



combining the use of potassium bicarbonate and micro sulfur

Posted by [Nathaniel Bouman](#)

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[Nathaniel Bouman](#)

[combining the use of potassium bicarbonate and micro sulfur](#)

April 13, 2020 11:59PM

Registered: 9 years ago

Posts: 81

I think I'm going to need allopathic treatments for powdery mildew and scab this year. I came across this research pub on the "integrated" use of potassium bicarbonate and wettable sulfur. [organic ontrol of scab and powdery mildew using potassium bicarbonate and wettable sulfur](#)

However, I couldn't figure out how to "integrate" the treatments. The researchers specifically say they didn't tank mix them. I can't figure out how they spaced the treatments. Anyone with experience using both in the same season for both scab and mildew? Or, any common sense answers here?

Also, what about tank mixing any of the other holistic ingredients (other than neem) with potassium bicarbonate?

Nat Bouman

Growing cider varieties in Zone 5b

On B.118 at 18X24

Susquehanna County, Pennsylvania

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[Brian Caldwell](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

January 26, 2021 07:36PM

Registered: 10 years ago

Posts: 69

Hi Nat,

I've used separate sprays of sulfur and potassium bicarbonate in a scab program for a couple years, leaving at least 5 days between sprays. I start with the bicarb, then switch to sulfur at pink for a few sprays when pressure is highest, then switch back to bicarb. I'm not ready to say it will always work, but in one block I've had near zero scab for those two years. In the other, scab was bad in 2019 but absent in 2020. I may have missed a sulfur spray there in 2019 during an infection period, but maybe the approach just failed that year. It's interesting that the other block was almost 100% scab-free in both years. In our area, scab was much worse in 2019 than in 2020. I have not noticed any serious phytotoxicity problems with these sprays, except on one tree when the sprayer was running out and I must have had some poorly mixed stuff in the bottom of the tank.

[Hemlock Grove Farm](#)

Zone 5 in New York

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[Peter Drevniok](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

January 29, 2021 10:50PM

Registered: 10 years ago

Posts: 31

Here are my notes on potassium bicarb and sulphur. These notes have been translated from French so there may be grammatical or even "something lost in the translation". Please note I have not used potassium bicarb and sulphur in my orchard so cannot vouch for any of this information. However, I may start using potassium bicarb in 2021...and I cannot replicate the RIMpro chart: All to say FOR INFORMATION ONLY:

"100%" bicarbonate can be used alone, but this approach is riskier than mixing equal parts of bicarbonate + sulfur. The mixture of bicarbonate and sulfur (Kumulus, Microthiol, wettable powder) is very often more effective than bicarbonate alone and allows more leeway when treating. Bicarbonate "alone" is rarely recommended in Europe. Mixing with sulfur is not listed on the label, but is permitted by regulatory authorities. No other mixing is recommended due to the high pH of the bicarbonate. Sirocco (85% bicarbonate, AEF) (formulated bicarbonate) is effective alone, without mixing. Adjuvants incorporated into the formulation are sufficient.

Dose?

"100%" bicarbonate is registered at 4 kg / ha. IRDA tests have shown that lower dose treatments can lead to an increase in the number of scab spots. Lower rate treatments will be effective on very small trees, but the registered rate is really at the lower limit of effectiveness for large trees and leaves no room for maneuver. We strongly recommend not to adjust this dose downwards on semi-dwarf or standard trees. No test was performed by varying the sulfur dose. The standard recommendation is therefore 4 kg / ha of bicarbonate + 4 kg of sulfur.

Sirocco is registered at 5.6kg / ha, or about 4.8 kg of bicarbonate. Again, this dose doesn't leave much room for downward adjustments. However, the label states that applications as low as 2.4 kg / ha are possible when disease pressure is low *.

Volume of porridge?

IRDA and European tests have shown that spray volume is not a determining factor for the effectiveness of bicarbonate. Bicarbonate is used successfully with "conventional" sprayers with 200 L / ha, 500 L / ha, 1000 L / ha. If the conditions of application are met and the coverage is good, there is no reason to increase the volume of spray.

Conditions of application?

When 100% bicarbonate is used ALONE (sulfur free), treatments on wet foliage are theoretically more effective than on dry foliage. The reason is physical: Since bicarbonate alone is inefficient, each concentrated droplet of product has a very small radius of action on the sheet. The film of water on wet leaves allows droplets from the sprayer to dissolve and reach a larger area. It is very difficult to achieve the same distribution on dry foliage with a sprayer, unless you "paint" the foliage, which requires 1000 to 3000 L / ha depending on the size of the trees. Airblast sprayers are not designed for this. The distribution effect is greatest when the leaves are thoroughly wet. As the leaves dry, the distribution of B2K decreases and the efficiency decreases. In IRDA testing, the B2K and sulfur mixture did not appear to be affected by drying. It is possible that the effectiveness of the sulfur compensates for the deficiencies of the baking soda on the dry foliage. Treatments in the rain are effective but risky: On the one hand, treatments must absolutely be carried out after the spores have arrived on the leaf. The rain leaches the baking soda very quickly, so the treatment will have no effect on the spores that arrive on the leaves after the treatment. In addition, the contact time between the baking soda and the germinated spores is very short during rain and the baking soda does not always have time to kill the spores before it is washed away. Finally, the bicarbonate is not very effective on spores that have not started to germinate. This problem is not encountered with "germination" treatments performed with sulfur or Captan because these "anti-germination" products kill spores very quickly. Bicarbonate alone is not an effective anti-germinator. The label mentions stopping treatments when the intensity of the rain exceeds 3 mm / h. To our knowledge, this recommendation is not supported by data. Rainfall with an intensity greater than 1 mm per hour (10,000 L / ha per hour) probably results in leaching too fast to allow good contact time between the bicarbonate and the spores.

Bottom Line: Baking Soda alone should be applied after spraying to still wet foliage, but preferably after rain. Applications of the bicarbonate + sulfur mixture should be made under the same conditions, but will be much less affected by drying of the foliage or conversely by more intense rain

According to the label, the Sirocco formulation should be applied after it rains.

Period of effectiveness:

Bicarbonate applied alone or formulated is effective in killing spores that have already germinated up to around 250 DH (eg 25h at 10 ° C) after the onset of infection. The germinating spores correspond to the white cloud of RIMpro. The infection starts in RIMpro when the red line appears. The limit of DH 250 for treatments with bicarbonate is not precisely stated in RIMpro, but comes around the time when the rising red line crosses the diminishing white cloud. It is not necessary to manually calculate this period. RIMpro's graph is visual and the best time for baking is relatively easy to spot once you understand the principle.

Visually, the bicarbonate should therefore be applied between the peak of the white cloud and when the white cloud crosses the red line (see illustration). The baking soda + sulfur mixture or Sirocco should be applied in the same window for maximum effectiveness but will still be partially effective up to DH 300-400 after the onset of infection. The accumulation of DH 300 after infection corresponds to the peak of the orange cloud of RIMpro. When the orange area begins to go down, it is a sign that the spores are gradually escaping the effect of the bicarbonate and that another product is needed. See the sheet on post-infection treatments.

The calculations shown on the "100%" bicarbonate label take the onset of rain as a reference. This calculation method is different from RIMpro and the matching of the numbers is not always easy to do. It is better to follow a pattern than the label recommendations.

Renewal of treatments

The 100% bicarbonate used ONLY has no "stickiness", it quickly disappears as soon as it rains again. It is therefore important to target the treatments well to kill as many spores as possible during application. Contrary to the recommendations of the label which suggests to renew the treatment each time 140 DH is accumulated during a rain (every 10 hours at 14 ° C), we suggest that you avoid multiplying the passages in the orchard and follow the ejection of spores predicted by RIMpro. Since nighttime ejections are marginal, baking soda is usually not applied more than once per day.

In the illustration, two infections are shown. The first (weak) infection was suppressed by protective treatment (big blue arrow), but this treatment was washed away before the second infection. For the second infection, the optimal 100% bicarbonate treatment window (boxed purple rectangle) takes place between 9 p.m. and 3 a.m. the next day (approx.), I.e. after ejections (yellow) and before reaching 250 DH of infection. Baking Sulfur Mix (or formulated baking soda) can be applied anytime during the purple season, until around noon. In this example, the foliage remained wet throughout the period (blue area above the dates)

Peter Drevniok

wakefield, qc

zone 4

[Reply Quote](#)

[Michael Phillips](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

January 31, 2021 05:01PM

Moderator

Registered: 11 years ago

Posts: 621

As it happens, Brian's isp connection to the forum is cutting out when he attempts to post . . . so here's his response:

Thanks Peter, for your detailed comments! I will study them.

For now, I should point out that when I spray potassium bicarbonate I also add Silmatrix (potassium silicate) and a bit of Golden oil, plus 1 fl oz per 100 gal of Therm X-70 as a sticker. I think the silicate maybe also helps to keep the bicarbonate in place. That seems to be the key point--bicarbonate is effective, but tends to wash off quickly.

I have been spraying before infection events, not after them.

Thanks!

Brian Caldwell

[Lost Nation Orchard](#)

Zone 4b in New Hampshire

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[Nathaniel Bouman](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

February 06, 2021 05:44PM

Registered: 9 years ago

Posts: 81

This is great info. Thank you. In 2020 I used only potassium bicarbonate and stilet oil in 1/2 the orchard and alternated sulfur and bicarbonate/oil in the other 1/2. The alternating thing was hard because I was trying to space at least 2 weeks between an oil spray and sulfur. In the end, I observed very little scab in either 1/2 and better control in the 1/2 that only got bicarbonate and oil. The whole orchard received many holistic treatments, but no neem that season. I didn't set up good controls however--so differences could be chalked up to varietal resistance. Nearby, wild apple trees were about as heavily infected with scab as they usually are, which is fairly intense.

Peter, I'm surprised that the info you provided implies tank mixing sulfur and bicarbonate is more effective. I thought one of sulfur's main mode of action was the reduction of pH on the leaf surface and therefore the bicarbonate and sulfur would kind of cancel each other out.

Nat Bouman

Growing cider varieties in Zone 5b

On B.118 at 18X24

Susquehanna County, Pennsylvania

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[Peter Drevniok](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

February 16, 2021 11:24PM

Registered: 10 years ago

Posts: 31

Here are some more notes about potassium bicarbonate from an article I found by an agronomist in Quebec which explains things nicely I think. Again I can't reproduce the RimPro diagram:

With the Pest Management Regulatory Agency (PMRA) recently withdrawing the registration of some fungicides (Polyram) and changing the use of a few others (captan), apple growers will have to change their habits. Potassium bicarbonate could be an interesting solution. In addition to being very effective against scab, it is minimally toxic to health and the environment, and it is also inexpensive. However, to ensure its full effectiveness, it is necessary to rethink the control strategy used against scab and adapt its methods. Here are some tips on this.

First of all, you should know that, unlike the usual fungicides, there is no need to apply it as a protection before the rain. Instead, wait until the infection is confirmed and apply it during the scab spore germination period when they are present on apple leaves. The RIMpro model, available free online, is particularly useful in determining the right time for treatment. In fact, the model indicates the onset of infection with a red line (item 2 in the figure). You can see at the bottom of the graph the time when the infection starts. This is when the bicarbonate treatment can begin. The length of the optimal period for treatment varies depending on the temperature: the hotter it is, the faster it is necessary to act. This is why there is talk of a period of 250 degree-hours to intervene (i.e. 250 divided by the temperature in degrees Celsius). For example, if it's 10 °C, we have 25 hours to apply the baking soda, but if it is 20 °C, we only have 12 hours 30 minutes. In the RIMpro model graph, the intervention period ends when the red line of infection crosses that of the white cloud (items 3 and 4 in the figure). After this period, the treatment gradually loses its effectiveness until it reaches the top of the orange cloud, which is 400 degree-hours after the onset of infection.

Thus, treatment can be started on varieties most susceptible to scab or in sections of orchards where the disease was more severe the previous year. The bicarbonate treatment can be applied even if it is raining, as long as it is not too intense (maximum of 3 mm per hour). It is even recommended to apply it to wet foliage since this results in a better distribution of the product on the leaves. When the rainfall intensifies, treatment can be stopped and resumed when the intensity of the precipitation decreases.

Caption:

White cloud: germinating spores

Red line: progression of infection

Point where the red line of infection crosses that of the white cloud: approximately 250 degree-hours

Optimal time to intervene with potassium bicarbonate: May 4 from 8:45 p.m. to May 5 around 2:30 a.m.

If you do not have access to the RIMpro model, you can rely on the time of the onset of rain. Scab infection is generally considered to occur when the foliage remains wet for 140 degree-hours (or 14 hours at 10 °C). You can then begin the baking soda treatment from this point on and continue until approximately 300 degree-hours after the onset of rain.

If you are concerned that you will not be able to apply the product to the entire orchard within the optimum 250 degree-hour period, you can limit its use to certain plots, while you gradually become familiar with the product and to master its use. In addition, when the risks of infection are very high, that is to say that a maximum of scab spores are mature, it is preferable to opt for a “belt and suspenders” type strategy, which consists of to use a fungicide for protection before the rain (sulfur or other conventional fungicide) and to intervene by means of bicarbonate during the period of spore germination (period of 250 degree-hours). However, apart from sulfur, which increases the effectiveness of bicarbonate, it should not be mixed with other treatments as this may reduce its effectiveness.

Potassium bicarbonate is used successfully by many apple growers in organic management and integrated fruit production, especially those participating in the showcase orchard project. Some apple growers have replaced up to eight conventional fungicide treatments with potassium bicarbonate in lower risk plots, without negative impacts on the percentage of crop damage.

Baking soda is sold by the Naturpac cooperative in Deux-Montagnes and it is best to order the product in advance to make sure you have enough. The 25 kg bag costs \$ 98.70; an application rate is 4kg per hectare, so one treatment costs just under \$ 15.80 per hectare, which is much cheaper than other common scab treatments. To increase efficiency, it is recommended to combine baking soda with a proportion of 4 kg of sulfur per hectare. Even with the sulfur-bicarbonate combination, the cost of treatment is still very reasonable at less than \$ 25 per hectare. You can also use Sirocco, which is a commercial preparation made from bicarbonate and sulfur and costs about \$ 70 to treat one hectare.

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[Sebastian Luczak](#)

[Re: combining the use of potassium bicarbonate and micro sulfur](#)

March 28, 2021 08:35PM

Registered: 2 years ago

Posts: 3

KHCO₃ is more expensive but safer for plants , 3kg per 400 liters water , plus sulfur like microthiol . You can add some sticky agent to KHCO₃ like liquid amino acids . Cacopsylla pyrisuga can be lowered by KHCO₃ and some orange peel oil. K₂CO₃ is similar but more aggressive , can damage some apples . Usually night spray only when leafs and apples are dry .Lower dosage preventively after rain. Higher can burn black scab but can cause apple russetting .

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