

# Recommendations for Management of Honey Bee Pests in Alberta 2018-2019

**Dr. Medhat Nasr and Samantha Muirhead**

Pest Surveillance Section, Crop Research and Extension Branch  
Alberta Agriculture and Forestry

Crop Diversification Centre North  
17507 Fort Road N.W., Edmonton, AB T5Y 6H3

Phone: 780-415-2314 Fax: 780-422-6096

Email: [bee@gov.ab.ca](mailto:bee@gov.ab.ca); [medhat.nasr@gov.ab.ca](mailto:medhat.nasr@gov.ab.ca); [sam.muirhead@gov.ab.ca](mailto:sam.muirhead@gov.ab.ca)

## Table of Contents

A Check List of General Recommendations .....	3
American Foul Brood .....	5
European Foul Brood .....	8
Chalkbrood .....	8
Honey Bee Viruses .....	8
Acarosis (Honey Bee Tracheal Mite) .....	9
Varroasis (Varroa Mite) .....	10
Nosemosis (Nosema Disease) .....	11
Small Hive Beetle .....	17
Monitoring Honey Bee Pests and Diseases .....	18
Disclaimer .....	21

## A Checklist of General Recommendations

We know how challenging it can be keeping honey bees alive and healthy. But don't worry—we've got you covered. Below, you'll find a roundup of interesting tips and tidbits of beekeeping management practices. Happy reading!

- ✓ Use Best Management Practices (BMP) based on Biosecurity Standard Management and On Farm Food Safety Systems to prevent the occurrence and spread of honeybee pests and diseases in your beekeeping operation and produce quality honey to meet consumers' expectations.
- ✓ Use Integrated Pest Management (IPM) practices to control bee pests.
- ✓ Routinely check your bee colonies for pests and diseases. If you suspect that there is an unknown pest such as the small hive beetle or sudden kill of bees, please immediately report the finding to the Provincial Apiculturist.
- ✓ An accurate diagnosis is needed to determine the proper treatment for an infection or infestation.
- ✓ When appropriate, apply treatments and use only medications that have been registered for use in bee colonies. The use of non-registered medications or formulations in bee colonies is a violation of the law.
- ✓ The label always takes precedence over the recommendations.
- ✓ The user assumes responsibility for the possible misuse and mishandling of recommended products.
- ✓ Any application of medications must be in accordance with the registered product label as prescribed under the Pest Control Products Act and the Food and Drugs Act, Canada. For example: the Apivar label calls for applying 1 strip for every 5 frames covered with bees and to leave strips inside the hive for 42 days. If strips are repositioned to allow better access of bees to the strips; leave the strips for 14 more days before removal. Strips must be removed after a maximum of 56 days.
- ✓ Please don't leave applied miticide strips in bee colonies for over winter. This practice is against the label if application period exceeded the allowed treatment period and it could also encourage development of resistance.
- ✓ Dispose any used miticides according to the label. Disposing used miticide strips in the apiary is a violation of Alberta Environmental Code of Practice for Pesticides and the federal Pest Control Products (pesticides act and Regulations
- ✓ Resistance to applied miticides can occur in Varroa mites at any time. Check for resistance before deciding which miticide to use for Varroa control.
- ✓ Monitor Varroa level infestation levels in bee colonies before and after treatment. If you applied a miticide (for example, Apivar) and high levels of mites are found after treatment, contact the Provincial Apiculturist immediately for advice.

- ✓ Bayvarol is a miticide that is recently registered in Canada. This product is from the same family as Apistan and it can have cross resistance with Apistan. Therefore, please check for resistance and efficacy first before use.
- ✓ Beekeepers must be prepared for a change of policy regarding the use of antimicrobials (i.e. Oxytetracycline and Tylosin). The antimicrobials will be used in bee colonies only by prescription from a veterinarian starting December 1, 2018.
- ✓ Do not unnecessarily feed antibiotics to healthy colonies. Routine “prophylactic” use of antibiotics is not an acceptable practice.
- ✓ The use of Tylosin in spring will increase the risk of contaminating honey with antibiotic residues. Tylosin can only be used in bee colonies with an active infection of American Foul Brood (AFB).
- ✓ Always follow instructions as outlined on the Tylosin label. If you have to use Tylosin, it is preferred to use as a fall treatment.
- ✓ Finding residues of medications not registered for use in bee colonies or residues above a product MRL is a violation of the law and it will affect honey marketability.
- ✓ Do not feed your bees diets that might contain unknown ingredients as they can contaminate your honey.
- ✓ Do not extract honey from the brood chamber to reduce any risks of contaminating extracted honey with residues.
- ✓ Store antibiotics and pesticides appropriately. Any antibiotics and pesticides must be handled safely when used and disposed.
- ✓ Use records to track bee management practices including treatments and evaluate outcomes.
- ✓ To check on current labels for registered miticides, please check “Bee Health App” or Go to Pesticide Label Search- Health Canada <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>
- ✓ Use proper personnel protection equipment as recommended on the label when handling and applying miticides.
- ✓ Honey bees are vulnerable to many pesticides. Beekeepers and farmers must communicate to maintain a delicate balance between protecting crops while at the same time protecting honey bees from potentially harmful insecticides, fungicides and other pest control materials.
- ✓ In case of suspected honey bee pesticide kill, you may report an incident directly to Health Canada by calling the Pest Management Information Service at:  
**1- 800-267-6315 or 780-495-5042.**
- ✓ Always remember preparation for wintering bees always starts in spring time (**NOW**): Keep strong colonies through the year, requeen to ensure healthy young queens heading the colony, monitor diseases and pests, treat when necessary, ensure big population of winter bees going into winter, and don’t forget to feed enough for wintering bees in northern climates.

**CONTAMINATION OF HONEY IS A SERIOUS PROBLEM  
FACING THE BEEKEEPING INDUSTRY. IT IS THE RESPONSIBILITY OF THE BEEKEEPER  
TO ENSURE THAT THEIR HONEY MEETS FOOD SAFETY STANDARDS.**

## **American Foulbrood (AFB)**

AFB is a bacterial disease caused by *Paenibacillus larvae larvae*. It is the most widespread and destructive of the honey bee brood diseases. It afflicts queen, drone, and worker larvae alike. An infection with AFB must be reported to the Provincial Apiculturist.

## **Preventative Measures**

### **To maintain healthy colonies without any use of antimicrobials:**

- Requeen colonies with new queens preferably from hygienic bred stocks.
- Replace 3-4 combs in the brood chamber every year with new drawn comb from honey supers or use new foundation comb. It is highly recommended to replace old brood comb to reduce the accumulation of pathogens and residues of chemicals used in bee hives. Thus, the risks of re-infection rates with various pathogens or exposure to sub-lethal doses of pesticide residues of bees and their developing stages will be significantly reduced. Replacing combs will also reduce the risk of contaminating extracted honey with accumulated chemical residues in combs.
- Disinfect dead outs and empty used hive boxes (no bees) using Electron Beam or Gamma Irradiation. For preparing equipment for irradiation, place each hive box with frames in a plastic bag, then, place in a cardboard box to reduce the risk of getting the irradiation line dirty with spilled honey. For more details, please contact the irradiation facility

### **Contact information:**

#### **IOTRON TECHNOLOGIES IN.**

1425 Kebet Way  
Port Coquitlam, BC,  
Canada V3C 6L3

Phone: 604-945-8838 Fax: 604-945-8827

Email: [iotron@iotron.com](mailto:iotron@iotron.com)

For more information go to: <http://www.iotron.com>

- Decontaminate empty hive boxes (no bees and no frames), bottom boards and inner covers using one of the following options:
  - Scorching
  - Washing with high pressure water
  - Using Virkon (Disinfectant sold at veterinarian drug stores), follow the instructions on the label. Then, rinse with water.
  - Dipping in hot wax

### **AFB Treatment with Antimicrobials Options:**

Starting December 1, 2018 antimicrobials will be used in bee colonies only by prescription from a veterinarian. Based on risks and finding the AFB, a Veterinarian may prescribe antibiotics for prevention or treatment to treat and reduce risks of spreading throughout the operation or other operations treatment.

**Time of application:** Spring and fall

**Oxy-Tetracycline** One of the following formulations can be used according to the label:

- 25-S in powdered (icing) sugar mix
- OxySOL-62.5
- Foul Brood Mix

**Note: Oxy-Tetracycline sugar syrup mix** -This formulation has a very short half-life. Therefore, it does not work effectively in some cases.

***Preparation and use of Oxy Tetracycline -25-S (D.I.N. 02231111) or OxySOL 62.5 (D.I.N.00560189) in icing sugar mix:***

- Mix Oxy-Tetracycline-25 S or OxySOL-62.5 with powdered sugar according to the label. Wear gloves and mask during mixing to avoid any exposure to antibiotics.
- Apply the proper dose of the powdered sugar antibiotic mix on the frame rests of the bottom brood chamber.
- Apply 28 grams (approximately two tablespoons) per colony.
- Repeat 3 times at 4-5 day intervals.
- For spring application, stop treating 4 weeks before the main honey flow.
- For fall application, apply the powdered sugar mix after removal of honey supers as described in spring application. Make sure that the recommended dosages of Oxy-Tet are applied 3 times. Resistance can develop faster if the full treatment is not applied.
- For more information, please check the label of Oxy Tetracycline -25-S (D.I.N. 02231111) or OxySOL 62.5 (D.I.N.00560189) label

***Preparation and use of Foul Brood Mix (D.I.N. 02231110):***

- Apply 18 grams (approximately 1.3 tablespoons) of Foul Brood Mix per colony on the frame rests.
- Repeat 3 times at 4-5 day intervals in spring and fall as described above. For more information, please check the label

***Preparation and use of Tylan Soluble 100 GM (Tylosin Tartrate) (DIN 00103616):***

For details about product use and preparation, check the label. Tylan Soluble should be used only in honey bee colonies showing active signs of American Foulbrood disease. It is highly recommended to use Tylosin only in the fall to reduce risks of containing honey with residues that could last for a long time. Beekeepers are encouraged to contact the Provincial Apiculturist for more information.

**Note:**

At any time when honey bee colonies show symptoms of active AFB (i.e. perforated capped cells, brown scales and sticky to ropy dead larvae or pupae) action must be taken immediately for proper diagnoses and treatment. Additional steps should be taken after treatment as described above to stop further reinfection and spread of AFB infection throughout the beekeeping operation. Antibiotics are not allowed for use in bee colonies during honey flow. Follow the instructions on the label regarding the withdrawn period of antibiotics before the honey flow starts. If colonies are treated with antibiotics during honey flow, do not extract any honey from those treated colonies.

## **Recommended actions based on infection levels:**

### **Bee colonies with heavy AFB infection:**

Inspection and proper diagnoses of brood combs must be done. AFB infected brood combs show that many capped brood cells are perforated, sunken or discolored. Brood combs have cells that contain AFB scales and decaying pupae.

### **Recommended actions are as follows:**

- Burn bees, all frames, and bottom boards of heavily infected hives or irradiate infected hives after burning all bees. Honey should not be extracted from these heavily infected bee hives. Any extraction of these combs will contaminate the extraction line. All combs run through the infected extraction system will be infected with AFB spores. Thus, bee colonies in the beekeeping operation will be at high risk of re-infection with AFB and the disease will spread throughout the operation.
- Disinfect empty hive boxes, inner covers and lids as described above.
- Send a sample of AFB infected combs to a specialist or the Provincial Apiculturist office to test for Oxytetracycline resistance.
- Use antimicrobial treatments as described above to stop re-infection of bee colonies and the spread of AFB throughout your operation after consultation with a veterinarian and reporting to the Provincial Apiculturist.

### **Bee colonies with clinical symptoms of AFB:**

Inspection and proper diagnoses of brood combs must be done. Inspection of infected brood combs with clinical symptoms show that a few capped cells are perforated, sunken or discolored in one or two frames. A few brood cells contain decaying pupae from AFB infection.

### **Recommended actions are as follows:**

#### **Option 1. Shaking method:**

- Shake all bees onto frames fitted with strips of wax foundation (1") in disinfected or new hive boxes.
- Don't feed the bees at this time to allow the bees to digest the honey contaminated with AFB spores in their stomach.
- After 3-4 days, shake the bees again onto frames with full size foundation in a disinfected hive box or new hive box. If the nectar flow is scarce, feed the bees after shaking them onto the frames with foundation.
- Burn all infected combs and decontaminate empty hive boxes, inner covers and lids as described above.
- Melt down combs used in the first shake.

In most cases the above described action will control the AFB in infected colonies.

#### **Option 2. Use antimicrobial measures:**

Use antimicrobial treatments as described above to stop re-infection of bee colonies and the spread of AFB throughout your operation after consultation with a veterinarian and reporting to the Provincial Apiculturist

### **Bee colonies with very light clinical symptoms:**

Inspection of brood combs show that very few (1-2) capped cells are perforated, sunken or discolored in one or two frames. Very few brood cells contain decaying pupae from AFB infection.

**Recommended actions are as follows:**

- Burn all infected combs, and replace them with foundation. Treat with oxy-tetracycline as described above.
- Use the shaking method to achieve better results in treating infected colonies
- Use antimicrobial treatments after consultation with a veterinarian or the Provincial Apiculturist as described above to stop re-infection of bee colonies and the spread of AFB throughout your operation.

**Bee colonies with AFB persistent symptoms:**

If inspection of brood combs shows persistent symptoms of AFB, preventative and treatment actions did not cure the problem. Take a sample of infected cells and submit to the Provincial Apiculturist. A test for Oxy-tet resistance will be performed on AFB infected cells. If AFB is resistant to Oxy-Tet, treatment methods recommended for heavy infestation should be immediately employed including using Tylosin. For more information, contact the Provincial Apiculturist office.

**European Foulbrood (EFB)**

EFB is a bacterial brood disease caused by *Streptococcus pluton*. This disease is considered a stress disease and it is most prevalent in spring and early summer. If the infection is very low, the visible disease symptoms might disappear as bee colonies become stronger during the season.

**Time of Treatment:** Spring and fall

**Methods of Treatment:** Same as described above for AFB. In most cases methods used for AFB are sufficient for EFB treatment.

**Chalkbrood**

Chalkbrood is a fungal brood disease of honey bees caused by *Ascosphaera apis*. Worker, drone, and queen larvae are mummified and can be found throughout the brood-rearing season. It is more prevalent in cold spring and early summer.

**Time of Treatment:** Spring and fall

**Methods of Treatment:** There is no registered chemical treatment.

**Recommended actions are as follows:**

- Maintain strong healthy colonies.
- Replace heavily infected combs with new combs.
- Provide good ventilation for bees.
- Requeen with new or **Hygienic queens**.

## Honey Bee Viruses

Honey bee viruses include Acute Bee Paralysis Virus (ABPV) or (APV), Israel Acute Paralysis Virus (IAPV), Kashmir Bee Virus (KBV), Chronic Bee Paralysis (CBPV), Cloudy Wing Virus (CWV), and Deformed Wing Virus (DWV). Some of these viruses are associated with Varroa mites and colony collapse disorder. Honey bees infected with viruses generally fail to fly, appear lethargic and often crawl on the ground. Bees often have bloated abdomens and discolored deformed wings. Infected colonies may suddenly collapse.

**Time of Treatment:** Spring and fall

**Methods of Treatment:** There is no registered chemical treatment. **Recommendations are as follows:**

- Maintain strong healthy colonies.
- Control Varroa mites and Nosema.
- Disinfect combs of dead-outs.
- Requeen with new or **Hygienic queens**.

## Sacbrood

Sacbrood is a viral brood disease. It may appear at any time during the brood-rearing season. Scattered brood cells are infected and contain dead brood. Their cappings are dark and may be punctured. The larva-prepupa dies from the virus. When it does, the head end turns up, stays pointed like the end of a canoe. The pearly white color of the prepupa darkens and the skin becomes tough. At this stage, the infected prepupa resembles a liquid-filled sac. Sacbrood does not usually cause severe losses.

**Time of Treatment:** Spring and fall

**Methods of Treatment:** There is no registered chemical treatment.

**Recommendations are as follows:**

- Maintain strong healthy colonies.
- Requeen with new or **Hygienic queens**.
- Replace heavily infected combs with new combs.

## Black Queen Cell Virus (BQCV)

BQCV is a viral disease. It infects developing queen larvae and causes them to turn black and die. It is thought to be associated with Nosema.

**Time of Treatment:** Spring and fall

**Methods of Treatment:** There is no registered chemical treatment.

**Recommended actions are as follows:**

- Control Varroa mites and Nosema.
- Disinfect combs of dead-outs and use new disinfected materials for queen rearing.
- Requeen with new or **Hygienic queens**.
- Disinfect all materials used for queen rearing such as queen cups, grafting tools, and bars.

## **Acarosis (Honey Bee Tracheal Mite) (HBTM)**

Acarosis is caused by the Honey Bee Tracheal Mite, *Acarapis woodi*. It infects worker, drone and queen honey bees, and can be serious if not treated.

**Time of Treatment:** Spring and early summer

Monitor tracheal mites in bee colonies in early spring and early fall as described in the section “Monitoring Honey Bee Pests and Diseases Guidelines” on page 14. If infestation levels are equal to or greater than 10%, treat your colonies. If you are using formic acid for Varroa treatment you will not need further treatment for HBTM.

### **Methods of Treatment:**

**Spring recommendations are as follows:**

#### **65% Formic acid:**

- Liquid formic acid can be used according to the Formic Acid 65% label.

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

Consult with the Provincial Apiculturist for application details.

#### **Mite Away Quick Strip (MAQS):**

MAQS are a 7-day, single application mite control product registered for use against Varroa and HBTMs. Pre-Harvest Interval: Zero Days.

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

#### **MiteGone:**

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

#### **Use HBTM Resistant Queens:**

- Requeen your colonies with queens from known honey bee tracheal mite resistant stocks once every two years.

#### **Fall recommendations are as follows:**

- If you treated with formic acid in the spring, it will not be necessary to treat again in the fall, unless the HBTM infestation level in samples is equal or more than 10%.
- Fall treatment should start as early as possible to protect winter bees from mites and before temperatures become too low for formic acid to be effective.
- Treat with **Formic acid** as described in spring treatment.

## **Varroasis (Varroa Mite)**

Varroasis is caused by the Asiatic Varroa mite, *Varroa destructor*. Varroa can be seen with the naked eye and appears as a small red or brown spot on the bee's thorax. Varroa reproduce on honey bee pupae and feed on bee hemolymph. Varroa are also known to carry and vector bee viruses that are particularly damaging to the bees. Varroa infestations can cause irreversible damage to honey bees which can lead to honey bee colony losses.

## **Treatments differ for Varroa mite in spring and fall, please see below information**

**Time of Treatment:** Spring and early summer

Varroa populations should be monitored at least 2-3 times in spring and early summer. There are two instances in which treatment is recommended: When a sample of 300 bees taken from brood combs and washed using the Varroa Hand Shaker has an infection rate equal to or greater than 3% (3 mites/100 bees). Or when the average natural mite drop on a sticky board (12x16") left in the hive for 3 days is equal to or greater than 10 mites/day. For more details, check "Monitoring Honey Bee Pests and Diseases Guidelines" on page 13.

Resistance to Apistan® and Checkmite+® is quite widespread throughout Alberta. Therefore, Varroa resistance to Apistan® and Checkmite+ should be tested to determine their efficacy before using.

To test for resistance, Please use the Pettis test as described:  
<http://www.nationalbeeunit.com/downloadDocument.cfm?id=195>

### **Methods of Treatments:**

#### **Chemical recommendations are as follows:**

##### **Apivar®:**

Apivar is effective against typical Varroa mites as well as Apistan and Checkmite+ resistant Varroa mites. Follow instructions on the label.

##### **Directions for Use:**

To control Varroa mites, remove honey supers before application of Apivar. Use 1 Apivar strip per every 5 full frames of bees in the brood chamber (maximum of 2 per brood chamber). Separate the double strip and hang each strip between two comb frames inside the brood area or the bee cluster, with a minimum distance of 2 frames between strips. Suspend Apivar® strips in the brood chamber in such a way that the bees can walk on both sides of the strips. Leave strips inside the hive for 42 days before removing. In case of movement inside the beehive far from the strips, a repositioning of the strips should be done to place them in the bee cluster. After repositioning the strips, leave the strips for 14 more days before removal. Strips must be removed after a maximum of 56 days. DO NOT re-use the strips. Strips should be removed from bee hives 14 days before the honey flow.

##### **Note:**

Always ensure placing the strips where bees are found. Placing strips in the top box where bees are not active or found will not help in the treatment of mites as bees must actively walk on the Apivar strips before acquiring the active ingredient that kills the Varroa mites.

### **Bayvarol beehive pest control strip:**

Bayvarol is newly registered by PMRA for use in bee hives for the control of Varroa mites. The active ingredient is Fulmethrin, which is a pyrethroid product. It is from the same group of insecticides (Group 3) as Fluvalinate that is used in Apistan. Therefore, beekeepers must consider testing for resistance to Apistan before using Bayvarol to ensure that mite population is sensitive to applied product and bayvarol is an effective treatment.

To test for resistance, Please use the Pettis test as described:

<http://www.nationalbeeunit.com/downloadDocument.cfm?id=195>

It is recommended that a developed colony receives a maximum of four strips per brood chamber. Nuclei and young colonies and newly collected swarms receive two strips. Strips are not to be used during honey flow periods. Remove Bayvarol Strips from the colonies after a six week (42-day) treatment period.

### **65% Formic acid:**

Please check the following links for instructions for various options for application of 65% formic acid: <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

Consult with the Provincial Apiculturist for application details.

### **Mite Away Quick Strip (MAQS):**

MAQS is a 7-day, single application mite control product registered for use against Varroa and HBTM. Pre-Harvest Interval: Zero Days. For the label and guidelines, please check the following website: <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

### **MiteGone:**

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

### **Oxalic Acid:**

Apply dripped or sublimated oxalic acid according to the label.

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

### **Thymovar:**

Thymovar is registered for use to control Varroa mites. Use according to the labels' instructions.

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

### **Checkmite+® Strips:**

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

Test for resistance before application and consult with the Provincial Apiculturist.

### **Apistan® Strips:**

For the label and guidelines, please check the following website:

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

Test for resistance before application and consult with the Provincial Apiculturist before use.

### **PEST MANAGEMENT REGISTERED MITICIDES LABELS CAN BE ACCESSED THROUGH “BEE HEATH” APP OR SEARCHING THE FOLLOWING WEBSITE:**

<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

### **Important note:**

Monitor the Varroa population before and after treatments to determine if your treatment was successful. Mite levels should be below the economic threshold (less than 3% in a washed sample of 300 bees using the Varroa Hand Shaker or less than 10 mites/day of natural mite drop on a sticky board (12" x 16") to keep healthy colonies. Honey bees going to winter must have less than 1% Varroa infestation (i.e. 2-3 mites per 300 washed bees or less than 3 dropped mites per day on sticky boards). Please consult with the Provincial Apiculturist if you have a question on control options for Varroa or would like an update on registered miticides.

### **Alternative Cultural and Genetic Options:**

Beekeepers are recommended to use cultural and genetic management practices to suppress the development of Varroa populations in bee colonies. The following options are suggested for use when the Integrated Pest Management (IPM) strategy for Varroa control is implemented.

### **Requeen colonies with resistant stock:**

Requeen your colonies with queens from hygienic genetic stock, Varroa Sensitive Hygiene (VSH), or Russian bees that are known for Varroa tolerance.

### **Trapping Varroa in drone brood:**

Drone brood removal is an effective method to trap adult and immature developing mites in bee colonies. The following instructions describe the process of implementing this method in a beekeeping operation:

- Place two empty plastic drone combs or two empty frames with a 1" piece of foundation fixed to the top bar or place two shallow frames in the standard brood box of bee colonies during the drone rearing season in spring and summer.
- Leave the drone combs in the hive for 3 weeks. Bees will draw drone cells on the drone foundation, on the 1" foundation strip fixed on the top bar, or on the bottom bar of the shallow frame. Using plastic drone foundation will save the bees a lot of time and energy. The plastic foundation can be recycled. The queen will lay eggs and Varroa will move into the drone brood, their preferred host, before bees cap the cells.

- After 3 weeks, remove these drone brood combs. Drone brood cells will be capped containing Varroa mites and their developing offspring.
- Destroy the capped drone brood to kill all of the developing varroa mites. Wax drone combs can be melted. If you want to recycle drone combs, kill capped brood by scratching all capped cells and placing the combs back in the hive. Bees will then clean up all of the damaged brood and Varroa offspring. Beekeepers can also freeze capped drone brood combs for one week, when this is complete, place combs back into bee colonies for the bees to clean and reuse.
- Repeat this method 2-3 times in spring-early summer.

**Warning:** Don't leave the drone brood for more than 24 days in the hives. Drones will emerge with mites and consequently the mite populations will increase in the colony. Timing of removing capped drone brood is vital for trapping and removing mites from infested colonies.

### **Screened Bottom Boards:**

Screened bottom boards with 8 mesh screens can be placed onto bottom boards of bee hives. Some research results have shown that this method could reduce mites by 0- 30%. In cold climates, the buildup of bee colonies could slow when screen bottom boards are used. However, some models are modified to reduce the drift of cold air into the hives and minimize the negative impact on brood production.

**Time of Treatment:** Late summer and early fall

Monitor Varroa populations as early as mid-August. Monitoring should be done 2-3 times, once every 10-15 days. If Varroa infestation levels are equal to or greater than 3 mites/100 bees (3%) after washing 300 housekeeping bees from the brood area using the Varroa Hand Shaker or 10 mites/24 h/sticky board, treatment should be immediately deployed. If Varroa levels are EXTREMELY HIGH, remove honey supers immediately for treatment. Waiting until honey harvest is completed will allow Varroa population to build up and cause irreversible damage to winter bees. Consequently, high losses of bee colonies will be expected.

**Fall recommendations are as follows:**

#### **Apivar®:**

- Follow instructions on the label. Make sure that strips are placed in the bottom brood box where most of the bees and brood are located at this time of the year.

#### **65% Formic Acid:**

- Use as described above

#### **Bayvarol:**

- Use as described above
- 

#### **Thymovar:**

- Use as described above

#### **Oxalic Acid:**

- Apply dripped or sublimated oxalic acid according to the label. Oxalic acid sublimation can be the last resort when other treatments fail. The best time for treatment is when temperatures are below 10 °C and there is no brood present. The efficacy of oxalic acid

sublimation can be up to 95% when brood is not present in bee colonies and the treatment is done properly.

**Checkmite+®:**

- Follow instructions on the label. Test for resistance before application.

**Apistan®:**

- Follow instructions on the label. Test for resistance before application.

**Important note:** Monitor the Varroa mite populations before and after treatment to determine if your treatment was successful. Mite levels should be below 3% in a washed sample of 300 bees or less than 10 mites/day of natural mite drop on a sticky board (12" x 16") in wintering bees.

**Nosemosis (Nosema Disease)**

Nosemosis is caused by *Nosema apis* and *Nosema ceranae*. It is a microsporidian fungal disease that infects the intestinal tract of adult bees. Nosema can cause detrimental effects on honey bees, colony development, queen performance, and honey production.

**Time of Treatment:** Spring

Nosema infection levels should be monitored in the spring. The total number of spores in a sample of 30-50 old foraging bees from honey combs or inner cover can be used to determine the average number of spores per bee per colony. If the average number of spores exceeds 1 million/bee, bee colonies should be treated with Fumagillin.

**Methods of Treatment:**

**Spring recommendations are as follows:**

**Fumagillin-B (D.I.N 02231180) in (1 sugar:1 water) sugar syrup:**

- If bees continue to have more than 1 million spores per bee in the spring, feed one gallon of Fumagillin medicated sugar syrup to each colony.
- When you prepare the mix, make sure you use the concentration of Fumagillin that is recommended on the label.
- Protect your Fumagillin medicated sugar syrup from direct sunlight when feeding bees. Fumagillin decays within hours when exposed to light.

**Recommendation for heavily infected colonies that will not take in syrup:**

- Prepare 50% sugar syrup and mix 2 g of fumagillin per one liter of syrup.
- Spray directly onto the bees (200-400 ml/hive) based on population size.
- Medicated syrup can be applied 4 times per hive at 10 day intervals.

**Note:** Feeding Fumagillin to bees in powdered sugar mix or pollen patties is not as effective as feeding Fumagillin in sugar syrup.

**Late spring and summer recommendations are as follows:**

**Requeen** colonies when queens are available.

**Disinfect dead outs and hive boxes with frames using one of the following options:**

- **Using Electron beam or Gamma irradiation:**  
Disinfect dead outs and contaminated combs and empty hives (no bees) using irradiation. For more information check the AFB section.
  
- **Disinfect dead out bee hives using acetic acid:**  
Use acetic acid to fumigate dead outs to kill Nosema spores before reusing boxes in the field. For more information check:  
[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/aqdex11780](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/aqdex11780)

**Fall recommendations are as follows:**

**Fumagillin-B (D.I.N 02231180) in (2 sugar:1 water) sugar syrup:**

- Feed bees 2 gallons of Fumagillin medicated sugar syrup/colony according to the label's instructions.
- Follow the same steps in preparing and feeding the Fumagillin medicated sugar syrup as described in spring treatment.

Australian beekeepers use management practices to minimize the incidence of nosema. Chemical treatments for control of nosema are not registered in Australia for use in honey production beehives. Use of any such treatment is illegal and could result in unacceptable residues in extracted honey.

**Management practices**

- Maintain colonies with young queens with good egg-laying potential
- Colonies prepared for winter should have a good population of young healthy bees and minimal or no Varroa mite infestation
- Ensure colonies prepared for winter have good supplies of stored honey/ sugar syrup.
- Place the bee colonies in a sunny position. Choose apiary sites that have good air drainage and protection from cold winds.
- Wrap outdoor wintered bee colonies to keep warm and protected through winter months or place indoor facilities with controlled temperature and ventilation.
- Avoid colony stress which can be caused by excessive opening of the hive, manipulation of combs, feeding and relocating colonies
- Replace old, dark brood combs to lower the number of spores in the hive and reinfestation of bees.

Irradiate combs or fumigate with Acetic acid to reduce nosema spores contaminating combs before reuse.

## Small Hive Beetle

The Small Hive Beetle (SHB) is an invasive species of North America. Soon after, beetles travelled into Canada across the US border via Ontario and Quebec. In 2016, SHB was also detected in the Fraser Valley of British Columbia. It was also introduced to Alberta Peace River with bees moved from Ontario.

### Management and Treatment:

#### Honey House

- Extract harvested honey combs within 1-2 days
- Check honey combs for damage caused by SHB before extraction
  - Damaged combs SHOULD NOT be extracted
- Return brood combs brought to the honey house immediately back to the field or store at  $\leq 10^{\circ}\text{C}$  for 24-48hrs before doing so
- Store any comb suspected of SHB infestation at  $\leq 10^{\circ}\text{C}$  for 24-48hrs or in the hot room with good circulation and  $< 50\%$  humidity to kill all SHB stages
- Use a queen pheromone lure in a nuc box to collect flying SHB and depopulate them (can be done by washing in soapy water)
- Melt wax cappings each night or store them in tight drums in a cold room ( $\leq 10^{\circ}\text{C}$ )
- Clean the honey house immediately after every extraction

#### Field

- Keep colonies queen-right, strong and healthy
- Get rid of weak colonies at any time through the season to reduce potential infestation sites
- Remove all dead colonies immediately (check for infestation and store in a cold room)
- Use caution when combining colonies or exchanging combs
- Use queen excluders to prevent bringing brood frames to the honey house
- Unused equipment should be stored in a cold room ( $\leq 10^{\circ}\text{C}$ )
- Avoid throwing burr comb and broken comb in the bee yard. It should be stored in the cold room until melting
- For pollen collection, harvest more often and store in a cold room for 24-48hrs
- Clean all equipment and vehicles so SHB can't use debris to pupate.
- Consider using a dry pollen supplement instead of patties
- Only buy bees/equipment from SHB-free apiaries
- If there is an infestation, use SHB traps such as beetle blaster traps

### Chemical Controls:

Chemical treatment should only be used in the event of an uncontrollable infestation and be aware that currently registered products have limited efficacy.

- Checkmite+<sup>®</sup>: Use for treatment inside the hive using a one-sided corrugated trap for application
- Permanone<sup>®</sup> (10%EC – permethrin): Use for drenching soil around the hive to kill SHB pupae

## **Monitoring Honey Bee Pests and Diseases**

### **Honey Bee Tracheal mites (HBTM):**

Samples should be collected in the early spring or early fall so that tracheal mites can be monitored, this will determine the efficacy of your treatment. For example, if you treat in the spring, samples should be collected in the fall and vice versa.

### **Methods for Monitoring HBTM:**

#### **Individual bee colony samples:**

Collect 50-75 bees per hive from honey combs or the inner cover. Place collected bees in a jar containing 70% alcohol. From each apiary, collect samples from 6 hives. In each operation collect samples from 5-10 apiaries. Then, dissect 30 to 50 bees per colony. Check the infestation levels to determine the average mite prevalence. If the average tracheal mite infestation level is 10% or more, treatment should be applied as previously described.

#### **Composite bee sample representing an apiary:**

Collect 5 -10 bees from honey combs or the inner cover from each hive in an apiary of 25 - 40 colonies. Place collected bees in a jar containing 70% alcohol. Collect composite samples from 5-10 apiaries. Dissect only 150 bees / apiary and examine the tracheae for the presence of tracheal mites. If the average tracheal mite infestation level is 10% or more per apiary, treatment should be applied as previously described.

### **Varroa mites:**

Monitor for mites in 6 colonies per apiary, in 4 -10 apiaries per operation, at least 2-3 times in spring and in fall. If you would like to improve accuracy, increase the sample size of monitored colonies and apiaries.

It is crucial to monitor Varroa infestation levels so as to make treatment decisions at the appropriate time and ensure the protection of bees from the irreversible damage. It is also important to monitor before and after treatments to determine the efficacy of applied treatments. If the infestation level using the washing method is less than 3% or the average natural mite fall is less than 10 mites/ day, you have good control. If the average mite infestation is higher than 3% in washed bee samples or 10 mites/ day as natural drop on sticky boards, action must be taken before colonies collapse.

### **Methods for monitoring Varroa mites:**

#### **Varroa Hand Shaker:**

This is a simple fast reliable method to monitor Varroa populations in the field. Follow these steps:

- Collect approximately 300 worker bees (1/3 cup) from brood frames into a sample jar that contains (up to half of the jar) winter windshield washing fluid, or 70% alcohol. 300 dead bees will fill about 1 inch (25 mm) in the bottom of the jar.
- Screw the sample jar onto the hand shaker and then shake the Varroa hand shaker vigorously up, down and sideways for 40-60 sec.
- Turn the jar with the bees upside down to keep the bees on the top of the screen allowing the mites in the liquid to pass through into the bottom jar.
- Check and count the number of mites collected in the fluid in the bottom jar.

- To determine the percent infestation, use the following equation: multiply the number of counted mites by (1.3). This will give you the corrected number of mites. Then divide the corrected number of mites by 3. For example, assuming that you collected 300 bees, and counted 7 mites in the bottom jar, the total number of mites is equal to  $7 \times 1.3 = 9$ . The percentage infestation is equal to  $9 \text{ divide by } 3 = 3\%$ .

**Note:** At the beginning of testing it is recommended to count the number of bees in 5 samples to standardize the method. 300 bees are required to results that accurately determine the prevalence of mites in bee colonies.

#### **Natural mite drop on a sticky trap:**

This is also a reliable method to monitor Varroa mite populations.

- Make sticky traps (12x16") using sticky materials (e.g. Tanglefoot) or a mixture of 50% Vaseline and 50% Crisco shortening.
- Cover the sticky trap with 8x8-mesh screen and place the sticky trap with screen on the bottom board of the bee hive, or place the sticky trap without a screen in the drawer of the screen bottom board fitted under a bee hive.
- Leave the sticky trap for 3 days to collect naturally dropped mites from the bee cluster.
- Remove the sticky trap and examine the trap for natural mite drop. Count the mites and calculate how many mites dropped per day.

**Note:** Leaving the sticky trap for 3 days (72 hours) gives more accurate results. Sticky traps left for more than 3 days in the hives will collect more debris and will make it harder to find and count dead mites.

#### **Nosema:**

There are two species of Nosema in Alberta, *Nosema apis* and *Nosema ceranae*. It is hard to distinguish between the spores of each species using microscopic examination. A specific genomic test is required for verifying what species of Nosema is in your operation. It is not necessary to distinguish between Nosema species to make treatment decisions. Fumagillin is effective on both species of Nosema.

#### **Monitoring Nosema Spores:**

To monitor *N. apis*, follow this procedure:

- Collect 30 - 50 bees / hive in the spring and fall from honey combs or bees on the inner cover.
- Homogenize the abdomens of 30 bees in 15 ml of water.
- Examine microscopically and count Nosema spores in 5 squares using a hemocytometer (Read Hemocytometer instructions before use).
- Calculate number of spores per bee by multiplying the total number of counted spores in the 5 squares by 25,000.
- If the number of spores calculated exceeds 1 million / bee, colonies should be treated with Fumagillin.

## **Small Hive Beetle:**

### **Detection:**

- Regular inspection of hives is essential in detecting a SHB infestation. Visual inspection, especially in the early stages of infestation can be very difficult, as beetles hide from bees in cracks of the hive.
- SHB will flee from direct sunlight as soon as a hive is opened. Therefore, it is important once a hive is opened to watch for beetles running along the top bars of frames and across the inner cover. After opening the top, if beetles are present, they will move down through the hive.
- A beekeeper can tilt the entire colony to expose the bottom board and look for adult beetles.
- Adult SHB can also be detected by placing corrugated plastic or cardboard on the bottom board to be checked after 24-48hrs. Beetles will hide in the tunnels of the cardboard or plastic to escape sunlight and honey bees.
- Beetle blaster traps can be used for diagnoses and treatment if needed.

## Disclaimer

1. The Recommendations for Management of Honey Bee Diseases and Parasites in 2017 are provided only as a guide for educational purposes. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used.
2. The label always takes precedence over the recommendations found in this publication.
3. The information given in the recommendations is supplied with the understanding that no discrimination is intended and no endorsement or exclusion of any registered products by the Apiculture Program, Alberta Agriculture and Rural development are implied.
4. The chemical recommendations are consistent with current federal and provincial pesticide regulations and labeling as of the date of publication. Use of common, trade or brand names in this publication is for clarity and information; it does not imply, nor does it guarantee or warrant the standard of the product or effectiveness of the product. Revisions in labels can occur at any time.
5. Due to constantly changing labels and product registration, some of the recommendations given in this writing may no longer be legal by the time you read them. If any information in these recommendations disagrees with the label, the recommendation must be disregarded.
6. To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Always read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide.
7. The Pest Management Regulatory Agency (PMRA) is the federal agency that is responsible for the regulation of pest control products in Canada. As the federal authority under the *Pest Control Products Act* (PCPA), the PMRA enforces compliance with the PCPA.

**If you have any questions,  
Please Contact the Provincial Apiculturist**



**Contact the Provincial  
Apiculturist office if you  
suspect any findings of  
Small Hive Beetles  
in your operation**