Developing Molecular Genetic Tools for the Detection of Varroa Mites (Varroa destructor) from Honey

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Honeybee keepers are experiencing increased mortalities, many of which have been attributed to Colony Collapse Disorder (CCD). CCD is theorized to occur after a hive has become susceptible to parasites or is exposed to toxic substances. Varroa mites (Varroa destructor) have been identified as perhaps the most virulent factor of CCD within hives. They weaken bees within the hive and are vectors for various diseases, including Israeli acute bee paralysis virus, Kashmir bee virus, and deformed wing virus. The mite infestations peak in spring and fall, and longer falls and springs associated with climate change are expected to increase mite infestations. Current monitoring approaches for varroa mites are time-consuming and prone to errors. Therefore, there's a need for a new, accurate monitoring method for varroa mites when infestations are at low densities. New applications of environmental DNA (eDNA) approaches successfully surveyed species of plants and insects from honey samples. To monitor varroa mite infestations, an eDNA assay was created to detect varroa mite DNA from honey samples. The eDNA assay was consistently sensitive- detecting varroa mite DNA in quantities as low as two copies per reaction- and also was validated using collected honey samples from local and commercial hives. The assay detected varroa mite DNA in all local hive samples, and in two of three of the commercial hive samples.

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