

TAKING A SECOND LOOK AT *LYGUS* BUGS IN THE PACIFIC NORTHWEST

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This project is directed at enhancing our understanding of the epidemiology of the beet leafhopper transmitted virescence agent (BLTVA) by examining the ability of *Lygus* (Heteroptera: Miridae) bugs to transmit the pathogen to potato, *Solanum tuberosum* L. In the Columbia Basin of Washington and Oregon, BLTVA, a phytoplasma, is the primary cause of potato purple top disease and is known to be transmitted to potato primarily by the beet leafhopper (BLH), *Circulifer tenellus* Baker (Heteroptera: Cicadellidae). Plants infected with BLTVA usually express flagging of leaflets, leaves, small stems and swollen nodes. In the summer of 2014, *Lygus* bugs were observed in the field in association with potato plants expressing purple top symptoms. Currently, it is not known if *Lygus* bugs are competent vectors of BLTVA. Reports from growers in the region also suggest a decline in the numbers of BLH in potato fields while *Lygus* bugs are more abundant in potato fields than previous years. Thus, the present study evaluated: (1) the abundance and species composition of *Lygus* bugs in commercial potato in the PNW, (2) the incidence of BLTVA in *Lygus* in commercial potato fields and (3) whether *Lygus* harbors the same strain of BLTVA as symptomatic potato plants.

Materials and Methods

In 2015, *Lygus* were collected from 34 potato fields in Oregon using a hand-held inverted leaf blower. Samples were collected at three time points: early, mid, and late season and the total number of *Lygus* bugs were estimated for each location. Samples were sorted and identified using the dichotomous key developed by Muller et al. (2003). Based on the 16S rRNA gene, we used the nested PCR technique described by Crosslin et al. (2006), to estimate the incidence of BLTVA in field-collected *Lygus*. PCR products were visualized on 1% agarose gel to confirm the presence of BLTVA. To determine if *Lygus* harbors the same strain of BLTVA as symptomatic potato plants, we cloned PCR products from *Lygus* and potato samples, sequenced both products then compared DNA sequences of BLTVA from *Lygus* and potato. Comparing BLTVA sequences from both *Lygus* and potato allows us to determine if *Lygus* is carrying the same BLTVA as symptomatic potato and whether or not we should worry about *Lygus* as potential vectors of BLTVA.

Results and Discussion

Morphological identification: In Oregon, the *Lygus* complex in potato is dominated by *Lygus hesperus*, *L. elisus* and *L. lineolaris* (Figs. 1A, B, and C). The 3 species are primarily distinguished by the unique pattern of frons, pronotum and wing membrane as well as the presence/absence of spots on the propleura (side of the pronotum).

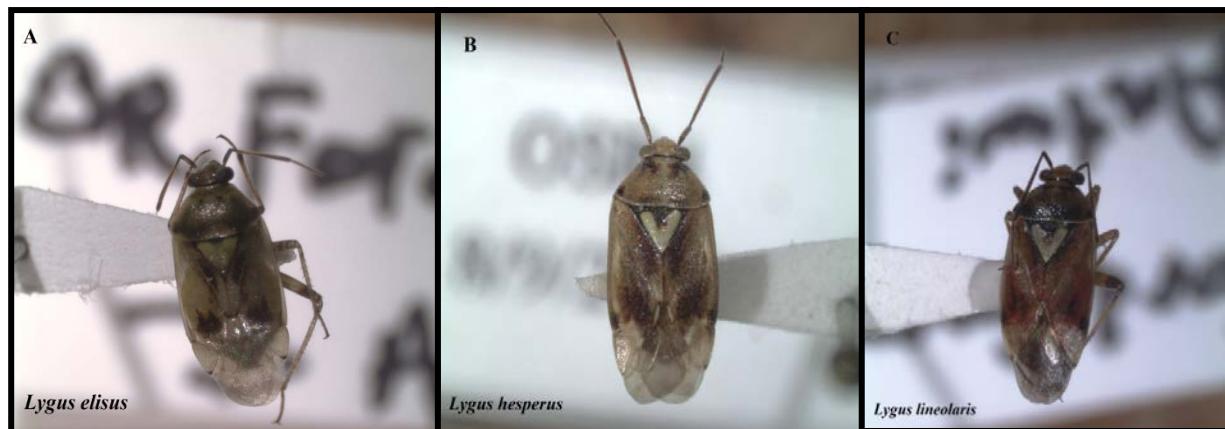
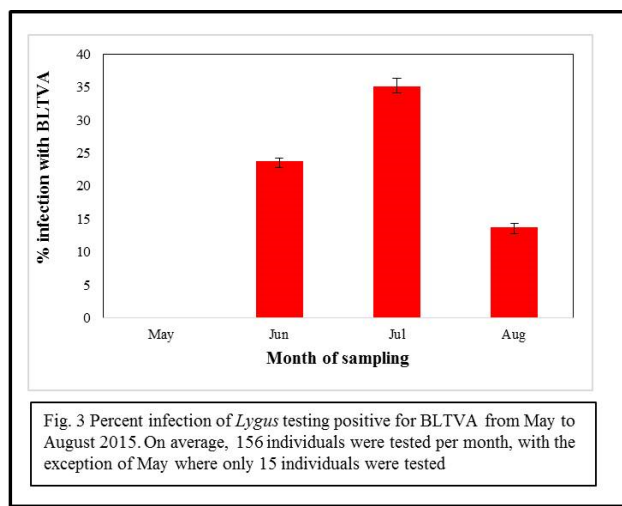
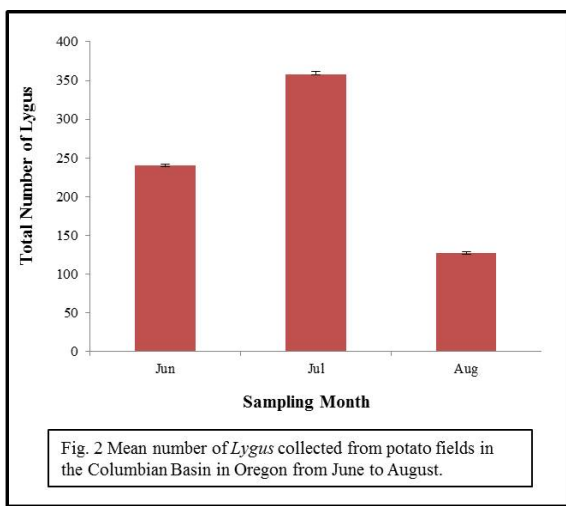


Fig. 1 Three major *Lygus* species identified in potato fields in the Columbian Basin in Oregon. Photo by OSU-IAEP (Rondon lab by J. Antwi).

***Lygus* population dynamics:** In general a total of 240, 358 and 127 *Lygus* were collected in June July and August, respectively (Fig. 2). Across all sampling sites, we collected an average of 7 *Lygus* per location; where the highest average (42 *Lygus* per site) occurred at location 14 and lowest average (1 *Lygus* per site) occurred at location 12 (see map and location of traps at <https://andersongeog.maps.arcgis.com/apps/webappviewer/index.html?id=e857a721431642188fa27b04c2f7c270>). All *Lygus* were tested for BLTVA; 0, 25, 36 and 12 % of the samples tested positive in May, June, July and August, respectively (Fig. 3).



BLTVA in potato and *Lygus*: 16S DNA sequences of BLTVA showed that field-collected *Lygus* carry/harbor the same strain of BLTVA in symptomatic potato (data not shown), suggesting that *Lygus* is acquiring and/or transmitting BLTVA to potato. A preliminary transmission assay demonstrated that BLTVA can indeed be transmitted by *Lygus* (unpublished data); however the mode of the transmission and the efficiency is unknown. We are currently undertaking more studies to further our understanding of the interaction between *Lygus* and BLTVA and whether or not *Lygus* bugs cause significant economic damage to potato.

The role of *Lygus* and its associated impact on potato production are unknown and need to be further investigated. If *Lygus* is a pest of potato, then, there is a strong need to focus our attention towards this problem.

References

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