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Integrated weed management in fingermillet (*Eleusine coracana*)

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ABSTRACT

A field experiment was conducted on fingermillet [*Eleusine coracana* (L.) Gaertn] during *kharif* 1996 and 1997 at Ranichauri under rainfed conditions. Pre-emergence spray of 0.5 kg a.i./ha of isoproturon alone and mixed with sand, and post-emergence spray of 0.75 kg a.i./ha of 2, 4-D Na-salt alone and with $CaSO_4$ gave similar grain and stover yields but markedly higher than control. However, isoproturon alone recorded comparatively higher net returns than all other herbicidal treatments and control. Two intercultivation along with 1 hand weeding gave the minimum weed count and weed dry weight and also gave significantly higher grain yield (21.06 q/ha) and monetary return (Rs 3,680/ha) as compared to other treatments.

Key words : Weed management, Fingermillet

Fingermillet [*Eleusine coracana* (L.) Gaertn] is one of the important food and fodder crop of U.P. hills in *kharif* season. Weed infestation is the major constraint limiting the production of fingermillet. Under the conditions of non-availability of labour for weeding and high costs involved there in, it has become difficult to maintain crop free from weeds in initial stages of growth. Chemical methods of weed control and its integration with cultural practices, therefore, assumed greater significance (Manjunath and Muniyappa, 1990; Singh and Arya, 1994). As not much information is available on the methods of herbicide application and cultural measures in fingermillet, the present investigation was undertaken.

MATERIALS AND METHODS

A field experiment was conducted at G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal (U.P.), during *kharif* season of 1996 and 1997 under rainfed conditions. The treatments comprised 5 methods of herbicide application (no chemical spray, isoproturon @ 0.5 kg a.i./ha as spray and mixed with sand as pre-emergence, 2, 4-D Na salt @ 0.75 kg

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a.i./ha alone as spray and mixed with $CaSO_4$ as post-emergence, and 3 cultural methods, i.e. 2 intercultivation, 2 intercultivation along with 1 hand weeding and control. Intercultivation was performed between rows by finger-type hoe. The experiment was laid out in randomized block design with 3 replications.

The soil of experimental field was silty clay loam in texture with pH 5.5. It contained 200-205 kg/ha available N, 12.5-13.5 kg/ha available P and 400-410 kg/ha available K. The region belongs to humid temperate climate with mean annual rainfall of 1,263 mm. The rainfall received during crop season was 821.7 mm in 1996 and 795.9 mm in 1997. Fingermillet variety 'VL 149' was sown in rows 25 cm apart on 19 and 20 June and harvested on 6 and 11 November in 1996 and 1997 respectively.

RESULTS AND DISCUSSION

Weed flora

The major weeds associated with fingermillet in experimental field were *Galinsoga parviflora* (53%), *Polygonum capitatum* (8.7%), *Cyperus rotundus* (5.0%), *Digitaria ciliaris* (20.8%), *Cynodon dactylon* (3.55), *Oxalis latifolia* (3.0%), *Commelina benghalensis* (4.0%), and *Setaria glauca* (2.0%).

Table 1. Effect of integrated weed control measures on weed population and their dry weight in fingermillet

Treatment	Weed population/0.25 m^2 (50 DAS)			Weed dry weiht (g)/0.25 m^2 (50 DAS)		
	1996	1997	Mean	1996	1997	Mean
Chemical						
No chemical spray	15.1	21.0	18.1	13.68	24.80	19.24
Isoproturon @ 0.5 kg ai/ha as pre-emergence	8.3	12.3	10.3	7.99	12.85	10.42
Isoproturon @ 0.5 kg ai/ha as pre-emergence mixed with sand	8.7	13.8	11.3	8.15	13.81	10.98
2, 4-D Na salt @ 0.75 kg ai/ha as post-emergence	10.3	15.1	12.7	8.31	16.08	12.20
2, 4-D Na salt @ 0.75 kg ai/ha with $CaSO_4$ as post-emergence	9.2	12.9	11.1	9.37	15.89	12.63
CD (P = 0.05)	4.7	3.9	3.3	4.04	3.87	2.93
Cultural methods						
Two intercultivation	9.0	13.3	11.2	8.53	15.32	11.93
Two intercultivation + 1 hand weeding	6.3	11.6	9.0	5.90	12.28	9.09
Control	15.3	20.2	17.8	14.08	22.67	18.38
CD (P = 0.05)	3.6	3.0	2.5	3.12	3.00	2.28

Effect on weed count and dry weight

Isoproturon @ 0.5 kg/ha spray alone and mixed with sand (both as pre-emergence), and 2,4-D Na salt @ 0.75 kg/ha alone and mixed with $CaSO_4$ both as post-emergence being at par recorded markedly lower weed density and weed dry weight than the control (Table 1). Further 2 intercultivation alone and with 1 hand weeding recorded significantly lower weed density and weed dry weight over the control. However, 2 intercultivations alone resulted in higher weed dry weight compared with 2 intercultivation with 1 hand weeding.

Effect on growth and yield attributes

All the herbicidal treatments being at par recorded significantly higher number of effective tiller/m in both the years and plant height in 1996 over control (Table 2). It could be attributed to least crop-weed competition for nutrients, moisture, space and sunlight in herbicidal treatments. Similar results were obtained by Singh and Arya (1994). Similarly, all the herbicidal treatments except 2,4-D spray alone also gave

Table 2. Effect of integrated weed control measures on growth and yield contributing characters of fingermillet

Ttreatment	Effective tillers/m at harvest		Plant height (cm) at harvest		Ear weight (g)		1,000-grain weight (g)	
	1996	1997	1996	1997	1996	1997	1996	1997
Chemical								
No chemical spray	21.3	19.6	70.57	68.90	2.66	2.88	2.02	2.09
Isoproturon @ 0.5 kg ai/ha as pre-emergence	31.7	28.5	89.33	74.96	3.73	3.34	2.42	2.32
Isoproturon @ 0.5 kg ai/ha as pre-emergence mixed with sand	29.9	26.9	86.92	75.83	3.46	3.36	2.41	2.31
2, 4-D Na salt @ 0.75 kg ai/ha as post-emergence	29.4	27.2	84.88	72.64	3.42	3.14	2.17	2.14
2, 4-D Na salt @ 0.75 kg ai/ha with $CaSO_4$ as post-emergence	28.4	26.0	85.27	74.86	3.54	3.21	2.18	2.17
CD (P = 0.05)	4.8	3.5	7.46	NS	0.32	0.33	0.29	0.17
Cultural methods								
Two intercultivation	28.6	26.6	83.31	74.45	3.29	3.15	2.27	2.19
Two intercultivation + 1 hand weeding	34.1	28.5	88.93	76.71	3.58	3.40	2.32	2.27
Control	21.7	21.8	77.95	69.15	3.22	3.01	2.13	2.17
CD (P = 0.05)	3-7	2.7	5.78	5.14	0.23	0.26	NS	NS

Table 3. Effect of integrated weed-control measures on yield and economics of fingermillet

	Grain yield (q/ha)			Stover yield (q/ha)			Net return (Rs/ha)		
	1996	1997	Mean	1996	1997	Mean	1996	1997	Mean
Chemical									
No chemical spray	12.89	11.22	12.06	48.22	53.94	51.08	1,811	1,374	1,593
Isoproturon @ 0.5 kg ai/ha as pre-emergence	20.40	15.44	17.92	66.04	71.25	68.65	3,949	2,614	3,282
Isoproturon @ 0.5 kg ai/ha as pre-emergence mixed with sand	18.11	14.25	16.18	61.60	70.72	66.16	3,228	2,279	2,754
2, 4-D Na salt @ 0.75 kg ai/ha as post-emergence	18.07	14.69	16.38	62.15	66.50	64.33	3,272	2,346	2,809
2, 4-D Na salt @ 0.75 kg ai/ha with $CaSO_4$ as post-emergence	18.93	14.00	16.47	60.40	66.39	63.40	3,452	2,141	2,797
CD (P = 0.05)	3.17	2.16	1.85	11.57	11.60	9.35			
Cultural methods									
Two intercultivation	17.54	13.97	15.76	59.52	67.67	63.60	3,001	2,401	2,701
Two intercultivation + 1 hand weeding	23.93	18.18	21.06	69.89	78.63	74.26	4,418	2,941	3,680
Control	11.56	9.62	10.59	49.64	50.78	50.21	1,949	1,409	1,679
CD (P = 0.05)	2.45	1.67	1.43	8.96	8.54	7.24			

significantly higher ear weight over control. A marked increase in 1,000-grain weight was noted with isoproturon alone and mixed with sand only. Two intercultivation along with 1 hand weeding significantly recorded more effective tillers and ear weight over the control in both the years. The differences between 2 intercultivation alone and with 1 hand weeding were marked in effective tillers and ear weight in 1996 where 2 intercultivations along with 1 hand weeding recorded higher values of these attributes than 2 intercultivations. The 1,000-grain weight was not influenced by cultural treatments in both the years. Similar results were also obtained by Rathee *et al.* (1992).

Effect on yield and monetary return

All the herbicidal treatments increased the grain and straw yields of fingermillet significantly over control in both the years and pooled data (Table 3). The mean increase in grain and straw yields of fingermillet in herbicidal treatments over control ranged between 34.2 and 48.6% and 24.1 and 34.4% respectively. It may be ascribed to higher values of yield contributing characters in herbicidal treatments. These results are in

close conformity with the results of Singh and Arya (1995). Application of isoproturon @ 0.5 kg/ha sprayed as pre-emergence gave the maximum monetary return.

In cultural measures, all the treatments, differed markedly among themselves in respect of grain and straw yields and were in the following order : 2 intercultivation with 1 hand weeding > 2 intercultivation > control (Table 3). Based on 2 seasons, 2 intercultivation with 1 hand weeding recorded 119.2% and 36.2% higher net return over 2 intercultivation alone and control, respectively. Two intercultivation alone gave 48.8% higher grain yield than control on mean basis. These findings are in close confirmity with those reported by Singh and Arya (1995).

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