THE FOLLY OF USING ALCOHOL WASH FOR VARROA DETECTION

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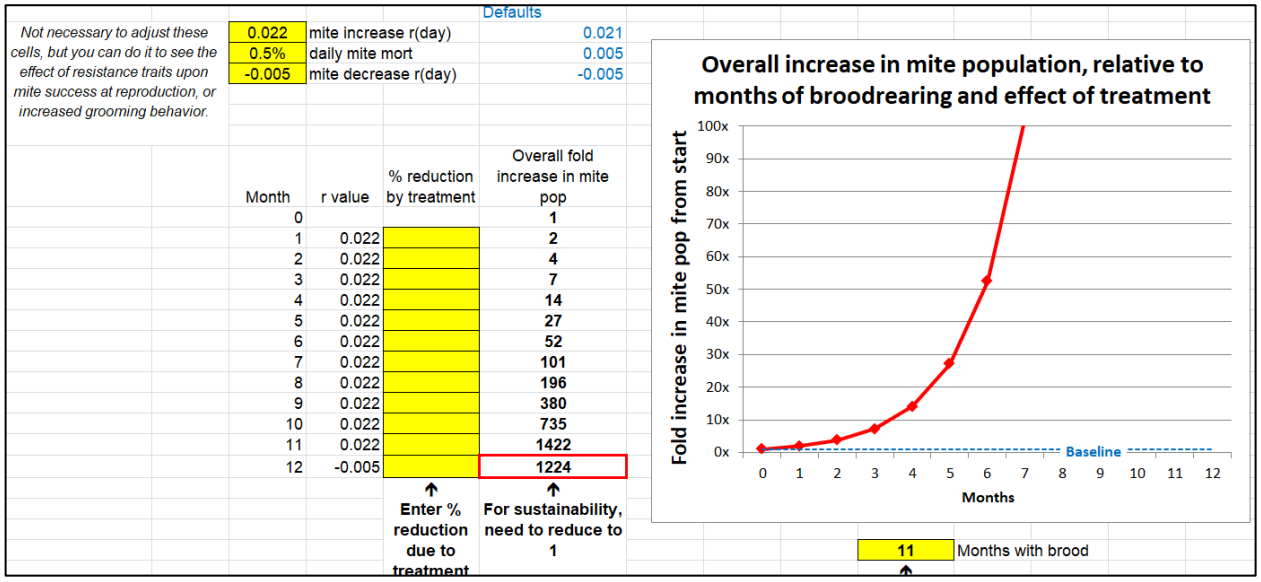
Varroa ***detection*** is more difficult than varroa monitoring, since for detection the goal is to detect the presence of even a very low infestation. So detection of varroa presence during the first months of possible exposure to even a single mite is critical.

It's important to understand the fact that varroa are very adept at dispersal to other hives by hitching rides on nurse bees that get lost during their first flights, and then drift to other hives. And also to understand the rate of expected varroa increase in a hive from a single drifted mite.

Imagine that a single mated female gets introduced into a hive by a drifting bee. At the expected rate of reproductive increase[a], the mite population in that hive will roughly double each month, increasing to ~25 mites in 5 months.



So what are the chances — using an alcohol (or Dawn detergent) wash of a half cup of bees taken from that hive — of actually detecting a mite in an alcohol wash? We can use an online binomial calculator to find out.

Assumptions:

- This recently-invaded colony contains 25 mites.
- If the colony contains brood, at least 50% of the mites will be under the cappings at any time. During spring buildup, up to 80%. So let's say that 40% of the mites will be on the adult bees.
- A half-cup sample of bees contains around 315 bees.
- Assume that the colony has 15 frames covered with bees, for a total adult population of ~30,000 bees.

Calculations

- 40% of the 25 mites in the colony would be expected to be on the adult bees — that's 10 mites.
- 10 mites/30,000 bees = 0.00033 probability of any worker carrying a mite.

Probability of success on a trial	0.00033
Number of trials	315
Number of successes (x)	1
Binomial probability: P(X=1)	0.09372
Cumulative probability: P(X<1)	0.90125
Cumulative probability: P(X≤1)	0.99497
Cumulative probability: P(X>1)	0.00503
Cumulative probability: P(X≥1)	0.09875

- The calculator indicates (in the bottom cell) that you'd have only a 10 percent chance of detecting one or more mites. ***That means that 9 times out of 10 you would not detect a single mite!***
- In order to reach 95% confidence of detection of varroa from a sample of a half cup of bees, the infestation rate would need to be at least at 1% of the adult bees:

Probability of success on a trial	.01
Number of trials	315
Number of successes (x)	1
Binomial probability: P(X=1)	0.1342
Cumulative probability: P(X<1)	0.04218
Cumulative probability: P(X≤1)	0.17638
Cumulative probability: P(X>1)	0.82362
Cumulative probability: P(X≥1)	0.95782

- That means that for a colony of 15-frame strength, for a 95% chance of detection of a single mite in an alcohol wash, that the colony would need to contain 30,000 x .01 = 300 mites. At that level of infestation rate, mites would already be infesting surrounding colonies for at least a kilometer in all directions, due to normal drifting of bees.

THE TAKEAWAY

Mite wash samples of a half cup of bees are useful for monitoring *infestation rates*, but nearly useless for ***detection*** of colonies with low levels of infestation. For detection, the bee samples must be far larger. Thus whole-hive sampling via an accelerated mite drop onto a stickyboard would provide far greater success.

[a] See the Necessary Mite Reduction tab in Randy's Varroa Model at Randy's Varroa Model - Scientific Beekeeping