New Zealand Training Guide

Educators Guide

Produced by NOD Apiary Products Ltd.

Mite Away® QuickStrips

we love bees!

July 21, 2014
Revision No. 2

Table of Contents

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The Goal of this Training Guide

Most beekeepers are not familiar with fumigation products to control mites on honey bees. This training guide is a quick-reference tool to assist beekeepers and distributors through the learning curve to a successful, sustainable mite control program using MAQS® technology.

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Company Background

NOD Apiary Products Ltd. is a Canadian company formed in 1997 by beekeepers in Canada. Honeybee health is our focus. NOD has been awarded the Premier's Award for Agri-Food Innovation Excellence, 2006, Innovation Project of the Year, 2008 and Agri Business of the Year, 2011.




The founders of NOD saw formic acid as the active ingredient most likely to be able to be developed into a practical, sustainable miticide for the beekeeping industry. Properly formulated, it could control the varroa and tracheal mites, protect the image of honey as a wholesome food, and leave no residues in honey, wax, or the hive components.

NOD's formic acid applications and other beekeeping products have been available in the US and Canadian markets since 2005. Since 2008 NOD has been working towards registering their formic gel strips, MAQS, in Europe. In February 2013, NOD gained VMD Marketing Authorization for MAQS in the United Kingdom. NOD is currently working towards gaining Mutual Recognition in a series of countries within the European Union. On March 13, 2014. Mite Away Quick Strips® received registration in New Zealand for beekeepers' use. Mite Away Quick Strips® has received approval by EPA (HSR100672) as well as the MPI, ACVM Group (P008556).

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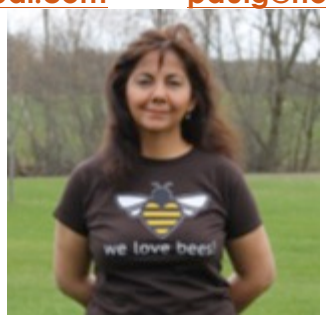

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Product Information

Mite Away Quick Strips® (MAQS®)

MAQS® is a formic acid polysaccharide gel strip wrapped in a vapour releasing wick, developed for the treatment and control of Varroosis caused by the *Varroa destructor* in honeybees (*Apis mellifera*).

The strips are placed in the brood rearing zone of a honeybee hive. What differentiates MAQS from other miticides/ vet medicines is that it causes the mortality/infertility of the varroa mite where it reproduces, under the brood cap.

The backbone of this easy-to-use strip is a film made of BASF's biodegradable plastic ecoflex®, a key component of the wick which surrounds the formic acid and saccharide (plant sugar) formulation. The ecoflex® and the bees control the release of the formic vapours into the hive, causing mortality to all life stages of both the female and the male varroa mite.

By combining BASF's ecoflex® product with NOD Apiary Product's mite control technologies the companies have not only created a convenient solution but by using formic acid as the active are also harnessing a defense mechanism observed in nature.

Key Features:

- ✓ Single application 7-day treatment that can be used almost anytime during the season
- ✓ Honey super(s) may be on the hives during treatment
- ✓ Temperature high on day of application: 10 to 29.5°C
- ✓ A vapour release technology that works with the bees: fully open entrance required

- ✓ Spent strips can remain in the hive until removed by the bees or the beekeeper
- ✓ Remnants of the strips can be disposed of by composting

Mite Away Quick Strips® Registered Label

10 Dose Label:
http://www.nodglobal.com/uploads/1/4/3/7/14371138/nz_10_dose_full_set.pdf

24 Dose Label:

http://www.nodglobal.com/uploads/1/4/3/7/14371138/nz_24_dose_full_set.pdf

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Understanding the Varroa Mite

Varroosis definition: Weakening of individual honey bees, the brood, and the honey bee colony due to parasitization by Varroa destructor, which amplifies viral affects. Typically leads to the death of the colony.

Why Formic Acid

The founders of NOD decided to develop products that used formic acid as the active ingredient because it was seen as having potential to be a sustainable miticide that, when properly formulated, could control both the varroa and tracheal mites, leave no residues in the honey, wax, or hive components, protecting the image of honey as a wholesome food.

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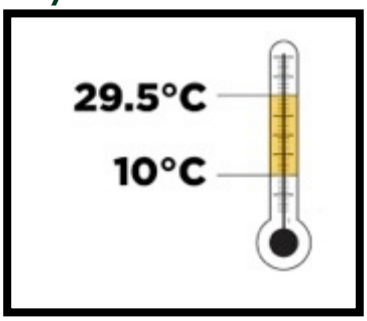
Field Guide

NOTE: This field guide is not a substitute for following the complete application instructions described on the label. Always read and follow the label.

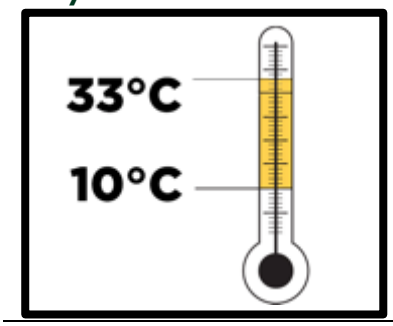
Before Treatment

Day 1

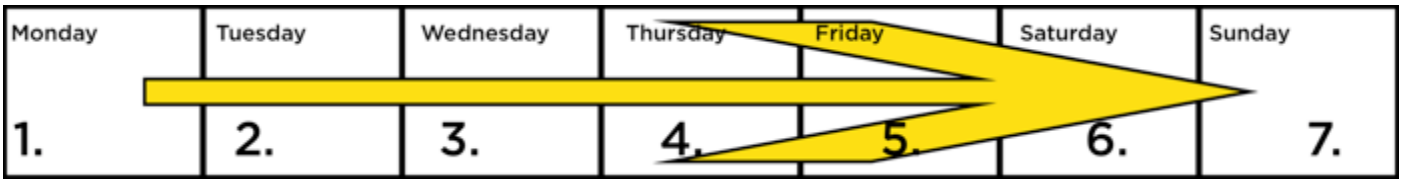


- ✓ Outside daytime temperature highs should be between 10°C - 29.5°C on day of application.

Day 2



- ✓ Temperatures above this range during the first three days of treatment may cause excessive brood mortality and queen loss.



- ✓ Treatment Period: **7 Days**
- ✓ Allow a minimum of one month between applications.

- ✓ Wear the PPE as required on the label.

- ✓ Disturb colony activity as little as possible during the application process.

- ✓ Colonies require adequate access to fresh air during treatment. An entrance must be provided that is the full width of the hive, typically the bottom board entrance. The bottom hive entrance needs to be fully open (full width of the hive and a minimum height of 1.3cm) for the entire duration of treatment (7days). Entrance reducers must be removed to prevent excessive damage to colonies.

- ✓ For hives with floors with permanently reduced entrances the second brood chamber can be set back to create an entrance the full width of the hive for at least the treatment period, or

- ✓ shims (tapered wedges) can be inserted under the lower front corners of the brood chamber to bring the entrance opening into compliance with the label.

- ✓ Carefully remove the two product strips from the sachet by cutting across one end, then lift the seal so the plastic comes away from the strips, and cut along the seal line the whole length of the sachet.
- ✓ Carefully separate the strips.
- ✓ **DO NOT REMOVE PAPER WRAPS.**

Application

- ✓ Apply the product on single or double brood-chamber standard Langstroth equipment or equivalent full-sized hives, colony cluster covering a minimum of 6 brood frames (approximately 10,000 bees).

- ✓ **For hives with single brood chambers,** lay two strips across the top bars of the frames of the brood chamber, staggering them so they lie flat and across the full width of the hive body, with approximately 5cm between strips and 10cm between the ends of the brood chamber and the outer edges of the strips.

- ✓ **For hives with two brood chambers** place the strips as described above on the frame top bars of the lower hive body, so the strips are in-between the brood chambers.

- ✓ Put on honey super(s) if required to provide adequate space for strong colonies to expand or if a honey flow is anticipated. It is acceptable to have queen excluders in place.

- ✓ Mesh floor/Screen Bottom Boards should be closed off to prevent formic vapours from dumping out bottom. The bees are not built to move air up through a screen, so open mesh floors should not be considered to be additional ventilation.

Post Application

- ✓ Colonies are expected to expand the cluster as part of controlling vapour concentration during the first 3 days of treatment; bearding behaviour may be observed.

- ✓ Do not destroy queen cells that may be observed prior to, or post treatment. Supercedure, even if thought to be set in motion by treatment, is a natural process, and should be allowed to proceed for the health of the colony. Verify queen-right one month after treatment. Mother and daughter queens present post treatment is not uncommon.

- ✓ **DO NOT DISTURB** the colony during the 7-day treatment period.

- ✓ The bulk of the formulation ingredients/excipients are food grade sugar and starch with a compostable paper wrap. The strips do not need to be removed from the hive after the application period of 7 days as the honey bees slowly dispose of the spent strips. If they are removed, dispose of by composting.

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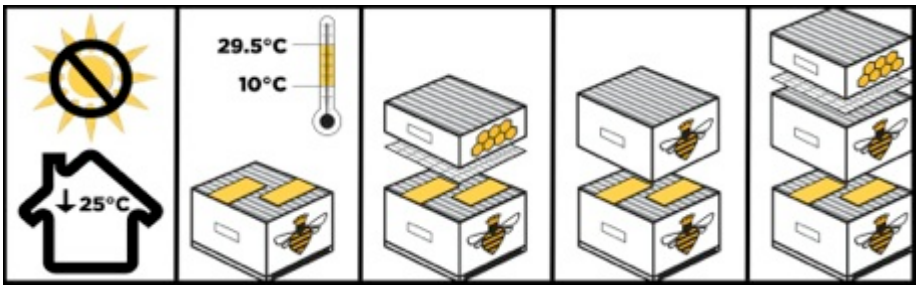
Frequently Asked Questions

Planning a Treatment

When/Why should I use MAQS®?
MAQS® should be used as part of an Integrated Pest Management (IPM) program. Apply MAQS® when the economic threshold is reached. Economic thresholds vary by region and season; check with local advisors. Allow a minimum of one month between applications.

What are the temperature guidelines of MAQS®?
Outside daytime temperature highs should be between 10 – 29.5°C on day of application. Excessive temperatures (> 33°C) during the first three days of treatment may cause excessive brood mortality and queen loss.



Can I move the bees during the 7-day treatment period?
The bees should not be disturbed during the treatment period.

Storage

I have an out building I usually store all of my beekeeping tools, boxes and feed in. Can I keep MAQS® in this same building?
MAQS® has specific storage requirements to keep it fresh and easy to use for the full year prior to expiry.
MAQS® must be stored below 25°C and out of direct sunlight. Store in a dry place in the original container in a well-ventilated area.

What is the shelf life for MAQS® beehive strips?
MAQS® has a one year shelf life when stored as per label. Each product pail has an expiry date printed on the label, which indicates when the gel is becoming very soft and therefore harder to handle. The active ingredient does not deteriorate. NOD is working on an extended shelf life formulation.

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Hive Type & Size

I only want to try MAQS® on a few hives in my apiary, is this ok?
All bee colonies in the apiary should be treated at the same time, to reduce environmental pressure.

I want to treat my newly split nucs, but they are only 4 or 5 frames, can I? MAQS® beehive strips should only be applied on single or double brood chamber standard Langstroth equipment or equivalent (e.g. Dadant, British National). Honey bee colony cluster must cover a minimum of 6 brood frames (approximately 10,000 bees). If you transfer your nucs into full size brood chambers and allow them time to expand to a full six frames, you can then treat with MAQS®.

I use polystyrene beehives in my operation, can I use MAQS® beehive strips without melting my beehives or having some obscure chemical reaction?
We haven't done any exact testing on polystyrene hives. However, we did do some testing with pieces of the polystyrene and found no chemical reaction. The data gave no indication that contact with formic acid would cause any melting or chemical reaction. Some polystyrene hive floor designs need to have the entrance size increased to meet label requirements.

Application & Product Specifics

When I remove the outer plastic wrap, should I peel the inner paper wrap off of the gel?
No, the paper wrap stays on. It works as a wick to control the formic acid vapour release.

The label says to avoid disturbing the colony at time of application. Can I do a full colony exam and then treat immediately, or should I wait and come back and treat?
The bees need to have their affairs in order when treated. When running trials we discovered that the colony assessments were best done *3 days in advance* of the application. If the colonies were taken apart, assessed, reassembled and then treated, we saw some absconding. It also increased the risk of queen loss. After an exam, it would be best to wait until at least the next day before applying MAQS®.

On the product label it states: "*This product is corrosive. Do not allow product to contact metal surfaces.*" Are the strips safe to use with metal queen excluders?
Formic acid vapours are corrosive to many metals, but not to aluminum or most stainless steels. Some queen excluders may get a white powder on them and show rust around the edges over time. Used metal excluders with wax and propolis on them are less affected than new ones. Plastic excluders are not affected; there are now some good ones available.

Honey Supers & Residue

Can I really treat with a honey super on? Why does it not flavour the honey?

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Formic acid is always naturally present in honey. When MAQS® technology is used as directed, formic acid levels remain within the levels found to be naturally occurring in honey. Therefore MAQS® can be used when honey supers are on the hives without concerns of residues.

Do I really need a honey super(s) on while treating or can I treat without one in place?
You do not need to have a honey super on during treatment. During treatment the colony will expand the cluster, so it is recommended to place an empty honey super(s) on the hive when you treat to give the bees room to move up and expand if the colony has a large population or a honey flow is expected. It is also recommended, when treating to protect the winter bees, to treat while the last honey super(s) is still in place.

Screen (mesh floor) Bottom Boards
Background:
Mesh floors are not standard equipment, however they have come into use to take advantage of the natural drop of live mites. There are mixed reports on their effectiveness.
Biology check: Honey bees are a cavity dwelling insect where the pupating stage of the developing honey bee larva is an incubation time that is optimized when the brood rearing zone is around 36°C. Cooler temperatures in the brood rearing zone extends the pupating period thereby creating more opportunity for the varroa offspring to successfully mate before the adult bee emerges.
As a tool for varroa control: use of mesh floor bottom boards can be counter-productive in cool/cold climates because the bees have more difficulty maintaining warmth in the brood rearing area; the incubation time of the developing honey bee pupae can be extended, resulting in actually enhancing the success of varroa offspring mating. Studies on the overall benefit of screen bottom boards have been conducted in various climate zones and are available for consideration. Each beekeeper will have to decide if screen bottom boards are a positive or a negative in the environment in which they keep bees.

Screen bottom boards are NOT a substitute for a fully open entrance.
Screen bottom boards are sometimes falsely seen as additional ventilation available to the bees, so some beekeepers think that they can reduce the hive entrance. The bees need to be able to control the concentration of formic acid in the brood rearing area, but, because honey bees are not designed to draw air up, having a mesh floor does not help the bees control the concentration of formic acid vapours in the hive. They need to be able to stand anywhere at the entrance across the full width of the hive for effective fanning behaviour.
Should I leave the screen bottom open or close it off?
There was only one trial run so far with screen bottom boards open by Randy Oliver (www.scientificbeekeeping.com). He published the results in the February 2011 issue of *American Bee Journal*. There was approximately a 5 % reduction in efficacy compared to

colonies treated in hives with solid bottom board. However, both open screen and solid bottom boards saw over 90% drop in mite loads.

Ventilation

Should I close off all entrances except the fully open bottom board entrance?
A fully open bottom entrance should be seen as meeting the *minimum* ventilation requirements. Having additional entrances does not seem to affect the efficacy of the treatment. Adequate ventilation is critical with this product because the bees need to be able to control the concentration of formic acid in the brood rearing area. For 2 brood chamber colonies, some beekeepers set back the second story to create a temporary full width entrance. The box can be pushed back into place after treatment. If permanently reduced entrances are used, use the set back procedure or entrance shims can be put in place under the bottom front corners of the brood chamber (see photo in field guide). It is absolutely necessary to provide adequate ventilation to the brood area.

It looks like most of the bees are bearding out on the front of the hive. Is this normal?
It is normal for the bees to beard out for the first day, especially under warmer conditions, if the hive is heavily populated or if a honey flow is underway. See the University of Hawaii photos in their report from 2009, found at: www.nodglobal.com/research.html.
Under these conditions, at time of application have on a honey super (with frames). This will give the bees space to move UP, away from the strips, instead of OUT on the front of the hive. The super will certainly reduce, but may not totally eliminate bearding.

There may be an observed increase in adult bee mortality in the first three days after application. Remember, natural loss of bees occurs at about the same rate as egg laying. With the treatment the bees may not be able to perform cleaning duties as quickly as usual.

Feed & Forage

Will the bees continue to forage during the treatment?
Yes, the bees continue to forage.

Can I feed during treatment?
No, feeding of any type that comes in contact with the hive (e.g. frame feeder, hive-top feeder) is not recommended during the 7 days of treatment. Open source (e.g. barrel) feeding is acceptable. Feeders in/on the hive can be filled after the 7-day treatment is finished.

Impact on Brood and Queen Health

What is the impact of MAQS® on the brood? Can I reduce the dose?
Studies have shown that reducing the dose reduces the effectiveness, and may still lead to some brood damage. We know from trials conducted that MAQS® works best with the 2-strip dose. Any brood damage that occurs is quickly made up by an egg-laying surge

throughout the cluster area by day 7. There are often lots of eggs by day 4, although they may be on the outer edges of brood rearing zone. The field bees can continue to collect pollen throughout the treatment, so there are good protein reserves when the larvae need feeding. The next time that MAQS® is used, even if it is months later, the bees somehow know how to cope better.

I am hearing about queen losses, how concerned should I be?
When reports of queen loss have been investigated, the #1 cause has been inadequate ventilation due to the entrance requirements set out on the label not being followed. However during dearth periods, and/or when ambient temperatures are above 29.5°C on day of application there is an elevated risk of queen loss, supercedure, or delay in egg laying. Treatment should be postponed until temperatures drop or nectar flow resumes.

Treatment will initially disturb colony activities and may, within one day of application, result in queen rejection especially if she is fragile for some reason (e.g. viruses, age). Do not destroy queen cells that may be observed prior to, or post treatment. Supercedure, even if thought to be set in motion by treatment, is a natural process, and should be allowed to proceed for the health of the colony. Verify colonies are queen-right one month after treatment. Mother and daughter queens present post treatment is not uncommon.

Disposal and Post-Treatment

The bees chewed up some, but not all of the strips. How do I dispose of the spent strips?
The leftover spent strips will simply compost over time. They can be handled the same way as any other organic yard waste material. The strips can stay in the hive after the 7-day treatment as they are totally biodegradable. The strips can also be removed at the beekeeper's convenience, post treatment.

I have some spent strips and some un-used strips; how and where do I correctly dispose of them?
Spent strips, if removed from the beehives, can be composted. Unused strips: "*Do not contaminate ponds, waterways and ditches with the strip or used packaging.*" Disposal of in accordance with local requirements.

Personal Protective Equipment (PPE) & Handling:

What type of gloves should I wear when working with MAQS® beehive strips?
When handling and applying the product, wear the usual beekeeping protective clothing. For gloves, always wear chemical/acid resistant gloves, e.g. PVC, neoprene or nitrile gloves (EN 374), when handling the product.

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Best Management Practices

Mite Control with the Mite Away Quick Strips®:

Avoiding Resistance, High Pathogen Build-up & Queen Management

Timely treatment can protect both key bee populations from varroa mites:
summer bees for the honey crop, and the
winter bees that will make up the overwinter cluster. Most colonies handle treatment with *MAQS* without difficulty and the invigorated colonies surge forward; however it is a powerful, acute, transparent treatment: background colony health issues, such as queen frailty, may be exposed.

Below are quick reference tools: a *Best Practices Check List and Storage & Application Options Pictogram*.

Success with MAQS®: **Best Practices** Check List				
	When			
Varroa Level Assessment (IPM)	Monitor through the season ☐	Alcohol wash or sugar shake ☐	Sticky Board ☐	
To Protect Summer Bees	Spring: Fresh pollen reared nurse bees present (4 weeks after 1st natural pollen) ☐			
To Protect Winter Bees	Starting late-summer **Treat once the queen starts laying the eggs that will become the bees that make up the winter cluster,** sooner better than later to keep viruses down and to allow time for natural queen supersedure that may occur. ☐			
Good food reserves:	Always	Spring ☐	Summer ☐	Fall ☐
Ventilation full width of hive:	During treatment ☐			
Brood area check:	One month after treatment. ☐			
Always take the time to read and follow the label.				

Natural queen supersedure typically occurs in the spring or in late-summer as the bees prepare for winter. The timing of a 7-day treatment with *MAQS* can be part of ensuring fit queens, as well as a tool for mite control, working with the natural, bee-identified best times. Queen cells seen pre and post treatment should be left in place, to become the young, locally raised and mated queens going forward. Alternatively, beekeepers can replace queens with the stock of their choice.