

3-30-2016

# Analysis of Competence of Thrips Species to Transmit Soybean vein necrosis virus and Impact of the Virus on Thrips Vector Biology and Behavior

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## Recommended Citation

Han, Jinlong and Keough, Stacy, "Analysis of Competence of Thrips Species to Transmit Soybean vein necrosis virus and Impact of the Virus on Thrips Vector Biology and Behavior" (2016). *2016 IPFW Student Research and Creative Endeavor Symposium*. Book 41. [http://opus.ipfw.edu/stu\\_symp2016/41](http://opus.ipfw.edu/stu_symp2016/41)

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## Abstract

*Soybean vein necrosis virus* (SVNV) is an emerging viral disease affecting soybean, first discovered in Tennessee in 2008. SVNV has been identified as being a new virus in the genus *Tospovirus*, which are typically vectored by thrips. So far, only soybean thrips have been confirmed to transmit SVNV. However, other thrips species are found in soybean fields, including eastern flower thrips and tobacco thrips. The objectives of this study were to: 1) Determine vector competence in three thrips species including soybean, eastern flower and tobacco thrips, and 2) Determine the effect of SVNV on host plant preference and life history of the thrips vector. Vector competence assays showed that eastern flower thrips and tobacco thrips were able to acquire the virus after being exposed to SVNV-infected leaf tissues for 48 hours. Both species were also able to successfully transmit SVNV to healthy plants, but at a lower efficiency (less than 10% of the plants were infected by eastern flower thrips and 36% by tobacco thrips) than soybean thrips (71% infection). SVNV infection did not influence host preference of soybean thrips that is both SVNV-infected and SVNV-uninfected soybean thrips aggregated on healthy plants compared to SVNV-infected plants. SVNV-infected soybean thrips had significantly higher fecundity compared to uninfected thrips. Taken together, these results contribute to a better understanding of virus-vector interaction, which is crucial for control of SVNV, as well as control of soybean thrips.



Fig. 1. SVNV symptoms on soybean leaf



Fig. 2. Three thrips species

## Objectives

- To determine vector competence of soybean thrips and identify other potential thrips vectors of SVNV.
- To determine the effect of SVNV on host plant preference and life history traits of the confirmed vector, soybean thrips.

## Vector Competence Assay

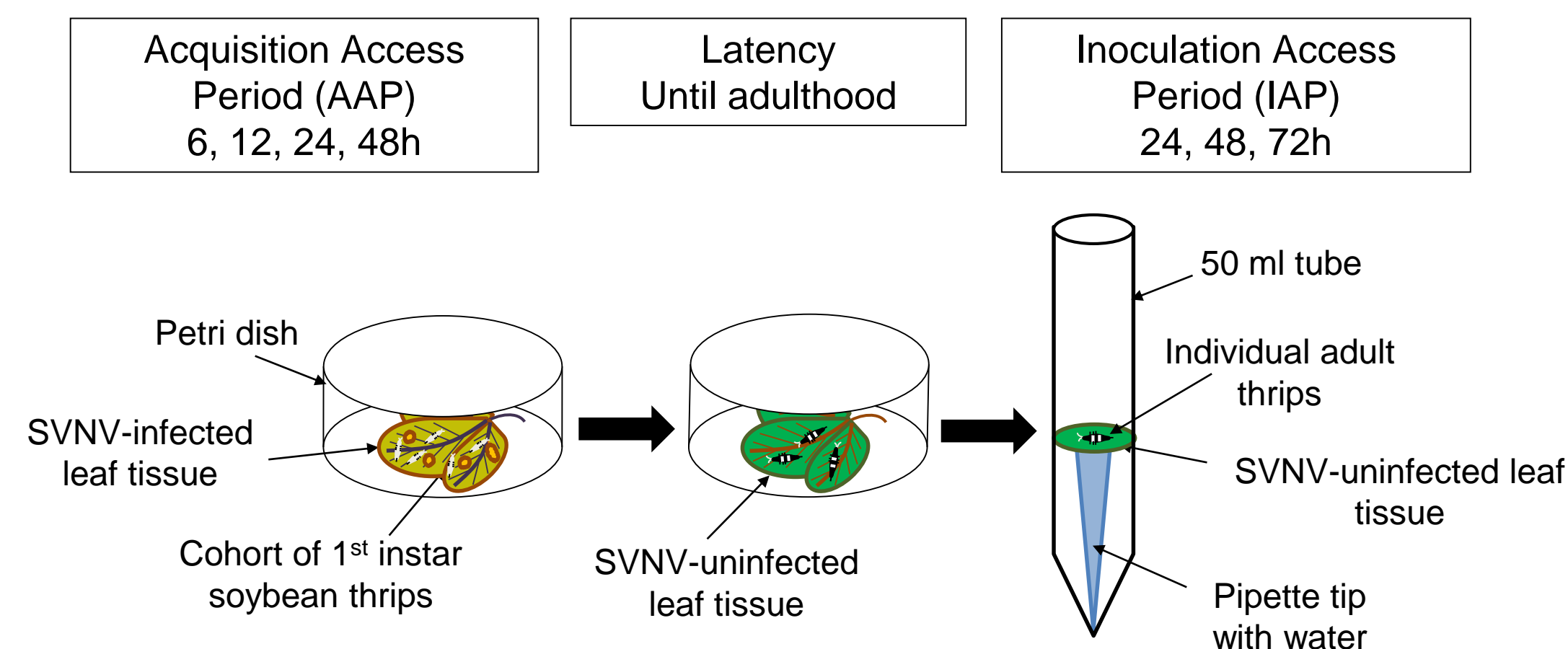


Figure 3. Experimental workflow.

## Acquisition and transmission efficiencies

- A total of 293 thrips and corresponding leaf disks were analyzed following AAP-IAP treatment combination as illustrated in Fig. 3.

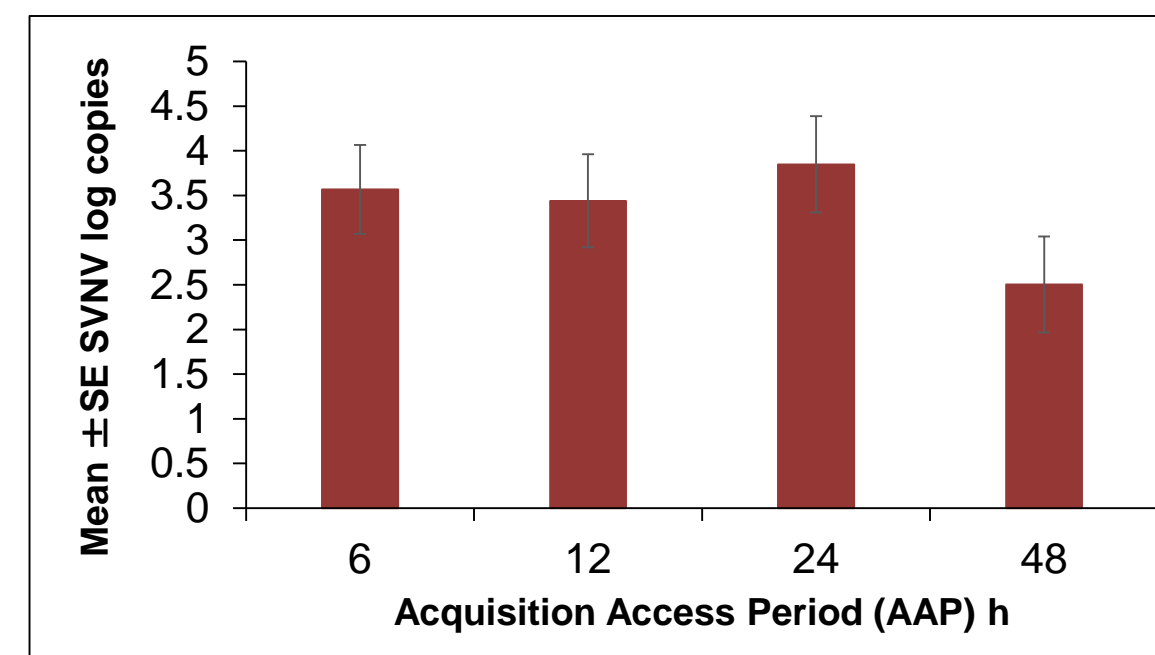


Fig. 4. SVNV levels in individual soybean thrips determined by qPCR.

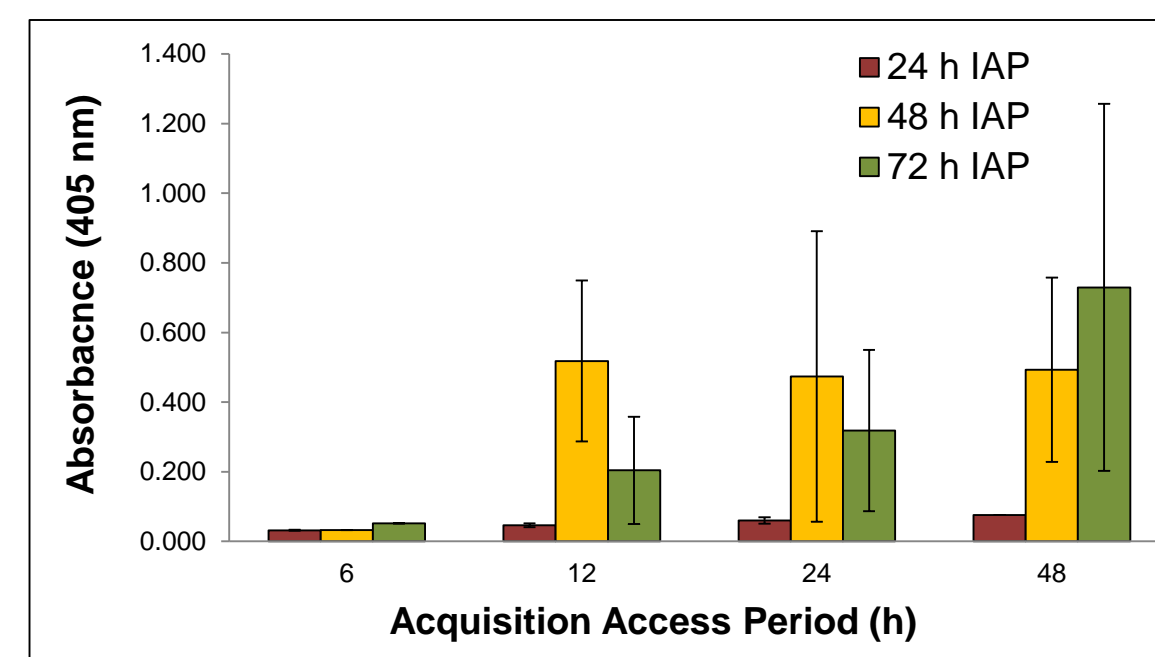


Fig. 5. SVNV levels in leaf disks as indicated by absorbance values measured using ELISA.

Table 1. SVNV transmission in leaf disk assays as determined by ELISA.

AAP-IAP (h)	n	Percentage of SVNV-positive leaves (%)
6-24	21	10
6-48	21	5
6-72	20	5
12-24	30	73
12-48	31	52
12-72	29	52
24-24	21	52
24-48	27	19
24-72	22	36
48-24	24	4
48-48	24	17
48-72	23	17

## Confirmation of potential new vectors

- Competence of eastern flower and tobacco thrips to transmit SVNV was analyzed using whole plant assays.

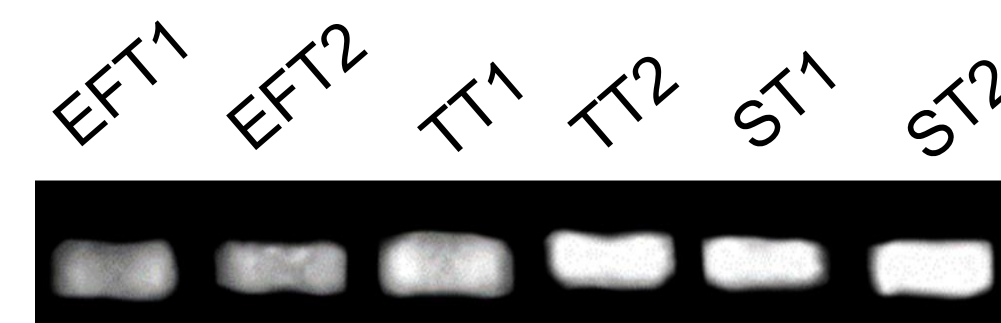


Fig. 6. A gel image showing presence of SVNV amplicons (234bp) in thrips species.

Table 2. SVNV transmission in whole plant assays.

Thrips species	Whole plant % (n)
Eastern flower thrips	6.5 (2/31)
Tobacco thrips	36 (10/28)
Soybean thrips	71 (22/31)

## Effect of SVNV on soybean thrips

### Choice test experiment

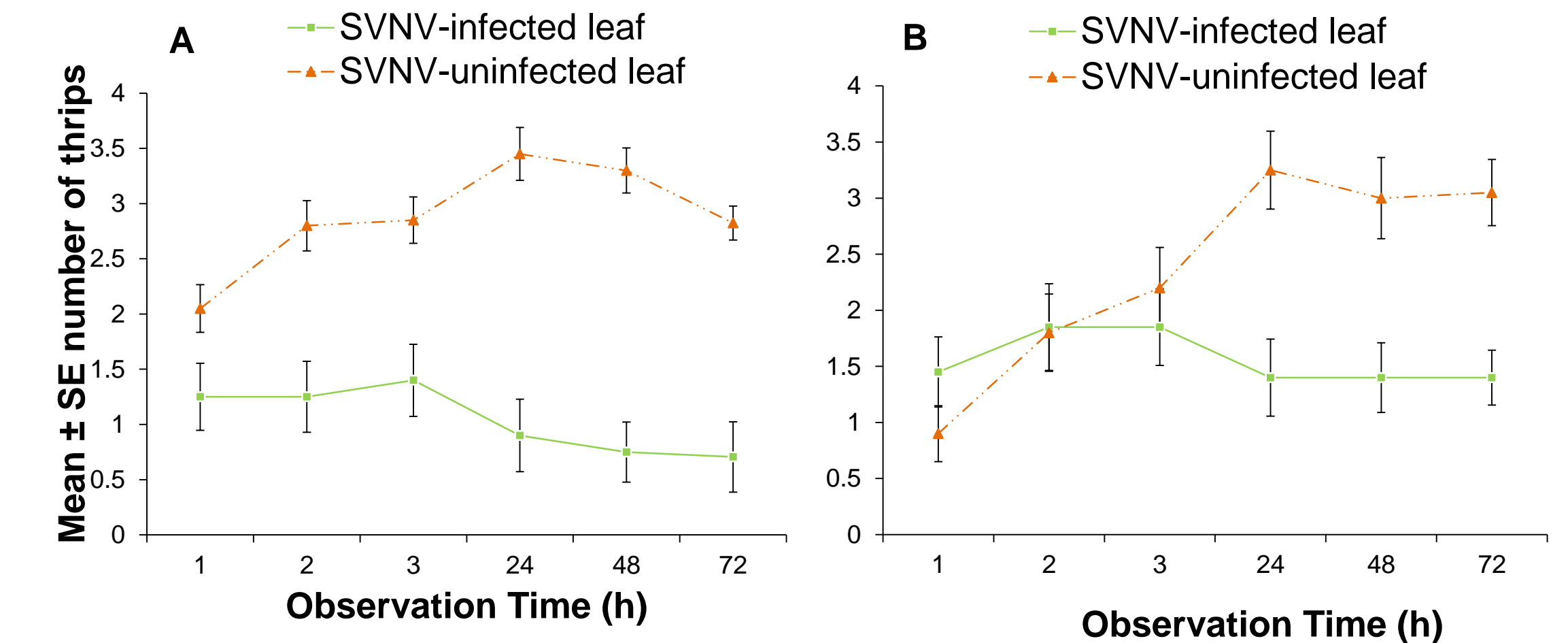


Fig. 7. Effect of SVNV infection on host plant preference

### Isofemale line approach

Life history trait	P-value	SVNV-infected soybean thrips (n=21)	Uninfected soybean thrips (n=20)
Hatching time (d)	0.25	9.05 ± 0.24	9.39 ± 0.19
<b>Total fecundity</b>	<b>0.03</b>	<b>20.29 ± 1.52</b>	<b>15.30 ± 1.34</b>
Development time (d)	0.09	11.82 ± 0.47	12.78 ± 0.39
Offspring survival (%)	0.52	37.43 ± 5.93	42.61 ± 5.01

Table 2. Comparison of life history traits of SVNV-infected and uninfected soybean thrips

## References

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## Acknowledgments

This research is funded by grants from the Indiana Soybean Alliance and USDA NIFA-AFRI Seed grant to Dr. Nachappa and Indiana Academy of Sciences grant to Jinlong Han.