DEVELOPMENT OF ECONOMIC WEED MANAGEMENT STRATEGIES FOR MUNGBEAN (Vigna radiata L. Wilczek)

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Abstract

Mungbean (Vigna radiata L. Wilczek) is emerging to be an important crop in Pakistan. The crop is susceptible to weeds, which reduce the yield and quality of the crop. The objective of the study was to evaluate the effect of different weed management strategies on the growth and yield of mungbean. The study was conducted in the field condition at the experimental farm of the Pakistan Agricultural Research Institute. The treatments included hand weeding, chemical weeding, and a combination of both. The results showed that chemical weeding was more effective in controlling weeds and increasing the yield of mungbean. The study also recommended the use of crop rotation and diverse crop varieties to manage weeds effectively. The study concluded that a combination of cultural and chemical methods is required to manage weeds effectively in mungbean.

Introduction

Mungbean (Vigna radiata L. Wilczek) is a leguminous crop grown for its seeds and leafy green parts. It is widely grown in Pakistan and other countries in Asia. The crop is susceptible to weeds, which reduce the yield and quality of the crop. The problem of weed infestation is increasing due to the use of high-yielding varieties, the adoption of monoculture, and the decrease in the use of chemical weedicides.

The weed management practices used in mungbean production include hoeing, hand weeding, and chemical weeding. Chemical weeding is more effective in controlling weeds but is expensive and may cause environmental pollution.

Methods

The experiment was conducted at the experimental farm of the Pakistan Agricultural Research Institute. The treatments included hand weeding, chemical weeding, and a combination of both. The chemical weedicides used were paraquat, glyphosate, and 2,4-D. The experiment was conducted in a randomized complete block design with three replications.

Results

The results showed that chemical weeding was more effective in controlling weeds and increasing the yield of mungbean. The yield of mungbean was significantly higher in the chemical weeding treatments compared to the hand weeding treatment.

Conclusion

The study recommended the use of chemical weedicides and crop rotation to control weeds effectively in mungbean. The use of diverse crop varieties and proper crop management practices is also recommended to manage weeds effectively in mungbean.
MATHILDE MAISONGOU ET AL. — DEVELOPMENT OF ECONOMICAL WOOD

Materials and Methods

Experiments were carried out in a R.F.D. with four replications. Kupang 7 was
sown in furrows spaced 20 cm apart and row-to-row spacing 100 cm. The
sowing rate was 100 seeds per kg. Fertilizer was applied at the rate of
8 kg/ha of N, 4 kg/ha of P2O5 and 4 kg/ha of K2O. Wood management
was done after 45 days emergence, using a needle tool. Weeds were
controlled using a mixture of herbicides 4 days after sowing.

The experiments were started on May 10th, 1988. The same treatments
were repeated at the second harvest. The statistical analysis of the
experiments was done following the methods described by Steel and
Torrie (1980).

Results and Discussion

Wood density 20 days after sowing

Wood density (%)

Steel and Torrie (1980) evaluated similar results that extract significant
differences between the
Fresh Weed Biomass (g m⁻²)

Analysis of the data showed that all the weed control treatments had significant effect on fresh weed biomass. The lowest fresh weight of weeds 7.56 and 7.69 g m⁻² were recorded in plots sprayed with Acacia and Sorghum water extracts, respectively. The highest fresh weed biomass (10.79 g m⁻²) was noted in control treatment. Cheema et al. (2002) reported that sorghum water extract application reduced fresh weight of weeds by 48%.

Dry weed Biomass (g m⁻²)

The analyzed data of dry weed biomass revealed that the differences between dry weeds biomass of weed management strategies and check treatment were significant, which means that weed control treatments significantly reduced the dry weight of weeds. The lowest dry weeds weight of 3.61 g m⁻² was recorded in plots sprayed with Acacia water extract followed by 4.48 and 4.51 g m⁻² in the plots which were sprayed with Sorghum water extract and pre-emergence herbicide + Two hand weeding, respectively. Cheema et al. (2002) also reported that extract application reduced dry weight of weed by 50%.

Table 1. Weed parameters as affected by various weed management strategies

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed density m⁻²</th>
<th>Fresh Weed biomass (gm⁻²)</th>
<th>Dry Weed biomass (gm⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 DAS</td>
<td>45 DAS</td>
<td>20 DAS</td>
</tr>
<tr>
<td>Control</td>
<td>7.93 a</td>
<td>16.59 a</td>
<td>10.97 a</td>
</tr>
<tr>
<td>Pre-emergence herbicide</td>
<td>5.19 b</td>
<td>8.61 b</td>
<td>9.04 b</td>
</tr>
<tr>
<td>Hand weeding</td>
<td>4.45 c</td>
<td>5.91 d</td>
<td>8.12 c</td>
</tr>
<tr>
<td>Pre-emergence + Hand weeding</td>
<td>4.39 c</td>
<td>4.85 c</td>
<td>7.97 cd</td>
</tr>
<tr>
<td>Sorghum extract</td>
<td>4.15 cd</td>
<td>4.35 ef</td>
<td>7.69 d</td>
</tr>
<tr>
<td>Eucalyptus extract</td>
<td>4.46 c</td>
<td>7.08 c</td>
<td>8.37 c</td>
</tr>
<tr>
<td>Acacia extract</td>
<td>4.05 d</td>
<td>4.04 f</td>
<td>7.56 d</td>
</tr>
<tr>
<td>LSD₀.₀₅</td>
<td>0.312</td>
<td>0.504</td>
<td>0.415</td>
</tr>
<tr>
<td>CV%</td>
<td>4.25</td>
<td>4.16</td>
<td>3.28</td>
</tr>
</tbody>
</table>

Means sharing common letter are not significantly different at alpha = 0.05.

Weed data 45 days after sowing

Weed density m⁻²

The performance of Acacia water extract application was the best amongst all weed management strategies in controlling the weed population, with the value of 4.04 weed m⁻². Sorghum water extract application has very close results with 4.35 weed m⁻². The control treatment had the highest weed density (16.59). Similar results were obtained by Cheema et al. (2003) who noted that extract application gave better weed control. Khan et al. (2004a &b) have also reported the inhibitory effect of tree extracts on the germination of weeds of wheat crop.
Fresh Weed Biomass (g m$^{-2}$)

The analyzed data of Fresh weed biomass at 45 days after sowing of mungbean revealed that all the weed management strategies had significant effect on the fresh weight of weeds. The lowest fresh weed weight of 5.46 g m$^{-2}$ was recorded in plots sprayed with Acacia water extract followed by 6.25 g m$^{-2}$ in the plot which had been sprayed with the Sorghum water extract. Among all the treatments, the highest fresh weed weight of 19.60 g m$^{-2}$ was noted in control treatment. Similar results was obtained by Bhatti et al. (2000) with the application of water extract in other crops. Khan et al. (2004 a&b) have reported the inhibitory effect of tree species on associated weeds of wheat crop.

Dry weed Biomass (g m$^{-2}$)

The statistical analysis of the data showed that all the weed control treatments had significant effect on dry weeds weight. The differences between dry weed weights of weed management treatments and control plots were significant. Three treatments i.e. Application of Acacia, sorghum water extracts and treatment with two grass weeding + Pre-emergence herbicide were statistically at par with 4.09, 4.34 and 4.48 g m$^{-2}$. While the highest dry weed biomass (16.58 g m$^{-2}$) was noted in control treatment. Water extracts resulted in reduction of weed biomass in the presence of either phytotoxic or allelopathic compounds. The results may have value in enabling weed control based on natural plant extracts. Similar results were obtained by Cheema et al (2002) who reported reduction of dry weed biomass in treatments where water extracts were applied.

Table-2. Mungbean yield parameters as affected by weed management strategies

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No of branches plant$^1$</th>
<th>No of pods plant$^1$</th>
<th>1000 grain weight (g)</th>
<th>Grain yield (kg ha$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>4.13 d</td>
<td>34.03 c</td>
<td>42.78 a</td>
<td>720 e</td>
</tr>
<tr>
<td>Pre-emergence herbicide</td>
<td>4.33 d</td>
<td>38.00 bc</td>
<td>38.31 b</td>
<td>1103 c</td>
</tr>
<tr>
<td>Hand weeding</td>
<td>4.70 c</td>
<td>41.18 b</td>
<td>39.92 ab</td>
<td>1125 bc</td>
</tr>
<tr>
<td>Pre-em+Hand weeding</td>
<td>5.16 a</td>
<td>55.69 a</td>
<td>37.68 b</td>
<td>1221 a</td>
</tr>
<tr>
<td>Sorghum extract</td>
<td>5.03 ab</td>
<td>42.64 b</td>
<td>38.25 b</td>
<td>1174 ab</td>
</tr>
<tr>
<td>Eucalyptus extract</td>
<td>4.90 bc</td>
<td>39.90 bc</td>
<td>38.74 ab</td>
<td>1135 bc</td>
</tr>
<tr>
<td>Acacia extract</td>
<td>5.23 a</td>
<td>58.46 a</td>
<td>37.86 b</td>
<td>1228 a</td>
</tr>
<tr>
<td>LSD ($^{0.05}$)</td>
<td>0.23</td>
<td>6.27</td>
<td>4.37</td>
<td>62.50</td>
</tr>
<tr>
<td>CV%</td>
<td>3.10</td>
<td>9.24</td>
<td>7.29</td>
<td>3.71</td>
</tr>
</tbody>
</table>

Means sharing common letter are not significantly different at alpha = 0.05.

**Number of branches plant$^1$**

The perusal of Table-2 indicated that weed management strategies significantly differed ($P=0.05$) in affecting branches plant$^1$. The number of branches plant$^1$ ranged from 4.58 to 6.53. The highest number of branches plant$^1$ (6.53) were recorded when Acacia extract was applied followed by pre-emergence herbicide + two hand weeding and Sorghum water extract application ($6.19$ and $6.01$, respectively). The lowest branches (4.58) were obtained in control plots which were significantly less than all the weed management strategies. Similar results were reported by Cheema et al. (2001) they reported that with the application of water extracts number of branches were increased.
Number of Pods plant$^{-1}$

Data regarding number of pods plant$^{-1}$ on given in Table-2 were found significantly different. Number of pods plant$^{-1}$ ranged from 40.83 to 66.10. The highest number (66.10) of pods plant$^{-1}$ were counted in the Acacia extract application followed by Pre-emergence herbicide + two hand weeding giving 62.60 pods plant$^{-1}$. The lowest pods (40.83) were obtained in control treatment. Cheema et al. (2001) also reported the increase in number of pods plant$^{-1}$ with application of water extracts.

1000 grain weight (g)

Data regarding 1000 grain weight as affected by different weed management strategies was non-significant at $P=0.05$, and ranged from 39.22 to 43.28 g. The highest value (43.28 g) was observed in control treatment followed by hand weeding treatment (41.80 g), while the lowest value (39.22 g) was recorded in Pre-emergence herbicide + Two hand weeding treatment.

Grain Yield kg ha$^{-1}$

The data given in Table-2 shows that grain yield was significantly affected by various weed management strategies applied for weed control. It ranged from 750 to 1266 kg ha$^{-1}$. The highest grain yield (1266) was recorded in Acacia extract application treatment closely followed by Pre-emergence herbicide + Two hand weeding treatment with grain yield of 1253 kg ha$^{-1}$ was obtained. While the lowest yield (750 kg ha$^{-1}$) was obtained in control treatment. Ali et al. (2004) reported similar results that water extract application increased the grain yield of crops.

REFERENCES CITED


