Serving replant disease a meal of mustard

Mark Mazzola finds ways to avoid costly condition that arises in fruit trees

By DAN WHEAT
Capital Press

Photos by Dan Wheat/Capital Press

Mark Mazzola, USDA Agricultural Research Service plant pathologist, looks at Geneva rootstock similar to what he's used in replant disease trials. Shashika Hewavitharana, Washington State University doctoral student, works on anaerobic soil disinfestation in the background in Wenatchee, Wash., March 17.

Yellow and white mustard seed meal can be used to combat replant disease in apple trees. Flake form is at left. Pellet form is at right.

WENATCHEE, Wash. — Mark Mazzola has been investigating replant disease in apple orchards for 20 years and says he's found a solution that may work better than soil fumigation.

A combination of yellow and white mustard seed meals combats replant disease longer than fumigants by addressing the whole ecosystem of soil rather than just its chemistry, says Mazzola, a research plant pathologist at USDA's Agriculture Research Service Tree Fruit Research Laboratory in Wenatchee.

Mustard seed meal also results in better tree growth and fruit yields than fumigation, he said.

Replant disease is pervasive when replanting an orchard and is a "major impediment to the establishment of an economically viable orchard," Mazzola said.

Replant disease is a build-up of micro-organisms in soil from old tree roots that hampers the growth and productivity of new trees. It wasn't much known before a disastrous freeze in 1968 and 1969 killed a lot of orchards in Central Washington.

Growers tore out dead trees and replanted new ones and began having more problems with diseases, Tom Auvil, research horticulturist at the Washington Tree Fruit Research Commission in Wenatchee, has said.

The industry turned to fumigation but it doesn't always work because temperature, soil texture and soil moisture all can hinder its effectiveness, Auvil said.

Mazzola, now 54, was hired at the ARS in Wenatchee in 1995, primarily to investigate replant disease. He has focused on apples but looked at pears and cherries, which are susceptible to the same pathogens.

He believes his undergraduate work in forest biology and strong foundation in ecology gives him a broad perspective in looking at replant disease and soils.

"Most people in this research come from agricultural programs like plant and soil science. It's relatively rare to find people with an ecology background in plant pathology. I try to understand how soils function from a biological and ecological perspective," he said.

Many diverse organisms are at work in soils, he said.

He has managed a nematode diagnostics lab, worked on rust fungi, soil bore fungi and bacteria and then studied the molecular genetics of bacteria that are pathogens of rice.

"You don't find a lot of people who have worked on trees, beans, rice, wheat and now apples. We get pigeon-holed quickly," he said.

In looking at replant disease, Mazzola first identified four fungal organisms and the lesion nematode as the main problems. He tested several cover crops to control the pathogens on the ground before it was replanted as orchard but without the results he was looking for. He left ground fallow for up to three years without a reduction in disease development.

About 15 years ago, there was a lot of interest in using mustards, canola, broccoli and other brassica plants as green manure in soil for their biologically active chemistries.

"But you can't produce enough biomass to obtain the chemistry needed to suppress plant pathogens. Seed meal possesses higher quantities of these chemistries," Mazzola said.

He began experimenting with seed meal from various brassica crops and found none of them alone controlled replant organisms. Then he tested various combinations and ratios. He landed on a 50-50 mix of yellow and white mustard seed meal applied in the fall before a spring planting.

The mix produces chemicals that kill the pathogens but also changes the microbiology of the soil to make it more resistant to re-infestation.

A field trial of Jonagold trees on Geneva 11 rootstock, planted in 2010, resulted in a 45 percent increase in fruit yield. Gala on Malling 9 and Geneva 11, also planted in 2010, in the mustard seed meal treated soil yielded 25 percent more fruit cumulatively in the first two years.

Mazzola used metagenome analysis, generating and sifting through millions of DNA sequences, to study roots and attached soil and found microbes in fumigated soil reverted back to their original state after two seasons while microbes in seed meal treatment were distinct and still suppressing disease after the fourth season.

"We're able to identify all the bacteria and fungi colonizing the apple tree root system and improve the root-soil ecosystem to manage the pathogens of this disease," he said.

Auvil has said Mazzola has done a great job of showing a wide array of organisms at work in tree fruit soil, but that the seed meal solution takes too much meal from too far away to be practical beyond test plots.

"Growers apply 20 tons per acre of compost in the fall to orchards," Mazzola said, noting he applies mustard seed meal at 3 tons per acre and has successfully reduced that by one-third.

Mustard seed meal is mainly a biodiesel byproduct produced in the Midwest but mustard seed is grown in Washington and can be increased, he said.

"Growers will make this work," he said, adding meal flakes have been turned into pellets commercially in California for easier application.

Interaction between Geneva rootstock and the seed meal are likely to allow further reductions in the quantities required, he said. And seed meal may not be the only solution. Mazzola continues to research other potential solutions.

"The Geneva rootstock was developed for precocity, dwarfing and fire blight resistance, not replant disease," he said. "That's a side benefit. It has a tolerance for replant disease. It handles it."

Mazzola and Yanmin Zhu, an ARS geneticist in Wenatchee, and Gennaro Fazio, an ARS rootstock breeder in Geneva, N.Y., who developed the Geneva rootstock, are collaborating to investigate differences in gene expression with an eye toward developing a rootstock truly resistant to replant disease.

Western Innovator
Mark Mazzola

Age: 54

Born and raised: Boston, Mass.

Family: Wife, Michelle Mazzola, a funding consultant.

Education: Bachelor's in forest biology, University of Vermont, 1983; master's in forest pathology, University of Vermont, 1985; doctorate in plant pathology, Washington State University, 1990.

Occupation: Research plant pathologist, USDA ARS Tree Fruit Research Laboratory, Wenatchee, since 1995.

Previous work: Research plant pathologist, USDA ARS, Pullman, Wash., 1993-1995; post-doctorate research associate, Kansas State University, 1990-1993; manager, Nematode Diagnostic Laboratory, University of Vermont, 1985-1986.

Quote: "My interests were in natural resources and that related to my first hiking trip in the White Mountains of New Hampshire."

Ranch projects put off by procrastination

By RYAN M. TAYLOR
For the Capital Press

Cowboy Logic
Ryan Taylor

TOWNER, N.D. — The weather has warmed up considerably in our neighborhood, making it feel like spring. That's an odd feeling for us in North Dakota, as the solstice turns to spring, to have our actual weather match the officially designated season.

It makes the kids want to play catch and ride their bikes when they get off the school bus. It makes me feel like being outside, working in our shop where the inside temperature is perfectly synchronized with the outdoor temperature, and catching up on a few assorted projects that I started a while back.

'A while back'

When I say, "a while back," it reminds me of when my dad used to say, "here the other day." In later years, he would say that and Mom would remind him that "here the other day" usually meant anywhere from 5 months to 15 years ago in actual calendar time.

Time flies, I guess, and it usually flies faster and farther as we get older. It's the reason we look at our children's rate of growth and maturity in disbelief, and wonder how it could be that our friends are becoming grandparents and that we somehow received notice of a 25-year, or more, school reunion.

One of the projects I'd started "a while back" was to put some electric lights in a small pole building I had built years ago with the help of a couple passing neighbors and relatives.

It's used mostly for storage, but I also have a horse pen and a hitching rail next to it so it's become my tack shed and the place to keep our saddles out of the weather. Sometimes, we start out early with the horses, or ride late in the evening, so I figured a little illumination would be handy.

I had an electrician run a line out and put an electric breaker panel in there — five years ago? Here the other day. I went to the store and bought the things I would need — switches, outlets, little blue boxes, lamp holders, wire and wire staples and wire nuts — four years ago? Just here the other day.

Ranch electrician

Now, with this warm weather I gathered up my pliers and screwdrivers and wire stripper and decided I was going to "let there be light" in our saddle shed. I'm no master electrician, but I am a ranch electrician. DIY is the acronym for us "do it yourself" types.

I can run wires out of a panel and put in some outlets and lights and simple switches. I can even do a three-way switch if I go to our shop that was wired by a real electrician, look at things and remind myself what to do with that extra red wire. My cardinal rule — make double and triple sure that the power is off on the start of the wire before I start messing with the end of the wire.

I gathered up my plastic bags of electrical pieces and parts from the hardware store that had been laying in that building for "a while now." I picked up the plastic bags and they disintegrated completely, dropping my new supplies on the ground.

Plastic timing

I don't know what the rate of deterioration is on good petro-chemical plastic. I'd always heard that plastic would live on a lot longer than we do. Maybe the bags were sitting in the sunlight. Perhaps they had some biodegradable corn starch components. But, in any case, my period of procrastination outlasted the plastic.

The lights are now on and I have a new goal for my long list of other projects — make sure to complete them faster than their plastic bags of supplies break down in the environment. It's not a high bar. We can do this.

Calendar

APRIL
OREGON

April 9 — Oregon Mint Commission budget hearing, 10 a.m., Hood River Hotel, 102 Oak St., Hood River, 503-364-2944

April 18 — Oregon Women for Agriculture Auction and Dinner, Linn County Fair and Expo Center, Albany, 503-243-FARM (3276), http://owaonline.org/

April 25-26 — AgFest, 8:30 a.m.-5 p.m. Saturday, 10 a.m.-5 p.m. Sunday, Oregon State Fairgrounds, Salem, $9 for adults, under 12 are free, http://www.oragfest.com

April 28 — Oregon Blueberry Commission budget hearing, noon, Chemeketa Events at Winema, Room 210, 4001 Winema Place, NE, Salem, 503-364-2944

CALIFORNIA

April 18-21 — California State FFA Conference, Selland Arena, Fresno, www.calaged.org/stateconvention

IDAHO

April 8-11 — State FFA Leadership Conference, College of Southern Idaho, Twin Falls, www.idffafoundation.org/

April 24 — Forester map and compass workshop, 9 a.m.-4 p.m., University of IdahoExtension office, 1808 N. Third St., Coeur d'Alene, $10 fee, 208-446-1683, http://www.uidaho.edu/extension/forestry/content/calendarofevents

WASHINGTON

April 4 — Washington State Sheep Producers Lambing and Management School, Sprague, $50 (member), $60 (non-member), 509-257-2230, dvm@feustelfarms.com

April 6-11 — Washington State Sheep Producers Shearing School, Moses Lake

April 16-19 — Washington State Spring Fair, Puyallup, 2-10 p.m. Thursday, 10 a.m.-10 p.m. Friday and Saturday and 10 a.m.-8 p.m. Sunday, http://www.thefair.com/spring-fair/

MAY
WASHINGTON

May 14-16 — Washington FFA Convention, Washington State University, Pullman, www.washingtonffa.org/convention

CALIFORNIA

May 1-2 — Forest Landowners of California annual meeting, Holiday Inn, Auburn, www.forestlandowners.org/

JUNE
CALIFORNIA

June 15-26 — Postharvest Technology Short Course, University of California-Davis, http://postharvest.ucdavis.edu/Education/PTShortCourse/

WASHINGTON

June 20-21 — Glenwood Ketchum Kalf Rodeo, 1 p.m. each day, 509-364-3371, http://business.gorge.net/glenwoodrodeo/

JULY
IDAHO

July 11 — 94th annual Idaho Ram Sale, Twin Falls County Fairgrounds, Filer, 208-334-2271 or iwga@earthlink.net

Capital Press

Established 1928

Board of directors
Mike Forrester ..... President
Steve Forrester
Kathryn Brown
Sid Freeman ..... Outside director
Mike Omeg ..... Outside director

Corporate officer
John Perry
Chief operating officer

Capital Press Managers
Mike O'Brien ..... Publisher
Joe Beach ..... Editor
Elizabeth Yutzie Sell .... Advertising Director
Carl Sampson ..... Managing Editor
Barbara Nipp ..... Production Manager
Samantha McLaren .... Circulation Manager

An independent newspaper published every Friday.

Capital Press (ISSN 0740-3704) is published weekly by EO Media Group, 1400 Broadway St. NE, Salem OR 97301.

Periodicals postage paid at Portland, OR, and at additional mailing offices.

POSTMASTER: send address changes to Capital Press, P.O. Box 2048 Salem, OR 97308-2048.

To Reach Us
Toll free 800-882-6789
Main line 503-364-4431
Fax 503-370-4383
Advertising Fax 503-364-2692

News Staff
N. California
Tim Hearden 530-605-3072
E Idaho
John O'Connell 208-421-4347
Idaho
Carol Ryan Dumas 208-860-3898
Boise
Sean Ellis 208-914-8264
Central Washington
Dan Wheat 509-699-9099
E Washington
Matthew Weaver 509-688-9923
Oregon
Eric Mortenson 503-412-8846
Mateusz Perkowski 800-882-6789
Graphic artist
Alan Kenaga 800-882-6789

To Place Classified Ads
Ad fax 503-364-2692
or 503-370-4383
Telephone (toll free) 866-435-2965
Online ..... www.capitalpress.com/classifieds

Subscriptions
Mail rates paid in advance
Easy Pay U.S. $3.75/month (direct withdrawal from bank or credit card account)
1 year U.S. $49.49
2 years U.S. $89.89
1 year Canada $275
1 year other countries ..... call for quote
1 year Internet only $49
1 year 4-H, FFA students and teachers $30
9 months 4-H, FFA students & teachers $25
Visa and Mastercard accepted

To get information published
Mailing address:
Capital Press
P.O. Box 2048
Salem, OR 97308-2048

News: Contact the main office or news staff member closest to you, send the information to newsroom@capitalpress.com or mail it to "Newsroom," c/o Capital Press. Include a contact telephone number.

Letters to the Editor: Send your comments on agriculture-related public issues to opinions@capitalpress.com, or mail your letter to "Opinion," c/o Capital Press. Letters should be limited to 300 words. Deadline: Noon Monday.

Capital Press ag media
www.capitalpress.com
www.FarmSeller.com
www.AgDirectoryWest.com
www.OnlyAg.com
www.facebook.com/capitalpress
www.facebook.com/farmseller
www.facebook.com/onlyAGdotcom
twitter.com/capitalpress
www.youtube.com/capitalpressvideo
www.blogriculture.com

Index

Correction policy

Accuracy is important to Capital Press staff and to our readers.

If you see a misstatement, omission or factual error in a headline, story or photo caption, please call the Capital Press news department at 503-364-4431, or send email to newsroom@capitalpress.com.

We want to publish corrections to set the record straight.