MANAGEMENT OF POTATO PSYLLIDS - 2016

Andy Robinson, Extension Potato Agronomist NDSU(andrew.p.robinson@ndsu.edu); Jan Knodel, Extension Entomologist NDSU (janet.knodel@ndsu.edu); Neil Gudmestad, Plant Pathologist NDSU (neil.gudmestad@ndsu.edu), Ian MacRae, Extension Entomologist University of Minnesota (imacrae@umn.edu)

Adult potato psyllids have been detected in some fields in both western and south central North Dakota potatoes. While this insect is mainly found in the Rocky Mountain states, it has been reported as far west as California and British Columbia and as far east as Quebec. Potato psyllids are believed to overwinter in the southern most U.S. states and Mexico and re-establish to northern locations in the summer via wind dispersal. They are not known to overwinter in North Dakota. Potato psyllids are of principal concern because they can transmit the Liberibacter bacterium which causes Zebra chip.

Life Cycle & Identification

Adult potato psyllids look like very small cicadas; they are tiny black insects (adults are only 1/10" – 1/5" long) with clear wings which are kept folded like a tent above its back when not flying. The adults have white stripes on the head and thorax, and bold, white bands on the abdomen (Fig. 1). Similar to leafhoppers, they can jump very quickly when disturbed. Psyllids feed by inserting their straw-like mouthparts into a plant and sucking sap. It is during this process that they transmit the bacterium that causes Zebra chip.

The basic life stages are: eggs, nymphs and adults (Fig. 2). The complete life cycle can take up to 25-33 days with an average of 28 days.

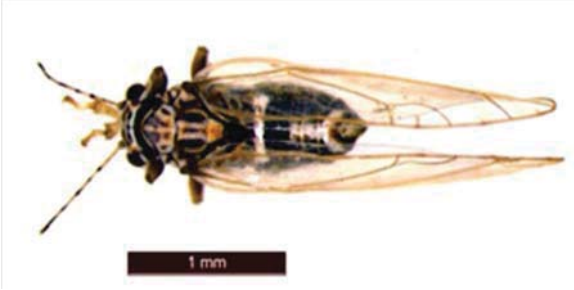

Figure 1. Adult potato psyllid has clear wings, white stripes on the head and thorax, and bold, white bands on the abdomen. Picture courtesy of Patrick Beauzay, NDSU.

Each female psyllid can lay about 200 orange, foot-ball shaped eggs (need 10x hand lens to see) which are supported on a short stalk (Fig. 2). They are typically laid on the edge of the leaf in the upper canopy. Eggs hatch into nymphs (immatures) in about 7 days and go through five instars in about 19-24 days. Psyllid nymphs do not look at all like the adults. Nymphs are flat, green, and oval-shaped, with spines on edge. They mimic the appearance of immature soft scales or whiteflies; however, psyllid nymphs are active when disturbed. Nymphs are most likely to be found in the top 1/3 of the potato canopy and are present on the underside of the leaf/leaflet. A 10-20X hand lens is useful for finding eggs and early nymph instars on the underside of potato leaflets.

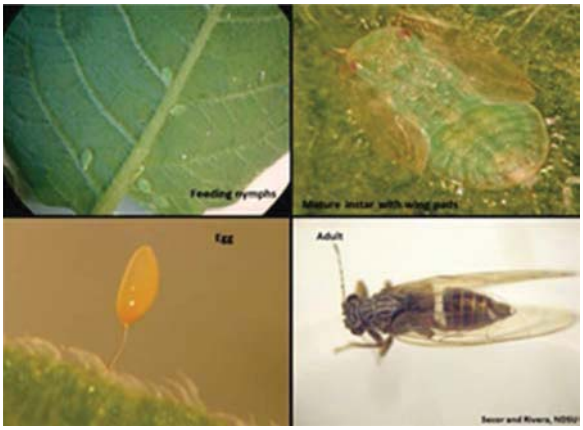

Figure 2. Potato psyllid egg, nymphs, and adult. Picture courtesy of Gary Secor and Vivian Rivera, NDSU.

Temperature significantly affects psyllid dispersal and population dynamics. Psyllids are dispersed by wind, but movement is greatly increased when temperatures are at or above 92°F. Developmental time is also dependent somewhat on temperature and prolonged exposure to higher temperatures (in excess of 90°F) has been reported to decrease egg survivorship. Some mortality may occur from

rain events but should not be counted on as reliable population control.
There are multiple generations of potato psyllids each season depending on when they arrive. Because the adults lay eggs over an extended period, these generations overlap and it is difficult to say how many generations we have in the northern plains.

Damage & Symptoms
Adult potato psyllids have a significant economic impact on potato production through their vectoring of the Liberibacter bacterium that causes the disease *Zebra chip*. Zebra chip causes a radiating pattern in the tuber that darkens during frying. The zebra chip bacterium can cause yellowing and curling of leaves (Fig. 3), leaf scorching (Fig. 4), stunting, swelling of stem nodes, aerial tubers and leaf growth from the axillary buds, brown discoloration in tubers (Fig. 5), and early plant death. The brown discoloration in tubers is visible in the vascular ring and the medullary ray tissues, and when potatoes are fried these discolorations are amplified (Fig. 6). This discoloration is thought to be caused by the conversion of starch into water soluble sugars. Consequently, although the discoloration is not harmful to consumers, the flavor of tubers from infected plants is affected. Reduction in yield and tuber quality also associated with Zebra chip can cause significant loss of marketable potatoes.

Potato psyllids that do not carry the Liberibacter bacterium can also injure plants.

Figure 3. Leaf yellowing and curling caused by potato psyllids with the Liberbacter bacterium. Photo courtesy of Neil Gudmestad, NDSU.

Figure 4. Scorching of leaves caused by Liberbacter bacterium, transmitted by potato psyllids. Photo courtsey of Neil Gudmestad, NDSU.

Figure 5. Discoloration of tuber caused by the Liberbacter bacterium. Photo courtsey of Neil Gudmestad, NDSU.

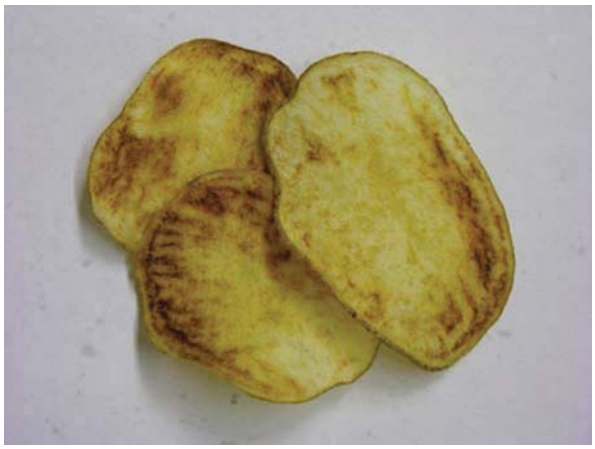

Figure 6. Zebra chip resulted from tubers infected with Liberbacter bacterium. Photo courtsey of Neil Gudmestad, NDSU.

When psyllids feed they inject toxins with their saliva, causing "psyllid yellows" (Fig 7). Psyllid yellows symptoms include yellow or purple leaves (similar to some nutrient deficiencies), reduced tuber number and size, malformed tubers, and chaining of tubers. These symptoms take from one to three weeks to appear after feeding. Typically yield impact is greatest if plants are infected prior to tuber set.

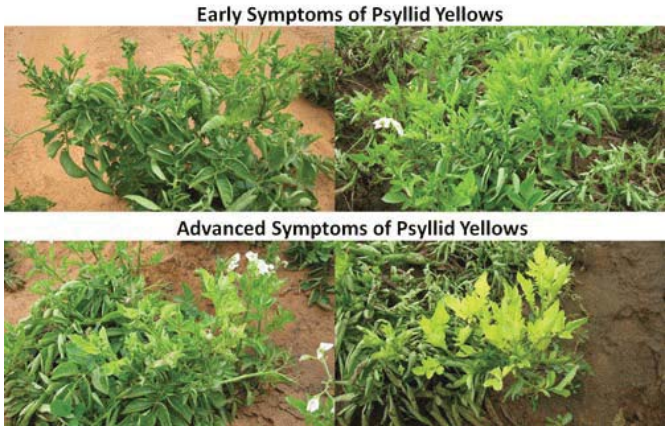

Figure 7. Psyllid yellows on potatoes(N. Gudmestad, NDSU).

Monitoring for Potato Psyllids

Scouting for potato psyllids can be done with yellow sticky traps, sweeping, or by collecting lower leaflets throughout the field and determining if psyllid adults, nymphs, or eggs are present. Sticky traps should be placed at the field edge and are usually detect the first occurrence of adult populations. There is no set number of traps per area, but more traps increase the chances of early detection. Sweeping the field edge is also effective in detecting adult psyllids; take 100 sweeps at field edges and place the contents into a ziplock bag. Freeze the insect specimens for 24 hours and examine later for adult potato psyillids. For leaf sampling, collect 100 leaves from the middle canopy at 10 locations in the field and count eggs, nymphs (Fig 8, 9, &10) and adults. Psyllid populations in ND and MN are not typically widespread so management decisions should be based on scouting results. There are no research-based treatment thresholds for potato psyllids; if psyllids are found in a field, it is recommended to apply effective insecticides.

Treatment

Insecticide resistance is not likely a problem with the psyllid populations in ND and MN, management practices in other locations recommend rotating insecticide modes of action in sequential applications. Once established in the field psyllids are very difficult to control. Insecticides are best used in blocks of two successive applications of the same insecticide followed by an insecticide of differing chemistry. Insecticides such as closely related products Fulfill (Group 9B) and BeLeaf (Group 9C) can reduce populations of small nymphs (first and second instars). In the case of Fulfill, use the high rate in the first application followed by the low rate seven days later. Movento (Group 23) is an insecticide with perhaps the highest degree of efficacy since it has activity on eggs and all stages of immatures (nymphs). It is also phloem systemic and when applied to the canopy it will translocate to the lower mid canopy where the psyllids are mostly likely present. Abamectin (Group 6) insecticides such as Agrimek and Reaper are active on adults and are an excellent choice to tank-mix with insecticides discussed above that are active on the immature psyllids. A tank-mix of abamectin with either Fulfill, BeLeaf and Movento is very cost effective as it will reduce all life stages of the psyllid.

Other insecticides such as Sivanto (Group 4D) and Torac (Group 21A) have activity on several life stages and can also be considered for psyllid suppression. Avoid pyrethroid insecticides as they will be harmful to beneficial insects which have been demonstrated to suppress psyllid populations. Additionally, pyrethroid insecticides are known to increase female egg-laying by 20-25% upon exposure causing psyllid populations to flare.

Figure 8. Potato psyllid eggs.

Figure 9. Potato psyllid nymphs.

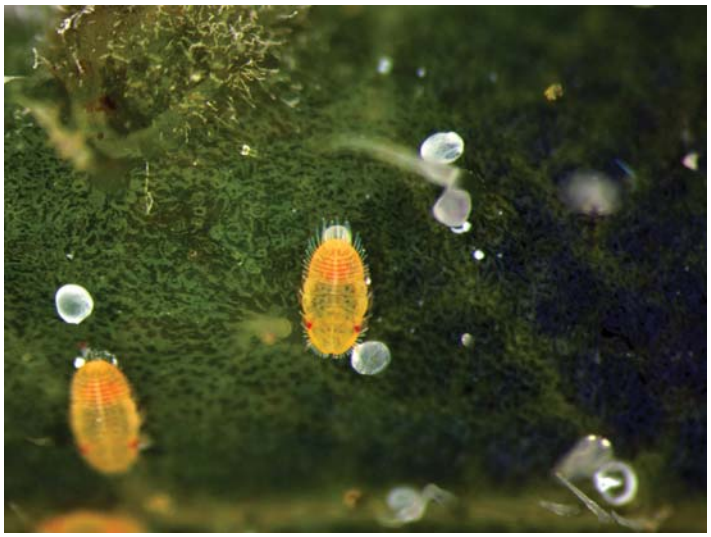

Figure 10. Potato psyllid young nymphs.

For additional information, see the following resources:

North Dakota Field Crop Insect Guide
https://www.ag.ndsu.edu/pubs/plantsci/pests/e1143.pdf

Biology and Management of Potato Psyllid in Pacific Northwest Potatoes
http://www.oregonspuds.com/images/publications/PotatoPsyllid.pdf.

The Potato/Tomato Psyllid
http://extensionpublications.unl.edu/assets/pdf/g2113.pdf

Potato Psyllid Vector of Zebra Chip Disease in the Pacific Northwest
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/30058/pnw633.pdf

Psyllids
http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7423.html

INSECTICIDES REGISTERED FOR USE IN POTATO FOR POTATO PSYLLIDS

IRAC Group	INSECTICIDE	PRODUCT PER ACRE	PHI
4A (neonicotinoid)	**dinotefuran** Scorpion 35SL	2 - 2.75 fl oz	7 days
4A (neonicotinoid)	**dinotefuran** Venom 20SG	0.33 lb	7 days
4A (neonicotinoid)	**imidacloprid** Impulse 1.6FL Pasada 1.6F Prey 1.6 Sherpa	3.8 fl oz	7 days
4A (neonicotinoid)	**imidacloprid** Advise 2FL AmTide Imidacloprid 2F Macho 2FL Montana 2F Nuprid 2SC	3 fl oz	7 days
4A (neonicotinoid)	**imidacloprid** ADAMA Alias 4F Montana 4F Nuprid 4F Max	1.5 fl oz	7 days
4A (neonicotinoid)	**imidacloprid** Admire Pro	1.3 fl oz	None
4A (neonicotinoid)	**imidacloprid** Malice 75WSP	1 oz	7 days
4D (butenolides)	**flupyradifurone** Sivanto 200 SL	7 - 14 fl oz	7 days
6 (avermectin)	**abamectin** ABBA 0.15EC Agri-Mek 0.15EC Epi-Mek 0.15EC Nufarm Abamectin 0.15EC Reaper 0.15EC Temprano Timectin 0.15EC *RUP*	8 - 16 fl oz	14 days Do not allow livestock to graze or feed treated foliage to livestock
6 (avermectin)	**abamectin** Agri-Mek SC *RUP*	1.75 - 3.5 fl oz	14 days
6 + 3A (avermectin + pyrethroid)	**avermectin + bifenthrin** Athena *RUP*	7 - 17 fl oz	21 days
9B (pyridine azomethine derivatives)	**pymetrozine** Fulfill †	5.5 oz	14 days
9C (flonicamid)	**flonicamid** Beleaf 50G	2 - 2.8 oz	7 days
21A (mitochondrial electron transport inhibitors)	**tolfenpyrad** Torac	14 - 21 fl oz	14 days
23 (tetronic and tetramic acid derivatives)	**spiromesifen** Oberon 2SC Oberon 4SC	8 - 16 fl oz 4 - 8 fl oz	7 days
23 (tetronic and tetramic acid derivatives)	**spirotetramat** Movento	4 - 5 fl oz	7 days
28 + 3A (diamides + pyrethroid)	**chlorantraniliprole + lambda-cyhalothrin** Besiege *RUP*	5 - 9 fl oz	14 days
28 + 3A (diamides + pyrethroid)	**chlorantraniliprole + lambda-cyhalothrin** Voliam Xpress *RUP*	5 - 9 fl oz	14 days

RUP = Restricted Use Pesticide; † = Suppression only