(33g/20ℓ)] were 162, 153, 173cm, those of the plots treated with dithianon WP [43%(20㎖/20ℓ)] were 135, 133, 145cm, those of the plots treated with difenoconazole WP [10%(10g/20ℓ)] were 132, 130, 138cm and those of the plots treated with benomyl WP [50%(13g/20ℓ0] were 157, 151, 165cm and the plant height of the plot treated with propineb WP [70%(40g/20ℓ)] were 112, 109, 128cm.

The number of total branches shows the same tendency as the plant height and Yudal, Naehan and Youngsan had 45, 43, 47 grains at

Table 2. Comparison of growth characters and yield of rapeseed varieties treated with fungicides

Fungicides		Plant height (cm)	Ear length (cm)	No. of tatal branches	1,000 grains wt .(g)	Grain yield (kg/10a)	Index
Mancozeb 75% WP (40g/20ℓ)	Y	146	42	40	3.0	245	108
	N	144	40	38	3.0	237	105
	S	148	48	43	3.1	251	116
Chlorothalonil 75% WP (33g/20ℓ)	Y	162	43	42	3.0	257	114
	N	153	41	40	2.9	250	111
	S	173	49	44	3.3	262	116
Dithianon 43% WP (20㎖/20ℓ)	Y	135	41	43	3.1	235	104
	N	133	40	41	3.0	231	102
	S	145	44	45	3.2	241	107
Difenoconazole 10% WP (10g/20ℓ)	Y	132	44	44	3.0	237	105
	N	130	42	43	2.9	234	104
	S	138	47	46	3.2	242	107
Benomyl 50% WP (13g/20ℓ)	Y	157	44	43	3.1	241	107
	N	151	41	42	3.0	238	105
	S	165	49	45	3.2	247	109
Propineb 70% WP (40g/20ℓ)	Y	112	43	44	3.2	243	108
	N	109	41	41	3.0	235	104
	S	128	48	47	3.3	252	112
Control	Y	107	45	43	3.1	225	100
	N	105	43	41	3.0	220	97
	S	112	47	45	3.2	229	101
LSD(0.05)		17.62	10.18	6.6	2.8	-	-

Y : Yudal, N : Naehan, S : Youngsan.

non-treated plot, the plot treated with mancozeb WP [75%(40g/20ℓ)] had 42, 40, 48, that treated with chlorothalonil WP [75%(33g/20ℓ)] had 43, 41, 49, that treated with dithianon WP [43%(20㎖/20ℓ)] had 41, 40, 44, that treated with difenoconazole WP [10%(10g/20ℓ)] had 44, 42, 47, that treated with benomyl WP [50%(13g/20ℓ)] had 44, 41, 49, and that treated with propineb WP [70%(40g/20ℓ)] had 43, 41, 48.

On the insect pest of sclerotinia rot plots treated with all fungicides and non treated plots at a broad outlook were slight as 1 and in the dry grain of yield per 10a, Yudal was 225kg, Naehan was 220kg and Youngsan was 229kg at non-treated plot, but plot treated with mancozeb WP [75%(40g/20ℓ)] were 245, 237, 251kg, which showed yield increase of 108, 105, 116% respectively, plot treated with chlorothalonil WP [75%(33g/20ℓ)] were 257, 250, 262kg, which showed yield increase of 114, 111, 116% respectively, plot treated with dithianon WP [43%(20㎖/20ℓ)] were 235, 231, 241kg which showed yield increase of 104, 102, 107%, plot treated with difenoconazole WP [10%(10g/20ℓ)] were 237, 234, 242kg, Which showed yield increase of 105, 104, 107%, plot treated with benomyl WP [50%(13g/20ℓ)] were 241, 238, 247kg, which showed yield increase of 107, 105, 109% and plot treated with propineb WP [70%(40g/20ℓ)] were 243, 235, 252kg, which showed yield increase of 108, 104, 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 rapeseed

The experiment of the amount of fungicide for sclerotinia rot and its harmful effects on the rapeseed 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 sclerotinia rot of the rapeseed, its yield can be increased by reducing the period of competition between sclerotinia rot and the rapeseed, the dry yield of grain per 10a at the plot treated with chlorothalonil WP [75%(33g/20ℓ)] showed 257kg at Yudal, 250kg at Naehan and 262kg at Youngsan and it is excellent fungicide, but the residue of agricultural chemicals after using fungicide and the change of effective components should be continuously examined.

According to Shin *et al.* (2001), yield of *Alisma Plantago* was increased largely with chlorothalonil-WP, 75% (33g/20ℓ), fungicide than the other fungicides and control, and had no injury with standard dosage. In this experiment, the results were much alike.

Table 3. Chemical injury of rapeseed varieties of applied fungicides.

Fungicides		Standard dosage			Double dosage		
		10[+]	20	30	10	20	30
Mancozeb 75% WP (40g/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1
Chlorothalonil 75% WP (33g/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1
Dithianon 43% WP (20ml/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1
Difenoconazole 10% WP (10g/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1
Benomyl 50% WP (13g/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1
Propineb 70% WP (40g/20ℓ)	Y	0	0	0	1	1	1
	N	0	0	0	1	1	1
	S	0	0	0	1	1	1

[+] Days after the appling fungicides
[‡] Y : Yudal, N : Naehan, S : Youngsan
Plant injury : 0 (No injury), 1 (Slightly injury).

Literature Cited

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991a. Leaf blight of Job's tears. Compendium of medicinal plant diseases with colour plates. p. 84-54.

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991b. Leaf blight of Peony. Compendium of medicinal plant diseases with colour plates. p. 111-117.

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991c. Leaf spot of *Lithospermum erythrorhizon* Sieh. et Zucc. Compendium of medicinal plant diseases with colour plates. p. 105-106.

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991d. Brown leaf blight of *Alisma canaliculatum* A. Braum et Bonche. Compendium of medicinal plant diseases with colour plates. p. 124-125.

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991e. Brown leaf blight of *Cyperus rotundus* L. Compendium of medicinal plant diseases with colour plates. p. 131-132.

Department of Plant Pathology, Agricultural Sciences Institute, RDA. 1991f. Sclerotinia rot of *Sclerotinia Sclerotiorum* (Libert) de Bary of Compendium of medicinal plant disease with color plants. p. 34-35.

Hwang, J. J., Y. S Jang, D. S. Jung and B. S. Kwon. 1993. Trial on heterosis breeding by nuclear substitution of rapeseed. Experimental research report of crop experiment station, Rural Development Administration. p. 441-459.

Kae, B. M. and B. S. Kwon. 1994. Trial on transplanting in Spring with Fall sowing nursery rapeseed. The Korean Society of Agriculture Promotion, Experiment Research Control of Special Crops. p. 561-562.

Kwon, B. S. 1994a. Regional cultural practice trial of rapeseed. The Korean Society of Agriculture Promotion, Experiment Research Control of Special Crops. p. 566-568.

Kwon, B. S 1994b. Weed control test of rapeseed. The Korean Society of Agriculture Promotion, Experiment Research Control of Special Crops. p. 571-572.

Kwon, B. S., S. G. Kim and S. M. Bae. 1984. Weed control test of rapeseed. Experimental research report of crop experiment station, Rural Development Administration. p. 449-452.

Kae, B. M., J. I. Lee and B. S. Kwon. 1971. A new rape variety "Yudal". The research report of office fo rural development. vol. 14 (crop). p. 67-70.

Kwon, B. S and D. S. Jung. 1972. Trial of weed control of rapeseed.

Experimental research report of national crop experiment station, RDA. p. 291-297.

Kim, S. G., B. S. Kwon, J. K. Bang and D. S. Jung. 1984a. Trial on high-yielding culture of rapeseed. Experimental research report of crop experiment station, Rural Development Administration. p. 449-452.

Kim, S. G., B. S. Kwon, J. K. Bang, S. M. Bae and Y. J. Kim. 1984b. Trial on F1 seed production culture of rapeseed. Experimental research report of crop experiment station, Rural Development Administration. p. 455-457.

Lee, J. I. and B. S. Kwon. 1994. Trial on seeding rate and density of rapeseed in Spring The Korean Society of Agriculture Promotion, Experiment Research Control of Special Crops. p. 556.

Lee, J. I. and B. S. Kwon. 1974. Regional cultural practice trial of rapeseed. The Korean Society of Agriculture Promotion, Experiment Research Control of Special Crops. p. 579-580.

Lee, J. I. and B. S. Kwon. 1972a. Trial of seeding method of rapeseed in spring sowing. Experimental research report of national crop experiment station, RDA. p. 274-284.

Lee, J. I. and B. S. Kwon. 1972b. Regional yield trial of rapeseed in Taejun, Iksan, Taegu, Jinju Korea. Experimental research report of national crop experiment station, RDA. p. 312-330.

(Received 8 March 2006; Accepted 1 June 2006)