THRIPS DISPERSAL AND SOYBEIN VEIN NECROSIS VIRUS (SVNV) IN WISCONSIN SOYBEAN

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Introduction

Soybean Vein Necrosis Virus (SVNV) is a *Tospovirus* that was first described in 2008 (Zhou et al., 2011) and first reported in Wisconsin in 2012 (Smith et al., 2013). SVNV symptoms include yellowing and clearing of the veins which eventually lead to necrosis of both the vein and leaf tissue. Soybean thrips, *Neohydatothrips variabilis* (Beach), have been identified as a principal vector of this virus (Zhou and Tzanetakis, 2013) making SVNV the first known virus to be transmitted by soybean thrips.

Since SVNV is new to Wisconsin, it is important to understand the timing of thrips movement and virus spread as well as the associated impacts the viral infection may have on soybean. The objective of this research was to establish field trials to investigate the species composition and timing of arrival of thrips in Wisconsin soybean fields, as this information might be important for developing management strategies to reduce the damage caused by SVNV.

Materials and Methods

Aerial thrips fauna were sampled weekly for twelve weeks (June 24, 2013, until September 12, 2013) using yellow sticky-panel traps (Seabright Laboratories, Emeryville, CA) to determine the timing of thrips flights, the periods of greatest thrips activity and predominant species of thrips in five research locations across Wisconsin. Specifically, trap transects were established alongside soybean variety trials in Chippewa Falls, Galesville, Lancaster and Fond du Lac, as well as another experimental soybean field at the Arlington Agricultural Research Station (AARS). After collection, all thrips were counted within ten quadrats on the card (approximately one third of the card's area). Fifty of the thrips found in this area were randomly chosen for speciation to estimate total thrips numbers and relative proportions of species present.

Disease incidence was recorded in fields near R5-R6 stage of development and symptomatic leaf samples were tested to confirm the presence of SVNV via nested polymerase chain reaction (PCR). Additionally, yield data were collected on symptomatic soybean breeding lines located at West Madison Agricultural Research Station to determine the effects of disease

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on soybean yield. This was achieved by marking symptomatic and asymptomatic plants at growth stage R6, hand harvesting pods from all plants marked and weighing and grading all pods and seeds.

Results

Logit-transformed proportions of total thrips counts showed peak capture periods during mid-July (week 3) and late August (week 9; Fig. 1). There was also a correlation between region of soybean field and thrips flights; thrips captures peaked earlier at locations on the west side of Wisconsin (Lancaster, Galesville and Chippewa Falls) versus eastern locations (Arlington and Fond du Lac; Fig. 2). PCR results confirmed SVNV associated symptom with the presence of SVNV at each location. Additionally, sampling was performed in commercial production fields by Wisconsin Department of Agriculture, Trade and Consumer Protection (Fig. 3), identifying other locations with disease. SVNV was identified in 12% of the fields sampled, a 100% increase in the number of positives found compared to 2012. Preliminary results do not show a strong correlation between SVNV severity and soybean yield loss in Wisconsin (data not shown).

Discussion and Future Objectives

Thrips sampling showed that a peak capture period in Wisconsin occurred during mid-July and late August 2013. This pattern of thrips captures suggests that there are two main thrips flights in Wisconsin. These data correspond to results reported from the southern U.S. (Nault et al., 2002). Additionally, there is a correlation between arrival of thrips and the region of the soybean fields, suggesting differences in thrips arrivals between the fields located in western Wisconsin and those located in eastern Wisconsin. Thrips peak catches for the eastern portion of Wisconsin lagged about 2 weeks behind those for the western part of the state in 2013. Larger populations of thrips were observed in the southwestern portion of Wisconsin than any other region.

Future objectives of this research are to continue identification of collected thrips to determine the thrips species composition in Wisconsin. Furthermore, insecticide trials, including seed treatment and foliar insecticide treatments, were implemented at the AARS in 2013, and we plan to evaluate the treatment effects of these products to control reproducing thrips populations in soybean. Finally, the impact of SVNV on soybean yield will be further investigated in the coming year to better understand the economic importance of this virus while determining which varieties of soybean are most resistant to the virus.

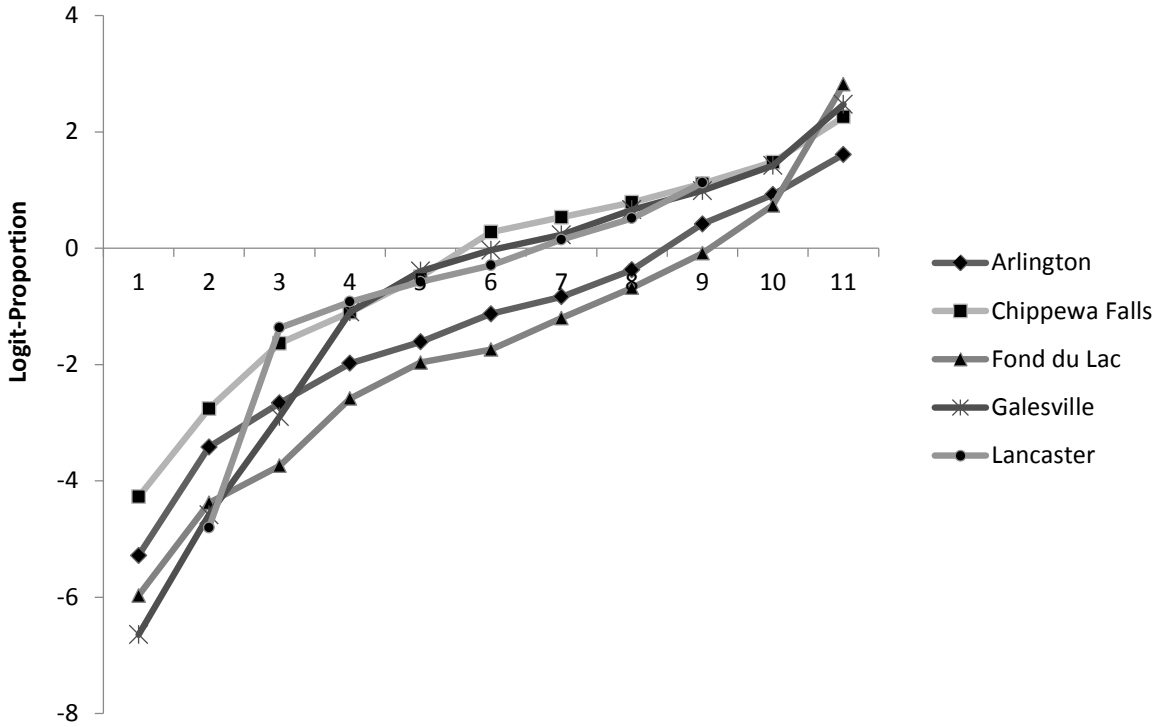

Figure 1. Logit-transformed proportions of total thrips at five sampling location in Wisconsin. Dates of sampling for week designations correspond to those in Figure 2.

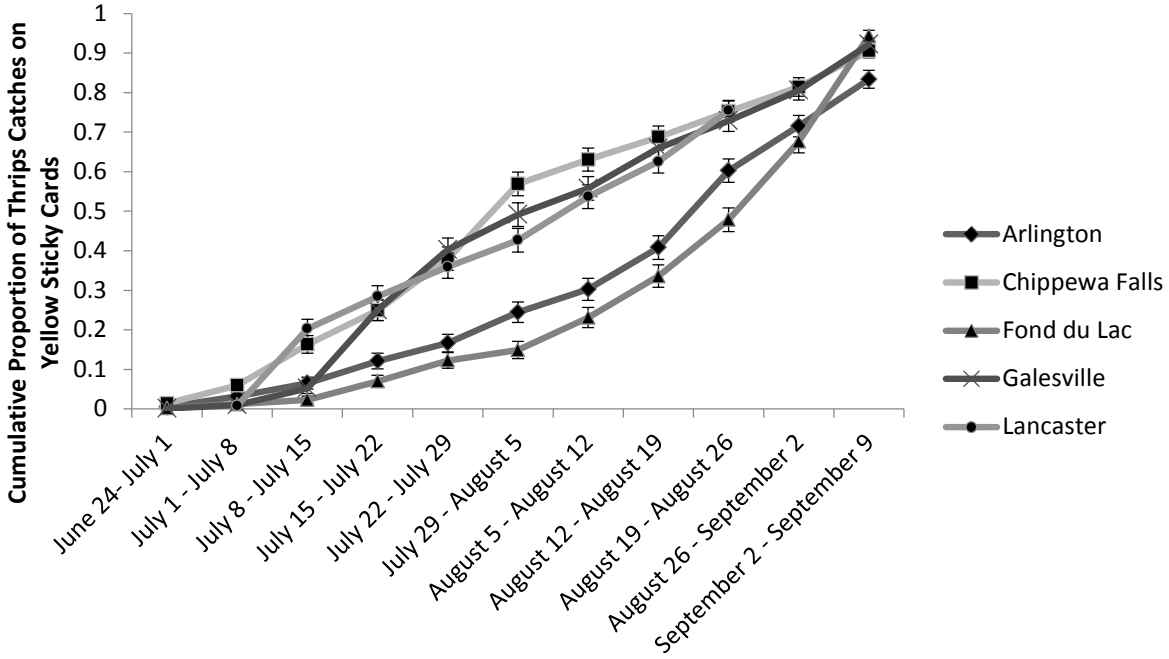

Figure 2. Cumulative proportion of thrips catches at each location sampled. Date ranges correspond to weeks one through eleven in Figure 1.

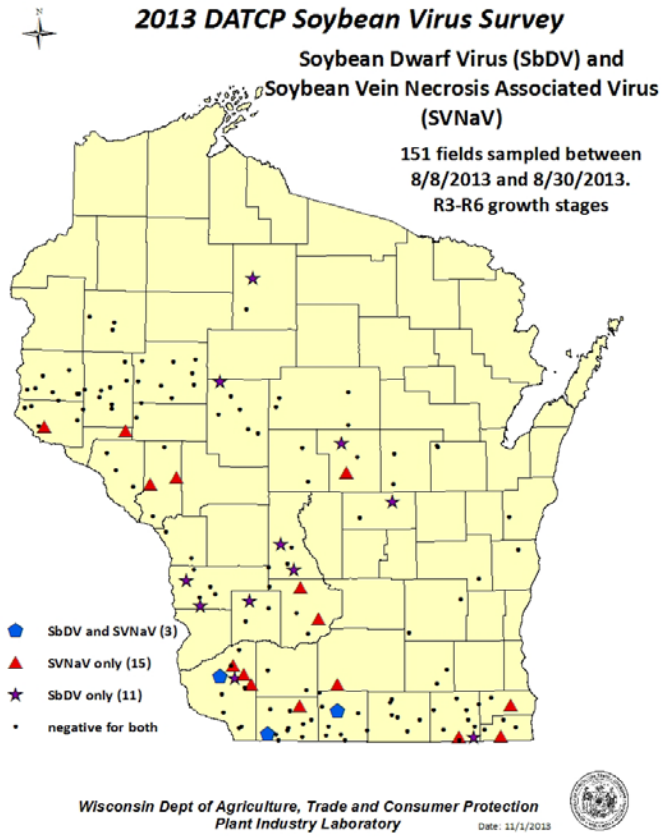

Figure 3. Map showing fields sampled for SVNV and SbDV. Fields positive for SVNV are denoted by triangles and pentagons. (Figure Courtesy of Anette Phibbs, Wisconsin DATCP)

References

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