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Efficacy of Pre- and Post-emergence Herbicides in Summer Blackgram (*Vigna mungo* L.)

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ABSTRACT

Application of herbicides viz., pendimethalin (1.00 kg ha^{-1}) as pre-emergence followed by fluazifop-p-butyl (0.375 kg ha^{-1}) as post-emergence demonstrated cent per cent mortality of *Trianthema monogyna,* a major dominating broad-leaved weed and *Sorghum halepense*– a perennial grass, respectively, and recorded seed yield (1012 kg ha^{-1}) similar to that obtained under weed-free check (1016 kg ha^{-1}).

INTRODUCTION

In view of severe infestations of annual and perennial weeds in summer blackgram, the potential yield is generally not realized. The available pre-emergence herbicides viz., pendimethalin, alachlor, fluchloralin and metolachlor are only able to check the emergence and growth of annual grasses and broad-leaved weeds. However, most of the perennial grasses viz., *Sorghum halepense, Saccharum spontaneum,* etc. are not controlled by these herbicides. Recently, haloxyfop-methyl and fluazifop-p-butyl have been reported as potential herbicides in controlling perennial grasses in most of the oilseeds and pulse crops. In view of high temperatures coupled with frequent irrigations, the infestations of perennial grasses occur and inflict the crop losses heavily. Keeping the above facts in view, the present investigation was undertaken to evaluate the efficacy of pre-emergence application of metolachlor and pendimethalin followed by post-emergence application of fluazifop-p-butyl in summer blackgram under alluvial tract of Uttar Pradesh at Kanpur.

MATERIALS AND METHODS

A field experiment was conducted during two seasons at Kanpur. Efficacy of pre-emergence of metolachlor (1.5 and 2.0 kg ha^{-1}) and pendimethalin (1.0 and 1.25 kg ha^{-1}) alone and under sequential application of fluazifop-p-butyl (0.250 and 0.350 kg ha^{-1}) was compared with untreated and weed-free manually in randomized block design. The soil was sandy loam in texture, low in organic carbon (0.25%) and available phosphorus (10 kg ha^{-1}) and medium in available potassium (150 kg ha^{-1}). The soil was slightly alkaline (pH 7.5). The crop cultivar Pant Urd-19 (80-85 days duration) was sown 30 cm apart in second week of March during both the years. A uniform application of 100 kg diammonium phosphate (18 kg N and 46 kg P_2O_5) was used as furrow placement. In all, four irrigations were given at 10-15 days interval. The harvesting was done in first week of June during both the years. Metolachlor (1.5 and 2.0 kg ha^{-1}) and pendimethalin (1.0 to 1.25 kg ha^{-1}) dissolved in 500 l ha^{-1} of water were sprayed second day after sowing through *bak pak* sprayer fitted with flood jet nozzle. The aqueous solution

Table 1. Effect of treatments on weed density (No. m^{-2}) at 60 DAS during two crop seasons

Treatment	Dose (kg ha^{-1})	*C. rotundus*		*S. halepense*		*T. monogyna*		*C. benghalensis*	
		I	II	I	II	I	II	I	II
Unweeded	-	39	43	26	28	28	29	29	28
Weed-free	-	8	8	8	8	8	8	8	8
Metolachlor	1.50	39	45	27	27	26	19	28	27
Metolachlor fb fluazifop	1.5 fb 0.250	38	44	15	14	24	18	27	33
Metolachlor	2.0	39	44	28	28	16	13	24	24
Metolachlor fb fluazifop	2.0 fb 0.375	41	42	14	11	15	12	23	23
Pendimethalin	1.0	40	38	27	27	16	18	23	22
Pendimethalin fb fluazifop	1.0 fb 0.250	40	40	14	11	14	15	22	22
Pendimethalin	1.25	41	40	29	26	7	9	21	21
Pendimethalin fb fluazifop	1.25 0.375	40	40	8	8	8	8	20	20
LSD (P=0.05)		0.2	0.2	0.3	0.4	0.5	0.3	0.3	0.3

of fluazifop-p-butyl (0.250 and 0.375 kg ha^{-1}) was applied at 20 days after sowing. Weed count was made at two places using quadrate (0.30 x 0.30 cm) and converted into m^2. The data were subjected to transformation $\sqrt{x+0.5}$ before statistical analysis.

RESULTS AND DISCUSSION

Effect on Weeds

The experimental crops were infested with *Trianthema monogyna, Sorghum halepense, Commelina benghalensis* and *Cyperus rotundus* during both the years. Pendimethalin (1.25 kg ha^{-1}) and metolachlor (2.0 kg ha^{-1}) demonstrated the mortality of *T. monogyna* to the extent of 97.8 and 78.5%, respectively (Table 1). Lower dose of metolachlor (1.5 kg ha^{-1}) and pendimethalin (1.0 kg ha^{-1}) proved inferior to their higher dose of application with respect to weed mortality. Pendimethalin established its superiority over metolachlor application under all the doses tried. This could be explained with the fact that pendimethalin did not allow the emergence and growth of weed seedlings particularly of *T. monogyna* because of reduced cell division and cell elongation. Fluazifop-p-butyl (0.250-0.375 kg ha^{-1}) proved ineffective against *T. monogyna.*

Pendimethalin (1.25 kg ha^{-1}) and metolachlor (2.0 kg ha^{-1}) reduced the population of *S. halepense* to the extent of 43.0 and 28.92%, respectively (Table 1). Reduction in the population of *S. halepense* due to pendimethalin and metolachlor might be attributed to inhibitory effect of these herbicides on weed seed germination of this weed. Fluazifop-p-butyl (0.250-0.375 kg ha^{-1}) demonstrated spectacular control of *S. halepense* satisfactorily. Excellent control of *S. halepense* was also demonstrated in pigeonpea+blackgram intercropping at Kanpur (Tewari *et al.*, 1998). Metolachlor (1.5-2.0 kg ha^{-1}) applied as pre-emergence showed satisfactory control of *C. benghalensis.* It was, thus, inferred that pendimethalin (1.25 kg ha^{-1}) as pre-emergence and fluazifop-p-butyl (0.375 kg ha^{-1}) as post-emergence treatment under sequential application were found very effective against *T. monogyna* and *S. halepense,* respectively. This finding is substantiated with the results of Pazahanivelan and Kandasamy (1996) who reported that pre-emergence of pendimethalin (1.00 kg ha^{-1}) followed by either fluazifop-p-butyl as post-emergence (0.25 kg ha^{-1}) or late hand weeding at 40 DAS gave

Table 2. Effect of treatments on weeds and crop during two crop seasons

Treatment	Dose (kg ha^{-1})	Dry matter (g m^{-2}) at harvest		Pods plant^{-1}		Seed weight plant^{-1} (g)		Seed yield (kg ha^{-1})	
		I	II	I	II	I	II	I	II
Unweeded	-	459.7	460.4	63.6	62.2	10.18	9.16	528	491
Weed-free	-	0.00	0.00	79.3	76.7	15.85	16.61	988	1045
Metolachor	1.50	365.5	353.1	66.6	63.8	11.20	10.26	600	555
Metolachlor fb fluazifop	1.5 fb 0.250	349.4	330.1	68.3	67.4	11.35	11.37	658	590
Metolachlor	2.0	329.8	313.5	70.5	70.2	12.46	11.45	706	630
Metolachlor fb fluazifop	2.0 fb 0.375	306.9	298.1	72.3	71.3	13.54	12.56	760	680
Pendimethalin	1.0	298.6	298.1	72.5	72.5	13.65	12.64	835	763
Pendimethalin fb fluazifop	1.0 fb 0.250	249.1	284.9	78.2	74.1	14.78	13.74	891	876
Pendimethalin	1.25	276.8	280.7	78.3	75.7	14.84	14.85	923	936
Pendimethalin fb fluazifop	1.25 0.375	273.6	274.1	79.6	79.0	15.94	15.92	998	1026
LSD (P=0.05)		2.1	2.4	5.0	4.8	1.18	1.29	45	61

effective weed control and recorded higher seed yield in rainfed pigeonpea.

Effect on Crop

The effect of herbicides was found significant on yield attributes and seed yield significantly. Pendimethalin (1.0-1.25 kg ha^{-1}) and metolachlor (1.5-2.0 kg ha^{-1}) applied as pre-emergence depressed weed growth and promoted yield parameters and seed yield (Table 2). Pods/plant and seed weight/ plant increased significantly in absence of crop-weed competition created due to application of pendimethalin and metolachlor supplemented with fluazifop-p-butyl as post-emergence.

Pendimethalin proved better than metolachlor with regard to seed yield regardless the doses tried over untreated. Pendimethalin (1.25 kg ha^{-1}) and metolachlor (2.0 kg ha^{-1}) recorded more grain yield than that obtained under low dose of pendimethalin (1.0 kg ha^{-1}) application (Table 2). The extent of increase in seed yield was found 23.8 and 45.2% under metolachlor (2.0 kg ha^{-1}) and pendimethalin (1.25 kg ha^{-1}), respectively, over unweeded. Pendimethalin (1.0 and 1.25 kg ha^{-1}) and metolachlor (1.50 and 2.0 kg ha^{-1}) as pre-emergence followed by fluazifop-p-butyl (0.250-0.375 kg ha^{-1}) as post-emergence enhanced weed control spectrum ranging from 56.70 to 63.94% resulting in increased grain yield over sole application of metolachlor and pendimethalin. Pendimethalin (1.25 kg ha^{-1}) followed by fluazifop-p-butyl (0.375 kg ha^{-1}) as post-emergence recorded similar grain yield (1012 kg ha^{-1}) to that obtained under weed-free manually (1016 kg ha^{-1}). This is in support of earlier findings where fluazifop-p-butyl (0.25 kg ha^{-1}) reduced the bulk of underground rhizomes of *Saccharum spontaneum* (37-39%) resulting at par grain yield of urdbean to that of manual weeding twice (Tewari *et al.*, 1990).

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