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Integrated weed management in summer sorghum

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ABSTRACT

A field experiment was conducted at College Farm, Navsari Agricultural University, Navsari (Gujarat) during summer season 2016 to study the effect of integrated weed management practices on weed density, weed dry weight and economics in sorghum. The experiment was laid out in randomized block design with three replications and ten treatments with pre- and post-emergence herbicides (atrazine, 2,4-D and metsulfuron-methyl) alone or combination of these herbicides followed by hand weeding and inter-culturing operation. That two hand weeding and inter-culturing operations at 20 and 40 DAS significantly reduced weed density and dry weight of broad-leaved, grassy and sedge weeds. Weed control efficiency was recorded to the range of 52.50 - 97.00%, with the highest value in two hand weeding and inter-culturing operations at 20 and 40 DAS and lowest in atrazine 0.50 kg/ha as pre-emergence *fb* metsulfuron-methyl 6 g/ha as post-emergence. Higher net return of ` 54623/ha was obtained with two hand weeding and inter-culturing operations at 20 and 40 DAS followed by ` 50179/ha with atrazine 0.50 kg/ha as pre-emergence *fb* atrazine 0.50 kg/ha as post-emergence at 25 DAS.

Sorghum (*Sorghum bicolor* L.) is one of the major staple food crops in semi-arid tropics. In Gujarat. Sorghum occupies about 0.14 million ha area and annual production of 0.19 million tonnes with the productivity of 1.35 t/ha (Anon. 2016). Weeds are major problems in increasing productivity of the crop. It was reported that yield loss of sorghum due to weeds ranges from 15-97%, depending on the nature and density of weeds (Thakur *et al*. 2016). Weeds germinated fast and grow rapidly at an initial growth period of crops competing with the crop severely for growth resources, *viz*. nutrients, moisture, sunlight and space. The integration of herbicides with some cultural and mechanical methods can provide effective weed control. The integrated weed management is gaining importance for preventing yield losses and achieving higher input-use efficiency (Ishaya *et al*. 2007). Hence, present experiment was carried out to study the effect of integrated weed management practices on weed density, weed dry weight and economics in summer sorghum.

The experiment was conducted during summer season of 2016 at Navsari Agricultural University, Navsari (Gujarat), India. The soil of the experimental field was clayey in texture, dark grayish brown type and characterized by medium to poor drainage with good water holding capacity. The soil was low, medium and high in available nitrogen, phosphorus and potassium status, respectively. The experiment was tried in randomized block design with ten treatments (**Table 1**). Sorghum cv. '*GJ-42*' was sown on 16 February, 2016 in rows at 45 cm apart using seed rate of 15 kg/ha and was harvested on 2 June, 2016. The number of weed present in 1 m² area was counted at three random places in each plot using quadrate at 20, 60 DAS and harvest and classified into broad-leaved, grassy and sedge weeds and further their population was recorded. The weed dry weight was recorded by drying weeds in oven till attaining a constant weight and then transformed into g/m^2 by using formula of square root transformation. Weed index was calculated using formula suggested by Gill and Kumar (1969).

Effect on weeds

The dominant weed species in the field included grasses, *viz. Echinochloa crus-galli, Cynodon dactylon, Sorghum halepense, Digitaria sanguinalis*; major broad-leaf weeds, *viz. Amaranthus viridis,*

Alternanthera pungens, Digera arvensis, Convolvulus arvensis, Vernonia cinerea, Eclipta alba, Trienthema portulacastrum, Euphorbia hirta, Physalis minima; and among sedges, *Cyperus rotundus* was dominantly present.

Two hand weeding (HW) and inter-culturing at 20 and 40 DAS recorded significantly lower number of all the weeds, *viz*. broad-leaved, grassy and sedge weeds per m^2 at 20, 60 DAS and harvest. Among the integrated weed management treatments, atrazine 0.50 kg/ha as pre-emergence (PE) *fb* atrazine 0.50 kg/ha as post-emergence (PoE) at 25 DAS *fb* HW and inter-culturing at 40 DAS recorded lower density of broad-leaved, grassy and sedge weeds (**Table 1**). The present results are in agreement with the earlier findings of Priya and Kubsad (2013).

The dry weight of weeds recorded at 40, 60 DAS and harvest in summer sorghum differed significantly due to weed management practices (**Table 2**). Significantly lower weeds dry weight was recorded with two HW and inter-culturing at 20 and 40 DAS. Among the integrated weed management treatments, atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS recorded lower weeds dry weight (2.07, 2.98 and 4.41 g/m^2 at 40, 60 DAS and harvest, respectively) as compared to other treatments. However, unweeded control recorded significantly higher dry weed biomass as compared to other weed management treatments. Similar result was also reported by Kumar *et al*. (2012).

All the weed management practices resulted in increased weed control efficiency over unweeded control (**Table 2**). The highest weed control efficiency (97.00%) was observed under two HW and inter-culturing at 20 and 40 DAS followed by treatment atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS (72.86%). Priya and Kubsad (2013) have also obtained similar effect of various weed control treatments on weed control efficiency. Weed index worked out at harvest of crop was found lowest under two HW and inter-culturing at 20 and 40 DAS (00.00%) followed by atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS (11.08%) (**Table 2**). This might be due to effective weed control achieved under these weed management treatments, which resulted in reduction of weeds biomass ultimately increase the crop yield in treated plots, which calculate lower weed index in a particular plots.

Table 1. Effect of weed management practices on broad-leaf, grassy and sedge weeds density at 20, 60 DAS and harvest in sorghum

Treatment	Weed density (no./m^2)								
	Broad-leaf			Grassy			Sedges		
	20 DAS	60 DAS	At harvest	20 DAS	60 DAS	At harvest	20 DAS	60 DAS	At harvest
Atrazine 1.0 kg/ha as PE	2.74 (7.0)	3.24 (10.0)	3.72 (13.3)	2.87 (7.8)	2.55 (6.0)	3.12 (9.3)	2.28 (4.7)	2.18 (4.3)	2.23 (4.5)
Atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS	2.67 (6.7)	3.08 (9.0)	3.13 (9.3)	2.86 (7.7)	2.23 (4.5)	2.45 (5.5)	2.24 (4.5)	2.08 (3.9)	2.17 (4.2)
Atrazine 0.50 kg/ha as PE *fb* 2, 4-D 0.50 kg/ha as PoE at 25 DAS	2.71 (6.8)	3.16 (9.5)	3.31 (10.4)	2.88 (7.8)	2.41 (5.3)	2.55 (6.0)	2.28 (4.7)	2.23 (4.5)	2.19 (4.3)
Atrazine 0.50 kg/ha as PE *fb* metsulfuron methyl 6 g/ha as PoE at 25 DAS	2.86 (7.7)	3.53 (12.0)	3.94 (15.0)	2.97 (8.3)	2.93 (8.1)	3.24 (10.0)	2.30 (4.8)	2.52 (5.9)	2.91 (8.0)
Atrazine 1 kg/ha as PE *fb* HW and inter-culturing at 40 DAS	2.63 (6.4)	3.03 (8.7)	3.06 (9.1)	2.80 (7.3)	2.16 (4.2)	2.41 (5.3)	2.21 (4.4)	1.95 (3.3)	2.11 (3.9)
Atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	2.58 (6.1)	2.73 (7.0)	2.94 (8.2)	2.74 (7.0)	2.03 (3.7)	2.23 (4.5)	2.09 (3.9)	1.86 (3.0)	1.95 (3.3)
Atrazine 0.50 kg/ha as PE *fb* 2, 4-D 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	2.61 (6.3)	2.86 (7.7)	2.99 (8.5)	2.80 (7.3)	2.12 (4.0)	2.37 (5.2)	2.20 (4.3)	1.90 (3.1)	2.07 (3.8)
Atrazine 0.50 kg/ha as PE *fb* metsulfuron methyl 6 g/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	2.76 (7.1)	3.33 (10.6)	3.85 (14.3)	2.92 (8.0)	2.80 (7.3)	3.21 (9.8)	2.27 (4.7)	2.32 (4.9)	2.73 (7.0)
Unweeded control	2.91 (8.0)	4.56 (20.3)	5.15 (26.0)	3.08 (9.0)	3.94 (15.0)	4.18 (17.0)	2.34 (5.0)	3.01 (8.6)	3.39 (11.0)
Two HW and inter-culturing at 20 and 40 DAS	2.54 (6.0)	1.47 (1.7)	1.86 (3.0)	2.55 (6.0)	1.47 (1.7)	1.58 (2.0)	1.94 (3.3)	1.56 (1.9)	1.50 (1.7)
LSD (p=0.05)	NS	0.23	0.31	0.26	0.23	0.20	0.22	0.20	0.18

Figures in parentheses are original values; PE - Pre-emergence; PoE - Post-emergence

Table 2. Effect of weed management practices on weed dry weight, weed control efficiency, weed index, seed yield and net returns in sorghum

Treatment	Weed dry weight (g/m^2)			Weed control efficiency (%)	Weed index (%)	Seed yield (t/ha)	Net returns ($x10^3$ `/ha)
	40 DAS	60 DAS	At harvest				
Un weeded control	*4.62(20.8)	6.96(47.9)	8.40(70.2)	0.0	34.48	2.16	35.56
Two HW and inter-culturing at 20 and 40 DAS	1.60(2.1)	1.50(1.8)	1.61(2.1)	97.0	0.00	3.30	54.62
Atrazine 1.0 kg/ha as PE	2.55(6.0)	3.40(11.1)	5.34(28.0)	60.0	21.95	2.58	45.76
Atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS	2.34(5.0)	3.22(9.9)	5.26(27.2)	61.3	15.92	2.78	50.18
Atrazine 0.50 kg/ha as PE *fb* 2, 4-D 0.50 kg/ha as PoE at 25 DAS	2.45(5.5)	3.27(10.2)	5.33(28.0)	60.1	20.83	2.61	46.74
Atrazine 0.50 kg/ha as PE *fb* metsulfuron methyl 6 g/ha as PoE at 25 DAS	3.29(10.3)	3.59(12.5)	5.82(33.4)	52.5	29.06	2.34	39.23
Atrazine 1 kg/ha as PE *fb* HW and inter-culturing at 40 DAS	2.29(4.8)	3.15(9.4)	5.08(25.3)	63.8	15.11	2.80	46.64
Atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	2.07(3.8)	2.98(8.4)	4.41(19.0)	72.9	11.08	2.94	49.75
Atrazine 0.50 kg/ha as PE *fb* 2, 4-D 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	2.16(4.2)	3.09(9.1)	4.85(23.0)	67.2	13.20	2.87	48.14
Atrazine 0.50 kg/ha as PE *fb* metsulfuron methyl 6 g/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS	3.21(9.8)	3.41(11.2)	5.54(30.3)	56.9	25.73	2.45	37.43
LSD (p=0.05)	0.24	0.29	0.37	-	-	0.56	-

Figures in parenthesis are original values; PE - Pre-emergence; PoE - Post-emergence

Effect on sorghum

All the weed management treatments resulted in significantly higher seed yield than the unweeded control (**Table 2**). Two HW and inter-culturing at 20 and 40 DAS recorded significantly higher seed yield of sorghum (3.30 t/ha) followed by atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and inter-culturing at 40 DAS (2.94 t/ha) over unweeded control (2.16 t/ha) (**Table 2**). Two hand weeding and inter-culturing at 20 and 40 DAS recorded maximum net return (` 54,623/ha) followed by atrazine 0.50 kg/ha as PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS (` 50,179/ha) and atrazine 0.50 kg/ha PE *fb* atrazine 0.50 kg/ha as PoE at 25 DAS *fb* HW and IC at 40 DAS (` 49,749/ha), whereas unweeded control recorded lowest net return (` 35,559/ha) (**Table 2**).

REFERENCES

Anonymous. 2016. Sorghum area, production and productivity. *www.indiastat.com*

Gill GS and Kumar V. 1969. Weed index - a new method for reporting weed control trials. *Indian Journal of Agronomy* **14**(2): 96–98.

Ishaya DB, Dadari SA and Shebayan JAY. 2007. Evaluation of herbicides for weed control in sorghum (*Sorghum bicolor*) in Nigeria. *Crop Protection* **26**: 1697–1701.

Kumar V, Tyagi S and Singh D. 2012. Yield, N uptake and economics of fodder sorghum and associated weeds as affected by different weed management practices. *Progressive Agriculture* **12**(1): 96–102.

Priya HR and Kubsad VS. 2013. Integrated weed management in rainy season sorghum (*Sorghum bicolor*). *Indian Journal of Agronomy* **58**(4): 548–553.

Thakur NS, Kushwaha BB, Girothia OP, Sinha NK and Mishra JS. 2016. Effect of integrated weed management on growth and yields of rainy season sorghum. *Indian Journal of Agronomy* **61**(2): 217–222.