How to Apply Oxalic Acid Via Sublimation to Control Varroa

Varroa mites are parasites of honey bees. They harm colonies by weakening the bees they feed on and by spreading virus diseases. Beekeepers use several methods to control varroa, including the natural chemical oxalic acid (OA).

Hives are treated with OA by Trickling, Spraying, and Sublimation (also called Vaporization). Trickling and spraying apply OA in solution. In sublimation, OA crystals are heated with an applicator tool. The heat causes the crystals to sublimate (turn directly from solid to gas). LASI research compared these methods at several OA doses. Sublimation was best: effective at killing varroa at lower doses, not harmful to the bees, and not needing the hive to be opened.

To apply OA via sublimation you need: 1) applicator tool (several types are sold); 2) battery (12 volt lead-acid battery as used in cars and caravans); 3) oxalic acid (technically “oxalic acid dihydrate”); 4) mask; 5) measure (half a teaspoon of OA weighs c. 2.25g); 6) foam to temporarily seal hive entrances.

Place half teaspoon (2.0-2.5g) of OA into the holder at the end of the applicator. Insert applicator into hive entrance and seal entrance with foam. If the applicator is cold it will take several minutes to heat up, and then several minutes to vaporize the OA. If the applicator is on and hot the OA will start to sublimate within seconds. Make sure the applicator is in the hive before OA vapour is produced, so that vapour is confined to the hive. During and for up to 10-15 minutes after application, seal the hive entrance with foam.

Apply OA to broodless hives. If capped brood cells are present, many varroa will be in these and will not be killed by the OA. In the UK, December is the month with least brood. It is best to check hives immediately or a few days before application and remove or scrape out any small patches of capped brood. It is recommended to apply OA at outside temperatures of 4-16°C.

Based on our research [http://dx.doi.org/10.1080/00218839.2015.1106777] LASI recommends applying 2.0-2.5g OA to broodless hives in winter.

Official Regulations

In the UK, a registered OA product, Api-bioxal, was approved in 2015 by the Veterinary Medicines Directorate, who state “When handling the powder (both during vapourisation phase and pre-treatment phases) wear protective mask conforming to European Standard EN149 (type FFP2).” Api-bioxal is oxalic acid dihydrate (88.6% by weight), plus silica gel and glucose. The recommendation for sublimation is 2.3g Api-bioxal (= 2.04g OA) per hive. LASI research tested almost exactly this amount. In the USA, approval was given in 2015 by the Environmental Protection Agency who state “In addition to the standard beekeeping suit (veil, long-sleeved shirt, long pants and gloves) as personal protective equipment, a respirator and goggles are required.”

Key Results of LASI Research Comparing Oxalic Acid Application Methods

* 2.25g OA applied to broodless winter hives via sublimation killed 97% of the varroa.
* Colonies treated with OA in winter via sublimation had 20% more brood in spring than those treated via trickling or spraying, or untreated control colonies.
* Sublimation is effective at killing varroa at lower doses than trickling or spraying.
* Sublimation has no negative effect on colony winter survival or bee mortality.
* The exact amount of OA used is not critical. 1.125g and 4.5g were also effective.

Oxalic Acid Safety

* OA is a natural chemical, and is found in honey and most vegetables.
* Carrots are 0.5% OA. One pound contains enough OA, 2.25g, to treat one hive.
* OA is toxic. It is estimated that 45g, enough to treat 20 hives, would kill if eaten.
* OA is more harmful if breathed in, as it affects mucous membranes.

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