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 has spread to most parts of the beekeeping world. It has caused serious losses to apiaries since its discovery and has been linked to Colony Collapse Disorder (CCD). Beekeepers in the U.S. have been sounding the alarm that Varroa mites in their hives have been increasing and commonly used treatments are less effective. This growing concern has prompted the need to investigate this phenomenon in greater detail.

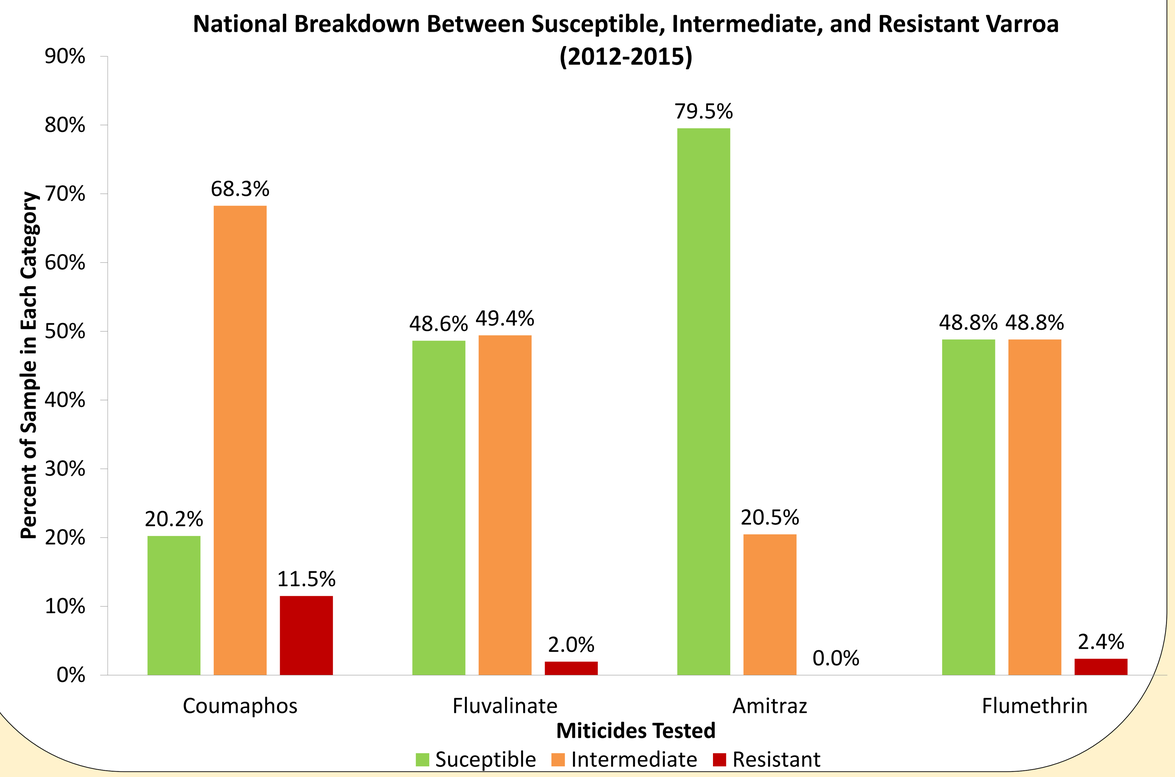
Methods:

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 of these four chemicals: 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. 150-200 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 252 of 551 samples taken from 2012 through 2015 with adequate Varroa population.



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.

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