



Weed management in rainfed finger millet

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Received: 24 December 2015; Revised: 18 January 2016

Key words: Critical period, Economics, Weed index, Weed wiper

Finger millet (*Eleusine coracana* L. Gaertn) is an important *Kharif* season crop of small millet group cultivated in rainfed tracks of hilly region of Uttarakhand. Initial growth period of finger millet is subjected to heavy weed infestation resulting into higher competition and drastic reduction in yield (Pradhan *et al.* 2012, Patil *et al.* 2013). 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. Pradhan *et al.* (2010) reported that weeds caused an appreciable reduction in crop density, dry weight and depletion of nutrients. Information on weed management in finger millet is limited, therefore, present experiment was carried out to study the effect of pre- and post-emergence herbicides and weed wiper on growth, productivity and economics of finger millet.

An experiment was carried out at Hawalbagh Experimental Farm of ICAR–Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora during rainy season of 2014. The soil was medium in available N (262 kg/ha) and P (13 kg/ha), high in available K (296 kg/ha) with pH 6.8. Finger millet cv. ‘VL-324’ was sown on 21st June of 2014 at 20 cm wide rows. Half dose of N (20 kg/ha) along with full dose of P₂O₅ and K₂O (20 and 20 kg/ha) were applied as basal, and remaining N (20 kg/ha) was applied as top dressing after 30 days of sowing. Seven treatments involving weedy check, weed free, manual weeding at 20 and 40 days after sowing (DAS) were taken. Pendimethalin at 1.0 kg/ha and 2,4-D at 1.0 kg/ha was applied as pre-emergence (2 DAS) and post-emergence (30 DAS), respectively. Weed wiper (Singh *et al.* 2014), a mechanical tool to control inter-row weeds evaluated at the institute was taken as another treatment. Non-selective herbicide glyphosate at 2.0 l/ha in 400 l of water was used to wipe out weeds in between rows through the weed wiper. Fresh and dry weight of weeds was recorded by putting a quadrat (0.25 m²) at three random spots in each plot at 60 DAS. Weed index was calculated on

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the basis of total dry weight of weeds at 60 DAS. Data on growth, yield attributes and economics were recorded and analysed statistically. Weed fresh and dry weight data were subjected to square root transformation and expressed in g/m². Gross income was calculated out by taking into account the main product and the byproduct. The prices of different produce per quintal used for calculation were: ₹1550/- for finger millet grains, ₹ 200/- for straw and ₹ 250/- per manday.

Ageratum conyzoides, *Echinochloa colona* and *Eleusine indica* were found to be dominant weeds across the plots (Table 1). All treatments significantly reduced the weed fresh and dry weight compared to weedy check. Weedy check registered the highest fresh weight for *A. conyzoides* (13.7 g/m²), *E. colona* (16.3 g/m²), *E. indica* (7.8 g/m²) and total fresh weight (23.1 g/m²). Manual weeding at 20 and 40 DAS was found to be the best treatment in controlling weeds. Similarly, dry matter of weeds also reduced to varying magnitude under different weed management practices. Apart from weed-free plots manual weeding at 20 and 40 DAS resulted in to the lowest total weed dry matter (5.6 g/m²). Manual weeding at 20 DAS (7.4 g/m²), pre-emergence application of pendimethalin (8 g/m²) and weed wiper (7.9 g/m²) resulted in to total weed dry matter which was on par with each other. Apart from weed free plots, manual weeding at 20 and 40 DAS recorded higher weed index (82.0%) compared to rest of the treatments (Table 1). Glyphosate applied through weed wiper resulted into 63.7% WCI. also been reported by

All weed management practices significantly improved the growth and yield attributes of finger millet over weedy check (Table 2). Apart from weed free plots (2.35 t/ha) two hand weeding at 20 and 40 DAS (2.20 t/ha) resulted in higher grain yield followed by manual weeding at 20 DAS (2.02 t/ha). Herbicide application as pre-emergence, post-emergence and through weed wiper resulted in similar grain yields. Straw yield was highest (4.28 t/ha) in plots received manual weeding at 20 DAS. The

Table 1. Effect of different weed control measures on fresh weight, dry weight and weed control index at 60 DAS of finger millet

| Treatment | Fresh weight (g/m ²) | | | | Total fresh weight (g/m ²) | Total dry weight (g/m ²) | Total biomass (kg/ha) | WI (%) |
|------------------------------------------------|----------------------------------|------------------|------------------|-----------|----------------------------------------|--------------------------------------|-----------------------|--------|
| | A. <i>conyzoides</i> | E. <i>colona</i> | E. <i>indica</i> | Others | | | | |
| Manual weeding at 20 DAS | 4.9(24) | 8.0(63.2) | 7.4(54.2) | 5.7(32.4) | 13.2(173.8) | 7.4(54.3) | 41.7(1738) | 68.5 |
| Manual weeding at 20 and 40 DAS | 0.7(0) | 5.4(28.4) | 5.9(34.4) | 4.3(18) | 9.0(80.8) | 5.6(31.1) | 28.4(808) | 82.0 |
| Pre-emergence pendimethalin at 1 kg/ha | 5.1(26) | 8.1(65.3) | 7.3(52.6) | 5.2(26.6) | 13.1(170.5) | 8.0(63.1) | 41.3(1705) | 63.3 |
| 2,4-D at 1.0 kg at 35 DAS | 4.5(20) | 7.0(48) | 8.0(64.3) | 5.7(32) | 12.8(164.3) | 8.3(68.5) | 40.5(1643) | 60.3 |
| Weed wiper (glyphosate at 2.0 kg/ha) at 20 DAS | 6.0(36) | 7.9(62) | 8.0(63.8) | 5.1(26) | 13.7(187.8) | 7.9(62.6) | 43.3(1878) | 63.7 |
| Weedy check | 13.7(186) | 16.3(264) | 7.8(60) | 4.9(24) | 23.1(534) | 13.1(172.3) | 73.1(5340) | - |
| Weed free | 0.7(0) | 0.7(0) | 0.7(0) | 0.7(0) | 0.7(0) | 0.7(0) | 0.7(0) | 100.0 |
| LSD (P=0.05) | 0.5 | 0.8 | 0.6 | 0.5 | 1.2 | 0.7 | 3.8 | - |

*Data were transformed through square-root ($\sqrt{(x+0.5)}$) method, Figures in the parentheses are original values.

highest B:C ratio (1.39) was recorded in manual weeding at 20 DAS. Higher cost of cultivation in weed free plots and twice manual weeded plots due to engagement of more labourers for weeding. Weed wiper treated and weedy check plots recorded B:C ratio of 1.1 and 0.52 (Table 2). Similar B:C ratio in finger millet in Uttarakhand was also reported by Pant and Srivastava (2014).

Table 2. Effect of different weed control measures on grain yield and economics of finger millet

| Treatment | Grain yield (t/ha) | Straw yield (t/ha) | B:C ratio |
|------------------------------------------------|--------------------|--------------------|-----------|
| Manual weeding at 20 DAS | 2.02 | 4.28 | 1.39 |
| Manual weeding at 20 and 40 DAS | 2.20 | 4.09 | 1.30 |
| Pre-emergence Pendimethalin at 1 kg/ha | 1.59 | 3.72 | 1.29 |
| 2,4-D at 1.0 kg at 35 DAS | 1.43 | 3.68 | 1.16 |
| Weed wiper (glyphosate at 2.0 kg/ha) at 20 DAS | 1.45 | 3.73 | 1.10 |
| Weedy check | 0.62 | 2.84 | 0.52 |
| Weed free | 2.35 | 3.99 | 1.29 |
| LSD (P=0.05) | 0.17 | 0.38 | 0.1 |

SUMMARY

A field experiment was conducted during rainy season of 2014 at Experimental Farm, Hawalbagh, Almora, to know the effect of weed management practices on weed index and grain yield of rainfed finger millet. All the weed control measures significantly reduced total weed dry weight and weed index as compared to that of weedy check. Manual weeding at 20 and 40 DAS (5.6 g/m²) significantly lowered the total weed dry weight followed by

manual weeding at 20 DAS (7.4 g/m²). Weed dry matter recorded in weed wiper treated plots were at par with pre-emergence pendimethalin at 1 kg/ha and post-emergence 2,4-D at 1 kg/ha. Apart from weed free check highest weed index was found in manual weeding at 20 and 40 DAS (82.0%) followed by manual weeding at 20 DAS (68.5%). Grain yield was significantly higher in hand weeding twice (2200 kg/ha) followed by weeding once (2.02 t/ha). The highest B:C ratio was in manual weeding at 20 DAS (1.39).

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