WiSys Ref: T180020

Wind Shield to Improve Overwinter Beehive Survival

Market and Background

Honey bees are pollinators critical to many realms, including ecosystem maintenance and the agricultural industry. They are estimated to have an overall annual economic impact of $16.8 billion (14.2 billion euros) in Europe (2017) and $15 billion in the United States (2014). A substantial proportion of honey bees are kept in managed colonies, or beehives, and the global beekeeping market in 2017 had an estimated value of $8.81 billion, including a $341 million in the United States. Unfortunately, seasonal loss of beehives has increased in recent years, with average winter hive losses over the last decade in the U.S. at approximately 30%, which is at least double the previous historic national average of 10-15% winter hive loss. Such a loss can compound for beekeepers, costing, for example, a commercial beekeeper with hundreds of hives tens of thousands of dollars a year in reduced honey profits, hive replacement, and labor.

While there are many complex reasons that a beehive colony might die in the winter, two of the main causes are condensation and cold temperatures. Over the winter, bees respire moisture, raising condensation in the hive. If too much condensation builds, it can drip back down into the hive and kill the bees in the cold. To reduce condensation, beekeepers often use strategies to enhance ventilation in the hive, including putting a simple screen over the hive entry. The screen prevents pests like rodents from entering, while still allowing airflow. However, this enhanced airflow allows gusts of cold wind to enter the hive, making it nearly impossible for the bees to maintain adequate heat despite insulation beekeepers install around the rest of the hive. A strategy that allows ventilation to minimize condensation while still blocking direct entry of wind flow would be an ideal solution that could enhance winter beehive survival rates.

Research and Development Status

University of Wisconsin-Superior researchers have developed a new technology that shields the beehive from wind while still promoting ventilation. This device has a curved structure that installs easily over the standard beehive entrance. Using an initial prototype, preliminary laboratory tests have indicated reduced wind infiltration, preventing 90% of entry of 20 mile per hour winds without inhibiting passive ventilation. Bees adapt to the device on the hive and are able to freely enter and leave the hive. Furthermore, 6 of 8 Wisconsin beehives fitted with prototypes survived the winter of 2017-2018. Although a small sample size, this 25% hive loss rate suggested a marked improvement over the local average 50% loss for the previous 5-10 winters estimated by the Wisconsin Department of Agriculture, Trade and Consumer Protection. Researchers have further optimized the device design and created new prototypes for testing on a larger scale in the winter of 2018-2019. Further testing is also needed to quantify impact on thermodynamics, aerodynamics, and passive ventilation. If the larger studies reinforce the preliminary outcomes seen in the previous winter, this new beehive wind shield will be a promising solution to minimize both condensation and cold winds, thereby improving winter beehive survival. WiSys is seeking a strategic commercial partner for development of this beehive wind shield for mass manufacturing, as well as partners for marketing, sales, and distribution.

Applications and Key Benefits

- Shields beehives from cold wind in winter to allow bees to maintain sufficient hive temperatures
- Permits passive ventilation of beehive, which minimizes lethal build-up of condensation inside hive in the winter
- Estimated 50% improvement of overwinter survivability of beehives
- Substantially reduces costs from beehive loss, including hive replacement and lost honey profits

Intellectual Property

A U.S. Patent Application is pending for this technology. For more information on partnering opportunities please contact us at licensing@wisys.org.