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Effect of weed managment techniques on weed dynamics and green foder yield of sorghum

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ABSTRACT

A field experiment was carried out during *kharif* season of 2001 to 2002 to study the effect of different weed management techniques on weed dynamics and green fodder yield of sorghum. The sorghum crop was infested with *Cyperus* spp. (38.9%) and *Echinochloa colona* (28.0%) as major weeds and others (33.1%), which reduced 75.0 and 22.8% of green forage yields during both the years, respectively. Application of atrazine at 0.5 kg/ha PE + 0.5 kg/ha at 10 days after sowing significantly reduced total population and dry weight of weeds being at par to atrazine 1.0 kg/ha PE, one hand weeding at 20 days after sowing and atrazine at 0.5 kg/ha PE+ one hand weeding at 30 days after sowing. These treatments had higher weed control efficiency (WCE) than that of alachlor, pendimethalin, cowpea as intercrop, one and half time seed rate and weedy check during both the years. Application of atrazine at 0.5 kg/ha PE + 0.5 kg/ha at 10 DAS produced more plant height, dry matter accumulation/shoot, leaf area/plant and also green fodder yield of the sorghum, being at par with that of atrazine at 1.0 kg/ha PE, one hand weeding at 20 DAS and atrazine 0.5 kg/ha PE + one hand weeding at 30 DAS but significantly higher than that of other treatments in both the years.

Key words: Alachlor, Atrazine, Pendimethalin, Weeds.

Sorghum (*Sorghum bicolor* (L) Moench) is grown for both food grain and fodder purposes owing to its more tolerance to fluctuating weather conditions during *kharif* season in India. Weed infestation is most serious problem in cultivation of sorghum. Its growth is quite slow during early stage and cannot compete with weeds. According to Mani *et al.* (1968) 31.5 to 99% losses are expected in forage sorghum depending on the degree of weed competition. Although hand weeding is quite effective in minimizing weed population, but it is costly, tedious, more time consuming and difficult to practice during continuous rains. Therefore, weed control through herbicides appears to be the possible strategy for reducing wide range of weeds in shorter time and cheaper way over hand weeding. However, the information on appropriate herbicidal weed management practices are meager for this region which necessitated the present study.

MATERIALS AND METHODS

A field experiment was conducted on forage sorghum in *kharif* season for 2 years (2001-02 and 2002-03) at Instructional Dairy Farm , G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand). The experiment was carried out in randomized block design with ten treatments (pendimethalin 1.0 kg/ha, alachlor 2.0 kg/ha PE, atrazine 1.0 kg/ha PE, atrazine 0.5 kg/ha PE + 0.5 kg/ha 10 days after sowing, atrazine 0.5 kg/ha PE + one hand weeding 30 days after sowing, one hand weeding at 20 days after sowing, one and half time seed rate, cowpea as intercrop, weedy and weed free conditions) with three replications. Soil was classified under silty clay loam having pH 7.8, organic carbon (0.96%) with medium available P (38.0 kg/ha) and K (265.6 kg/ha) contents. The sorghum variety 'Rio' was sown requiring 30 kg seed/ha in rows 30 cm apart. In case of sorghum + cowpea intercropping, the seed rate for sorghum and cowpea was 15 and 20 kg/ha respectively. The crop was fertilized with 60 kg/ha nitrogen and 60 kg/ha P_2O_5 through urea and diammonium phosphate, respecitvely. Herbicides were applied by Maruti foot sprayer having flat fan nozzle as per treatment. Herbicides were sprayed carefully and uniformily by using 500 litres of water per hectare. Weed samples were collected by random placing of 50×50 cm quadrate in each plot at monthly interval. Weeds were cut down at ground level and then identified, counted and the samples were kept in an oven at 70 $\pm 1^0$C until they attained constant weight. The crop growth and yield attributing characters of fodder sorghum also were recorded at different stages of crop. The data on weeds so collected were subjected to logarithmic transformation $\sqrt{x+1}$ for statistical analysis (Panse and

Sukhatme 1967).

RESULTS AND DISCUSSION

Effect on weeds

The dominant weeds found in weedy check plot were *Cyperus* spp. and *Echinocloa colona* with 38.9 and 28% relative density. Remaining minor weeds consisted of *Eleusine indica, Cynodon dactylon, Digitaria sanguinalis, Trianthema monogyma, Bracharia ramosa, Parthenium hysterophorus* and *Commelina benghalensis* had relative density of 31.1%. Weed population and dry matter accumulation of weeds significantly varied due to weed control treatments in both years. Maximum weed population (552 and 331/m^2) and dry matter accumulation (274.7 and 192.1 g/m^2) were found in weedy check during both the years. Application of atrazine 0.5 kg/ha PE + 0.5 kg/ha 10 DAS gave significantly minimum weed population and dry matter accumulation, being at par with atrazine 1.0 kg/ha PE atrazine 0.5 kg/ha PE + one hand weeding at 30 DAS and one hand weeding at 20 DAS. Alachlor and pendimehalin were observed to be inferior than that of atrazine and hand weeding treatments and superior over intercropping cowpea, one and half time seed rate and weedy check treatments during both the years (Table 1). Highest weed control efficiency was recorded with application of atrazine 0.5 kg/ha PE + 0.5 kg/ha at 10 DAS (74.43 and 97.24%), closely followed by atrazine 1.0 kg/ha PE (72.4 and 89.22%), atrazine 0.5 kg/ha PE + one hand weeding at 20 DAS (71.63 and 83.5%) and one hand weeding at 30 DAS (71.23 and 81.62%) and these were remarkably high over other weed control treatments in both the years. Singh *et al.* (1987), Rathore *et al.* (1985) and Mukherjee *et al.* (2000) also reported similar findings.

Effect on crop

Plant height, dry matter accumulation and leaf area of fodder sorghum significantly varied due to various weed management practices in both the years. Application of atrazine 0.5 kg/ha PE + 0.5 kg/ha at 10 DAS produced

Table 1. Effect of various weed management treatments on density, dry weight of total weeds and weed control efficiency

Treatments	Density of weeds/m^2		Dry weight of weeds/(gm^2)		Weed control efficiency (%)	
	2001	2002	2001	2002	2001	2002
One hand weeding 20 DAS	5.44 (229)	4.62 (100)	4.35 (76.3)	3.51(35.3)	72.25	81.62
One and half time seed rate 45 kg/ha	6.12 (452)	4.98 (144)	5.42 (224.6)	3.20 (23.8)	18.30	87.61
Pendimethalin 1.0 kg/haPE	5.74 (309)	5.13 (168)	4.80 (120.3)	4.18 (64.5)	56.25	66.42
Atrazine 1.0 kg/ha PE	5.29 (197)	4.94 (132)	4.34 (76.0)	3.08 (20.7)	72.40	89.22
Alachlor 2.0 kg/ha PE	5.53 (252)	5.18 (176)	4.71 (109.8)	3.44 (50.3)	60.60	73.82
Atrazine 0.5 kg/ha PE + one hand weeding 30 DAS	5.35 (209)	4.19 (95)	4.37 (78.0)	3.49 (31.7)	71.63	83.50
Atrazine 0.5 kg/ha PE + 0.5 kg/ha 10 DAS	5.23 (192)	1.79 (85)	4.27 (70.3)	1.84 (5.3)	74.43	97.24
Cowpea as intercrop	6.02 (412)	5.46 (235)	5.28 (193.6)	4.88 (130.0)	29.57	32.33
Weed free	0.00 (0.00)	0.00 (0.00)	0.00 (0.0)	0.00 (0.0)	100.00	100.00
Weedy	6.31 (552)	5.81 (331)	5.62 (275.0)	5.26 (192.1)	0.00	0.00
L.S.D. (P = 0.05)	0.13	0.91	0.23	0.68	-	-

Original values are given in parenthesis
PE : Pre emergence , DAS : Days after sowing

Table 2. Effect of various weed management treatments on plant height, dry matter accumulation and green forage yield of sorghum

Treatments	Plant height (m)		Dry matter accumulation (g/plant)		Green forage yield (t/ha)	
	2001	2002	2001	2002	2001	2002
One hand weeding 20 DAS	2.64	3.12	83.10	78.29	32.8	44.9
One and half time seed rate 45 kg/ha	1.75	2.85	47.34	62.41	13.20	45.1
Pendimethalin 1.0 kg/haPE	2.58	2.28	73.85	79.40	28.20	41.7
Atrazine 1.0 kg/ha PE	2.60	3.08	77.51	81.95	36.6	47.2
Alachlor 2.0 kg/ha PE	2.60	3.28	75.01	82.23	31.2	39.8
Atrazine 0.5 kg/ha PE + one hand weeding 30 DAS	2.56	2.94	75.98	82.33	32.4	41.2
Atrazine 0.5 kg/ha PE + 0.5 kg/ha 10 DAS	2.57	2.93	78.31	86.22	38.7	47.5
Cowpea as intercrop	1.83	2.98	48.77	66.73	14.4	41.7
Weed free	2.66	3.05	86.80	96.24	41.6	48.2
Weedy	1.74	2.93	44.70	50.61	10.4	37.0
L.S.D. (P = 0.05)	0.09	N.S.	4.02	5.32	3.01	2.1

maximum green forage yield (38.7 and 48.2 t/ha), being at par to atrazine at 1.0 kg/ha PE, one hand weeding at 20 DAS and atrazine 0.5 kg/ha PE + one hand weeding at 30 DAS and gave higher yields over other treatments during both the years. However, alachlor at 2.0 kg/ha and pendimethalin at 1.0 kg/ha PE gave non significant difference in green forage yield but showed superiority over cowpea as inter crop and one and half time seed rate, but significantly produced higher green forage yield of sorghum by cowpea as intercrop and one and half time seed rate over weedy check condition. Cowpea as intercrop showed better yield in quantity and quality due to suppression of weed growth by smothering effect and gave more nutritious and palatable fodder for cattles (Table 2). These results were also in conformity with the findings of Singh (1987) and Mukherjee *et al.* (2000).

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