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Effect of Time and Dose of Post-emergence Herbicides on *Echinochloa colona* (L.) Link. in Blackgram Grown as Relay Crop

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ABSTRACT

Field experiments were conducted during **rabi** 2002-03 and 2004-05 at the Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh to study the optimum time and dose of post-emergence herbicides for *Echinochloa* spp. control in blackgram grown as relay crop. Results indicated that all the post-emergence herbicides like fenoxaprop-P-ethyl, clodinafop-propargyl and cyhalofop-butyl significantly reduced *Echinochloa colona* growth and increased blackgram yield by 27 to 42% over weedy check without any crop injury. Among different herbicides and their doses, fenoxaprop 68 g/ha recorded the highest seed yield (1332 kg/ha) and net monetary returns (Rs. 21,993/ha) and B : C ratio of 1.95 and was on par with its lower dose (56 g/ha). Herbicide application at 21 and 28 days after sowing (DAS) resulted in significantly higher reduction in *Echinochloa colona* density at 20 and 40 days after treatment (DAT) and total weed dry weight compared to its application at 14 DAS. However, blackgram seed yield did not differ significantly due to the time of herbicide application.

Key words : Post-emergence grass herbicides, relay cropping, grassy weed control

INTRODUCTION

In coastal districts of Andhra Pradesh, cultivation of blackgram as relay crop in rice-fallows is a unique system, wherein sprouted seeds of blackgram are broadcasted in standing rice crop, two to three days prior to rice harvest. Blackgram sown in this system survives entirely on residual soil moisture and fertility only. As there is no field preparation, the weed growth particularly of *Echinochloa colona* is severe and effectively competes with the blackgram for residual moisture, nutrients and reduces the blackgram yield to the extent of 49% (Rao and Rao, 2003). As manual weeding and normal pre-emergence application of herbicides is difficult to practice because of trampling and injury, respectively, use of selective post-emergence herbicides is the only option under this system of cultivation. Information pertaining to correct time and dose of post- emergence herbicides for effective weed management in rice fallow blackgram is scanty. Hence, an attempt was made to study the effect of time and dose of post-emergence herbicides on their weed control efficacy in blackgram grown as relay crop.

MATERIALS AND METHODS

A field experiment was conducted consecutively for three years during **rabi** seasons of 2002-03 to 2004-05 at the Pulse Project area of Regional Agricultural Research Station, Lam farm, Guntur, Andhra Pradesh. The soil of the experimental field was clay in texture with medium in available nitrogen and available phosphorus and high in available potassium with a pH of 7.5. The experiment consisting time of application as main plots and herbicide doses as sub-plots (Table 1) was laid out in split plot design with three replications. In order to maintain uniform plant population, the sprouted seeds of blackgram (cv. LBG 17) were dibbled immediately after removal of paddy sheaves by adopting a spacing of 30 x 10 cm.The crop survived entirely on residual moisture and fertility only except for one supplemental irrigation was given at 30-35 DAS (days after sowing). Post-emergence herbicides were sprayed as per schedule using a spray volume of 500 l/ha. During the second year (2003-04) of experimentation, the trial was vitiated because of cyclone occurred on December 15, 2003. Therefore, the data for first (2002-03) and third (2004-05) year were only considered and pooled data for two years were presented on weed and crop parameters. Echinocloa density and total weed dry matter were recorded at various stages with the help of quadrate and then converted in per square metre and the data on weed parameters were subjected to square root transformation before statistical analysis (Panse and Sukhatme, 1978).

Table 1. Effect of different treatments on *Echinochloa colona* density and total dry weight of weeds in blackgram (Pooled data of two years)

Treatment	*Echinochloa colona* density (No./m^2) at			Total weed dry weight (g/m^2) at			Weed control efficiency (%) of *Echinochloa colona* at		
	20 DAT	40 DAT	Harvest	20 DAT	40 DAT	Harvest	20 DAT	40 DAT	Harvest
Main plots (Time of application)									
14 DAS	9.3 (123.5)	8.3 (93.5)	7.8 (79.5)	5.0 (30.2)	11.3 (155.6)	6.9 (54.2)	-	-	-
21 DAS	7.2 (79.8)	6.5 (61.5)	7.7 (80.6)	5.5 (32.3)	7.8 (80.1)	7.0 (54.3)	-	-	-
28 DAS	6.2 (63.0)	6.3 (63.5)	7.8 (78.7)	6.7 (48.9)	8.3 (71.2)	6.6 (52.6)	-	-	-
LSD (P=0.05)	0.86	1.06	NS	0.64	0.38	0.23	-	-	-
Sub-plots (Herbicides doses)									
Weedy check	15.8 (288.2)	14.3 (235.6)	12.6 (195.3)	8.5 (81.4)	12.6 (208.2)	10.0 (101.3)	-	-	-
Fenoxaprop-P-ethyl 56 g/ha	6.3 (51.6)	5.3 (37.8)	6.6 (55.6)	5.4 (30.2)	8.2 (84.6)	5.9 (44.3)	60	63	48
Fenoxaprop-P-ethyl 68 g/ha	4.4 (36.5)	4.7 (35.6)	5.8 (43.1)	4.7 (24.5)	8.3 (77.5)	5.4 (37.3)	70	67	54
Clodinafop-propargyl 52 g/ha	6.1 (46.8)	6.3 (49.3)	7.4 (64.2)	5.2 (28.2)	8.9 (87.5)	6.9 (52.4)	61	56	42
Clodinafop-propargyl 56 g/ha	5.5 (42.0)	5.4 (41.3)	6.2 (45.1)	5.1(28.4)	7.9 (69.0)	6.2 (46.1)	65	62	51
Cyhalofop-butyl 100 g/ha	8.7 (98.0)	7.2 (64.7)	8.2 (82.7)	6.1(38.4)	9.0 (90.9)	6.6 (48.0)	45	50	35
Cyhalofop-butyl 125 g/ha	6.9 (58.5)	6.1 (46.2)	7.6 (71.1)	5.2 (28.9)	8.9 (98.5)	6.5 (46.3)	56	57	40
LSD (P=0.05)	1.10	057	1.01	0.66	0.59	0.58	-	-	-
Interaction	NS	NS	Sig.	NS	NS	NS	-	-	-

Data transformed to √x+0.5 to transformation. Figures in parentheses are original values. DAT–Days after treatment, Sig.–Significant, NS–Not Significant.

Table 2. Effect of different treatments on yield components, yield and economics of blackgram (Pooled data of two years)

Treatment	Crop dry weight (g/m^2) at			No. of pods/ plant	No. of seeds/ pod	100-seed weight (g)	Seed yield (kg/ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	BCR
	20 DAT	40 DAT	Harvest							
Main plots (Time of application)										
14 DAS	26.1	230	339	16.5	6.4	6.4	1166	29150	19150	1.90
21 DAS	35.3	302	374	16.6	6.5	6.4	1201	30025	20025	2.00
28 DAS	50.1	223	407	17.0	6.5	6.2	1209	30225	20225	2.00
LSD (P=0.05)	6.88	12.6	22.3	NS	NS	NS	NS			
Sub-plots (Herbicides doses)										
Weedy check	24.2	163	256	9.8	5.5	6.0	937	23425	13425	1.34
Fenoxaprop-P-ethyl 56 g/ha	38.9	267	379	17.2	6.7	6.4	1286	33150	21025	1.89
Fenoxaprop-P-ethyl 68 g/ha	43.3	258	433	21.4	6.9	6.3	1332	33300	21993	1.95
Clodinafop-popargyl 52 g/ha	33.6	276	370	16.6	6.5	6.2	1168	29200	17670	1.53
Clodinafop-propargyl 56 g/ha	40.8	262	400	18.5	6.8	6.7	1191	29775	16969	1.33
Cyhalofop-butyl 100 g/ha	38.3	255	377	15.8	6.3	6.4	1197	29925	18275	1.57
Cyhalofop-butyl 125 g/ha	41.1	279	399	17.3	6.5	6.3	1232	30800	18800	1.57
LSD (P=0.05)	6.63	27.6	19.9	0.82	0.18	NS	73.5			
Interaction	Sig.	NS	NS	Sig.	NS	NS	NS			

DAS–Days after seeding, DAT–Days after treatment, BCR–Benefit : cost ratio, Sig.–Significant, NS–Not Significant.

RESULTS AND DISCUSSION

Effect on Weeds

The experimental field was dominated by the natural infestation of *Echinochloa colona* (L.) Link, which constituted 80% of the total weed population. Other weeds like *Dinebra retroflexa* (5%), *Cyperus haspan* L. (3%) and broad-leaved weeds : *Xanthium strumarium* L. (2%), *Gnaphalium polycaulon* (1%), *Cleome chelidoni* L.f. (3%), *Nasturitium indicum* (1%), *Grangea maderaspatana* (L.) Poir. (5%) and *Euphorbia virgatus* (2%) were also present but their population was negligible.

All the post-emergence herbicides and their doses significantly reduced *E. colona* density and total weed dry weight over unweeded check at all stages of observation (Table 1). Among the herbicides, at all stages of observation fenoxaprop ethyl at 68 g/ha recorded the lowest density of *E. colona* and total weed dry weight but was on par with its lower dose (56 g/ha) at 40 days after treatment (DAT). Fenoxaprop 68 g/ha recorded higher weed control efficiency (WCE) of 70, 67 and 54% of *E. colona* density at 20, 40 DAT and harvest, respectively over other herbicides. Time of herbicide application significantly influenced the *E. colona* spp. density at 20, 40 DAT and total weed dry weight. Delayed application of post-emergence herbicides resulted in lower density of *E. colona* upto 40 DAT. The interaction effect of time of application and various herbicides was significant only regarding density of *E. colona* at 40 DAT.

Effect on Crop

The uncontrolled weed growth during the crop season reduced the seed yield to the extent of 30%. All the post-emergence herbicides applied at different doses and time did not cause any injury to blackgram crop. All the post-emergence herbicides significantly influenced the yield and yield attributes (except 100-seed weight and crop dry weight) over unweeded check (Table 2). Among the herbicides, post-emergence application of fenoxaprop 68 g/ha recorded significantly the highest seed yield (1332 kg/ha) over all other herbicides but was on par with its lower dose (56 g/ha).The increased seed yield (37 to 42%) in these treatments might be due to effective control of the dominant weed *E. colona* as evidenced by higher weed control efficiency (WCE). Time of herbicide application failed to have significant influence on yield and yield attributes of blackgram. The interaction effect of time of application and herbicide doses was significant only for crop dry weight at 20 DAT and number of seeds per plant. Rao (2005) also reported that fenoxaprop was effective in controlling *E. colona* in blackgram.

Economics

The highest net monetary return (Rs. 21,993/ha) and benefit : cost ratio of 1.95 was obtained with the post-emergence application of fenoxaprop 68 g/ha. This was closely followed by post-emergence application of fenoxaprop 56 g/ha with monetary return of Rs. 21,025/ha and benefit : cost ratio of 1.89 which may be due to higher WCE and lower cost of treatment.

Thus, post-emergence application of fenoxaprop 68 g/ha appears to be effective and economically viable for the control of *E. colona* in blackgram when grown as relay crop.

REFERENCES

Panse, V. G and P. V. Sukhatme, 1978. *Statistical Methods for Agricultural Workers*. ICAR, New Delhi. pp. 152.

Rao, A. S. 2005. Effect of fenoxaprop ethyl on *Echinochloa* spp. control in blackgram grown as relay crop. In : Extended Summaries of National Biennial Conference of Indian Society of Weed Science, held at PAU, Ludhiana, April 6-8. pp. 88-89.

Rao, A. S. and R. S. N. Rao, 2003. Bio-efficacy of clodinafop propargyl on *Echinochloa* spp. in blackgram. *Ind. J. Weed Sci.* **35** : 251-252.