Effect of weed management practices on weed dynamic, yield of isabgol (*Plantago ovata* Forsk) and germination of succeeding crop

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Abstract

A field experiment was carried out during rabi season of 2012-13 to study the effect of Integrated weed management in isabgol (*Plantago ovata* Forsk). Twelve treatments of weed control were evaluated in Randomized Block Design with three replications. Crop kept weed free (T\(_{12}\)) recorded the maximum seed (1225 kg ha\(^{-1}\)) and straw (2930 kg ha\(^{-1}\)) yields and were statistically just to similar with physical method i.e., interculturings followed by two hand weedings at 20 and 40 DAS (T\(_{10}\)) and integrated weed management practices i.e., oxadiargyl @ 100 g/ha at 15 DAS + interculturings followed by hand weeding at 30 DAS (T\(_{11}\)) but significantly higher over alone post-emergence application of oxyfluorfen (T\(_{1}\) and T\(_{2}\)) or oxadiargyl (T\(_{5}\) and T\(_{6}\)) or unweeded control (T\(_{12}\)). Further, in general, isoproturon as pre-emergences and oxadiargyl as post-emergences at various doses were more effective herbicide in isabgol than oxyfluorfen as post-emergence. Integrated approach of weed management were more effective than alone use of physical and chemical methods. Moreover, herbicides used in experiment have no any harmful residual effect on germination of succeeding green gram crop.

Key words: Germination, herbicide, interculturing, isabgol and weed

Introduction

The name Isabgol (*Plantago ovata* Forsk) derived from two Persian words “Isab”and “Ghol” meaning horse’s ear is one of the important medicinal plants, known to be grown during rabi season and introduced into India during Muslim settlement in middle ages. The seed of isabgol are mainly valued for their mucilaginous rosy white husk (24.26%) an economical product. In addition to medicinal uses, it has a place in dyeing, printing, ice-cream, confectionary and cosmetic industries. In India, isabgol is cultivated on commercially in Gujarat, Rajasthan, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh and Bihar. Isabgol is a late rabi cash crop. Due to lower production cost and higher market price it is, as known as low volume but high value crop. Initial slow growth rate of isabgol may pose sever, weed problem during early stage which is responsible up to 50 per cent loss in yield. During recent past, fast development in industries and infrastructure sectors which reduced labour availability in agriculture and also increased labour wages. In these circumstances, it is quite difficult to control weeds in time by hand weeding which reduced yield and quality of produce also. Integrated weed management approach involving the physical and chemical weed control techniques, achieve complete, long and effective control of weeds during crop season. Keeping this in view, the present experiment was planned as per the methods below.

Materials and methods

The field experiment consisting of twelve treatments of weed control i.e.,T\(_{1}\): oxyfluorfen @ 50 g/ha post-emergence at 20 DAS, T\(_{2}\): oxyfluorfen @ 50 g/ha at 15 DAS + interculturings followed by hand weeding at 30 DAS, T\(_{3}\): oxyfluorfen @ 75 g/ha post-emergence at 15 DAS + interculturings followed by hand weeding at 30 DAS, T\(_{4}\): oxyfluorfen @ 75 g/ha post-emergence at 15 DAS + interculturings followed by hand weeding at 30 DAS, T\(_{5}\): isoproturon @ 500 g/ha as pre-emergence, T\(_{6}\): oxadiargyl @ 80 g/ha at 20 DAS, T\(_{7}\): oxadiargyl @ 80 g/ha at 15 DAS + interculturings followed by hand weeding at 30 DAS, T\(_{8}\): oxadiargyl @ 100 g/ha at 20 DAS, T\(_{9}\): oxadiargyl @ 100 g/ha at 15 DAS + interculturings followed by hand weeding at 30 DAS, T\(_{10}\): interculturings followed by hand weedings at 20 and 40 DAS, T\(_{11}\): unweeded, T\(_{12}\): weed free evaluated in randomized block design with three replications was conducted at Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University,
Influence of integrated weed management on yield

Different integrated weed management practices (Table 1) recorded marked effect on yield of isabgol. The maximum seed and straw yield of 1225 and 2930 kg ha\(^{-1}\), respectively were found under treatment of weed free condition (T\(_{0}\)), followed by hand weedings at 20 and 40 DAS (T\(_{0}\)) over treatments T\(_{1}\), T\(_{2}\), T\(_{3}\), T\(_{4}\), T\(_{5}\), T\(_{6}\), T\(_{7}\), T\(_{8}\), T\(_{9}\) and T\(_{11}\), respectively. Effective removal of weeds throughout the crop growth period by physical and integrated weed control practices provided better space and resources i.e., moisture, nutrients, solar radiation etc., for crop plant which could be improved ultimately to higher yields. These findings corroborate the results reported by Patel et al., (8), Sharma and Jain (10), Kumawat et al., (5) and Sagarka et al., (9) as well as Yadav et al., (12) and Mehariya et al., (7) in case of cumin.


total weed count

A perusal of data (Table 2) showed that at 30 and 60 DAS as well as at harvest significantly the lowest total weed count was recorded under treatment T\(_{0}\), i.e., keeping weed free crop condition which was closely followed by adoption of interculturings done by hand weedicings at 20 and 40 DAS (T\(_{0}\)). During the periodical observations i.e., 30 and 60 DAS as well as at harvest, the maximum number of weeds i.e., 4.25, 4.76 and 6.23 at 30, 60 DAS and at harvest were recorded under unweeded crop conditions (T\(_{1}\)), respectively and was at par with treatments T\(_{2}\) and T\(_{3}\).

Among the different integrated weed management treatments, treatments T\(_{5}\), T\(_{7}\), and T\(_{4}\) were at par during all the periodical growth stages except at 60 DAS. During all the periodical growth stages, alone application of oxyfluorfen (T\(_{5}\) and T\(_{7}\)) as well as oxadiargyl (T\(_{4}\) and T\(_{3}\)) as post-emergences at different rates were not differed significantly with each other and recorded more number of weeds than integrated approach i.e., herbicides...
oxiﬂuorfen and oxadiargyl applied at varying rate as post-emergence with interculturing and hand weeding at 30 DAS i.e., T2, T4, T7, and T9. Application of oxiﬂuorfen as post-emergences at different rates (T1 and T3) recorded signiﬁcantly higher weed count over integrated approaches (T2, T4, T7, and T9) as well as alone pre-emergence application of isoproturon (T5). Thus, in general, isoproturon as pre-emergences and oxadiargyl as post-emergences at various doses were more effective herbicide in isabgol than oxiﬂuorfen as post-emergence. Integrated approach of weed management were more effective than alone use of physical and chemical methods. The lowest weed population was observed under weed free condition at any stage of crop growth due to complete elimination of weeds by hand weedicings as and when needed. In addition to this, dense crop canopy might have smothering effect on weeds. These ﬁndings are in close conformity with the Singh et al., (11), Patel et al., (8), Kumar (6), Yadav, et al., (12) in cumin and Kulmi and Dubey (4).

Dry weight of weeds at harvest

It is explicated from the data (Table 2) that signiﬁcantly low dry weight (0.0 kg ha\(^{-1}\)) of weeds was recorded when crop kept weed free (T11). Interculturings followed by hand weedicings at 20 and 40 DAS (T10) recorded lower dry weight of weeds and was at par with treatments T9, T7, T4, T5 and T12 but statistically higher over rest of the treatments. Signiﬁcantly the maximum dry weight of weeds i.e., 1702 kg/ha was recorded under unweeded ﬁeld (T11).

Weed control efﬁciency

Different integrated weed management treatments affected the weed control efﬁciency. Weed free crop condition (T12) recorded the highest weed control efﬁciency (100%) followed by treatments T10, T9, T7, T4 and T5. The minimum weed control efﬁciency was recorded with unweeded plot (T11) which was closely followed by alone post-emergences application of oxiﬂuorfen at different doses i.e., T1 and T3. In this way, dry weight of weeds (kg ha\(^{-1}\)) and weed control efﬁciency (%) were inversely proportional to each other. These ﬁndings are conﬁrmed to those reported by Patel et al., (8), Sharma and Jain (10) in isabgol and Yadav et al., (12) in case of cumin.

Weed index

The data on weed index (Table 2) showed that, weed index was 0.00% under weed free crop condition (T12) and closely followed by treatment T10 i.e., 11.18 per cent. The highest weed index i.e., 68.88 per cent was recorded under unweeded crop condition (T11). This might be due to poor crop yield. These ﬁndings are in agreement with results reported by Sharma and Jain (10).

Correlation studies

Yield is a complex quantitative character, which depends on different interrelated characters. These
Table 2: Weed population in isabgol field at initial and at harvest as influenced by different integrated weed management treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total weed count per m²</th>
<th>Weeds dry weight (kg ha⁻¹)</th>
<th>Weed control efficiency (%)</th>
<th>Weed index (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 DAS</td>
<td>60 DAS</td>
<td>At harvest</td>
<td></td>
</tr>
<tr>
<td>T₁: Oxyfluorfen @ 50 g/ha post-emergence at 20 DAS</td>
<td>3.70</td>
<td>4.54</td>
<td>5.53</td>
<td>1440</td>
</tr>
<tr>
<td>T₂: Oxyfluorfen @ 50 g/ha at 15 DAS + Interculturing followed by hand weeding at 30 DAS</td>
<td>2.57</td>
<td>3.23</td>
<td>3.57</td>
<td>950</td>
</tr>
<tr>
<td>T₃: Oxyfluorfen @ 75 g/ha post-emergence at 20 DAS</td>
<td>3.66</td>
<td>4.39</td>
<td>5.12</td>
<td>1400</td>
</tr>
<tr>
<td>T₄: Oxyfluorfen @ 75 g/ha post-emergence at 15 DAS + Interculturing followed by hand weeding at 30 DAS</td>
<td>2.39</td>
<td>2.98</td>
<td>3.23</td>
<td>865</td>
</tr>
<tr>
<td>T₅: Isoproturon @ 500 g/ha as pre-emergence</td>
<td>2.41</td>
<td>3.16</td>
<td>3.27</td>
<td>933</td>
</tr>
<tr>
<td>T₆: Oxadiargyl @ 80 g/ha at 20 DAS</td>
<td>2.95</td>
<td>3.43</td>
<td>4.20</td>
<td>1000</td>
</tr>
<tr>
<td>T₇: Oxadiargyl @ 80 g/ha at 15 DAS + Interculturing followed by hand weeding at 30 DAS</td>
<td>2.33</td>
<td>2.65</td>
<td>2.94</td>
<td>830</td>
</tr>
<tr>
<td>T₈: Oxadiargyl @ 100 g/ha at 20 DAS</td>
<td>2.84</td>
<td>3.37</td>
<td>3.60</td>
<td>980</td>
</tr>
<tr>
<td>T₉: Oxadiargyl @ 100 g/ha at 15 DAS + Interculturing followed by hand weeding at 30 DAS</td>
<td>2.30</td>
<td>2.62</td>
<td>2.76</td>
<td>777</td>
</tr>
<tr>
<td>T₁₀: Interculturing followed by hand weeding at 20 and 40 DAS</td>
<td>2.03</td>
<td>2.31</td>
<td>2.53</td>
<td>725</td>
</tr>
<tr>
<td>T₁₁: Un weeded</td>
<td>4.25</td>
<td>4.76</td>
<td>6.23</td>
<td>1702</td>
</tr>
<tr>
<td>T₁₂: Weed free</td>
<td>0.71</td>
<td>0.71</td>
<td>0.71</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: Original data given in parentheses were subjected to square root transformation \((\sqrt{x} + 0.5)\) before analysis.
components may show varying degree of association, either favourable or unfavourable. Hence, in order to attain rational improvement in yield, the extent of relationship between the seed and straw yield (kg ha\(^{-1}\)) as well as weed biomass were studied. It was noticed that straw yield (kg ha\(^{-1}\)), total weed count m\(^{-2}\) at harvest and dry weight of weeds (kg ha\(^{-1}\)) showed positive significant correlation with seed yield (Table 3).

**Germination percentage**

The results presented in fig. 1 indicated that the effect of different integrated weed management treatments on germination percentage of succeeding crop (Green gram) was not observed. There was no any harmful or beneficial effect of various herbicides i.e., oxadiargyl, oxyfluorfen and isoproturon on germination of succeeding green gram crop. Thus, herbicides used in experiment have no any harmful residual effect on germination of succeeding green gram crop. Similar results were also observed by Kulmi (3).

### Conclusion

In view of the results obtained from the investigation, it is concluded that the most appropriate weed management strategy for getting higher yields and effective weed control in isabgol on loamy sand soil of North Gujarat was obtained by performing two interculturings followed by hand weeding at 20 and 40 DAS. Under unavailability of labour during peak period, higher production can be achieved by adopting integrated weed management practices i.e., post-emergence application of oxadiargyl @ 100 g/ha at 15 DAS with interculturing followed by hand weeding at 30 DAS, without causing any harmful residual effect on germination of succeeding crop.

### References


