MANAGEMENT OF RICE YELLOW STEM BORER \((SCIRPOPHAGA INCERTULAS \text{ WALKER})\) THROUGH TRAP CROPPING

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INTRODUCTION

Trap cropping is a very useful and healthy pest control tactic that complies with the concepts of agro-ecological crop protection or ecological engineering for pest management (Hokkanen, 1991). The deployment of trap crops for pest control had been very effective in some agricultural crops (Martin and Woodcock, 1983). Rice is one of the most important and extensively grown foods in the tropical and subtropical regions of the world (Saxena and Shrivastava, 2007). About 25-30\% reduction in yield of rice had been calculated caused by Yellow stem borer (YSB) \(S. \text{ incertulas}\). It is a very dominating and destructive pest species of rice and distributed throughout India and regarded (Mahar et al., 1985). The yellow stem borer (YSB) \(S. \text{ incertulas}\) causes 27.34\% loss annually (Pasulu et al., 2002) in rice production. From the dark history of yellow stem borer (YSB) \(S. \text{ incertulas}\) attack in India, it has assumed status as national pest (Pasalu et al., 2002). In Eastern Uttar Pradesh, the insects like brown planthopper and stem borer are a permanent threat to rice cultivation (Khan and Mishra, 2003). Trap plants attract the pests and consequently divert them away from the main crops (Shelton & Badenes-Perez, 2006). Yellow stem borer larvae feed only on rice plants. So only a rice plant such as Pusa Basmati 1 and TN1 are chosen as trap crops, both being highly susceptible to the stem borer. The trap crop should reach booting stage 6-7 days before the main crop. It can protect the main crop without much economic loss. The yield trap crop would be of an added advantage (DRR, 2009, 2010 and 2011). It can be used as an eco-friendly pest management strategy to control YSB. Despite the regular use of chemicals insecticides as a control measure, pest damage remains on an incredible level. Hence present study was undertaken to know the impact of trap crop against yellow stem borer in rice crop.

MATERIALS AND METHODS

In order to ascertain the influence of trap crop on the incidence of yellow stem borer (\(SCIRPOPHAGA INCERTULAS \text{ WALKER})\) of rice. A field trial was conducted at research farm, R.A.U., Pusa, Samastipur, Bihar during Kharif, 2010 and Kharif, 2011 with following treatments.

Treatments

\(\begin{align*}
T1 & : \text{Main crop with trap crop (9:1).} \\
T2 & : \text{Main crop with trap crop (9:1) with application of carbofuran (3G) @ 1.1kg a.i./ha in nursery.} \\
T3 & : \text{Main crop with trap crop (9:1) with application of carbofuran (3G) @ 1.1kg a.i./ha in nursery and monocrotophos (36SL) @ 1390ml/ha at 25DAT.} \\
T4 & : \text{Main crop with application of carbofuran (3G) @ 1.1kg a.i./ha in}
\end{align*}\)

ABSTRACT

The current effort revealed pioneering role of trap crop in rice to reduce the harm caused by yellow stem borer. The combination treatment of major crop with trap crop and application of carbofuran 3G plus monocrotophos 36SL was found superior over all other treatments (7.41\% DH, 7.84\% DH and 7.70\% WEH) at 30, 50 and 90 DAT. Moreover, the maximum net advantage over the control has been observing in combination treatment of main crop with trap crop as well as the application of carbofuran 3G and monocrotophos 36SL (Rs. 41,298). The highest cost benefit ratio has been obtained by combination treatment of main crop with trap crop (1:35.80) followed by combination treatment of main crop with trap crop and application of carbofuran 3G (1:9.03) during both the years of observation. From the experiment it was concluded that the trapcrop and need based use of insecticide in rice produce less incidence of yellow stem borer, high yielding and eco-friendly manor of pest control.

KEY WORDS

Rice, 
\(SCIRPOPHAGA INCERTULAS\), Trap crop, Yellow stem borer

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nursery and monocrotrophos (36SL) @ 1390ml/ha at 25DAT. T5: Main crop alone (Control).

Rajendra Kasturi was used as main crop while Pusa Basmati-1 was used as trap crop, which attracts for oviposition of yellow stem borer moths more than other non-aromatic varieties. This phenomenon was utilized to divert the pest from main crop and to reduce the damage. The sowing time of the trap crop was adjusted such that trap crop flowered one week before the flowering of main crop. For every 2.5-3.0 m of main crop one row of Pusa Basmati 1 as trap crop (Kumari and Pasalu, 2003) should be planted preferably in east-west direction. All the recommended agronomic practices were observed. Five treatments were taken for the investigation. Each treatment was replicated four times in randomized block design.

**Deadheart and white earhead**

Observation of insect pest infestation were recorded from randomly selected ten hills from each replication of each treatment of the investigation at 30DAT, 50DAT and 90DAT. Finally, worked out data converted into percentage of deadheart and percentage of white earhead with the help of following formulas described by Singha and Pandey (1997).

\[
\% \text{ Deadheart} = \frac{\text{Total number of deadhearts}}{\text{Total number of tillers}} \times 100
\]

\[
\% \text{ White earhead} = \frac{\text{Totalnumber of white earheads}}{\text{Totalnumber of tillers}} \times 100
\]

The infestation and yield data transformed by using appropriate transformation and subjected to statistical analysis.

### RESULTS AND DISCUSSION

**Deadheart**

Pooped data of *kharif*, 2010 and *kharif*, 2011 (Table 1) revealed that all the treatments were found significantly superior over untreated control with regard to per cent dead heart infestation caused by rice yellow stem borer at 30DAT to the level of 7.41 to 24.46 per cent with minimum and maximum being in treatment T3 and untreated control, respectively. However, treatment T1 was found superior to all other treatments while treatment T4 (9.09% DH) was at par with treatment T2 (9.23% DH) followed by treatment T1 (22.36% DH). The data pertaining to the mean percentage of deadheart (Table 1 and Fig. 1) showed the same trend.

**White earhead**

It is evident from the data presented in Table 1 that during *kharif*, 2010 and *kharif*, 2011 all the treatments were found significantly superior over untreated control in respect to per cent white earhead infestation caused by rice yellow stem borer at 90DAT, which varied from 7.70 to 23.95 per cent with minimum and maximum being in treatment T3 and untreated control, respectively. However, treatment T3 was found superior to all other treatments while treatment T4 (9.22% WEH) was found at par with treatment T2 (9.66% WEH) followed by treatment T1 (17.41% WEH).

**Yield (q/ha)**

The pooled mean yield production varied from 42.91 to 62.35 q/ha with maximum and minimum being in treatment T3 and untreated control, respectively. Treatment T4 (60.48 q/ha) was found at par with treatment T2 (59.71 q/ha) followed by treatment T1 (52.22 q/ha).

**Economics**

Pooped of *kharif*, 2010 and *kharif*, 2011 (Table 2) revealed that the maximum gross income over the control was found in treatment T3 (Rs. 48,600) followed by treatment T4 (Rs. 43,925), treatment T2 (Rs. 42,000) and treatment T1 (Rs. 37,275). Whereas, net profit over control did not get affected due to high selling price of rice cv. Rajendra Kasturi (Rs. 2500/q) as the cost of these treatments ranged from Rs. 22,625 to 41,298. However, the maximum net profit over the control was estimated with treatment T3 (Rs. 41,298) followed by treatment T2 (Rs. 37,350), treatment T4 (Rs. 37,273) and treatment T1 (Rs. 22,625). However, the maximum cost benefit ratio was obtained with treatment T1 (1:35.80) followed by treatment T2 (1:35.80), treatment T3 (1:6.65) and treatment T4 (1:6.60). The findings of the present investigation are in close agreement with the reports of DRR (2009), DRR (2010) and DRR (2011) which enforced that deadheart and white ear infestation by stem borer were significantly lower in main treatment where trap crop Pusa Basmati 1 was grown along with main crop. The total grain yield was higher in treatment of main crop with trap crop Pusa Basmati 1 was grown along with main crop. The total grain yield was higher in treatment of main crop with trap crop as compared to main crop only. In case of lepidopteran pests the planting of trap crop show effective attractant to lay their eggs and feeding (Potting et al., 2005).

### Table 1: Management of rice yellow stem borer (*Scirrhophaga incertulas*) in rice cv. Rajendra Kasturi through trap crop (Pusa Basmati 1) application (pooled mean of *kharif*, 2010 and *kharif*, 2011)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Deadheart(%)</th>
<th>White earhead(%)</th>
<th>Grain Yield(q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>18.28</td>
<td>17.41</td>
<td>52.22</td>
</tr>
<tr>
<td>T2</td>
<td>8.92</td>
<td>9.66</td>
<td>59.71</td>
</tr>
<tr>
<td>T3</td>
<td>7.41</td>
<td>7.70</td>
<td>62.35</td>
</tr>
<tr>
<td>T4</td>
<td>8.35</td>
<td>9.22</td>
<td>60.48</td>
</tr>
<tr>
<td>T5</td>
<td>24.46</td>
<td>23.95</td>
<td>42.91</td>
</tr>
<tr>
<td>CD (P = 0.05)</td>
<td>0.726</td>
<td>1.204</td>
<td>1.226</td>
</tr>
<tr>
<td>SEM (±)</td>
<td>0.233</td>
<td>0.386</td>
<td>0.394</td>
</tr>
</tbody>
</table>

*Values in parenthesis are % increase/decrease over the control.*
Crop infestation by these lepidopteron pests has been successfully managed in okra by using pigeon pea as a trap crop (Virk et al., 2004; Youm et al., 2005). However, research during previous years added a conceivable option for rice pest and disease management through the use of biocontrol agents (Mina et al., 2013; Gade, 2013; Ramteke et al., 2011 and Balai et al., 2013). Therefore, to minimise the health problem occurring through continuous use of high dose of pesticides and to keep our environment healthy, it is quite necessary to replace the application of synthetic chemical insecticides by trap crops or trap crop with insecticide combinations. Trap crops or trap crop with insecticide combinations are safe and successful management of yellow stem borer in paddy field.

**REFERENCES**


**Table 2: Economics of management of rice yellow stem borer (Scirpophaga incertulas) in rice cv. Rajendra Kasturi through trap crop (Pusa Basmati 1) application (pooled mean of kharif, 2010 and kharif, 2011)**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Additional yield over control (Rs./ha)</th>
<th>Price of additional yield over control (Rs./ha)</th>
<th>Cost of treatment over control (Rs./ha)</th>
<th>Net profit/loss over control (Rs./ha)</th>
<th>ICBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>9.31</td>
<td>23275</td>
<td>650</td>
<td>23625</td>
<td>1:35.80</td>
</tr>
<tr>
<td>T2</td>
<td>16.80</td>
<td>42000</td>
<td>4650</td>
<td>37350</td>
<td>1:9.03</td>
</tr>
<tr>
<td>T3</td>
<td>19.44</td>
<td>48600</td>
<td>7302</td>
<td>41928</td>
<td>1:16.65</td>
</tr>
<tr>
<td>T4</td>
<td>17.57</td>
<td>43925</td>
<td>6652</td>
<td>37273</td>
<td>1:6.65</td>
</tr>
<tr>
<td>T5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Price rate: Rajendra Kasturi (@Rs.2500/q), Pusa Basmati 1 (@Rs.100/kg seed), Carbofuran 3G (@Rs.105/kg), Monocrotophos 36SL (@Rs.900/lit.) and Man power (@Rs.150/man day)