SHORT COMMUNICATION

EFFECT OF POST EMERGENCE HERBICIDE ON GROWTH AND YIELD OF FINGER MILLET

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Abstract: The experiment comprising 13 weed management practices which comprised single application of different post-emergence herbicides either alone or in combination and hand weeding was conducted on Clayey *Vertisols* soil of College of Agriculture, Raipur during *kharif* season of 20012. *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. This higher yield in Hand weeding twice was reflected in terms of better yield parameter like Number of fingers m^{-2}, finger length, number of fingerlet $finger^{-1}$, grains $finger^{-1}$ and test weight and growth parameter like plant height, dry matter accumulation, Number of tillers. Application of ethoxysulfuron registered the highest B:C ratio which was at par with metsulfuron methyl + chlorimuron ethyl and hand weeding twice.

Keywords: Weed management, Finger millet, herbicide

INTRODUCTION

Finger millet (*Eleusine indica*) 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 statue 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 (Kushwaha *et al*., 2002). The production and productivity of the country is lower because of weeds pose one of the major constraints in the production of finger millet. Owing to initial slow growth of the finger millet favours weed growth, which cause more competition for sunlight, nutrient and water in early stages of growth lead in lowering productivity (Kumara *et al*., 2007). The critical period of crop weed competition for the finger millet varies from 25-45 days after sowing (Lall and Yadav, 1982). Weeds compete with crop plants for water, nutrients, space and solar radiations by reduction of yield upto 20 to 50 per cent. (Kushwaha *et al*., 2002) and (Singh and Singh, 1984) reported that weeds caused an appreciable reduction in density, dry weight and depletion of nutrients. 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. Chemical weed management practices might be an answer to achieve greater weed control efficiency, which in turn, 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 to evaluation of post-emergence herbicides for weed management in direct sown finger millet.

MATERIAL AND METHOD

The present investigation entitled "Evaluation of post-emergence herbicides for weed management in direct sown Finger millet." was carried out at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) India, during the *kharif* season (July-November) 2012. The soil of experimental field was Clayey *(Vertisols).* 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^{-1} at 25 cm distance and gaps were maintained by thinning to obtain proper plant population. Sowing was performed by manually and crop was fertilized with 60:40:40 N: P_2O_5:K_2O kg ha^{-1}. Plant protection measures were followed as per recommendation. The treatments were *viz*. T_1- Fenoxaprop-p-ethyl (37.5 g ha^{-1}), T_2- Fenoxaprop-p-ethyl (45.0 g ha^{-1}), T_3- Metsulfuron methyl + Chlorimuron ethyl, T_4- Ethoxysulfuron, T_5 – Cyhalofop-butyl, T_6- Fenoxaprop-p-ethyl (37.5 g ha^{-1}) + metsulfuron methyl + chlorimuron ethyl, T_7- Fenoxaprop-p-ethyl (45.0 g ha^{-1}) + metsulfuron methyl + chlorimuron ethyl, T_8- Fenoxaprop-p-ethyl (37.5 g ha^{-1}) + ethoxysulfuron, T_9- Fenoxaprop-p-ethyl (45.0 g ha^{-1}) + ethoxysulfuron, T_{10}- Cyhalofop-butyl + metsulfuron methyl + chlorimuron ethyl, T_{11}- Cyhalofop-butyl + ethoxysulfuron, T_{12}- Hand weeding twice and T_{13}- Weedy check. The experimental data recorded for growth, yield and economics were statistically analyzed. Plant height and number of tillers $plant^{-1}$ of five tagged plants in each net plot area and Dry matter accumulation (g $plant^{-1}$) was recorded at an interval of 15, 30, 45, 60, 75 and 90 DAS and at harvest. Post harvest observations were recorded from net plot area under each treatment. Five fingers of the tagged plants were harvested separately finger length (cm), total

fingerlets finger^{-1}, grains finger^{-1} was counted. Number of fingers was recorded from one m^{-2} area of each plot. 1000 seeds from the winnowed produce of each plot were counted and same were oven dried till constant weight and then weight was recorded in gram by using an electronic digital balance. Their average was worked out and used for statistical analysis. Grain yield of the net plot was noted after threshing, winnowing and drying, and then calculated in kilogram hectare $^{-1}$ 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. Bundle weight was recorded in kilogram hectare^{-1} with the help of spring balance. Harvest index was computed as the ratio of economic yield *i.e.* grain yield ha^{-1} to the total biomass *i.e.* biological yield ha^{-1} (grain and straw) and expressed in per cent, using formula given by Donald (1962),

$$\text{Harvest index (\%)} = \frac{\text{Grain yield}}{\text{Biological}} \times 100$$

And weed index expressing the reduction in yield due to presence of weeds in comparison with weed free situation. It was expressed in per cent and calculated by using the formula given below as suggested by (Reddy 2007).

$$\text{Weed Index (\%)} = \frac{\text{Seed yield from weed free plot} - \text{Seed yield from treated plot}}{\text{Seed yield from weed free plot}} \times 100$$

RESULT AND DISCUSSION

Weeds

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. There was complete control of broad leaf weeds *viz. Alternanthera triandra, Eclipta alba* and *Phyllanthus urinaria* and sedges *i.e. Cyperus iria* by the application of metsulfuron methyl + chlorimuron ethyl and ethoxysulfuron, where as grassy weed *i.e. Echinochloa colona* was completely killed by the application of fenoxaprop-p-ethyl. The crop experienced severe weed competition in cyhalofop-butyl followed by fenoxaprop-p-ethyl at both levels which might be due to unfavourable conditions leading to vigorous growth of weeds. Application of metsulfuron methyl + chlorimuron ethyl and ethoxysulfuron alone was found most suitable for weed control without any harm to the crop. They completely killed all the broad leaf weeds and sedges. Weedy check recorded the highest density and dry weight by weeds owing to their greater competitive ability than crop plant put under highest biomass of weedy check.

Crops

The maximum plant height of finger millet was recorded under the treatment hand weeding twice which was at par with that of ethoxysulfuron and metsulfuron methyl + chlorimuron ethyl but highest dry matter accumulation was observed in fenoxaprop-p-ethyl (37.5 g ha^{-1}) + ethoxysulfuron which was at par with that of hand weeding twice, fenoxaprop-p-ethyl (45.0 g ha^{-1}) + ethoxysulfuron and fenoxaprop-p-ethyl (37.5 g ha^{-1}) + metsulfuron methyl + chlorimuron ethyl. Number of tillers of finger millet were maximum with application of fenoxaprop-p-ethyl (45.0 g ha^{-1}) + ethoxysulfuron which was at par with that of hand weeding twice, fenoxaprop-p-ethyl (37.5 g ha^{-1}) + ethoxysulfuron, fenoxaprop-p-ethyl (37.5 g ha^{-1}) + metsulfuron methyl + chlorimuron ethyl, cyhalofop-butyl, metsulfuron methyl + chlorimuron ethyl, ethoxysulfuron, weedy check and cyhalofop-butyl + metsulfuron methyl + chlorimuron ethyl. Number of fingers m^{-2}, finger length, number of fingerlet finger^{-1}, grains finger^{-1} and test weight were maximum under the hand weeding. Grain yield of finger millet was significantly influenced by different weed management practices. Hand weeding twice at 20 and 40 DAS proved significantly superior to all other treatments. Prasad *et al.* (1991) recorded that the weeds reduced yield of finger millet by 55-61 per cent and hand weeding twice gave the highest grain yield. Singh and Arya (1999) also noted similar findings. Among different herbicidal weed management practices, ethoxysulfuron recorded the highest grain yield which was at par with metsulfuron methyl + chlorimuron ethyl and significantly better than rest of the treatments including weedy check. Straw yield of finger millet was the highest under hand weeding twice, which was at par with that of metsulfuron methyl + chlorimuron ethyl and ethoxysulfuron and significantly superior over rest of the treatments including weedy check. Harvest index varied significantly due to application of post emergence herbicides either alone or in combination at lower or higher dose. Hand weeding twice gave higher harvest index, which was at par with combined application of fenoxaprop-p-ethyl (37.5 g ha^{-1}) + ethoxysulfuron and fenoxaprop-p-ethyl (45.0 g ha^{-1}) + ethoxysulfuron and significantly superior over rest of the treatments. 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.

Economics

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. Fenoxaprop-p-ethyl (45.0 g ha^{-1}) 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 and B:C ratio was observed with ethoxysulfuron which was at par with that of metsulfuron methyl + chlorimuron ethyl and hand weeding twice.

Table 1: Grain yield, Straw yield, Harvest Index and Weed Index of finger millet as influenced by different herbicidal treatments

Treatment	Dose (g ha^{-1})	Grain yield (Kg ha^{-1})	Straw yield (Kg ha^{-1})	Harvest index (%)	Weed index (%)
T_1 : Fenox		140	1395	9.11	88.47
T_2 : Fenox	45.0	77	637	11.11	93.62
T_3 : MSM+CME	2.0+2.0	771	6155	11.34	36.23
T_4 : Ethox	15.0	794	5479	13.00	34.37
T_5 : Cyhalo	62.5	188	1217	13.39	84.53
T_6 : Fenox+MSM+ CME	37.5+2.0+2.0	191	1427	12.44	84.23
T_7 : Fenox+MSM+ CME	45.0+2.0+2.0	188	1219	13.44	84.52
T_8 : Fenox+Ethox	37.5+15.0	180	966	15.67	85.15
T_9 : Fenox+Ethox	45.0+15.0	165	819	15.56	86.37
T_{10} : Cyhalo+MSM+ CME	62.5+2.0+2.0	163	1328	11.00	86.53
T_{11} : Cyhalo+Ethox	62.5+15.0	119	1276	8.44	90.22
T_{12} : Weed free (HW at 20 and 40 DAS)		1210	6363	16.00	-
T_{13}: Weedy check		540	3737	12.64	55.40
SEm ±		**21.58**	**310.86**	**0.76**	**-**
CD at 5 %		**63.00**	**907.34**	**2.23**	**-**

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^{-1})	Gross Return	Net Return	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

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