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# Effect of weed management on growth and yield of finger millet

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## ABSTRACT

**The experiment comprising 12 weed management practices with different herbicidal doses and hand weeding was conducted on light textured soil of S.G. College of Agriculture and Research Station, Jagdalpur, during *kharif* season of 2004, 2005 and 2006. *Digitaria sangunalis, Eleusine indica, Setaria gluaca, Cyperus rotundus* and *Echinochloa colona* among monocot and *Celosia argentea, Commelina benghalensis, Spilanthus ecmela* and *Euphorbia geniculata* among broad leaf weeds were dominant. Irrespective of weed management practices, density and dry weight of weeds and weed control efficiency were higher in pre-emergence application of oxyfluorfen 0.50 kg/ha + one hand weeding at 20 DAS (60.18) over weedy check. The control was highest under oxyfluorfen 0.50 kg/ha + two hand weeding at 30 and 45 DAS, followed by oxyfluorfen 0.25 kg/ha + two hand weeding at 30 and 45 DAS.**

**Keywords:** Weed management, Finger millet, Oxyfluorfen

Finger millet (*Eleusine indica* L. Gaertn) is an important member of small millet group in rainfed tracks of the country. 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). Weeds compete with crop plants for water, nutrients, space and solar radiations by reduction of yield upto 20 to 50%. Kushwaha *et al*. (2002) and Singh and Singh (1984) reported that weeds caused an appreciable reduction in density, dry weight and depletion of nutrients. Since single method is not able to control all weeds upto desired level, therefore, integration of chemical and mechanical methods might be an answer to achieve greater weed control efficiency, which in turn, may increase over all benefit of finger millet cultivation. Information on weed management in finger millet is limited, therefore, present experiment was carried out to study the effect of herbicides and their integration on growth and productivity of finger millet.

## MATERIALS AND METHODS

This experiment was conducted with 12 treatments on light textured soil of S.G. College of Agriculture and Research Station, Jagdalpur during *kharif* season of 2004, 2005 and 2006. The treatments comprised with hand weeding and oxyfluorfen doses 0.15, 0.25 and 0.50 kg/ha alone were applied under randomized block design with three replications. The soil was medium in available N (260 kg/ha), P (15 kg/ha), and high in available K (290 kg/ha) with pH 6.5. Finger millet "*VR 708*" was sown on 26$^{th}$ June, 2004, 28$^{th}$ June 2005 and 22$^{nd}$ June 2006 at 30 cm distance and gaps were maintained by planting seedling to obtain proper plant population. Half dose of nitrogen (30 kg/ha) and full dose of P and K (40 and 20 Kg/ha respectively) were applied as basal and remaining half of nitrogen (30 kg/ha) was top dressed one month later. Oxyfluofen was applied through incorporation just after sowing. Plant protection measures were followed as per recommendation. Weed counts (number/m$^2$) and dry weight (g/m$^2$) were recorded by putting a quadrate (0.25 m$^2$) at two random spots in each plot at 30 days after sowing (DAS) and harvesting stage of crop. Weed control efficiency (WCE) was also calculated on the basis of dry matter production of weeds. The experimental data recorded for growth, yield and economics were statistically analyzed. Data on weed density and dry weight of weeds were transformed using square root transformation ($\sqrt{X+0.5}$) before statistical analysis (Panse and Sukhatme 1967).

## RESULTS AND DISCUSSION

### Weeds

The major grass and sedge weed flora of experimental field consisted of *Digitaria sangunalis, Eleusine indica, Setaria gluaca, Cyperus rotundus* and *Echinochloa colona*. Among broad leaved weeds, *Celosia argentea, Commelina benghalensis* and *Euphorbia geniculata* were more rampant. Irrespective of weeds management practices, density, dry weight and weed control efficiency were higher in pre-emergence application of oxyflourfen 0.50 kg/ha + one hand weeding at 20 DAS over other treatments except pre-emergence application of oxyfluofen 0.25kg/ha *fb* two hand weeding

at 30 and 45 DAS. The crop experienced severe weed competition in alone application of oxyflourfen (0.15, 0.25 and 0.5 kg/ha) having nominal WCE (37, 35.45 and 40.81 %) which might be due to unfavourable conditions leading to vigorous growth of weeds. All the weed management practices caused significant reduction in density, dry weight of weeds in comparison to weedy check plot (Table 1). In general, weed management practices reduced from 0.00 to 2.03 weeds/$m^2$ and 0.00 to 3.25 g/$m^2$ in density and dry matter of total weeds, respectively as compared to weedy check. However, lowest density (0.00) and dry weight (0.00) of weeds were recorded under hand weeding twice (20 and 45 DAS) followed by per-emergence application of oxyfloufen 0.25 kg/ha + one hand weeding at 20 DAS (1.23 and 1.58 as density and dry weight, respectively). Similarly, plot receiving oxyflourfen 0.25 kg/ha + hand weeding at 20 DAS registered highest weed control efficiency (60.18 %) followed by application of oxyflourfen 0.15 kg/ha + two hand weeding (20 and 45 DAS). Similar results were reported by Pareek *et al*. (2000) and Mehriya *et al.* (2003). 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.

**Crop**

All weed management practices significantly improved the growth and yield attributes of finger millet over weedy check. The highest values of plant height (97.57, 99.22 and 96.71 cm in 2004, 2005 and 2006 respectively), number of tillers/plant (4.75, 3.90 and 4.60 in 2004, 2005 and 2006, respectively), number of fingers/plant (5.69, 525 and 5.25 in 2004, 2005 and 2006, respectively), finger length (8.54, 8.10 and 8.10 in 2004, 2005 and 2006, respectively) and 1000 grain weight (6.15, 6.83 and 6.66 g, respectively) were recorded under oxyflourfen 0.50 kg/ha + two hand weedings at 20 and 45 followed by oxyflourfen 0.25 kg/ha + two hand weeding at 30 and 45 DAS (Table 2). Two hand weedings at 20 and 45 DAS were not effective as combined application on late flushes of weeds which provided competition to crop. The creation of weed suppressive environment for crop helped to check the growth of the weeds. Oxyflourfen, being broad spectrum herbicides supplemented by one or two hand weeding either 20 DAS and 45 DAS alone or in combination suppressed the weed growth for a longer period led to improvement in growth and yield parameters of finger millet. It might be attributed to the reduction in weed competitiveness with the crop. Similar findings were also reported by Mehriya *et al.* (2007) in cumin.

Two hand weeding at 20 and 45 DAS with higher dose of oxyflourfen (0.50 kg/ha) resulted in highest grain yield (2203, 2551 and 2544 kg/ha), straw yield (4324, 4439 and 4312 kg/ha) and harvest index (35.55, 36.49 and 37.11%) during 2004, 2005 and 2006, respectively of finger millet on medium dose of oxyflourfen (0.25 kg/ha) combined with one or two hand weeding (Table 3). Weed management resulted in significantly improvement in yield of crop compared to weedy check.

**Table 1. Influence of integrated weed management on weed density and dry matter accumulation of weeds in finger millet (mean of three years)**

| Treatments | Cumulative density of weeds | Cumulative dry matter of weeds (g/$m^2$) | Weed control efficiency (%) | B:C ratio |
|---|---|---|---|---|
| $T_1$ - Oxyfloufen 0.15 kg/ha as PE | 1.3 (1.2) | 1.9 (3.17) | 37.00 | 1.75 |
| $T_2$ - Oxyfloufen 0.25 kg/ha as PE | 1.6 (2.0) | 1.9 (3.25) | 35.45 | 1.74 |
| $T_3$ - Oxyfloufen 0.50 kg/ha as PE | 1.6 (2.0) | 1.8 (2.84) | 40.81 | 1.81 |
| $T_4$ - One HW at 20 DAS | 1.6 (2.0) | 1.8 (2.82) | 44.09 | 1.78 |
| $T_5$ - Two HW at 20 DAS and 45 DAS | 1.4 (1.6) | 1.7 (2.41) | 43.65 | 1.58 |
| $T_6$ - $T_1$ + one HW at 20 DAS | 1.6 (2.2) | 1.7 (2.50) | 50.45 | 1.75 |
| $T_7$ - $T_1$ + two HW at 20 and 45 DAS | 1.5 (1.6) | 1.7 (2.26) | 55.13 | 1.89 |
| $T_8$ - $T_2$ + one HW at 20 DAS | 1.2 (1.0) | 1.6 (2.01) | 60.18 | 2.07 |
| $T_9$ - $T_2$ + two HW at 20 and 45 DAS | 1.3 (1.3) | 1.7 (2.37) | 53.01 | 1.97 |
| $T_{10}$ - $T_3$ + one HW at 20 DAS | 1.6 (1.9) | 1.9 (2.98) | 52.19 | 1.71 |
| $T_{11}$ - $T_3$ + two HW at 20 and 45 DAS | 0.7 (0.0) | 0.7 (0.00) | 100.00 | 1.67 |
| $T_{12}$ - Control | 2.1 (4.0) | 2.4 (5.04) | 0.00 | 1.75 |
| LSD (P=0.05) | 0.54 | 0.43 | 8.15 | - |

*Figures in parenthesis denote original values, HW-Hand weeding, PE - Pre-emergence, B:C - Benefit - cost

**Table 2. Influence of weed management on plant height, no. of tiller, no. of fingers and 1000 grain weight of finger millet**

| Treatments | Plant height (cm) | | | Number of tiller/plant | | | No. of fingers/plant | | | Finger length (cm) | | | 1000 grain wt (g) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 |
| $T_1$ - Oxyfloufen 0.15kg/ha as PE | 88.4 | 90.8 | 87.5 | 3.2 | 2.3 | 3.0 | 3.1 | 4.7 | 4.3 | 6.0 | 7.6 | 7.1 | 5.2 | 5.8 | 5.5 |
| $T_2$ - Oxyfloufen 0.25kg/ha as PE | 87.0 | 89.4 | 86.1 | 3.5 | 2.6 | 3.3 | 4.1 | 4.5 | 4.8 | 6.9 | 7.4 | 7.5 | 5.3 | 6.0 | 5.6 |
| $T_3$ - Oxyfloufen 0.50kg/ha as PE | 88.5 | 90.9 | 87.7 | 4.1 | 3.3 | 4.0 | 4.1 | 4.6 | 4.6 | 7.0 | 7.4 | 7.6 | 5.6 | 6.2 | 5.6 |
| $T_4$ - One HW at 20 DAS | 88.6 | 90.9 | 87.7 | 4.1 | 3.2 | 3.9 | 4.5 | 4.8 | 4.9 | 7.4 | 7.7 | 7.7 | 5.5 | 6.3 | 6.2 |
| $T_5$ - Two HW at 20 DAS and 45 DAS | 92.6 | 95.0 | 91.8 | 4.6 | 3.8 | 4.5 | 4.9 | 4.6 | 4.1 | 7.7 | 7.5 | 6.9 | 5.3 | 6.7 | 6.1 |
| $T_6$ - $T_1$ + one HW at 20 DAS | 88.3 | 90.6 | 87.4 | 3.3 | 2.4 | 3.1 | 4.8 | 4.4 | 4.8 | 7.6 | 7.2 | 7.6 | 5.7 | 6.2 | 5.9 |
| $T_7$ - $T_1$ + two HW at 20 and 45 DAS | 91.4 | 93.7 | 90.5 | 3.8 | 2.9 | 3.6 | 4.8 | 4.6 | 4.6 | 7.6 | 7.4 | 7.4 | 5.8 | 6.2 | 6.1 |
| $T_8$ - $T_2$ + one HW at 20 DAS | 95.8 | 98.2 | 95.0 | 4.4 | 3.5 | 4.2 | 5.1 | 4.9 | 4.9 | 8.1 | 8.0 | 7.8 | 6.0 | 6.4 | 6.6 |
| $T_9$ - $T_2$ + two HW at 20 and 45 DAS | 92.4 | 94.8 | 91.6 | 4.3 | 3.5 | 4.2 | 5.2 | 5.2 | 5.0 | 8.0 | 7.7 | 7.7 | 6.1 | 6.3 | 6.2 |
| $T_{10}$ - $T_3$ + one HW at 20 DAS | 92.5 | 94.9 | 91.6 | 3.3 | 2.5 | 3.2 | 4.7 | 4.5 | 4.9 | 7.5 | 7.3 | 7.7 | 5.7 | 5.8 | 6.1 |
| $T_{11}$ - $T_3$ + two HW at 20 and 45 DAS | 97.6 | 99.9 | 96.7 | 4.8 | 3.9 | 4.6 | 5.7 | 5.3 | 5.3 | 8.5 | 8.1 | 8.1 | 6.2 | 6.8 | 6.7 |
| $T_{12}$ - Control | 80.1 | 82.4 | 79.2 | 3.6 | 2.7 | 3.4 | 2.6 | 4.4 | 4.3 | 5.4 | 7.3 | 7.1 | 5.7 | 5.7 | 6.1 |
| LSD (P=0.05) | 4.3 | 2.1 | 2.3 | 0.4 | 0.4 | 0.3 | 0.6 | 0.4 | 0.4 | 0.6 | 0.4 | 0.4 | 0.5 | 0.5 | 0.1 |

PE-Pre-emergence, HW-Hand weeding, DAS-Days after sowing

**Table 3. Influence of integrated weed management on yield attributing characters and yield of finger millet**

| Treatments | Grain yield (kg/ha) | | | Straw yield (kg/ha) | | | Harvest index (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 |
| $T_1$ - Oxyfloufen 0.15kg/ha as PE | 1558 | 1775 | 1687 | 3328 | 3782 | 3597 | 31.89 | 31.94 | 31.93 |
| $T_2$ - Oxyfloufen 0.25kg/ha as PE | 1561 | 1771 | 1951 | 3322 | 3512 | 3856 | 31.97 | 33.52 | 33.60 |
| $T_3$ - Oxyfloufen 0.50kg/ha as PE | 1742 | 195 | 1686 | 332 | 3826 | 356 | 34.41 | 33.76 | 32.14 |
| $T_4$ - One HW at 20 DAS | 1744 | 1985 | 1681 | 3818 | 3825 | 3325 | 31.36 | 34.17 | 33.58 |
| $T_5$ - Two HW at 20 DAS and 45 DAS | 1658 | 1886 | 1776 | 3535 | 3825 | 3429 | 31.93 | 33.02 | 34.12 |
| $T_6$ - $T_1$ + one HW at 20 DAS | 1815 | 1912 | 2015 | 3825 | 3926 | 4013 | 29.57 | 32.75 | 33.43 |
| $T_7$ - $T_1$ + two HW at 20 and 45 DAS | 1785 | 2.23 | 2016 | 3425 | 3856 | 3820 | 34.26 | 34.00 | 34.51 |
| $T_8$- $T_2$ + one HW at 20 DAS | 2038 | 2347 | 2245 | 3728 | 4013 | 3825 | 35.35 | 34.41 | 34.85 |
| $T_9$ - $T_2$ + two HW at 20 and 45 DAS | 2059 | 2067 | 2046 | 3745 | 4035 | 4012 | 35.48 | 36.78 | 35.88 |
| $T_{10}$ - $T_3$ + one HW at 20 DAS | 2028 | 2032 | 1884 | 3625 | 4012 | 3629 | 35.87 | 33.62 | 34.17 |
| $T_{10}$ - $T_3$ + two HW at 20 and 45 DAS | 2203 | 2551 | 2544 | 4324 | 4439 | 4312 | 36.55 | 36.49 | 37.11 |
| $T_{12}$ - Control | 854 | 1033 | 861 | 1952 | 2202 | 2016 | 30.43 | 31.93 | 29.93 |
| LSD (P=0.05) | 230 | 251 | 501 | 301 | 455 | NS | - | - | - |

PE-Pre-emergence, HW-Hand weeding, DAS-Days after sowing

**Economics**

Oxyflourfen 0.25 kg/ha + one hand weeding at 20 DAS realized maximum benefit : cost ratio (2.07) followd by oxyflourfen 0.25 kg/ha + two hand weeding at 20 and 45 DAS (1.97) and oxyflourfen 0.15 kg ai/ha + two hand weeding at 20 and 45 DAS in three years (1.89). Among alone application, higher B:C ratio (1.81) was found in pre-emergence application of oxyfloufen 0.50 kg/ha (Table 1). This might be owing to higher weed control efficiency in this treatment.

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