On Solid Ground – December 2014

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Reducing the mess: keeping Christmas tree needles where they belong

Nobody wants to set up a Christmas tree in their home and have the needles start falling off well before Santa shows up.

So to help Christmas tree buyers, Washington State University researchers are using a $90,000 grant to study the effect of ethylene on needle retention in species commonly grown in the Pacific Northwest.

Gary Chastagner, a professor of plant pathology at WSU, has studied Christmas trees since 1980. He's made a career out of Christmas tree research, and he said needle loss is a huge concern for the Christmas tree industry.

An older clonal block of grafted

"There's some research that indicates ethylene exposure can cause needles to drop prematurely on balsam fir trees," Chastagner said. "We don't grow those in

this area, but we want to see if the gas impacts our trees."

Christmas trees at WSU's Puyallup research orchard.

Ethylene is a colorless gas, produced naturally in plants, that is often used in agriculture to trigger ripening in fruits.

Chastagner just started this line of research when the grant funding came through on October 1, so no results are available yet. WSU has about 15 acres of Christmas trees, including a number of grafted clonal orchards in Puyallup. Researchers there have baseline knowledge of the needle retention characteristics of each tree in these orchards.

"We're going to be exposing branches to different concentrations of ethylene for a 24-hour period," Chastagner said. "Then the branches will be moved to a postharvest display room where we do needle loss testing. We also have a set of branches only exposed to air, as a control."

A companion ethylene study involves exposing branches to different levels of the gas over a simulated seven-day storage period. Those branches are then displayed and measured for needle loss.

Chastagner and his team are collaborating with USDA scientist James Mattheis in Wenatchee, who has years of experience working with ethylene on apple storage. Chastagner said the research partnership makes this project possible.

"It's a good marriage of people who have extensive expertise in their own areas," he said.

Much of the grant, $62,666, comes from the Washington State Department of Agriculture, with the balance from WSU.

Research approach two

Chastagner is also using the Puyallup research orchards to work on a grant to learn how the genetic makeup of trees can reduce needle loss.

"We're using the traditional genetic knowledge we've accumulated from trees that either do or don't shed, and taking samples from them," he said.

Another aspect of this project is looking at resistance to Phytophthora root rot, a disease that can impact water and nutrient uptake in Christmas trees and ultimately kill highly susceptible varieties like noble and Fraser fir.

This grant, a collaboration between WSU, North Carolina State, Michigan State, Penn State, and the University of California, Davis, is $1.3 million over five years from the USDA National Institute of Food and Agriculture through its Specialty Crop Research Initiative. It aims to find a national solution to needle retention and Phytophthora root rot.

"This is a first-of-its-kind collaborative effort between researchers with diverse expertise at multiple universities working together to help solve two national problems facing the Christmas tree industry," Chastagner said. "We normally do regional projects on Christmas trees produced in the Pacific Northwest. This is much bigger in scale."

Christmas tree branches will be held in a postharvest display room after they've been exposed to the ethylene gas. Researchers will measure needle loss on each branch to see what effect the gas has.

He hopes both of these programs lead to longer-lasting Christmas trees in people's homes, and the elimination of Phytophthora root rot in the Christmas tree industry.

Until that time, consumers can minimize needle loss by keeping their trees well watered throughout the display season.

—Scott Weybright

Study: Conserving soil and water in dryland wheat region

In the world's driest rain-fed wheat region, Washington State University researchers have identified summer fallow management practices that can make all the difference for farmers, water and soil conservation, and air quality.

Wheat growers in the Horse Heaven Hills of south-central Washington farm with an average of 6-8 inches of rain a year. Wind erosion has caused blowing dust that exceeded federal air quality standards 20 times in the past 10 years.

"Some of these events caused complete brown outs, zero visibility, closed freeways," said WSU research agronomist Bill Schillinger.

Science to anchor farmer incentives

He and WSU agricultural economist Doug Young compared three fallow management systems in two part of the Horse Heaven Hills where annual rainfall differed by two inches.

The five-year study, published in the Soil Science Society of America journal in September, provides the U.S. Department of Agriculture's Natural Resources Conservation Service with science-based information needed to develop incentives for wheat farmers to change from traditional tillage fallow practices to undercutter tillage or no-till fallow systems.

Harvesting hard red winter wheat at the western trial site in 2008 yielded 16 bushels per acre.

Timing to trap moisture

Farmers in the Horse Heaven Hills practice a winter wheat-summer fallow rotation where only one crop is grown every other year on a given piece of land.

Average yields can be as low as 18 bushels per acre – compared to upwards of 120 bushels per acre in the higher rainfall area of the Palouse in eastern Washington. Though the margins are tight, with careful management wheat farming in the Horse Heaven Hills can be profitable.

To get the highest yield, farmers need to plant winter wheat in late August or early September after a year of fallow. The fallow period allows enough moisture from winter and spring rains to accumulate in the soil for seeds to get established.

"In east-central Washington, if you can't plant in late summer into deep seed-zone moisture in fallow, then you have to wait for fall rains in mid-October or later," Schillinger said.

The longer it takes to get winter wheat seedlings established, the lower the potential for good yields.

To help ensure precious soil moisture remains in the seeding zone, farmers till the soil in the spring. Tillage breaks up the capillary action of the soil; this

helps slow soil moisture evaporation in the seed zone during the hot, dry summer months.

But too much tillage can cause soil loss through wind erosion that feeds hazardous dust storms.

Undercutting in the east

Compared with traditional tillage, Schillinger and Young found that undercutter tillage was the best option for fallow in the slightly moister eastern region of the Horse Heaven Hills, where late-August planting is possible and spring tillage helps retain summer soil moisture.

An undercutter with V-shaped blades is used for primary spring tillage with fertilizer injection added during the fallow year.

With wide, narrow-pitched, V-shaped blades, the undercutter slices beneath the soil surface to interrupt capillary action in the seed zone without causing much disturbance of the soil surface.

Schillinger said scientists and farmers have conclusively shown that spring tillage with an undercutter effectively retains seed-zone moisture. It also retains significantly greater surface residue and surface soil clods – which are less likely to be disturbed by wind and become airborne – versus traditional tillage implements such as a tandem disk or field cultivator.

No till in the west

In the western region of the Horse Heaven Hills, the best option for controlling wind erosion was to practice no-till fallow; that is, to avoid tillage altogether. Most of the time, rainfall in this area simply isn't sufficient to establish an early stand of winter wheat with any fallow management system.

"There's no reason to till the soil when you already know in the spring that it will be too dry to plant wheat in late August," Schillinger said.

Young found that, despite the modest grain yield potential, wheat farming in this environment can be profitable – with enough acreage and judicious use of inputs to manage costs. In fact, late-planted winter wheat on no-till fallow was just as profitable as traditional tillage and undercutter tillage fallow

treatments at the western site.

—Sylvia Kantor

Invading stink bug eats Cinderella's pumpkins

Why an insect the size of a fingernail has been compared to a great white shark is becoming more apparent as the brown marmorated stink bug accelerates across the Pacific Northwest.

"They've got to be stopped," said Joe Beaudoin of Vancouver, Washington, who bears the distinction of being the first farmer in the region to do battle against the invasive pest whose appetite leaves boreholes in fruit and vegetable crops.

"I'm concerned that the damage they've done here is just a tip of the iceberg for area crops," he said, referring to the apples, pears, sweet peppers and, most recently, pumpkins that the insects destroyed on his 90-acre farm in Vancouver's city limits.

Ruin and stink in their wake

It's a concern shared by government and university researchers nationally as they monitor the bug's advance and try to reduce the mounting threat.

"We're getting more reports of new locations where they've shown up. It's clear that populations are growing and dispersing," said entomologist Todd Murray, director of Washington State University's Skamania County Extension.

He is among a group of researchers working with Beaudoin and other growers to control the pest. WSU, Oregon State University (OSU) and the U.S. Department of Agriculture (USDA) are part of the nationwide effort.

White bands on the antennae of the brown marmorated species help distinguish it from other stink bug varieties that are beneficial to crops.
(Photo by Todd Murray, WSU Extension)

Originally from Asia, the brown marmorated stink bug landed in the eastern United States in the late 1990s. Now in 41 states, its whereabouts in the Northwest range from the moist, lush

areas near Portland, Ore., and Seattle to semi-arid lands around Yakima, Walla Walla and the Tri-Cities in Washington.

"As they make their way from the mid-Atlantic states, we're learning more about how they behave and what they feed on," said Murray. "Unfortunately, when it comes to climate and food, they're not very choosy."

Unlike most insects, these bugs eat many plant species, he said. Not only do they leave behind soggy brown pockmarks, but another concern is that they can transmit a bad flavor or odor as they feed on smaller, more delicate crops such as grapes.

Pumpkin eaters

The stink bug species was first detected in Portland in 2004. From there over the Columbia River I-5 interstate bridge and into Vancouver is Joe's Place Farms, run by Beaudoin. His was the first farming operation to "identify significant stink bug damage to crops," said Murray who, teaming with scientists at OSU, sets odor-attractant traps for the insects.

Because stink bugs deftly catch rides in boxes and crates packed in cars, trucks and trailers, colonies have settled in and around urban areas off of I-5, Murray said. Though the bugs can fly up to 15 miles a day by themselves, "they travel quite well as stowaways," he said.

"Joe's uniqueness of being located in an urban area made him susceptible to be the insects' 'first hit' in the region," Murray explained.

Last growing season, the stink bug invaded multiple rows of Beaudoin's apples, pears and sweet peppers. This year, they drilled into his elegant French heirloom pumpkins that resemble Cinderella's horse-drawn carriage.

Large deep-orange pumpkins with dense rinds, "they couldn't withstand a tiny single penetration by a stink bug," said Beaudoin. "They looked injured, bruised. I just left them lying in the field."

Small but mighty

The marmorated stink bug's culinary victory over an object a thousand times its size and weight doesn't astound USDA entomologist Tracy Leskey, who leads the scientist SWAT team from her base in Kearneysville, West Virginia.

"They seem to have no trouble penetrating tree bark to get sap so it's not surprising that they can get through the thick, tough skin of pumpkins," she

said.

The pests destroy crops by injecting a salivary enzyme that breaks down tissues so they can suck out the juices. This process opens the pathway for secondary rot to develop, said Leskey, further setting the stage for a big pumpkin to decay.

What is surprising, she said, is that these tiny critters never seem to give up – surviving pesticides, cold winters, dry climates and long hitchhike journeys on trains and vehicles. One morning, she watched a throng of them feed on a newly planted ornamental maple tree.

WSU entomologist Richard Zack displays a brown marmorated stink bug on an apple. (Photo by Robert Hubner, WSU Photo Services)

Their mouthparts were going right through that lovely tree's bark," Leskey recalled. "I remember standing there and saying out loud, 'Aren't you guys ever going to give up?'"

Until scientists can figure out how to stop them, the answer is "No." Which is why, as winter approaches, the pests are seeking warm homes to settle into until spring.

Know your stink bugs

"We're definitely getting more calls from people wondering if what they've found crawling on a wall or the carpet is a marmorated stink bug," said WSU entomologist Richard Zack at the Pullman campus. "It's good they're asking us. We want the public to know that not all stink bugs are the marmorated variety."

That's because not all stink bugs are crop destroyers. In fact, some native species are actually beneficial, said Zack, because they eat other insects that harm crops.

Good or bad? To help homeowners and Master Gardeners know the difference, WSU has designed a "Pest Watch" guide.

For more information on work being done by members of the national research team, go here.

—Linda Weiford

Renewable biofuel crop attractive to local economy

Trees and technology are making the road to renewable resources more promising with each growing season.

At the first poplar-for-bioenergy harvest recently in Stanwood, a harvester with a specialized header cut and chipped trees in a single pass.
(Photo by Patricia Townsend, WSU)

"It's a much different cropping system for harvesting these trees than a timber harvest," said Patricia Townsend, WSU regional extension specialist with Advanced Hardwood Biofuels Northwest.

"This machine, specifically for poplars and willows, works like an agriculture machine in terms of cutting and getting usable product."

The poplars, planted in spring 2013, are known for fast growth and ease of conversion into acetic acid and renewable transportation fuels. Acetic acid is a high-value chemical made in the first steps of the conversion process that can be used to make paint, plastics, textiles and environmentally friendly deicing salts.

The trees are the focus of the Advanced Hardwood Biofuels Northwest project.

"We are excited because of what these trees mean for a future bioeconomy," said Townsend. "The poplars provide a local and renewable resource that can potentially displace our need for petroleum-based products."

The next harvest at the Snohomish County Pilchuck site is scheduled for 2017. Click here for a companion video to this story.

—Betsy Fradd

Foresters workshop fast approaching

The 23rd annual Family Foresters Workshop will take place January 16, 2015 in Coeur d'Alene, Idaho. The event is designed to strengthen the skills of consulting foresters, state-employed service foresters, and other natural resource professionals who work with family forest owners. It serves as a

forum for updates on emerging technology and knowledge applicable to family forestry.

Up to 100 people can participate. Registration forms, due Jan. 9, are available online and at local University of Idaho and Washington State University Extension offices.

The $85.00 pre-registration fee ($95.00 after Jan. 10) includes lunch and refreshments. For questions on the program, contact: Chris Schnepf at (208) 446-1680 or Steve McConnell at (509) 477-2175.

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