



Postbiotics in beekeeping: benefits in the strength of the beehives and direct effect against *Varroa destructor*

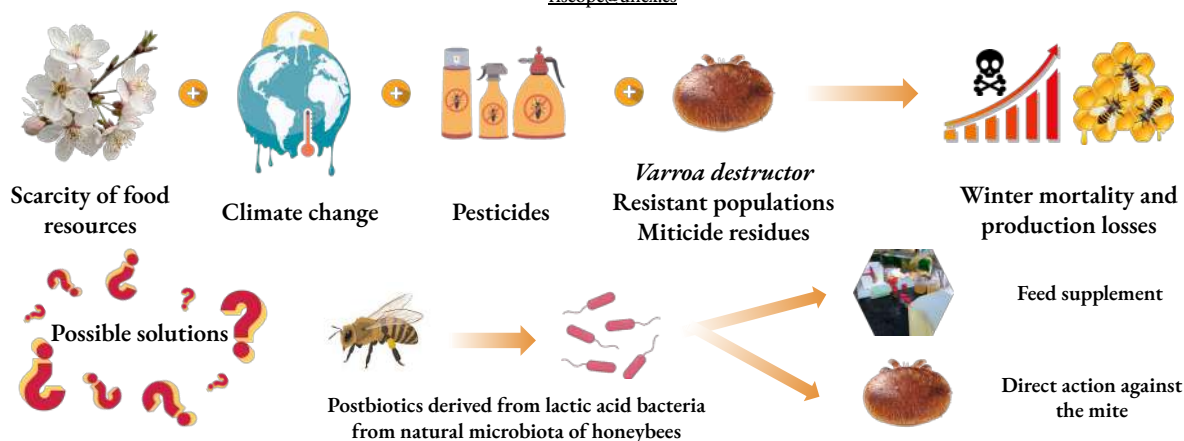


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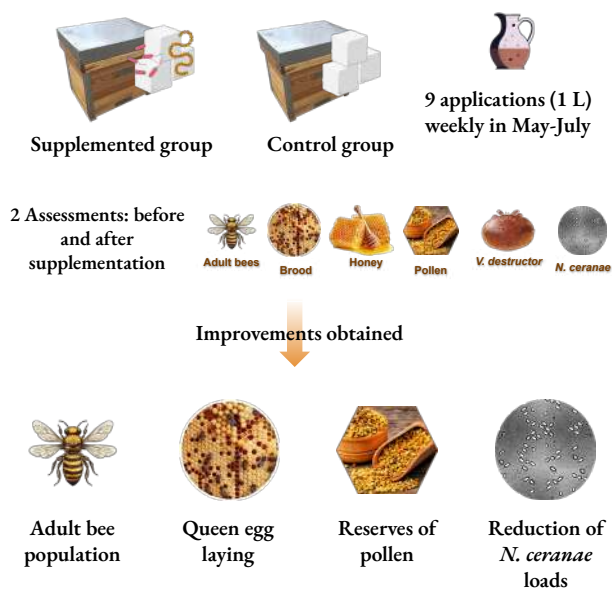
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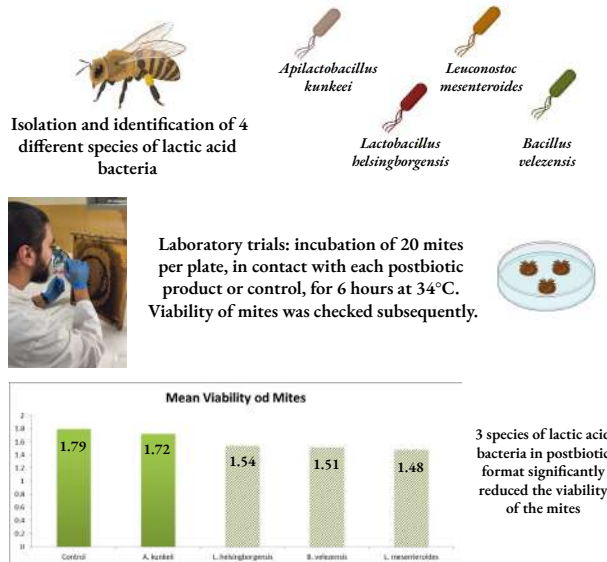
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Experiment 1: feed supplement



Experiment 2: direct action against *V. destructor*



- The application of postbiotic products such as feed supplementation in the beehives could improve key factors such as adult bee population, queen egg laying - amount of brood and foraging activity; and reduce the loads of *N. ceranae*, enhancing the productivity and survival of the colonies during the cold season
- The activity of lactic acid bacteria in postbiotic format against *V. destructor* mites registered in laboratory bioassays shows that postbiotics could be a very promising tool in the fight against this pathogen in the beehives
- More studies are carrying out to a better comprehension of the mechanisms of action of postbiotics and to discover the best methods of application under field conditions

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Beekeeping is facing many risks today that jeopardize its continuity. Some of the more important are scarcity of food resources, climate change, exposure to agricultural pesticides or pathogens such as Varroa destructor or Nosema ceranae. Bioactive compounds, like probiotics, are being investigated such as a novel and promising approach to improve the strength of the beehives due to their ability to enhance the immune system and compete with pathogens. The aim of this study was to explore the beneficial effects of postbiotics (i.e. inactivated beneficial lactic acid bacteria and their metabolites from natural microbiota of honeybees) in beekeeping in two different ways, such as feed supplements and as a direct tool to fight against V. destructor. Two different experiments were carried out to achieve these goals. The first experiment was performed in beehives under field conditions, applying postbiotics together with sucrose syrup. Two assessments (before and after supplementation) of the strength (number of bees, brood and pollen/honey reserves) and sanitary status (V. destructor and N. ceranae infestation levels) were performed. Beehives that consumed postbiotics increased the population of adult bees and the queen egg laying, as well as their storage of pollen, and reduced the loads of N. ceranae. The second experiment was carried out to assess the possible effect of postbiotics against V. destructor under laboratory conditions. Four different species of lactic acid bacteria isolated from honeybees and larvae samples were cultured, inactivated by heat and tested. Frames from beehives with high V. destructor infestations levels were taken to laboratory, and pupae and mites were extracted from capped cells. The mites were exposed to the different bacterial species via bioassay and subsequently their viability was checked. Three species significantly reduced the viability of the mites (Leuconostoc mesenteroides, Lactobacillus helsingborgensis and Bacillus velezensis). These results showed how postbiotics could be a promising tool to help the beekeepers to face the risks to which beekeeping is currently exposed, showing that could improve the strength, production and sanitary status of the beehives such as feed supplements and act against V. destructor.