

IPM with APINOVAR

A Simple Control Strategy for Varroa



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APINOVAR is a screened bottom board that has been designed to facilitate the control of varroa through an adapted non chemical integrated pest management strategy. This strategy gives us a very good control of the situation. It relies on being adequately informed of our infestation levels at key moments during the season and applying to our colonies a complete treatment in the fall. If needed, colonies can also be treated at other moments during the season when definite thresholds are reached.

General Presentation

For sampling we use natural mites fall.

For treating we use “flash”⁽¹⁾ applications of formic acid.

The success our IPM strategy depends mainly on not exceeding the following levels (table 1) of natural mites fall just before the fall treatment is started:

Maximum Daily Mites Fall just before the Fall Treatment	
Maximum average ² mites fall for all colonies	25

Table 1

Exceeding these thresholds leads to higher than normal winter losses and/or weaker colonies the next spring.

At the end of the season we lower rapidly the infestation level with repeated “flash” applications. Our goal is to obtain a very low level of infestation for the winter. This insures that:

- The wintering bees are not weakened and secondary viral secondary infections don’t have much chances to develop
- Next spring infestation levels will be low and chances are good that we will not have to treat before the next fall

We target the following result from our fall treatment:

Maximum Daily Mites Fall 2 Weeks after the Last Fall Flash
0.5 to 1

Table 2

Using bee stock that has been improved⁽³⁾ for resistance to varroa will help reduce the number of treatments required during the whole season.

¹ In this text « flash» refers to a method of using formic acid to treat bee colonies. Formic acid is poured on a paper towel deposited in the sampling drawer of the APINOVAR bottom board. Volatilisation of the acid is very fast opposed to the other slow release methods commonly used in Canada.

² Individual colonies with daily mites fall above 75 will likely die or suffer severe damage during the winter.

Nevertheless sampling should be performed at two other times during the season to make sure the fall threshold will not be exceeded. Table 3 suggests tentative thresholds for spring and mid-season.

Spring and Mid-season Thresholds (daily mites fall)	
1 st week of May	0.5 to 1
50 days before the fall treatment	6.25
25 days before the fall treatment	12.5

Table 3

We sample in early May and at another time in mid-season just before we remove the first crop. These samplings coincide with time windows where a treatment can be done if necessary. In areas where it is not possible or desirable to take off the honey supers at mid-season, it will be essential to make sure the spring natural mortality is lowered to the acceptable level before the honey supers are put on.

Sampling

Sampling is our information tool. Our treatment decisions will be based on your sampling results. Too many times, sampling is not done right. Here are a few hints.

Preparation

- As a sampling carton we use pieces of “corroplast” (cardboard like plastic sheet) cut to the full dimensions of the sampling drawer. These can be cleaned out after each sampling and can be reused indefinitely.
- It will be much easier to do the counting if you draw lines on your cardboard. Draw them perpendicular to the longest side of the carton and a few centimetres apart.
- We coat our cartons with melted vegetable grease (“Crisco”) using a paint roller. It is not necessary to protect the carton as the bees do not have access to the sampling drawer.

³ For average bee stock the varroa population seems in our conditions to double more or less every 15 days. Our experience of selecting for varroa resistance shows us that the duration of the doubling period can easily be extended to 25 days and more. Such stock will take 124 days or more to reach the fall threshold (spring natural mortality of 1 assumed) and no treatments other than the fall treatment will be required in most areas.

When do we sample?

Sampling at the following moments gives us all the information required for a perfect control:

Sampling		
Moment of the season	Duration of the sampling	Purpose/comments
Early May	3-4 days	Decide if a spring treatment is needed
Mid-season	1-2 days	Decide if a mid-season treatment is needed
Early September (just before the fall treatment)	1-2 days	Gives indication on the number of flash applications required
15 days after the last flash application	3-4 days	Make sure mites fall is at a safe level for the winter

Table 4

Low infestation levels require longer sampling periods to obtain a reasonable precision and vice versa. We keep in mind that very long sampling period will make dirty cardboards that will be difficult to read. So if we can sample a fair number of hives, we do not necessarily go for the longest period. We may not obtain super high accuracy at individual colony level but we are able to trust the averaged results. We always express our results on a 24 hour basis as most of the information is provided in this format.

IMPORTANT WARNING

Put all the necessary attention when you do the counting. The great majority of beekeepers are overconfident and obtain counts on average 50% lower than reality! You must count all the varroas that have some coloration. The ones that are not fully pigmented are more difficult to see and they could be easily taken for hive debris. So use a magnifier lamp and... take your time. It may be wise to have your counts checked by somebody else. Younger people have more facility seeing all the varroas on the carton. Once you learned to do it correctly counting is easy... but you have to learn.

“FLASH” Treatments

You will find in this section the basic information concerning the “flash”⁽¹⁾ application of formic acid.

As opposed to the methods currently used here in Canada all based on the slow release of the formic vapours, “flash” relies on the fast volatilisation of the acid in the hive over a very short time (6-12 hours)⁽⁴⁾. Fast volatilisation methods are very popular in Europe and have been used since a long time.

Here are the main advantages of this method, when it is used in conjunction with APINOVAR:

- High efficiency over a short time period, mainly because some mites in the brood are killed
- The colonies are disturbed only for a very short period and resume rapidly their normal activities.
- No need to open the hive: the application is extremely fast
- Dosage can be adapted to suit colony size and temperature conditions
- No special material is needed although using a drench gun is a plus. (Dosage is very accurate and application is very fast).
- This is the most economical way of delivering formic to colonies.

Method

⁴ What we present here is basically a refinement of the method presented in PMRA’s C94-05 document.

We “flash” our colonies from the bottom, more exactly from the sampling drawer of the APINOVAR board. We use a drench gun to inject the formic on a paper towel placed in the sampling drawer. We use one single section of paper towel for singles and 2 sections (folded to form a double layer) for doubles.

Table 5 presents the dosages we actually use:

Formic Dosages we use for Flash		
Maximum temperature⁽⁵⁾ <u>anticipated in the following 6 hours</u>	DOUBLES	SINGLES
20 – 24 Celsius	40 ml	20 ml
16 - 19 Celsius	45 ml	22 ml
10 – 15 Celsius	55 ml	27 ml

Table 5

Basically applications of formic acid by the fast volatilisation method based on this table give us approximately a 60% reduction of the natural mites fall⁽⁶⁾ measured 14 days after the treatment⁽⁷⁾. The dosages in table 5 are adaptations of European recommendations. These dosages have been adjusted for Langstroth hives equipped with APINOVAR from a 2 years large scale testing in Québec. These dosages did not cause queen losses or significant brood damage. Higher efficiency can be obtained with higher dosages but the risk of damage increases also. Despite this potential damage it could be wise to use higher dosages in emergency situations to save otherwise endangered colonies⁽⁷⁾.

Caution

- In order to avoid important drifting, we flash the whole yard at the same time. If we want to treat individual colonies we flash them at the end of the day, or when bees are not flying.
- You have to be careful with the dosages you are using. Overdosing can result in damage to the colony.
 - Remember that the same dosage will have a stronger effect if applied at higher temperatures.
 - Weak colonies (colonies that do not fill their super) will not stand the same dosage as strong colonies. We have little experience for the moment with very small colonies like nucs. We think it is preferable to treat colonies when they are strong. When we had to treat weak colonies we had a fair success with an experimental dosage of 2-2½ ml per frame of bees (depending on temperature). Mite Wipe is a good option to consider for such weak colonies.
- The dosages in table 5 will not result in the same efficiency with other bottom boards than APINOVAR as their different designs will changes the formic concentration and distribution pattern in the hive.
- Always wear appropriate clothing, rubber gloves, and safety glasses when working with formic. Always have plenty of water nearby.

We used flash for fall, mid-summer and spring treatment.

⁵ We suggest not applying flash treatments under 10° Celsius.

⁶ Mites fall will not reflect natural mortality until all the capped brood present at the moment of the treatment has hatched. This is because some mites present in the brood are killed by the high concentration of the formic vapours.

⁷ The efficiency may be reduced somewhat if uncapped nectar is abundant in the brood chambers.

Flash as a fall treatment

For two consecutive years we have used repeated flash as our main fall treatment. An average natural mites fall of 20-25 varroas/day or more in early September will require 4 applications to clean the hive. We knock down rapidly most of the mites with 2 early applications at 4-5 days interval. We do a third application approximately a week later. We hold the fourth application until early October when there is very little brood in the hives. This way a very high efficiency can be obtained with this last treatment. Lower average pre-treatment mites fall may require fewer applications. The following table shows the number of applications we use according to de daily mites fall.

Number of Applications Depending on the Daily Mites Fall (Fall Treatment)	
Daily pre-treatment mites fall	Number of applications
< 2	2
2 - 7	3
8 - 30	4
over 30	4 plus oxalic

Flash as a mid-season treatment

We have very good results with one single application in early August. Colonies can be flashed as the first crop is removed⁽⁸⁾. Honey supers have to be removed. We do not apply a mid-season treatment unless justified by mites fall level (table 3).

Flash as a spring treatment

We have limited experience with spring flash. This is not an option we favour. We really prefer to treat colonies when they are strong. If you want to do it, make sure you adapt the dosages accordingly. Many factors suggest avoiding spring treatments whenever possible:

- colonies weakened by the winter are more vulnerable to formic vapours
- there is usually an important variation in the strength of the colonies and it is difficult to apply a uniform dosage
- a high proportion of the varroas are in the brood and brood is in expansion
- outdoor temperatures are seldom ideal.

Nevertheless, if mites fall justifies, we have to do something. If we can afford, we hold the treatment until the brood chambers are pretty much filled up with bees. Remember 2 things:

- fall is the time where we really want to exterminate most of the varroas;
- using resistant stock will help avoid the spring treatment.

Avoid treating during the dandelion flow. The abundance of nectar in open cells reduces the efficiency of formic.

One or 2 applications of Mite Wipe may be a good alternative when colonies do not fill the brood chamber(s) in the spring.

For more information:

Chapleau, J.-P. [Control of Varroa Using APINOVAR, Resistant Bee Stock and Organic Acids Treatments reineschapleau.wd1.net](http://reineschapleau.wd1.net)

⁸ In an emergency situation we could save highly infested and weak colonies by flashing them in early August with 27 ml (singles) or 55 ml (doubles) at 20-22° Celsius. 14 days after the treatment the natural mortality had been reduced by 90%. Note that some brood had been damaged and that 10% of the queens had disappeared.

Les Reines Chapleau Inc, Frequently asked questions on APINOVAR, reineschapleau.wd1.net

Short video of the FLASH application of formic, reineschapleau.wd1.net

More information is available on our web site.