Potato Progress

Research and Extension for Washington's Potato Industry
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Potato Tuberworm Pheromone Trapping for 2006

Peter Landolt and Andy Jensen
USDA-ARS Wapato and Washington State Potato Commission

Like hundreds of other moths, the adult female potato tuberworm releases a sex pheromone to attract males for mating. That pheromone has been identified and is sold for use in traps to detect or monitor changes in the presence of the moth. The pheromone is a blend of two chemicals: (E,Z)-4,7-tridecadienyl acetate and (E,E,Z)-4,7,10-tridecadienyl acetate. These chemicals are absorbed into rubber septa as the lures, which then slowly release the pheromone when placed in a trap. The attractiveness of the lure varies with the amount of pheromone put into the septum, and less so by the ratio of the two chemicals. The numbers of moths captured is also affected by the design of the trap. In order to compare experimental results between sites and years, it is best for researchers to consistently use the same lures and traps. In order to appropriately interpret trap catch data, it is best for growers to use lures and traps that are as similar as possible to those used by researchers.

The multi-year potato tuberworm monitoring project coordinated by Andy Jensen uses lures that are loaded with a 1:1 ratio of the two chemicals, with a total load per septum of 200 micrograms. These lures have been made at the USDA-ARS Laboratory near Yakima by Connie Smithhisler. These are put in Delta traps and are replaced after 4 weeks exposure in the field. When purchasing pheromone lures from a company, it is important to specify that you need the complete blend of the pheromone. Trece, for example, sells lures that only include one of the two pheromone chemicals, and they sell lures that include both chemicals. The lures with one chemical, referred to as their "California" lure, are expected to be considerably less attractive to the potato tuberworm than the two component lures, referred to as their "International" lure. We have been told by Cam Oeschlager of Chem Tica in San Jose, Costa Rica that their potato tuberworm lures, sold through AgBio, include both chemicals.

We expect to be able to conduct comparative tests this spring, to verify that these and possibly other commercial lures are similar in attractiveness, and comparable to the lures that have been provided by USDA-ARS to the survey project. Both Trece and ChemTika have expressed strong interest in working with us and providing the types of lures that are needed by PNW researchers and growers.

All growers in areas even potentially affected by tuberworm should maintain at least one pheromone trap adjacent to each field throughout the season. This insect can have very localized infestations, and it is risky to conclude too much from traps that are miles away from your field(s). Pheromone traps should be mounted within or very near the potato fields, close to the ground or canopy (about 12" high). We recommend using a re-usable plastic Delta trap with replaceable sticky liners. These liners should be monitored as often as possible, and replaced weekly. Pheromone lures should be changed every 4 weeks, and kept frozen prior to use. In the Columbia Basin of Washington and Oregon the tuberworm pheromone lure attracts many other species of moth that are not tuberworm and are not pests of potato. Persons uncertain about moth identification are encouraged to have an entomologist

confirm the identification of their moths. See also the tuberworm information on the potato commission's website: www.potatoes.com/research.cfm. Moth trap catch information cannot be readily translated into risk of tuber damage, but it is clear that at lower population densities, greater moth catch indicates greater risk. Pheromone traps are especially useful for detecting initial infestations in an area.

We currently plan on conducting the regional tuberworm trapping network again this coming season. Watch the potato commission website for data when it becomes available:

http://www.potatoes.com/research.cfm.

WSPC Research Results and Review Meeting, February 16-17

Each year the WSPC funds a substantial research program in potato production, pest management, cultivar development, new uses for potatoes, etc. A key part of the research funding process is a 2-day meeting held in Pullman during which scientists present results from the previous years' work and discuss their plans for the coming year. Anyone from industry is welcome and encouraged to attend this meeting, ask questions, etc. This is where decision-making begins about how to allocate the commission's research funding of over $600,000. Please join us for all or part of this event! Contact Andy Jensen at the WSPC office with questions, etc.

Date and Time: February 16th, 8:00 am - 5:15 pm
February 17th, 8:00 am - 12:30 pm

Location: Holiday Inn Express, Pullman WA
1190 Bishop Blvd.
Pullman, WA 99163
Hotel Reservations: 1-888-465-4329
Hotel Front Desk: 1-509-334-4437

Pesticide applicator recertification credits have been requested for this meeting.

WSPC Research and Production Information on the Web

As many of you know, the WSPC has been building into our website a database of research information, potato conference proceedings, newsletters, photos, and more. We recently implemented a password system on this portion of the website. If you don't have a password there is a simple password request process – you should have a password within 1 work day of your request. If you don't know whether you have a password, or cannot remember it, there is a simple password reminder system. I encourage everyone to visit the site regularly and see what we have added.

http://www.potatoes.com/research.cfm

Volunteer Potato Management and Outlook for 2006

Rick Boydston
USDA-ARS, Prosser, WA

Volunteer potatoes are a significant weed problem most years in the Columbia Basin. Managing volunteer potatoes in crop rotations requires an integration of many techniques and practices in order to prevent yield and quality losses and to prevent new tuber production that perpetuates the problem in the rotation. A new WSU extension bulletin (EB1993) is available that covers the biology and management options for volunteer potatoes. The bulletin can be downloaded for free at http://cru.cahe.wsu.edu/CEPublications/eb1993/eb1993.pdf.

Many potato tubers left in the soil after harvest may have been killed by cold soil temperatures throughout the Columbia Basin this winter. Potatoes normally are killed when they reach temperatures ≤ 28° F. Data from numerous AGWeatherNet weather stations with buried thermocouples indicated that soil temperatures reached a minimum on Dec. 19, 2005 throughout the region. Minimum soil temperatures at the 8 inch depth recorded at AGWeatherNet stations near Quincy and Royal City, WA reached 27.8 F and 26 F, respectively (Fig. 1). However, minimum soil temperatures in December recorded at 4 and 8 in. at Prosser, Hermiston, and Odessa did not drop below 29 F (Fig. 1 and 2). In addition, minimum soil temperatures in December recorded 8 in. deep near Othello and Paterson (100 Circles) did not drop below 31 F and 29 F, respectively (Fig. 1). Minimum soil temperatures at the ARS Paterson research farm in December were 26.6 F at 4 in. deep and 29.1 F at 7 in. deep, which has the potential to eliminate the majority of the tubers left in the soil. Differences in soil temperatures throughout the region are likely due to differences in air temperatures, snow cover, soil moisture, aspect, and amount of crop residues.

Due to variation in soil temperatures from site to site, examination of potato fields should be done to accurately determine the extent of winter kill. Tubers killed by cold temperatures are soft and often leak fluids under pressure, although internally appear relatively normal when cut. Viable tubers that have escaped cold injury are firm. Tubers that are firm on the underside and soft and leaking on the upper side can often be found, and these mark the depth of killing temperatures.

We estimate more tuber mortality than occurred in 2005, but certain areas of the Columbia Basin that had snow cover during cold events, north facing slopes, etc., may still be faced with significant volunteer potato problems in 2006.

Recommendations for Volunteer Potato Control:

Growers should minimize the number of tubers left in the field during potato harvest (see EB1993). Newberry and Thornton (2004) demonstrated that deep fall tillage (mold board plow) that buries tubers deeper prior to cold winter temperatures should be avoided. Previous studies comparing tillage practices indicated that plowing **following** a deep penetrating frost could be beneficial by exposing deeper buried tubers to additional freezing

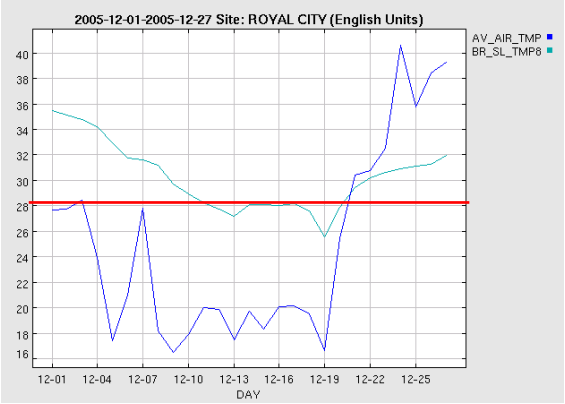
events (Thomas and Smith, 1983). However, weather patterns are not always conducive to make this practice effective and field access in winter months is often limited.

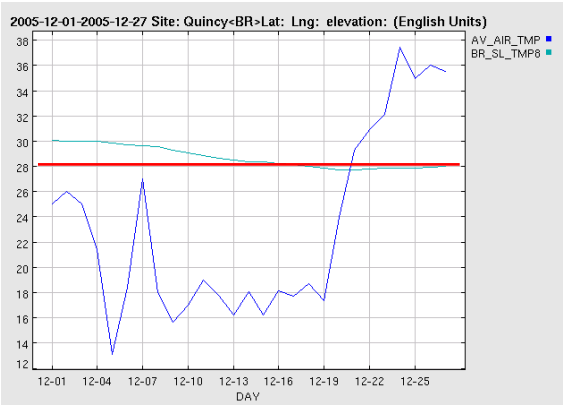
Control measures should aim to minimize competition with rotational crops and formation of new daughter tubers that can persist and cause problems in subsequent crops. Several components of volunteer potato management are listed below.

- On higher value crops with nematode problems such as carrots or onions, spring fumigate with metam sodium (Vapam, Busan, and others) and 1, 3,-dichloropropene (Telone II). Field studies indicate about 70 to 75% of tubers are killed by a combination of Telone II at 10 GPA applied with shanks plus Vapam at 30 GPA applied by center pivot. Lower rates of fumigants are less effective in killing tubers. Follow labels for proper rates, soil temperatures, soil moisture, and time required between fumigation and planting of subsequent crop.
- If possible, delay planting of the rotation crop to allow maximum early volunteer potato emergence and apply glyphosate (Roundup) or remove with tillage.
- Use herbicides that are active in reducing volunteer potatoes in rotation crops. Several herbicides can be very effective in killing potato plants and reducing daughter tuber weight, including mesotrione (Callisto), fluroxypyr (Starane), atrazine (Aatrex, Atrazine), glyphosate (Roundup), dicamba + diflufenzopyr (Distinct), dicamba (Banvel, Clarity), and imazamox (Raptor). Repeated applications of contact herbicides such as, oxyfluorfen (Goal), carfentrazone (Aim), fomesafen (Reflex), pyridate (Tough), glufosinate (Rely), and paraquat (Gramoxone) can also be effective. Follow labels closely for labeled crops, proper rates, timing of applications, and crop rotation restrictions.
- When possible, apply postemergence herbicides when potatoes are just beginning to initiate tubers on stolons. If applications are made earlier, mother tubers often resprout and the volunteer plants will require additional herbicide applications. If applications are made later, yield loss may have already occurred and many new tubers will have already formed which will infest next year's crop.
- Previous USDA-ARS research demonstrated that cultivation about 1 week after postemergence applications of Starane, Goal, Roundup, and Banvel greatly reduced the number of daughter tubers formed compared to herbicides alone. In corn, Callisto herbicide has reduced new daughter tuber formation greater than other postemergence herbicides. Cultivation after Callisto application may not improve volunteer potato control.
- Select competitive crops and those with effective herbicide and cultivation options like field corn. Crops like carrots have no effective herbicides registered for volunteer potato control, so avoid planting such crops in fields where volunteers will be plentiful. Winter wheat is a very competitive crop and delays volunteer potato emergence in the spring. However, cultivation isn't practical in wheat and there are limited opportunities for timing effective herbicide applications in winter wheat prior to new tuber set on volunteer potatoes.
- Repeated cultivations and hand weeding can control volunteer potatoes, but they are most effective and economical when combined with other control methods.
- Grazing fields with hogs, sheep, or cattle may also reduce the number of tubers available to sprout.

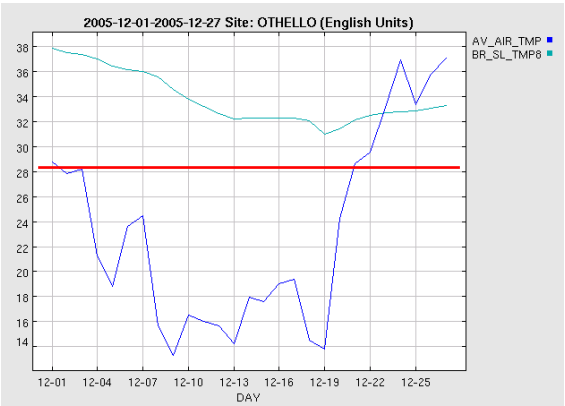
For more detailed control information contact Rick Boydston, USDA-ARS, 24106 N Bunn Road, Prosser, WA 99350. Phone (509) 786-9267. Email:boydston@pars.ars.usda.gov

Figure 1. Minimum soil temperatures recorded 8 in. deep at four AGWeatherNet stations during December 2005 and minimum soil temperatures recorded Dec. 19, 2005 at 4 in. and 8 in. from two Agrimet weather stations at Odessa, WA and Hermiston, OR. Dark blue line indicates average air temperature. Red line indicates critical temperature required to kill potato tubers.





Dec. 19 Hermiston, OR Soil Temp. 4" = 33.1 and 8"=34.3 Odessa, WA Soil Temp. 4" = 29.8 and 8" = 32.5



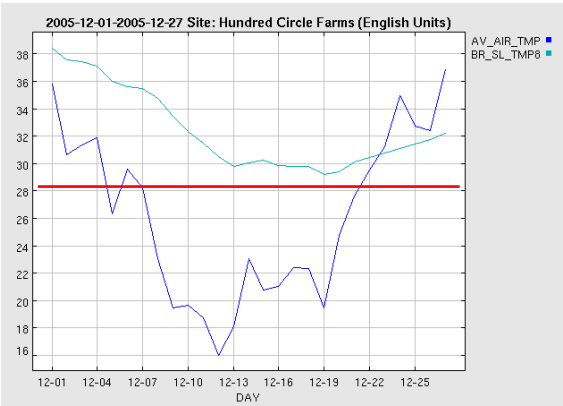
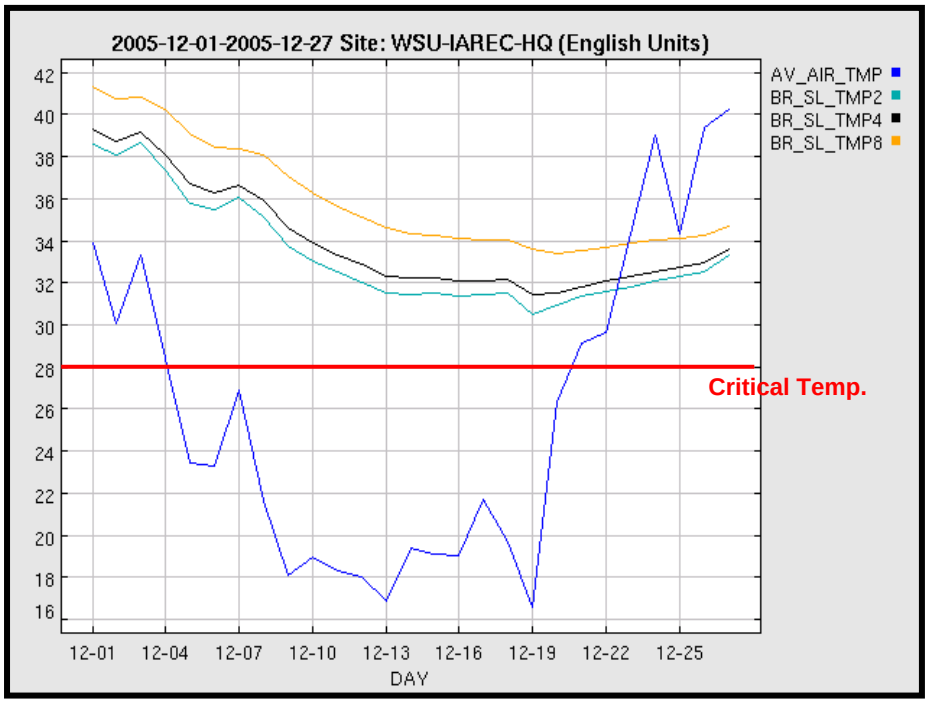


Figure 2. Minimum soil temperatures recorded at 2, 4, and 8 in. deep at AGWeatherNet station near Prosser, WA in December 2005.



Literature cited.

Newberry, GD and RE Thornton. 2004. Influence of post harvest tillage and rotation crop selection on volunteer potato survival. Abstract in Amer Potato J 81:77.

Thomas, PE and DR Smith. 1983. Relationship between cultural practices and the occurrence of volunteer potatoes in the Columbia Basin in northwest United States. Amer Potato J 60:289-294.