

Survey and monitoring of wheat head armyworm by using pheromone traps

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Wheat head armyworm is found throughout the USA and Canada. This complex encompasses two species *Dargida diffusa* (Walker) and *Dargida terrapictalis* (Buckett). The greater population of these species is recorded in wheat growing regions such as Kansas, Nebraska, Oklahoma, and Colorado. Out of these two species, *Dargida diffusa* is reported to cause damage to the wheat and barley crops in Washington, Idaho, and Oregon in North America. Since 2014, *D. diffusa* is also been reported in Montana.

The damage caused by wheat head armyworm in field resembles the damage caused by some stored grain weevils. Hence, when grains get stored, assessment of damage caused by this insect to cereal crop can be little confusing. Another problem faced by growers and researchers is the indistinctness between both species of wheat head armyworm. Identification is not possible based on variations in physical characteristics of larvae of both the species. Collection and identification of adults will be necessary to state the presence of either species. Although both species have straw-colored wings adults of *D. diffusa* have somewhat lighter wings compared to the wings of adult *D. terrapictalis*. The life cycle of *D. diffusa* includes two or three generations per year. Pupa of *D. diffusa* passes the winter in the soil and adults can be seen flying first in March–May, then from mid-June to early July and then also in October.

Feeding damage caused by wheat head armyworm is called insect damage kernel (IDK). Usually, the larvae feed during nighttime and can be found on plant heads and leaves during early mornings. During daytime they move to the base of the plants. Larvae, with their strong mouthparts, bore a small hole into the base of the floret and feed on developing grain and cause damage to the insect kernel. The damage usually occurs along the field margins.

In terms of management strategies, we do not have adequate knowledge. As the chemical control, no insecticides are specifically labeled for control of wheat head armyworm in Montana but it is believed that chemicals which are registered to control cutworms and armyworms on wheat or barley should also manage wheat head armyworms. However, practice of reading and following the labels should be followed without mistake. Nevertheless, pyrethroids are reported to work well in the field conditions in this region. In terms of biological control agents also, natural predators such as rodents, birds, spiders and other predatory insects such as ground beetles and predatory bugs feed on them. Some unidentified parasitoids have been reported from Washington.

Thresholds levels for wheat head armyworm are not available yet. To survey the presence of *D. diffusa* in Montana, we have been studying this insect since 2015 at Western Triangle Agricultural Research Center (WTARC), Conrad. In this study, we are surveying locations in Pondera and Chouteau Counties. In September 2017, we published some preliminary observations of this study in Traders Dispatch. In this article, we are elaborating our results obtained till now. In our study, we have used sweep nets and pheromone traps to collect adults of *D. diffusa*. Both these methods indicated the maximum population of *D. diffusa* in Golden Triangle Area from mid-June to early July. Further, we also tested the dose response of lures to *D. diffusa*, at four different amounts. We have used the rubber septa impregnated with (Z)-11-hexadecenyl acetate (Z11-16Ac) and (Z)-11-hexadecenal (Z11-16Ald) with Hercon Vaportape as the pheromone. This pheromone is reported to be effective in attracting male *D. diffusa*. We have used 1 mg of pheromone as low dose, 3

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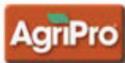
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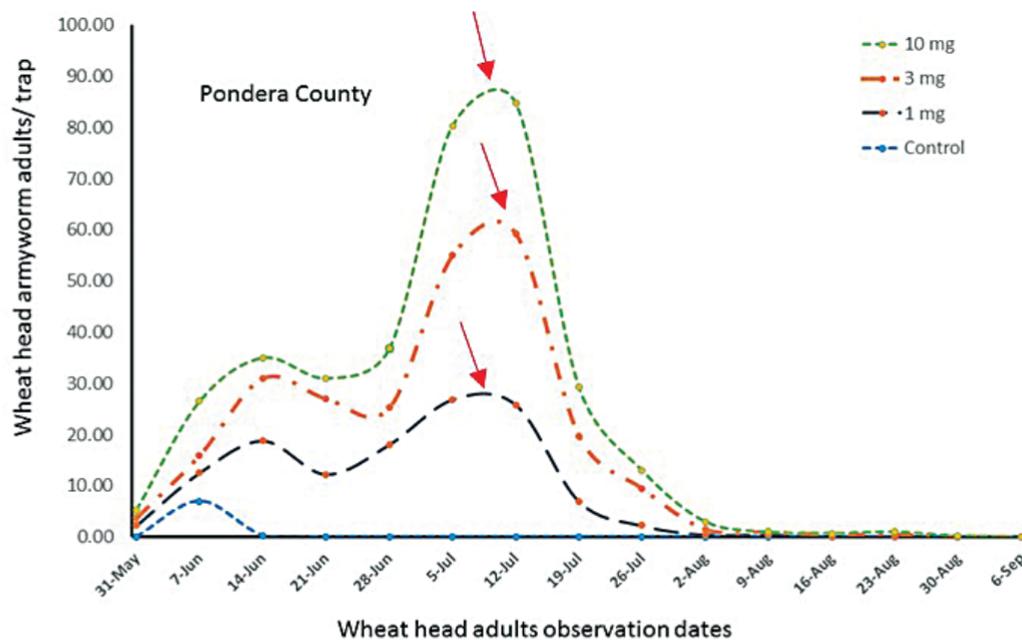
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mg as medium and 10 mg as high dose. In all the studied locations pheromone traps with high dose although attracted greater number of adults of *D. diffusa*, however low dose were also found to be equally effective and showed no statistical significant difference. It seems that a higher dose of this pheromone might be disrupting the sensory organs and hence might not be attractive to the males of *D. diffusa*. Moreover, no adults were attracted in zero dose lure indicating the effectiveness of this pheromone trap in collecting and predicting the population of *D. diffusa*. The majority of the population attracted by these traps were of *D. diffusa*, which indicates the presence of this species as predominant species in the Golden Triangle Area. In 2018, almost negligible population was recorded

from Pondera County and much lesser number were collected from Chouteau County. This indicates a decline in the population of *D. diffusa* in 2018 compared to 2015, 2016 and 2017. Nonetheless, throughout the study years, Chouteau County had almost two times greater population of *D. diffusa* compared to Pondera County.

This initial data will allow us to select the right dose for future study to monitor and manipulate the mating behavior of *D. diffusa*. This study will also enable the preparation of pheromone traps with correct dose for growers. Although we have recorded a decline in population in 2018 it would be important to be extremely vigilant about monitoring the changing population dynamics of this pest in the Golden Triangle Area.



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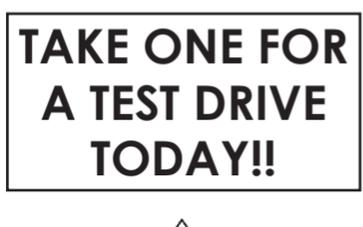
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