

## Screening of Insecticides for Control of *Spodoptera exigua* in Double Cropping after Early Rice *Alisma plantago*

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**ABSTRACT:** This study was conducted to evaluate the effect of insecticides on control of *Spodoptera exigua*, growth characteristics, and dry root yield in the cultivation of *Alisma plantago* after early maturing rice cropping. All pesticides treated had no effect on growth and flowering rate of *Alisma plantago*. The major insecticides were teflubenzuron Wp, 5%, tebufenozide Wp, 8%, lufenuron Ec, 5%, and tebufenozide Wp, 5%. Dry root yield were increased largely with tebufenozide Wp, 5% (20 g/20 l), insecticide than the other insecticides and no control. All insecticides had no injury with standard dosage. On the other hand, all insecticides had slight injury in the double dosage level for the *Alisma plantago*.

**Keywords:** Insect pest, *Spodoptera exigua*, *Alisma plantago*, Insecticide

*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, 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, has 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.

*Spodoptera exigua* damages leaf and stem of crops such as perilla, green onion, bean and Chinese cabbage and the productivity is greatly lowered by increasing damages to crops (Kim, 1998a and 1998b; Park *et al.*, 1997).

Therefore, this study reports the results of treating some insecticide for preventing *Spodoptera exigua*, one of important harmful insect pests damaging *Alisma plantago* (Lim *et al.*, 2000).

## MATERIALS AND METHODS

This experiment was conducted at farmer's field located at Yongjun-ri, Haeryong-myon, Sunchon City, Chonnam, Korea where is the major production area of the *Alisma plantago* from July to December, 1999. The *Alisma plantago* cultivar, Yongjun local was used.

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

Experimental harmful insect pest is *Spodoptera exigua* and Insecticide is teflubenzuron Wp[5%(20 ml/20 l)], tebufenozide Wp[8%(20 g/20 l)], lufenuron Ec[5%(20 ml/20 l)], tebufenozide Wp[5%(20 g/20 l)] which is already on the market is applied on September 11, when 30~50 larvae per plot which are enough to examine the medicinal effects are found.

Experimental plot is arranged with randomized block design through three replications, experimental area per plot is 10 m<sup>2</sup>, which is transplanted with 20 × 15 cm in the 30 th of August, and 2,000 kg of compost as the amount of applied fertilizer (kg/10a) is applied, compound fertilizer(21-17-17) is used as basal fertilization in the whole quantities and then urea of 25 kg is 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 of Korea.

The whole area of 10 m<sup>2</sup> per plot is observed before applying insecticides for examining the number of live insect of *Spodoptera exigua*, 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.

### Experiment of harmful effects of insecticides by treated dosage in cultivating *Alisma plantago* as second crop

The spray in jury effects of teflubenzuron Wp[5%(20 ml/20 l)], tebufenozide Wp[8%(20 g/20 l)], lufenuron Ec[5%(20 ml/20 l)], tebufenozide Wp[5%(20 g/20 l)] of standard

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design plots and teflubenzuron Wp[5%(40 ml/20 l)], tebufenozide Wp[8%(40 g/20 l)], lufenuron Ec[5%(40 ml/20 l)], tebufenozide Wp[5%(40 g/20 l)] of double design plots applied to *Alisma plantago* under growth are compared after three days September 14, five days September 16 and ten days September 21 of applying it by a broad outlook (0-9) examination through three times.

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

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

#### Preventive effects of *Spodoptera exigua* by insecticide treatment

Four kinds of Insecticides including teflubenzuron Wp[5% (20 ml/20 l)] were treated on September 11 when 30~50 larvae which were enough to judge the insecticide effects at experimental field of *Alisma plantago* were found and the results of examining the preventive effects of *Spodoptera exigua* 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 32 to 43 of 142 plants per plot and according to the examination on September 16, 5 days after applying the insecticides, while the rate of live larvae at non-treated plot is 107.0%, that of live larvae at the plot treated with teflubenzuron Wp[5%(20 ml/20 l)] is 0.8% and preventive value is 99.2%, the rate of live insect at plot treated with tebufenozide Wp[8%(20 g/20 l)] is 0.7% and its pre-

ventive value is 99.3%, that of live insect at the plot treated with lufenuron Ec[5%(20 ml/20 l)] is 1.7% and its preventive value is 98.4% and high preventive values are shown in all insecticide. Also according to the examination on September 21, 10 days after applying disinfectants, while the rate of live insect at non-treated plot is 118.6%, that at the plot treated with teflubenzuron Wp[5%(20 ml/20 l)] is 6.5% and its preventive value is 94.5%, that at the plot treated with tebufenozide Wp[8%(20 g/20 l)] is 6.7% and its preventive value is 99.3%, the rate of live insect at the plot treated with lufenuron Ec[5%(20 ml/20 l)] is 7.6% and its preventive value is 93.6%, and the rate of live insect at the plot treated with tebufenozide Wp[5%(20 g/20 l)] is 8.3% and its preventive value is 93.0%.

#### 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 doesn't show a great difference between non-treated plot with plant height of 51 cm and that of the plots treated with insecticides, but that of the plots treated with teflubenzuron Wp[5%(20 ml/20 l)] was 54 cm and tebufenozide Wp[5%(20 g/20 l)] respectively was similar as 56 cm and that of the plots treated with tebufenozide Wp[8%(20 g/20 l)] was 61 cm and that of the plots treated with lufenuron Ec[5%(20 ml/20 l)] was 59 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 the plots treated with tebufenozide Wp[5% (20 g/20 l)] was 18, that of the plots treated with teflubenzuron Wp[5%(20 ml/20 l)] was 21, that of the plot treated with tebufenozide-Wp[8%(20 g/20 l)] was 23 and that of the plots

**Table 1.** The control effect of insecticides on *Spodoptera exigua* in *Alisma Plantago*.

Insecticides	No. of live larvae before spary/plot	Rate of live larvae (%)	Significant difference (DMRT) (0.05)	Control value (%)
		Mean $\pm$ SD		
Teflubenzuron-Wp <sup>†</sup> , 5% (20 ml/20 l)	35.0	0.8 $\pm$ 0.2	a	99.3
		6.5 $\pm$ 2.8	a	94.5
Tebufenozide-Wp, 8% (20 g/20 l)	43.0	0.7 $\pm$ 0.2	a	99.3
		6.7 $\pm$ 2.4	ab	94.3
Lufenuron-Ec <sup>‡</sup> , 5% (20 ml/20 l)	32.0	1.7 $\pm$ 0.8	a	98.4
		7.6 $\pm$ 3.2	ab	93.6
Tebufenozide-Wp, 5% (20 g/20 l)	37.0	4.8 $\pm$ 1.9	a	95.5
		8.3 $\pm$ 3.4	ab	93.0
Control	33.0	107.0 $\pm$ 28.8	b	-
		118.6 $\pm$ 31.4	c	-

<sup>†</sup>Wp: wettable powder, <sup>‡</sup>EC: emulsifiable concentrate  
Upper: Investigated on Sep.16 ( 5 DAT pesticide spray)  
Lower: Investigated on Sep.21 (10 DAT pesticide spray)

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

Insecticides	Flowering date	Plant height (cm)	No. of leaves	dry root yield (kg/10a)	yield index
Teflubenzuron Wp 5% (20 ml/20 l)	Sep. 16	54	21	316	136
Tebufenozide Wp 8% (20 g/20 l)	Sep. 16	61	23	342	148
Lufenuron Ec 5% (20 ml/20 l)	Sep. 16	59	20	331	143
Tebufenozide Wp 5% (20 g/20 l)	Sep. 16	56	18	290	125
Control	Sep. 17	51	15	231	100
LSD(0.05)	-	8.0	6.2	89.6	-

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

Pesticides	Standard dosage			Double dosage		
	3 <sup>†</sup>	5	10	3	5	10
Teflubenzuron Wp 5% (20 ml/20 l)	0	0	0	1	1	1
Tebufenozide Wp 8% (20 g/20 l)	0	0	0	1	1	1
Lufenuron Ec 5% (20 ml/20 l)	0	0	0	1	1	1
Tebufenozide Wp 5% (20 g/20 l)	0	0	0	1	1	1

<sup>†</sup>Days after apply pesticides

treated with lufenuron Ec[5%(20 ml/20 l)] was 20. 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 10a is 231 kg at non-treated plot, it was 290 kg at the plot treated tebufenozide Wp[5%(20 g/20 l)] and it showed the yield increase of 25%, it is 316 kg at the plot treated with teflubenzuron Wp[5%(20 ml/20 l)] and it means the yield increase of 36%, 48% at the plot treated with tebufenozide Wp[8%(20 g/20 l)] and 43% at the plot treated with lufenuron Ec[5%(20 ml/20 l)] and then it is considered that it is ideal preventive measure because there is no decrease in yield.

#### Experiment of phytotoxicity of insecticides by treated dosages in cultivating *Alisma plantago* as second crop

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

There were no harmful effects of experimental 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 *Spodoptera exigua* and crops for the prevention of *Spodoptera exigua* in the

cultivation of *Alisma plantago* and it is considered that tebufenozide Wp[8%(20 g/20 l)] has high preventive value for *Spodoptera exigua* 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.

#### REFERENCES

- Kim, D. I. 1998a. Insect pest control of *Spodoptera exigua* for perilla. Research report of Chonnam Agricultural Research and Extension Services. (crop) : 644-645.
- Kim, D. I. 1998b. Insect pest control of *Spodoptera exigua* for green onion. Research report of Chonnam Agricultural Research and Extension Services. (crop) : 651-652.
- Lim, Y. T., B. S. Kwon, H. J. Park, and J. S. Shin 2000. Insect pest control of *Spodoptera exigua* for *Alisma plantago*. *Korean J. of Crop Sci.* 45(Suppl. 1) : 186-187.
- Park, J. D. 1997. Insect pest control of *Spodoptera exigua* for chinese cabbage. Research report of Chonnam Agricultural Research and Extension Services. (crop) : 506-507.
- Park, J. D., I. Lee, S. S. Kim, and K. J. Kim 1997. Insect pest control of *Spodoptera exigua* for soybean. Research report of Chonnam Agricultural Research and Extension Services. (crop) : 461-466.