Original Research Article

Effect of integrated weed management practices on growth, physiology and yield of direct sown finger millet (*Eleusine coracana* L.)

ABSTARCT

Aim: To determine "Effect of integrated weed management practices in direct sown finger millet"

Place and duration of study: The field experiment was conducted during *rabi* 2022 at South Farm, Division of Agronomy, Karunya Institute of Technology and Sciences, Coimbatore. The soil of the experimental field was sandy clay loam in texture, pH 6.9, level of organic content (0.37%), available N (336 kg ha^{-1}), P (91 kg ha^{-1}) and K (261 kg ha^{-1}).

Study design: Completely randomized block design.

Methodology: T_1:PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Hand weeding (HW) @ 35 DAS, T_2: PoE 2,4-D @ 2 kg ha^{-1} 40 DAS + Hand weeding (HW) @ 35 DAS, T_3: PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Hand weeding (HW) @ 35 DAS, T_4: PoE 2,4-D @ 2 kg ha^{-1} 40 DAS + Twin wheel hoe weeding (TWHW) @ 30 DAS, T_5: PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS, T_6: PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding (TWHW) @ 30 DAS, T_7: Hand weeding (HW) @ 25 and 40 DAS, T_8: Twin wheel hoe weeding (TWHW) @ 25 and 40 DAS, T_9: Hand weeding (HW) @ 25 DAS + Twin wheel hoe weeding (TWHW) @ 40 DAS, T_{10}: Unweeded control.

Results: The result shows that the weed control practices significantly decreases weeds also higher control of weed infestation was observed in PE pretilachlor @ 0.75kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS. The maximum dry matter production, CGR, RGR, NPK uptake and grain yield (2368 kg ha^{-1}) were also found higher in PE pretilachlor @ 0.75kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS.

Conclusion: From this study it is concluded that application of pre emergence herbicide pretilachlor along with twin wheel hoe weeder increases the crop growth and yield.

Keywords: dry matter production; finger millet; grain yield; integrated weed management

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1. INTRODUCTION

Finger millet (*Eleusine coracana*) locally known as *ragi* is an annual herbaceous belongs to poaceae family In India, finger millet is a significant small millet crop cultivated on 1.15 million ha of agricultural area with a yield of 1724 kg ha-1 and a production of 1.99 million tonnes in 2020–21 (Indiastat, 2022). After rice, maize, wheat, sorghum, and barley, it is India's sixth most important crop. It is frequently

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cultivated as an individual crop, a mixed crop, or in a rotation with pulses and oilseeds. Due to the finger millet's initial slow development, which promotes weed growth in early stages of growth fighting for sunlight, nutrients, and water, weeds are a key limitation and have a negative impact on productivity. Applying pre- and post-herbicides together with intercultural operations will limit the weed growth. To control weed infestation, suitable management practices should be carried out. An experiment has been conducted in this situation to find out how integrated weed management techniques influence directly sowed finger millet.

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2. MATERIALS AND METHOD

A field experiment was conducted during *Rabi* season of 2022in field no. R24 at South farm of Karunya Institute of Technology and Sciences, Coimbatore. The experimental site is geographically located in the Western agro-climatic zone of Tamil Nadu at 10^{o} 56' N latitude and 76^{o} 44' E longitude with an elevation of 474 m above mean sea level.The soil of the experimental site was clay loam in texture with neutral soil pH (6.9). The available nitrogen is 336 kg ha^{-1}, available phosphorus is 91 kg ha^{-1} and available potassium is 261 kg ha^{-1}. The organic content was 0.37%.The experiment was laid out in Randomized Complete Block Design with ten treatments and three replications *viz.,* T_1:PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Hand weeding (HW) @ 35 DAS, T_2: PoE 2,4-D @ 2 kg ha^{-1} 40 DAS + Hand weeding (HW) @ 35 DAS, T_3: PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Hand weeding (HW) @ 35 DAS, T_4: PoE 2,4-D @ 2 kg ha^{-1} 40 DAS + Twin wheel hoe weeding (TWHW) @ 30 DAS, T_5: PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS, T_6: PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding (TWHW) @ 30 DAS, T_7: Hand weeding (HW) @ 25 and 40 DAS, T_8: Twin wheel hoe weeding (TWHW) @ 25 and 40 DAS, T_9: Hand weeding (HW) @ 25 DAS + Twin wheel hoe weeding (TWHW) @ 40 DAS, T_{10}: Unweeded control. Finger millet CO 14 with a medium duration of 110 days was used as a test variety which was sown at inter-row spacing of 30 cm × 15 cm. The pre-emergence herbicide was applied 3 DAS. The post-emergence was mixed with 750 liter of water ha^{-1} and sprayed at 40 DAS using knap-sack sprayer. Hand weeding and twin wheel hoe weeding was done as per the treatment schedule.The data obtained in the study were statistically analyzed using AGRES at 5% level of significance suggested by Gomez and Gomez (2003).

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3. RESULT AND DISCUSSION

3.1 Dry matter production

The integrated weed management practices significantly enhanced the dry matter production in finger millet. The maximum dry matter accumulation was recorded in pre-emergence application of pretilachlor 0.75 ka ha^{-1} on 8DAS + Twin wheel hoe weeder on 30 DAS (T_6) (9588 kg ha^{-1}). The better weed management practices will controls weed growth throughout the crop growth period and leads to higher dry matter production in crops. Similar findings was noticed by Dubey *et al.*(2005), Sanjoy Saha (2005 and 2009), Singh *et al.* (2005) and Sunil *et al*. (2011) and the minimum dry matter accumulation was

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noticed in unweeded control (T_{10}) (2324 kg ha^{-1}). The dry matter accumulation was lesser in unweeded control when compared to all other weed control treatments. These findings are similar with Lakshmi *et al.* (2008) on rice.

3.2 Crop growth rate

During 0-30 DAS, 30-60 DAS and 60 DAS- harvest the maximum CGR was recorded in pre-emergence application of pretilachlor 0.75 kg ha^{-1} on 8 DAS + Twin wheel hoe weeding on 30 DAS(T_6) (0.46 g m^{-2} d^{-1}, 0.69 g m^{-2} d^{-1} and 2.30 g m^{-2} d^{-1}) which was on par with pre-emergence application pendimethalin 0.75 kg ha-1 on 8 DAS + Twin wheel hoe weeding on 30 DAS (T_5) (0.40 g m^{-2} d^{-1} , 0.60 g m^{-2} d^{-1} , 2.00 g m^{-2} d^{-1}). The reduction in weed growth and increased availability of resources, soil moisture paved way for higher crop growth rate and consequently increases the biomass of the crop. These results are similar to Arunachalam *et al. (*1995) findings. The lowers range of CGR was recorded in unweeded control (T_{10}) (0.11 g m^{-2} d^{-1} , 0.76 g m^{-2} d^{-1} , 0.56 g m^{-2} d^{-1}) (Figure 1)

3.3 Relative growth Rate

The highest RGR on 0-30 DAS, 30-60 DAS and 60 DAS-harvest was recorded in pre-emergence application of pretilachlor 0.75 kg ha^{-1} on 8 DAS + Twin wheel hoe weeding on 30 DAS (T_6) (0.0644 g g^{-1} day^{-1}, 0.0340 g g^{-1} day^{-1}, 0.02291 g g^{-1} day^{-1}) which was on par with pre-emergence application pendimethalin 0.75 kg ha^{-1} on 8 DAS + Twin wheel hoe weeding on 30 DAS (T_5) (0.0596 g g^{-1} day^{-1},0.0300 g g^{-1} day^{-1}, 0.02291 g g^{-1} day^{-1}) (Figure 1).Veerabadhran and Kennedy (2001) observed that higher values of physiological parameters were increasing the yield in sorghum were confirmed findings. The lowest RGR was recorded in unweeded control (T_{10}) (0.0172 g g^{-1} day^{-1}, 0.0121 g g^{-1} day^{-1}, 0.02291 g g^{-1} day^{-1}).

3.4 NPK uptake by crops

During harvest among different weed control treatment PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_6) significantly records higher nitrogen uptake (79.4 kg ha^{-1}) which was on par with PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_5) recorded 76.2 kg ha^{-1} followed by PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Hand weeding @ 35 DAS (T_3) recorded 72.4 kg ha^{-1}. At harvest PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_6) significantly records higher phosphorous uptake 17.4 4 kg ha^{-1} followed by PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_5) recorded 16.2 4 kg ha^{-1} . At harvest uptake of potassium was significantly higher in PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_6) 57.4 kg ha^{-1} followed by PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + Twin wheel hoe weeding @ 30 DAS (T_5) 56.1 kg ha^{-1}. Significant increase in total N, P and K uptake was due to significantly lower weed population and weed dry weight, lesser toxicity, increased grain yield and straw yield. These results are in line with findings of Bhanu Rekha et al. (2003), Rana et al. (2002), and Sunil et al. (2011). Whereas unweeded control (T_{10}) recorded lower nitrogen, phosphorus and potassium uptake 18.4 kg ha^{-1}, 4.54 kg ha^{-1} and 11.2 kg ha^{-1}.

3.5 Grain yield

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Among different integrated weed management practices on direct seeded finger millet significantly influenced. The pre-emergence application of pretilachlor 0.75 kg ha^{-1} on 8 DAS + Twin wheel hoe weeding on 30 DAS (T_6) recorded highest grain yield 2368 kg ha^{-1} was on par with pre-emergence application pendimethalin 0.75 kg ha^{-1} on 8 DAS + Twin wheel hoe weeding on 30 DAS (T_5) recorded grain yield of about 2209 kg ha^{-1}(Table 1). The higher grain yield in these treatment was due to better control of weed growth in all stages of finger millet which results in better availability of nutrients and resources helps to increase the yield in crop. These results are in conformity with Singh *et al.* (2005). Hence the lower grain yield was recorded in unweeded control (T_{10}) (698 kg ha^{-1}).

Table 1: Effect of integrated weed management practices on dry matter production (Kg ha^{-1}) and grain yield (Kg ha^{-1}) at harvest in finger millet

Treatment	DMP (Kg ha^{-1})	Grain yield (Kg ha^{-1})
T_1 - PE pendimethalin 0.75 kg ha^{-1} @ 8 DAS + HW @ 35 DAS	6924	1810
T_2 - PoE 2,4-D 2 kg ha^{-1} @ 40 DAS + HW @ 35 DAS	4858	1436
T_3 - PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + HW @ 35 DAS	5949	1835
T_4 - PoE 2,4-D @ 2 kg ha^{-1} 40 DAS + TWHW @ 30 DAS	3826	1468
T_5 - PE pendimethalin @ 0.75 kg ha^{-1} 8 DAS + TWHW @ 30 DAS	8313	2209
T_6 - PE pretilachlor @ 0.75 kg ha^{-1} 8 DAS + TWHW @ 30 DAS	9588	2368
T_7 - TWHW @ 25 and 40 DAS	3156	942
T_8 - TWHW @ 25 and 40 DAS	3031	971
T_9 - HW @ 25 DAS + TWHW @ 40 DAS	2400	827
T_{10} - Unweeded control	2324	698
SEd	269	153
CD (P=0.05)	528	322

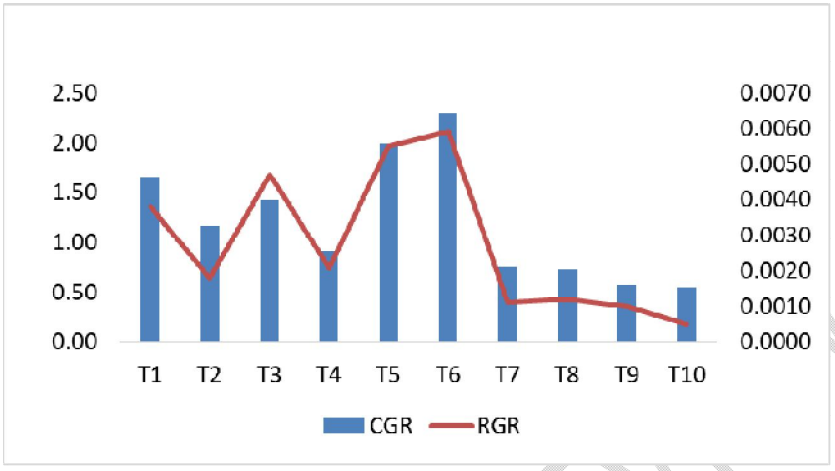

Fig 1: Effect of integrated weed management practices on crop growth rate and relative

T_1 =PE pendimethalin @ 0.75 kg ha^{-} + HW, T_2 = PoE 2,4-D @ 2 kg ha^{-1} + HW, T_3 = PE pretilachlor @ 0.75 kg ha^{-1} + HW, T_4 = PoE 2,4-D @ 2 kg ha^{-1} + TWHW, T_5 = PE pendimethalin @ 0.75 kg ha^{-1} + TWHW, T_6 = PE pretilachlor @ 0.75kgha^{-1} + TWHW, T_7 = HW, T_8 = TWHW, T_9 = HW + TWHW & T_{10} = Unweeded control

growth rate in finger millet

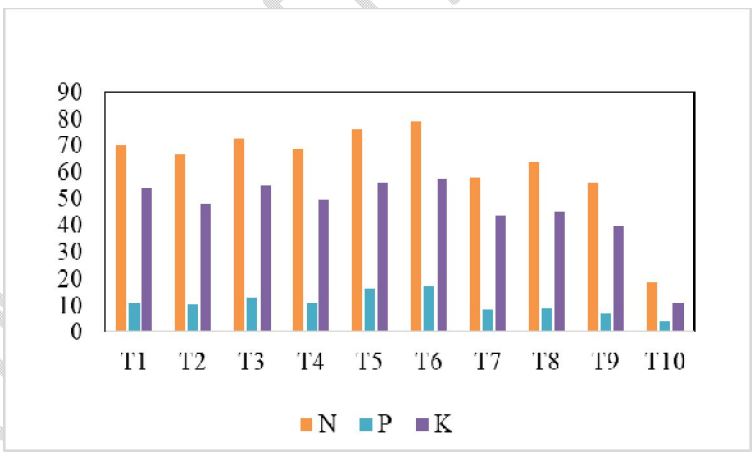

Fig 2: Effect of integrated weed management practices on nitrogen, phosphorus and potassium

T_1 =PE pendimethalin @ 0.75 kg ha^{-} + HW, T_2 = PoE 2,4-D @ 2 kg ha^{-1} + HW, T_3 = PE pretilachlor @ 0.75 kg ha^{-1} + HW, T_4 = PoE 2,4-D @ 2 kg ha^{-1} + TWHW, T_5 = PE pendimethalin @ 0.75 kg ha^{-1} + TWHW, T_6 = PE pretilachlor @ 0.75kgha^{-1} + TWHW, T_7 = HW, T_8 = TWHW, T_9 = HW + TWHW & T_{10} = Unweeded control

uptake in finger millet

4. Conclusion

Based on the result it is found that pre emergence application of pretilachlor 0.75 kg ha-1 on 8 DAS + Twin wheel hoe weeding on 30 DAS shows the best integrated weed management practices for better weed control in the experimental plot and improves dry matter accumulation, CGR, RGR, NPK uptake and grain yield gives high productivity and profitability in direct sown finger millet production under irrigated condition. The experimental trial on weed management practices in the field identifies the most prevalent weed species, thereby helping the farmers to design an effective integrated weed management system for finger millet cultivation in the specified region.

References

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