Cedar Apple Rust 2018

Posted by Mike Biltonen
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Mike Biltonen
Cedar Apple Rust 2018
January 15, 2018 06:07PM
Registered: 10 years ago
Posts: 298

To me, figuring out Cedar Apple Rust is the holy grail of pomological pathology. We've tried what is supposed to work, but with limited success. Here's what I know [or think I know]:

1. No red cedar trees = no CAR
2. Above 1100' = no red cedar trees = no CAR
3. Proximity [distance] to/from red cedar trees increases/decreases your trees' susceptibility to infection.
4. There is distinct varietal susceptibility.
5. Cool wet springs increase the potential for susceptibility to CAR and other diseases [e.g., marssonia leaf blotch].
6. Control is required as long as those nasty CAR galls are a clear and present danger, even though symptoms may not show up for weeks after infection.

So, my initial questions are:

1. What is about the epidemiology of CAR that differs from other diseases that make it so much harder to control organically/holistically than say Apple Scab?
2. We know what drives varietal resistance in apple scab, but drives it for CAR?
3. For anyone in the "red zone," have you tried any holistic or organic materials that really, truly work? If so, please share.

I do plan to investigate these questions before stump sprouts, so hopefully it can be a topic of discussion this year.

Thanks, Mike

Mike Biltonen, Know Your Roots
Zone 5b in New York
Reply Quote

Michael Phillips
Re: Cedar Apple Rust 2018
January 15, 2018 08:16PM
Moderator
Registered: 11 years ago
Posts: 621

I may not know what the "red zone" is but we indeed have some red meat here as far as engaged discussion goes. Bring it on, Mike.

I live in a part of the northern hemisphere where Cedar Apple Rust is mere myth, given that eastern red cedar trees are not yet found at this latitude. *Every grower gets some kind of break at any given site!* Yet I'm fascinated by the topic and do consult with growers who deal with galls on nearby cedars and orange-spotted defoliation in turn on their apple trees. Here are some bits to add to the discussion.

Rust is a biotrophic fungal disease, by which is meant that the pathogen utilizes enzyme strategies to penetrate the leaf cell to access nutrients. Yet rust hyphae have fallen into an open-door strategy as well. I've seen a photo (ala Getty Images) of a rust hypha entering an unguarded stomata on the underside of the apple leaf. Keeping competitive colonization of benign microbes up in order to keep stomata openings guarded is HUGE.

MacIntosh genetics features a hypersensitive cellular response to CAR invasion akin to what the Vf gene does for the so-called scab immune cultivars.

The infection period for CAR extends as much as several weeks beyond the end of the primary scab infection period. Keeping up holistic sprays through the Fruit Sizing Window is imperative. Frequency of application can be as short as every seven days after petal fall in a rainy spring, given that "holistic oomph" holds strong on the order of 7 to 10 days in the field.

Some growers have suggested Regalia has special immune relevance to deter CAR. That an alcoholic extract of giant knotweed (the commercial product in essence) somehow triggers the right sort of systemic resistance that other immune elicitors don't quite achieve. This would fall under the banner of advanced phytochemistry if true, methinks. Oil is thought to increase efficacy.

Sulfur seems of no avail with CAR. It's been suggested that rather than creating acidic moisture puddles, far better to push things alkaline with sodium bicarbonate or potassium bicarbonate. This has particular timing nuance as indicated in the most recent version of the Cedar Apple Rust Protocol in the portal library.

Lost Nation Orchard
Zone 4b in New Hampshire

Reply Quote
Mike Biltonen
Re: Cedar Apple Rust 2018
January 15, 2018 09:10PM
Registered: 10 years ago
Posts: 298

Thanks, Michael.

Red Zone = high intensity areas [i.e., not northern New Hampshire or the Catskills, in general]. Places where there is a high density of red cedar in close proximity to orchard with susceptible cultivars.

And yes to everything you said and that's in the protocol. However,

1. Which benign microbes? Any/All? Are there some that are more antagonistic to CAR than others, or is just CC strategy and not giving them a landing strip? Or we just don't know the specifics?
2. How does that hypersensitive response in McIntosh manifest itself? In other words, specific phytochemicals, physical response, etc.?
3. The problem with Regalia and oil is that it is $$, needs to be sprayed often in a bad year, the combination does have mild thinning effects, oil can impact other products being applied, etc. And basically by the time you spray 2-4 sprays of that combo, you'll have dropped between $100-200 per acre. And I have yet to see it work when pressure is high [red zone].
4. Sulfur is worthless.

What about a micronutrient spray [e.g., cobalt for scab] regimen? Any thoughts on that?

Back to your aforementioend enzyme strategies - anyway to denature or inhibit the production of those enzymes?

Inquiring minds want to know. Thanks for your help maestro!

Mike Biltonen, Know Your Roots
Zone 5b in New York
Reply Quote
Michael Phillips
Re: Cedar Apple Rust 2018
January 16, 2018 01:06AM
Moderator
Registered: 11 years ago
Posts: 621

Competitive colonization with microbes for me is all about diversity. Effective microorganism offer one profile; compost tea many others. Protecting a niche from an organism perspective is about either consuming an errant invader, using up nutrient resources the pathogen might need to get its own enzyme juices flowing, and/or producing antimicrobial compounds. It's true that product manufacturers want to isolate proprietary microbes (case in point can be seen with Blossom Protect for fire blight) and that's interesting . . . but **diversity, diversity, diversity** is like a creed with me.

MacIntosh genetics feature a gene much like the Vf gene originally found in *Malus floribunda* for so-called scab immunity. The rust pathogen penetrates a single leaf cell . . . triggering that one cell to abort and die, thus cutting off nutrient flow to the pathogen. Chances are I heard of this from Dave Gadoury at Geneva a long, long time ago.

I agree on the cost of Regalia, which is why we should ascertain once and for all how its immune impact may somehow be special with respect to CAR. As an aside, I recently had a fantastic talk with the researcher for Marrone Bio Innovations (the makers of Regalia) who primarily works with fruit crops out of Michigan. He hasn't worked with cedar apple rust per se (given where he is) but did give me insight into assumed thinning reputation of Regalia. A previous formulation contained Hexanol, which apparently browned the edges of blossoms, and thus looked like thinning action was taking place. This is no longer in the new formulation.

And just for the record, I figured somehow maybe the "red zone" had to do with political parties and really serious pathogens.

NOW. How about *someone else* surprise us both and add to this juicy discussion and speak about their approach to Cedar Apple Rust?

Lost Nation Orchard
Zone 4b in New Hampshire
Reply Quote
Eliza Greenman
Re: Cedar Apple Rust 2018 (and a weird observation)
May 24, 2018 07:17PM
Registered: 9 years ago
Posts: 23

This year I've observed bad CAR on golden russet and goldrush (no surprise with this one). I'm going to throw my crazy thoughts out there to see what people think...

Disclaimer: These thoughts are along the lines of tree abuse, but maybe implementing with love will make it a bit better. Like resetting a bone of a loved one.

In July of 2016, on the hottest day of the year, I burned many of the leaves off of a juvenile Harrison tree on M111 using 501 prep. I was experiencing upwards of 8 feet in new growth and the 501 prep easily burned off the leaves from that year's new growth. I figured this might be a better route than summer pruning in terms of reducing vigor, and in a very unscientific way, I think it did. The last 24 hours worth of stem growth (heavy soil and rain and heat for me has revealed daily growth) was damaged, but the rest of the stem looked to only be defoliated. I didn't see any fireblight infection as a result of my actions. However, an interesting addition to this was the re-leaf.

The harrison had a decent scab infection and after burning off many of the leaves and getting rid of them (I used a leaf blower to get them off and then mowed), the re-leaf was clean. And continued to be quite clean for the rest of the season. Provoking me to think about the idea of a reboot after a vicious spring infection period here in the mid atlantic. For varieties showing lots of vigor who can more than likely handle a set back, why not try to

get the infected leaves removed and destroyed on my watch and then start over earlier in the season? I should add that these trees are not at the bearing age just yet. Though I have begun the search to find studies on the effects of early defoliation on fruit maturation.

This is what I may try this year on a few CAR stricken goldrush and golden russet. My thought is that the infection period is over and they are going to defoliate anyways, so why not get this party started on my watch and have it re-leaf sooner. Any thoughts/warnings/impassioned protestations are welcome! I'm not sure what I'll use as a defoliant just yet, as I'd like to burn the leaves and leave the stems rather unscathed if that's even possible. Any speculations there are welcome. From there, I'm heading down mid season new leaf competitive colonization route.

ALSO: Golden Russet has a CAR reaction of a little raised bump in the middle of the orange spot. I have found this to be a unique reaction to CAR, but I could be wrong. However, I recently witnessed ants going directly to this raised bump in the middle of the CAR spot. They would go from one to another to another. Guy King Ames suggested these bumps were exuding a sugar and that's why the ants were seeking them out. Unlike Michael's sentence above on Macintosh's ability to section off an infection by cutting off nutrients to the individual site, perhaps this is the opposite. A geiser of nutrients. But I thought I'd throw it out there to see if anyone had any experience/thoughts on this seemingly weird interaction.

-Eliza (7a Mid-Atlantic)

Edited 6 time(s). Last edit at 05/24/2018 08:26PM by Eliza Greenman.
Reply Quote

Karn Piana
Re: Cedar Apple Rust 2018
June 12, 2018 09:02PM
Registered: 5 years ago
Posts: 77

Has anyone considered the use of UV sterilization lamps as a part of a regimen of suppression? The 1100' altitude limit of Cedar Apple Rust seems note worthy. Perhaps UV lamps beneath trees and in the rows in some form of rotation after sporulation events might be an interesting means of supplementing EM sprays. Are stoma more open at night? Might a night bath of intense UV followed by a fog of wholistic healing be worthy of experimentation? The lamps can be pretty low wattage and could run off of a PV system or small generator. Hospitals are using UV to attempt to kill MRSA bacteria, perhaps this approach has potential in agriculture.

Also Eliza's observation of ants at the site of fruition is interesting. Stamets is working on cordyceps insecticides targeting ants and termites that have shown success and promise. I don't know where one would go from the idea of symbiosis between insects and Gymnosporangium Juniperivirginianae, but the fact that there may be evidence of such a relationship is interesting.

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 1 time(s). Last edit at 06/12/2018 09:09PM by Karn Piana.
Reply Quote

Joanne Patton
Re: Cedar Apple Rust 2018
June 16, 2018 10:00PM
Registered: 7 years ago
Posts: 62

Greetings from a rain deluged northern Virginia. A few of our orchard trees have severe CAR infection - Pixie Crunch, Calville Blanc d'Hiver and Red Yorking to name a few. My bad for even planting such susceptible varieties!!

Because of the continuous, and I do mean continuous rainfall we had in April and May, I had next to no chance to spray anything. The orchard didn't get sprayed but 25-30 fruit trees did with everything but neem and fish. The pears still look PERFECT and even the apples look surprisingly good including Gold Rush, Honeycrisp and Grimes Golden.

Only real thing I have to contribute is the use of SilMatrix. Applied to young tender leaves, it hardens the leaf surface and would be another layer of protection, along with all those beneficial microbes you can spray at the same time.

Next year I'll be sure to spray the orchard, and include SilMatrix. My eagle eyes will be focused on these susceptible varieties.

Joanne Patton, Squire Oaks Farm
Zone 6A, Northern Virginia
Reply Quote

Ethan Gouge
Re: Cedar Apple Rust 2018
August 02, 2018 10:09PM
Registered: 9 years ago
Posts: 36

I am dealing with a 'red zone' CAR infection basically orchard wide. I'm at 3200 ft in North Eastern Tennessee with cedar trees growing in an adjacent poorly grazed pasture. I think the the 1100' should be 1100 meters (3500 ft) per the forestry service website. I'm following, hoping glean some control knowledge!

Roan Highlands Farm 6b, Roan Mountain, TN elevation: 3200 ft.

Edited 3 time(s). Last edit at 08/03/2018 03:14AM by Ethan Gouge.
Reply Quote

Karn Piana
Registered: 5 years ago
Posts: 77

Pathogenic exploitation of SAR
August 04, 2018 08:42AM

I want to establish, out of humility and full disclosure, that I am a beginner and lack the experience of others here on this forum. I establish this out of respect for that experience and because it is necessary to communicate with clarity and confidence and I want there to be no confusion with regard to my claiming unearned expertise. The point of this forum, at least as I see it, is to have open dialog and cross pollination in hopes of collectively bringing about greater understandings within these endeavors.

I read about Ethan Gouge's dilemma at Roan Highlands Farm and had previously poked around, obviously, in this nook of the forum and have been thinking about Mike Biltonen's description of this pathogen as particularly vexing to holistic methodology. In the interim I've been reading and thinking quite a bit about plant immunity and attempting to comprehend how these processes work because there is a substantial amount of research that seems to indicate that we are capable of interacting with the plant immune system to help it fight against pathogens.

As I've been reading about these functions, we've had a few outbreaks of insect pests in our gardens which are not as susceptible to predation, and have required manual removal into soap emulsion water. These were formerly a type of blister beetle (Meloidae) eating eggplant, and a huge (and now extinct) population of Harlequin bugs (Murgantia histrionica) attacking Daikon. Both of these creatures are impalpable to our healthy population of predators and I have been thinking that perhaps this is due to these insects being able to exploit the plant immune systems by converting repellent phytochemical exudates induced by insect predation into concentrated compounds which deter predation and allow for explosive population growths.

The veracity of that particular supposition is irrelevant however, as the important ideas to me are a hypothesis that the most persistent and destructive pathogens afflicting plants are those which have managed to subvert or alter the ISR and SAR (Induced Systemic Resistance & Systemic Acquired Resistance) mechanisms to their own reproductive advantage. Cedar apple rust would be one excellent example, Erwinia amylovora another.

This is obviously being written in full speculation mode.

With CAR, I am speculating that the fungal organism is able to suppress SAR due to the requirement that the fungi be able to colonize intact leaves in order to produce fruiting bodies on the their underside for sporulation. SAR coincides with Hypersensitive Response (HR) a phase of programmed cell death which would certainly cause leaf abscission and thus prevent sporulation and cause the organism to die out.

The plant immune system is not a cohesive cellular network like that in an animal system, but could perhaps be thought of as a quasi autonomous cellular mosaic, each with it's own immune system detecting attacks through protein receptors protruding from the walls of the cell. When a pathogen attacks and triggers SAR, a concentrated barrier of peroxides form around the afflicted cells and trigger HR while a system wide flush of Salicylic acid (drug comprising aspirin & hormone in willow water) is produced which in turn activates a chain reaction that results in a heightened state of immunity capable of resisting further attack and other stressors. When Hypersensitive Response occurs, it is similar to tales told of Amazonian construction workers hacking off a snake bitten limb with a chainsaw to prevent the venom from entering into their blood stream (W. Herzog, the making of Fitzcarraldo). HR triggers a quarantining programmed cell death. Each of the the cells percepting the pathogen self destruct which cause leaves to detach and limbs to die back, effectively wiping the contagion from the organism and setting a clean slate for a heightened immune state to resist further stress.

Above, in an earlier post, Micheal refers to the Macintosh as being able to induce HR, but it seems that other CAR susceptible varieties are incapable of this defense mechanism (?).

Interestingly enough, it is possible to activate SAR via a foliar application of super diluted Salicylic Acid (1 / 10,000 ratio = 3 aspirin dissolved in 4 gallons of water) and I wonder if this exogenous induction method could override the possible immune suppressive aspects of CAR and open the door to further treatment.

Phases of an Experimental Method:

Phase 1:
Exogenous induction of SAR through a dilute Salicylic Acid foliar spray in order to elicit HR. If this is successful, one should see afflicted leaves turn brown, shrivel up, and die.

Phase 2:
Milk:

There is a growing understanding that the composition of milk (raw, whole, & even skim) creates a greater resistance against fungal attacks. The main research has been focused on powdery mildew infesting cucurbits and there seems to be a consensus that the milk is extremely effective against leaf attacking fungi.

Here is the oft referenced 1999 research paper.

Here is a simple & well organized summary of the efficacy of milk as a fungicide from Washington State University.

This is an insightful article about the benefits of milk and blackstrap molasses as a soil drench. There are a number of useful and interesting details worth incorporating into one's understanding therein.

There are anecdotal accounts (There are other online references to this beyond this link, and I am linking here to the comments, not the initial question) of milk being used to prevent the spread of CAR and black spot (Diplocarpon rosae) on roses. Evidently, it works best as a preventative buttress against initial infection (as do most holistic medicinal regimens) and this quality would be utilized as a post Hypersensitive Response shield in the form of a foliar spray regimen. HR destroys all fungal infiltration and the milk, in theory, aids in the resistance against further spore infiltration of stoma.

There are tons of anecdotal ratios given online ranging from full strength sprays, 60/40, 50/50, however, this useful link to a posting on a cannabis forum has the best practical information I found regarding formulations and other details to consider.

Phase 3:
ISR stimulation

A sub mulch application of fresh fungal dominate compost followed by a rootzone flood of black strap molasses (30-50 grams of black strap per liter of water per square meter of ground beyond the canopy drip line) combined with a foamed egg. This stage is pretty much simultaneous with the initiation of phase 2 (phase 2 should be ongoing during period of sporulation) and the idea is to supercharge the rhizome biology in order to facilitate optimum ISR (primary immunity) overlap (with SAR) potential.

Phase 4:

Continuation of holistic regimen.

Thoughts?

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 3 time(s). Last edit at 08/04/2018 08:55AM by Karn Piana.
Reply Quote

Mike Biltonen
Re: Pathogenic exploitation of SAR
August 04, 2018 03:46PM
Registered: 10 years ago
Posts: 298

I'd like to say that I am intrigued and fascinated by the depth of your comments and interest - especially since you are a so-called beginner. I'd love to get a little more background on you, your farm, background, etc. just to get a feel for where you are coming from. Again, because the depths of your comments are extraordinary. Unfortunately, for me, I am so busy right now that to properly respond to almost anything you've written is impossible. However, I do read almost everything you post - and I thank you for that.

Now, as far as triggering a strong SAR/ISR response in plants of any kind requires a very robust and healthy ecosystem (above and below ground). To me, and what's becoming more intriguing, is the complexity of the networks involved in these response systems (e.g., specific fungi for specific responses). And my feeling is that to get the proper response you actually need a little of the "bad stuff" (e.g., scab, CAR, fireblight) to trigger to appropriate phytochemical pathways that can ward off further infection and spread, as well as make the plant innately stronger to future attacks. Now, this doesn't mean we can let CAR or FB run rampant by any means. It means we need to be (as growers) assistants to the natural plant processes - but also good stewards of the land. In other words, "think more, do less" and pay attention to the damn fireblight. I always tell people that a little scab is OK, a lot not so much, in response to the "stressed trees are better trees" crowd.

The intricate pathways we're just starting to understand have everything to do with the above ground biodiversity plants and insects, as well as the underground plant and mycorrhizal systems that everything in the ecosystem is dependent upon - but our understanding is so basic, in terms of which ones work best together especially in managed landscapes and - as importantly - how we can truly manage those 3D biodiversity matrices, that just farming from the perspective that more biodiversity is better (than say a monoculture) is the best starting point for creating those networks (or allowing them to create themselves) for greater SAR/ISR pathways in our crop plants.

Anyway, there is always more to be done and studied - including a better understanding of the minutae of how SAR/ISR works; though that understanding is less important than a basic approach that native biodiversity is the key. I have more thoughts and work that I have been doing, but it'll have to wait for winter (it might already be winter in NH, don't know). Keep the good stuff coming - any other folks want to chime in here.

Mike Biltonen, Know Your Roots
Zone 5b in New York
Reply Quote

Karn Piana
edited post (remove)
August 09, 2018 08:14AM
Registered: 5 years ago
Posts: 77

delete

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 4 time(s). Last edit at 09/04/2018 07:43AM by Karn Piana.
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Karn Piana
edited post (remove)
September 02, 2018 09:53AM
Registered: 5 years ago
Posts: 77
delete

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 1 time(s). Last edit at 09/04/2018 07:46AM by Karn Piana.
Reply Quote
Glenn Aldridge
Re: Cedar Apple Rust 2018
February 01, 2019 03:13AM
Registered: 6 years ago
Posts: 8
I'm in zone 7 on Long Island and caretake a small community orchard which is on Nassau County land. There are about 30 or so apple trees (standards for the most part),most of which the County planted in 1992. These include Roxbury Russet, Newtown Pippen, Summer Rambo, Northern Spy, Sheepsnose and 1 beautiful Gravenstein, I've planted Hauer Pippen, Goldrush, Cox's Orange, Liberty, and Enterprise (a couple of each). Some of these new ones are on M111. The little guys have just started bearing. (some of them). I also grow berries on this land, and a few peach trees...

I have CAR every year. The cedar trees are on the property and I cannot cut them down. I try to prune the CAR galls out of them each year, but I know I am not getting them all. My report is that Roxbury Russet can definitely handle CAR. Hauer Pippen looks great. Liberty and Enterprise look good, but just started to bear (hopefully) now after 5 full years. The others are so-so. I think the Goldrush and Cox's Orange were mistakes and will have to be replaced. Hard to do....

We pretty much only get apples every other year. I've decided that's OK, because we can get really psyched for the on year. The apples also make some awesome cider, of which I'm down to my last two bottles.....There are some nice crabapples on the property which help.

I think I want to plant Smokehouse, which Tom Burford notes is CAR resistant. Anyone have any experience with Smokehouse?

I did use GreenCure (potassium bicarbonate) one year, and it worked pretty well, but was expensive! I also struggled with decisions on spraying Surround with GreenCure. They didn't look real compatible to me.

I'm going to try do a righteous job on pruning soon, and hope for the best with CAR. I'll try to continue keeping the orchard healthy and wholesome. I wanted to let everyone know how much I appreciate their posts and I want to let Michael know that I am rereading and enjoying his books very much this winter.
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