PETITION TO INCLUDE OXALIC ACID DIHYDRATE ON NATIONAL LIST OF APPROVED SUBSTANCES FOR ORGANIC TREATMENT OF VARROA MITES IN THE BEEHIVE

ITEM A.1 – Section of National List
Organic livestock production (section §205.603).

ITEM A.2 – OFPA Category
OAD would fall under the OFPA Category: Livestock parasiticides and medicines

ITEM A.3 – Inert Ingredients
Not Applicable since OAD is not an inert substance.

ITEM B.1 - Substance Name
Oxalic Acid Dihydrate (OAD)

ITEM B.2 - Petitioner
Michael Domeier, Rare Hawaiian Honey Company, 72-1137 Makalei Drive, Kailua Kona, HI 96743.
Manufacturer: Numerous: Univar USA, Allan Chemical Corporation, Seidler Chemical Corporation, Neuhem, GKM Resources, Cole Chemical, Veckridge Chemical, Barker Industries, Penta Manufacturing Company, etc.

ITEM B.3 - Intended or Current Use.
OAD would be used as a treatment to control varroa mite in beehives.

ITEM B.4 - Intended Activities and Application Rate.
The EPA has approved Oxalic acid to be labeled for application to beehives by three different methods:

1. By Solution to Package Bees (Oxalic acid in sugar solution is applied as a spray to the package)
2. By Solution to Beehives (Oxalic acid in sugar solution is trickled between frames and other spaces)
3. Vapor Treatment of Beehives (Oxalic acid dihydrate is heated and the vapor sublimates in the hive)

The solution method and the vaporized applications are made in the late fall to early spring, when little brood is present. Additionally, honey supers are not present when applications to the hive are made. Packaged bees (small artificial swarms of broodless bees used for repopulating hives/colonies) can be treated any time before shipping or after receiving the bees before introducing them to the entire population (i.e., when brood are not present). Treatment of package bees is intended to reduce the rate at which Varroa are spread around the country. Researchers at Penn State and individual beekeepers have reported directly to EPA staff that packaged bees shipped around the country contain high levels.of Varroa mites. An effective tool, such as oxalic acid, used to spray package bees before shipping or before "hiving" will limit the proliferation of Varroa in the U.S.

With the solution-method of application, oxalic acid dihydrate is dissolved into a 1:1 sugar:water solution~ which is directly applied to the space between frames of infested colonies. The bees can

tolerate the concentration of oxalic acid in the applied solution, but the Varroa mites cannot. With the vaporization method of application, oxalic acid dihydrate crystals are heated using a specialized application device until they liquefy and vaporize. Oxalic acid vapor fills the hive and all the bees and hive interior surfaces are covered with a very thin layer of oxalic acid dihydrate crystals during sublimation. While bees tolerate these fine crystals, they are toxic to the Varroa mites.

ITEM B.5 - Manufacturing Process.
From Wikipedia: "Oxalic acid is mainly manufactured by the oxidation of carbohydrates or glucose using nitric acid or air in the presence of vanadium pentoxide. A variety of precursors can be used including glycolic acid nd ethylene glycol. A newer method entails oxidative carbonylation of alcohols to give the diesters of oxalic acid:

$$4\ ROH + 4\ CO + O_2 \rightarrow 2\ (CO_2R)_2 + 2\ H_2O$$

These diesters are subsequently hydrolyzed to oxalic acid."

ITEM B.6 - Ancillary Substances.
N/A.

ITEM B.7 - Previous Reviews.
NOSB recommended that OAD be petitioned for use as a miticide in beehives when/if OAD was approved by the EPA for this purpose. The EPA has indeed approved OAD for use in beehives (Registration #91266-1). The National Standard of Canada has approved OAD for inclusion on its Organic Production Systems Permitted Substances List for use against varroa mites in beehives (Appendix 1 - Table 5.3)

ITEM B.8 - Regulatory Authority.
OAD is approved by the EPA as a miticide in beehives (Registration #91266-1).

ITEM B.9 – Product Label.
Label attached as Appendix 3.

ITEM B.10 - Physical and Chemical Properties.

(a) Oxalic Acid is a Brønsted acid, capable of donating a hydron (proton or hydrogen ion H+). In an aqueous solutions, OAD forms the hydronium ion H3O+.
(b) Oxalic acid dihydrate (the crystalline form) is a relatively strong organic acid that occurs naturally in the environment. It is commonly found in many plants, plant sap and vegetables. Oxalic acid is also found in honey and it is a natural byproduct of the metabolism of mold.
(c) OAD can burn unprotected skin; nitrile or latex gloves must be used when handling OAD

Although no data have been submitted directly to EPA to assess the likelihood of adverse effects on non-target organisms from the proposed use of oxalic acid to control Varroa mites on adult bees, the Agency believes that the likelihood of non-target exposure is low given that the compound is proposed for use in the honeybee colony; environmental exposure would occur primarily through accidental spillage or leakage during application. Following the entire label and preventing accidental spillage will minimize environmental exposures.

Oxalic acid is a naturally occurring compound that degrades rapidly in the environment. It readily dissolves in water because it has a high solubility. It occurs as the oxalate ion at environmentally relevant pHs where high mobility of the ion in soil is expected to occur (as with most anions).

While there are data to demonstrate that oxalic acid can be acutely toxic to adult bees, the proposed treatment rates have been established based on research demonstrating that oxalic acid will provide effective control of mites while minimizing adverse effects to adult bees. There is evidence to suggest oxalic acid is toxic to brood. However, based on the available information, the Agency does not have any evidence that the proposed use of oxalic acid will be detrimental to the colony especially given that the use of oxalic acid is intended to reduce mite loads that could otherwise be far more detrimental to individual bee and colony survival. Given the in-hive use of the product, and the absence of exposure to non-target organisms other than the honey bee, the Agency has determined that the proposed in-hive use of oxalic acid will have no effect (NE) on federally listed threatened or endangered species and will not modify their habitat.

Based on limited exposure, the chemical's natural occurrence and the likelihood for relatively rapid transformation under environmental conditions, the proposed use of oxalic acid is not expected to pose a significant risk to the environment.

Item B.11- Safety Information.
See Appendix 1: MSDS Sheet for OAD.

Item B.12 - Research Information.

Published, citable research relative to the use of oxalic acid to control varroa mites could not be directly found, however, the EPA and Canada's Pest Management Regulatory Agency conducted research in cooperation with two ODA manufacturers. The results of the research are eluded to in this quoted text from the EPA announcement that ODA has been approved for the control of varroa mites in beehives:

The use pattern for this compound is in beehives when honey supers are not present. Dietary exposure from the proposed use as an in-hive application will be indistinguishable from naturally occurring levels of oxalic acid. In fact, oxalic acid is a natural constituent of honey and is commonly found in the range of 1 mg/kg to 800 mg/kg. Moreover, EPA has established an exemption from the food tolerance requirement for oxalic acid under 40 CFR 180.910. Oxalic acid is ubiquitous in the environment and exposures from use in honeybee hives will be minimal, therefore the contribution to aggregate risk from this use will be insignificant relative to the total exposure from other sources.

Additionally, in 2005 EPA confirmed the safety of oxalic acid for its use in pesticide formulations, i.e., use as a calcium chelating hard water inhibitor in pesticides applied to growing crops and to raw agricultural commodities after harvest. Oxalic acid may be used in pesticide formulations up to 2 lbs per acre (40 CFR § 180.910). In assessing this use, EPA determined that there is a reasonable certainty that no harm to any population subgroup would result from aggregate exposure to oxalic acid. By contrast, the maximum application for oxalic acid in honeybee hives is 50 mL of 2.8% oxalic acid sugar solution which is far lower than 2 lbs of 98-1 00% oxalic acid per acre.

In evaluating the risk to applicators, EPA notes that oxalic acid is corrosive to the eyes and skin and has been placed in Toxicity Category I, indicating the highest degree of toxicity. It is also highly irritating and damaging to the respiratory system if inhaled. Thus, the product label carries the "Danger" signal word.

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.

Item B.13 – Petition Justification Statement
The introduced parasitic mite, Varroa destructor, remains the single greatest threat to organic honey producers. Left untreated, the vast majority of organic bee colonies would perish within a 1-year period. Presently, the only treatment approved for organic honey production is formic acid. The approved method of formic acid treatment fumigates the brood chamber, killing a large percentage of mites, but also killing an entire generation of brood while often killing the queen bee as well. Organic honey producers are in dire need of an alternative treatment that could be used either as a replacement treatment or used as an additional (not simultaneously) treatment.

One of the important factors in the approval of formic acid as a miticide was the fact that formic acid naturally occurs in honey. Similarly, OAD naturally occurs in honey. OAD is already approved for organic honey production in Canada, and the National Organic Standards Board recommended that OAD be petitioned for use in organic honey production in the US once the EPA approved it as a miticide in beehives. The EPA has approved it for this specific use.

B.14 – References.
Giacomini, D.G. 2010. Formal Recommendation by the National Organic Standards Board (NOSB) to the National Organic Program (NOP). Apiculture Recommendation. 9pp.

National Standard of Canada, Canadian General Standards Board, Organic production systems, Permitted substances lists. 2015. CAN/CGSB-32.311-2015. 82pp.

Table 4.3 — Crop production aids and materials

Substance name(s)	Origin and usage
Treated seed	Seed treated with biological management agents is permitted. Seed pelletized with clay, gypsum, biological organisms (such as *Rhizobium*) or other non-synthetic coatings is permitted. Plastic polymer pelletization of seed is prohibited. See Table 4.3 *Peracetic acid*; *Seed treatments*.
Tree seals	Plant or milk-based paints are permitted. Shall not be combined with fungicides or other synthetic chemicals. See Table 4.3 *Plant Protectants.* For planting stock: synthetic grafting materials are permitted, provided that plants are maintained in accordance with requirements of CAN/CGSB-32.310 for at least 12 months prior to harvest of organic products.
Vegetable oils	Plant oils shall not contain synthetic pesticides. For use as spreader-stickers, surfactants and carriers.
Vinegar (acetic acid)	Non-synthetic sources. See Table 4.3 *Acetic acid.*
Virus sprays	
Water	
Water, recycled	Recycled water shall only contain substances listed in Tables 4.2, 4.3, 7.3 and 7.4. Recycled wash water from all organic operations, including dairy operations, may be spread on crop lands. Requirements for land application, as specified in 5.5.2.5 of CAN/CGSB-32.310, shall be met. In all other uses, recycled water shall meet applicable irrigation water regulatory requirements.
Wetting agents	Non-synthetic wetting agents, including saponins and microbial wetting agents, are permitted. See Table 4.3 *Soaps.*

5 Permitted substances lists for livestock production

5.1 Classification

5.1.1 Livestock production substances are classified according to the following uses and applications:

a) Feed, feed additives and feed supplements;

b) Health care products and production aids — Health care products include medications, remedies, parasiticides and other substances used to maintain or restore the well-being of an animal. Production aids include all other substances used on animals and their living areas, such as bedding, teat seals and dips.

5.1.2 Substances listed in Tables 5.2 and 5.3 shall comply with prohibitions in 1.4 of CAN/CGSB-32.310. The following additional requirements apply to substances produced on substrates or growth media (for example, micro-organisms and lactic acid):

a) if the substance includes the substrate or growth media, the substrate or growth media ingredients shall be listed in Tables 5.2 or 5.3;

b) if the substance does not include the substrates or growth media, the substance shall be produced on non-genetically engineered substrate or growth media, if commercially available.

NOTE In Canada, livestock feed must meet the compositional and labelling standards of the *Feeds Regulations*, 1983. Ingredients used in livestock feed must be approved and listed in Schedule IV or V of the *Feeds Regulations*, 1983. Some ingredients and products require registration (such as enzymes and milk replacers).

Table 5.2 — Feed, feed additives and feed supplements

Substance name(s)	Origin and usage
Amino acids	Non-synthetic sources. Amino acids are considered non-synthetic if they are produced by plants, animals and micro-organisms and are extracted, or isolated, by hydrolysis or by physical or other non-chemical means. Exceptions: a) L-lysine extracted using biofermentation and not produced from genetically engineered organisms shall be permitted if the need to supplement hog or poultry feed with lysine can be demonstrated; and b) DL-methionine, DL-methionine—hydroxy analog and DL-methionine—hydroxy analog calcium 15 (CAS#'s 59-51-8, 853-91-5, 4857-44-7, and 922-50-9) may be used in organic poultry production. NOTE These exceptions shall be reviewed at the next full revision of the standard.
Antioxidants	Non-synthetic sources. Derived using substances listed in Table 6.3 *Extraction solvents, carriers and precipitation aids.*
Diatomaceous earth	Approved as an anti-caking agent in feed to a maximum of 2% of the total diet.
Energy feeds and forage concentrates (grains) and roughages (hay, silage, fodder, straw)	Shall be obtained from organic sources. May include silage preservation products. See Table 5.2 *Hay or silage preservation products*.

Table 5.2 — Feed, feed additives and feed supplements

Substance name(s)	Origin and usage
Enzymes	Non-synthetic enzymes are permitted, including bromelain, catalase—bovine liver, ficin, animal lipase, malt, pancreatin, pepsin, trypsin, proteases and carbohydrases. Animal-derived enzymes shall be guaranteed free of specified risk materials including the skull, brain, trigeminal ganglia (nerves attached to the brain), eyes, tonsils, spinal cord and dorsal root ganglia (nerves attached to the spinal cord) of ruminants aged 30 months or older; and the distal ileum (portion of the small intestine) of ruminants of all ages.
Hay or silage preservation products	Preference should be given to bacterial or enzymatic additives derived from bacteria, fungi and plants and food by-products (such as molasses and whey). The following acids may be used: lactic, propionic and formic.
Micro-organisms and yeasts	If organic sources of yeast are not commercially available, non-synthetic yeast sources, including yeast autolysate, shall be used.
Milk replacer	Shall be organic if commercially available. Permitted for emergency use. Without antibiotics and animal fats or by-products.
Minerals, trace minerals, elements	Non-synthetic chelated or sulphated minerals. Examples include oyster shell, calcium choride or magnesium oxide. Synthetic nutrient minerals may be used if non-synthetic sources are not commercially available.
Molasses	Shall be organic.
Pre-mixes	Concentrated mixture of minerals and vitamins. From organic sources if commercially available. All ingredients in pre-mixes shall be essential for animal nutrition, and listed in Table 5.2. Non GE fillers, for example rice hulls, may be non-organic.
Probiotics	Probiotics may be administered orally, as dietary supplements, via pharmaceutical preparations in the form of capsules, tablets, alginate gels, or dry powder.
Protein feeds	Shall be from organic sources.
Seaweed meal	
Vitamins	Permitted for enrichment or fortification.

Table 5.3 — Health care products and production aids

Substance name(s)	Origin and usage
Acetylsalicylic acid	Aspirin.
Acids for water treatments	Non-synthetic acids may be used on farm to neutralize the pH of livestock drinking water.
Activated charcoal	Shall be of plant origin.
Alcohol, ethyl (ethanol)	Permitted as a disinfectant and sanitizer.
Alcohol, isopropyl	Permitted as a disinfectant.
Antibiotics	See 6.6 of CAN/CGSB-32.310, for conditions pertaining to antibiotic use in livestock. See Table 5.3 *Antibiotics, oxytetracycline.*
Antibiotics, oxytetracycline	For emergency use for bees. The equipment shall be destroyed, in accordance with 7.1.15.7 of CAN/CGSB-32.310; treated bees do not need to be destroyed if they are taken out of organic production.
Anti-inflammatories	Such as ketoprofen. Preference shall be given to non-synthetic alternatives. To reduce inflammation.
Biologics, including vaccines	
Botanical compounds	Botanical preparations, such as atropine, butorphanol and other medicines from herbaceous plants shall be used according to label specifications.
Calcium borogluconate	For milk fever. No withdrawal period required.
Chlorohexidine	For surgical procedures conducted by a veterinarian. To be used as a post-milking teat dip when alternative germicidal agents and physical barriers have lost their effectiveness.
Colostral whey	Probiotic.
Colostrum	Shall be organic if commercially available.
Copper sulphate	As an essential nutrient (source of copper and sulphur) and for topical use (foot baths).
Diatomaceous earth	For use in control of external parasites.
Electrolytes	Including, but not limited to: CMPK (Calcium, Magnesium, Phosphorus, Potassium), calcium propionate and calcium sulphate. Shall not contain antibiotics. Orally or by injection.

Table 5.3 — Health care products and production aids

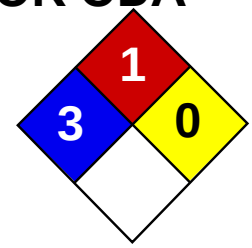
Substance name(s)	Origin and usage
Formic acid	For apicultural use, to control parasitic mites. This substance may be used after the last honey harvest of the season and shall be discontinued 30 days before the addition of honey supers.
Formulants (inerts, excipients)	Shall be used in conjunction with substances listed in Table 5.3.
Glucose	
Glycerol (glycerine, glycerin)	Shall be from organic sources if commercially available. Shall be from vegetable or animal fats and/or oils. Shall be produced using fermentation or by hydrolysis.
Homeopathy and biotherapies	
Honey	Shall be organic.
Hydrogen peroxide	Pharmaceutical grade hydrogen peroxide is permitted for external use (disinfectant). Food-grade hydrogen peroxide is permitted for internal use (for example, added to livestock drinking water).
Iodine	If used as a topical disinfectant: permitted iodine sources include potassium iodide and elemental iodine. If used as a cleaning agent: non-elemental iodine shall be used; iodine shall not exceed 5% solution by volume (example: iodophors). Use shall be followed by a hot-water rinse.
Iron products	May be supplied by ferric phosphate, ferric pyrophosphate, ferrous lactate, ferrous sulphate, iron carbonate, iron gluconate, iron oxide, iron phosphate, iron sulphate or reduced iron.
Lime, hydrated	Shall not be used to deodorize animal wastes.
Local anesthetics	Such as lidocaine. Preference shall be given to non-synthetic alternatives. Use shall be followed by withdrawal periods of 90 days for livestock intended for slaughter, and seven days for dairy animals.
Magnesium sulphate	Mined sources. A source of magnesium and sulphur.
Mineral oil	For external use.

Table 5.3 — Health care products and production aids

Substance name(s)	Origin and usage
Minerals, trace minerals, elements	Non-synthetic chelated or sulphated minerals. Examples include oyster shell, calcium choride and magnesium oxide. Synthetic nutrient minerals may be used if non-synthetic sources are not commercially available. Minerals from any source are permitted for medical use.
Micro-organisms and yeasts	If organic sources of yeast are not commercially available, non-synthetic yeast sources, including yeast autolysate, shall be used.
Oxalic acid	For mite control in honeybee colonies.
Oxytocin	For post-parturition therapeutic use. Meat from treated animals will not lose its organic status. See 6.6.10 d) of CAN/CGSB-32.310, for criteria pertaining to the mandatory withdrawal period.
Paraffin	Shall be food-grade. For use in hives.
Parasiticides and anti-microbials	Shall respect requirements set out in 6.6 of CAN/CGSB-32.310 with regard to the use of internal parasiticides.
Physical teat seals	Synthetic and non-synthetic ingredients are permitted. Shall be free from antibiotics. For post-lactation use. Shall be completely removed prior to nursing or milking. Shall be prescribed and administered under veterinary supervision.
Plant oils	To control external parasites.
Prebiotics	From organic sources if commercially available.
Probiotics	Probiotics may be administered orally, as dietary supplements, via pharmaceutical preparations in the form of capsules, tablets, alginate gels, or dry powder.
Sedatives	Such as xylazine.
Selenium products	Derived from sodium selenate or sodium selenite. May be used to address documented deficiencies in the stock, soils or feed supplies. See Table 5.3 *Minerals, trace minerals, elements*.
Sodium hydroxide	For use in dehorning paste.
Sulphur	For control of external parasites.
Vaccines	See Table 5.3 *Biologics, including vaccines*.
Vitamins	Vitamin formulants that comply with Canadian regulations are accepted. Orally, topically or by injection.

APPENDIX 2 - MSDA FOR ODA

ScienceLab.com
Chemicals & Laboratory Equipment



Health	3
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Oxalic acid dihydrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Oxalic acid dihydrate

Catalog Codes: SLO1429, SLO1054

CAS#: 6153-56-6

RTECS: Not available.

TSCA: TSCA 8(b) inventory: No products were found. It is a hydrate and exempt from TSCA inventory requirements.

CI#: Not applicable.

Synonym: Ethanedioic Acid, dihydrate

Chemical Name: Oxalic Acid, dihydrate

Chemical Formula: (COOH)2.2H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Oxalic acid dihydrate	6153-56-6	100

Toxicological Data on Ingredients: Oxalic acid dihydrate LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, the nervous system, mucous membranes, heart, brain, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures

Special Remarks on Explosion Hazards:
Fine dust dispersed in air in sufficient concentrations, and in the presences of an ignition source is a potential dust explosion hazard.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 STEL: 2 (mg/m3) from OSHA (PEL) [United States] TWA: 1 STEL: 2 (mg/m3) from NIOSH [United States] TWA: 1 STEL: 2 (mg/m3) [United Kingdom (UK)] TWA: 1 STEL: 2 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 126.07 g/mole

Color: Colorless. White.

pH (1% soln/water): Not available

Boiling Point: Not available.

Melting Point: 101.5°C (214.7°F)

Critical Temperature: Not available.

Specific Gravity: Density: 1.653 @ 18.5 eg. C(Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Soluble in cold water, diethyl ether. Soluble in alcohol, glycerol. Insoluble in benzene, petroleum ether. Solubility in cold water: 1g/7ml. Solubility in hot water: 1g/2ml

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, dust generation.

Incompatibility with various substances: Reactive with oxidizing agents, metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with chlorites, hypochlorites, silver and silver compounds, furfuryl alcohol. Hygroscopic; keep container tightly closed.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
May cause damage to the following organs: kidneys, the nervous system, mucous membranes, heart, brain, skin, eyes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals:
LD50 data for Oxalic acid, ahydrous (CAS no. 144-62-7): LD50[rat] - Route: oral; Dose: 7500 mg/kg

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects based on animal test data. No human data found.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. Rare chemical burns may occur. Harmful if absorbed through the skin. Eyes: Causes severe eye irritation with possible burns. It may result in corneal damage and conjunctivitis. Inhalation: Causes irritation of the respiratory tract, ulceration of the mucous membranes. Inhalation of oxalic acid may also cause digestive disturbances such as nausea and vomiting as well as affecting the nerves and urinary system and causing

headache, muscular irrritability, weakness, and albuminuira Ingestion: Harmful if swallowed. Causes severe digestive tract irritation and possible burns. It may affect the cardiovascular system, and urinary system. Symptoms may include vomiting (often bloody or with coffee-ground appearance), diarrhea, bloody stool, hypermotility, abdominal pain, intense burning pain in the throat, esophagus, stomach, ulceration/burning of the mouth, esophagus, and stomach, severe purging, weak pulse, hypotension, caridac irregularities, cardiovascular collapse. Other symptoms may include convulsions, headache, twitching, tetany, stupor, coma, tingling of fingers and toes, muscular irritability. Renal damage, as evidenced by oliguria, albuminuria, hematuria, may occur because Oxalic acid can bind calcium to form calcium oxalate which is insoluble at physiological pH. The calcium oxalate formed might precipitate in the kidney tubules. Hypocalcemia may also occur, which is what may affect the function of the heart and nerves and cause the above cardiovasular and nervous system effects. Chronic Potential Health Effects: Skin: Prolonged or repeated exposure may cause localized pain and cyanosis of the fingers, and even

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 4000 mg/l 24 hours [Fish (Bluegill)]. 1000 ppm 0.5 hours [Fish (Goldfish)]. 100 ppm 0.3 hours [Fish (Trout)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Corrosive Solid, Acidic, Organic, n.o.s. (Oxalic Acid, Dihydrate) UNNA: 3261 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: Pennsylvania RTK: Oxalic acid dihydrate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). Oxalic Acid, anhydrous (CAS no. 144-62-7) is listed on the Canadian DSL Oxalic Acid, dihydrate (CAS 6153-56-6) is not listed on the Canadian DSL. EINECS no. for Oxalic Acid, anhydrous: 205-634-3 EINECS no. for Oxalic Acid, dihydrate: unlisted Oxalic Acid, dihydrate is on the inventory lists for China, Japan, and Philippines.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R21/22- Harmful in contact with skin and if swallowed. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:44 PM

Last Updated: 05/21/2013 12:00 PM

APPENDIX 3 - PRODUCT LABEL

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER  **POISON**

Fatal if swallowed. Corrosive. Causes irreversible eye damage. Causes skin burns. May be fatal if absorbed through the skin. May be fatal if inhaled. Do not get on skin, in eyes, or on clothing. Do not breathe vapor or spray mist. Wear protective clothing, eyewear, and respiratory protection as listed under "Personal Protective Equipment."

PERSONAL PROTECTIVE EQUIPMENT:

Handlers and Applicators who apply product by the Solution Method must wear:

- Long-sleeved shirt and long pants
- Socks and shoes
- Chemical resistant gloves (barrier laminate, butyl rubber ≥14 mils., nitrile rubber ≥ 14 mils., neoprene rubber ≥ 14 mils., natural rubber ≥ 14 mils., polyethylene, polyvinyl chloride ≥ 14 mils, or viton ≥ 14 mils.)
- Protective eyewear such as goggles
- Half-face respirator with cartridge and/or particulate filter

Handlers and Applicators who apply product by the Vaporizer Method must wear:

- Long-sleeved shirt and long pants
- Socks and shoes
- Chemical resistant gloves (barrier laminate, butyl rubber ≥14 mils., nitrile rubber ≥ 14 mils., neoprene rubber ≥ 14 mils., natural rubber ≥ 14 mils., polyethylene, polyvinyl chloride ≥ 14 mils, or viton ≥ 14 mils.)
- Protective eyewear (goggles or face shield)
- Half-face respirator with cartridge and/or particulate filter

User Safety Requirements:

Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.

Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

Oxalic Acid Dihydrate

For Varroa mite control on bees

Active Ingredient:	
Oxalic Acid Dihydrate:	97.0%
Inert Ingredients:	3.0%
TOTAL:	100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO **POISON**

ACCEPTED
Oct 13, 2015
Under the Federal Insecticide, Fungicide and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No. 91266-1

FIRST AID

If swallowed	-Call a poison control center or doctor immediately for treatment advice. -Have person sip a glass of water if able to swallow. -**DO NOT INDUCE VOMITING** unless told to by the poison control center or doctor. -Do not give anything to an unconscious person.
If in eyes	-Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. -Call a poison control center or doctor for advice.
If on skin or clothing	-Take off contaminated clothing. -Rinse skin immediately with plenty of water for 15-20 minutes. - Call a poison control center or doctor for advice.
If inhaled	-Move person to fresh air. -If person is not breathing, call 911 or an ambulance, then give artificial respiration, if possible. DO NOT use mouth-to-mouth method if victim ingested or inhaled the substance, use respiratory medical device. -Call a poison control center or doctor for advice.

Have the product container or label with you when calling a poison control center, doctor, or going for treatment.

For non-emergency information concerning this product, call the National Pesticides Information Center (NPIC) at 1-800-858-7378 seven days a week, 6:30 am to 4:30 pm Pacific Time (NPIC Website: www.npic.orst.edu).

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Provide general supportive measures and treat symptomatically. Treatment should be rapidly instituted by giving a dilute solution of calcium lactate, limewater, finely pulverized chalk, plaster, and/or milk to supply large amounts of calcium to inactivate oxalate by forming an insoluble calcium salt in the stomach. Gastric lavage is controversial, since this may compound an already severe corrosive lesion in the esophagus or stomach. However, if used, gastric lavage should be done with limewater (calcium hydroxide). Intravenous gluconate or calcium chloride solutions should be given to prevent hypocalcemic tetany; in severe cases parathyroid extract also has been given. Additionally, acute renal failure should be anticipated, and careful fluid management is necessary. Metabolically its toxicity is believed to be due to the capacity of oxalic acid to immobilize calcium and thus upset the calcium-potassium ratio in critical tissues. Effective therapy against burns from oxalic acid involves replacement of calcium.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

USE RESTRICTIONS:

Oxalic Acid Dihydrate applications are for outdoor use only.

DO NOT use in enclosed overwintering areas.

Use only in late fall or early spring when little or no brood is present. Oxalic Acid Dihydrate might damage bee brood. Oxalic Acid Dihydrate will not control Varroa mites in capped brood.

Do not use when honey supers are in place to prevent contamination of marketable honey.

Apply only when monitoring indicates treatment is required. Consult state guidelines and local extension experts for monitoring protocols and thresholds for treatment.

(See next page for additional DIRECTIONS FOR USE)

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE, Bee Research Laboratory
10300 Baltimore Avenue, Bldg. 306, Rm. 315
BARC-EAST
Beltsville, MD 20705

EPA Reg. No. 91266-1
EPA Est. No. 73291-NC-001
Net Contents: _____
Batch Code No.: _____

DIRECTIONS FOR USE, continued

APPLICATION DIRECTIONS:

Oxalic acid is used to treat colonies during low brood periods, packages, or swarms. This product can also be used as a "clean up" Varroa treatment following the application of a different acaricide where Varroa infestations continue to be problematic.

SOLUTION METHOD:
NOTE: To completely dissolve Oxalic Acid Dihydrate, use warm syrup.

Dissolve 35 g of Oxalic Acid Dihydrate in 1 liter of 1:1 sugar: water (weight:volume). Smoke bees down from the top bars. With a syringe or an applicator, trickle 5 ml of this solution directly onto the bees in each occupied bee space in each brood box. The maximum dose is 50 ml per colony whether bees are in nucs, single, or multiple brood chambers. Under certain unfavorable conditions (e.g., weak colonies, unfavorable overwintering conditions), this application methods may cause some bee mortality or overwintering bee loss.

VAPORIZER METHOD:
Apply only to outdoor colonies with a restricted lower hive entrance. Seal all upper hive entrances and cracks with tape to avoid escape of Oxalic Acid vapor. Smoke bees up from the bottom board, Place 1.0 g per brood chamber of Oxalic Acid Dihydrate powder into vaporizer. Follow the vaporizer manufacturer's directions for use. Insert the vaporizer apparatus through the bottom entrance. Apply heat until all Oxalic Acid has sublimated.

SPRAYING PACKAGE BEES
Ensure bees are clustered before applying oxalic acid (for example store in cool dark location 24 hours before application).

Spray broodless package bees with a 1:1 sugar:water solution at least 2 hours before spraying with oxalic acid. This allows bees to fill honey stomachs with sugar water reducing ingestion of oxalic acid.

Mix a 2.8% oxalic acid solution by dissolving 35 g of Oxalic Acid Dihydrate in 1 liter of 1:1 sugar: water (weight:volume). Evenly apply 3.0 mL of 2.8% oxalic acid solution per 1,000 bees using a pump sprayer or battery powered sprayer (for example, a typical 2 lb package contains approximately 7,000 bees which requires 21 mL of solution). Apply solution evenly on both sides of the package.

Store bees in a cool darkened room for 72 hours before hiving.

RESISTANCE MANAGEMENT: Oxalic acid's mechanism of action is unknown at this time. Any Varroa mite population has the potential to become resistant to acaricides. Resistance development is affected by both the frequency of application and rate/dose of application. Continued reliance on a single class of miticide or single miticide with the same mode of action will select for resistant individuals which may dominate the mite population in subsequent generations. In order to prevent resistance development and to maintain the usefulness of individual insecticides it is important to adopt appropriate resistant management strategies.

To delay resistance:

- When possible, rotate the use of miticides to reduce selection pressure as compared to repeatedly using the same product, mode or action or chemical class. If multiple applications are required, use a different mode of action each time before returning to a previously-used one.
- Base miticide use on Integrated Pest Management (IPM). This includes proper pest identification, monitoring for locality specific economic threshold and economic injury levels, record keeping, and utilizing all available control practices (cultural, biological and chemical).
- Maximize efficacy by following all label instructions including dosage and timing of application.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original container, in a dry place inaccessible to children, pets, and domestic animals.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container.

PLASTIC CONTAINER DISPOSAL: Triple rinse container (or equivalent) promptly after use. Offer for recycling, if available. Otherwise, puncture and dispose of in a sanitary landfill, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.