PHREC 97-05b

NEBRASKA

POTATO EYES

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Updates

Section 18 registrations for late blight control has been granted for ACROBAT MZ, CURZATE M8, MANEX C8, and TATTOO C in Nebraska.

Section 18 "crisis" was granted to MAXIM seed treatment for silver scurf in Nebraska. Maxim is also reported to suppress common scab, black dot and black scurf/stem canker. The regular Section 18 is pending. Full registration (Section 3) is expected next year once tolerance levels are set.

Section 24c is being considered to raise the seasonal maximum limit on chlorothalonil usage from 12 lb to 16 lb active ingredient per acre. This will allow more flexibility to deal with late blight control and primarily affects Bravo Zn and Bravo Ultrex. ISK BioScience still needs to answer several questions required by Nebraska, but I expect approval in June or early July.

Note: MATRIX cannot be used on fields designated for seed production in Nebraska and other northern states. Check the "precautions" section on the supplemental label. This restriction may change in a year or two.

ULTRA is a better formulation of POAST which is no longer available.

Late Blight on WWW

The University of Idaho has developed a "Late Blight Update" home page on the World Wide Web. It serves as an electronic bulletin board. It has the "Idaho Action Plan" and outlines "how to" topics such as recognizing late blight, elimination of disease sources, varietal susceptibility, and chemical treatment information. The URL is: http://decit.if.uidaho.edu/blight/update.html

Alexander D. Pavlista

Green Peach Aphid

Green Peach Aphid and Potato Leaf Roll Virus in Nebraska

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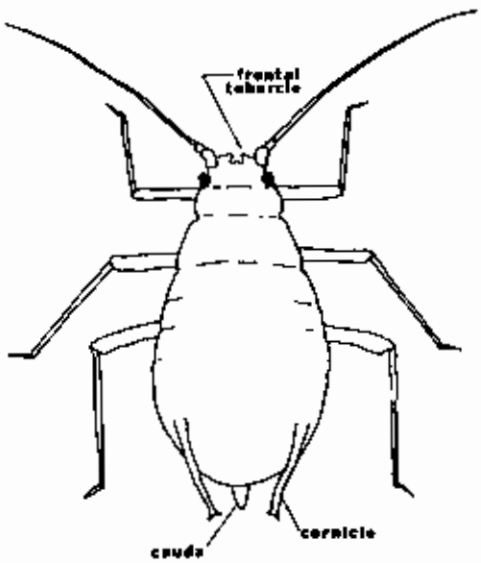
The incidence of potato leaf roll virus (PLRV) has recently increased for seed potato producers in Nebraska. There are several possible reasons. Perhaps the most plausible is that we have had a number of fairly mild winters in the region. As a result, we have seen an increased presence of the green peach aphid which transmits PLRV. Mild winters have also occurred in Idaho, and they have also seen an increase in PLRV. This is not the sole reason for our problems, but if this is a contributing factor, last winter likely will not improve our situation.

Another contributing factor, at least in 1996, may have been an increase in the level of PLRV present in the region because of the increase in virus present in growers planting year-out seed. Even though the level of PLRV in seed potatoes must be low to be certified, levels may have been elevated within the limits. Other factors in the problem relate to insecticidal control of the green peach aphid. Since there hasn't been an aphid problem until recently, monitoring and control of populations may not have been adequate.

Some growers have indicated poor aphid control, and this could be due to insecticide selection, timing or to development of resistance to insecticides. All these may contribute to the problem, but reports and previous evidence does not point to the presence of serious insecticidal resistance in our area.



Distinctive characteristics of the green peach aphid.

In discussions with specialist throughout the country, several points were highlighted that need to be addressed. The first point that was emphasized was that the inoculum reservoir be kept to a minimum. This is achieved primarily through seed testing and certification, eliminating use of non-certified seed (e.g., home gardens) may help. Inoculum levels present in nuclear and early generations of certified seed are low enough to prevent problems from developing if aphid populations are managed properly. I will deal mainly with green peach aphid problems as they relate to PLRV transmission. The management of green peach aphid as its relates to net necrosis problems will be somewhat different, although it presents similar challenges.

Green Peach Aphid Sources

In Nebraska, green peach aphid (GPA) infestations can originate from several sources. They can overwinter in the region, but hosts are sparse. The significance of this has not been demonstrated recently in Nebraska. A second possible source of aphids in the spring is from bedding plants. No surveys have been done in Nebraska, but a 1990 Idaho survey of bedding plants showed that over a third of the salable units were infested with GPA. A third source of aphids in the region is long range migration from other areas. While GPA have demonstrated this long range movement in some areas, not enough is known of this movement to assess its importance in Nebraska or predict its occurrence.

Aphid Life Cycle

The green peach aphid (GPA) overwinters as a shiny-black egg on the bark of its primary hosts which includes members of the genus *Prunus*. In Nebraska, *Prunus* species include wild plum, choke cherry and sand cherry. These hosts have been shown to have different preferences for GPA in different parts of the country. Eggs hatch in the spring just after full bloom (green-tip), and the aphids begin to feed on the leaves and may complete two to three generations on the *Prunus* host. In late spring, a winged generation is produced on the primary host, and these aphids migrate to secondary hosts. The GPA can migrate to potato at this time, but they are more likely to move to one of over 100 species of plants that can serve as secondary hosts. Some of the more common of these hosts may include mustards, nightshades, ground cherries, and several ornamental or vegetable species. After leaving the overwintering host, the first hosts in the spring are generally found near the area where the aphids overwintered. The migrants are capable of infesting a wide array of secondary hosts as they move from plant to plant depositing a few nymphs that later develop colonies on that plant. Within these new colonies wingless aphids develop for the first generation, but as subsequent generations develop an increasing proportion of the population is winged. These winged aphids can eventually move into and infest potato fields initiating the spread of potato leafroll virus. As with all aphids, GPA's generation time can be rather short. With the exception of the overwintering generation, the females give live birth to only females so their reproductive energy is very streamlined. Their optimal developmental temperature is **70°F**, and they can develop from birth to reproducing adult in about **10 days**.

PLRV Transmission

Several species of aphids can transmit potato leafroll virus (PLRV), but the green peach aphid (GPA) is by far the most efficient vector of this virus. PLRV transmission is more complicated compared to other potato viruses. PLRV is concentrated in the phloem of the plant. To pick up this virus an aphid must feed from the phloem which occurs only if the plant is a host plant. When the aphid ingests the virus, the virus will pass through the wall of the gut into the blood of the aphid. The virus will eventually move to the salivary gland where it can potentially be transmitted to the next plant the aphid injects saliva into. The virus can be picked up in less than 30 minutes of feeding, but there is a lag time of from 12 to 36 hours before the virus will enter the salivary gland and be capable of transmission. A major aspect of this type of transmission is that it is persistent and the aphid will be able to transmit the virus for the rest of its life.

Management

Several cultural practices can be undertaken to reduce the potential for developing potato leafroll virus (PLRV). The greatest factor in keeping PLRV occurrence low is planting only certified seed potatoes. This practice severely limits the amount of PLRV inoculum that is present during the early part of the season. PLRV inoculum can also be reduced by eliminating culls and subsequent volunteers in production areas, and if possible, by isolating seed potatoes in areas away from recent production areas. Weeds that are spring hosts for the green peach aphid (GPA) should be controlled in and around potato fields to reduce the potential for these to provide buildup of aphid populations. Roguing can also help to reduce the level of PLRV inoculum. Proper roguing techniques should include the removal of the infected plant, plus the adjacent plants on all four sides of the infected plant. In some areas where the concentration of overwintering hosts makes it practical, the treatment of overwintering hosts for GPA is done to reduce the spring migrant population.

The major management tool for PLRV is insecticidal control of the GPA. The most important consideration in Nebraska for insecticidal control of the GPA is to avoid the development of aphid resistance. The GPA is one of only a few species of insects that has developed resistance to all major insecticide classes. However, tests on aphids in our area done a few years ago did not indicate severe resistance problems. If our current GPA populations remain relatively susceptible, it is to the benefit of the entire industry to do everything possible to manage the insecticide so as to reduce the potential development of resistance. The number of insecticide applications of all types should be kept to a minimum. Insecticides used at any time

Table 1. Varietal Sensivitly

Variety	Leaf Roll	Net Necrosis
Atlantic	susceptible	resistant
Centennial Rus.	resistant/susceptible	resistant
Century Rus.	susceptible	?
Chieftan	?	resistant
Chipeta	susceptible	?
Frontier Rus.	susceptible	resistant/susceptible
Gemchip	susceptible	?
HiLite Rus.	resistant	resistant
Kennebec	?	resistant
Lemhi Rus.	susceptible	?
Norchip	susceptible	?
Norgold Rus.	susceptible	?
Norking Rus.	susceptible	resistant
Norland	susceptible	?
Ranger Rus.	susceptible	resistant
Rus. Burbank	susceptible	susceptible
Rus. Norkotah	susceptible	susceptible
Sangre	resistant	resistant
Sebago	?	resistant
Shepody	susceptible	resistant
Superior	susceptible	resistant
Yukon Gold	resistant	?

(sources: "North American Potato Varieties" PAA, "Characteristics of Potato Varieties" PNW #454, "San Luis Valley Production Manual" XCM-181.)

during the season could add to the selection pressure on the aphid population. When treatments are used they should be chosen to minimize selection pressure. Try to rotate the use of chemicals as much as possible if multiple applications are required. This includes applications targeted at pests other than the green peach aphid. Reliance on pest monitoring and the use of application thresholds for all insect pests is critical in managing resistance.

The inability to predict the occurrence of GPA populations causes difficulty in aphid and disease management. Several sampling tools have been used to aid in predicting GPA populations in potatoes. Large suction traps and smaller yellow pan traps have been used for sampling. However, current evidence indicates that these may not be the best ways. Most recommendations for GPA population monitoring include regular leaf sampling to determine the aphids presence and proper timing for treating individual fields.

Regular monitoring for GPA will allow the grower to identify the presence of the aphid at the earliest possible time. Beginning early in the season, weed hosts (mustards, nightshades, ground cherries, and others) in and around the field can be monitored for the aphid. GPA infestations tend to begin or be higher near the edges of fields, particularly the windward side of the field and near building and shelter belts; therefore, special monitoring of these areas may provide additional information on the early presence of the aphids.

As soon as full leaves are out on the potato plant, sampling should be initiated in seed fields. GPAs are more likely to be found on the lower third of the plant, so leaves should be chosen from this area of the plant. The entire field should be covered with a criss-cross or diagonal pattern when sampling. Leaves should be selected from random plants, and all leaflets on the leaf should be inspected for aphids. It is important to properly identify them in the field or collect them for later identification. Also, note the form of the aphids found (winged or wingless). The form of the aphids indicates the status of the aphid population in the field. If wingless aphids are present, colonies are likely to have been established in the field. However, if only winged aphids are present, the aphids found likely arrived only recently into the field. A minimum of 50 leaves should be sampled from across a field, but a 100-leaf sample will give an even better estimate of their potential presence. Monitoring for the aphids should continue as long as the vines are green and growing.

Leaf-sample thresholds vary a great deal depending on the type of potatoes being grown. For seed potatoes a threshold of 10 wingless GPA per 100 leaves has been established in the upper Midwest. This threshold is used to eliminate treatments that are of little value. However, several other seed producing areas use a zero-tolerance threshold. Thresholds to reduce net necrosis vary between different production regions. Idaho indicates that their threshold is 10 wingless aphids per 50 leaves, while the upper Midwest (MN, ND, WS) threshold is set at 30 wingless aphids per 100 leaves.

Many potato growers apply some type of soil insecticide at planting time. The most commonly used product in this area is Thimet/phorate, which will only give sporadic control of GPA. Admire, a new product, may give better control of the aphid, lasting well into mid summer, but at a high cost of about $80/acre. The need for early season (before July 1) aphid control in this region has not been documented over the years, indicating that most of the time GPA move into potato fields in Nebraska after this time. We do not know when aphids have first become present in the fields in the last few years. If they are showing up before July 1, an at-planting application of Admire may be warranted, or at least an application to the edge of the field where aphids are most likely to colonize first. A border treatment may hold off aphid buildup and would be cheaper than treating the entire field.

Green peach aphid nymph

Later season foliar treatments have been largely relied upon in the past to control the GPA in Nebraska. Some growers have relied upon Asana to do "double duty" on Colorado potato beetle and the GPA; however, several potato entomologist that I have talked to indicate that this may cause problems because it is not the best at controlling aphids. Pyrethroids in general along with Guthion, Sevin and methyl parathion are listed as products that will likely encourage the development of severe GPA problems. Reports from this region indicate that Asana may have reasonable activity still on our aphids, but it is not the best option and should not be used as the sole chemical for aphid control. Without a doubt, Monitor is the best GPA control chemical that is registered. It is more costly, but as with many things "you get what you pay for." Multiple applications of Monitor in a year should be avoided so selection pressure on the aphid population can be lessened. If additional treatments are needed, Thiodan and Provado are rated as good products for green peach aphid. Provado should not be used on fields where Admire was used at planting.

As with all vectored viruses, potato leaf roll virus is managed by managing the vector along with minimizing the inoculum. Optimizing green peach aphid management requires regular monitoring, proper insecticide timing, and the use of the most effective insecticides.

Table 2. Highlights

GPA Sources:	PLRV Sources:
Prunus hosts	infected seed
bedding plants	bedding plants
migration	weed hosts
	cull piles & volunteers

Management:	certified seed, lower generations best
	weed control in and around field
	roguing infected and adjacent plants
	locating away from *Prunus* trees
	monitoring aphid populations
Pesticides:	apply near GPA threshold
	rotate foliar chemicals
	Admire at planting
	Monitor best foliar
	Provado and Thiodan foliars

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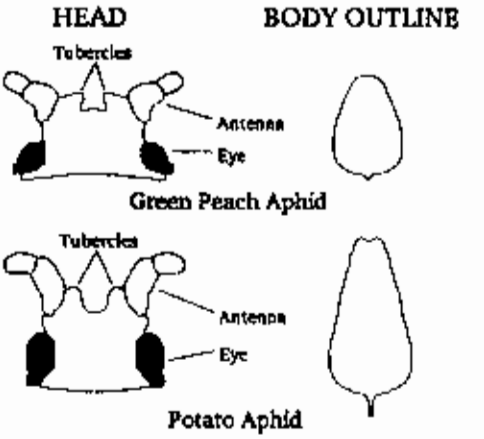
Aphid Identification

The green peach aphid (GPA) is not the only aphid likely to be found in potato fields. Several other aphids, particularly the potato aphid, can be seen in fields as they try to establish colonies or as they move through in search of more adequate hosts. The GPA adults can be either winged or wingless. The wingless adults are tear-dropped shaped and light green to light pink in color. Winged adults will be much darker with a brown to black thorax and a greenish abdomen. The potato aphid is much larger and elongate than the GPA. The distinguishing characteristic of the GPA is the converging tubercles or projections at the base of the antennae as viewed from above. Making a positive identification of the GPA requires a 10X magnification.



Distinguishing features of the green peach and potato aphids.

Suggested Readings

"Potato Health Management" 1993 APS Press.
"IPM for Potatoes in Western US" 1986 U. Calif. Publ.#3316.
"Management of Potato Insects in the Western States" 1982 WREP#64.