Summary of Controls

CHEMICAL CONTROLS

Synthetic Chemicals	
Product Name	**Active Ingredient**
Apivar® and Apivar® 2.0	Amitraz
Amiflex® *(Amitraz)*	Amitraz
Apistan®	*Tau*-fluvalinate
CheckMite+®	Coumaphos

Biopesticides	
Essential Oils	
Apiguard® (U.S.)	Thymol
Thymovar® (CAN)	Thymol
API LIFE VAR®	Thymol Eucalyptus oil Menthol
Organic Acids	
FORMIC PRO©	Formic acid
Formic Acid 65% (CAN)	Formic acid
Oxalic Acid/Api-Bioxal®	Oxalic acid dihydrate
EZ-OX Tablets	Oxalic acid dihydrate
Api-Bioxal Powder	Oxalic acid dihydrate
Api-Bioxal RTU (U.S.)	Oxalic acid
HopGuard®3	Potassium salt of hops beta acids
OrganiShield®	Sucrose octanoate esters
VarroxSan®	Oxalic acid dihydrate
MBG2X5G® (U.S.)	L-glutamic acid
RNAi	
Norroa™ (U.S.)	Vadescana

NON-CHEMICAL (CULTURAL) CONTROLS

Screened Bottom Board
Sanitation (bee biosecurity/comb management)
Drone Brood Removal
Brood Interruption
Requeening with Varroa-Resistant Stock
Robber Screens

Notes:

- **The repeated use of the same synthetic chemicals may lead to mites developing resistance to the chemical. It is important to monitor and consider using alternative registered products.**
- **In addition to being illegal under federal, state, provincial, and territorial laws, the off-label use of synthetic chemicals may lead to mites developing resistance to the chemical.**
- EPA and PMRA define a *biopesticide* as a pesticide that: 1) is a naturally-occurring substance or structurally-similar and functionally identical to a naturally-occurring substance; and 2) has a history of exposure to humans and the environment demonstrating minimal toxicity, or in the case of a synthetically-derived biochemical pesticides, is equivalent to a naturally-occurring substance that has such a history.

Note on Efficacy: *HBHC has not independently verified effectiveness claims made by the registrant, manufacturer, or brand.

	**APIVAR® & APIVAR 2.0® (VÉTO-PHARMA)**  
Active Ingredient	**Amitraz**
Label Information	APIVAR®: EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:499700,87243-1) PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2729092%27&p_regnum=29092 Company website: https://www.veto-pharma.com/beekeeping-products/apivar-amitraz-treatment/ APIVAR 2.0®: EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5578090218375::NO::P8_PUID,P8_RINUM:538833,87243-5 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2735663%27&p_regnum=35663 Company website: https://www.veto-pharma.com/beekeeping-products/apivar-2-0-varroa-treatment/
Formulation	Formulated as slow-release blended and extruded polymer strip
Route of Exposure	Contact
Application	Place 1 Apivar strip per 5 frames of bees. Place strips near the bee cluster or – in case brood is present – in the center of the brood nest. 42 to 56 days, then remove strips. Keep a minimum distance of 2 frames between strips. Treat all hives in apiary at same time. Do not treat more than 2x/year. Apivar 2.0: treatment duration is 6-10 weeks. 10-week option is recommended when brood is still present in the colony. 6-week duration is recommended for broodless treatment. Do not treat more than 2x/year.
Time of Year	**Population Increase:** Only if colonies will NOT be **supered** within 8 weeks; **Population Decrease:** Immediately following peak population once honey harvested.
Brand-reported Effectiveness*	Up to 95% effective. Please note that this reported efficacy depends on mite resistance and on the extent of prior use. See label for mite resistance management.

Conditions for Use	**Capped Brood:** Product is designed to kill successive generations of varroa mites. **Colony Size:** No conditions noted. **Temperature:** No conditions noted. **Honey Supers:** Can not be used when colonies are supered for honey. Apivar: must be removed 2 weeks before colonies are supered. Apivar 2.0: okay to super immediately after removing strips.
Advantages	Effective unless there is mite resistance or the cluster moves away from contact with strips.
Disadvantages	Contamination of beeswax and pollen in brood nest.; some indications of mites developing resistance where Amitraz has been used for several seasons (including prior to registration of Apivar®). Apivar® is a long-term treatment that does not provide immediate mite knockdown.
Consideration	The only legally permissible (i.e., registered for use in bee colonies) amitraz products are Apivar®, Apivar 2.0® and Amiflex®; **do not reuse strips**; store unopened packages at room temperature; use up opened packages immediately; perform resistance test (if possible before use) and monitor mite levels following use to confirm control effectiveness. (See Resources for information on resistance testing). Chemical is controlled release so mite knock down may not occur immediately.

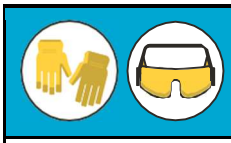
	**AMIFLEX® (VÉTO-PHARMA)** 
Active Ingredient	**Amitraz**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:::::P8_PUID,P8_RINUM:544669,87243-6 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2735751%27&p_regnum=35751 Company website: https://www.veto-pharma.com/beekeeping-products/amiflex-amitraz-flash-treatment/
Formulation	A premixed gel applied with a dosing gun to a wooden strip.
Route of Exposure	Contact
Application	Two 3-milliliters doses per brood box. Place wooden strips in the center of the brood area or in the center of the bee cluster, leaving a minimum of one frame free of gel between two frames with gel. Scrape frames clear of wax before application. Can apply 7 days before a long action treatment to obtain a knockdown effect. Do not use more than four times per year. **Low infestation:** Apply once. Remove any remaining product at 7 days. **High infestation:** Day 1: Apply the first treatment. Day 7: remove any remaining product. Day 14: apply the second treatment. Day 21: remove any remaining product from the second treatment.
Time of Year	**Population increase:** Must remove product before adding supers. **Population decrease:** Apply following peak population once honey supers are removed.
Brand-Reported Effectiveness*	**Colonies with brood:** A single treatment removes 56% of varroa on average. Two treatments removes an average of 81-83%. **Colonies without brood:** A single treatment removes 98-100% of varroa.
Conditions for Use	**Capped brood:** May be effective if multiple treatments are used. **Colony size**: Do not use on sparsely populated or inactive colonies. **Temperature**: No temperature restriction, but avoid treatment during times of the year when bees are not actively foraging (e.g., winter). **Honey supers**: Do not use when honey supers are present. Remove any remaining product before adding supers. Do not apply Amiflex® more than two times in a row before a honey flow. Rotate with other products including different active ingredients.
Advantages	Effective unless there is mite resistance.

Disadvantages	Contamination (breakdown products/metabolite byproducts) of beeswax and pollen in brood nest; evidence of mites resistant to Amitraz; some beekeepers report bees absconding.
Considerations	Amiflex was formerly registered as a **Restricted Use Pesticide; c**heck product label to ensure that product is updated formulation without Restricted Use designation.

	**APISTAN® (VITA BEE HEALTH)** 
Active Ingredient	***Tau*-fluvalinate**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=113:8:::NO::P8_PUID,P8_RINUM:30109,2724-406 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2733771%27&p_regnum=33771 Company website: https://www.vita-europe.com/beehealth/product/apistan/
Formulation	Formulated as slow-release impregnated flexible polymer strip.
Route of Exposure	Contact
Application	Use 1 strip for each 5 combs of bees or less. Hang strips on brood combs. Treat all hives in apiary at the same time. **Treatment duration**: 42 to 56 days.
Time of Year	**Population Increase:** Before honey flow if 7 weeks or more until supering. **Population Decrease:** Following honey harvest.
Brand-reported Effectiveness*	95 to 99% but ONLY if no mite resistance; however, resistance has been widely documented
Conditions for Use	**Capped Brood:** Product is designed to kill successive generations of varroa mites. **Colony Size:** No conditions noted. **Temperatures** > 50˚F (10˚C); do not use during nectar flow. **Honey Supers:** Do not use when colonies are supered for honey.
Advantages	Highly effective with susceptible mite populations *(Note: mite resistance has been well documented).*

Disadvantages	Widespread mite resistance; contamination of beeswax and pollen in brood nest; persistent continued use may affect brood development; interaction with other pesticides may occur potentially jeopardizing colony health.
Consideration	May adversely affect queen and drone reproductive health; perform resistance test before use and monitor mite levels following use to confirm control effectiveness. (See Resources for information on resistance testing.)

	**CHECKMITE+® (ELANCO HEALTHCARE)** 
Active Ingredient	**Coumaphos**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:395046,11556-138 PMRA Label: Unavailable. Company Website: Unavailable.
Formulation	Formulated as slow-release impregnated rigid polymer strip.
Route of Exposure	Contact
Application	One strip for each five combs of bees in each brood chamber. **Treatment length**: 42 to 45 days.
Time of Year	**Population Increase:** Only if colonies will NOT be supered within 6 weeks. **Population Decrease:** After honey harvest.
Brand-reported Effectiveness*	85 to 99% if no mite resistance; however, mite resistance has been widely reported. Effective against small hive beetles, but application method is different than for mite control.
Conditions for Use	**Capped Brood:** Treatment is most effective when brood rearing is lowest. **Colony Size:** No conditions noted. **Temperature:** No conditions noted. **Honey Supers:** Do not use with honey supers, wait two weeks after use before supering.
Advantages	Effective when mite populations are susceptible *(Note: extensive mite-resistant populations in United States and Canada);* Can be used to control the small hive beetle adults (applied in different manner).
Disadvantages	Mite resistance; organophosphate pesticide; persists in beeswax and pollen in brood nest; greater additive effects when combined with other products; adversely affects reproductive health of queens & drones (sperm production).
Consideration	Perform resistance test and monitor mite levels following use to confirm control effectiveness. (See Resources for information on resistance testing.)

	**APIGUARD® (USA VITA BEEHEALTH)** 
Active Ingredient	**Thymol**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:462105,79671-1 Company Website: https://www.vita-europe.com/beehealth/product/apiguard/
Formulation	Individual hive dose or bulk tub
Route of Exposure	Contact and fumigant
Application	Twice at 2-week intervals, apply individual dosage tray or 50 gm per double box hive (remove or spread remaining gel over frame top bars at end of 4th week). At temperatures above 77˚F, a lower dosage of 25-26 ml (approximately 0.88 oz/25g) of Apiguard gel can be used effectively. Repeat dose applications may be applied at intervals of 1-2 weeks, as needed for up to 4 applications of 25-26 ml (approximately 0.88 oz/25g) where mite infestations persist. Small and over-wintering bee colonies and nuclei see “Conditions for Use” below. Apiguard gel (depending on the colony or nucleus size) left in place until the product disappears from the tray.
Time of Year	**Population Increase:** Only if colonies will not be supered within 6 weeks. **Population Peak:** Only if bees are not storing honey for human consumption. **Population Decrease:** Post-honey harvest or approaching dormancy.
Brand-reported Effectiveness*	74 to 95% (more effective with warmer temperatures)
Conditions for Use	Ensure that there is a free space of at least ¼ inch between the top of the tray and the hive cover to ensure that bees have adequate access (e.g., an empty super or shim on top of the brood box). **Capped Brood:** No conditions noted. **Colony Size:** Small and wintering bee colonies and nuclei require only one dose of 12-13 mL (approximately 0.44 oz/12.5g) to 25-26 mL (approximately 0.88 oz/25g); combine weak colonies before treatment. **Temperature:** Between 60˚F and 105˚F (15 to 40˚C); do not apply when the colony activity is very low. **Honey Supers:** Do not use when colonies are supered for honey.
Advantages	Naturally derived; no known varroa resistance to thymol.
Disadvantages	May reduce queen egg-laying activity; may increase adult and young larvae mortality; works best under warmer temps; may cause bees to beard in hot weather; human skin irritant; taints honey taste if used improperly.

Consideration	Effectiveness reduced for light mite infestations; requires solid bottom board or closed screened bottom board; product occupies a ¼-inch space above brood nest; avoid opening treated colonies for 48 hours after dosing.



THYMOVAR® (ANDERMATT-CANADA)	
Active Ingredient	**Thymol**
Label Information	PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2729747%27&p_regnum=29747 Company Website: https://www.andermattcanada.com/thymovar
Formulation	Impregnated strip
Route of Exposure	Contact and fumigant
Application	Twice at 3-4 week intervals, 1 strip for single brood chamber and 2 for double box hive, remove excess materials at end of 2nd application.
Time of Year	**Population Increase:** Only if colonies will not be supered within 6 weeks. **Population Peak:** Only if bees are not storing honey. **Population Decrease:** Post-honey harvest or approaching dormancy
Brand-reported Effectiveness*	74 to 95% (more effective with warmer temperatures)
Conditions for Use	**Capped Brood:** No conditions noted. **Temperature:** Between 60˚F and 85˚F (15 to 30˚C) **Honey Supers:** Do not use when colonies are supered for honey.
Advantages	Naturally derived; no known varroa resistance to thymol.
Disadvantages	May reduce queen egg-laying activity; may increase adult and young larvae mortality; works best under warmer temps; may cause bees to beard in hot weather; human skin irritant; taints honey taste if used improperly.
Consideration	Effectiveness reduced for light mite infestations; requires closed screened bottom board; requires a ¼-inch space above brood nest; cannot enter treated areas for 48 hours after dosing.

	**APILIFE VAR® (CHEMICALS LAIF S.P.A.)** 
Active Ingredient	**Thymol**, **Eucalyptus oil**, **Menthol**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:398422,73291-1 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2733821%27&p_regnum=33821 Company Website: https://www.alveis.it/en/products/apilife-var/
Formulation	Tablet (wafer)
Route of Exposure	Fumigant
Application	3 tablets for 7-10 days each (leave 3rd tablet in hive for 12 days). Divide tablet (wafer) into 4 pieces and place each piece in a corner of the hive on the top bars. Repeat or combine with another product, if heavy mite numbers. Do not treat more than 2x/year. Apply during the coolest time of the day either in the early morning or evening.
Time of Year	**Population Increase:** Less effective. **Population Peak:** If honey supers are not present. **Population Decrease:** After nectar flow, with temperature considerations.
Brand-reported Effectiveness*	70 to 90%
Conditions for Use	**Sealed Brood:** Most effective when little to no sealed brood is present. **Colony Size:** For best results, the colony should be as compact as possible during treatment; combine weak colonies before treatment. **Temperature:** 64 to 95˚F (18-35˚C); lower efficacy if average daily temperatures are below 54˚F (12˚C) degrees. **Honey Supers:** Do not use when colonies are supered for honey; remove treatment at least 1 month before harvesting honey.
Advantages	Naturally derived, no known resistance to essential oils mix.
Disadvantages	High temperatures may cause bees to exit hives and/or adult/brood death; taints honey taste if used improperly; may melt some plastic hive parts.
Consideration	Requires solid bottom board or closed screened bottom board; reduce entrances and any other openings that exist.

ACIDS

	**FORMIC PRO® (NOD APIARY PRODUCTS)**  
Active Ingredient	**Formic acid**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:519978,75710-3 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2733321%27&p_regnum=33321 Company Website: https://nodglobal.com/formic-pro/
Formulation	Saccharide gel strip in a laminated paper wrap; 42.25% formic acid.
Route of Exposure	Fumigant
Application	**Option 1:** 2 strips for 14 days. **Option 2:** 1st strip for 10 days, then remove and replace with 2nd strip for an additional 10 days. Suitable for a single or double brood-chamber of standard Langstroth equipment. There should be a strip touching each top bar containing brood.
Time of Year	**Population Increase/Population Peak:** Can be used with **honey supers** present. **Population Decrease:** Following harvest if not too warm and when bees are still flying regularly.
Brand-reported Effectiveness*	83-97%
Conditions for Use	**Capped Brood:** Effective when Capped brood is present. **Colony Size:** Colony cluster should cover a minimum of 6 frames. **Temperature:** Use when outside day temperature 50-85° F (10-29.5°C). **Honey Supers:** Can use with honey supers. **Feeding:** Colonies should not be fed during treatment.
Advantages	Application Option 1 enables killing mites under cappings; formic acid is naturally found in hives; not required to immediately remove strips following treatment; OMRI listed for use in organic agriculture.
Disadvantages	Potential for bee brood mortality and queen loss; recommended to not disturb colony during treatment period (except for addition of second single strip); check if colony is queenright after treatment is finished.

Consideration	Requires solid bottom board or closed screened bottom board, bottom hive entrance open; do not remove paper packaging; may see bee bearding in first couple of days following treatment.

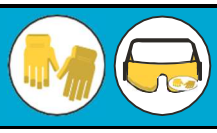
	**FORMIC ACID 65% (VITA BEE HEALTH)**
Active Ingredient	**Formic acid** 65%
Label Information	PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2730108%27&p_regnum=30108 Company Website: https://nodglobal.com/65-formic-acid/
Formulation	Liquid 65% formic acid In Canada, 65% formic acid liquid is permitted to be applied in soaked absorbing (dri loc) pads or MiteGone pads.
Route of Exposure	Fumigant
Application	**Option 1:** Using absorbing (dri loc) pad, 21-30 day application; 30-40 ml per 2 story hive; up to 6 applications: one every 10 days. **Option 2:** Using MiteGone pad; 20 day application (1x every 10 days); 120-125 g formic acid 65% per pad, 2x per year.
Time of Year	**Population Increase:** Application must be removed 6 weeks prior to adding supers for honey collection. **Population Decrease:** Post-honey harvest.
Brand-reported Effectiveness*	60 to 93% effective within **temperature range** of 60-86˚F (15-30˚C).
Conditions for Use	**Sealed Brood:** Effective when sealed brood is present. **Colony Size:** Minimum 5 frames of bees. **Temperature:** Use when outside temperatures are between 50-86 ºF (10˚C-30˚C) and leave hive entrances fully open. Temperatures above or below the recommended range can lead to colony damage and impacts efficacy. **Honey Supers:** Do not use when colonies are supered for honey.
Advantages	Can kill mites underneath cappings; formic acid is naturally found in hives; no known mite resistance to formic acid; OMRI listed for use in organic agriculture.
Disadvantages	Potential for bee brood mortality and queen losses under higher temperature; check if colonies are queenright after treatment is finished.
Consideration	Formic acid liquid and fumes can be dangerous to applicators.

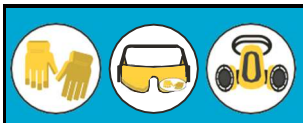
	**EZ-OX (MIKE'S BEES, LLC)** 
Active Ingredient	**Oxalic acid dihydrate**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:539277,101743-2 PMRA Label: Unavailable. Company Website: https://www.facebook.com/p/Mikes-Bees-LLC-100083562638861/
Formulation	**Option 1:** Sugar syrup drip with syringe or drenching applicator. **Option 2:** Vaporization (fumigation or sublimation). **Option 3:** Spray application for caged (package) bees. Product comes in powder or 1-gram tablets (tablets for vaporization only).
Route of Exposure	Contact
Application	**Sugar solution method (dribble):** Dissolve 2 grams of Oxalic Acid Dihydrate in ¼ cup (59 ml) of 1:1 sugar : water. With syringe, trickle 5 milliliters of this solution directly onto the bees in each occupied bee space between frames in each brood box; maximum dose of 50 milliliters per colony of oxalic acid in sugar syrup. **Vaporizer method:** 2 grams (2 1-gram tablets, or 2 grams powder) per deep hive body. Follow vaporizer directions. **Spray application:** Approved for caged (package) bee use; mix oxalic solution as above; spray with sugar syrup to engorge bees before applying.
Time of Year	**Dormant Phase:** Best used during Dormant Phase when capped brood is not present. Early **Population Increase** and late **Population Decrease** when brood rearing is reduced. May be used when honey supers are on colony.
Brand-reported Effectiveness*	82 to 99% when brood not present.
Conditions for Use	**Capped Brood:** Less effective in colonies with capped brood. **Colony Size:** No restrictions. **Temperature:** None, but risks when opening hive below 40˚F/4˚C. May not be as effective if tight cluster is present. **Honey Supers:** Can be used with honey supers.
Advantages	Kills/damages varroa on adult bees; can be used in alternate types of hives; OMRI listed for use in organic agriculture.
Disadvantages	Corrosive. Vaporizer application is extremely dangerous to applicator health - follow label precautionary directions for handling. When applying, need to use proper protective equipment (respirator, goggles, long pants, long sleeves).

	Orientation upwind is recommended. Vapors quickly recrystallize.

	API-BIOXAL® POWDER (CHEMICALS LAIF S.P.A)
Active Ingredient	**Oxalic acid dihydrate**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:516779,73291-2 PMRA Label: Unavailable. Company Website: https://www.alveis.it/en/products/api-bioxal-powder/?_gl=1*ao9wkq*_up*MQ..*_ga*MTAxODUyMjk0LjE3Nzk5MTI3NjM.*_ga_72X0TV4WH6*czE3Nzk5MTI3NjMkbzEkZzAkdDE3Nzk5MTI3NjMkajYwJGwwJGgw
Formulation	White crystalline powder
Route of Exposure	Contact
Application	**Sugar solution method (dribble):** Mix 35 grams (approximately 2.3 tablespoons) into 1 liter of 1:1 sugar syrup. With syringe, trickle 5 milliliters of this solution directly onto the bees in each occupied bee space between frames in each brood box; maximum dose is 50 milliliters per colony. **Spray application:** Approved for caged (package) bee use. Spray untreated sugar syrup to engorge bees before applying. Prepare the solution as above Apply 0.1 fl oz (3.0 mL) of 2.8% Api-Bioxal solution per 1,000 bees using a pump sprayer or battery powered sprayer. **Vaporizer method:** 4 grams per brood box. Follow vaporizer directions.
Time of Year	**Dormant Phase:** Best used during Dormant Phase when sealed brood is not present. Early **Population Increase** and late **Population Decrease** when brood rearing is reduced. May be used when honey supers are on colony.
Brand-reported Effectiveness*	82 to 99% when brood not present.
Conditions for Use	**Capped Brood:** Less effective in colonies with capped brood. **Colony Size:** No restrictions. **Temperature:** None, but risks when opening hive below 40˚F/4˚C. May not be as effective if tight cluster is present. **Honey Supers:** Can be used with honey supers.
Advantages	Kills/damages varroa on adult bees; can be used in alternate types of hives; OMRI listed for use in organic agriculture.
Disadvantages	Corrosive; vaporizer application is extremely dangerous to applicator health - follow label precautionary directions for handling; when applying, need to use proper protective equipment (respirator, goggles, long pants, long sleeves); orientation upwind is recommended; vapors quickly recrystallize.

	**Api-Bioxal RTU® (CHEMICALS LAIF S.P.A.)** 
Active Ingredient	**Oxalic acid**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:::::P8_PUID,P8_RINUM:544301,73291-3 Company Website: https://www.alveis.it/en/products/api-bioxal-solution/?_gl=1*doyowz*_up*MQ..*_ga*MTAxODUyMjk0LjE3Nzk5MTI3NjM.*_ga_72X0TV4WH6*czE3Nzk5MTI3NjMkbzEkZzAkdDE3Nzk5MTI4MjckajU2JGwwJGgw
Formulation	Ready-To-Use (RTU) liquid formulation
Route of Exposure	Contact
Application	Smoke bees down from the top bars. With a syringe or an applicator, trickle 5 mL of premixed solution directly onto the bees in each seam (space between frames) occupied with bees, in each brood box. Dose is 5mL per seam occupied with bees, no matter colony size. Treatment can be repeated up to 4 times, 7 to 10 days apart when sealed brood is present.
Time of Year	**Dormant Phase:** Most effective when colony has minimal capped brood. **Population increase; Population peak; Population decrease:** Less effective when capped brood present.
Brand-reported Effectiveness*	Effectiveness ranges from 70 to 99% depending on the number of repetitions or presence/absence of brood.
Conditions for Use	**Capped brood:** Ideal when capped brood is absent or minimal. Does not penetrate cappings and could harm open brood. Can be repeatedly applied when capped brood present. **Colony size**: Colonies of any size can be treated. Very weak colonies may have detectable bee mortality. **Temperature**: No temperature restrictions. **Honey supers**: Can be used with honey supers on the hive. **Wintering colonies**: Cannot use in enclosed overwintering areas.
Advantages	Premixed formulation saves time and prevents math and mixing errors; contains no sugar, so bees are not tempted to consume treatment; safe to use at any ambient temperature, any colony size, and whether or not supers are in place; no maximum per-hive dose (calculate dose based on occupied seams); stored solution does not develop toxic hydroxymethylfurfurol (HMF).
Disadvantages	Each box must be exposed to treat space between each frame.
Considerations	Api-Bioxal RTU is formulated with a higher dose of oxalic acid than allowed in homemade dribble solutions made with other registered oxalic acid miticides.

	**HOPGUARD®3 (BETATEC)**  
Active Ingredient	**Potassium salt of hops beta acids**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:513781,83623-2 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2733571%27&p_regnum=33571 Company Website: https://betatec.com/wp-content/uploads/2021/09/HopGuard-3-Instructions.pdf
Formulation	Folded cardboard strips
Route of Exposure	Contact
Application	Apply one strip per five frames covered with bees, spaced evenly in the cluster and at least two frames between each strip; maximum of 2 strips per brood chamber per application. 2-week treatment; to increase efficacy apply consecutive treatments according to the label; max use 4 times per year. Do not leave in colony for more than 30 days.
Time of Year	**Population Peak:** Less effective when capped brood is present. **Population Decrease:** Most effective when brood is reduced. **Dormant Phase:** Suggested to use when brood not present or brood reduced.
Brand-reported Effectiveness*	75 to 95%
Conditions for Use	**Capped Brood:** More effective with little to no brood **Colony Size:** No restrictions. **Temperature:** Above 55˚ F (13˚ C) and under 100˚ F (38˚ C.) **Honey Supers:** Can use with honey supers; honey or wax may only be harvested from honey supers, not the treated brood chambers.
Advantages	No known resistance of mites to HopGuard; water-based compound doesn't dissolve in wax, so little beeswax residue risk; quick knockdown of mites on adult bees; can be used in alternate types of hives.
Disadvantages	Strips are messy to use; expect mortality of bees and brood that touch the strip.
Consideration	Easier to apply with two people (1 to handle treatment, 1 to handle hive); use disposable gloves; strips must be wet to be effective; may stain clothing; opened packages can be stored up to two months with proper storage.

	**VarroxSan™ (VITA BEE HEALTH LIMITED)**  
Active Ingredient	**Oxalic acid dihydrate**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5182282990985::NO::P8_PUID,P8_RINUM:540371,94413-3 PMRA Label: https://pr-rp.hc-sc.gc.ca/ls-re/lbl_detail-eng.php?p_disp_regn=%2735658%27&p_regnum=35658 Company Website: https://www.vita-europe.com/beehealth/product/varroxsan/
Formulation	Slow-release fiberboard strips
Route of Exposure	Contact
Application	Use up to 4 strips per brood chamber per application (1 strip per 2.5 frames of bees). Leave strips in for a 42–56 day treatment period. Fold each strip in half and hang over 1 frame in the brood area or bee cluster, slightly away from the comb surface. Maintain a distance of 2 frames between strips (i.e., place on frames in positions 2, 4, 6, 8). Reposition any strip not in contact with the bees to be closer to the cluster. Leave the strips inside the hive for 42 to 56 days, then remove.
Time of Year	Effective during **early population increase**, **population peak**, and **population decrease.**
Brand-reported Effectiveness*	92-98% with an average of 96%.
Conditions for Use	**Capped Brood:** Long-acting treatment to kill several successive generations of varroa mites. **Colony size:** No conditions noted. **Temperature:** No restrictions. **Honey supers:** Approved for use when honey supers are in place, but treatment must be separated by at least one chamber from any honey that is to be extracted for human consumption.
Advantages	Can suppress mite population growth while honey supers are in place.
Disadvantages	Strips can be challenging to insert into the hive without disrupting the bees on the comb and hang properly between frames; difficult to remove from hive; expect brood removal behind strips.
Consideration	May be more effective when the external temperature is 60˚F (15˚C) or above and the colony is active; ensure that the strips are in the cluster of bees; can be used in combination with a knockdown treatment to provide additional control of mite populations.

MBG2X5G® (MITE BEE GONE, LLC)

Active Ingredient	**L-Glutamic Acid**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5578090218375::NO::P8_PUID,P8_RINUM:541112,100908-1 Company Website: https://mitebeegone.com/
Formulation	Impregnated strip
Route of Exposure	Contact
Application	**Treatment application:** Identify and count brood frames, then suspend strips between top bars of frames using a medium binder clip, one strip for every three to four frames of brood. Increase spacing between frames if possible to increase worker contact with strips. Monitor and replace when chewed below 25% of original size and reinsert new strip, typically after 42 days. **Prophylactic application:** Can insert one strip per brood box.
Time of Year	**All phases.** Recommended in **Dormant phase** into **early Population Increase phase**, with periodic reapplication throughout year.
Brand-reported Effectiveness*	Unavailable
Conditions for Use	There are **no restrictions on use** with regard to colony phase, whether or not honey supers are in use, colony size, or temperature. The product has been developed for **frequent or continuous applications throughout the year**.
Advantages	Open-ended, continuous application method provides flexibility to stay ahead of mite population growth, with no known biological stress to adult or larval honey bees.
Disadvantages	Since strips must achieve contact with mites, strip placement and bee activity around the strip can affect effectiveness.
Considerations	The benign nature of the active ingredient formulation allows for year-round use and no frequency limitation, however, as with all miticides, recommend rotating and non-continuous use of products; since strips must contact bees to work, best performance is achieved when hive box contains one fewer frames than would fit to make extra space (*e.g.,* 9 frames in a 10-frame box). The registrant of this newly developed and registered product (in 2025) is pursuing further testing and a route to market.

	**OrganiShield® (Applied Power Concepts, Inc.)** 
Active Ingredient	Sucrose octanoate esters
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:5578090218375::NO::P8_PUID,P8_RINUM:531256,75197-3 Company Website: https://organishield.com/
Formulation	Formulated as a liquid
Route of Exposure	Contact
Application	Apply 1.3 fl. oz. (38 mL) to each full depth frame of bees or 3 fl. oz. per frame space to the upper frame spaces (typical 18 frame two-story colony will receive 20 – 30 fl. oz. (591 – 900 mL). Repeat applications at intervals of 7 – 10 days, up to three times per infestation. Apply using garden type pressure sprayer, backpack sprayer, or powered commercial sprayer.
Time of Year	**Population Increase:** Provided that bees are not in winter cluster or at temperatures below 55° F (13˚C) **Population Peak:** Apply at temperatures at or above 55° F (13˚C) **Population Decrease:** Apply at temperatures at or above 55° F (13˚C)
Brand-reported Effectiveness*	None reported; product must come into contact with varroa mites to be effective.
Conditions for Use	**Capped Brood:** Product is designed to kill varroa mites emerging from brood cells. **Colony Size:** No restrictions. **Temperature:** Do not apply at temperatures below 55° F (13˚C) **Honey Supers:** No restrictions.
Advantages	Effective provided that compound comes in direct contact with mite; alternative to synthetic miticides; OMRI listed for use in organic crop production.
Disadvantages	Entire frame of bees must be sprayed; product must come into contact with mite to be effective; limited residual activity.
Consideration	Causes substantial but temporary eye injury; thorough spray coverage of adult bees on frame is essential for control of mites; remove frames with adhering bees and spray both sides or leave frames in place and apply product to the frame spaces.

Genetic Technologies (RNAi)

	NORROA® (GREENLIGHT BIOSCIENCES) 
Active Ingredient	**Vadescana**
Label Information	EPA Label: https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:8:::::P8_PUID,P8_RINUM:540281,94614-4 Company Website: https://norroa.com/
Formulation	Liquid Pouch
Route of Exposure	Contact (Mites absorb biopesticide in brood food, disrupting mite reproduction)
Application	Option 1: 2 pouches per brood box, remove when emptied. Option 2: 1 pouch per brood box, second pouch applied after 1st pouch is emptied. Both options: Apply pouch(es) inside brood box. Remove protective sticker and place pouch directly in hive allowing bees to feed from the pouch. Can be used twice per calendar year. Do not apply more than 2 pouches per brood chamber per treatment or 4 pouches per brood chamber per year.
Time of Year	**Population increase:** Should be used when open brood present, mite populations are low and food resources are available for the colony. **Population decrease:** Can be used prior to fall mite buildup.
Brand-reported Effectiveness*	Prevents foundress mite reproduction. Maintains or reduces mite levels for up to 18 weeks if applied when open brood is present and mite levels are below 3%.
Conditions for Use	**Capped brood**: Only effective when open brood present. **Colony size**: More effective on smaller colonies, <10 frames of bees. **Temperature**: No temperature restrictions. **Honey supers**: Avoid applying when supers are on, since product must be stored in brood chamber.
Advantages	Ready to use; new chemistry that can be rotated with other active ingredients; can be used on small colonies; up to 18 weeks of mite infestation reduction; no negative effects on queens or colonies.
Disadvantages	Effectiveness of product relies on bees storing product in brood cells where mites become exposed; must not be used during heavy nectar flows because product becomes diluted, or during nectar dearth (low nectar flows) because product is consumed by adult bees; not a fast knockdown mite treatment.
Considerations	Use when mite levels are low but approaching injury thresholds; if mite levels are above recommended treatment threshold, can be used in combination with a knockdown treatment to provide extended control of mite populations.

Non-Chemical: Cultural or Mechanical Management

	Screened Bottom Board  
Name	Screened Bottom Board
Technique	Replace solid bottom board with #8-mesh (1/8") screen surface. Falling mites drop out of colony through screen.
Route of Exposure	N/A
Treatment Time/ Use Frequency	Continuous, year-round
Time of Year	Year-round, unless in cold climate regions, it should be removed or closed.
Effectiveness	Minimal; up to 5-10% reduction in mite levels
Conditions for Use	Replace bottom board; recommended to leave space under the screen for mites and debris to fall ('trash' or 'garbage pit').
Restrictions	None.
Advantages	Low-tech; may be used with hive debris sticky board; can be used with sticky board as monitoring method for varroa infestation.
Disadvantages	Minimal to little control; may need to close hive bottom when fumigant control chemicals are used; may inhibit brood rearing in lower frames in spring with cool temperatures; may attract scavengers beneath hive.
Considerations	Minimally to not effective; must be used with other controls; not reliable as single control technique; works best with good hive location (sunny site, good air drainage and hive ventilation with winter protection in northern locations).
Video	Watch our Screened Bottom Board video: *http://bit.ly/controls-bottomboard*

	Colony Biosecurity
Name	Sanitation (bee biosecurity) comb management
Technique	• Locate hives in sunny sites with good air drainage • Reduce bee adult drifting by spacing out hives in apiary and adding distinguishing color, markings, and/or visual landmarks • Remove dead-outs from apiaries • Store equipment inside or in covered stacks • Clean hive inspection tools between hives • Remove brood frames 5 years or older, or with excessive number of drone cells
Route of Exposure	Basic biosecurity practices that improve colony health may reduce drifting, re-infestation, and exposure to residues in comb.
Treatment Time/ Use Frequency	Continuous examination and taking actions as needed every time hives inspected. Move undesired frames to edge of box during active season, remove when broodless; possible negative effect on bee population if excessive frames removed/added at one time.
Time of Year	**Population Increase** and **Population Decrease**
Effectiveness	Unknown; considered to improve overall colony health and bee environment in the hives.
Conditions for Use	No conditions (use as necessary).
Restrictions	May reduce potential honey harvest; brood comb culling best performed under ideal comb drawing conditions (or replace with empty drawn honey combs from honey supers).
Advantages	May assist with improving overall bee colony health and performance and reduce accumulated residues of chemicals used for varroa control.
Disadvantages	None.
Considerations	Minimally to not effective if used without other controls; avoid movement of frames or bees between colonies as much as possible.
Video	Watch our Sanitation video: *http://bit.ly/controls-sanitation*

	Drone Brood Removal 
Name	Drone Brood Removal (Drone Trapping Varroa)
Technique	Remove and destroy (freeze, uncap, feed to chickens, etc.) drone brood once capped. Use drone frames/foundations in brood chamber or comb with elevated number of drone brood cells.
Route of Exposure	Mites are preferentially attracted to and have greater reproduction in drone brood; removal of capped drone cells selectively removes reproducing mites.
Treatment Time/ Use Frequency	Use one or two frames devoted to drone brood when colonies rear drones.
Time of Year	**Population Increase** and **Population Peak**
Effectiveness	Not as effective as stand-alone treatment; effectiveness compounded by repeating 2 to 3x during **Population Increase**.
Conditions for Use	Need to remove capped brood in timely manner before adult drones emerge. Comb can be reused after drone brood is destroyed.
Restrictions	None.
Advantages	Non-chemical method; inexpensive and effective.
Disadvantages	Time-consuming management; if drone brood is not removed before emergence, it will rapidly increase mite population; requires more colony resources than other non-chemical controls; using this method excessively can negatively impact honey production; reduces drones available for mating.
Considerations	Use drone foundation frames (e.g., "green" drone frames), frames more shallow than the brood box (stimulating bees to build drone comb from bottom bar), or foundationless frames; to improve effectiveness, reduce drone brood on other brood combs and cull drone cells built between brood boxes.
Video	Watch our Drone Brood Removal video: *http://bit.ly/controls-dronebrood*

	Induced Brood Break
Name	Induced Brood Break
Technique	Interrupt egg-laying and thus brood production by: • Make a split without a currently laying queen, and/or • Caging queen for 1-2 weeks, and/or • De-queening, and/or • Moving bees to a controlled environment (e.g., cold storage). May combine with other techniques like requeening, timely use of miticides.
Route of Exposure	Interrupt reproductive cycle of mite population.
Treatment Time/ Use Frequency	Treatment ideally during **Population Increase** or **after Population Peak** (during nectar flow or post- harvest). If used during Population Increase, may reduce harvest yield.
Time of Year	**Population Increase**, **Population Peak,** or after **Population Peak**
Effectiveness	Not a stand-alone management strategy.
Conditions for Use	Need a queen or queen cell for each split/division created.
Restrictions	Splitting and requeening splits difficult when there are limited forage resources.
Advantages	Non-chemical; Potentially effective if utilized with chemical control and/or subsequent introduction of mite-resistant stock. Can be utilized with other hive managements
Disadvantages	Requeening and/or holding original queen in cage not always successful; highly time consuming; need to purchase or raise queens to place queen in split; in short season climates it may affect honey production; research indicates that caging queens during **Population Decrease** can negatively impact hive survival.
Considerations	Effective but requires good beekeeping skills for season-long management; many treatments are more effective when there are no or few capped brood; potential lower honey harvest or population growth due to delay in brood production; be prepared to cull developing queen cells if caging queen; be prepared to monitor queen laying after inducing a brood break.
Video	Watch our Induced Brood Break (Brood Interruption) video: *http://bit.ly/controls-broodinterruption*

	Requeening with Varroa-Resistant Stock  
Name	Requeening with varroa-resistant stock
Technique	Utilize bee stock with demonstrated hygienic or other mite-reducing mechanisms
Route of Exposure	Selected stock demonstrates slower mite population growth.
Treatment Time/ Use Frequency	Treatment during **Population Increase, Population Peak, or Population Decrease**. Use annually when queens are available.
Time of Year	**Population Increase, Population Peak, or Population Decrease**
Registrant-reported Effectiveness	Long-term solution to reduce need for chemical controls. Works well when combined with other methods.
Conditions for Use	Works best with standard queen introduction methods.
Restrictions	Not always easy to introduce new queen into colony, especially when resources are not abundant. Late season queen replacement is often unsuccessful.
Advantages	Stocks selected for mite resistance or tolerance may reduce chemical miticide dependency.
Disadvantages	Cost of buying or rearing queens; requeening not always successful; overly hygienic stock can negatively impact colony growth; there can be variability in the mite resistance level of the colony; currently no standardization or labelling for "varroa-resistant" stock.
Considerations	Known stocks with some potential mite population reductions: Varroa Sensitive Hygiene (VSH), Russian bees, Hilo Bees, Purdue Mite-biters, Minnesota Hygienic, Pol-line bees, Carniolan bees, Buckfast bees, and some locally derived stocks.
Video	Watch our Requeening video: *http://bit.ly/controls-requeening*

	Robbing Screen  
Name	Robbing Screen
Technique	• Install robbing screens on hive entrances, especially for weaker colonies • Robbing screen will reduce robbing of hive, as robber bees fail to find entrance
Route of Exposure	Reducing robbing decreases chances for mite transmission
Treatment Time/ Use Frequency	Can be used any time. Particularly helpful when robbing is prevalent (i.e., in dearth) and when mite populations are highest.
Time of Year	**Population Increase, Population Peak, Population Decrease**
Effectiveness	Not a standalone treatment. Reduces incoming mite pressure to a hive, but does not reduce existing mite population in a hive.
Conditions for Use	Hive equipment must accommodate design of chosen robbing screen.
Restrictions	None, but may need to be removed for some miticide treatments.
Advantages	Generally inexpensive; reduces mite transmission passively; protects honey from robbing.
Disadvantages	Very strong hives could struggle with traffic or reduced airflow when screens are installed.
Considerations	Most effective if robbing screens are placed on hives with highest mites, but a better intervention is treating or removing these hives. In circumstances where this is impossible, e.g., a neighbor's untreated hive, a hive involved in an experiment, etc. this intervention can reduce varroa risk to other hives. Use on all hives in an apiary can keep mites in their original colony, reducing distribution of mites to all colonies.

Disclaimer

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Precaution and legal responsibility.

Any product mentioned in this document must be used in accordance with the directions on the label. The user assumes the risk to persons or property that arises from any use of the product in a way that is inconsistent with the label.

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ADDITIONAL RESOURCES

Please visit and provide varroa monitoring data to www.mitecheck.com

General information

To find your state pesticide regulator: https://npic.orst.edu/reg/state_agencies.html

To find your provincial or territorial pesticide regulator:

Advisory on the Applicability of FIFRA and FFDCA for Substances used to Control Varroa Mites in Beehives | US EPA, EPA-registered Pesticide Products Approved for Use Against Varroa Mites in Bee Hives | US EPA).

HBHC Hive Health BMPS.
https://honeybeehealthcoalition.org/resources/hive-health-best-management-practices/

Canadian BMPs for Honey Bee Health
https://honeycouncil.ca/wp-content/uploads/2016/12/BMP-manual-for-honey-bee-health-Feb-2017-English.pdf

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SAMPLING FOR VARROA TUTORIALS

www.extension.umn.edu/honeybees

https://extension.oregonstate.edu/video/sampling-varroa-mites

https://bee-health.extension.org/methods-for-varroa-sampling/

http://capabees.org/content/uploads/2013/02/varroathreshold.pdf

www.scientificbeekeeping.com

VARROA INFORMATION

Good general information on varroa mites *http://nodglobal.com/the-varroa-mite/*

From Vita infographic on *varroa www.vita-europe.com/gallery*

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MITICIDE RESISTANCE

Beltsville (Pettis) Test to Detect Varroa Mite Resistance to Apistan and Coumaphos: http://www.agf.gov.bc.ca/apiculture/factsheets/223_pettistest.htm

OTHER

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Other Resources

www.scientificbeekeeping.com

Bee Health App iTunes:
https://itunes.apple.com/ca/app/bee-health/id1005231410?mt=8

Bee Health App google Play:
https://play.google.com/store/apps/details?id=ca.ab.gov.beehealth&hl=en

Varroa Integrated Pest Management - Sampling & Control Tracking Worksheet

Inspection Date	Apiary	Colony #	# of Sampled colonies	Initial Sampling Results	Action/treatment taken	Treatment date applied	Treatment date completed	Follow-up Sampling Date	# of Sampled Colonies After Treatment Completed	Sampling Results After Treatment (was treatment effective?)	Notes (e.g., observations, batch number if chemical used, follow-up treatment if any, etc.)