

Screening of Insecticide to Control *Rhopalosiphum nymphaeae* for *Alisma plantago* as Second Crop in Paddy Field

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ABSTRACT : The purpose of this study was to evaluate the effect of pesticides on insect pest control of *Rhopalosiphum nymphaeae*, growth characteristics and dry root yield from the cultivated after early maturing rice cropping. All pesticides treated had no effect on the growth period, flowering rate of *Alisma plantago*. The major pesticides were methomyl-Lf, 24.1%, imidacloprid-Wp, 10%, carbosulfan-Wp, 20%, and methomyl-Wp, 45%. Dry yield of root were increased largely with imidacloprid-Wp, 10% (10 g/20 l), pesticide than the other pesticides and control. All pesticides were had no injury with recommended concentration. On the other hand all pesticides were slightly harmful in the double dosage level for the *Alisma plantago*.

Key words : Insecticides, Control value, Plant injury, *Rhopalosiphum nymphaeae*, *Alisma plantago*, Growth Characteristics

Alisma plantago is a medicinal crop used for diuresis, the reduction of diuresis, strengthening of weak stomach, vomiting, and vertigo. It is a perennial plant grown at the pond or water. It has short rootstock, fascicled mustache root, straight stem, 90 cm of plant height and leaves of fascicled root and long and oval petiole. Its flower leaves in vertical, have long petiole, large raceme, and white flower.

The cultivation of *Alisma plantago* at Sunchon occupies 76% of the national production as the area of 100 ha and it is harvested in Mid or late December by transplanting it in late August or early September after early cultivation of rice with double cropping method. *Rhopalosiphum nymphaeae* and *Spodoptera exigua* damage leaf and stem of crop such as perilla, green onion, bean, and Chinese cabbage and the productivity is greatly lowered by increasing damages to crop (Kwon, 1979; Park, 1997; Park *et al.*, 1997; Park *et al.*, 2000; Shin *et al.* 2000; Kim, 1998a and 1998b).

Therefore, this study reports the results of treating some insecticide for preventing *Rhopalosiphum nymphaeae*, one of important harmful insect pests damaging *Alisma plantago*

(Lim *et al.*, 2000).

MATERIALS AND METHOD

This experiment was conducted at farmer's field located at Yongjun-ri, Haeryong-myon, Sunchon City, Jeonnam, Korea where is the major production area of *Alisma plantago* from July to December, 2001. The *Alisma plantago* cultivar, Sunwol local was used.

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

Rhopalosiphum nymphaeae was used as Experimental pest insect and methomyl-Lf [24.1%(20 µl/20 l)], imidacloprid-Wp [10%(10 g/20 l)], carbosulfan-Wp [20%(20 g/20 l)], methomyl-Wp [45%(13 g/20 l)] which is already on the market were applied on September 11, when 50-100 larvae per plot which were enough to examine the chemical effects were found.

Experimental plots were arranged with randomized block design through three replication, Experimental area per plot was 10 m². where *Alisma plantago* was transplanted with the density of 20×15 cm on the August 30. Twenty tons of compost per ha were applied and compound fertilizer (21-17-17) is used as basal fertilization in the whole quantities and then urea of 250 kg/ha were used through three times in the early and late September and the Mid-October.

The other cultural management was carried out in accordance with the conventional culture method of the Yongjun district in South Korea. The whole area of 10 m² per plot is observed before applying insecticides for examining the number of live insect of *Rhopalosiphum nymphaeae*, the rate of live insect (%) is examined first on September 16, 5 days after applying insecticides and on September 21, 10 days after applying insecticides.

Effect of excess pestside dosage on *Alisma plantago* damage.

Standard and double dosage plot were compared three

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lines to evaluate the damages of *Alisma plantago* on 3, 5 and 10 days after insecticide application. The damage as applied over dosage was ranked from 0, no damage, to 9, some damage. Experimental plot is arranged with randomized block design with three replications and experimental area and cultivation method per plot is as described above.

RESULTS AND DISCUSSION

Effect of insecticides on *Rhopalosiphum nymphalae* control

Four kinds of insecticides including methomyl-Lf [24.1%(20 µl/20 l)] were treated on September 11 when 60-110 larvae which were enough to evaluate the insecticide effects at experimental field of *Alisma plantago* and the results are shown in Table 1.

There was no effect by rainwater after insecticide treatment and the number of live larvae examined before applying the insecticides were 60 to 80 on 142 plants per plot and

according to the observation on September 16, 5 days after applying the insecticides, while the rate of live larvae at non-treated plot was 104.3%, that of live larvae at the plot treated with methomyl-Lf [24.1%(20 µl/20 l)] was 2.4% and control value was 96.4%. The rate of live insect at plot treated with imidacloprid-Wp [10%(10 g/20 l)] was 1.0% and its control value was 96.9%, that of live insect at the plot treated with carbosulfan-Wp [20%(20 g/20 l)] was 1.5% and its control value was 97.3% and high control values were shown in all insecticides. Also according to the observation on September 21, 10 days after applying disinfectant, while the rate of live insect at non-treated plot was 115.2%, that at the plot treated with methomyl-Lf [24.1 %(20 µl/20 l)] was 7.2% and its control value was 91.4%, that at the plot treated with imidacloprid-Wp [10%(10 g/20 l)] was 7.2% and its control value was 91.4%, the rate of live insect at the plot treated with carbosulfan-Wp [20%(20 g/20 l)] was 7.0% and its control value was 92.1%, and the rate of live insect at the plot treated with methomyl-Wp [45%(13 g/20 l)] was 6.8% and its preventive value was 92.5%.

Table 1. Insect pest control effect of *Rhopalosiphum nymphalae* in *Alisma plantago* field.

Pesticides	No. of live insect before the spray/142 plant	Rate of live larvae (%)		Significant difference (DMRT)(0.05)	Control value (%)
		Mean	±SD		
Methomyl-Lf, 24.1% (20 µl/20 l)	62.0	2.4	±0.3	a	96.4
		7.2	±2.5	a	91.1
Imidacloprid-Wp, 10% (10 g/20 l)	72.0	1.0	±0.2	a	96.9
		7.1	±2.6	ab	91.4
Carbosulfan-Wp, 20% (20 g/20 l)	55.0	1.5	±0.7	a	97.3
		7.0	±3.0	ab	92.1
Methomyl-Wp, 45% (13 g/20 l)	65.0	3.2	±1.8	a	96.2
		6.8	±3.5	a	92.1
Control	69.0	104.3	±29.8	b	
		115.2	±32.5	c	

C V(%)-----70.3, -----64.3

Upper : Investigation in Sep. 16 (5 days the after pesticide spray)

Lower : Investigation in Sep. 21 (10 days the after pesticide spray)

Table 2. Comparison of growth characteristics and yield of *Alisma plantago* treated with insecticides.

Pesticides	Flowering date	Plant height (cm)	No. of leaves	Dry root yield (kg/1 ha)	Yield index
Methomyl-Lf, 24.1% (20 µl/20 l)	Sep. 13	65	21	3,420	142
Imidacloprid-Wp, 10% (10 g/20 l)	Sep. 13	67	23	3,550	147
Carbosulfan-Wp, 20% (20 g/20 l)	Sep. 13	62	18	3,390	141
Methomyl-Wp, 45% (13 g/20 l)	Sep. 13	57	17	3,270	136
Control	Sep. 14	53	15	2,410	100
LSD (0.05)		7.5	2.3	14.7	
C.V. (%)		2.8	4.8	6.2	

Table 3. Plant injury of *Alisma plantago* of application of insecticides.

Pesticides	Standard dosage			Double dosage		
	3*	5	10	3	5	10
Methomyl-Lf, 24.1% (20 µl/20 l)	0	0	0	1	1	1
Imidacloprid-Wp, 10% (10 g/20 l)	0	0	0	1	1	1
Carbosulfan-Wp, 20% (20 g/20 l)	0	0	0	1	1	1
Methomyl-Wp, 45% (13 g/20 l)	0	0	0	1	1	1

*Days after insecticide application

Effects of insecticide treatments on growth and yield of *Alisma plantago*

The effects of insecticide treatments on growth and yield of *Alisma plantago* are shown in Table 2. The plant height did not show a great difference between non-treated and insecticide treated plot with the ranges from 50 cm to 67 cm.

The number of leaves have the same tendency as plant height and while the number of leaves at non-treated plot was 15, that of plots treated with methomyl-Wp [45%(13 g/20 l)] was 17, that of plots treated with methomyl-Lf [24.1%(20 µl/20 l)] was 21, that of plots treated with imidacloprid-Wp [10%(10 g/20 l)] was 23 and that of plots treated with imidacloprid-Wp [10%(10 g/20 l)] was 23. Brown leaf blight and plant louse are about 2 at non-treated plot by a broad outlook, but those of the plots treated with all insecticides are 1 and while the yield of dry root per ha is 2,410 kg at non-treated plot, it was 3,270 kg at the plot treated with methomyl-Wp [45%(13 g/20 l)] and it showed the yield increase of 36%, it is 3,420 kg at the plot treated with methomyl-Lf [24.1%(20 µl/20 l)] and it means the yield increase of 42%, 47% at the plot treated with imidacloprid-Wp [10%(10 g/20 l)] and 41% at the plot treated with carbosulfan-Wp [20%(20 g/20 l)] and then it is considered that it is ideal preventive measure because there is no decrease in yield. However, plant height, number of leaves and dry root yield were not significantly different (Table 2).

Phytotoxicity trial of insecticides on *Alisma plantago*

The examination of the harmful effects of standard and double dosage of insecticides to control *Rhopalosiphum nymphaeae* on *Alisma plantago* cultivation is shown in Table 3.

There were no harmful effects of experiment insecticides as shown in Table 3 and double dosage also shows slight symptom.

Accordingly, the yield of *Alisma plantago* can be increased by reducing the competition period of *Rhopalosiphum nymphaeae* and crops for the prevention of *Rhopalosiphum nymphaeae* in the cultivation of *Alisma plantago* and it is considered that imidacloprid-Wp [10%(10 g/20 l)] has high preventive value for *Rhopalosiphum nymphaeae* and high yield and it is regarded as good insecticide, but the residue of insecticides and the change of effective component after using insecticides should be continuously examined.

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