# Holistic Approach to Fireblight

Posted by adam sanborn
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adam sanborn
**Holistic Approach to Fireblight**
February 25, 2016 11:52PM
Registered: 7 years ago
Posts: 9

I am in the early stages of a small orchard in a fairly heavy fireblight state, so I'm told. I'm especially worried as during the trees' early years and vigor. We have tried to pick fairly resistant apples(mostly cider) on semi-standard-standard rootstock) to reduce our risk. I'm trying to maintain a purely holistic approach to the orchard and received some advice from Mike on blossom protect as well as other potential compounds, which I really appreciate, but was wondering if anyone had any approach that they have used . I will be following the 4 holistic sprays of spring as well as addition of EM that I have multiplying from a mother culture in this time period.

Are the EM enough to populate and crowd out the bacteria or can I optimize with other sprays as well?

Thanks,
adam

No fences orchard and cidery
Spokane WA 5b

Edited 1 time(s). Last edit at 02/26/2016 12:59AM by Michael Phillips.
Reply Quote

Michael Phillips
**Re: Holistic Approach to Fireblight**
February 26, 2016 01:18AM
**Moderator**
Registered: 11 years ago
Posts: 621

The holistic spray plan in the primary infection window (for scab and the like) straddles the bloom period with a pink application and petal fall application. If conditions warrant, and they often do, I make a **Competitive Colonization Boost** one or two times.

This holistic spray mix leaves out the heavy-hitting fats of neem and fish in favor of more microbes and flavonoid stimulation of plant immune function. Here's the recipe for community orchardists per 100 gallons of spray, enough to cover an acre:
1 quart karanja oil (0.25%)
4 gallons effective microbes
1 pint blackstrap molasses
12 oz. *seaweed extract*

More on this can be found in past newsletters, plus Tim Bates and others can chime in from CCB experience other than mine.

Are some microbes specific antagonists of invasive bacteria? The product manufacturers will tell you their strain is the one. Blossom Protect consists of two strains of *Aureobasidium pullulans* yeast; effective microbes has a few assorted yeasts going as well. Some bacteria manufacture antibiotic compounds to protect their niche, which could well include lactobacilli that keep pickles from turning. Throw in some compost tea and there's now untold diversity on the scene.

I also will point out another suggestion from *Holistic Orchard* which I think escaped notice. Hops resins. Recently I was writing about essential oils and humulene came up again for antibiotic purpose, reminding me of those Washington growers trying this approach.

Somehow between competitive colonization and perking the systemic immune response . . . trees do not need to be victimized by *Erwinia* bacteria. What's exciting is just how many good options there are. And timely of you, Adam, to bring this up!

Lost Nation Orchard
Zone 4b in New Hampshire
Reply Quote

Mike Biltonen
**Re: Holistic Approach to Fireblight**
February 26, 2016 01:55AM
Registered: 10 years ago
Posts: 298

MP: Whats the basis of karanja for fighting fireblight - is it just more ISR/SAR? What info can you provide re: "those Washington growers trying this approach" for essential oils. I've read about thyme oil being used and having a good degree of success against fireblight. I'd love to learn more!

As far as relying too much on a holistic approach -- beware a bad year, especially in an area with a history of fireblight. In addition to the blossom

infections, fireblight bacteria can remain latent (without symptom) in the tree for a period of time, then hit you when you least expect it. I have seen even in holistically managed orchards where fireblight has gotten the best of a grower even though the script was followed. There is not a doubt it is the right path to go down, and there is no doubt that all of the above can help in creating a healthy orchard ecosystem and an environment where fireblight has an uphill (hopefully futile) battle, but understanding all of the tools in the toolbox and knowing when to use them is important. Fireblight is nothing to be trifled with.

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

Michael Phillips
**Re: Holistic Approach to Fireblight**
February 26, 2016 04:17AM

**Moderator**
Registered: 11 years ago
Posts: 621

Here's what's so very cool about fire blight . . . even chemical growers do not have a real solution. Yes, you can spray chemical antibiotics until such time as the offending organism seems to develop resistance. Hear Charboussou on this point--the medicine weakens the plant thus eventually putting the disease on top. The real remedy lies in healthy trees having all the right players involved. In that sense, we should appreciate "the symptom" for forcing us to better understand healthy plant metabolism and where real solutions will be found.

Karanja oil. I'm simply going to repeat what's been shared before. This tree seed oil is rich in flavonoids. White blossoms produce flavonoids by definition. Higher levels of flavonoids prove ever more antimicrobial. Yes, this is "just more ISR" and not near the best defense in the case of bacterial opportunists. Then again, Nature works by means of package deals. This nutritional oil has a carrier aspect for the flood of microbes being introduced to the open blossom.

Hops resins. I guess I'll be the one to open the book. What I learned five years ago is what I know today as I still haven't been invited out to the Pacific Northwest to meet with fruit growers. Here's where I left the trail in hopes others nearer at hand might follow-up:

> Quote
>
> "Plan C takes an entirely different tack on the microorganism front. A nutrient-based Tree Wash consisting of hops extract and a vegetable oil (along with kelp, molasses, and yucca extract) is applied as buds become active in spring and then every 10–14 days thereafter through the bloom period. Resin acids found in hops are known to be antibacterial. Commercial growers in the lower Yakima River Valley in Washington were the first to discover the synergy of these plant-based ingredients in keeping both fire blight and bacterial canker from occurring on apple and cherry respectively. Advocates explain that “the bacteria are deprived of their food source” which to my mind is just another way of saying that the arboreal food web—given deep nutritional support—does indeed outcompete bacterial pathogens."

The reference note with this passage refers to a patent application I had found and subsequent studies undertaken by Washington State University. Untreated control blocks of apple and cherry were subject to the usual incidence of fire blight and bacterial canker respectively. Those "resin acids" are terpene-derived essential oils, ie., humulene and more. Why haven't we heard of this since? Must be there's no money to be made selling homegrown herbs.

I'm not trying to be glib here, but frankly? I think the bacteria (and the fungi and the drosophila and everything else) enjoy these little debates of ours.

Lost Nation Orchard
Zone 4b in New Hampshire

Edited 1 time(s). Last edit at 02/26/2016 12:52PM by Michael Phillips.
Reply Quote

adam sanborn
**Re: Holistic Approach to Fireblight**
February 27, 2016 05:39AM

Registered: 7 years ago
Posts: 9

Thanks so much for all the information guys, so much to think about but I'm loving learning!
adam
Reply Quote

Paul Weir
**Re: Holistic Approach to Fireblight**
February 27, 2016 10:48PM

Registered: 11 years ago
Posts: 187

For those looking to trial some hops and to benefit from the Humulene therein, beware that not all varieties are high in this essential oil constituent. Ask your source about it when procuring your hops and it is my understanding that it is more common with the old world European 'noble" varieties of hops.

Along with humulene, myrcene and caryophyllene % content may be of important significance in this plant medicine too. I had looked into humulene previously and recall learning it is a highly volatile compound with both a short shelf life and quick to oxidize. So, using really fresh product may be a key. That should not deter you from trying it, but just something to be aware of.

Besides, it may indeed provide be a heavy blow to FB, but your timing may need to be especially tuned.

Lastly, stay tuned to the work being done at Washington State on Fireblight as they are paying as much attention to organic approaches, these days, as to conventional methods. Their Cougar Model 2010 modeling program for FB will help you use your orchard's real data to properly time your supplemental FB focused holistic sprays, when needed most.

Gopher Hill Apples
Zone 8 in California
Reply Quote
Tim Bates
**Re: Holistic Approach to Fireblight**
March 20, 2016 11:46PM
Registered: 11 years ago
Posts: 58

Piping in on CCB's I have only used it once last year, but only because it was a dry Spring. This year...wet Spring and I've been out twice on my pears and other early bloomers already. My concern is scab at this time with concern for pollinator and petal damages with more Neem. I ran out of money and now time to get some Karanja (next year), but used EM, Compost Tea, and my own cider syrup (lower pH) instead of molasses. Anyway off topic CCB's may be the real ticket to keep ahead of them scab spores on wet years. Anyhow, I did have fireblight last year for the first time in any meaningful amount, but way less than my neighbors. It does appear I lost one 8 year old pear. Am quite interested in the hops potential, we've been growing a "hops arbor" for years---very easy to grow here. Is cascade an old world and noble variety, I wonder? More research to do...and how to extract the Humelene...and the Couger Model...and on and on

The Apple Farm
Zone 8b in California
Reply Quote
Michael Phillips
**Re: Holistic Approach to Fireblight**
July 11, 2016 09:03PM
**Moderator**
Registered: 11 years ago
Posts: 621

An insightful bit crossed the radar today concerning lactic acid bacteria and fire blight:

"Lactic acid bacteria can be a source of biological control agents (BCA) of fire blight disease. Several species of LAB are inhabitants of plants and are currently used as biopreservatives of food because of their antagonistic properties against bacteria, and are considered as generally safe. Candidates to BCA were selected from a large collection of LAB strains obtained from plant environments. Strains were first chosen based on the consistency of the suppressive effect against E. amylovora infections in detached plant organs (flowers, fruits and leaves). Lactobacillus plantarum strains PC40, PM411, TC54 and TC92 were effective against E. amylovora in most of the experiments performed. Besides, strains PM411, TC54 and TC92 had strong antagonistic activity against E. amylovora and also other target bacteria, and presented genes involved in plantaricin biosynthesis (plnJ, plnK, plnL, plnR and plnEF). The strains efficiently colonized pear and apple flowers; they maintained stable populations for at least 1 week under high RH conditions, and survived at low RH conditions. They were effective in preventing fire blight on pear flowers, fruits and leaves, as well as in whole plants and in a semi-field blossom assay. The present study confirms the potential of certain strains of L. plantarum to be used as active ingredient of microbial biopesticides for fire blight control that could be eventually extended to other plant bacterial diseases."

From European J. of Plant Pathology (2013) Volume 137, Issue 3, pp 621-633: http://link.springer.com/article/10.1007/s10658-013-0275-7

This speaks volumes to the application of effective microbe through a Competitive Colonization Boost during bloom and other holistic applications following bloom. One of the chief organism groupings in EM being lactic acid bacteria, though TeraGanix does not specify strains as far as I can see. This information couples nicely with the yeast component which is noted for producing antimicrobial compounds to protect its niche. Interestingly, I didn't think we had much for fire blight conditions here this year yet now we see brown twigs throughout an ornamental hawthorn in the medicinal herb garden . . . one of the very few fruit trees here that did not get holistic sprays.

Lost Nation Orchard
Zone 4b in New Hampshire
Reply Quote
Karn Piana
**Re: Holistic Approach to Fireblight**
June 12, 2018 07:58AM
Registered: 5 years ago
Posts: 77

I was curious if more information would be available two years after the above reference on the use of hops as a counter measure to overpower Erwinia Amylovora. Perhaps a little more digging beyond the cursory searches I've done might reveal something more useful or informative, but here is an outline of what I found:

hops resin (humulus lupulus) pesticide patent application US8293258 summary: utilized as a method for controlling spider mites on plants, control of downy and powdery mildew, and control of late blight by incorporating ratios of hop alpha and hop beta acids in an aqueous emulsion.

Pseudoperonospora humuli (powdery mildew) is a major pathogen of hops.

Here is another patent application (US6423317) using hops to kill protozoa with the same alpha and beta resin acids.

USDA ARS article on agricultural applications of hops.
Summary:
•There is reference to the drinking of beer as a means of avoiding water born disease due to in part to the anti microbial and anti fungal properties of hops.
•People are experimenting with using low alpha varieties of hops (more palatable) as a chicken feed that also functions as an alternative to antibiotics.
•The beta acids are the primary anti microbial drivers according to this article, but the aforementioned patent applications describe higher ratios of alpha acids in some formulations.

Most references to a fermented tea of hops as a foliar spray yielded references to either extension experiments with compost teas to combat powdery mildew on hops crops or to a new cultivar of hops low on alpha acids called "Tea Maker" that might have uses outside of a not-so-bitter medicinal tea

as a biocide in sugar or as a natural co-evolved antibiotic livestock feed.
Researchers are studying the uses of hops beta acids as a miticide to combat varroa destructor mites decimating the worlds bees. (Paul Stamets is doing interesting research with various fungi in conjunction with WSU on colony collapse)

You can actually buy hops resin extracts. Some of the patents refer to very specific ratios of alpha and beta acids in their emulsions and perhaps someone might wish to conduct their own experiments.
Reply Quote
Christian Annese
**Re: Holistic Approach to Fireblight**
July 05, 2018 09:22PM
Registered: 7 years ago
Posts: 12
Old thread but I am interested in the application of hop resin/oils to combat Fire Blight.

I have a small hop yard that yields more than I can possibly use and I'd like to start doing some trials.

Anyone interested?

I'll start a new thread where findings can be shared.
Reply Quote
Karn Piana
**Re: Holistic Approach to Fireblight**
July 10, 2018 09:01PM
Registered: 5 years ago
Posts: 77
I would be stoked to read about your hops experiments Christian.

•Craft brewing magazine: "Hop alpha acid levels are highest at the point of harvest and diminish gradually and continuously during storage because of oxidation. This is especially true of baled whole hops. Refrigerating or even freezing hops after they have been harvested and kiln dried helps to delay oxidation and preserve their alpha acids longer."

•Alpha acids are most commonly extracted using liquid CO2.

•Boiling hops converts alpha acids into iso alpha acids which I think may be still possess the same anti pathogenic properties. This needs to be looked into. The longer the boil, the more potent?

•There should be a dialog regarding the efficacy of teas and also of fermentations (horticultural beer) in an attempt to understand more.

•From the patent application above: "An 'emulsion' is different from a 'solution' and enables hop acids and other hop extract components to be applied to plants as a component of a water-based spray, rather than using a non-aqueous solvent. Emulsions are essentially colloidal suspensions of small globules of one liquid in a second liquid, with no mixture in the sense of one substance dissolving into another."

"As discussed above, hop acids are not highly soluble in water. However, stable aqueous solutions of certain hop acids can be prepared by the selection of appropriate concentration and pH. Further, it is possible to convert these solutions into stable aqueous emulsions (i.e., colloidal suspensions in water) that will not separate over time, with the added advantage that the emulsions can be diluted with water, as required, by the end user for spraying onto plants for pest control."

"Although the emulsions are stable, they are also susceptible to film or residue creation when diluted with hard water. Films are problematical with spray applicators in the field because they clog spray nozzles. Regardless of the effectiveness of the treatment formulation as an active agent in controlling plant pests, if the solution cannot be applied effectively because of nozzle clogging, then it is essentially useless. The film or residue problem can be eliminated by adding liquid soap to the treatment solution at a low concentration of approximately 0.5%."

*Is there anyone on this forum who might be able to elaborate or opine on how best and most simply to produce an alpha / beta acid hops emulsion?

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 1 time(s). Last edit at 07/11/2018 09:24AM by Karn Piana.
Reply Quote
Zea Sonnabend
**Re: Holistic Approach to Fireblight**
July 11, 2018 08:54AM
Registered: 10 years ago
Posts: 58
I am more interested in Michael's older reference to lactic acid for bio control. However the article cited costs $39.95! Not in my budget. We are having a very bad FB year out west this year. Any glimmer of bio control is worth looking into.

Fruitilicious Farm
Zone 9b in California
Reply Quote
Karn Piana
**Re: Holistic Approach to Fireblight**
July 11, 2018 09:06AM
Registered: 5 years ago
Posts: 77
Zea,

Here is a link to the full publication sans monetization: Biological Control of Fire Blight of Apple and Pear with Antagonistic Lactobacillus Plantarum.

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 1 time(s). Last edit at 07/11/2018 09:11AM by Karn Piana.
Reply Quote
Karn Piana
**Re: Holistic Approach to Fireblight**
July 12, 2018 04:27AM
Registered: 5 years ago
Posts: 77

The Hops Patent outlines several methods for obtaining a hops acids emulsion. If anyone on this forum with an aptitude for chemistry is able to ascertain the best (most simple, least expense, least time / effort) method of obtaining a hops acid emulsion, it might open a door to another means of maintaining holistic equilibrium. I copied and pasted two stages in the production of hops emulsion spray from the patent below. HPLC stands for High-Performance Liquid Chromatography which is some kind of specialized system of analysis in chemistry. Is it possible to side step the need for specialized equipment and develop a simple scalable orchard formula?

Example of Solution Production:

"Supercritical CO2 extract was used to prepare a 10% aqueous alpha-acids solution. The hop extract was placed in a volume of water calculated to produce an aqueous alpha acids solution, with a concentration of 3-20% by HPLC. An alpha acid concentration of less than 8% was optimum. At this concentration, beta acid solubility in the aqueous phase was lowered. The temperature was raised to 50-70° C., and the pH was adjusted to 6-8, with constant mixing. A pH of 7-8 was optimum. The extract solution was then allowed to sit for at least 45 minutes. The resinous fraction containing beta-acids, oils, and waxes was set aside, while the aqueous alpha-acids solution was decanted. The temperature was raised to 60° C. and the pH was raised to 7-9. The solution was analyzed by HPLC. If the alpha-acids concentration was 10% or greater, water was added to bring the concentration to 10%. The solution was cooled to 1-19° C., and filtered or decanted."

10% aqueous solution brought into emulsion:

"10% aqueous beta acids solutions and 10% aqueous alpha acids solutions are clear with no precipitated material. They are similar to weak iced tea in color, clarity, and consistency. Dilutions of these 10% solutions with tap or well water result in the formation of stable aqueous emulsions which have the appearance of pineapple juice and do not exhibit any separation even after days of storage. They are very stable, and precipitate does not form even down to a dilution of 1:16. Also, as these solutions are diluted with water, pH drops by about 0.5 pH units but not enough to cause precipitation."

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 3 time(s). Last edit at 07/12/2018 04:30AM by Karn Piana.
Reply Quote
Zea Sonnabend
**Re: Holistic Approach to Fireblight**
July 21, 2018 07:41AM
Registered: 10 years ago
Posts: 58

Thanks for that link.

Fruitilicious Farm
Zone 9b in California
Reply Quote
Karn Piana
**Biofilm matrix / Necrotrophic Incipience**
August 30, 2018 09:34AM
Registered: 5 years ago
Posts: 77

You're welcome Zea. Good luck to you.

Here is an article which I've only taken a cursory glance at which describes necrotrophic behavior of Erwinia amylovora that allow it to overwinter inside of dead leaf matter devoid of living cells.

Generally, it is thought that the bacteria resides in cankers on still living trees, but the finding of large quantities of Erwinia amylovora in leaf litter leads one to consider an additional cyclic process of infection through a sporulation from dead matter, the infection of the host and it's subsequent immunologic subversion to programmed cell death, followed by more dead material for the bacteria to overwinter in.

I thought that was interesting.

It would seem that either the leaf material should be removed or that the forest floor must be a critical target for competitive colonization and that a powerful IMO presence and/or a spray regimen might reduce virulence and boost overall immunity.

Also, more useful perhaps, would be the idea of looking more closely at the biofilms these cankering bacteria produce. Erwinia amylovora produces an exopolysaccharide (a polymer / i.e. bonded together ) with the main constituent being amylovoran (hence the name of the bacteria I assume). This material is involved in a biofilm formation that bonds the bacteria to one another within a protective buffer against environmental stressors in addition to a suggested suppressive effect on the plant immune system. I wonder also if Pseudomonas siringae gummosis might have any biofilm affiliation.

The question then would be to ask if an enzyme or biofilm disruptor might be a useful precursor to break apart the pathogen defense and expose it to attack from beneficial microbes.

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Edited 1 time(s). Last edit at 09/01/2018 08:03AM by Karn Piana.