Controlling Wireworms with Neonicotinoid Insecticides in Wheat

WSU WIREWORM PROJECT

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Abstract

Wireworm (*Limonius* spp.) populations and crop damage have been increasing in wheat (*Triticum aestivum* L.) production across eastern Washington. Today nearly all spring cereal crop acres throughout eastern Washington are treated for wireworms with neonicotinoid insecticides such as Cruiser® (thiamethoxam) or Gaucho® (imidacloprid) at rates between 0.190-0.315 oz/cwt. At these rates, the neonicotinoids are toxic to wireworms but at sub-lethal doses, or in other words they repel or provide only seedling protection. Our objective is to find a labeled lethal dose of neonicotinoid insecticide to reduce wireworm populations. An on-farm test (OFT) was initiated in 2008 to examine spring wheat treated with 2.0 oz/cwt of Gaucho vs. a non-Gaucho treated spring wheat check. At this location frost severely limited yield, however 2.0 oz/cwt Gaucho had a trend for improved yield and economic return over costs, and it reduced wireworm populations by 78%. A second OFT was repeated in 2010. Spring wheat treated with 2.0 oz/cwt Gaucho significantly improved yield, economic return over costs and reduced wireworm populations 41%.

Background

Wireworm (*Limonius* spp.) populations and crop damage have been increasing in wheat (*Triticum aestivum* L.) production across eastern Washington. Today nearly all spring cereal crop acres throughout eastern Washington are treated for wireworm control with seed applied neonicotinoid insecticides. These insecticides are under the trade names Cruiser® (thiamethoxam) or Gaucho® (imidacloprid) to name a few, and are traditionally applied at rates between 0.190-0.315 oz/cwt (verbal communication). At these rates, the neonicotinoids are toxic at sub-lethal doses to wireworms, or in other words, they repel or provide only seedling protection (Vernon, et al., 2009). Our objective is to increase yield and profitability, and to determine if we can find a lethal labeled dose of neonicotinoid insecticide to reduce wireworm populations.

PROBLEM: Wireworms crop damage is increasing in wheat production across eastern Washington.

Treatments and Operations

On-farm tests (OFT) were initiated to examine whether or not a high labeled dose of neonicotinoid insecticide will reduce wireworm populations. Two treatments: spring wheat treated with 2.0 oz/cwt of Gaucho, and a non-Gaucho treated check were established. The OFT were located north of Davenport, WA in the spring of 2008 and near Rosalia, WA in the spring of 2010. The study was a RCBD with 4 and 6 replications respectively. Stand establishment (Rosalia only), grain yield, protein, test weight, and relevant economic data were collected. Economic return over costs were calculated using Ritzville Warehouse Company F.O.B. (free on board) price on September 15 each year, less Gaucho insecticide cost. Modified solar bait traps (4 per plot) were used the following spring to determine the treatment effects on wireworm populations.

Study Details

Variable	Davenport Location	Rosalia Location
Variety	'Jefferson' DNS wheat	'Louise' SWSW
Seed Rate	70 lb/ac	110 lb/ac
Seed Date	May 1, 2008	April 15, 2010

METHODS: Cooperator seeding and harvesting OFT in 2010.

METHODS: Modified wireworm solar bait traps are used to monitor populations following the two treatments.

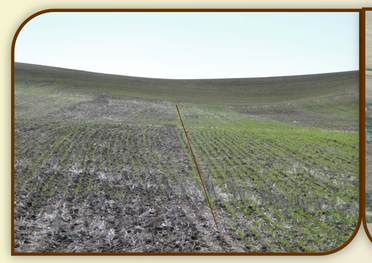
Agronomic and Economic Results

At Davenport, grain production was reduced by severe frost. Despite damage, spring wheat treated with 2.0 oz/cwt Gaucho had a trend for improved yield and economic return over costs (data not presented). Wireworm populations were significantly ($P<0.05$) reduced with an average of 0.4 wireworms/trap following 2.0 oz/cwt Gaucho treatment compared to the check which averaged 2.0 wireworms/trap. At Rosalia, spring wheat stand establishment, grain yield, test weight, and economic return over costs was significantly improved with 2.0 oz/cwt Gaucho compared to the check (Table 1). Test weight in the check was reduced because of increased weed seeds. Wireworm populations were significantly ($P<0.10$) less with an average of 2.0 wireworms/trap following 2.0 oz/cwt Gaucho treatment compared to 3.4 wireworms/trap following the check.

Table 1. Stand establishment, yield, protein, test weight, and economic return over costs of spring wheat treated with 2.0 oz/cwt Gaucho and a non-Gaucho check in an on-farm test near Rosalia, WA.

TRT	Stand (plants/ft^2)	Yield (bu/ac)	Protein (%)	Test Wt (lb/bu)	R over C ($/ac)†
2.0 oz /cwt Gaucho	16.5	66.1	11.0	56.4	392
Non-Gaucho Check	6.8	27.6	11.2	54.0	166
Level of Significance	0.001	0.001	n.s.	0.05	0.001

† Economic returns over costs was calculated using Ritzville Warehouse Company F.O.B. (free on board) price on September 15, 2010 less Gaucho insecticide cost.



RESULTS: Stand establishment with non-Gaucho check (left) and 2.0 oz/cwt Gaucho (right).

RESULTS: Non-Gaucho check plots in the middle with 2.0 oz/cwt Gaucho on the left and right .

Conclusions

In locations with heavy wireworm infestations, spring wheat treated with 2.0 oz/cwt Gaucho increased stand establishment, grain yield and profitability compared to the non-Gaucho check. In regards to wireworm populations, the 2.0 oz/cwt Gaucho treatment did not eliminate wireworm populations but it did reduce them between 41and 78% respectively (Figure 1).

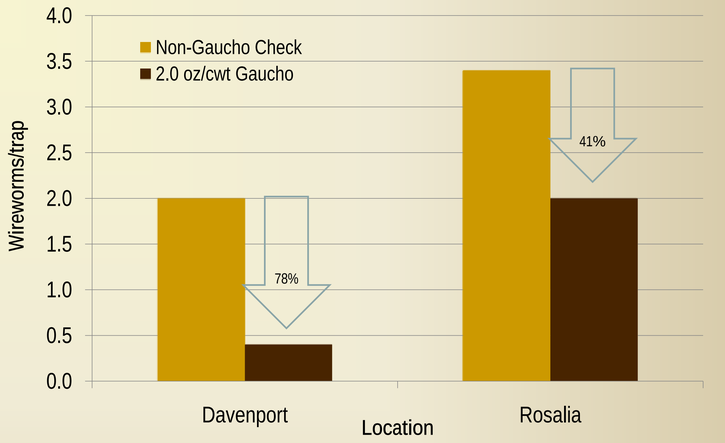


Figure 1. Wireworm populations in the spring of the year following spring wheat treated with either 2.0 oz/cwt Gaucho or a non-Gaucho check in on-farm tests near Davenport and Rosalia.

ACKNOWLEDGEMENT

The authors would like to thank the following for financial support: The Washington Grain Commission, Lincoln-Adams Crop Improvement Association, Northwest Columbia Plateau PM_{10} Project, and Carol Quigg

CITATION

Vernon, B.S., W.G. Van Herk, M. Clodious, and C. Harding. 2009. Wireworm Management I: Stand Protection Versus Wireworm Mortality with Wheat Seed Treatments. Journal of Economic Entomology. 102(6):2126-2136.