

## POTATO UPDATE

Hermiston Agricultural Research and Extension Center

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### Essential information about Zebra Chip (ZC) in the Columbia Basin: Identification, Late Season Control, and Storage

Zebra Chip (ZC) is a new disease in the Columbia Basin. This disease causes significant yield and tuber quality losses in southern areas of the United States, Mexico and further south. So far it appears to have been confined entirely to the most southern portion of the Basin. A number of fields and potato cultivars (Russet Norkotah, Umatilla Russet, Alturas, Russet Ranger, a red cultivar, and Pike) have been confirmed to have been infected but damage has been reported to be overall minor though some issues have developed during processing/packing. Why and how the disease arrived in the Basin this year is unknown. Whether or not this disease will return next year is also unknown given the biology of the vector (Potato Psyllid) and the bacterium (*Candidatus Liberibacter*). The following information is provided to help with understanding and identification of this new disease, control where necessary, and provide limited storage information as our season winds down for the fall. More discussion will occur at Farm Fair in December as well as the joint Washington/Oregon potato conference early next year.

#### General Information

- First identified in Texas, but now ZC has been reported from at least California, Colorado, Kansas, Nebraska, New Mexico, Wyoming, Oregon, and Washington.
- The disease reduces yield and tuber quality.
- Apparently ZC affects all potato varieties to some extent
- After as little as 6 hours of feeding the Potato Psyllid can transmit the bacterium to a healthy potato plant.
- The bacterium is vectored by the potato psyllid (Fig. 1). This small insect lays eggs on the potato plant (Fig 1 A), which hatch into nymphs (Fig. 1 B) and mature into adults (Fig. 1 C and D).
- Potato Psyllids apparently do not overwinter in the Columbia Basin but migrate from the south and arrive in the lower Columbia Basin around early July, based on trap data.
- The insect (adult or nymph) picks up the bacterium when feeding on an infected plant. Once infected the insect is always a carrier of the bacterium. Eggs laid by an adult with the bacterium passed the bacterium to the eggs and future nymphs and adults.
- Unlike aphids, the adult and nymph stages of the Potato Psyllid are both frequent movers and therefore each has the possibility to spread the disease widely.
- The disease usually takes about 3 weeks from infection to produce symptoms in the tubers.
- Little if any resistance to this disease is present in the cultivars commonly grown in the area.

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- Plants arising from infected seed are at low frequency and have not been considered an important source of the bacterium in Texas.
- Even in areas of high plant infection the percentage of Potato Psyllids carrying the bacterium has been found to be low.
- Potato Psyllids are not easy to trap. There is no one trap that provides good data on numbers. They are not attracted to yellow. As today, there is no pheromone trap available to aid in collecting/assaying Psyllid numbers.
- If this disease becomes a regular issue in the Columbia Basin, early Potato Psyllids infestations will be extremely important, though these low numbers will be difficult to detect.

## Identification

- Plants affected by ZC at an early stage has symptoms similar to BLTVA (Beet Leafhopper Virulence Agent, transmitted by the Beet Leafhoppers), or Psyllid Yellows (caused by a toxin introduced to the plant when Potato Psyllids [free of the bacterium] or other Psyllids feed on potato). Infected plants have leaf curling, are bushy (due to axial bud elongation, may have purpling in the upper plant (Fig. 2). Plants may also have aerial tubers (Fig 3). Early on the plants can also resemble a plant infected with Potato Leafroll Virus (PLRV) due to the curling leaves.
- Plant infected by *C. Liberibacter* will often times possess a scorch appearance (Fig. 4).
- Tubers possess a characteristic “net” symptom on cutting, first seen on the stolon end (Fig. 5) but it can progress through the tuber. The net necrosis has a Potato Leafroll Virus (PLRV) appearance but remember net necrosis caused by that virus is seen only in Russet Burbank from a current season infection by PLRV. This net appearance can be seen in aerial tubers (Fig. 6). Even the smallest tubers from an infected plant can possess internal symptoms (Fig. 7).
- Stolons easily separate from the tuber and looking at the stolon end one can often times see a “browning” that will be further seen when the tuber is cut.
- Not all tubers of an infected plant will show internal tuber symptoms.
- If the infection is severe “stretch” marks or lines can also be seen on the stolon end (Fig. 8).
- Individual plants in the field can be infected and killed (Fig. 9). Often times a small (2-6 feet or larger) circular patch of plants killed by the bacterium can be seen among green plants (Fig. 10). Some of these patches can be seen in infra-red photographs (Fig. 11).

## Control

- Fortunately the Potato Psyllid adult and nymphs are relatively easy to kill. However season long weekly applications are needed in areas where this disease has been problematic. Likely most/all Insecticides registered for potatoes with Potato Psyllid on their labels can be used.
- Even inexpensive pyrethroids can be use and given the lateness of the season, the issue of flaring mites may no longer be relevant.
- Timing of chemical application is important. Also knowing what stage of the insect to target is also important. Some products will work well against the eggs, while others work well controlling nymphs and/or adults. No chemicals trials to control the Potato Psyllid have been completed in the Basin. Most of the chemical work has been done in Texas due to the severity of the problem in that area.

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- Destroying eggs is difficult and products that do a good job may no longer be available due to limited supplies. Due to the lateness of the season, killing eggs may no longer be necessary.
- Based on the information available, the following is recommended for Potato Psyllid control in the lower Columbia Basin for the next few weeks to reduce the likelihood of new fields being damaged or additional damage in the fields where it has been found. Keep in mind that this information is provided without knowledge of the effect of late season infections by this bacterium, how late season infection impacts the production of tuber symptoms or how storage will be impacted. This is a very conservative (pro-active) approach. Be sure to follow label instructions and pay particular attention to pre-harvest intervals (PHI).
  - If the field is dead do nothing
  - If the field is green but will be harvested within the next two weeks, going directly for processing, do nothing.
  - If the field is green but will be harvested within the next two weeks, going into storage, spray immediately (if out a week from the last insecticide application) with a single or combination of insecticides to ensure that both adults and nymphs are killed.
  - If the field is green and will be harvested after two weeks but may stay green for 4 weeks or longer, whether for direct dig or storage, immediately apply a single material or a combination of insecticides (if an insecticide application has not been made within the last 7 days) that will kill adults and nymphs. Spray weekly thereafter until two weeks from harvest to kill adults and nymphs

## Storage

- Unfortunately where this disease has caused substantial damage potatoes are rarely stored and are dug and move directly to the processing plants. So little information is available.
- Information suggests that infected tubers do not rot in storage.
- What about development of symptoms in storage? This work has also not been done since tubers have not been stored. However, tubers with symptoms put into storage will maintain those symptoms. Will they get worse? That is unknown. What about symptomless tubers from an infected plant.... will symptoms develop in these tubers in storage? Again unknown. Given the unknowns, processing tubers with little or no storage from fields with confirmed infections may be the best alternative to reduce risk at this time.

If you have questions contact Silvia Rondon or Phil Hamm at (541) 567- 8321

Visit <http://oregonstate.edu/dept/hermiston/>

Additional information regarding ZC can be found by following this link

[https://www.fritolayag.com/public/zc/LiuTX\\_ZC-Report.pdf](https://www.fritolayag.com/public/zc/LiuTX_ZC-Report.pdf)

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Fig 1. Eggs (A), Nymph (B), Newly emerged adult (C) and Adult (D). B and C photo by A. Murphy, S. Rondon's lab, OSU; D, photo by J. Munyaneza, USDA.



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Fig. 2. Bushy appearance, leaf roll and pink discoloration of a Zebra Chip infected plant. At this stage, the plant, given the symptoms, could be infected with BLTVA or Psyllid Yellows. (P. Hamm photo).



Fig. 3. Aerial tubers formed from the axial bud (see yellow arrows). (P. Hamm photo).



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Fig. 4. Scorch (many dead leaves) appearance of a ZC infected plant (P. Hamm photo).



Fig. 5. Internal “net” appearance of an infected tuber (S. Rondon photo).



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Fig. 6. Net symptoms in a cut aerial tuber from an infected ZC plant. (P. Hamm Photo).



Fig. 7. Small tubers can also exhibit ZC symptoms. (P. Hamm Photo).



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Fig. 8. Pinkish discoloration inside of where the stolon attached. Also notice the “stretch lines or minor cracks that are often a characteristic of a tuber impacted by ZC. (P. Hamm Photo).



Fig. 9. Individual plants killed by ZC (S. Rondon photo).



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Fig. 10. A large patch area of dead plants killed by ZC (P. Hamm photo).



Fig 11. Infra red photograph of a portion of the field showing dead (dark areas) areas where ZC infected plants have been killed.(Photography Plus photo).

