

DEVELOPMENT OF "L-TIP": A NEW  
DELIVERY SYSTEM COMPRISING  
MICROSPHERES, NANOSPHERES  
AND/OR PICOSPHERES MADE WITH  
BEESWAX AND NATURAL FUMIGANT  
COMPOUNDS FOR FUNCTION AS A  
LOW-TOXICITY INTEGRATED PEST  
MANAGEMENT PRODUCT

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**Abstract:** Feral and commercial honey bee populations in the USA are at great risk of dying due to parasite infestations by trachea mites, varroa mites, AFB/EFB (American/European Foul Brood Disease) and more recently in southeastern states, the (bee) Hive Beetle. Other risk factors, e.g., exposure to neurotoxins found in man-made, chemical pesticides, present additional concerns. Recalcitrant problems for beekeepers is attack on bee hives by large and small Wax Moths, rodentia and other consumers, resulting in the loss of individuals (larvae) and decreases honey flows/output and harvests. Current pesticide products, although marginally effective, are costly with some containing chemicals and compounds that have been found to

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have migrated into the human food chain with additional concern that these may traverse blood-bell barriers and gain entry to the human genome. Too, these products may be lethal to other beneficial pollinators, to symbiotic insects, ants, for example, which also play a role in pollination. Some products are found to be cumbersome, bulky, difficult to use, costly, and not readily available in more remote regions of the USA. Expense of present products to small/large producers, alike, is also a major consideration. Of further concern is overburden/use of chemical pesticides to remedy honey bee infestations resulting in possible negative genetic impact and consequences to targeted individuals, target-vectors and future apis phylogeny/ontogeny.

**Key words:** Bees, Americanized Bees, Bees of Malaysia, Pesticide, Residual Affects

## 1 Introduction and Background

This paper discusses recent advancements in development of a novel delivery system wherein conventional treatment modalities, e.g., bee cakes, wafer-type sheets and products placed on paper (strips), are replaced with micro-capsules configured to enable delivery of low-toxicity adjuvants at the macro, micro, nano and pico scales. Unique features of microsphere-manufactures, e.g., ability to configure new delivery modalities in the macro, micro, nano and pico scales-ranges, is discussed with attention to affording the new delivery modulus with specificity for:

1. Targeted treatment vectors;
2. Elimination of lethal chemical components and replacement with low-toxicity , natural, organic compounds; and
3. Reduction of physical, ergonomic and logistical stressors to the colony by eliminating present treatment barriers, i.e., worker bees having to access present treatment products, e.g., densely-formed bee-cakes, wafers and wafer-strips.

A proposal to configure next-generation adjuvants for delivery at the pico-scale enabling delivery of low-toxicity countermeasure to residual neurotoxins, e.g., nicotinomide, is presented.

## **2 The Problem**

In November 2006 about Colony Collapse Disorder (CCD), a potentially new phenomenon described by sudden and widespread disappearances of adult honey bees from beehives in the U.S., the CCD Steering Committee was formed with the charge to help coordinate a federal response to address this problem. The CCD Steering Committee consists of scientists from the Department of Agriculture (USDA), Agricultural Research Service (ARS), National Institute of Food and Agriculture (NIFA), Animal Plant Health Inspection Service (APHIS). Who correspondingly combined their scientific and analytical resources together to bring about some of the finest minds in these governmental and scientifically based organization to solve this ever growing problem.

In addition to the aforementioned sources the Natural Resources Conservation Service (NRCS), Office of Pest Management Policy (OPMP), the National Agricultural Statistics Service (NASS), and also includes scientists from the Environmental Protection Agency (EPA), further provided their own forms of research to help try to find a solution to these problems. At that time, the Committee requested input and recommendations from a broad range of experts in apiculture about how to approach the problem. Out of this, the steering committee developed the CCD Action Plan [1]. Which outlined the main priorities for research and outreach to be conducted to characterize CCD and to develop measures to mitigate the problem. Since formation of the CCD Steering Committee early in 2007, the USDA, EPA and public and private partners have invested considerable resources to better address CCD and other major factors adversely affecting bee health.

## **3 Intense Levels of Unresolved Research**

Despite a remarkably intensive level of research effort towards understanding causes of managed honeybee colony losses in the United States, overall losses continue to be high and pose a serious threat to meeting the pollination service demands for several commercial crops. Best Management Practice (BMP) guides have been developed for multiple stakeholders, but there are numerous obstacles to widespread adoption of these practices. In addition, the needs of growers and other stakeholders must be taken into consideration before many practices can be implemented.

To address these needs, several individuals from the CCD Steering Committee, along with Pennsylvania State University, organized and convened a conference on October 15-17, 2012, in Alexandria, Virginia that brought together stakeholders with expertise in honey bee health. Approximately 175 individuals participated, including beekeepers, scientists from industry/academia/government, representatives of conservation groups, beekeeping supply manufacturers, commodity groups, pesticide manufacturers, and government representatives from the U.S., Canada, and Europe.

## 4 Conclusion and Solution

Studies at UC-Davis in 2007 have demonstrated that parasitic infestation(s) are a contributing factor in the onset of "Colony Collapse Disorder" in honeybee populations, nationwide. According to the USDA, domestic honey production is off by 16% for the year 2012. CCD and recalcitrant infestations by the varroa mite (*V. destructor*) have contributed to this decreased production and has negatively impacted crop pollination/production, in general.

Our team has developed a new delivery system comprising 100% natural low-toxicity components, called "L-Tip" that has been shown to be effective in treatment of colonies where *V. destructor* is present. Preliminary field studies indicate effectiveness in treatment of Varroaosis and infestations by the Parasitic Phorid Fly *Apocephalus borealis* as well. Ongoing studies leading to Chapter 13 certification by the USDA are in progress in the states of NC and CA. RMANCO Labs, further initiated microscopic analysis and micro-encapsulation denominators for introduction to eliminate the parasites causing infestations. While Stewart Research and Consulting initiated and completed micro-imaging studies to help identify pesticide residual pre and post pesticide residue pathologies within the American Bee population.

### 4.1 Acknowledgements

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## 4.2 Financial Stipulations

Financing of this research was made possible by RMANNCO Labs and The Melstevia Corporation.

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