PP-097 [Bee Health]
Causes of periodic mass bee mortality in Ukraine

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Since the 1990s, Ukraine has experienced periodic mass bee mortality, affecting 20-40% of colonies approximately every ten years. Similar occurrences have been noted in other beekeeping countries. Our objective was to investigate the causes of these periodic losses.

Materials and METHODS: Bee samples were collected from apiaries with significant colony losses and examined for Varroa destructor mites and Nosema apis and N. ceranae microsporidia. Data on other diseases and health improvement measures were analyzed.

RESULTS: Colony mortality was primarily caused by varroosis, often accompanied by nosemosis. Bees affected by varroosis died in autumn and winter, while nosemosis-related deaths occurred in late winter and early spring. During the summer honey collection period, mass mortality was often due to pesticide poisoning caused by non-compliance with application regulations.

The prevalence of V. destructor varied from 1% to 50%, depending on the season and treatments applied. These treatments included:

- Autumn (August-September): Acaricides with flumethrin, fluvalinate, or amitraz.
- Summer (between honey collections): Organic acids (oxalic, formic, lactic).
- During honey collection: Acaricides based on essential oils and thymol.

N. apis and N. ceranae were found in nearly all apiaries. Nosemosis outbreaks in late winter and early spring were linked to high V. destructor infestations in autumn before acaricide treatments. Weak colonies, unable to maintain the hive microclimate, further contributed to nosemosis development. In addition to the spring exacerbation of nosema in apiaries, where there was a significant mortality rate of families from varroa, viral diseases (paralysis in adults or sacbrood in larvae) became more active in the summer.

CONCLUSIONS: Periodic mass bee mortality in Ukraine results from mono- and mixed infestations with V. destructor and Nosema pathogens. Removing mites only from the winter bee generation is insufficient, as affected colonies continue to suffer autumn disappearances or winter deaths. The lowest colony losses occurred in apiaries where acaricide treatments targeted both winter and summer bees, and anti-varroosis measures were applied during broodless periods with mandatory mite infestation monitoring. The decreasing efficacy of chemical acaricides in autumn in recent years is not manufacturer-dependent but results from acquired V. destructor resistance to treatments.