Comparative efficacy of herbicides against spurge (Euphorbia geniculata) in soybean (Glycine max)

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ABSTRACT

A field experiment was conducted during the rainy seasons of 2001 and 2002 at Jabalpur to study the comparative bioefficacy of different herbicides for the control of the problem broadleaf weed spurge (Euphorbia geniculata Ortegi.) in soybean (Glycine max L. Merr.). Among the test herbicides, chlorimuron ethyl 0.01 kg/ha being at par with metribuzin 0.5 kg/ha significantly reduced the growth of spurge. Uncontrolled weeds caused 59% seed yield loss compared with the metribuzin 0.5 kg/ha. Lactofen 0.15 kg/ha showed slight phytotoxicity on the crop and reduced the plant population and pods/plant. Metribuzin 0.5 kg/ha being at par with chlorimuron-ethyl 0.01 kg/ha gave the maximum seed yield and additional return owing to higher yield attributing characters. But maximum benefit: cost ratio (11.37) was recorded with chlorimuron 0.01 kg/ha due to its lower cost.

Key words: Soybean, Glycine max, Herbicides, Metribuzin, Chlorimuron-ethyl, Euphorbia geniculata, Additional return

Soilbean [Glycine max (L.) Merr.] has emerged as one of the major rainy season cash crops in central India. Being the rainy season crop and initial slow growth, it suffers heavily due to severe weed infestation. Weeds are one of the major deterrents in sustaining the soybean productivity. Season-long weed infestation causes yield losses ranging from 20–77% (Kurchania et al. 2001). Several herbicides like pendimethalin, fluchloralin and alachlor have been used effectively for weed control in soybean for 3–4 decades. Continuous use of these herbicides is resulting in development of severe infestation of non-grassy weeds particularly spurge (Euphorbia geniculata Ortegi.) in Madhya Pradesh. In general, growth rate of this weed in soybean is very high and it suppresses the crop in its early growth stage. Presently the weed is more pronounced in soybean–chickpea (Cicer arietinum L.) system than in soybean–wheat (Triticum aestivum L. emend Fiori & Paol.) or soybean–mustard (Brassica Juncea L. Czemrij & Cosson) systems (Mishra and Singh 2000). Due to non-dormancy, short life cycle and ability of seeds to remain viable in soil for longer period, it poses a problem for its control. The present study was, therefore, undertaken to evaluate the comparative bio-efficacy of different herbicides for the control of Euphorbia geniculata in soybean.

MATERIALS AND METHODS

A field experiment was conducted to study the comparative bioefficacy of different herbicides for the control of Euphorbia geniculata in soybean during the rainy seasons of 2001 and 2002 at the National Research Centre for Weed Science, Jabalpur. The soil was clay loam, low in available nitrogen (240 kg/ha), medium in available phosphorus (18 kg/ha) and high in available potassium (314 kg/ha) with organic carbon content 0.56% and pH 6.8. Treatments consisting of fluchloralin 1.0 kg/ha as PPI (one day before sowing), pendimethalin 1.0 kg/ha, oxyfluorfen 0.2 kg/ha, metribuzin 0.5 kg/ha, alachlor 1.5 kg/ha and metolachlor 1.0 kg/ha as pre-emergence spray (2 days after sowing) and lactofen 0.15 kg/ha, bentazon 1.5 kg/ha, chlorimuron 0.01 kg/ha and imazethapyr 0.07 kg/ha as post-emergence herbicides (21 days after sowing) were replicated thrice in a randomized block design. 'JS 335' soybean was sown in rows 30 cm × 5 cm apart in an experimental plot size of 6 m × 4 m on 24 June in 2001 and 29 June in 2002. A uniform dose of 22 kg nitrogen and 55 kg phosphorus through diammonium phosphate/ha was applied in rows at sowing. The field was irrigated immediately after sowing through sprinkler to ensure proper seed germination. Population and dry weight of weeds were recorded 15, 30 and 45 days after sowing by placing a quadrate of 50 cm × 50 cm randomly at 4 places in each plot. The data on number and dry weight of weeds were subjected to square root transformation using v X+0.5.

RESULTS AND DISCUSSION

Effect on weeds

The major weeds which infested the experimental field...
were spurge (Euphorbia gregiculata), common day flower (Convolvulus arvensis L.) and cichory (Cichorium intybus L.) as broadleaves, jungle rice (Echinochloa colona L.) as grassy weed and umbrella sedge (Cladium jamaicense) as sedge (Table 1). Among pre-emergence herbicides, metribuzin 0.5 kg/ha and oxyfluorfen 0.2 kg/ha were found most effective for the control of all weeds while other pre-emergence herbicides were effective only against jungle rice and tongue weed. Among the test herbicides, chlorimuron ethyl 10 g/ha being at par with metribuzin 0.5 kg/ha significantly reduced the growth of spurge (Euphorbia gregiculata) over the rest of the treatments. All the herbicidal treatments except chlorimuron and pendimethalin significantly reduced the population and dry matter production of weeds (Table 1). The lowest population and dry matter were recorded with metribuzin 0.5 kg/ha which was comparable to oxyfluorfen 0.2 kg/ha at all the stages of crop growth and chlorimuron ethyl 0.01 kg/ha at 45 days stage of crop growth. Rana and Angasa (1996) and Singh et al. (2002) also reported the effective control of broadleaves with the post-emergence application of chlorimuron and chlorimuron 0.01 kg/ha at all the stages of crop growth and chlorimuron 0.01 kg/ha at 45 days stage of crop growth. Rana and Angasa (1996) and Singh et al. (2002) also reported the effective control of broadleaves and wild jute (Corchorus sp.) with chlorimuron 0.01 kg/ha at 45 days stage of crop growth. Rana and Angasa (1996) and Singh et al. (2002) also reported the effective control of broadleaves and wild jute (Corchorus sp.) with chlorimuron 0.01 kg/ha at 45 days stage of crop growth. Rana and Angasa (1996) and Singh et al. (2002) also reported the effective control of broadleaves and wild jute (Corchorus sp.) with chlorimuron 0.01 kg/ha at 45 days stage of crop growth. Rana and Angasa (1996) and Singh et al. (2002) also reported the effective control of broadleaves and wild jute (Corchorus sp.) with chlorimuron 0.01 kg/ha at 45 days stage of crop growth.
Table 2: Efficacy of herbicides on yield and yield attributing characters in soybean (mean of 2001 and 2002)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose (kg/ha)</th>
<th>Time of application (DAS)</th>
<th>Plants/running meter</th>
<th>Pods/plant</th>
<th>100 seed weight (g)</th>
<th>Seeds' yield (kg/ha)</th>
<th>Gross return (Rs/ha)</th>
<th>Additional return over weedy check (Rs/ha)*</th>
<th>Treatment cost (Rs/ha)**</th>
<th>Benefit: cost ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluchloralin</td>
<td>1.0</td>
<td>1 day before sowing</td>
<td>17.33</td>
<td>49.0</td>
<td>6.71</td>
<td>2.67</td>
<td>1129.67</td>
<td>15820</td>
<td>6132</td>
<td>1468</td>
</tr>
<tr>
<td>Pendimethalin</td>
<td>1.0</td>
<td>2</td>
<td>16.00</td>
<td>48.0</td>
<td>6.30</td>
<td>2.50</td>
<td>1024.00</td>
<td>14326</td>
<td>4648</td>
<td>1613</td>
</tr>
<tr>
<td>Oxyfluorfen</td>
<td>0.2</td>
<td>2</td>
<td>16.67</td>
<td>53.0</td>
<td>7.23</td>
<td>2.67</td>
<td>1398.67</td>
<td>19586</td>
<td>9898</td>
<td>2180</td>
</tr>
<tr>
<td>Metribuzin</td>
<td>0.5</td>
<td>2</td>
<td>18.33</td>
<td>61.0</td>
<td>7.24</td>
<td>2.97</td>
<td>1670.33</td>
<td>23380</td>
<td>13792</td>
<td>1751</td>
</tr>
<tr>
<td>Metolachlor</td>
<td>1.0</td>
<td>2</td>
<td>16.67</td>
<td>42.3</td>
<td>6.26</td>
<td>2.60</td>
<td>836.67</td>
<td>11718</td>
<td>2030</td>
<td>1260</td>
</tr>
<tr>
<td>Alachlor</td>
<td>1.5</td>
<td>2</td>
<td>16.33</td>
<td>44.0</td>
<td>6.12</td>
<td>2.40</td>
<td>901.67</td>
<td>12628</td>
<td>2940</td>
<td>820</td>
</tr>
<tr>
<td>Lactofen</td>
<td>0.15</td>
<td>21</td>
<td>14.00</td>
<td>40.0</td>
<td>6.18</td>
<td>2.40</td>
<td>764.67</td>
<td>10710</td>
<td>1022</td>
<td>1555</td>
</tr>
<tr>
<td>Bentazon</td>
<td>1.5</td>
<td>21</td>
<td>17.67</td>
<td>52.0</td>
<td>7.00</td>
<td>2.80</td>
<td>1105.67</td>
<td>15484</td>
<td>5796</td>
<td>1680</td>
</tr>
<tr>
<td>Chlorimuron</td>
<td>0.01</td>
<td>21</td>
<td>19.67</td>
<td>59.3</td>
<td>7.27</td>
<td>2.90</td>
<td>1488.00</td>
<td>20832</td>
<td>11144</td>
<td>980</td>
</tr>
<tr>
<td>Imazethapyr</td>
<td>0.07</td>
<td>21</td>
<td>18.67</td>
<td>56.0</td>
<td>7.24</td>
<td>2.90</td>
<td>1219.33</td>
<td>17066</td>
<td>7378</td>
<td>1370</td>
</tr>
<tr>
<td>Weedy check</td>
<td>12.00</td>
<td>26</td>
<td>6.23</td>
<td>2.30</td>
<td>692.30</td>
<td>9688</td>
<td>246.5</td>
<td>79–82</td>
<td>79–82</td>
<td>79–82</td>
</tr>
</tbody>
</table>

kg/ha over weedy check (Table 2). But maximum benefit: cost ratio (11.37) was recorded with chlorimuron 0.01 kg/ha due to its low cost which was superior to rest of the treatments. The lowest additional return and benefit: cost ratio was registered with lactofen 0.15 kg/ha. The reason could be poor seed yield due to its phytotoxicity on crop plant.

Thus, the problem broadleaf weed spurge (Euphorbia geniculata) can easily be controlled in soybean by pre-emergence application of metribuzin 0.5 kg/ha or oxyfluorfen 0.2 kg/ha or post-emergence application of chlorimuron 0.01 kg/ha or imazethapyr 0.07 kg/ha.

REFERENCES