PP-174 [Bee Health]
Applied mycology in beekeeping, impact of fall Ganoderma lucidum supplementation on winter survival

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Applied mycology has shown tremendous potential in various applications such as biomaterials, mycoremediation, pesticide detoxification or medicine. The impact of mushroom supplementation on mammals has been widely documented; however, few studies have explored its potential on insects. In 2018, Stamets et al. investigated the potential of polypore mushroom mycelia's extract supplementation in honeybees' sucrose syrup food diet and found large reduction of the main virus associated with Varroa destructor infestations. Since then, a handful of studies have explored the potential of several species with different mechanisms of actions on bees. Varroa could, for example, be treated directly with the use of ectoparasite fungi. While beekeepers need to actively treat mites or other parasites, a more holistic approach may even further improve colony health. The improvement of bees' nutrition can make them less prone to infestation and could potentially reduce treatment needs; we could not only prevent colony losses but also improve performance and beekeepers revenues.

We speculate that like the complex yeast and bacteria communities of natural nectar could influence bees behavior, their inner microbiota and overall colony health, reishi (Ganoderma lucidum) which properties are well known for medicinal and veterinary purposes could readily act as a beneficial immunomodulatory prebiotic in the hives. This strategy may be easily generalizable, even more effectively and at a lower cost than commercial probiotic formulae.

In order to validate the potential of reishi supplementation, we have treated 60 of the 120 hives of Miellerie Flavo's operation facility each fall for four seasons (2021-2024). Half of the colonies were mocked-supplement while the other half benefited from Cubee's G. lucidum extract proprietary composition. History of beekeeping practices, location and hive state (i.e. strength, mortality, varroa level…) were thoroughly recorded using the Nectar application in order to train a Bayesian survival model with time as covariate and our preliminary results show clear health improvement and a drastic increase in winter survival of 32% (± 7%).