Potato Progress

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

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2014 Integrated Pest Management Guidelines for Insects and Mites in Idaho, Oregon and Washington Potatoes

In the year 2002 Alan Schreiber led the first effort to summarize the best information available in the Northwest for management of insects, insect-vectored diseases, and mites in our potato crops. This first edition document was 10 pages long and was prepared in response to a major upsurge in new insecticides available in potatoes. Many of these new products controlled a narrow range of pests, had specialized use directions, or unusual modes of action. This was a big change from the broad-spectrum organophosphate, carbamate, and organochlorine insecticides of the 20th century. This document was called, "Integrated Pest Management Guidelines for Insects and Mites in Idaho, Oregon and Washington Potatoes" (a.k.a. the "Guidelines").

Since that first Guidelines document was prepared, the region has dealt with new and serious pests including beet leafhopper and the BLTVA phytoplasma it transmits (causing purple top), potato tuberworm, potato psyllid/zebra chip, and an increase in importance of occasional and secondary pests such as spider mites, thrips, and caterpillars. New insecticides have continued to enter the marketplace, and old ones have departed. Each year Schreiber and various colleagues across the Northwest have amended and added to the Guidelines until this year it has reached a massive 66 pages.

Prior to release each year, the Guidelines are reviewed by a large group of persons in industry including research and extension scientists, crop advisors, and pesticide registrants. We strive to make the Guidelines as thorough and up-to-date as possible.

This year, the Guidelines are complete and available online in various locations, including the links below. In addition, we intend to publish edited excerpts from the Guidelines here in *Potato Progress* periodically through the spring and summer. On the following pages we publish our first Guidelines excerpt on potato psyllid and zebra chip control, knowing that this issue is top-of-mind for many in industry.

The Guidelines can be found in their entirety here:

http://www.nwpotatoresearch.com/IPM-Home.cfm

and

http://www.schreiberagricultureresearch.com/

Potato Psyllid and Zebra Chip in 2014

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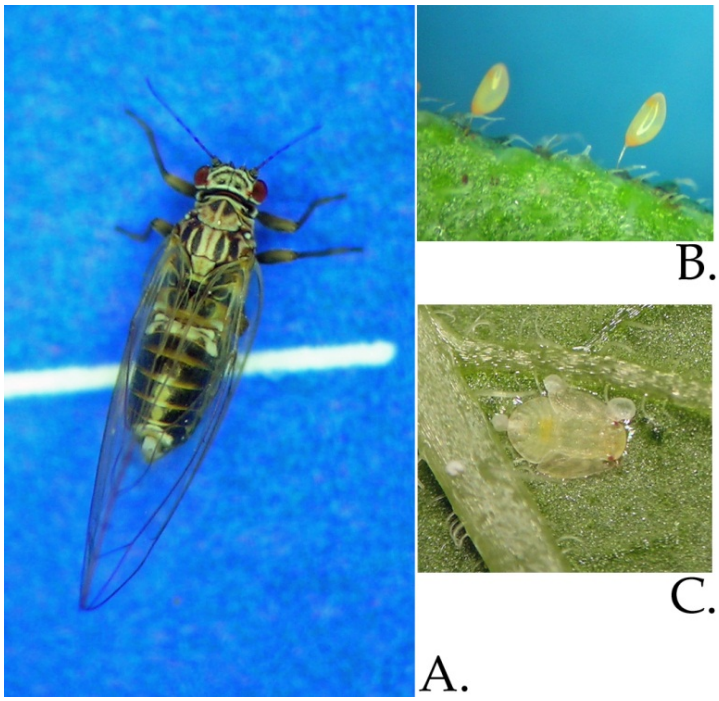
Research conducted by Schreiber and others indicates that potato psyllid is easier to control when applications start prior to population establishment. Population establishment is defined as potato psyllids successfully laying eggs that lead to development of a nymphal population. Products that controlled psyllids when applications started prior to population establishment were less effective when applied in a rescue situation. It is critical to start psyllid control programs prior to population establishment. Rescue treatments made to established populations of potato psyllids containing the causal agent of zebra chip may not be successful.

The potato psyllid is a phloem-feeding insect that has an extensive host range of at least 20 plant families, but reproduces mostly on the potato and nightshade family (Solanaceae). Zebra chip (ZC) is characterized by development of a dark striped pattern of necrosis in tubers (Fig 1). The pathogen associated with ZC is the bacterium *Candidatus* Liberibacter solanacearum that is vectored by potato psyllid.

Figure 1. Zebra chip tuber symptoms.

IDENTIFICATION.

Potato psyllids pass through three life stages: egg, nymph and adult. All life stages are difficult to detect. The adults look like small cicadas, about 0.08 inch (2 mm) long (Fig. 2A). They are closely related to aphids and leafhoppers and have clear wings that rest roof-like over the body. Although predominantly black, the potato psyllid has white markings. The first abdominal segment shows a broad white band, the last segment has an inverted white "V". Psyllids jump readily when disturbed.



The football-shaped eggs (Fig. 2B) are extremely small, slightly larger than leaf hairs, and on a short stalk. They are usually on the underside and along the edges of leaves and are usually laid in the upper plant canopy. A 10X hand lens is required to see them. Psyllid nymphs (Fig. 2C) look like immature soft scale or whiteflies. Unlike whiteflies, when disturbed they move readily. They are flat and green with a fringe of short spines around the edge. Immature psyllids go through five stages in as little as 13 days in warm temperatures.

Figure 2. Life stages of potato psyllid.

Potato psyllids can damage a plant even if they do not carry the ZC bacterium since these insects feed directly on the plant and may weaken it. As they feed, psyllids inject toxins with their saliva that can cause leaf yellowing or purpling, smaller and fewer tubers, and misshapen tubers. This physiological condition has been dubbed "psyllid yellows" disease (Fig 3) and is generally less damaging than zebra chip.

The psyllid acquires the ZC bacterium when feeding on an infected plant or from its mother who can transmit the bacterium to her offspring via the egg. Once infected, the psyllid is always a carrier of the bacterium. The ZC disease usually takes about 3 weeks from infection to produce symptoms in the foliage and tubers.

Figure 3. Psyllid yellows foliar damage.

First identified in northeastern Mexico in 1994 and south Texas in 2000, ZC has now been reported from at least California, Idaho, Kansas, Nebraska, New Mexico, Oregon, Wyoming and Washington. Also, the disease was recently reported from New Zealand. Plants affected by ZC exhibit a range of symptoms that are similar to potato purple top and psyllid yellows, including stunting, chlorosis, leaf scorching, swollen internodes near apical portions, axillary bud and aerial tuber proliferation, necrosis of vascular system, and early death. The name "zebra chip" refers to the characteristic brown discoloration of the vascular ring and medullary ray tissues within the tubers that is enhanced when tubers are sliced and fried into chips or fries.

Potato psyllids will feed on and transmit the disease-causing organism to all varieties of potatoes tested so far. While there are differing susceptibilities across potato varieties, virtually all varieties will express symptoms of ZC.

The bacterium affects the phloem tissue, causing the foliar symptoms described above and higher than normal sugar concentrations in tubers. When cooked, the sugar caramelizes and forms dark brown stripes. Though not a human health concern, ZC negatively affects the taste of fried products and renders the tubers unmarketable. This disease is not restricted to potato chips. In addition to causing tuber necrosis, the ZC organism can significantly reduce yields and tuber size. For additional photos and other information, please see the complete version of this document at: http://www.nwpotatoresearch.com/IPM-Home.cfm or http://www.schreiberagricultureresearch.com/.

Psyllid and ZC Biology

Potato psyllid has infested potato fields in the Northwest for decades but was never considered a pest until the advent of ZC in the region. For many years it was thought to migrate from other regions of the country, but this has not been demonstrated. Research from 2011 to 2013 has proven overwintering of this psyllid in Oregon, Washington and Idaho in association with the perennial weed called bittersweet nightshade (*Solanum dulcamara*), a native to Eurasia. Bittersweet nightshade can be found in fence rows, stream banks, pond margins, low woods, and roadsides throughout the Northwest. The relative significance of this overwintering life style versus long-range migration is still uncertain.

The potato psyllid is now known to have at least four genetically distinct types ("haplotypes") in North America, with evidence emerging about variability amongst them in terms of mating and ecology. The importance of these haplotypes and whether one or all are relevant to ZC are not yet known.

The historical lack of ZC in Northwest potatoes, even though the insect has long since been present here, is probably due to the insects in previous years not carrying the pathogen. It is possible that psyllids have carried the disease in previous years in the Northwest but disease symptoms were attributed to other causes such as viral infections.

Psyllids are typically first detected in Northwest potatoes in June and early July, but the timing of the ZC outbreak in 2011 suggests that they first colonized the earliest affected fields in mid-June. Theoretically, the only important psyllids are those that carry the ZC pathogen, Liberibacter. It is generally possible to detect Liberibacter in psyllids using PCR tests. An additional complicating factor in ZC biology is that there are at least two biologically distinct, genetically different, haplotypes of the Liberibacter that infects potatoes. Initial research information suggests that one haplotype causes a more severe foliar disease than the other. It is not known how important this is in the real world of crop production, or whether the diverse psyllid/Liberibacter haplotype interactions are relevant to growers and IPM.

Monitoring. The most commonly used scouting method for psyllids is yellow sticky traps (we suggest AlphaScents brand). Psyllid adults are active flyers and are attracted to yellow, but traps must be placed inside crop fields close to the canopy. This differs from monitoring beet leafhoppers, which feed and reproduce outside potato fields. Psyllids feed specifically on potatoes and are rarely caught on yellow sticky traps deployed outside potato fields to catch beet leafhoppers. Research strongly indicates that yellow sticky traps are effective at detecting psyllid migrants into potato fields, but do not effectively detect resident populations. There are several native psyllid species that are routinely caught on yellow sticky traps in the Northwest, so knowing how to recognize potato psyllid is important. Research is underway to develop a specific monitoring tool for potato psyllids. For detailed information on monitoring psyllids using yellow sticky traps, see: http://www.nwpotatoresearch.com/pr/Insect-Trapping-Guides.cfm.

Psyllids can also be detected by sampling leaves. Generally, the goal of leaf sampling is early detection of psyllids in your field. The best way to detect psyllids early is to sample the extreme edge of the field. This means the outer-most plants. Psyllids have a strong tendency to colonize edges first, making the most likely place for early detection the edges.

Management. The guidelines contained herein and in the complete document online should be viewed with the caution that products may perform better in a low pressure situation than they would in a higher pressure situation. Also, we note that suggestions below reflect a conservative and risk-averse management option.

For a far more complete discussion of insecticide options and use instructions, see the complete document at:

http://www.nwpotatoresearch.com/IPM-Home.cfm

and

http://www.schreiberagricultureresearch.com/

Table of Activity for Psyllid Life Stages and Other Potato Insect Pests. Each x indicates the insecticide has activity against that pest and life stage.

		Psyllid Lifestage			Efficacy Against Other Potato Pests					
	Group #	eggs	nymphs	adults	BLH	CPB	GPA	Thrips	Worms	Mites
pyrethroids	3		x	x	x	x			x	
Platinum	4a	x	x	x	x	x	x			
Cruiser	4a	x	x	x	x	x	x			
Belay	4a	x	x	x	x	x	x			
Admire Pro	4a	x	x	x	x	x	x			
Transform	4c		x	x	x		x			
Radiant	5		x			x		x	x	
Abamectin	6		x	x		x		x	x	x
Fulfill	9b		x	x			x			
Beleaf	9c		x	x			x			
Rimon	15		x			x			x	
Torac	21a		x	x		x	x			
Movento	23	x	x				x	x		x
Oberon	23	x	x							x

Insecticide at planting time followed by foliar applications. Apply a neonicotinoid to the seed piece, in furrow at planting or at cracking, such as Admire Pro, CruiserMaxx, or Platinum. At just prior to the effective decline of the planting time insecticide, initiate a foliar insecticide program. The point at which one decides to make the first application is based on a combination of the pest management professional's aversion to risk and the choice of product. Based on the 2012 field research season, neonicotinoid insecticides appeared to provide at least 80 to 90 days of residual control. A foliar program should begin no later than 80 to 90 days after application of a neonicotinoid program. For resistance management reasons we recommend that no more than 80% of fields on a farm be treated with Group 4 neonicotinoid insecticides at planting/cracking.

Foliar only program. If no planting time insecticides are applied then start a foliar insecticide program at the first detection of potato psyllids in your area (do not wait until psyllids are detected in a particular field). Apply foliar insecticides with known effectiveness against adult potato psyllids at the beginning of your program. Continue a foliar program until your field has been desiccated or harvested.

Timing of Application. Actively growing potato plants can double in size every 7 days until bloom starts. Application of contact (non-systemic) products will only provide control on the plant tissue that is present at the time of application, necessitating a shorter application interval than when using a highly systemic insecticide. Later in the season when a potato plant is not actively growing above ground, a contact insecticide may provide 14 days or longer residual control. When a potato plant is fully mature, a systemic insecticide can take up to 2-4 days to become fully translocated throughout the plant.

Method of Application. Due to our lack of knowledge on effect of method of application on efficacy, we recommend that you do not apply insecticides for potato psyllids in potatoes via chemigation unless you are confident the application will result in adequate deposition of insecticide residues on the foliage. Obtaining adequate coverage, particularly with contact insecticides, is critical since the immature stage of the potato psyllids prefers the underside of the leaves.

2014 WA Commercial Potato Seed Lot Pick up &Trial Information

Info also available each year at: **www.potatoes.wsu.edu**

Commercial potato seed samples are requested for the 2014 Washington Seed Lot Trial. **Two hundred whole (single drop) seed is an acceptable sample size, or 50 lbs of 4 oz single drop seed.**

Requested: 50 lbs of 2-4 oz whole seed, no seed treatments We want a representative sample - if applicable, include a representative amount of ROTTEN TUBERS!

(Seed over 6 oz is not acceptable)

A representative sample is needed. Sampling the first (or last) 300 seed from the truck is not likely to provide a representative sample of the lot. Sample tags may be obtained by visiting the Potato Commission in Moses Lake or calling at 509-765-8845.

Your assistance with collection and drop off of seed samples is needed. Seed samples may be taken to the WSU Othello Research Unit (509-488-3191); located on Booker Road ¼ mile south from State Highway 26 and about five miles east of Othello. For sample pick up and any questions regarding the seed lot trials please call:

South Basin: Tim Waters (509-545-3511), Mark Pavek (509-335-6861), or Zach Holden (509-335-3452).

North Basin: Carrie Huffman Wohleb (509-754-2011), Mark Pavek (509-335-6861), or Zach Holden (509-335-3452).

In the North Basin, one seed "drop-off" has been established. It is located at Qualls Ag Labs (Mick Qualls, 509-787-4210 ext 16) on the corner of Dodson Road and Road 4; come to front office between 8 am and 5 pm. Please call the numbers below to arrange additional pick up sites. Samples will be picked up at 2:00 pm the day before each planting date (below) to be included. Growers planting in early March should drop their samples off at the Othello Research Center or store the samples and call the numbers below for pick up. For all alternative pick up locations or questions please call Mark Pavek at 509-335-6861 or Zach Holden at 509-335-3452.

PICK UP DATES ARE ONE DAY PRIOR TO THE PLANTING DATES BELOW

The seed lot planting dates for 2014 are:	1st (Early)	March 25
	2nd	April 8
	3rd	April 22
	4th (Late)	May 6

2014 Potato Field Day - Thursday June 26

This year's virus reading of the seed lots will take place on June 10 and 24.