Multi-year *Varroa destructor* resistance assay against four common miticides

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Introduction:

The Varroa mite (*Varroa destructor)* is a parasitic mite that was originally detected in the Asian honey bee (*Apis cerana*) and jumped host to the European honey bees *(Apis mellifera*) and has since spread to most parts of the beekeeping world. It is considered the primary driver of losses to colonies in the US and Europe. This parasitic mite feeds on the hemolymph of adult and developing bees, transmitting viruses and otherwise making bees more susceptible to disease. Beekeepers rely on varroacides to control this mite, as untreated colonies generally die within 2 to 3 years. There concern that mite populations have developed resistance to these miticides.

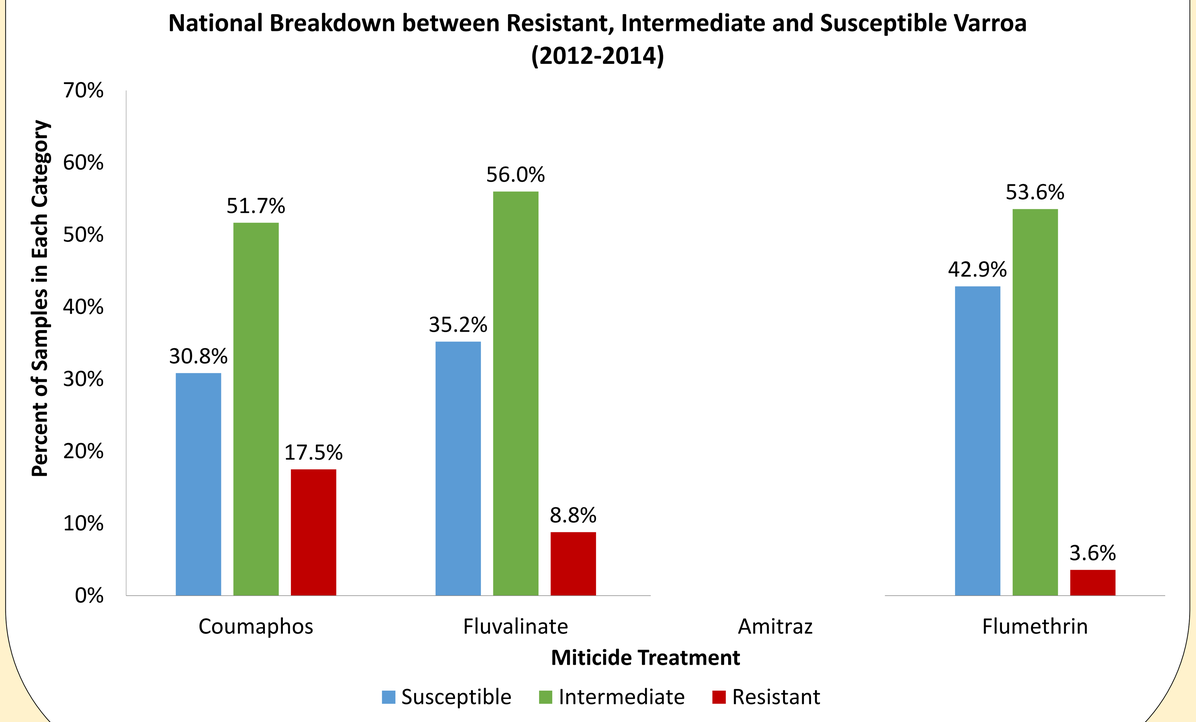
Methods:

Our lab receives shipments of live bees from across the country for the analysis of viruses as part of the National Honey bee Disease Survey effort. For many of these samples approximately 150-200 bees (one sample) were separated into five groups and placed into a controlled environmental chamber at 30°C. One group from each sample was used to test each one of four known miticides: Coumaphos, Fluvalinate, Amitraz and Flumethrin (10% active ingredient of each respective chemical) as well as a control. The mode of exposure by these chemicals are via contact strips which were cut into 3/8” x 1” size pieces. These smaller strips were then attached to the center of an index card and placed in the 500 mL glass jar with mesh lid containing one group of bees (approx. 30-40 specimens). After a 6 hour exposure time, the number of dropped mites were collected and counted.

Temperature of the chamber was then increased to 40°C and dropped mites were counted again after 18 hours. Increasing the temperature to 40°C killed the rest of the mites causing them to drop. If less than 5 total mites were recovered following completion of the trial, the sample was disregarded due to an inadequate mite population in the sample. The percentage of resistant mites was determined by dividing the dropped mites by the total mites. “Resistant” mites were categorized by ≤20% mortality after treatment, “Susceptible” mites were categorized by ≥80% mortality after treatment, and “Intermediate” mites had between 21-79% mortality after treatment.

Results:

The graph below shows the national results for 233 samples taken from 2012 through 2014. Amitraz resistance data is redacted as we continue to validate the resistance assay for this product.



Discussion:

Varroa mite resistance is a growing concern for beekeepers and this study is conducted to determine the efficacy of commonly used miticides. Mite treatment is necessary if the population increases to a threshold in which the entire colony health is at risk. Our data show that mite populations demonstrate resistance to three of the miticides tested. Coumaphos resistance was most prevalent within our sample population and Amitraz showed no resistance. When comparing efficacy of the tested miticides, Amitraz may be more effective in reducing mite loads than the other miticides, however, caution must be used when looking at this data as no known amitraz resistant mite populations have been identified and so the resistance assay has not been properly vetted.

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