MANAGEMENT OF POTATO PSYLLIDS

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Adult potato psyllids have been detected in North Dakota's potatoes, about one month earlier than 2011 *(Source: N. Gudmestad, Dept. Plant Pathology, NDSU).* Potato psyllids have also been found in Manitoba, Canada. 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.

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.

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. 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.

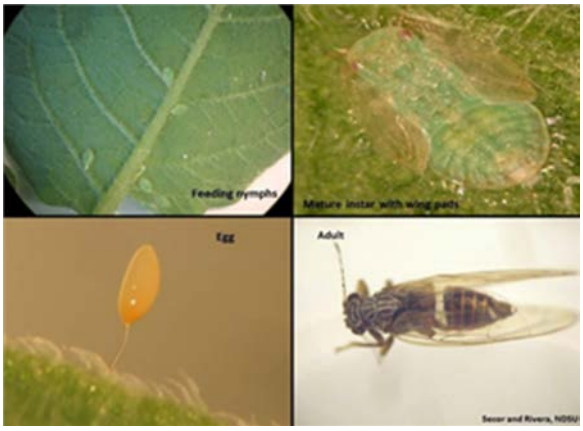

Figure 2. Potato psyllid egg, nymphs, and adult. Picture courtesy of Gary Secor and Vivian Rivera, NDSU.

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.

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.

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

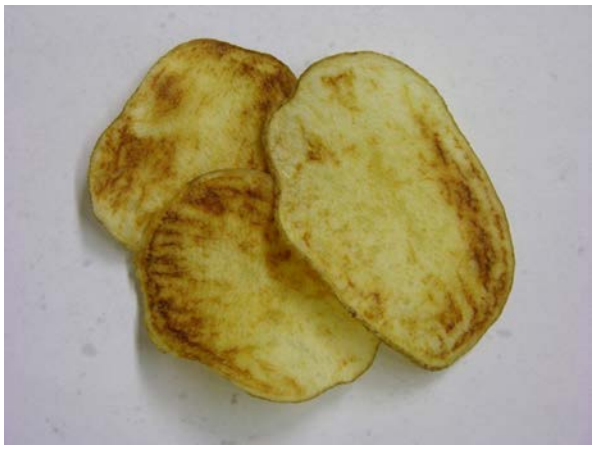

Figure 6. Zebra chip resulted from tubers infected with Liberbacter bacterium. Photo courtsey of Neil Gudmestad, NDSU.

When psyllids feed they inject toxins with their saliva, causing "psyllid yellows". Psyllid yellows symptoms include yellow or purple leaves, reduced tuber number and size, malformed tubers, and chaining of tubers. These symptoms take from one to three weeks to appear after feeding.

Monitoring for Potato Psyllids

Managing potato psyllids is achieved through vigorous scouting. This can be done by using yellow sticky traps, sweeping, or 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 used to detect the first occurrence of adult populations. There is no set number of traps per area, however, more traps increase the chances of early detection. Sweeping the field edge is also effective in detecting adult psyllids. Use 100 sweeps at the field edge and place the sweep contents into a clear plastic bag. Because psyillds are so active, freeze the insect specimens for 24 hours and examine later for adult potato psyllids. For leaf sampling, collect 100 leaves from middle canopy from 10 locations and observe the presence of eggs, nymphs or adults, which confirms field colonization.

Action Threshold

Research has not determined a treatment threshold for potato psyllids. Currently, if psyllids are found in a field, it is recommended to start applying foliar insecticides that are effective against adult potato psyllids. There have been a low number of psyllids found in North Dakota as of 10 July 2012, thus *it is important to know what the trap counts are and their proximity before applying insecticide treatments for psyllids*. Although 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. For list of insecticides registered for control of potato psyllid, please see the 2012 North Dakota Field Crop Insect Guide. A partial list of insecticides that are registered for potato psyllid control can be seen in Table 1.

For additional information, see the following resources:
North Dakota Field Crop Insect Guide
http://www.ag.ndsu.nodak.edu/aginfo/entomology/entupdates/ICG_12/e1143_all.pdf#page=69
Biology and Management of Potato Psyllid in Pacific Northwest Potatoes
http://www.potatoes.com/IPMStuff/PDFs/PotatoPsyllid.pdf.
The Potato/Tomato Psyllid
http://www.ianrpubs.unl.edu/epublic/live/g2113/build/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

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Table 1. Insecticides registered for use in potato for potato psyllid and other insect control in North Dakota.

INSECTICIDE	PRODUCT PER ACRE	PHI	Aphids	Cabbage Looper	Colorado Potato Beetle	Flea Beetles	Potato Leafhopper	Potato Psyllid	Variegated Cutworm	White Grubs	Wireworms
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			●			●			
avermectin + bifenthrin Athena *RUP*	7 - 17 fl oz	21 days	●	●	●	●	●	●	●		
beta-cyfluthrin Baythroid XL *RUP*	0.8 - 2.8 fl oz	None for tubers 14 days for grazing if more than 5.6 fl oz per acre is applied	†	●	●	●	●	●	●		
beta-cyfluthrin + imidacloprid Leverage 360 *RUP*	2.8 fl oz	7 days	●	●	●	●	●	●	●		
bifenthrin + imidacloprid Brigadier Swagger *RUP*	At Plant: 16 - 25.6 fl oz 32 - 51.2 fl oz	21 days	●		●	●	●	●		●	●
bifenthrin + imidacloprid Brigadier Swagger *RUP*	Foliar Application: 3.8 - 6.14 fl oz 7.6 - 12.28 fl oz	21 days	●	●	●	●	●	●			
chlorantraniliprole + lambda-cyhalothrin Voliam Xpress *RUP*	5 - 9 fl oz	14 days	●	●	●	●	●	●	●		
clothianidin Belay	In-furrow or Side-dress Application: 9 - 12 fl oz	None	●		●	●	●	†			
cyfluthrin Renounce 20WP Tombstone Tombstone Helios *RUP*	1 - 3.5 oz 0.8 - 2.8 fl oz 0.8 - 2.8 fl oz	0 days for tubers 14 days for grazing	†	●	●	●	●	●	●		
dinotefuran Scorpion 35SL	Soil Application: 11 - 13 fl oz Foliar Application: 2 - 2.75 fl oz	7 days	†		●	●	●	●			
dinotefuran Venom 20SG	Soil Application: 1.4 - 1.65 lbs Foliar Application: 0.33 lb	7 days	†		●	●	●	●			

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dinotefuran Venom	Soil Application: 6.5 - 7.5 oz Foliar Application: 1 - 1.5 oz	14 days			●	●	●	●			
esfenvalerate Adjourn Asana XL *RUP*	2.9 - 9.6 fl oz	7 days	●	●	●	●	●	●	●		
flonicamid Beleaf 50G	2 - 2.8 oz	7 days	●					++			
imidacloprid Impulse 1.6FL Nuprid 1.6F Pasada 1.6F Prey 1.6 Sherpa	Foliar Application: 3.8 fl oz	7 days	●		●	●	●	●			
imidacloprid Advise 2FL AmTide Imidacloprid 2F Couraze 2F Macho 2FL MANA Alias 2F Montana 2F Nuprid 2F Nuprid 2SC Widow	In-furrow, Side-dress or Banded Application: 0.9 - 1.3 fl oz per 1,000 row-feet	None	●		●	●	●	●			●
imidacloprid Advise 2FL AmTide Imidacloprid 2F Couraze 2F Macho 2FL MANA Alias 2F Montana 2F Nuprid 2F Nuprid 2SC Widow	Seed Piece Treatment: 0.4 - 0.8 fl oz per cwt	None	●		●	●	●	●			●
imidacloprid Advise 2FL AmTide Imidacloprid 2F Couraze 2F Macho 2FL Montana 2F Nuprid 2SC	Foliar Application: 3 fl oz	7 days	●		●	●	●	●			
imidacloprid Couraze 4F Mana Alias 4F Montana 4F Nuprid 4F Max Wrangler	In-furrow, Side-dress or Banded Application: 0.45 - 0.65 fl oz per 1,000 row-feet	None	●		●	●	●	●			●

INSECTICIDE	PRODUCT PER ACRE	PHI	Aphids	Cabbage Looper	Colorado Potato Beetle	Flea Beetles	Potato Leafhopper	Potato Psyllid	Variegated Cutworm	White Grubs	Wireworms
imidacloprid Couraze 4F Mana Alias 4F Montana 4F Nuprid 4F Max Wrangler	Seed Piece Treatment: 0.2 - 0.4 fl oz per cwt	None	●		●	●	●	●			●
imidacloprid Couraze 4F Mana Alias 4F Montana 4F Nuprid 4F Max	Foliar Application: 1.5 fl oz	7 days	●		●	●	●	●			
imidacloprid Admire Pro Nuprid 4.6F Pro	In-furrow, Side-dress or Banded Application: 5.7 - 8.7 fl oz per acre	None	●		●	●	●	●			●
imidacloprid Admire Pro Nuprid 4.6F Pro	Seed Piece Treatment: 0.17 - 0.35 fl oz per cwt	None	●		●	●	●	●			●
imidacloprid Admire Pro	Foliar Application: 1.3 fl oz	None	●		●	●	●	●			
imidacloprid Malice 75WSP	1 oz	7 days	●		●	●	●	●			
lambda-cyhalothrin Grizzly Z Lambda-Cy EC LambdaStar Lambda-T Lamcap Nufarm Lambda Cyhalothrin 1EC Province Silencer Silencer VC Taiga Z Warrior II *RUP*	1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 1.92 - 3.84 fl oz 0.96 - 1.92 fl oz	7 days	●	●	●	●	●	●	●		
lambda-cyhalothrin + thiamethoxam Endigo ZC *RUP*	3.5 - 4.5 fl oz	14 days	●	●	●	●	●	●	●		
permethrin Ambush 25W Ambush Arctic 3.2EC PermaStar Permethrin 3.2EC Perm-UP 3.2EC Pounce 3.2EC *RUP*	3.2 - 12.8 oz 3.2 - 12.8 fl oz 4 - 8 fl oz 4 - 8 fl oz 4 - 8 fl oz 4 - 8 fl oz	14 days	●	●	●	●	●	●	●		

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phorate Phorate 20G Thimet 20G SmartBox Thimet 20G Lock n Load *RUP*	At Plant for Light or Sandy Soils: 8.5 - 11.3 oz per 1,000 row-feet At Plant for Heavy or Clay Soils: 13 - 17.3 oz per 1,000 row-feet	90 days	●		●	†	●	●			●
pymetrozine Fulfill	2.75 - 5.5 oz	14 days	●					†			
spinetoram Radiant SC	4.5 - 8 fl oz	7 days		●	●			†			
spiromesifen Oberon 2SC	8 - 16 fl oz	7 days						●			
spirotetramat Movento	4 - 5 fl oz	7 days	●					●			
thiamethoxam Cruiser 5FS	Seed Piece Treatment: 0.11 - 0.16 fl oz per cwt **Consult label for correct rate based on seeding rate**	None	●		●	●	●	●			●
thiamethoxam Cruiser MAXX Potato	Seed Piece Treatment: 0.19 - 0.27 fl oz per cwt **Consult label for correct rate based on seeding rate**	None	●		●	●	●	●			
thiamethoxam Platinum Platinum 75SG	Soil Applications: 5 - 8 fl oz 1.66 - 2.67 fl oz **Consult label for soil application methods**	None	●		●	●	●	●			●

RUP = Restricted Use Pesticide

● = Control

† = Suppression only

‡ = Control of nymphs

ALWAYS READ THE LABEL!! **These recommendations are for North Dakota. Registration data may change year-to-year! Check labels for state registration status.**

Inclusion in or exclusion from this publication does not infer any recommendation or statement of efficacy.

No statement or inference of comparative efficacy between products is included in this document.

This information is from current registration labels as available.