

YIELD AND ECONOMICS OF FINGER MILLET INFLUENCED BY POST EMERGENCE HERBICIDES

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Abstract : Finger millet (*Eleusine coracana* L.) is an important small millet crop that is hardy and grows well in dry zones as rain-fed crops. It is used both as medicinal and traditional purposes. Finger millet is a high stature crop with slower initial growth which remains under smothering due to the infestation of weeds at early stages of growth. This situation causes higher competition and may result in drastic reduction in yield up to 20 to 50 per cent (Kushwaha *et al.*, 2002). The critical period of crop weed competition for the finger millet varies from 25-45 days after sowing (Lall and Yadav, 1982). Manual weed management, which is the most prevalent method for weed management in finger millet, requires a lot of labour. Now a day, due to the scarcity of labours, chemical weed management is considered as better option than the hand weeding. It may increase over all benefit of finger millet cultivation. The work on effect of post emergence herbicides in weed management of finger millet is very limited; therefore, keeping these points in view the present investigation was carried out for evaluation of post-emergence herbicides for weed management in direct sown finger millet.

Keywords: Weed management, finger millet, herbicide

INTRODUCTION

The present investigation was carried out at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) India, during the *kharif* season 2012. The soil of experimental field was Clayey (*Vertisols*), which was low in nitrogen, medium in phosphorus and high in potassium contents with neutral in pH. The experiment was laid out in randomized block design (RBD) with three replications. There were thirteen treatments of post-emergence herbicides along with two hand weeding and untreated control. The finger millet cultivar "GPU-28" was sown and harvested on 11th July, 2012 and 20th November, 2012 respectively, using seed rate of 10 kg/ha at 25 cm distance and gaps were maintained by thinning to obtain proper plant population. Sowing was performed manually and crop was fertilized with 60:40:40 N: P₂O₅:K₂O kg/ha. Application of herbicide was done at 20 DAS. Plant protection measures were followed as per recommendation. The treatments were T₁- Fenoxaprop-p-ethyl (37.5 g/ha), T₂- Fenoxaprop-p-ethyl (45.0 g/ha), T₃- Metsulfuron methyl + Chlorimuron ethyl, T₄- Ethoxysulfuron, T₅ - Cyhalofop-butyl, T₆- Fenoxaprop-p-ethyl (37.5 g/ha) + metsulfuron methyl + chlorimuron ethyl, T₇- Fenoxaprop-p-ethyl (45.0 g/ha) + metsulfuron methyl + chlorimuron ethyl, T₈- Fenoxaprop-p-ethyl (37.5 g/ha) + ethoxysulfuron, T₉- Fenoxaprop-p-ethyl (45.0 g/ha) + ethoxysulfuron, T₁₀- Cyhalofop-butyl + metsulfuron methyl + chlorimuron ethyl, T₁₁- Cyhalofop-butyl + ethoxysulfuron, T₁₂- Hand weeding twice and T₁₃- Weedy check. Grain yield of the net plot was noted after threshing, winnowing and drying, and then calculated in kg/ha with appropriate multiplication factor. The harvested produce from each net plot was tied in bundles separately. Straw yield of plot was noted down after subtraction of grain yield from bundle weight. Weed index expressing the reduction in yield due to

presence of weeds in comparison with weed free situation was calculated using the formula given below as suggested by (Reddy, 2007).

$$\text{Weed Index \%} = \frac{S_w - S_t}{S_w} \times 100$$

S_w = Seed yield from weed free plot

S_t = Seed yield from treated plot

The major weed flora of experimental field consisted of *Echinochloa colona*, *Phyllanthus urinaria*, *Eclipta alba*, *Alternanthera triandra* and *Cyperus iria* and other weed species like *Commelina benghalensis*, *Cynodon dactylon*, *Cynotis axillari*, *Cyperus rotundus*, *Euphorbia hirta*, *Euphorbia geniculata*, *Fimbristylis miliacaea* etc. were also observed in the experiment field in negligible quantum. All the weed management practices caused significant reduction in density, dry weight of weeds in comparison to weedy check plot.

Grain yield and straw yield of finger millet was significantly influenced by different weed management practices. Among different herbicidal weed management practices, application of ethoxysulfuron alone recorded the highest grain yield which was at par with that of metsulfuron methyl + chlorimuron ethyl alone and significantly better than rest of the treatments including weedy check. The application of fenoxaprop-p-ethyl and cyhalofop-butyl alone or in combination with metsulfuron methyl + chlorimuron ethyl or ethoxysulfuron caused severe reduction in grain yield due to their phytotoxicity effect on finger millet and hardly 77 kg/ha to 191 kg/ha grain yield was achieved. Weed free treatment recorded the highest grain yield. Weed caused 55.4% reduction in grain yield of finger millet. It is in conformity with Prasad *et al.* (1991). Similarly the highest straw yield was noted with weed free treatment. Among herbicidal treatments straw yield of finger millet was observed high with application of metsulfuron methyl + chlorimuron ethyl or ethoxysulfuron alone. The straw yield was

significantly reduced with application of fenoxaprop-p-ethyl and cyhalofop-butyl due to phytotoxicity. Weed index (loss of yield due to weeds) was found to be minimum with application of ethoxysulfuron (34.37 %) followed by metsulfuron methyl + chlorimuron ethyl (36.23 %). Weedy check registered 55.40 per cent weed index. The maximum weed index was found with application of fenoxaprop-p-ethyl (93.62 %) at higher level (45.0 g ha⁻¹) followed by cyhalofop-butyl + ethoxysulfuron (90.22%). Weed index in rest of the herbicidal treatments ranged between 84.23% to 88.47%. Hand weeding twice recorded the highest gross return. Among herbicides, ethoxysulfuron gave maximum gross return which was at par with that of metsulfuron methyl + chlorimuron ethyl. In other herbicidal treatments *viz.* fenoxaprop-p-ethyl,

cyhalofop-butyl alone or in combination with metsulfuron methyl + chlorimuron ethyl or ethoxysulfuron gross return was drastically reduced due to lower seed yield which was affected due to phytotoxicity. Fenoxaprop-p-ethyl (45.0 g/ha) gave minimum gross return. The maximum net return was observed in hand weeding twice which was at par with application of ethoxysulfuron and metsulfuron methyl + chlorimuron ethyl other herbicidal treatments were uneconomical due to lower seed yield. The highest B:C ratio was observed with application of ethoxysulfuron which was at par with that of metsulfuron methyl + chlorimuron ethyl and hand weeding twice. These results were in conformity with Kumara *et al.* (2007) reported that the herbicides are economical and cost effective in managing weeds as compared to hand weeding.

Table 1. Grain yield, straw yield and weed index of finger millet as influenced by different herbicidal treatments

Treatment	Dose (g/ha)	Grain yield (Kg/ha)	Straw yield (Kg/ha)	Weed index (%)
T ₁ : Fenox		140	1395	88.47
T ₂ : Fenox	45.0	77	637	93.62
T ₃ : MSM+CME	2.0+2.0	771	6155	36.23
T ₄ : Ethox	15.0	794	5479	34.37
T ₅ : Cyhalo	62.5	188	1217	84.53
T ₆ : Fenox+MSM+ CME	37.5+2.0+2.0	191	1427	84.23
T ₇ : Fenox+MSM+ CME	45.0+2.0+2.0	188	1219	84.52
T ₈ : Fenox+Ethox	37.5+15.0	180	966	85.15
T ₉ : Fenox+Ethox	45.0+15.0	165	819	86.37
T ₁₀ : Cyhalo+MSM+ CME	62.5+2.0+2.0	163	1328	86.53
T ₁₁ : Cyhalo+Ethox	62.5+15.0	119	1276	90.22
T ₁₂ : Weed free (HW at 20 and 40 DAS)		1210	6363	-
T ₁₃ : Weedy check		540	3737	55.40
SEm ± CD at 5 %		21.58 63.00	310.86 907.34	- -

Fenox = Fenoxaprop-p-ethyl, MSM = Metsulfuron methyl, CME = Chlorimuron ethyl, Ethox = Ethoxysulfuron, Cyhalo = Cyhalofop-butyl, HW = Hand weeding

Table 2. Economics of different post emergence herbicides for weed management in finger millet

Treatments	Total Cost of Cultivation (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio
T ₁ : Fenox	12028	2863	-9165	0.24
T ₂ : Fenox	12162	1551	-10611	0.13
T ₃ : MSM+CME	11662	15417	3755	1.32
T ₄ : Ethox	11795	15662	3867	1.33
T ₅ : Cyhalo	12706	3682	-9023	0.29
T ₆ : Fenox+MSM+ CME	12328	3801	-8527	0.31
T ₇ : Fenox+MSM+ CME	12462	3689	-8773	0.30
T ₈ : Fenox+Ethox	12548	3488	-9060	0.28
T ₉ : Fenox+Ethox	12682	3199	-9483	0.25

T ₁₀ : Cyhalo+MSM+ CME	13006	3260	-9746	0.25
T ₁₁ : Cyhalo+Ethox	13226	2467	-10759	0.19
T ₁₂ : Weed free (HW at 20 and 40 DAS)	18370	23377	5007	1.27
T ₁₃ : Weedy check	11070	10648	-422	0.96
SEm ±		451.39	451.39	0.03
CD at 5 %		1317.5	1317.5	0.10

Fenox = Fenoxaprop-p-ethyl, MSM = Metsulfuron methyl, CME = Chlorimuron ethyl, Ethox = Ethoxysulfuron, Cyhalo = Cyhalofop-butyl, HW = Hand weeding

SUMMARY

The experiment comprising single application of different post-emergence herbicides either alone or in combination and hand weeding was conducted on *Vertisols* of Instructional cum Research Farm at College of Agriculture, Raipur during *kharif* season of 2012. *Echinochloa colona* among grasses, *Cyperus iria* among sedges and *Alternanthera triandra*, *Eclipta alba* and *Phyllanthus urinaria* among broad leaf weeds were dominant. Hand weeding twice recorded the highest grain yield and net return however application of ethoxysulfuron registered the highest B:C ratio which was at par with metsulfuron methyl + chlorimuron ethyl and hand weeding twice.

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