

# Target Site Insecticide Resistance

## in the Tarnished Plant Bug



Utah State University



### Authors

Nathan Merrill, Madison Landon, Rose Sepesy

### Faculty

Scott Bernhardt, PhD.

## Introduction

The tarnished plant bug (also known as the lygus bug) is a common pest of many agricultural crops. Including cotton, alfalfa, and various fruit and vegetable crops.

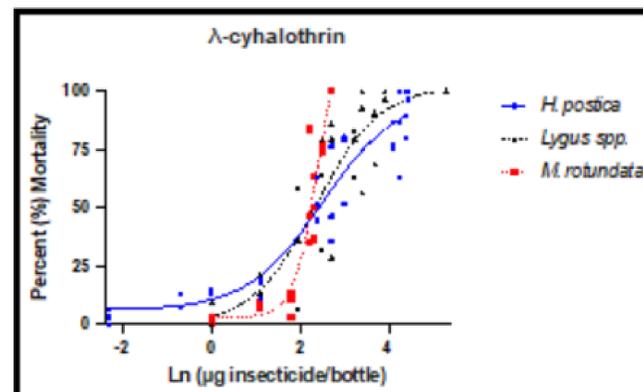
- Lygus bugs can cause substantial economic damage to alfalfa fields which may result in as much as a 20% reduction in crop yield, and an annual cost of over \$100 million in the US alone.
- The research aims to develop a molecular marker to assess target site specific mutations associated with insecticide resistance. Specifically, KDR and the ace1 genes which have been well defined in other agricultural pests.

Ace1 Primer Sequences	
LLEstF1	AGCAATTGGTCGTGTCCTCA
Para Nested-For	ACGGACTTCATGCATTCATTC
LLEstF4	TGGCTCTGAAGTGGGCAAC
Para Nested-Rev	TGGTGCTGATSSSCTTGACG

KDR Primer Sequences	
KDR_DPI1	TCTTGGCCCACACTTAATCTTT
New F	ACGGACTTCATGCATTCATTC
KDR_DPI4	CTCGCCGTTTGCATCTTATT
R8	CGAACAGCCTTGAATA

## Methods

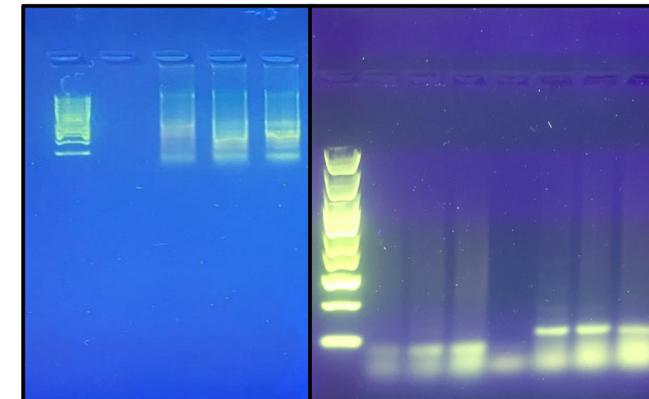
- Lygus bugs were identified using morphological traits.
- Lygus bugs were crushed, DNA was extracted using a qiagen extraction kit.
- Extracted DNA was then amplified using PCR analysis with KDR and ace1 specific sand fly primers.
- St-nPCR was used to allow for greater specificity of primer sequences.



LC50 and LC90 dose responses to  $\lambda$ -cyhalothrin, a common pyrethroid used in insecticides.

## Results

- Three species were identified within the lygus population, Lineolaris, Hesperus, and Elisus.
- New F and R8 sand fly primers were able to successfully amplify the KDR genes.
- Multiple attempts using different primer combinations were unsuccessful in the amplification of ace1 genes.



DNA extractions from lygus bug (left) and PCR amplification (right) ran on an electrophoresis gel.

## Conclusion

Newly found research suggests that the LLEstF1 and LLEstf4 ace1 primers are similar enough to allow for amplification of lygus DNA. With the successful purification and sequencing of KDR and Ace1 genes, we may be able to better predict how these resistance mutation come to be. As well as how to better control them in the agricultural production cycle.

- Overall, this study provides valuable insight into the mechanisms of insecticide resistance and has important implications for pest management in agriculture.
- Limited research has been conducted in target site specific mutations in lygus species. This research can contribute to how these specific genetic sites can contribute to resistances in agricultural pests.

