

Application considerations for Vaporized Oxalic Acid (OA) in your Hives

By Bob Johnson

Necessary legalese: The following are my opinions and thoughts and should be considered as such. In no way should they be considered to be strictly prescriptive to the point of endangering people or property. I accept no liability for errors, typos, omissions or other considerations in the following. Oxalic Acid is a powerful and dangerous chemical and it is up to you to consider what will be the safe and effective application in your specific situation and environment. Use at your own risk.

With the recent approval of Oxalic Acid for use as a Varroicide in beehives I suspect that a number of people might be considering the application and use in their hives.... If you are one of them who is considering using the vaporization method, I would offer the following notes from my (brief) experience:

Oxalic Acid Vaporization – Questions and Answers: The following excellent summary is taken directly from an excellent post provided by “SNL” on Beesource (<http://www.beesource.com/forums/showthread.php?307844-Oxalic-Acid-Vaporization-Questions-and-Answers>).

What is Oxalic Acid?

Specifically: Oxalic acid is an [organic compound](#) with the [formula](#) $H_2C_2O_4$. It is a colorless crystalline solid that forms a colorless solution in water. In terms of acid strength, it is much stronger than [acetic acid](#). Typically, oxalic acid occurs as a [dihydrate](#) (containing 2 molecules of water) with the formula $H_2C_2O_4 \cdot 2H_2O$.

Where is Oxalic Acid found?

OA is found in peanuts, pecans, wheat bran, spinach, rhubarb, beets, beet greens and chocolate. Some others include soy foods, sweet potatoes, black tea, berries and other dark leafy greens, like Swiss chard and collards. It is what gives food that “bitter” taste.

What happens to Oxalic Acid when heated (vaporized)?

When OA reaches 215 degrees (f) the water boils off leaving anhydrous (water free) OA crystals. At 315 degrees the OA crystals start to sublime (go from a solid to a gas). At 372 degrees, OA which has not sublimed decomposes to form formic acid and carbon monoxide. Although for the last, I'm trying to find out if this will only occur under “lab conditions.”

How does Oxalic Acid kill mites?

The jury is still out. It is thought that OA vapors enter and destroy the cuticles thus rendering them footless. It is also thought that it destroys parts of the mite's mouth. However it works, it decimates mites.

Is Oxalic Acid Safe for my bees and will it contaminate my comb?

When used as directed, OAV does not harm the queen, bees or the brood! And it does not contaminate the comb as poisons do. There are naturally occurring levels of oxalic acid in a hive. While OAV elevates that level, the hive returns to pre-treated levels shortly after treatment.

How much Oxalic Acid is used in the OAV process?

The recommended dosage is one gram per brood chamber. Most have two brood chambers, so use two grams (which is very close to ½ a teaspoonful. You could use a ½ teaspoon measure

in lieu of two one gram (¼ teaspoons).

How is Oxalic Acid Heated for use in beehives?

Mostly, a 12 volt, 15 amp vaporizer is used. The OA is placed in the vaporizer's pan which is then inserted into the beehive and connected to the battery. When the current is connected to the vaporizer, it heats the pan thus vaporizing the OA.

How long does it take to vaporize OA?

Some vaporizers take 2.5 minutes to vaporize OA, others less. The current is disconnected after the time limit and the vaporizer remains in the hive another minute to finish vaporizing. One should "test fire" their vaporizer prior to using as batteries in various states of age may take longer. Also, if one were to vaporize several hives (using a vaporizer not connected to continuous charger (such as in a running vehicle)), vaporization will start to take longer and longer as the battery degrades.

Do I have to seal the hive when vaporizing?

Yes, although a "perfect" seal is not necessary. During the vaporization period, the hive is sealed and once the vaporizer is removed, the hive resealed for an additional 10 minutes.

Is Oxalic Acid safe for the beekeeper?

Yes, if the beekeeper takes adequate safety precautions. Keep a smoker lit in the beeyard and stand up-wind. Do not BREATHE the vapors! The EPA is stating that an acid gas vaporizer is sufficient. In Europe a mask with an N95 particulate rating is the standard. OA vapors very quickly re-crystallize to cover all the surfaces in the hive making the breathing of the vapors unlikely. However, there is always the chance, error on the side of safety!

Sourcing: I have worked with two different vaporizers. Both are equally effective:

- The Heilyser Technology JB200 Electric Vaporizer which is imported from Canada and requires you to fabricate a wire connection to your battery. Runs around \$105
<http://www.bedillionhoneyfarm.com/store/beekeeping-equipment>
- The VarroCleaner which is imported from Serbia and comes ready to use out of the box. This runs around \$125. <http://oxavap.com/product/varrocleaner-oxalic-acid-vaporizer/>
- If you are interested in trying to make your own Vaporizer, there is a good thread on beesource on the subject <http://www.beesource.com/forums/showthread.php?288482-Homemade-oxalic-acid-vaporizer/page2&highlight=oxalic>
- Power – I use the deep cycle battery from my boat. My son has tried using the smaller ATV batteries and they don't have enough oomph to be effective. I recommend you use a car battery. Also be aware that the length of the wire connecting the battery to the vaporizer will have a definite effect. You want enough wire to be safely away while the vaporization is taking place but other than that keeping it just long enough will help speed the vaporization.
- Oxalic acid for purchase can be found either through the web <http://www.amazon.com/Oxalic-Acid-99-bag-C2H2O4/dp/B007HUR0EK> (recommended) or through your local Hardware store (Savogran Wood Bleach) for a significantly higher price
<http://www.walmart.com/ip/38753776?wmlspartner=wlp&adid=2222222227026732630&wl0=&wl1=g&wl2=c&wl3=52587566231&wl4=&wl5=pla&wl6=84468417791&veh=sem> Please

note that at 2 grams per treatment per hive you will get roughly 227 hive treatments per pound so a little goes a long way here....;-)

- Safety Equipment – Vaporized Oxalic Acid is a significant irritant when inhaled or when blown in your eyes. Since it is a fine dust you need to make sure that any eye protection completely seals around the eyes like those used in a lab. <http://www.homedepot.com/p/3M-Chemical-Splash-Impact-Goggle-91252-80025/100021545> Breathing masks should be an N95 or equivalent.

FDA Stuff

- I recommend you read the final FDA approval letter. Lots of good information on their thoughts supporting their decision to approve Oxalic Acid.
<http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2015-0043-0119>
- I also recommend that you **print out a copy of the proposed Oxalic Acid label and read it carefully. As with any potentially dangerous chemicals or treatments, the label is the Law!** Warnings, application considerations are what will be considered the law for usage going forward. <http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2015-0043-0018>

Application Process. This is the process I follow:

- Carefully consider the wind when planning to vaporize your hives. I like the wind steady enough to be consistent in direction and strength to rapidly dissipate any vapors that leave the hive in a safe direction.
- Gather your equipment.
 - Vaporizer
 - Small container of cool/cold water
 - Oxalic acid
 - Fully Charged Battery
 - Electrical Connections (as necessary)
 - Safety Equipment
 - Hand towel
- Remove honey supers from most upwind hive
- Remove any robbing screens or entrance reducers
- Gear up with Safety Equipment
- Measure out Oxalic Acid and put in Vaporizer
- Push vaporizer into hive entrance so the Oxalic acid is roughly in the center of the bottom board
- Place hand towel loosely over the entrance
- Power up vaporizer and immediately move upwind.
- Wait at least 3 minutes for OA to vaporize
- From the upwind side carefully approach the hive, disconnect the power and remove the vaporizer and towel.
- Dip vaporizer in water to cool and clean off residue
- Replace supers and robbing screens/entrance reducers

- Repeat process on the next hive

Repeat treatments – OA is not effective for mites in capped cells. The recommended treatment regime is to treat at least 3 times on 5 day intervals. I treat 4 successive times on a weekly schedule and it has worked well so far.

Well, that's pretty much it.... Please feel free contact me directly if you have any questions at bob.johnson@schneider-electric.com;-)