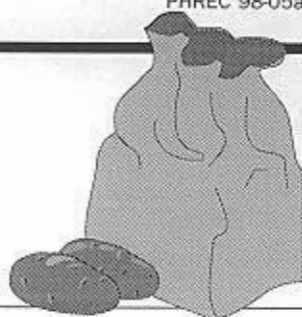


# POTATO EYES



Vol. 10, Issue 1, March 1998 • Alexander D. Pavlista, Extension Potato Specialist

## Late Blight Management

### Ten Recommendations

- 1 - Eliminate potato cull piles and all other sources of living tubers; eliminate volunteer potatoes from last season.
  - 2 - Be aware of the relative susceptibility to late blight of the potato varieties that you're planting. Russet Burbank and Snowden are moderately susceptible; Atlantic, Monona, Norchip, Red Norland, Russet Norkotah, and Yukon Gold are very susceptible.
  - 3 - Plant certified seed and be aware of the late blight situation in the field from which it was harvested. Check the "North American Certified Seed Potato Health Certificate" provided for each lot.
  - 4 - Minimize handling of seed tubers; if seed is cut, immediately treat with a mancozeb-containing fungicide.
  - 5 - Hill potatoes to ensure that developing tubers are adequately covered by soil.
  - 6 - Fertilize and irrigate optimally for the variety.
  - 7 - Apply the first foliar fungicide treatment when recommended by disease forecasting models, confirmed sightings of disease or weather patterns favorable for carrying late blight from other states; whichever occurs first.
  - 8 - Thoroughly scout each field throughout the season to detect late and/or early blight as soon as possible. Pay special attention to the first span of center-pivots, low-lying areas and along the sides of the pivot platform.
  - 9 - Kill vines totally prior to harvest because late blight does not sporulate on dead plant tissue. It's an obligate parasite.
  - 10 - Infected tubers should not be stored; monitor storage carefully for any sign of tuber decay. Use the Colorado State Univ. San Luis Valley protocol for detecting late blight.
- [Compiled through cooperation between University of Nebraska, Colorado State University, and University of Wyoming.]

## More . . .

### Insects

Entomologists in our region have predicted that this season will be a very active insect year. An invasion of cutworms has already begun. Alfalfa weevil larvae have been detected, about two months ahead of schedule.

### Bats

Our natural population of bats can help control night-flying insects in potato fields. These insects include European corn borers, leafhoppers and cabbage loopers. According to *National Geographic* (Aug. 1995) 150 brown bats eat enough cucumber beetles in a summer to protect growers from 18,000,000 rootworm larvae.

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## Beneficial Insects: Commercially Available

Several growers especially of seed potatoes have asked me during the past year about beneficial insects. The key target pests are Colorado potato beetles (CPB) and green peach aphids (GPA). Growers have asked specifically about predatory insects that may be commercially available. I will focus on the **(common) green lacewings, pink spotted and seven-spotted lady beetles, and two-spotted and spined soldier stink bugs**, all of which are found naturally in Nebraska potato fields and are commercially available.

Using predatory insects may aid delaying insecticide application and lessen the number of needed treatments. Also many insecticides especially those used for the Colorado potato beetle are harmful to the predators that feed on aphids. Other advantages of predatory insects, both natural and released populations, are lowering the risk of chemical resistance by pests and suppression of secondary pests.

Support for the release of commercially obtained predators is primarily anecdotal and theoretical; there is little, if any, scientific documentation supporting the value of releasing bought insects. Releasing predatory insects does NOT guarantee pest control, NOR replace scouting, threshold adherence and other good Integrated Pest Management (IPM) practices. Growers going into bio-control need to have realistic expectations that the method may not do the job alone. "Use is not discouraged, but a realistic expectation of the potential benefits is needed," Gary Hein, Extension Entomologist.

The performance of natural populations of predatory insects is better documented and varies with different situations. For instance, they work well in perennials such as alfalfa but less well in semi-annuals such as potato. The major drawback is their lag time to respond to rapidly growing prey (pest) populations. The crop may have been economically damaged before the predator insects build up sufficiently to reduce the pest population.

Although early GPA populations are not high enough to attract natural populations of predators, these same predators also feed on CPB which usually appears earlier. Therefore, early release of predators for CPB control may delay the need for early season GPA control and allow fewer and later insecticide applications for GPA. **In the absence of lady beetles and/or other predators after insecticide application, GPA populations often flare up in potato fields.**

The new transgenic clones of potato varieties would not affect the predatory insects since they do not feed on foliage nor do they have the gut chemistry to be affected by the Bt genes.

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# Beneficial Insects: Commercially Available

## Green Lacewing

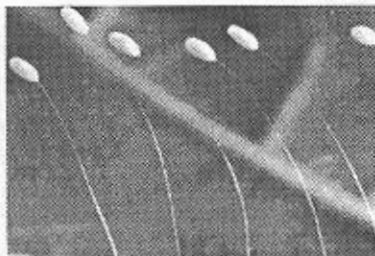


Adult green lacewing



Newly hatched larvae of green lacewings, called aphid lions

Eggs of green lacewing



**Common Green Lacewing** (*Chrysoperla carnea*) is readily available commercially both in the USA and Canada, and is considered the best for row crops and in drier areas than the green lacewing (*C. rufilabris*) that is also available. The common green lacewing specializes in feeding on aphids. Adults are reared in insectaries and eggs are sold mixed with a carrier. The eggs should be dispersed as soon as they arrive since the larvae are cannibalistic. Don't release them near ants since they will eat the lacewing eggs. The main problem with using these predators has been the method of dispersal on a large scale. Recently, however, a successful method was developed called the BioSprayer used with an adhesive, BioCarrier. The BioSprayer can be mounted to a vehicle and BioCarrier is used to adhere the eggs to potato leaf surfaces.

**Life Cycle** - Green lacewings are found naturally in Nebraska and I've observed them in potato fields. Lacewing larvae eat CPB, GPA and potato psyllid; adults feed on nectar, pollen and aphid honeydew. They disperse through the field as adults. Pupae overwinter and an adult emerges in late March and early April. Eggs are laid in April and larvae emerge around the end of the month. The larvae change to adults after a couple of weeks. The life cycle is about one month. There are two to four generations produced during the growing season. The larvae are voracious predators.

**Appearance** - Adults are colored light or pale green and golden eyes. The wings are lacy - large, clear, membranous with green veins and margins and are held over the length of the body, about 3/4 inch long. Antennae are long and hair-like. They are attracted to and feed on aphid honeydew, laying eggs nearby or near other prey. The eggs are white and each is held at the end of a hair-like stalk attached to the leaf. Larvae, called aphid lions, are able to eat up to 600 aphids each. They look like tiny alligators and are creamy colored, mottled with brownish red markings; they are about 1/4 inch long. They have well-developed legs and large pincers with which to suck out bodily fluids from prey. The larvae spin out a cocoon (pupa) on the underside of leaves.

**Lady Beetles** are commercially available BUT the species commonly sold (*Hippodamia convergens*) is not the preferred lady beetle for effective bio-control of pests. There are over 400 species of lady beetles in North America. The one commonly sold is the convergent lady beetle that is captured while overwintering in migratory hordes, many in California. These beetles are captured and shipped while in a dormant state (diapause) and it takes about a month before they will lay eggs. Also, they tend to disperse away from the field in which they were placed. Improved techniques in pre-feeding lady beetles prior to release has improved egg maturation and earlier deposit. Several sources now sell these "pre-conditioned" beetles but are ten-fold more expensive. It is still recommended to release them only in large fields.

I found a couple of sources, in Indiana and Quebec, of one of the best species of lady beetle, *Coleomegilla maculata* (pink spotted lady beetle). This species is a particularly voracious egg predator of CPB. They're dark pink to red with lots of large black spots, and are often found in or near alfalfa and grain (esp. Wheat) fields. Populations build up in these fields in late spring and summer. Both adults and larvae eat eggs, and the larvae will eat CPB larvae, GPA nymphs and adults, and European corn borer eggs. The adults will also feed on nectar, pollen and GPA honeydew. This species is readily observed in potato fields during the season in Nebraska.

The seven-spotted lady beetle (*Coccinella septempunctata*) is another species which is voracious CPB and GPA predator. It was introduced into the USA from Europe and is found throughout North America. This 7-black spotted orange lady beetle appears in potato fields everywhere and is the best known of the predators. Although not yet commercially available, this species has recently been mass reared.

## Lady Beetle



Lady beetle larva eating aphid nymphs.

Pink spotted lady beetle adult



# Lady Beetle



Lady beetle pupa



Lady beetle eggs

Nine-spotted lady beetle larva



**Life Cycle** – Lady beetles overwinter as adults in debris, fallen leaves, building cracks, under rocks, and in mulch. Some migrate for winter covering at high altitudes as much as 9,000 ft. These include *C. maculata* (pink spotted), *C. septempunctata* (seven-spotted) and *H. convergens* (convergent) lady beetles. During overwintering, they go through a dormant or inactive period as adults called diapause. In spring, as weather warms, they break diapause and become active. Adults resume feeding and begin egg production in crops, especially alfalfa and winter wheat in Nebraska. They will move into potato fields looking for CPB eggs and GPA. In these fields and near prey, eggs are deposited. Eggs hatch after 3-7 days and the first generation of larvae are eating by the end of May. Although the adult is most recognized as a predator, the larvae are voracious eaters of CPB eggs and GPA nymphs. Each larva can consume 500 to 1000 GPA during its 2-4 weeks of growth. Pupae are formed in the dining area and, after 5-7 days, the adult emerges to eat and lay eggs. There are 2-5 generations per season and a life cycle lasts about a month.

**Appearance** – There are over 60 species of lady beetles in Nebraska. Most are beneficial to potato production eating many insect pests. The two most voracious and common are *Coleomegilla maculata* (pink spotted) and *Coccinella septempunctata* (seven-spotted). The adult of the pink spotted ladybeetle's body is oblong and the wing covers are deep pink to red with 12 large black irregular spots that may converge. The seven-spotted ladybeetle adult is round-oval and domed; its wing covers are orange with seven circular black spots. Adults are about ¼ inch long and are found from April to late September. A female will lay 200-1000 eggs. Eggs are spindle-shaped or oblong, yellow to orange-red, and clustered (less than 20) on leaf surfaces. They are usually found near prey, aphids and CPB. The eggs look similar to CPB eggs but these are larger, darker red-orange, and are more clustered, 30-50 eggs. CPB eggs are only found on solanaceous plants such as potato and nightshades while ladybeetle eggs will be found there and in other crops (alfalfa, wheat) and weeds, wherever prey is nearby. The ladybeetle larvae are elongated and dark with a slightly pointed rear. Their legs stick out from the side as if they are bow-legged. Their color is gray to black and have spotting of yellow, orange or blue. The pupae are round and hang from the leaf surface attached in the rear. They are dark usually with spots.

# Stink Bugs

Dark form of adult twospotted stink bug feeding on Colorado potato beetle larva.



**Two-spotted and spined soldier stink bug** (*Perillus bioculatus* and *Podisus maculiventus*) are specialist predators of beetle larvae, especially CPB. Other prey include cutworms and armyworms. They are found throughout Nebraska, and I've often seen the adults sucking blood out of CPB larvae in potato fields. Other larval prey of importance to potato production in the State are European corn borer and cabbage looper. In Washington potato fields, released stink bugs reduced CPB populations by 50%. They are available commercially as adults; I found sources in Massachusetts, New Hampshire and Ontario. Cost, however, may be prohibitive for large scale addition to natural populations.

**Life Cycle** – The adult overwinters and, in spring, each female lays a thousand eggs. The eggs hatch into nymphs (not larvae) several days later. The nymphs feed on pest larvae, grow and form a hard shell. After reaching their final size, they become reproductive adults and lay eggs. There are 2-3 generations per season.

**Appearance** – Adults are about ½ inch long and have a broad shield-like body. The name comes from the release of a strong, unpleasant odor when adults are disturbed. The spined soldier stink bug adult is tan to pale brown with prominent spurs at the "shoulders" behind the head. Two-spotted stink bugs are usually yellow or red with a black "Y" on the back and two black spots on the "shoulders." Eggs are deposited in tight clusters of 20-30 on leaves and twigs. They are gray, cream or gold colored and are barrel-shaped. Young nymphs are red and black, and round instead of shield-like. As they grow, they become marked with yellow-orange, black and cream bands and patches. Nymphs are wingless but disperse in search of prey. Both adults and nymphs have beaks used for stabbing prey larvae and extracting the insides.

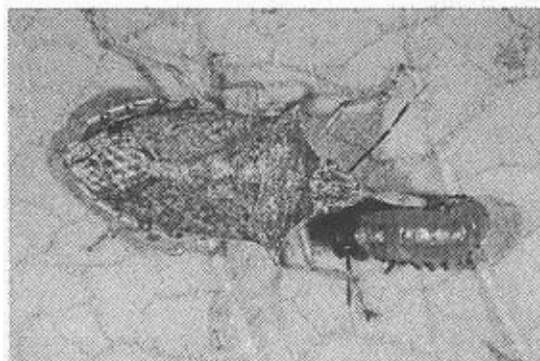


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## Stink Bugs

Adult spined soldier bug beginning to feed on Colorado potato beetle larva.



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*Pesticide Tolerance* – Lacewings may have tolerance for many insecticides. In the lab, tolerance developed to pyrethroids (Ambush, Pounce, etc.), organophosphates (Guthion, Imidan, Monitor, etc.) and carbaryl (Sevin). Tolerance by lady beetles to insecticides has not been demonstrated. Stink bugs are more susceptible to organophosphates and carbamates (Furadan, Sevin, etc.) than their prey but less susceptible to pyrethroids. In general, natural enemies are sensitive to insecticides and will be reduced dramatically.

*Flowering Plants* – As noted several times, the adult of many beneficial insects also feed on nectar and pollen. So, it's helpful to have wild flowers along fence rows and in the general area. This helps keep adults in the area looking for prey. For instance, flowering dandelions are a heavily used pollen source for lady beetles in late spring around potato fields. There are commercially available artificial foods and honeydew substitutes to enhance lacewing populations.

(For those using the web, a good source for colored pictures is <http://www.nysaes.cornell.edu> and search for beneficial insects.)

[Written with the cooperation of Drs. Whitney Cranshaw, CSU, and Gary Hein, UNL.]



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