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Freeze Protection

Posted by [Brittany Kordick](#)

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[Brittany Kordick](#)

[Freeze Protection](#)

March 09, 2022 05:34PM

Registered: 4 years ago

Posts: 211

When I departed the farm a week and a half ago for a transcontinental outing, our apple trees were just exhibiting signs of silvertip following a few days of 60 plus F degree daytime temps. While I was away, we had a couple of high 70's days, and I returned home to few trees still at silvertip stage, most approaching or at greentip, and one variety sitting at half inch green bordering on tight cluster. And guess what the forecast for the weekend is? A hard freeze of 19 degrees.

Given that we have a month and a half to go before we're safely out of traditional hard freeze danger, the worst may be inevitable, orchard-wide. However, my immediate concern is attempting to convey some protection to the 36 odd trees that will be at tight cluster when this more immediate freeze hits, just three days hence, since we could see 90% kill or worse on those blossoms at the currently forecasted low temp, which is guaranteed to hold for hours, given the plummeting temps during the day, no merely brief dip. Conventional wisdom would hold to just let the chips fall where they may, and we haven't bothered to intervene much in such cases in the past. But we lost our entire crop to hard freezes last year, and I guess facing down such a notion this early in the season just pisses me off.

I know some people tout spraying nitrogen, kelp, sugars, or any number of things for the bit of frost and freeze protection they may impart, but when you're talking 19 degrees, most of these modest protectors go out the window anyway, even if we were so inclined. One thing I am considering, however, is filling our airblast tank with plain water and going out to spray when the temperature hits 31 degrees, probably late evening, in the hope of icing the bloom clusters. I don't have huge hopes of success and the odds of hitting on just the right amount of ice formation in conjunction with vaporization, particularly given that I'll be using micronized spray from an airblast, is unlikely; I'm mostly just curious, and don't think the risk of doing damage is greater than the damage that would be sustained via the freezing temps without water. Anybody ever try this?

It's going to be an interesting night, and of course, much depends on particulars surrounding the freeze. Winds are forecast to to be 10-15 mph, and we'll be coming off a rainy prior night and morning.

[Kordick Family Farm](#)

Westfield, NC

Zone 7a

Edited 1 time(s). Last edit at 03/09/2022 05:43PM by Brittany Kordick.

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[James Smith](#)

[Re: Freeze Protection](#)

March 09, 2022 05:46PM

Registered: 2 years ago

Posts: 57

My orchard came with a wind machine. No time for you to obtain one of those, and they are a big expense. I did see some portable ones though, I'll try to find them again if you are interested.

As for using water for freeze protection it is my understanding (which could very well be wrong) that it isn't the ice that protects the plant, it is the freezing of the water. Therefore, the water has to be applied constantly to protect, and turned off only after the ice melts off. You may want to do some research.

Citrus growers in Southern California, where I was hatched and raised, and apple growers here in the Okanogan, used smudge pots for frost protection, which has since been made illegal. But one night I was driving through Prosser, WA and farmers had 55 gallon drums placed about with wood burning in them. The smoke was thick, but it was providing protection.

Washington Okanogan Valley

Zone 6b

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[Brittany Kordick](#)

Registered: 4 years ago

Posts: 211

[Re: Freeze Protection](#)

March 09, 2022 06:11PM

How neat to have someone in our group with an actual wind machine! Will be very curious to hear how that works for you in coming years. Of course, the degree to which even dedicated infrastructure like that might assist in events of frost and freeze vary, given all the variables involved, but still, it's nice to enjoy the confidence of having a big gun on your hip sometimes. We don't anticipate investing in anything like this, even on a smaller scale, but thanks for offering to track down the info, and if it's convenient, it may be of interest to others who find their way to this thread.

You know, if it wasn't for the forecasted wind conditions, I might even be tempted to try the burn barrel route for smoke protection, given that we are talking about a small block laid out in three rows. I'm thinking of water only because it's so very little skin off my back (no money spent on an input, just time and gas), but the wind may render this option moot, as well; I'll have to wait and see, and yes, more research needs to be done before committing. The chemistry and biological principles involved are definitely not my strong suits, but I do understand that any hope of success would be a commitment of hours of spraying to keep continuously adding water. Of course, the risks of sprayer damage and damage to branches and limbs from weight of ice must be considered, as well, hence we typically just throw up our hands rather than attempt to hit any elusive bull's eyes in frost and freeze events. Your time is often better spent curling up with a movie than trying to do anything, but it's almost a form of therapy to try something, even if it is half-baked, just to feel like you did something.

One impetus to try something is that we are obviously going to have to deal with more and more inopportune spring frost and freeze events, and it would be nice to have experimented to some degree this year and this early in this year's season to have some firsthand knowledge going into subsequent events.

[Kordick Family Farm](#)

Westfield, NC

Zone 7a

Edited 2 time(s). Last edit at 03/09/2022 06:51PM by Brittany Kordick.

[Reply Quote](#)

[James Smith](#)

[Re: Freeze Protection](#)

March 09, 2022 07:23PM

Registered: 2 years ago

Posts: 57

Actually, wind machines are part and parcel here, just about every orchard has at least one. Some put sprinklers on tall risers to shoot water over the trees. Nelson makes a nice low volume sprinkler, I'll post a link later.

I don't believe you need to worry about your sprayer as long as it is running.

Got to run, neighbour on his way to help out on a chore.

[Reply Quote](#)

[Mike Biltonen](#)

[Re: Freeze Protection](#)

March 09, 2022 07:26PM

Registered: 10 years ago

Posts: 298

The ultimate answer will be: it depends. I have used wind machines extensively over the years and they work, but only under specific conditions. You need to have an inversion and the temperatures can't get too low before it just blows around cold air. In my experience, they are ineffective below 28F. Water (ice) is effective, but as James said you need to keep pouring it on while it is freezing/thawing to get thermal energy release and the until it melts to avoid breakage (or much anyway). Other options are actual undertree sprinklers using ground temp or even warmed water - this allows for some thermal barrier rising up from the ground into the canopy. No water is applied to the tree. Even a small shift in canopy temperature can help reduce or even avoid frost damage. Again, there is a temperature threshold - it probably doesn't work below 28F. Fires have worked, but you need a lot and you need clouds or smoke to keep the warmth in the "orchard zone." Biodynamically, the use of the warming preps and specifically valerian probably have some positive effect as well. Lastly, supercharging the cells with sugars and minerals a few days to a week before can act like an anti-freeze, reducing the freezing point of the cell cytoplasm a few degrees. However, none of these steps will work if it gets too cold - like below 28F - depending on the tree phenology; though there is some buffer between 25-28F. If it gets below 25F, or there is no inversion, or no wind, it always better to climb back into bed and read a book.

[Mike Biltonen, Know Your Roots](#)

Zone 5b in New York

Edited 1 time(s). Last edit at 03/09/2022 07:39PM by Mike Biltonen.

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[Brittany Kordick](#)

[Re: Freeze Protection](#)

March 11, 2022 03:58PM

Registered: 4 years ago

Posts: 211

Sigh. OK, I've been convinced to hold fast (I think I was hoping for an intervention of sorts and my mother was always going to employ her iron fist anyway). The forecast low has plummeted another 2 degrees to 17 degrees F anyway, with high winds. A sudden forecast of

snow has also been added to the mix, which sure would be nice for stuff like my onions and peas, but don't expect much insulatory accumulation on the trees, what with the winds. But in the interest of having some more information on the forum about cold damage in general, here's another consideration that has come up:

Ideally, we'd be long done with our pruning, but of course, being that we refrain from pruning for so long to ensure that our trees are fully dormant, with prevention of likelihood of cold damage actually in mind more than anything, we generally feel the need to push the envelope in the spring and plow ahead with certain varieties, even if they have reached greentip, or even tight cluster in certain varieties. We've never experienced any issues, though we're never happy about this, and always nervous about cold injury during temperature swings.

But it feels a little different this go-round: the sap is definitely flowing; cuts are quite wet to the cut. Being that ambient daytime temps have been averaging 50 to 70 degrees consistently for the past couple of weeks, with lows varying from upper 30s to as high as 60 a couple of nights, this little dip we're expecting constitutes quite a sudden plunge. I know 0 degrees F is kind of a benchmark for cold injury to freshly pruned trees, but there's always the caveat of a sudden 30-50 degree plunge causing damage, as well. We've already made the call to refrain from pruning for the 48 hours pre-hard freeze, but for trees pruned up to that point, being that there really hasn't been any sealing yet and the sap is flowing, we're nervous about seeing some potential cold injury to even our mature trees.

How could anyone think farming is boring?

[Kordick Family Farm](#)

Westfield, NC

Zone 7a

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[Brittany Kordick](#)

[Re: Freeze Protection](#)

March 26, 2022 05:49PM

Registered: 4 years ago

Posts: 211

One more interesting, tangentially related entry to add under the broad heading of freeze protection:

Apparently, Bud 9 rootstock boasts inherent freeze protection by producing significantly higher amounts of sugars compared to other rootstocks. I tuned in to a NAFEX rootstock discussion the other evening and someone in the comment thread mentioned that new research from Winchester, VA had found a correlation between Bud 9 and withstanding freeze events. Coincidentally, the next morning I headed to a southwest VA apple growers meeting and heard a discussion from the researcher himself, Dr. Sherif Sherif. Pretty cool stuff: After some major freeze events in their research plots at the Winchester station, it was noticed that apples on Bud 9 had visibly minor damage compared to those on other rootstocks. They sampled some root sprouts and found that the Bud 9 had produced much higher sugar concentrations than other rootstocks. I've asked Dr. Sherif for a copy of his research results so I can post them here, and will edit that in when I get them (oops, he said the research is ongoing and nothing's been published yet, so please don't share).

We're M111 gals all the way, so this would be the polar opposite of where we want to go with our orchard, but I'm really spooked about the apparent increasing frequency of untimely freeze events and how we can possibly deal with them (and I'm amazed at how spooked the conventional folks are, too, after most in our area lost every bit of their cherries, peaches, and apples for the first time in their careers last year). Putting in a few blocks of Bud 9 may well be sound insurance for the future.

As far as our most recent untimely freeze two weeks ago, we sustained significant damage, though it's too soon to quantify that, with some interesting variations. It was by no means a total wipe-out even in the trees farthest along (but judging from stigma damage within buds, it was up there), but on varieties around greentip, as they've continued to develop flower buds, they're behaving very strangely. On some, the outer buds surrounding the king blossom are severely stunted, but the king blossom is doing great and looking healthy (that'd sure be nice from a thinning standpoint if we don't get any more freezes, yeah, right) -- complete opposite of what I'd expect. The only explanation we can think of is that the outer buds provided some kind of insulatory effect to the king blossom. And now we've got three consecutive freeze events starting tonight: lows of 30, 29, and 28 degrees. Fun, fun, fun.

Life in the big city . . .

[Kordick Family Farm](#)

Westfield, NC

Zone 7a

Edited 2 time(s). Last edit at 03/26/2022 08:21PM by Brittany Kordick.

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[Brittany Kordick](#)

[Re: Freeze Protection](#)

November 10, 2023 04:50PM

Registered: 4 years ago

Posts: 211

I attended a Southeast wine and grape conference yesterday and was intrigued to see a new cold protection system represented at the tradeshow. Back in my vegetable growing days, a cheap and easy way for us to keep temps up in low tunnels was to either run a strand of Christmas lights down it or even larger light bulbs via an extension cord. The similar appearance of this Froflight system caught my eye initially, but unsurprisingly, the technology is way, way more sophisticated than a mere strand of lights. The company is currently targeting

vineyards, and apparently, the systems are currently being used in Europe, but they're interested in working with high density apple growers, as well. Application in an orchard of MM111 or otherwise larger freestanding trees isn't very practical, but I know there are a lot of grape growers and dwarf apple growers on this forum, so just thought I'd pass this info along.

Basically, Froflight is a permanent installation that a grower would ideally set up when initially putting out the trellis or not too long after (but you can certainly retrofit). Infrared light tubes (they look like floor tube lighting) are simply affixed in a line down the trellis. The power source is a generator or distribution cabin. The system remains in place permanently, but it only powers up when needed for a cold event, as determined by sensors in the light tubes that are managed to your settings. My brochure says the lights tubes come in lengths of 82, 164, 246, 328, 410, or 492 feet; they're rolled up on rolls that you just pull out. From their website: "These IR tubes emit infrared light, which is directed onto the plant's buds. This targeted infrared radiation gently warms the plant, effectively mitigating the risks associated with frost damage. Unlike conventional methods, Froflight's infrared light approach minimizes heat loss due to environmental factors such as wind or rain, ensuring that the warmth generated is concentrated on the vines."

I can't find anything in their literature about how many degrees protection the system provides, but the rep I talked to gave an impressive number that I've since forgotten -- it may have been double digits; I remember my mouth falling open. I like that the pricing is transparently on their website (none of this call for pricing crap that lets you know you can't afford something). I have to say, the pricing seems pretty reasonable, especially when compared with other cold protection installations on the market. I would definitely be crunching numbers if this was practical to maneuver into large trees. Aesthetically, also, the system is appealing. Your orchard/vineyard would look like it was strung with strands of Christmas lights when the system was activated -- maybe folks who do nighttime events or work in their vineyards/orchards could further help justify the cost of installation..

Anyway, fyi.

PS: I just found a more informative packet I got from the Froflight people: they claim protection down to -6 degrees C, which is 21.2 degrees F. I swear the rep said even lower, so there may be some nuance to that figure, depending on installations. This actually is a pretty new product -- first prototype was developed in 2019 and the company formed in 2021. There's a really good graphic in my info booklet that is not on the Froflight website. It shows a blueprint layout of the system: at the end of a cluster of vine rows outfitted with IR tubing, there is a master slave box. These master slaves then all connect to an electrical distribution cabin, which in turn connects to a power source (you can connect to the electric grid or hook it up to a generator you own or rent temporarily). Apparently, you need not leave the system in place permanently; in fact, Froflight recommends taking it up and storing it for all the months you won't need it to lessen risk of theft, vandalism, damage during vineyard work, and just to increase the lifespan overall. They recommend installing it during or after pruning. Of course, you can find videos regarding the system and installation on YouTube.

[Kordick Family Farm](#)

Westfield, NC

Zone 7a

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