Effect of pre- and post-emergence herbicides on weed control and productivity of soybean (*Glycine max*)

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ABSTRACT

A field experiment was conducted during the rainy seasons of 2000 and 2001 on Vertisol, to study the effect of different pre- and post-emergence herbicides on ‘JS 335’ soybean (*Glycine max* (L.) Merr.). Among the tested herbicides, the highest seed yield was recorded with combi product of imazamox + imazethapyr @ 75 g/ha PoE, i.e. 1,622 kg/ha, and it was significantly on a par with 2 hand-weedings (1,710 kg/ha). The highest weed-control efficiency and lowest weed biomass were recorded with 2 hand-weedings, followed by application of imazamox + imazethapyr @ 75 g/ha PoE and quizalofop ethyl @ 50 g/ha PoE. Among the pre-emergence herbicides, S-metolachlor @ 750 g/ha performed better than application of alachlor @ 2 kg/ha and lower dose of S-metolachlor @ 500 g/ha.

Key words: Weed control, Herbicides, Soybean

Soybean is extensively grown in all over Madhya Pradesh because of its wide adaptability to agro-climatic conditions and high market value of the product. Intense weed competition is one of the constraints in realizing higher soybean productivity and reduction in the yield due to weeds varies from 35 to 50%, depending on type of weeds, their intensity and time of crop–weed competition (Chandel and Saxena, 1988). Unavailability of adequate labourers during weeding peaks and difficulty in the use of mechanical weeders in heavy soil due to rains creates problem for effective control of weeds. Herbicidal weed control particularly post-emergence remains the only viable option under such a situation. An experiment was, therefore, conducted to study the effect of pre- and post-emergence herbicides on soybean.

MATERIALS AND METHODS

A field experiment was conducted during the rainy seasons of 2000 and 2001 at RAK College of Agriculture, Sehore, under All-India Co-ordinated Research Project (AICRP) on Soybean. The soil was clayey in texture and neutral in reaction. It had medium N (204 kg/ha), medium P (17.28 kg/ha) and high K (485 kg/ha) contents. Ten treatments of weed control were evaluated (Table 1) in randomized block design, replicated three times.

Soybean cv. ‘JS 335’ was sown on 7 July and 18 June in 2000 and 2001, respectively, using seed rate of 75 kg/ha. Seed was inoculated with *Bradyrhizobium japonicum* and phosphorus-solubilizing bacteria both @ 5 g/kg seed. Crop was fertilized with 100 kg diammonium phosphate (18 kg N + 46 kg P₂O₅/ha). Weed-control operations were accomplished as per treatments. Weeds of experimental field were identified and their intensity was recorded.

RESULTS AND DISCUSSION

Weed intensity

Major 7 species of weeds belonging to different groups were identified. Their occurrence and intensity varied in different treatments. Intensity (%) of weeds varied due to different weedicides and hand-weeding treatments at 50 days after sowing (DAS). Maximum weed infestation was observed in weedy check and the dominant weeds were *Caesalia axillaries* Roxb. (30.34%), *Cyperus rotundus* L. (15.55%), *Digitaria sanguinalis* L. (14.21%), *Echinochloa colonum* Link. (11.8%), *Commelina benghalensis* L. (7.97), *Acalypha indica* L. (5.74%) and *Anotic monthuloni* Hook. (4.71). The contribution of other weeds was less than 10.5% to total weed infestation.

The intensity of all weeds significantly reduced by pre-emergence application of alachlor and S-metolachlor than all other treatments including weed check at early growth stage of crop (20 DAS). It may be because the pre-emergence herbicides checked the emergence of weeds, resulting in reduced intensity of weeds. Mishra and Bhan (1996) also reported similar results. At 50 DAS, the treatment 2 hand-weedings recorded significantly lowest weed...
Table 1. Effect of weed-control treatments on weed intensity, weed biomass and weed-control efficiency (WCE) in soybean

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed intensity/m²</th>
<th>Weed biomass (g/m²)</th>
<th>WCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 days after sowing</td>
<td>50 days after sowing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monocot</td>
<td>Dicot</td>
<td>Total</td>
</tr>
<tr>
<td>Alachlor 2 kg/ha PE</td>
<td>6.61</td>
<td>9.45</td>
<td>11.52</td>
</tr>
<tr>
<td>S-metolachlor 500 g/ha PE</td>
<td>(43.50)</td>
<td>(89.16)</td>
<td>(132.66)</td>
</tr>
<tr>
<td>S-metolachlor 750 g/ha PE</td>
<td>6.01</td>
<td>11.30</td>
<td>12.79</td>
</tr>
<tr>
<td>Quinalofop ethyl 5 sc @ 37.5 g/ha PoE</td>
<td>11.81</td>
<td>12.78</td>
<td>17.91</td>
</tr>
<tr>
<td>Quinalofop ethyl 5 sc @ 50 g/ha PoE</td>
<td>11.64</td>
<td>13.11</td>
<td>19.55</td>
</tr>
<tr>
<td>Quinalofop tefuryl 4% @ 50 g/ha PoE</td>
<td>12.03</td>
<td>12.48</td>
<td>24.51</td>
</tr>
<tr>
<td>Imazamox 70% @ 40 g/ha PoE</td>
<td>12.25</td>
<td>12.30</td>
<td>24.55</td>
</tr>
<tr>
<td>Imazamox + imazethapyr 5% @ 75 g/ha PoE</td>
<td>12.47</td>
<td>12.40</td>
<td>24.87</td>
</tr>
<tr>
<td>2 hand-weedings at 30 and 45 DAS</td>
<td>12.20</td>
<td>12.89</td>
<td>24.38</td>
</tr>
<tr>
<td>Weedy check</td>
<td>11.76</td>
<td>13.13</td>
<td>24.90</td>
</tr>
</tbody>
</table>

Figures in parentheses are original values and outside are transformed (Vx+0.05) values.

PE, Pre-emergence; PoE, post-emergence; DAS, days after sowing.

population. Chokar and Balyan (1999) reported that the critical period of weed control was 30–45 DAS in soybean. Among post-emergence herbicides, combi product of imazamox + imazethapyr @ 75 g/ha was effective against both monocot and dicot weeds. Similar findings were reported by Nelson and Enner (1999). Other PoE herbicides were effective only against grassy weeds and less effective to control the broad-leaf weeds. Vidrine et al. (1995) reported similar results for quinalofop ethyl and quinalofop tefuryl.

Weed dry matter

In general the dry weight of weeds increased with the increase in weed population. Only slight variation was observed due to different species. The highest dry matter of weeds was recorded under weedy check at 60 DAS (Table 1). At this stage, the lowest weed dry matter was recorded in 2 hand-weedicngs because of weed removal. Out of the herbicides applied, post-emergence application of imazamox + imazethapyr @ 75 g/ha resulted in the maximum reduction in weed dry matter, followed by quinalofop ethyl @ 50 g/ha.

Weed-control efficiency

The highest weed-control efficiency (WCE) (95.43%) was found in 2 hand-weedings, followed by application of imazamox + imazethapyr @ 75 g/ha (88.90%) as PoE. The lowest WCE was recorded with application of quinalofop tefuryl (53.26%). Singh and Chandel (1995) also reported the higher WCE with 2 hand-weedings.

Yield and yield attributes

The yield and yield attributes, viz. branches/plant, pods/plant, seeds/pod, were significantly influenced by different weed-control treatments (Table 2). The highest values of these parameters over weedy check were higher in 2 hand-weedings. Among herbicides, an application of imazamox + imazethapyr @ 75 g/ha had maximum values of these parameters, followed by quinalofop ethyl @ 50 g/ha. Higher level of these parameters could be attributed to low competition stress and clean cultivation.

The 2 hand-weedings treatment significantly enhanced the seed yield (73.66% and 20.97%) over the weedy check and application of quinalofop tefuryl @ 50 g/ha. Among the herbicides, post-emergence application of imazamox + imazethapyr @ 75 g/ha and quinalofop ethyl @ 50 g/ha enhanced the seed yield by 64.50% and 59.14% over weedy check respectively. Nelson and Renner (1999) reported that imazamox + imazethapyr gave soybean yield equal to the hand-weeded plot. Nelson et al. (1999) also

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observed that this combi product was effective in controlling a wide spectrum of weeds, i.e. monocot and dicots.

**REFERENCES**


