

Integrated weed management in rainfed kodo millet (*Paspalum scrobiculatum*)

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) season of 2002, 2003 and 2004 to study integrated weed management in rainfed kodo millet (*Paspalum scrobiculatum* L.). Application of isoproturon (0.50 kg ai/ha) as pre-emergence + one intercultivation (20 days after sowing) + one hand-weeding (40 DAS) appreciably lowered the weed population (16.7/m²) and dry weight of weeds (56 g/m²). It increased the weed-control efficiency by 50.21 per cent compared with pre-emergence application of isoproturon @ 0.50 kg/ha. It was followed by intercultivation (20 DAS) and hand-weeding (40 DAS), which gave the highest grain yield (18.42 q/ha) and fetched higher net monetary return (Rs 5,698/ha) in all weed-control measures.

Key words: Weed management, Isoproturon, Kodo millet, Rainfed

Small millets are generally grown rainfed in Madhya Pradesh, and they face recurring drought almost every year. Low soil fertility and moisture-retention capacity, diverse climate, topography and option for low-crop diversification compel the farmers to grow small millets in the region. Slow initial growth of kodo millet (*Paspalum scrobiculatum* L.) and favourable conditions for weed multiplication and a wide spectrum of heterogeneous weed flora, which gradually become a serious limitation for low production of kodo millet. Hence the present investigation was undertaken to identify integrated weed management in rainfed kodo millet.

MATERIALS AND METHODS

The field experiment was conducted during the rainy (*kharif*) season of 2002, 2003 and 2004 at the farm of Agricultural College, Rewa. The soil was sandy clay-loam having pH 7.1, organic carbon 0.47 per cent, electrical conductivity 0.39 dS/m and the available N, P₂O₅ and K₂O 198.7, 16.3 and 355.4 kg/ha respectively. There are 12 treatment combinations, viz. T₁, isoproturon @ 0.5 kg ai/ha used as pre-emergence; T₂, isoproturon @ 0.5 kg ai/ha mixed with sand and applied as pre-emergence; T₃, isoproturon @ 0.5 kg ai/ha mixed with soil and applied as pre-emergence; T₄, T₁ + two inter-cultivations (20 and 40 days after sowing); T₅, T₁ + one intercultivation + one hand-weeding (20 and 40 DAS); T₆, T₂ + two intercultivations (20 and 40 DAS); T₇, T₂ + one intercultivation + one hand-weeding (20 and 40 DAS); T₈,

T₃ + two intercultivations (20 and 40 DAS); T₉, T₃ + one intercultivation + one hand-weeding (20 and 40 DAS); T₁₀, farmer's practice, i.e. two intercultivations + one hand-weeding (20, 40 and 60 DAS); T₁₁, weed-free one intercultivation + two hand-weedings (20, 40 and 60 DAS), and T₁₂, weedy check. These treatments were laid out in randomized block design with three replications.

Pre-treated seed (10 kg) of kodo millet 'JK 155', was sown 30 cm apart in rows during 1-12 July in the three consecutive years of experimentation. The recommended fertilizer, i.e. 40 kg N+ 20 kg P₂O₅/ha, was applied through urea and single superphosphate respectively. Half nitrogen and full quantity of phosphorus were applied at the time of sowing in furrows, opened manually; the remaining nitrogen was top-dressed at 30 days after sowing. Data pertaining to weed population and dry weight of weeds were recorded using 50 cm × 50 cm quadrat. Economic analysis was done on the basis of prevailing market price of inputs used and the output obtained under each treatment. The total rainfall received during the crop season was 818.8, 1,359.2 and 894.8 mm, distributed in 41, 48 and 42 rainy days respectively.

RESULTS AND DISCUSSION

Effect on weeds

The major weeds observed in kodo millet included *Cyperus rotundus* L., *Digitaria sanguinalis* Link and *Cynodon dactylon* Pers. among grasses; *Argemone mexicana* L., *Ageratum conyzoides* L., *Portulaca*

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quadrifida, *Amaranthus viridis* L., *Euphorbia hirta*, *Celocia argentea*, *Tridax procumbens* and *Digera arvensis* among dicotyledonous weeds.

All the weed-control treatments caused identical reduction in weed population, dry weight of weeds and weed index, and increased the weed-control efficiency compared with the weedy check (Table 1). Application of isoproturon @ 0.5 kg ai/ha as pre-emergence + one intercultivation (20 DAS) + one hand-weeding (40 DAS) produced significantly lesser weed population (10.7/m²), weed biomass (56.0 g/m²) and the maximum weed-control efficiency (50.21%), but it was on a par with weed-free condition. Application of isoproturon @ 0.5 kg ai/ha mixed with sand and applied as pre-emergence + one intercultivation + one hand-weeding (20 and 40 DAS) was the second best treatment with less weed population (14.33/m²), weed biomass (64.22 g/m²) and higher weed-control efficiency (43.31%). All the weed-control treatments were found significantly superior to the weedy check. These findings are in close conformity with those of Ashok *et al.* (2003).

Effect on crop

Application of isoproturon @ 0.5 kg ai/ha as pre-emergence + one intercultivation (20 DAS) + one hand-weeding (40 DAS) resulted in significantly higher grain yield (18.4 q/ha) than the other treatments, but was on a par with weed-free treatment (20.2 q/ha), T₂ + one intercultivation + one hand-weeding 20 and 40 DAS (17.9 q/ha) and T₂ + two intercultivations 20 and 40 DAS (16.9 q/ha). Isoproturon applied as such, applied with sand and applied with soil gave respectively 28.01, 20.64 and 18.5 per cent more grain yield over the weedy check. Farmer's practice of weed management in kodo millet was found superior to the weedy check in giving higher yield (15.9 q/ha) (Table 2). Similar trend was noted in straw yield also under each treatment. These findings are in close conformity with those of Ramachandra Prasad *et al.* (1991).

Economics

The net return and benefit: cost ratios were the actual profit and monetary gain over each rupee investment under a particular treatment. The net return and the benefit:cost ratio was maximum (Rs 5,698/ha and 1.90) with isoproturon @ 0.5 kg ai/ha applied as pre-emergence one intercultivation (20 DAS) + one hand-weeding (40 DAS), closely followed by T₂ + one intercultivation + one hand-weeding at 20 and 40 DAS (Rs 5,201/ha and 1.82). The net return and the benefit : cost ratio were lower (Rs 5,239/ha and 1.69) under weed-free condition (one intercultivation + two hand-weedings), indicating that it was less remunerative than other integrated weed man-

Table 1. Effect of integrated weed-management practice on number of weeds, dry weight of weeds, weed-control efficiency and weed index in kodo millet

Treatment	No. of weeds/m ² at 30 DAS		Dry weight of weeds/m ² at harvest		Weed-control efficiency (%)				Weed-index (%)	
	2002	2003	2004	2002	2003	2004	2002	2003	2004	Pooled
T ₁ : Isoproturon @ 0.5 kg ai/ha (pre-eme)	15.67	17.33	20.67	83.00	81.00	96.00	17.55	27.67	23.80	31.33
T ₂ : Isoproturon @ 0.5 kg ai/ha mixed with sand (pre-eme)	13.33	18.00	23.67	69.67	84.00	118.67	30.79	25.00	5.81	35.29
T ₃ : Isoproturon @ 0.5 kg ai/ha mixed with soil (pre-eme)	20.00	19.67	21.67	95.00	87.33	112.67	5.63	22.02	10.57	36.62
T ₄ : T ₁ + two IC (20 and 40 DAS)	20.33	20.67	13.67	98.33	90.67	62.00	2.32	19.04	50.99	29.56
T ₅ : T ₁ + one IC + HW (20 and 40 DAS)	10.67	9.00	12.33	52.33	56.00	59.67	48.01	50.00	52.64	8.79
T ₆ : T ₂ + two IC (20 and 40 DAS)	12.00	15.00	19.33	64.33	64.00	91.00	36.09	42.85	27.77	16.41
T ₇ : T ₂ + one IC + HW (20 and 40 DAS)	10.33	16.00	16.67	54.00	64.00	74.67	46.35	42.85	39.15	24.76
T ₈ : T ₃ + two IC (20 and 40 DAS)	11.67	19.67	17.67	62.00	82.67	76.67	38.41	25.29	40.33	11.12
T ₉ : T ₃ + IC + HW (20 and 40 DAS)	13.00	21.33	15.00	67.00	106.67	67.33	33.44	4.75	46.56	34.10
T ₁₀ : Farmers practice - (2 IC + HW)	11.67	18.00	21.00	61.00	80.67	110.00	39.40	27.97	12.67	21.20
T ₁₁ : Weed-free (1 IC + HW)	9.33	5.67	9.00	52.33	47.33	53.67	48.01	57.74	57.40	46.36
T ₁₂ : Weedy Check	20.33	24.33	27.33	100.67	112.00	126.00				
CD (P=0.05)	3.28	6.01	4.54	10.1	8.99	13.45				

DAS = Days after sowing; IC : Intercultivation; HW : Hand weeding

Table 2. Yield, net profit and benefit:cost ratio of kodo millet as influenced by different weed-control treatments

Treatment	Grain yield (q/ha)			Straw yield pooled (q/ha)	Net profit (Rs/ha)	B:C ratio
	2002	2003	2004			
T ₁	11.72	16.80	13.14	47.5	4,098	1.78
T ₂	12.77	16.50	10.00	42.2	3,433	1.65
T ₃	10.98	15.30	12.19	47.6	3,569	1.68
T ₄	10.05	14.80	17.90	49.0	3,254	1.51
T ₅	14.06	23.20	18.09	55.9	5,698	1.90
T ₆	13.55	23.10	14.09	53.9	4,826	1.76
T ₇	16.41	22.30	15.23	50.7	5,201	1.82
T ₈	15.63	15.00	15.04	46.7	3,622	1.57
T ₉	13.59	10.30	16.09	47.6	2,722	1.43
T ₁₀	15.63	18.40	13.80	40.5	3,674	1.58
T ₁₁	16.41	25.90	18.38	48.9	5,239	1.69
T ₁₂	10.62	12.60	9.33	45.4	2,971	1.56
CD (P=0.05)	2.54	9.16	6.28	11.4		

DAS = Days after sowing

The details of treatments are given under Table 1

agement treatments (Table 2).

It was concluded that isoproturon @ 0.5 kg a.i./ha applied as pre-emergence + one intercultivation (20 DAS) + one hand-weeding (40 DAS) is the most remunerative and effective integrated approach for controlling the weeds in kodo millet, followed by its application as pre-emergence through mixing with sand along with two intercultivations at 20 and 40 DAS.

REFERENCES

- Ashok, E.G., Chandrappa, M., Kadalli, G.G., Kumar, Kiran, Mathad, V. and Krishne Gowda, K.T. 2003. Integrated weed control in drill-sown rainfed finger millet (*Eleusine coracana*). *Indian Journal of Agronomy* **48**(4): 270–273.
- Ramachandra Prasad, R.V., Narisimha, N., Dwarakanath, N., Munigowda, M.K. and Krishnamurthy, K. 1991. Integrated weed management in drilled finger millet (*Eleusine coracana*). *Mysore Journal of Agricultural Sciences* **25**: 13–17.