WEED CONTROL IN SOD-SEEDING SOYBEAN IN JAPAN

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Summary. Efficacy was not reduced by mixing glufosinate or diquat-paraquat with soil applied herbicides such as alachlor, metolachlor, linuron, prometryn and trifluralin. The efficacy against weeds of glyphosate combined with soil applied herbicide such as trifluralin reduced slightly as compared with glyphosate alone. Efficient weed control was obtained by sequential application, namely preplant treatment of foliar applied herbicide followed by postplant treatment of soil applied herbicide or combined application of postplant treatment using both types of herbicides in sod-seeding cultivation of soybean.

INTRODUCTION

Double cropping, of wheat and soybean is popular in the rotational upland fields in Japan. In June (the rainy season in Japan) soybean is sown soon after harvesting of wheat using sod-seeding cultivation in order to use mechanical seeder effectively (1,2). Experiments on the herbicidal efficacy to weeds and injury of herbicides to soybean were conducted to establish an efficient weed control system for sod-seeding cultivation of soybean.

METHODS

Experiment 1. Efficacy of foliar applied herbicides mixed with soil applied herbicides was investigated. Herbicides used were as follows:

Foliar applied herbicides: glyphosate, glufosinate, diquat-paraquat
Soil applied herbicides: alachlor, metolachlor, linuron, prometryn, trifluralin, prometryn-metolachlor.

These herbicides were applied at growing stage of *Digitaria ciliaris* (Retz.) Koeler and *Amaranthus patulus* Bertoloni. Concrete pots of 50x50 cm filled with volcanic ash soil to 30 cm depth were used in this experiment with 3 replications.

Experiment 2. Injury of herbicides to soybean was investigated. Soybean, cultivar Tachinagaha was sown with no soil cover or 3 cm depth of soil cover using the same concrete pots as in Experiment 1 with 3 replications. Herbicides used were as follows:

alachlor, metolachlor, linuron, prometryn, trifluralin, prometryn-metolachlor, glyphosate, glufosinate, diquat-paraquat.

Experiment 3. Efficacy and injury of herbicides to sod-seeding soybean were investigated using rotational upland field continuing sod-seeding culture during 3 years. Soybean, cultivar Tachinagaha was sown on 19 June 1990. Five levels of herbicide application method were designed as follows:

a. Foliar application of glufosinate 925 g/ha before seeding
b. Soil application of prometryn-metolachlor 0.8+1.2 kg/ha after seeding

c. Foliar application of glufosinate before seeding followed by soil application of prometryn-metolachlor after seeding
d. Combined application of glufosinate mixed with prometryn-metolachlor after seeding
e. Untreated.

This experiment was carried out at a rotational upland field of the National Agriculture Research Center. Plot size was 7.2x2 m with 3 replications.

RESULTS AND DISCUSSION

Effect of soil applied herbicides mixing with foliar applied herbicides on the herbicidal efficacy to growing weeds is shown in Table 1. Herbicidal efficacy was not reduced by mixing glufosinate or diquat-paraquat of foliar applied herbicides with soil applied herbicides such as alachlor, metolachlor, linuron, prometryn, trifluralin and combination of prometryn-metolachlor. The efficacy against *Amaranthus patulus* of glyphosate combined with soil applied herbicide such as trifluralin was slightly reduced compared with glyphosate alone.

Table 1. Effect of soil applied herbicides mixing with foliar applied herbicides on the efficacy to growing weeds

Foliar applied herbicide	Dosage (kg/ha)	Weed	% Weed control						
			Al[1]	Met	Li	Pro	Tri	Pro-mt	No mix
Glyphosate	1.04	D[2]	100	100	100	100	100	99	100
		A	99	100	100	95	90	100	100
Glufosinate	0.56	D	100	100	100	100	95	100	100
		A	100	100	100	100	100	100	100
Diquat-paraquat	0.42 +0.30	D	88	80	97	91	87	95	73
		A	100	100	100	100	100	100	100

Footnotes: [1] Al : alachlor 2.58 kg/ha, Met : metolachlor 1.8 kg/ha, Li : linuron 1.O kg/ha, Pro : prometryn 1.O kg/ha, Tri : trifluralin 1.34 kg/ha, Pro-mt : prometryn-metolachlor 0.8+1.2 kg/ha, No mix : no mixing.
[2] D : *Digitaria ciliaris*, A : *Amaranthus patulus*

Effect of herbicides on emergence and early growth of soybean is shown in Table 2. Foliar applied herbicides, namely glyphosate, glufosinate and diquat-paraquat, caused reduced emergence of soybean seeded with no soil cover. As shown in Table 2, the number of emergence of soybean was reduced 13-41% compared with untreated plot. Adverse effect on early growth of soybean seeded with no soil cover was not observed in the plots of application of foliar applied herbicides. Soil applied herbicides such as trifluralin and prometryn caused a slightly reduced emergence of soybean seeded with no soil cover, and delay of growth was observed in the plots of alachlor, metolachlor and prometryn-metolachlor application. In the plots 3 cm soil cover condition, the adverse effect on emergence or early growth of soybean was not observed by foliar applied herbicides, but alachlor, metolachlor and prometryn-metolachlor reduced early growth of soybean due to heavy rainfall soon after herbicide treatment.

Efficacy and injury of herbicides to sod-seeding cultivation of soybean was shown in Table 3. A poor herbicidal efficacy to weeds was observed in the single application of foliar applied herbicide before seeding or soil applied herbicide after seeding. Efficient weed control was obtained by sequential application, namely preplant treatment of foliar applied herbicide followed by postplant treatment of soil applied herbicide or combined application of postplant treatment using both types of herbicides. Herbicide injury to soybean was not observed even with 1 cm soil cover in this experiment. More experiments including a method for avoiding herbicide injury to no or shallow soil cover, a method for convenient herbicide application etc. are necessary for sod-seeding in order to establish an efficient weed control system.

Table 2. Effect of herbicides on emergence and early growth of soybean

Herbicide	Dosage (kg/ha)	Emergence (%)	Stem length (cm)	No. of leaf/plant	Top fresh weight (g/plant)
			0 cm of soil cover		
Alachlor	2.58	100	21.8	4.6	8.8
Metolachlor	1.8	100	22.0	4.5	8.2
Linuron	1.0	92	24.0	5.0	11.9
Prometryn	1.0	88	23.8	5.3	11.2
Trifluralin	1.34	87	23.8	5.1	11.5
Prometryn-metolachlor	0.8 + 1.2	96	22.0	4.9	9.7
Glyphosate	2.05	77	24.0	5.0	12.4
Glufosinate	0.93	59	23.5	5.1	13.7
Diquat-paraquat	0.7 + 0.5	87	23.0	5.0	12.0
Untreated	-	100	25.3	5.1	12.0
l.s.d. P=0.05		13.5	n.s.	0.4	2.1
			3 cm of soil cover		
Alachlor	2.58	100	21.6	5.0	11.0
Metolachlor	1.8	100	21.6	4.8	11.2
Linuron	1.0	100	24.1	5.1	13.3
Prometryn	1.0	91	24.8	5.5	15.0
Trifluralin	1.34	100	24.8	5.4	15.0
Prometryn-metolachlor	0.8 + 1.2	91	21.4	5.0	11.7
Glyphosate	2.05	100	25.9	5.3	15.7
Glufosinate	0.93	100	24.4	5.3	16.3
Diquat-paraquat	0.7 + 0.5	100	25.1	5.3	16.9
Untreated	-	100	24.6	5.2	14.3
l.s.d. P=0.05		n.s.	2.6	0.3	3.7

Table 3. Efficacy and injury of herbicides to sod-seeding cultivation of soybean

Plot	Weed control (%)	Soybean			
		1 cm of soil cover		3 cm of soil cover	
		Stem length (cm)	Top fresh wt (g/plant)	Stem length (cm)	Top fresh wt (g/plant)
a[1]	44	40	23.2	46	25.2
b	42	43	21.9	48	25.4
c	98	42	25.1	45	27.0
d	99	46	28.0	49	29.2
e	0	43	20.7	46	22.6
l.s.d. P=0.05	51	n.s.	n.s.	n.s.	n.s.

Footnote: [1] a,b,c,d: See Experiment 3 in METHODS.

REFERENCES

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