Potato Progress

Research & Extension for the Potato Industry of Idaho, Oregon, & Washington

Andrew Jensen, Editor. ajensen@potatoes.com; 509-760-4859

www.nwpotatoresearch.com

Volume XVII, Number 11 | *18 July 2017*

Evaluating Insecticides for Managing Potato Psyllids and Other Potato Pests: Where We Are and Some Challenges Ahead

Stuart Reitz, Oregon State University, 541-881-1417, stuart.reitz@oregonstate.edu, 710 SW 5th Ave., Ontario, OR 97914

Silvia Rondon, Oregon State University, 541-5678321, silvia.rondon@oregonstate.edu, 2121 S First Street, Hermiston, OR 97838

Alan Schreiber, Agriculture Development Group, Inc., 509 266 4348, aschreib@centurytel.net, 2621 Ringold Road, Eltopia, WA 99330

Tim Waters, Washington State University Extension, 509 545-3511, twaters@wsu.edu, 404 W Clark Ave, Pasco, WA 99301

Erik Wenninger, University of Idaho, 208-423-6677, erikw@uidaho.edu, 3806 N 3600 E, Kimberly, ID 83341

Introduction

Potatoes have always been susceptible to damage from a number of insect pests, although the severity of pest infestations varies by location and year. Unfortunately, in recent years, there has been an increasing number of pests with which potato growers in the Pacific Northwest (PNW) have had to contend. In the early 1990s, the major pests of potatoes in the PNW were generally limited to wireworms, Colorado potato beetles, aphids, and two-spotted spider mites.

Species that have emerged recently as pests in the PNW include the potato tuberworm, which causes direct damage to tubers late in the growing season and in storage, and the beet leafhopper, which can vector Beet Leafhopper-Transmitted Virescence Agent (BLTVA, a.k.a. potato purple top). In contrast to potato tuberworm, beet leafhoppers typically are of greater concern in the first half of the growing season. These two pests illustrate the season-long pest management challenges facing growers.

In addition to those pests, thrips, stink bugs, *Lygus* bugs, cutworms, loopers, and armyworms can reach damaging levels in some years and are now routinely managed as pests by growers in certain areas of the PNW. This increase in pest species coupled with rapid changes in registered insecticides and maximum residue levels (MRLs) has severely complicated management of potato pests in the PNW.

As important as all of these species are, the recent emergence of potato psyllid (Figures 1 – 3) as the vector of the Liberibacter bacterium (Lso) that causes zebra chip (ZC) disease has created the most fundamental changes to insect management strategies in the PNW. Outbreaks of ZC first occurred across the PNW in

2011and again in 2012 (Figure 4). Since those initial outbreaks, populations of the psyllid and the incidence of ZC have been relatively low. However, the risks from an outbreak are so severe that detection of potato psyllids at any level still triggers season-long insecticide treatment programs, which disrupt traditional integrated pest management programs. Many growers feel compelled to design their overall insect management programs around this one pest and simply fit management of other insect pests around their psyllid management strategies.

Working together to control the potato psyllid and ZC

Given the importance that psyllid and ZC management has taken on, our group of entomologists, with funding from the Northwest Potato Research Consortium, initiated a project to evaluate insecticides and develop insecticide recommendations for potato psyllid management in the PNW. Our project began in the 2014 growing season with research trials located in the Columbia Basin (Eltopia, WA; Pasco, WA, Hermiston, OR), the Treasure Valley (Ontario, OR), and the Magic Valley (Kimberly, ID) (Figures 5 & 6). Conducting trials at a number of locations in different growing regions has allowed us to account for variation in the pest complexes as well as abundance and timing of pests across the PNW. We have also been able to take advantage of capabilities that each location has to offer, including the ability to apply insecticide treatments by chemigation and by aerial application in addition to standard foliar applications.

Insecticide Trials in the PNW

For our project, we have used standard experimental designs and data collection methods at all locations. We collect leaf samples to determine the abundance of psyllid eggs and nymphs (immatures). Because adult psyllids move readily from plant to plant, leaf sampling is not be feasible for the adults. Therefore, we use a vacuum sampling technique to collect them (Figure 7). These two sampling methods also allow us to sample other pest and beneficial insects. Thrips, spider mites, and wingless aphids are collected on leaves. Leafhoppers, *Lygus* bugs, winged aphids, caterpillars, and predatory insects are collected in vacuum samples. These standardized methods will help us to compare the performance of various insecticides under different environmental and pest population conditions.

We have included a broad range of insecticides and modes of action in our trials. To this end, we have been working with established products and a number of the new chemistries that have recently come on the market. Most insecticides with psyllid efficacy also have activity, and are currently used against, other pests including aphids, thrips, and Colorado potato beetles. Therefore, it has been critical to determine what insecticides would be most suitable for psyllid management and which would be suitable for management of other pests.

Our overarching goal has been to determine the efficacy of insecticides against potato psyllids, and how those products fit within the context of overall pest management programs by determining their effects on other pests and on beneficial insects. This information will enable growers to make better informed choices regarding their insecticide selections and will help in developing appropriate insecticide resistance management programs for potatoes in the PNW.

Despite our efforts to design effective trials, the insects have not always cooperated. Potato psyllid populations, in particular, have not been as large as expected across the PNW. We have found seemingly low numbers of psyllids in many of our research trials, which makes statistical comparisons among insecticide treatments difficult. Although low populations are good news for growers, they have made it challenging to draw definitive conclusions about the most effective insecticides for potato psyllid management.

Something to keep in mind: the low populations found in recent seasons do not mean that potato psyllids have reverted to a minor pest. The mobility of adults and the number of infective psyllids in a population are key concerns. The propensity of adults to move and the efficiency with which an individual psyllid can transmit the ZC bacterium mean that low numbers of infective psyllids can still create epidemics of ZC.

Despite low psyllid pressure, our trials have provided useful information. Thus, (1) we encourage growers to limit their use of pyrethroids. In our trials in all locations, we have repeatedly found pyrethroid use leads to increases in populations of aphids, spider mites, and thrips while reducing beneficial insect populations. (2) We strongly recommend growers not to make in-season applications of neonicotinoids if they have already used one at planting. This recommendation is primarily to minimize the development of resistance in Colorado potato beetle populations and preserve neonicotinoids as a valuable early season control tool. (3) We recommend that growers rotate their insecticides to minimize the development of resistance. There are new concerns about potato psyllid populations in Texas developing resistance to neonicotinoids because of extensive use of those products there. A range of other insecticides with efficacy against sucking pests is available for in-season use. For example in our trials, products such as Beleaf and Sivanto, among others, provide good in-season management of aphids.

Over the past several years, Alan Schreiber has led efforts in preparing a comprehensive IPM guide for potato pests. The latest version of these recommendations, which includes information from our project, is available at http://www.schreiberagricultureresearch.com/research.html

As useful as the trial results have been regarding other pests and beneficial insects are, the potato psyllid remains the primary focus for our research project. The potato psyllid has proven to be a different and more challenging species to study in open-field situations than other insect pests. This has been true for our trials in the PNW as well as in Texas, which has been trying to contend with the psyllid and ZC much longer than the PNW. Research plots comparable to the sizes we have used in our previous trials appear suitable for detecting treatment differences in egg and nymph stages of the psyllid, but larger plots appear to be more statistically reliable and powerful for detecting treatment differences. Few studies other than our previous trials have attempted to test for treatment differences against adult psyllids. It is nevertheless critical to understand how insecticides affect the different of the life stages of the psyllid.

New Studies in the Upcoming Seasons

To address these gaps in understanding insecticide efficacy and in experimental design, we are conducting two complementary types of trials in 2017. We are using sleeve cage trials in Kimberly, ID and Hermiston, OR to determine insecticide efficacy against all psyllid life stages. In these trials, plants in the field will be treated with an insecticide. After treatment, Lso-positive psyllids from a laboratory colony will be released in nylon sleeves fitted around leaves of treated plants (Figure 8). This approach ensures that psyllids are exposed to the insecticides. The efficacy of each insecticide will be determined by counting the number of live psyllid adults, nymphs, and eggs at time points after treatment. These experiments also will allow us to assess how treatments affect development of ZC symptoms in plants and harvested tubers.

In conjunction with these sleeve cage trials, we are conducting open field trials in Ontario, OR; Pasco, WA; and Eltopia, WA. These trials will be similar in approach to our past trials. These trials will use the same insecticide treatments as in the sleeve cage trials. However, we are using plots that are twice as large as previous trials and additional sampling techniques. We expect that the larger research plots will better characterize the effects of insecticides on psyllid populations. Improvements in experimental design and sampling protocols will lead to improved efficacy trials in the future.

Final Thoughts

We anticipate that psyllids will remain a key pest of concern in the PNW. Other researchers across the PNW are working to answer many of the questions regarding the biology of potato psyllid. In the short-term, growers still need to know what insecticides offer the best control for potato psyllid and what impact psyllid control strategies may have on other insects. Our sleeve cage trials will provide immediate efficacy data for psyllid management. More importantly, combining results of the sleeve cage trials and open-field trials will enable us to develop simpler yet robust field trials for studying insecticide efficacy and psyllid management in the future. Our goal is to help ensure that potato production in the PNW remains viable and economically sustainable.

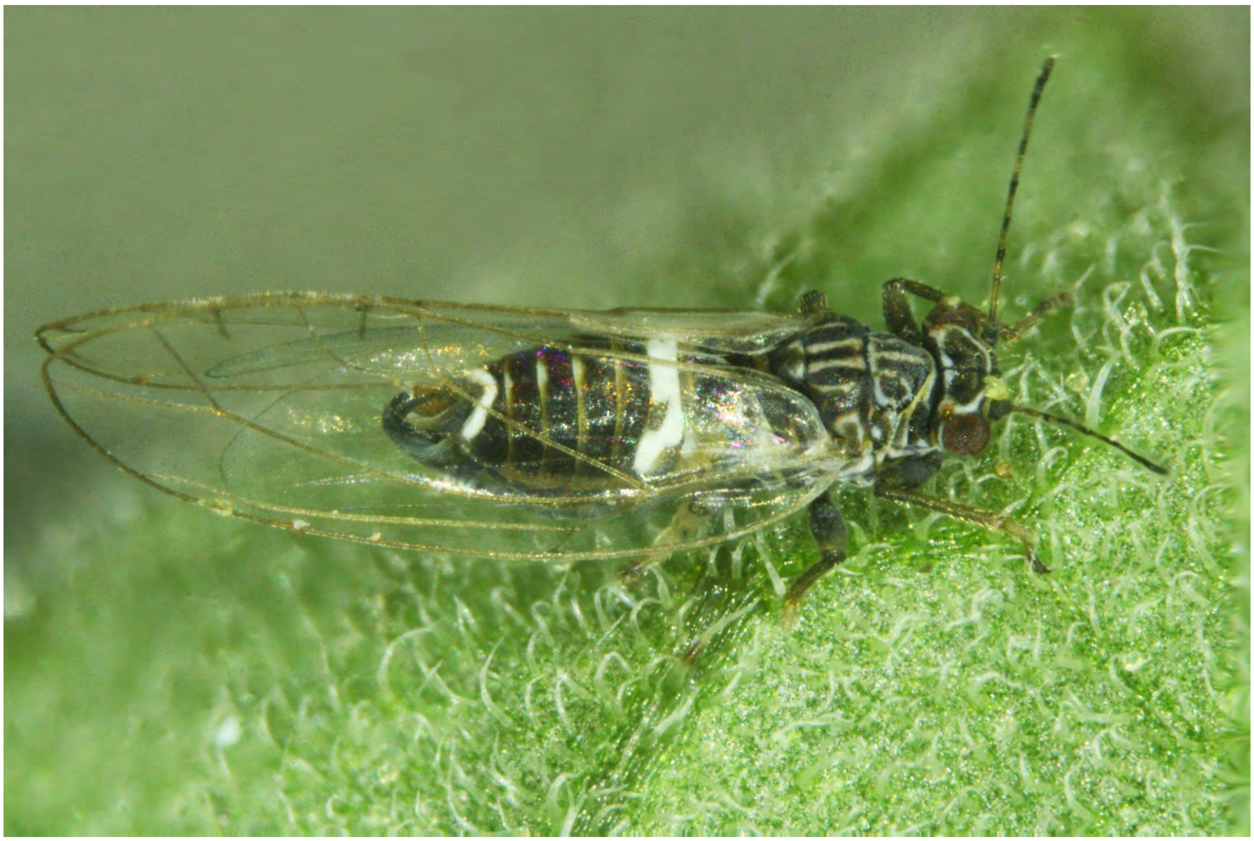

Figure 1. Potato psyllid adult on potato. Photo courtesy of Erik Wenninger, University of Idaho

Figure 2. Potato psyllid nymph on potato. Photo courtesy of Erik Wenninger, University of Idaho.

Figure 3. Potato psyllid eggs on potato. Photo courtesy of Erik Wenninger, University of Idaho.

Figure 4. Progression of zebra chip infections in the field. Photo courtesy of Silvia Rondon, OSU-Hermiston.

Figure 5. Planting one of our potato trials at the Malheur Experiment Station, Ontario, OR. Photo courtesy of Stuart Reitz, OSU-Malheur County

Figure 6. One of our regional insecticide trials at Pasco, WA. Photo courtesy of Tim Waters, WSU-Franklin County.

Figure 7. Vacuum sampling for adult psyllids and other insects. Photo courtesy of Stuart Reitz, OSU-Malheur County.

Figure 8. Sleeve cage for testing insecticide efficacy against potato psyllids. Photo courtesy of Erik Wenninger, University of Idaho.