Influence of tillage and residue management practices on weeds in rice-wheat cropping system

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Losses caused by weeds

• World food losses due to weeds
  – 11.5% of total food production

(Parker and Fryer, 1975)

• Annual loss by weeds in India
  – 1/3rd of total loss caused by pests

(Mukhopadhyay, 1993)
Worldwide losses caused by weeds in six major crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Attainable production (M t)</th>
<th>% Losses caused by weeds</th>
<th>% Total losses by all pests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Potential</td>
<td>Actual</td>
</tr>
<tr>
<td>Wheat</td>
<td>785.0</td>
<td>23.0(18-29)</td>
<td>7.7(3-13)</td>
</tr>
<tr>
<td>Maize</td>
<td>890.8</td>
<td>40.3(37-44)</td>
<td>10.5(5-19)</td>
</tr>
<tr>
<td>Rice</td>
<td>933.1</td>
<td>37.1(34-47)</td>
<td>10.2(6-16)</td>
</tr>
<tr>
<td>Potatoes</td>
<td>517.7</td>
<td>30.2(29-33)</td>
<td>8.3(4-14)</td>
</tr>
<tr>
<td>Soybeans</td>
<td>244.8</td>
<td>37.0(35-40)</td>
<td>7.5(5-16)</td>
</tr>
<tr>
<td>Cotton</td>
<td>78.5</td>
<td>35.9(35-39)</td>
<td>8.6(3-13)</td>
</tr>
</tbody>
</table>

(Oerke, 2006)
Chemical weed control preferred

- Economical and quick
- Eliminates early crop-weed competition
- Effectively controls morphologically similar weeds
- Effective on inter and intra row weeds
Herbicide usage made no-till system successful
Weed flora shift in NT
Emerging weeds in wheat in ZT

*Malva parviflora*  *Rumex retroflex*
TILLAGE AND HERBICIDE IN WHEAT PRODUCTIVITY

![Bar chart showing yield comparison between herbicide weeded and weedy check conditions for conventional and zero tillage methods.](chart.png)
Effect of tillage options on *P. minor* biomass
Rice yield under various tillage options

Yield, q/ha

Zero Tillage
Conventional Tillage
Rotary Tillage

Tillage in Rice

ZT
Dry Rotary
Wet Rotary
Wheat yield under various tillage options
Effect of various tillage options in rice-wheat system on *Polypogon monsplensis* density.
Residue Management Practices

- Removal
- Burning
- Incorporation
- Retention
Herbicide selection affects herbicide efficacy.
Presence of ash affect herbicide efficacy

- Pendimethalin
  - 500 g/ha
  - 1000 g/ha
- Isoproturon
  - 250 g/ha
  - 500 g/ha
Effect of ash on herbicide efficacy

- Control
- Pendimethalin 1000 g/ha
- Pendimethalin 500 g/ha

Soil: Ash (1:0)
Soil: Ash (6:1)
Effect of ash on herbicide efficacy against *P. minor*

![Bar chart showing mortality percentage for different ash and herbicide combinations](chart.png)
Conservation Agriculture- triple no-till system
Wheat yield under residue management over years
Effect of various tillage options in rice-wheat system on *Polypogon monsplensis* density

![Bar chart showing the effect of various tillage options on *Polypogon monsplensis* density. The x-axis represents nitrogen levels in kg/ha (100, 150, 200), and the y-axis represents weed number per sq.m. The chart includes bars for Removal RW, Burning R, Burning RW, Incorporation R, Incorporation RW, Retention R, and Retention RW.](chart.jpg)
Effect of nitrogen and residue management options on *Eragrostis japonica* density

![Bar chart showing the effect of nitrogen levels on weed density](chart.png)
Residue cover effect on weed biomass in wheat

![Graph showing the effect of residue cover on weed biomass in wheat. The x-axis represents residue t/ha (0, 2, 4, 6, 8), and the y-axis represents weed biomass g m⁻² (0, 50, 100, 150, 200). The graph shows a decrease in weed biomass as the residue t/ha increases.]
Effect of residue retention on *P. minor* dry wt.
Effect of residue retention and herbicide on weeds in wheat under rice-wheat system

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed dry weight, g/m²</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P. minor</td>
<td>Medicago denticulata</td>
</tr>
<tr>
<td>ZT + residue removal</td>
<td>291</td>
<td>215.1</td>
</tr>
<tr>
<td>ZT +2.5 t/ha residue</td>
<td>304.6</td>
<td>175.4</td>
</tr>
<tr>
<td>ZT +5.0 t/ha residue</td>
<td>214.8</td>
<td>130.1</td>
</tr>
<tr>
<td>ZT+ 7.5 t/ha residue</td>
<td>190.9</td>
<td>123.4</td>
</tr>
<tr>
<td>ZT with sulfosulfuron + metsulfuron at 25+3 g/ha</td>
<td>2.9</td>
<td>0</td>
</tr>
<tr>
<td>CT without herbicide and residue</td>
<td>466.7</td>
<td>44.6</td>
</tr>
<tr>
<td>CT with sulfosulfuron + metsulfuron at 25+3 g/ha</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>83.5</td>
<td>52.5</td>
</tr>
</tbody>
</table>
Residue and irrigation in wheat productivity

![Graph showing yield variations with different irrigation regimes and residue removal levels.]
Effect of residue and irrigation on CATD

CATD, degree celcius

Removal
2t/ha
4t/ha
6t/ha

Irrigation Treatments

CATD, degree celcius

Removal
2t/ha
4t/ha
6t/ha

Irrigation Treatments
A day after heavy rain

CA Field

Non-CA Field
Effect of residue management on soil organic carbon
Thanks