

CULTURAL MANAGEMENT PRACTICES TO COMBAT TUBER MOTH

M.J. Pavek

Tubers infested with tuber moth larvae (tuber worms) are not marketable. The tuber worms develop from eggs deposited by tuber moths on tubers that lie close to the soil surface. Regions with mild winters are often affected more than those with harsh winters. In the Columbia Basin of Washington and Oregon, tuber infestation and moth activity is highest near the warmer, south end of the Basin. Tuber moths have been found in Western Idaho, but the numbers are low and they do not appear to have migrated to any extent. Tuber moth control relies on an understanding of the life cycle and activities of the insect. However, the infestations are somewhat new to the Northwest and there is still much to learn.

WHAT WE KNOW:

- Tuber infestation is typically end of season (Figure 1) when vines senesce and tubers have expanded
- Infested tubers are those that are typically within 2 inches of the soil surface and are often protruding through the soil surface
- Green, surface-exposed tubers are more likely to be infested with tuber moth larvae than those that are not green or exposed.

WHAT WE DON'T KNOW:

- Full Understanding of the Habits/Lifecycle
- Economic Threshold, When to Spray
- Pinpointing Optimum Spray Intervals and Locations
- What are the Most Effective Insecticides?
- Why is Tuber Moth Now a Pest in the Northwest?
- Who's at Risk in Idaho?
- Alternative Approaches to Management
- Trap crops, Biological Control, Etc

In an attempt to combat the tuber moth, many research projects are currently underway in the Columbia Basin. The research includes: pest biology and habits, chemical control, storage biology & control, biological control, season long monitoring, and resistance breeding.

FIRST LINE OF DEFENSE: GOOD MANAGEMENT PRACTICES

Literature from the past indicates that the first line of defense comes from good management practices, similar to that used for a large range of diseases and insects. Eliminating cull piles and controlling volunteer potatoes reduces habitat for the tuber moth

and worm. Tillage to leave tubers near surface during winter, long rotations, and the use of harvester chains with a tight pitch to remove small tubers is essential for volunteer control where the winters are mild. Some herbicides are also effective against volunteers, but rotation crops will dictate which herbicides can be used.

REDUCING TUBERS NEAR THE SOIL SURFACE

Because of what we know about the tuber moth, reducing the amount of tubers near the top and side surfaces of the hill will likely reduce the ability that tuber moths and tuber worms have to invade tubers. Put another way, management to reduce green tubers is management to reduce tuber worm infestation. In a 3-year Washington State University study, tuber greening and surface-exposed tubers were effectively reduced as seed pieces were planted deeper (Figures 2 and 3). Planting depth was determined by measuring from the top of the planted seed piece to the top of the final hill. Planting too shallow (< 6 inches) increased tuber greening and surface exposed tubers and reduced yields. Additionally, plant emergence was occasionally delayed by planting into dry, shallow ground (< 6 inches) versus planting into deeper moist ground (6 to 10 inches). Planting too deep (> 8 inches), however, also reduced emergence. The varieties 'Umatilla Russet' and 'Gem Russet' were especially sensitive to soil temperatures and generally slower to emerge from deeper planting depths than the other cultivars tested.

In addition, hill drag-off followed by moderate post-planting hilling with a dammer-diker effectively reduced green and surface-exposed tuber production by widening the hill. After both operations, final seed piece depth was between 6 and 8 inches. Widening the hill provided tubers additional room to bulk without being pushed out the side of the hill by other tubers. It is important to note, however, that planting deeper to start with was typically more effective at reducing green tubers than dragging-off later.

ADDITIONAL CULTURAL MANAGEMENT SUGGESTIONS

Other things that can increase green tuber yield include missing plants, a long interval between vine-kill and harvest, soil erosion and cracks, and low soil organic matter. Rolling vines does not appear to help "seal" the soil and may actually remove soil or open up cracks. Growers should avoid using big irrigation guns and utilize low impact irrigation practices. Maintaining a green canopy season-long with proper fertility, fungicide use, irrigation, and pest management is also important. Growers should prevent early vine senescence by fumigating for verticillium wilt and planting vert. resistant varieties. The interval between vine-kill and harvest should be minimized and wind-rowed potatoes picked up quickly. Additionally, results from on-going research by George Clough of Oregon State University suggests that keeping the soil moist between vine senescence and harvest may help reduce tuber worm infestation. Moreover, a crop rotation that increases soil organic matter can help hold soil together and reduce surface cracks and using tools like a dammer-diker can help reduce wind and water erosion.

PESTICIDE USE

As yields increase, it takes more soil to cover the tubers; because of this, all growers will have some surface exposed tubers. Because it is next to impossible to keep the tuber moths away from all tubers, chemical control probably will play a major roll in reducing

tuber infestations. Research done by Phil Hamm of Oregon State University during 2005-2006 indicates that monitoring moth populations with sticky traps is crucial to pesticide use. He found that damage was typically associated with high tuber moth numbers and that monitoring populations was essential for proper pesticide application timing. Hamm's research also suggests that pesticide applications prior to vine senescence were not effective and that pesticides should be applied during senescence when tuber moth numbers are at a season average of 8 moths/trap or 15 moths/trap during an overnight period. Following vine senescence growers will likely need to follow with multiple pesticide applications and therefore, rotating chemistries is important. Additionally, systemic seed-piece treatments have been found to be ineffective. More specific recommendations for pesticide timing and application are still being developed and will be reported in the near future. Because pesticide studies are ongoing, growers and fieldmen are encouraged to contact their local university extension professionals for up-to-date recommendations.

SUMMARY

Growers in suspect areas should monitor fields with traps, eliminate cull piles, reduce volunteers, keep tubers away from soil surface, keep soil moist after vine death, and minimize the interval between vine death and harvest. Pesticide application timing and interval are being established and will be reported in the near future. For a more permanent solution, the USDA/ARS in Prosser, Washington is conducting cultivar resistance breeding against the tuber moth. However, potato breeding is a long process and it may take 20 or more years to develop a suitable cultivar. Until a new cultivar is developed, growers will have to integrate all the strategies listed within this report along with up-to-date pesticide recommendations.

LITERATURE UTILIZED

Schreiber A., A. Jensen, G. Reed, and K. Pike. 2005. Integrated Pest Management Program for Insects and Mites in Oregon and Washington Potatoes. Washington State Potato Commission Website: www.potatoes.com.

Stalham, M.A., J.H. Fowler, and M.J. Pavek. 2001. Effect of planting depth and re-ridging on crop growth and tuber greening in FL 1953. *In*: Cambridge Univ. Potato Growers Res. Assoc. Annual Rep. 2001. Cambridge: CUPGRA, pp. 16-21.

Figure 1. 2006 Tuber moth counts from sticky traps near Hermiston, OR. Data collected by Andrew Jensen and Phil Hamm.

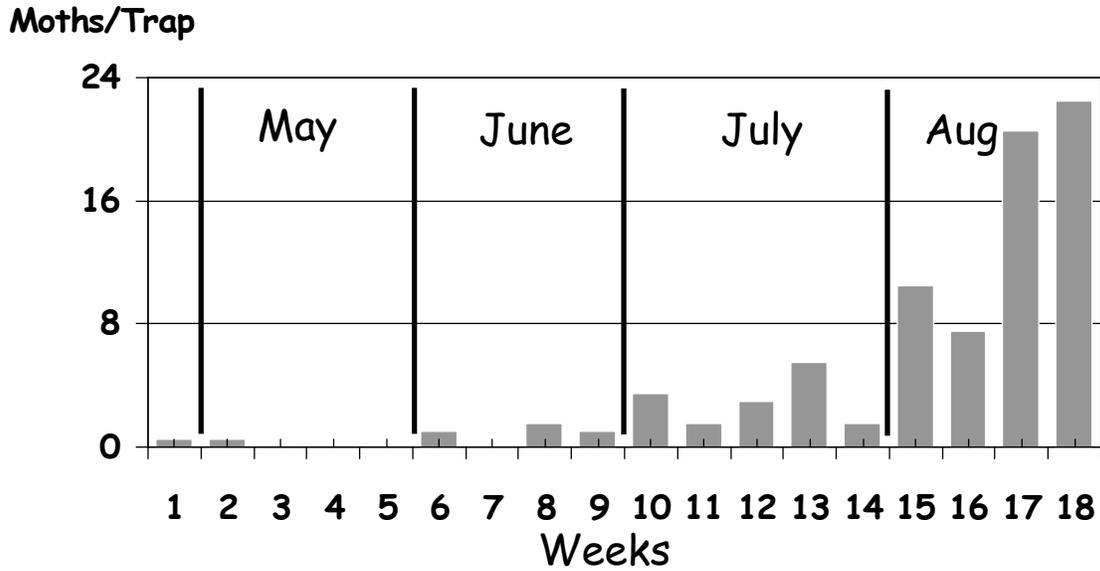


Figure 2. Green Tuber Weight At Harvest Averaged Across RB, Ranger, Umatilla

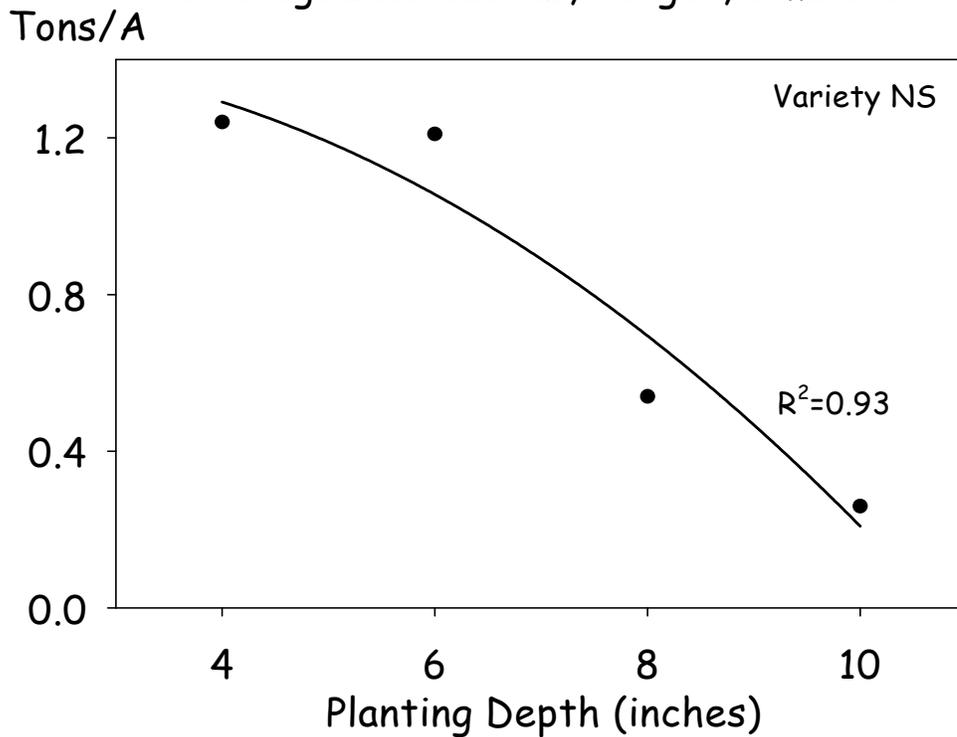


Figure 3. Tubers Per Acre Exposed on Soil Surface
Prior to Harvest

