Effect of herbigation through micro sprinkler on weeds flora, weed dry weight and weed control efficiency

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Abstract
Field investigation was carried out during 2018 at Agricultural College and Research Institute, Madurai, to study the effect of herbigation through micro sprinkler on weed flora, weed dry weight and weed control efficiency. The field experiment was laid out in randomised block design with nine treatments. The pre emergence herbicides of pendimethalin and oxyfluorfen were applied each at three different doses (100, 125 and 150% of recommended dose) in the non-cropped field and its weed control efficiency were worked out. The highest weed control efficiency of 80.8 per cent was obtained in pre emergence application of oxyfluorfen 0.188 kg a.i ha⁻¹ (150%) through micro sprinkler and the lower weed control efficiency was obtained in weedy check (0.0 %). The lowest weed density and dry weight were recorded in the same treatment. Increased dose of herbicide application resulted in lesser weed density, weed dry weight and higher weed control efficiency. Among the herbicides tried oxyfluorfen performed better in terms of weed control than the pendimethalin. Further, results revealed that weed density and its dry weight obtained under 100 % of recommended dose applied as herbigation through micro sprinkler was at par with conventional method of spraying.

Keywords: Herbigation, micro sprinkler, pendimethalin, oxyfluorfen and weed control efficiency

Introduction
Herbigation is the recent technique in which herbicides applied through irrigation water. The application of agro inputs like fertilizer through irrigation is practiced for decades and has preceded such technologies with herbicides. Conventional method of application of herbicides is difficult and person applying this exposed to chemical and some instances failed to suppress the growth of target weeds and in addition spray drift is the major problem in it. To avoid such problems, herbigation through micro irrigation controls the target weeds excellently and it is the safe and eco-friendly method of herbicide application (Sujith et al., 2003) [13]. Herbicides through irrigation water are generally effective in controlling weeds in only portion of the area wetted by the irrigation water. Herbigation through micro irrigation system may have higher degree of acceptability in arid climates. Research findings have established a fact that some of the herbicides exhibit good activity by providing control of target weeds when applied through irrigation water. Sprinklers are the most widely used irrigation system for applying herbicides. The extent of the movement of herbicides applied through irrigation systems is a function of solubility, adsorption and volatility. With herbigation, there will be efficient use of both water as well as herbicide chemical (Sujith et al., 2003) [13].

Moreover, the efficiency of herbigation reduction controlling target weeds under sprinkler irrigation system could be attributed to herbicide uniformity in wetted area under emitters (El-Gindy et al., 1995) [4]. With considering the above facts in view, the present investigation was carried to find out suitable dose of herbicide for herbigation through micro sprinkler irrigation.

Materials and Methods
A field experiment was conducted in rabi, 2018 at Agricultural College and Research Institute, Madurai. The experimental farm is geologically located at 9°54’ N latitude and 78°54’ E longitude with an altitude of 147 m above the mean sea level in the southern part of Tamil Nadu, India. The experiment was laid out in Randomized Block Design with nine treatments and four replications. Herbicides of pendimethalin and oxyfluorfen each were applied at three
different doses (100, 125 & 150% recommended dose) and weedy plot and conventional method of application of herbicides were maintained for comparison.

Irrigation water was pumped using 7.5 HP motor and conveyed to the main line of 63 mm OD (outer diameter) PVC (Poly vinyl chloride) pipes after filtering through sand filter. From the mainline, sub mains of 40 mm diameter PVC pipes were connected. From the sub main, laterals of 16 mm LLDPE pipes were installed at an interval of 2 m. Along the laterals, 16 mm riser pipe of 1m height was connected at 2 m apart on which the sprinkler heads were fixed, so that each sprinkler head uniformly wetted the plot area with discharge capacity of 42 l hr⁻¹. Sub mains and laterals were closed at the end with end cap. This was taken into account while giving herbigation.

The data on weed density was recorded at 20th day using quadrate size 1 m². The quadrate was placed randomly in three times at different locations in each plot separately, the weeds falling within the frames of the quadrat were collected, categorised into grasses, sedges and broadleaved weeds. Thereafter the weeds were shade dried and air dried in hot-air oven at 65±5°C for 72 hrs. The dry weight of grasses, sedges and broadleaved weeds were recorded and expressed in g ha⁻¹.

Weed control efficiency (WCE) were calculated as per the procedure is given by Mani et al. (1973) [7].

\[ WCE \% = \frac{WDC - WD_T \times 100}{WDC} \]

Where,

- WCE - weed control efficiency (per cent)
- WDC - weed dry weight (g m⁻²) in control plot
- WD_T - weed dry weight (g m⁻²) in the treated plot

Statistical analysis

The data on weeds were statistically analysed (Gomez and Gomez, 1984). The data on weed density and weed dry weight were subjected to square root transformation \(\sqrt{x+0.5}\) before analysis. The critical difference was worked out at five present probability level.

### Table 1: Effect of weed management methods on weed density (No. m⁻²)

<table>
<thead>
<tr>
<th>T. No</th>
<th>Treatments</th>
<th>Broadleaf</th>
<th>Sedge</th>
<th>Grass</th>
<th>Total weed</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀</td>
<td>Weedy check</td>
<td>13.83(191.60)</td>
<td>14.16(201.20)</td>
<td>2.91(8.00)</td>
<td>2.27(4.67)</td>
</tr>
<tr>
<td>T₁</td>
<td>PEA of pendimethalin 0.75 kg a.i ha⁻¹ (100%) by micro sprinkler</td>
<td>8.62(74.40)</td>
<td>12.36(152.80)</td>
<td>2.91(8.00)</td>
<td>2.27(4.67)</td>
</tr>
<tr>
<td>T₂</td>
<td>PEA of pendimethalin 0.94 kg a.i ha⁻¹ (125%) by micro sprinkler</td>
<td>7.45(55.53)</td>
<td>11.44(131.00)</td>
<td>2.27(4.67)</td>
<td>1.69(3.29)</td>
</tr>
<tr>
<td>T₃</td>
<td>PEA of pendimethalin 1.125 kg a.i ha⁻¹(150%) by micro sprinkler</td>
<td>7.31(53.60)</td>
<td>11.11(123.80)</td>
<td>1.68(3.33)</td>
<td>1.34(2.66)</td>
</tr>
<tr>
<td>T₄</td>
<td>PEA of oxyfluorfen 0.125 kg a.i ha⁻¹(100%) by micro sprinkler</td>
<td>7.40(55.00)</td>
<td>10.35(107.60)</td>
<td>1.69(3.29)</td>
<td>1.34(2.66)</td>
</tr>
<tr>
<td>T₅</td>
<td>PEA of oxyfluorfen 0.156 kg a.i ha⁻¹(125%) by micro sprinkler</td>
<td>7.07(50.00)</td>
<td>9.74(95.00)</td>
<td>1.34(2.66)</td>
<td>1.05(2.05)</td>
</tr>
<tr>
<td>T₆</td>
<td>PEA of oxyfluorfen 0.188 kg a.i ha⁻¹(150%) by micro sprinkler</td>
<td>5.83(34.13)</td>
<td>8.41(71.00)</td>
<td>1.05(2.05)</td>
<td>1.05(2.05)</td>
</tr>
<tr>
<td>T₇</td>
<td>PEA of pendimethalin 0.75 kg a.i ha⁻¹(100%) by sprayer</td>
<td>8.76(76.80)</td>
<td>12.96(168.40)</td>
<td>2.58(5.17)</td>
<td>2.58(5.17)</td>
</tr>
<tr>
<td>T₈</td>
<td>PEA of oxyfluorfen 0.125 kg a.i ha⁻¹(100%) by sprayer</td>
<td>7.40(55.00)</td>
<td>10.92(119.50)</td>
<td>1.83(3.66)</td>
<td>1.32(2.62)</td>
</tr>
<tr>
<td>T₉</td>
<td>Weedy check</td>
<td>13.83(191.60)</td>
<td>14.16(201.20)</td>
<td>2.91(8.00)</td>
<td>2.27(4.67)</td>
</tr>
</tbody>
</table>

Figure in the parenthesis are original values PEA – Pre emergence application

### Weed dry weight (g m⁻²)

The data showed that different herbicide treatments had significant effects on weed dry weight (Table 2). The higher weed dry weight of 56.24 g m⁻² was recorded with the weedy check plot and the lowest weed dry weight of 10.77 g m⁻² was recorded in PEA of oxyfluorfen 0.188 kg a.i ha⁻¹(150%) by micro sprinkler (T₀). This might be due to reduction in weed density. Similar findings were reported by Priyadharshini and Anburani (2004) [10]. When comparing the weed dry weight of different doses (100%, 125%, 150%) of herbicides of pendimethalin and oxyfluorfen weed dry weight of T₁ (38.88) was at par with T₁ (38.96) and T₁ (24.69) was at par with T₉ (24.96). These indicated that the effect of the same dose of herbicides on weed dry weight was not differed either applied by micro sprinkler or knapsack sprayer.
Figure in the parenthesis are original values PEA – Pre emergence application

**Weed control efficiency (per cent)**

Different dose of herbicides through micro sprinkler irrigation has positively influence the weed control efficiency (Fig 1). Among the treatments, the higher weed control efficiency of 80.8% was recorded in pre emergence application of oxyfluorfen @ 0.188 kg a.i ha⁻¹ (150%) under herbigation through micro sprinkler. These results were attributed owing to reduced weed population, weed dry weight of different weed flora resulted in increased weed control efficiency. These findings were in agreement with the earlier reports of Patel et al. (2000) [9] and Raj et al. (2012) [10]. Next to this treatment, higher weed control efficiency of 62.8 and 56.5 per cent was recorded respectively under pre emergence application of oxyfluorfen 0.156 kg a.i ha⁻¹ (125%) and pendimethalin @ 1.125 kg a.i ha⁻¹ (150%) herbigation through micro sprinkler.

Results showed that the weed control efficiency was higher by increasing the herbicide application rate as well as herbicides applied through micro sprinkler when compared to the conventional method of application. Singh et al., (2018) also suggested that increased rate of application increases the weed control efficiency. Ogg (1980) [8] reported that sprinkler was effective for investigating the application of herbicide chemicals. Pre emergence application of oxyfluorfen @ 0.188 kg a.i ha⁻¹ (150%) under herbigation through micro sprinkler has increased the weed control efficiency 31.8 per cent increased over PEA of oxyfluorfen 0.125 kg a.i ha⁻¹ (100%) by sprayer (T₅). Likewise, PEA application of pendimethalin 1.125 kg a.i ha⁻¹(150%) by herbigation through micro sprinkler has increased weed control efficiency over 45.66 per cent when compared to PEA of pendimethalin 0.75 kg a.i ha⁻¹ (100%) by sprayer (T₆). Similarly, comparable weed control efficiency was observed in between the 100 % of recommended dose of herbicides applied through micro sprinkler as herbigation and sprayer.

**Summary**

Increased dose of application of herbicides resulted in reduced weed density, weed dry weight and higher weed control efficiency.

With regard to the method of application of herbicides, herbigation through micro sprinkler registered comparable or even more weed control efficiency than conventional method of application. The 100 per cent recommended dose through as herbigation through micro sprinkler has comparable weed control efficiency with spraying. The another parallel study conducted to know the impact of 100 % recommended dose of pendimethalin and oxyfluorfen applied as herbigation through micro sprinkler on aggregatum onion indicated that above dose did not have any phytotoxicity on crop.

**Conclusion**

From the above study, it can be concluded that pre emergence application of herbicides can be applied as herbigation through micro sprinkler as it is recorded comparable weed control efficiency with conventional method of application. Further, it is also concluded that 100 % recommended dose of herbicide can be used without affecting the crop.

**References**


