

## Effect of Weed Control Measures on Weed and Yield of Pearl Millet (*Pennisetum glaucum* L.)

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### Abstract

A field experiment was Carried out during rainy (*Kharif*) season 2018 to 2020 in medium black soil at the ICAR-AICRP on Pearl millet, College of Agriculture, Dhule, Maharashtra to identify the effective weed control measures to manage weeds and increase yield of pearl millet (*Pennisetum glaucum* L.) with pre emergence application (PE) of atrazine @ 0.4 kg a. i. ha<sup>-1</sup> followed by one weeding at 3-4 week after sowing, four levels of post emergence application of tembotrione (42% SC @ 90,100,110, and 120 gm a.i. ha<sup>-1</sup> respectively) at 3-4 leaf stage of weeds. Eight treatment combinations were laid out in randomized block design in three replications. All weed management practices caused significantly improvement in grain and dry fodder yield of pearl millet compared to weed free check (16.23 and 31.089 q ha<sup>-1</sup>). The best treatment was found weed free and it was followed by two hand weeding 3 and 5 weeks after sowing and pre emergence application of atrazine @ 400 gm a. i. ha<sup>-1</sup> followed by one weeding at 3 to 4 weeks after sowing. In comparison to the weed dry matter recorded at 30 DAS and at harvest with weedy check (439 and 567 kg ha<sup>-1</sup>), all weed management practices recorded quite lower weed dry matter of weeds and were found to be at par in managing weeds compared to the weed free plot. Efficiency of post emergence application of tembotrione 42% SC @ 90,100, 110 and 120 gm a. i. ha<sup>-1</sup> at 3-4 leaf stage of weeds was found better in controlling weeds than the recommended practices of managing weeds. Weed control efficiency were also found higher in weed free and it was followed by two hand weeding at 3 and 5 weeks after sowing and post emergence application of atrazine @ 0.4 kg treatment respectively.

**Key words :** Atrazine, Tembotrione, Pre emergence, Post emergence, Pearl Millet, *Pennisetum glaucum* L., Weed management.

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In India pearl millet is the fourth most widely cultivated food crop after rice, wheat and maize. Pearl millet was grown in 7.41 million ha with an average production of 10.3 million tones and 1391 kg ha<sup>-1</sup> productivity (DMD, 2021). Pearl millet (*Pennisetum glaucum* L.) also known as candle millet or bajra, is an important crop in India. It is a unique crop among the major cereals and used as staple food and feed of poor, marginal and rural populations in the arid and semiarid region of the world. It is a drought resistant cereal having the maximum potentiality of grain production in adverse condition (Acharya et al.2017). As pearl millet is grown pre dominantly in warm rainy season heavy infestation of weeds depress the crop of vital nutrients, moisture, light and space. Like other

rainy season crops, pearl millet faces sever weed competition during initial slow growth stage leading to heavy (20-72%) reduction in grain yield due to heavy weed infestation (Das and Yaduraju 1995, Banga *et al.* 2000). The weeds are major constraints for low production and productivity of pearl millet especially during rainy season. Girase *et al.* (2017) reported that application of atrazine herbicide attained yield by 62.14% over weed check. Pearl millet pick up growth, start tillers and increase in height after 25-30 DAS for attaining higher pearl millet yield. The pre dominant methods of weed management used in pearl millet by farmers are inter culturing and hand weeding. The use of herbicides for weed management reduces the cost of cultivations due to non availability of

labour and increased wages. Das *et al.* (2013) reported that pre emergence application of herbicide have been found very effective against the weed in pearl millet crop. Atrazine is a broad spectrum herbicide and is recommended for pre emergence application (PE). Post emergence herbicides application (PoE) appear to be as more practical and recommended as these can be applied after weeds emergence. Hence, in this study both pre and post emergence application of herbicides were evaluated to identity the best effective and economical option for weed management in pearl millet.

A field experiment was conducted during rainy (*Kharif*) season of 2018 to 2020 at the ICAR-AICRP on Pearl millet, College of Agriculture, Dhule (Mahatma Phule Krishi Vidyapeet), Maharashtra. The soil of experimental field was medium black having organic carbon (0.5 to 0.6%), available N (197.0 kg ha<sup>-1</sup>), available P (16.50 kg ha<sup>-1</sup>) and available K (568 kg ha<sup>-1</sup>) with pH 8.05.

Geographically experimental site was located between 20.900 North latitude and 74.780 East longitude at an altitude and of 250 meters above mean sea level. The average annual rainfall is about 608.3 mm and major part of it (85 to 90%) is received from June to September (*Kharif* season) through South West monsoon. The eight (8) treatments, viz. weedy check, weed free, two hand weeding 3 & 5 weeks after sowing, pre emergence application of Atrazine @ 400 g a.i. ha<sup>-1</sup>. followed by one weeding at 3-4 weeks after sowing, tembotrione 42%SC @ 90 g a.i. ha<sup>-1</sup> at 3-4 leaf stage of weeds, tembotrione 42%SC @ 100 g a.i. ha<sup>-1</sup> at 3-4 leaf stage of weeds, tembotrione 42%SC @ 110 g a.i. ha<sup>-1</sup> at 3-4 leaf stage of weeds and tembotrione 42% SC @ 120 g a.i. ha<sup>-1</sup> at 3-4 leaf stage of weeds. The experiment was laid out using randomized block design with three (3) replication. Pearl millet variety “GHB 558” was sown at 45 x 15 cm row spacing using seed rate of 4 kg ha<sup>-1</sup>. Except management of weeds, all other agronomic practices were adopted as per

**Table 1.** Mean grain, fodder yield and economics of pearl millet as influenced by different treatments of weed control. (Pooled data 2018-2020)

Treatments	Pearl millet yield (q ha <sup>-1</sup> )		GMR (Rs. ha <sup>-1</sup> )	Cost of cultivation (Rs. ha <sup>-1</sup> )	NMR (Rs. ha <sup>-1</sup> )	B:C ratio
	Grain	Fodder				
Weedy check	16.23	31.08	34110	19977	14133	1.70
Weed free	27.60	48.63	56855	26381	30474	2.15
Two hand weeding 3 & 5 weeks after sowing	25.87	46.67	51772	25365	26407	2.04
Pre-emergence application of Atrazine @400 g.a.i ha <sup>-1</sup> followed by one weeding at 3-4 weeks after sowing	24.89	44.68	50856	22682	28174	2.28
Tembotrione 42%SC @ 90 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	19.88	36.94	43762	23055	20708	1.92
Tembotrione 42%SC @ 100 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	21.61	37.29	47810	23061	24749	2.09
Tembotrione 42%SC @ 110 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	23.17	42.13	50905	23482	27423	2.19
Tembotrione 42%SC @ 120 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	24.05	43.44	53413	24084	29329	2.24
SE(+)	1.12	1.97	-	-	-	-
CD @5%	2.41	4.23	-	-	-	-
CV (%)	7.20	7.88	-	-	-	-

the University recommendation. Weed density was taken from two random spots in each plot by counting the number of weeds per quadrant of 1.0 m<sup>2</sup> and the average was computed. Weed control efficiency of each treatment was calculated by using the following formula:

$$\text{WCE(\%)} = \frac{\text{Weed biomass in weedy check plot} - \text{weed biomass in treated plot}}{\text{Weed biomass in treated plot}} \times 100$$

Grain and stover yield were recorded from net plot and economics was worked out in terms of net return and B:C ratio to find out most economical treatment using prevailing market prices of inputs and out puts. The data were analyzed statistically and results of pooled data were presented.

Weed flora of the experimental field consisted of were grassy weeds like *Cynodon dactylon*, *Brachiaria eruciformis*, *Digera muricata*, *Tribulus terrestris*, *Amarantus viridis*, *Parthenium hysterophorus*, *Cenchrus biflorus*, *Corchorus tridense*, *Cyperus spp.*, *Euphorbia microphylla*, *Cyperus rotundus* and *Phyllanthus niruri*.

In companision to the weed dry matter

recorded at 30 DAS and at harvest with weedy check (493 and 567 kg ha<sup>-1</sup>) all weed management practices recorded quite lower dry matter of weeds and were found to be at par in managing weeds compared to the weed free check plot (Table 2). The weed dry matter was significantly lowest in weed free check. Among the different weed management treatment dry matter, it was lower in two hand weeding at 3 & 5 weeks after sowing when compared with other treatments. In weed free treatment, there was no weed dry matter due to lack of weed. These results are in close conformity of Girase *et al.* (2017) and Sharma and Jain (2003). Among different post emergence weed management practices post emergence application of tembotrione 42% SC @ 120 g a. i. ha<sup>-1</sup> at 3-4 leaf stage of weeds recorded highest (49.28%) weed control efficiency among different doses of 90, 100 and 110g a. i. ha<sup>-1</sup> (Table 2). The weed free treatment was found significantly superior by recording 100% weed control efficiency. Similar findings were reported by Girase *et al.* (2017) and Sharma and Jain (2003).

All weed management practices caused significant improvement in grain and dry fodder yield of pearl millet compared to the weedy

**Table 2.** Effect of weed management practices on weed characters (Pooled data 2018-2020)

Treatments	Weed intensity 30 DAS (no m <sup>-2</sup> )	Weed intensity at harvest (no m <sup>-2</sup> )	Weed dry matter 30 DAS (g m <sup>-2</sup> )	Weed dry matter at harvest (g m <sup>-2</sup> )	Weed control efficiency 30 DAS (%)	Weed control efficiency at harvest (%)
Weedy check	34.56	38.33	49.02	56.8	0.00	0.00
Weed free	0.00	0.00	0.00	0.0	100.00	100.00
Two hand weeding 3 and 5 weeks after sowing	9.78	8.56	15.63	12.4	64.18	76.92
Pre-emergence application of Atrazine @400 g.a.i ha <sup>-1</sup> followed by one weeding at 3-4 weeks after sowing	11.89	11.56	21.42	18.9	52.99	66.65
Tembotrione 42%SC @ 90 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	20.78	22.45	31.19	38.4	34.74	34.29
Tembotrione 42%SC @ 100 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	17.11	18.89	27.00	36.6	41.60	35.70
Tembotrione 42%SC @ 110 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	16.33	17.66	25.33	29.0	42.36	47.12
Tembotrione 42%SC @ 120 g a.i. ha <sup>-1</sup> at 3-4 leaf stage of weeds	14.11	15.67	20.46	22.2	53.96	54.43

check (16.23 q ha<sup>-1</sup> and 31.08 q ha<sup>-1</sup>). The best treatment was found weed free (27.60 q ha<sup>-1</sup> and 48.63 q ha<sup>-1</sup>) and it was followed by two hand weeding at 3 & 5 weeks after sowing (25.87 q ha<sup>-1</sup> and 46.67 q ha<sup>-1</sup>) and pre emergence application of atrazine @ 400 g a. i. ha<sup>-1</sup> followed by one weeding at 3-4 weeks after sowing (24.89 q ha<sup>-1</sup> and 44.68 q ha<sup>-1</sup>) (Table 1). Efficiency of post emergence application of tembotrione 42% SC120 g a. i. ha<sup>-1</sup> was found more better in controlling weeds than the other rates of application of tembotrione @ 90, 100 and 110g a. i. ha<sup>-1</sup>. (24.05 q ha<sup>-1</sup> and 43.44 q ha<sup>-1</sup>). The lowest grain and fodder yield (16.23 q ha<sup>-1</sup> and 31.08 q ha<sup>-1</sup>) was recorded in weedy check because presence of more weeds and there are competition for growth and development with the crop and compete for nutrients, moisture, light and space. These results are in close conformity with those of Sharma and Jain (2003), Deshveer (2005) and Manoj kumar *et al.* (2022).

It was concluded that two hand weeding at 3 and 5 weeks after sowing and pre emergence application of atrazine @ 400gm a. i. ha<sup>-1</sup> followed by one hand weeding at 3-4 weeks after sowing appeared to be the best weed management practices they remained at par with each other.

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