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Effect of integrated weed management on weed and yield of sorghum (*Sorghum bicolor* L.)

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Abstract
A field experiment entitled Effect of Integrated Weed Management on Weed and Yield of Sorghum (*Sorghum bicolor* L.) conducted during *kharif* 2024 at Agriculture farm, Suresh Gyan Vihar University, Jaipur on sandy loam soil. Among the integrated weed management treatments atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS recorded significantly lower the weeds density and dry matter per m^2. At 60 DAS and harvest stage minimum weed dry matter were recorded with application of Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS as compared to weedy check, atrazine @ 1.0 kg ha^{-1} (PE), atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE and atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS and remained statistically at par with atrazine @ 0.50 kg ha^{-1} PE fb atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS and atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS. The application of atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS significantly increased the seed, straw, biological yield, net return and B: C ratio as compared to weedy check, atrazine @ 1.0 kg ha^{-1} (PE), atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE and atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS and remained statistically at par with atrazine @ 0.50 kg ha^{-1} PE fb atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS.

Keywords: Integrated weed management, sorghum, weed density, weed dry matter

Introduction
Sorghum (*Sorghum bicolor* L.) is the fifth most important cereal crop after wheat, rice, maize and barley. It is a self-pollinated C_4 plant with a high photosynthetic efficiency, belongs to the grass family Poaceae and is an important staple food crop in the world. Sorghum is grown on 43.81 million ha area in the world, producing about 65.42 million tonnes grain with an average yield of 1523 kg ha^{-1}. India and USA have largest share of global sorghum area, while the maximum production of sorghum occurs in the USA. India presently produces about 5.54 million tonnes of sorghum grain from an area of 6.16 million ha and productivity of 884 kg ha^{-1} (Anonymous, 2023). In Rajasthan, the total area under sorghum in Rajasthan is 0.50 million hectares with the production of 0.53 million tonnes and average productivity of 1036 kg ha^{-1} (Commissionerate of Agriculture, Rajasthan, 2023-24). Among various pests, weeds are known to cause heavy loss in wheat crop. Numerous studies revealed that more than one-third of the total yield losses were mainly due to biotic stresses i.e. weeds (Mesterhazy *et al*., 2020). The productivity of wheat has fallen due to various constraints such as biotic and abiotic factors. Poor weed management practices are most important yield reduction factors in wheat (Yadav *et al*., 2019) [7]. Weeds are major limiting biotic factors in wheat and it reduces 17 to 30 per cent yield losses in wheat annually (Goudar *et al*., 2020). Under arid conditions of Western Rajasthan, both grassy and broad leaf weeds are dominant. It was seeming that early management of weeds in wheat crop may enhanced yield due to lesser crop-weed competition. Wheat crop is infested with both grassy as well as broad leaf weeds and cause yield loss of 7 to 50 per cent depending upon the species of weed flora and their intensity.

Methods and Materials

The experiment was conducted during *kharif* 2024 at Agronomy farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. Geographically, the study area is located at 75o48'84" E longitude and 26o82'47" N latitude and this region falls under agro-climatic zone III A (Semi-arid Eastern Plain Zone) of Rajasthan. The experiment consisting ten treatments weedy check, weed free, atrazine @ 1.0 kg ha^{-1} (PE), atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE, atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS, atrazine @ 0.50 kg ha^{-1} PE fb atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS and atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS. The total ten treatment combinations were tested in randomized block design with three replications.

Results and Discussion

Among the integrated weed management treatments atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS recorded significantly lower the density and dry matter accumulation of weed at 30 DAS as compared to weedy check, atrazine @ 1.0 kg ha^{-1} (PE), Atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS and remained statistically at par with atrazine @ 0.50 kg ha^{-1} PE fb Atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS and atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS. The pre-emergence application of atrazine more effectively controlled the broad-leaf weeds than a pre-emergence application of pendimethalin, whereas pendimethalin proved more effective against grasses than atrazine (Singh *et al*., 2007 and Das, 2008) [5, 2].

The reasons for better weed suppression with atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS and atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS might be due to both the weeding operation was performed at the critical period of crop-weed competition that provide competitive advantage to the crop. However, it was not economically remunerative because of more manpower required for manual weeding coupled with high wage required for weeding operation (Yadav *et al*., 2017) [7].

The application of atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS significantly increased the seed, straw and biological yield a compared to weedy check, atrazine @ 1.0 kg ha^{-1} (PE), atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE and atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS. This may be due to cumulative effect of reduced weed competition and higher value of yield attributes. This is in conformity with the findings of and Satheeshkumar *et al*. (2011) [4]. Seed yield is primarily a function of accumulation of photosynthates resulted in growth and increase yield. These results are in corroboration with findings of Priya and Kubsad (2013) [3].

Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS significantly increased net returns compared to rest of weedy check, atrazine @ 1.0 kg ha^{-1} (PE), atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS, atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE and atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS. Highest benefit: cost ratio in sorghum was obtained with weed free (2.11) followed by atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS (1.73), atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS (1.70), Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE (1.67) and atrazine @ 0.50 kg ha^{-1} PE fb atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS (1.66). The higher benefits obtained under these treatments were also due to comparatively higher seed and stover yield. Similar results were also reported by Akhtar *et al.* (2015) [1] and Swetha *et al.*, (2015) [6].

Table 1: Effect of Integrated weed management on weed density (No. m^{-2}) of sorghum

Treatments	Weed density (No. m^{-2})		
	30 DAS	60 DAS	At harvest
Weed check	3.58(12.33)	4.30(18.00)	4.80(22.67)
weed free	0.71(0.00)	0.71(0.00)	0.71(0.00)
Atrazine @ 1.0 kg ha^{-1} (PE)	2.72(7.00)	3.13(9.33)	3.39(11.00)
Atrazine @ 0.50 kg ha^{-1} PE fb atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS	2.22(4.44)	2.41(5.33)	2.58(6.33)
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS	2.33(5.00)	2.43(5.44)	2.54(6.00)
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE	2.20(4.33)	2.29(4.78)	2.50(5.78)
Atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS	2.71(6.89)	1.92(3.22)	2.12(4.00)
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS	2.06(3.78)	1.78(2.66)	2.01(3.55)
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS	2.12(4.00)	1.68(2.33)	1.99(3.34)
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS	2.09(3.88)	1.51(1.78)	1.77(2.67)
SEm±	0.12	0.10	0.13
CD (0.05%)	0.35	0.29	0.39
CV (%)	8.99	7.70	9.38

Table 2: Effect of Integrated weed management on weed dry matter accumulation (g m^{-2}) of sorghum

Treatments	Weed dry matter (g m^{-2})		
	30 DAS	60 DAS	At harvest
Weed check	2.41(5.33)	7.92(62.33)	16.07(259.0)
weed free	0.71(0.00)	0.71(0.00)	0.71(0.00)
Atrazine @ 1.0 kg ha^{-1} (PE)	1.85(2.93)	5.31(28.00)	12.42(153.67)
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS	1.55(1.91)	4.26(17.67)	9.63(93.33)
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS	1.65(2.24)	4.40(19.00)	9.36(87.30)
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE	1.56(1.94)	4.24(17.66)	9.20(84.34)
Atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS	1.86(2.97)	3.28(10.33)	7.47(55.33)
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS	1.51(1.78)	3.15(9.66)	7.14(50.63)
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS	1.53(1.87)	3.06(9.00)	6.96(49.00)
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS	1.49(1.73)	2.88(8.00)	5.87(34.00)
SEm±	0.06	0.24	0.40
CD (0.05%)	0.19	0.72	1.17
CV (%)	6.83	10.74	8.07

Table 3: Effect of Integrated weed management on yields of sorghum

Treatments	Yields (kg/ha)		
Weed check	1067	2182	3248
weed free	2077	4328	6405
Atrazine @ 1.0 kg ha^{-1} (PE)	1529	3114	4643
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS	1595	3292	4887
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS	1618	3359	4977
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE	1655	3440	5095
Atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS	1696	3526	5222
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS	1742	3615	5357
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS	1778	3682	5460
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS	1799	3713	5512
SEm±	63	123	184
CD (0.05%)	188	367	548
CV (%)	7	6	6

Table 4: Effect of Integrated weed management on economics of sorghum

Treatments	Net return	B: C ratio
Weed check	21757	0.79
weed free	65488	2.11
Atrazine @ 1.0 kg ha^{-1} (PE)	42359	1.50
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine 0.50 kg ha^{-1} (PoE) at 25 DAS	45192	1.57
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS	46274	1.60
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE	48071	1.67
Atrazine @ 1.0 kg ha^{-1} PE fb HW at 40 DAS	48481	1.60
Atrazine @ 0.50 kg ha^{-1} PE fb Atrazine @ 0.50 kg ha^{-1} PoE 25 DAS fb HW at 40 DAS	50458	1.66
Atrazine @ 0.50 kg ha^{-1} PE fb 2,4-D @ 0.50 kg ha^{-1} PoE at 25 DAS fb HW at 40 DAS	52004	1.70
Atrazine @ 0.50 kg ha^{-1} PE fb Metsulfuron methyl @ 6 g ha^{-1} PoE 25 DAS fb hand weeding at 40 DAS	52891	1.73
SEm±	2868	0.10
CD (0.05%)	8521	0.29
CV (%)	11	10.63

References

1. Akhtar P, Kumar A, Kumar J, Sharma AK, Bharti V. Efficacy of tembotrione on mixed weed flora and yield of spring maize (*Zea mays* L.) under irrigated sub-tropical Shiwalik foothills. In: Proceedings of the 25th Asian Pacific Weed Science Society Conference on Weed Science for Sustainable Agriculture, Environment and Biodiversity; 2015 Oct 13-16. p. 1-6.
2. Das TK. Weed science: basics and applications. New Delhi (India): Jain Brothers Publishers; 2008. p. 1-901.
3. Priya HR, Kubsad VS. Integrated weed management in rainy season sorghum (*Sorghum bicolor*). Indian J Agron. 2013;58(4):548-553.
4. Satheeshkumar N, Thukkaiyannan P, Ponnuswamy K, Santhi P. Effect of sowing and weed management methods and intercrops on weed control and grain yield of sorghum under intercropping situation. Crop Res. 2011;41(1-3):46-51.
5. Singh R, Sharma AR, Behera UK. Tillage and crop establishment practices for improving productivity of maize (*Zea mays*) under different weed control methods. Indian J Agric Sci. 2007;77(11):731-737.
6. Swetha K, Madhavi M, Pratibha G, Ramprakash T. Weed management with new generation herbicides in maize. Indian J Weed Sci. 2015;47(4):432-433.
7. Yadav T, Nisha KC, Chopra NK, Yadav MR, Kumar R, Rathore DK. Weed management in cowpea: a review. Int J Curr Microbiol Appl Sci. 2017;6(2):1373-1385.