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CONTROL STRATEGY FOR RICE STEM BORER IN WHEAT CROP BY THE MANAGEMENT OF RICE STRAW

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ABSTRACT

Wheat is an important economic crop and major staple food all over the world including Pakistan. Among rice pests, the rice pink stem borer (*Sesamia inferens* Walker) has been reported on wheat crop for the last many years resulting in whiteheads in the wheat crop. This study was planned to determine the effect of rice straw management on the incidence of *S. inferens* on wheat crop in the rice-wheat cropping pattern of Multan, Punjab. There were five treatments including wheat sowing on non-rice field, zero tillage after burning rice stubbles, zero tillage without burning rice stubbles, rotavator after burning rice stubbles, and rotavator without burning rice stubbles. The results revealed that the maximum number of tillers/m² (708) was produced in zero tillage after burning rice stubbles. The maximum incidence (1.75%) of *S. inferens* was observed in zero tillage without burning rice stubbles. In conclusion, the appropriate management of rice stubbles has an important role in the management of *S. inferens* in the wheat crop. The results proved that using a rotavator as a tillage tool before the sowing of the wheat crop has remarkably reduced the incidence of *S. inferens*. The burning of stubbles was statistically at par with zero tillage with the highest infestation and environmentally hazardous. Therefore, the destruction of rice stubbles through rotavator is the most effective tool against *S. inferens*.

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INTRODUCTION

Wheat is the major staple food of Pakistan and Punjab province contributes 70-75% of the total wheat consumption of Pakistan (Mudasser et al., 2001). Wheat in the canal irrigated areas is mostly followed by rice crops. Many insect pests and diseases are major constraints in limiting the wheat yield including termites, aphid, and pink stem borer (Dhaliwal et al., 2010). A higher population of pink rice borer has been reported from the wheat sown under zero tillage system after rice crop (Singh et al., 2014). Change in tillage system is supporting rice pink stem borer (*Sesamia inferens*) incidence in wheat crop. Severe damage has

been reported in wheat crops due to this new emerging pest. Dead hearts in tillering stage and white heads on the booting stage appeared due to the attack of *S. inferens*, whose larvae feed inside of wheat's stem (Singh, 2012). The pink stem borer an important insect pest of sugarcane has now shifted its infestation to rice and other crops (Li et al., 2011). *S. inferens* have been reported from sorghum, millet, sugarcane, rice, barley, wheat, and some other grasses (Sidar et al., 2017). The insect lays eggs in clusters and is found in between sheath and leaf whorl. Larvae enter the stem soft cells and feed inside until pupation causing dead hearts or white ears (Reddy et al., 2003).

Management of *S. inferens* includes the rice straw management before sowing of crop and field sanitation (Prasad and Babu, 2016). Destruction of stubbles and weeds after the crop harvest is the most effective for managing *S. inferens* in wheat field followed by rice crop. Late sown rice crops are more damaged by *S. inferens*, resulting in minimum time for stubble management and so affecting the wheat crop. Destruction of stubbles was practiced by burning of remaining rice straw in the field which is strictly prohibited by Government of Pakistan and Punjab simultaneously to avoid the smog in areas. It is important to beat climate change and manage the economic pests at the same time. This study was planned to observe the role of tillage conditions for sowing of wheat crops and the incidence of *Sesamia inferens*.

MATERIALS AND METHODS

The extensive survey was conducted in different rice-growing areas of district Multan based on the *S. inferens* incidence history from the previous year rice crop in October 2021. A farmer of 100 acre rice crop was selected from tehsil Multan to conduct the experiment. Different tillage conditions were selected for wheat (Akbar-2019) sowing. Detail of treatments is given below;

T₁ = Wheat sowing on non-rice filed

T₂ = Zero tillage after burning rice stubbles

T₃ = Zero Tillage without burning rice stubbles

T₄ = Rotavator after burning rice stubbles

T₅ = Rotavator without burning rice stubbles

Farmer has sown each 20 acre of wheat according to 4 different tillage conditions (T₂ to T₅) and the adjacent farmer was also motivated to sow the same wheat variety on same date after cotton crop (T₁). Wheat crop

was sown on 15th of October 2021 and seed rate was maintained 50 kg/acre. All the cultural practices were applied at the same rate except the tillage conditions before sowing of wheat crop. The weekly survey was conducted to observe the incidence of *S. inferens*. After first reported incidence on 12th of February 2022, the research plan was executed on 1st of March 2022. The data were recorded from 10 randomly selected wheat fields (replications) according to pest scouting methods described by Pest Warning & Quality of Pesticides, Punjab. The data were recorded regarding total number of tillers/m² and number of affected or dry tillers/m². Some larvae were also collected after dissection the stems for confirmation of species and preserved in 10% alcohol solution.

The collected data were maintained in Microsoft excel sheets and the percent damage was calculated. The data were subjected to statistical analysis through randomized completed block design using Statistix 8.1 analytical software. The means were compared using LSD test ($\alpha = 0.5$).

RESULTS AND DISCUSSION

The results regarding the management of *S. inferens* in wheat crop through altering the tillage conditions are presented and discussed below;

Number of tillers

Tillage condition has imposed no significant effects on the number of tillers per meter square as shown in figure 1. Maximum numbers of tillers/m² (708) were observed in wheat sown through zero tillage after burning rice stubbles (T₂) and minimum (667) were observed in wheat sown on non-rice filed (T₁).

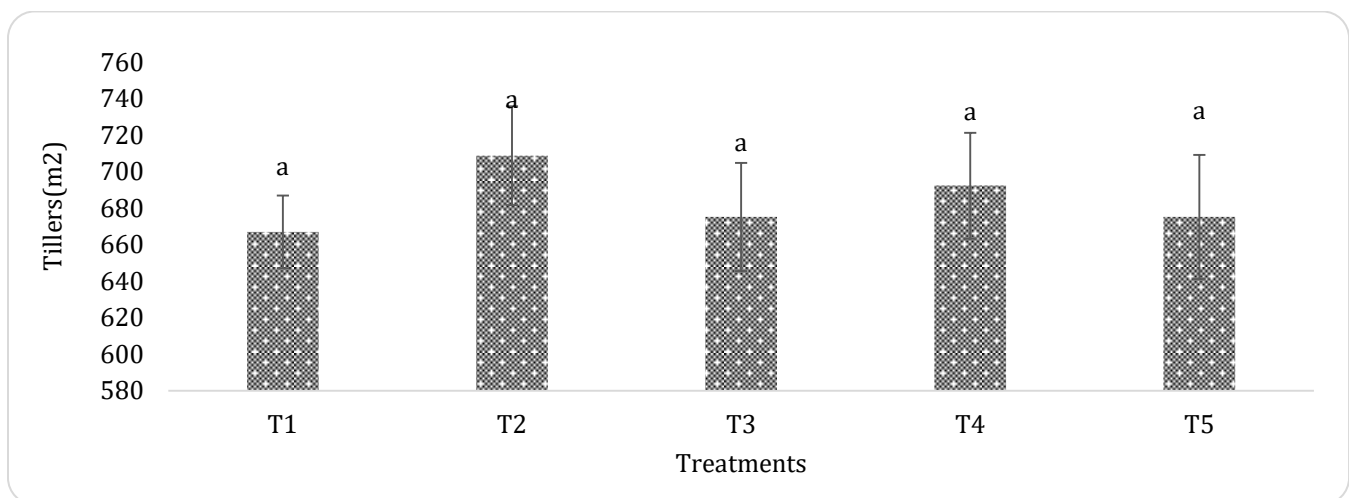


Figure 1. Number of tillers/m² of wheat crop sown under different tillage conditions.

Number of affected tillers

This study has revealed that tillage conditions had significant effect on pest incidence in wheat crop as shown in figure 2. Maximum affected tillers/m² (11.7) were observed in zero tillage without burning rice stubbles (T₃) followed by the zero tillage after burning rice stubbles (T₂) i.e. 8.3 affected tillers/m². The minimum or neglectable affected tillers/m² were observed in wheat in non-rice fields i.e 0.2 tillers/m². Figure 2 is showing the infestation trends of rice pink borer in wheat crop.

Percent incidence

Results revealed that tillage conditions had a significant

effect on crop losses due to the attack of pink rice borer as shown in figure 3. The maximum tillers loss (1.8%) was observed in wheat sown tillage without burning rice stubbles (T₃) followed by zero tillage after burning rice stubbles (T₂) i.e. 1.2% tillers loss. This study has shown that burning cannot minimize the pest attack and cannot be opted as a pest management tool so it could be discouraged for saving the environment. Minimum pest attack was observed in wheat followed by non-rice crop (T₁). Figure 3 revealed that the rotavator with burning or without burning the stubbles can effectively manage *S. inferens* in the wheat crop.

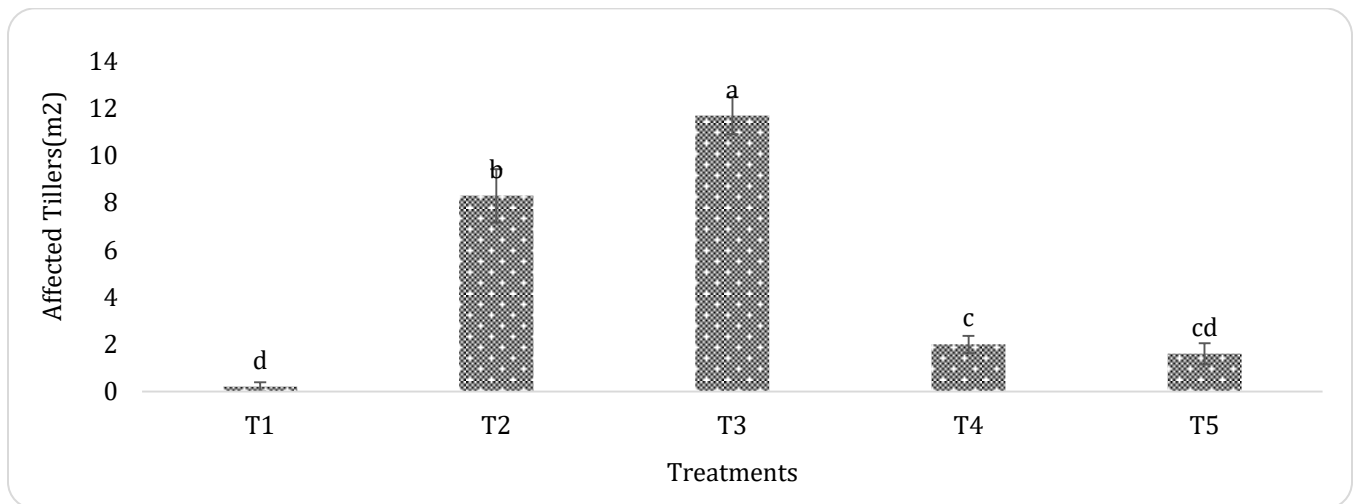


Figure 2. Number of affected tillers/m² of wheat crop sown under different tillage conditions.

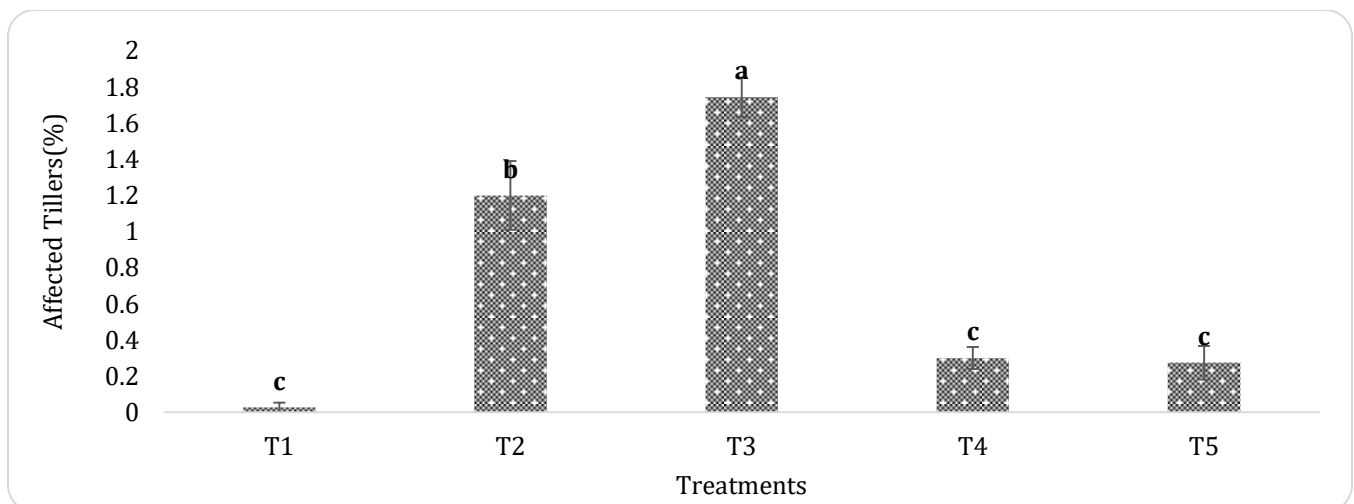


Figure 3. Percent wheat damage in crop sown under different tillage conditions.

The results of this study are in agreement with many other studies conducted in different areas of rice

production including India, South Africa, and Pakistan. Singh et al. (2014) has revealed that zero-tillage

condition for wheat sowing is the most favorable for the proliferation of pink borer in wheat crop and rotavator cultivation has remarkably reduced the pest infestation. Prasad and Babu (2016) have recommended the field sanitation for managing the pink stem borer and suggested discouraging the collection of paddy straw for house building. Similar results were obtained by Baladhiya et al. (2018) suggesting that pink rice borer can be effectively managed through the destruction of paddy straw as well as early and late sowing of rice crop.

CONCLUSION

In conclusion, the appropriate management of rice stubbles has an important role in the management of *Sesamia inferens* in the wheat crop. The results proved that using a rotavator as a tillage tool before the sowing of the wheat crop has remarkably reduced the incidence of *S. inferens*. The burning of stubbles has statistically at par with zero tillage with the highest infestation and environmentally hazardous also so; destruction of rice stubbles through rotavator is the most effective tool against *S. inferens*.

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AUTHORS' CONTRIBUTION

All the authors equally designed the study, conducted surveys, performed the experiments, collected and analyzed the data, wrote the manuscript and proofread the paper.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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