Potato Progress

Research and Extension for Washington's Potato Industry

Published by Washington State Potato Commission www.potatoes.com

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Volume XI, Number 10 *August 5, 2011*

Biology and Control of Thrips in Potatoes

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Thrips biology in potatoes. Historically, thrips were not thought of as a pest of potatoes. However, now there are thousands of acres of potatoes treated in Idaho, Washington and Oregon each year. We estimate that between 10 and 25% of potato acres in Washington are treated for thrips depending on the year. Thrips are most commonly a problem in longer season potatoes because they have more time to build up to damaging levels (see thrips damage on potatoes, Figure 1). Actual damage or yield loss on a per acre basis is unknown. The only places in the world that thrips are recognized as a pest of potatoes are the Columbia Basin of Washington and Oregon and southern Idaho.

The distribution of fields treated for thrips ranges from the southern Columbia Basin to north of Moses Lake and the western half of southern Idaho. However, some areas of the Northwest seem to perennially avoid problems with thrips -- these include western Oregon and Washington, central Oregon, eastern Idaho and the Yakima Valley. Most of these areas either have shorter growing seasons or grow potatoes for shorter periods of time. The leading theory as to why thrips have become known as a pest in potatoes is the recent shift in insecticides used on potatoes. Formerly, most potatoes in Washington were treated with carbamate (Temik, Furadan) and organophosphate (Monitor, dimethoate, Di-Syston, etc.) insecticides. These products have efficacy against thrips. In the last ten years, product removals (e.g. Di-Syston, Monitor and Furadan) and introduction of new insecticidal products that do not have thrips activity have probably influenced thrips populations. The widespread use of neonicotinoid insecticides, such as Admire, Platinum and Belay and highly selective insecticides such as Beleaf and Fulfill has allowed thrips populations to surge that formerly had been controlled by broader spectrum insecticides.

There are thousands of thrips species worldwide, but only a few primary pest species in the Pacific Northwest. Knowing the species involved is important because thrips species have varying susceptibility to insecticides. Based on informal surveys, it has been assumed that the thrips species involved in potato outbreaks is western flower thrips, *Frankliniella occidentalis*. Based on grower observations that potato fields following onions have thrips outbreaks more often than fields not following onions, and some preliminary research by WSU entomologist Bill Snyder, there is evidence onion thrips, *Thrips tabaci*, may also occur in potato fields.

Due to its cryptic nature, life cycle characteristics and recent appearance as a pest, virtually no research has been conducted on thrips in potatoes. Based on some limited efficacy research funded by the Washington State Potato Commission, products found to have some efficacy against thrips on potatoes are Radiant, Lannate, Hero, Mustang Max, abamectin (e.g. Agri-Mek) and dimethoate.

Understanding the life cycle of thrips is important to improving control. Thrips on potatoes have a relatively short life cycle, have shorter life cycles when it is warmer, and have multiple generations per year. The longer and warmer the season, the greater is the potential for high thrips numbers. Thrips grow whenever temperatures are above 46° F and their ideal temperature range is 77 to 90° F. At the higher temperature range, western flower thrips complete a full life cycle in 9 to 13 days.

Thrips often invade fields from adjacent areas, particularly dryland areas. The earlier in the season or the greater number immigrating into the fields, the more likely an area is to have a thrips outbreak.

Thrips eggs are inserted into the leaf tissue, the immature thrips (Figure 2) hatch from the eggs and feed on the surface and more commonly on the underneath of the leaf surface. There are two active feeding larval instars. After a few days they will drop off the plant and pupate in the soil. There are two pupal instars. Adults (Figure 2) emerge from the soil and climb or fly up to the plant and start feeding and reproducing. A key point to this is that the egg stage and the pupal stages are hidden and may not be sufficiently exposed to receive a toxic dose of insecticides.

Thrips have a curious characteristic, called thigmatism, that causes them to seek out and spend much of their time in tightly enclosed and concealed places on a plant. In particular, thrips are common in flowers and growing points of the plant. This further keeps some insecticides from reaching the pest. Unfertilized thrips eggs turn into males and fertilized eggs turn into females which helps the population colonize and build in number more quickly.

Management. The combination of the short life cycle, multiple generations, one life stage buried in the plant, one life stage off the plant, and their predisposition for not being exposed to pesticides on the plant surfaces make this insect a difficult one to manage. Potato growers can learn something from onion growers who have been dealing with thrips problems for a long time.

- Thrips will rarely be controlled by a single application. A typical onion program will include up to six or more applications. A successful thrips program in potatoes may require two to four applications.
- Better control is achieved by rotating chemistries. Fortunately, the six products that are listed for thrips control belong to five different modes of action (Hero and Mustang Max are both pyrethroids and should be considered similar products from the same class of insecticides).
- Applications should be 7 to 14 days apart depending on pressure. The higher the pressure, the shorter the interval.
- Use a higher rate.
- Each of these products controls other pests and your decision on which to use may depend on what other pests you have. Abamectin will also control Colorado potato beetle. Radiant will also control armyworms, cutworms, loopers, potato tuberworm and Colorado potato beetle. Dimethoate and Lannate will also control aphids and leafhoppers. Hero and Mustang Max will also control leafhoppers, armyworms, cutworms, loopers, potato tuberworm and Colorado potato beetle.
- Consider other factors. Hero and Mustang Max will remove most beneficial organisms and increase your risk of flaring aphids and mites. It is not recommended to use pyrethroids between June 15 and two weeks before harvest. Dimethoate and Lannate are relatively short residual products and should not be expected to have residual control longer than 7 days.
- There is no established economic threshold or action threshold for thrips in potatoes. It is not known when growers should initiate applications. If thrips have built up into high numbers it is probably impossible to reduce the population to a negligible level. Initiate insecticidal programs prior to the presence of necrotic lesions caused by thrips feeding.

A potato thrips program would probably consist of something like 1. Radiant followed by dimethoate, followed by Radiant, followed by dimethoate or 2. abamectin, abamectin, Lannate, Lannate. These are two styles of programs, but with six products and five modes of action, there are several combinations. There are no nonchemical control methods recommended for use on potatoes.

Figure 1. Thrips damage to potatoes.

Figure 2. An adult (left) and feeding nymph (right).

Water is for Fighting

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I'm sure you all have heard the famous Mark Twain quote, "Whiskey is for drinking, water is for fighting over." As the world population increases this quote seems to ring truer every day.

As a kid growing up on a potato farm it was always my responsibility to do the irrigation. I always referred to the job as "irritation" because it seemed like no matter how much preparation went into making things run smoothly they very rarely did. As the Agriculture and Natural Resources Educator with WSU Skagit County Extension it is my job to improve the lives of farmers in Washington State so when I received a grant to attend the Irrigation Training and Resource Center (ITRC) at Cal Poly University in June of 2006 I gladly accepted. At the ITRC training I learned the method that is most commonly used for irrigation in western Washington, referred to as the big gun, is the least effective at applying water to crops. Furthermore, when vandals began stealing portions of the irrigation systems and the Native American tribes began questioning the agricultural leadership on their permitted usage of irrigation water, it made me consider alternatives. These events combined with my childhood memories of "irritation" sent me investigating irrigation alternatives.

My first thought was "Why can't potato growers use the most efficient form of irrigation?" The berry and nursery growers have figured out how to use drip irrigation in their crops but they are largely in perennial cropping systems. I did a research review and talked with irrigation service providers and they said that it could be done. The question for me to answer then was "Could it be done on a commercial basis in a way that will give my growers a competitive advantage with less irritation?" I determined the best way to answer this was to become a researcher myself. I applied for and received two grants for the 2010 growing season. Funding came from a WSU mini-grant and the Washington State Potato Commission (WSPC) to do trial of drip irrigation in potatoes at WSU NWREC and a commercial trial in western Washington. This is what we learned from a very wet summer of 2010:

- Drip Irrigation can be installed and removed on a commercial potato field with additions to existing machinery.
- Bed systems do not perform well after 5 inches of rain and do not allow for deep tillage after storm events.
- Drip irrigation appears to encourage more uniform sizing of potatoes.
- Drip does not appear to pay for itself based on increased yield alone.

Since this first trial did yield some positive results, more research was needed to study fully all the economic impacts of drip irrigation. Funding has been approved from the Washington State Department of Agriculture (WSDA) and WSPC to investigate the economics, including chemigation, fertigation and skin set with drip irrigation in potatoes for 2011.

I believe this research is increasingly important as growers are going to need to scientifically prove that they are being good stewards of water resources, using the least amount of resources to provide the very best product in the world. As the population grows, more strain is going to be placed on water, and more specifically, irrigation water. Drip irrigation is a good place to start because it is 95% efficient at getting water to the crop. Along with this efficient delivery method, if we can decrease the amount of commercial fertilizers and chemicals through fertigation and chemigation while growing a better crop of potatoes, I believe that the potato producers of Washington State will be better off, but I leave it to you and the WSPC research committee to be the ultimate decider. Thank you for the continued funding of the drip irrigation in potatoes trial, and if I can be of further assistance feel free to contact me directly.