Increasing the Population of Varroa Mite Resistant Honey Bees in the Upper Cumberland

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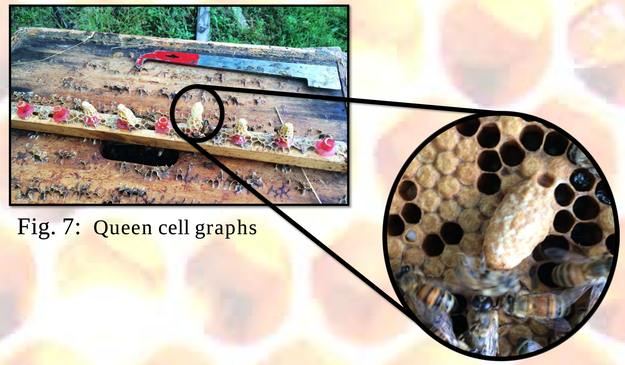

Fig. 7: Queen cell graphs

Introduction

This project was initiated to increase the population of varroa mite resistant honey bees in the Upper Cumberland region of Tennessee and create a teaching resource documentary to raise awareness of the importance of honey bees.

Fig. 1: Upper Cumberland (UC) Region

Significance

Beekeepers across the United States reported a loss of 44 percent of their honey bee colonies in the year spanning April 2015 to April 2016. This was a 3.5 percent increase from the previous year. Tennessee had a reported 36.4 percent loss in the 2014-215 year.

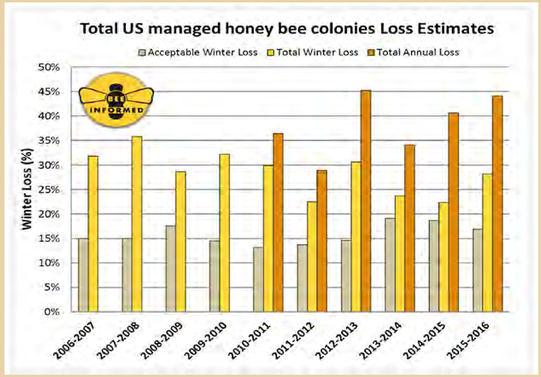

Fig. 2: Summary of the total overwinter colony losses (October 1 – April 1) of managed honey bee colonies in the United States across nine annual national surveys.

Infestation of honey bee colonies with varroa mites has been shown to be the major cause of the catastrophic loss of honey bees in the United States. Numerous commercial pesticide and management methods for control of varroa mites have been investigated with variable results.

A more desirable goal would be to locate, select, and propagate honey bees that are locally adapted to the environment and genetically resistant to varroa mite infestation. This study focused on selecting resistant genetics from a successful hive that had survived for three years at the Tennessee Tech Apiary. Queens with potential to produce genetic resistance to varroa mite infestation were propagated. New colonies with this genetic potential were established at Tennessee Tech University.

Methodology: Increasing the Population of Varroa Mite Resistant Honey Bees in the UC

1. A colony was selected from the apiary that had shown resistance to varroa mites (Fig. 3) and had persisted for three years.
2. Day-old larvae were collected from this colony and grafted into queen cell cups.
3. Cups were attached to an empty frame and placed in a starter nuclear hive (Half –size hives called nucs) along with nurse bees.
4. The hive was placed in a dark place for 24 hours to stimulate the nurse bees to feed the larvae royal jelly to produce queen larvae.
5. After removing queen larvae from the starter nuclear hives, they were placed in a strong colony with a large number of worker bees and the queen excluded from her brood in order to stimulate the nurse bees to finish feeding the queen larvae and draw out the queen cells.
6. The colony was checked after 7 days to insure that queen cells had been drawn and capped.
7. Fully drawn and capped queen cells (Fig. 5) were then placed in individual cages to prevent an early emerging queen from destroying the other queens before they emerged.
8. On day 11 after placing in finishing hives, emerged queens were placed in individual mating nucs with a small number of (About 300) worker bees.
9. Frames of honey, pollen, and comb were added to the mating nucs, and the queens were allowed to take their mating flight, return to the mating nuc, and begin laying eggs.
10. New colonies were placed in a full-size hive when the queens had laid sufficient brood and new worker bees had emerged.

Fig. 8: Resulting Documentary—Fighting for Survival: A Bee's Life

Methodology: Documentary

For the educational documentary, contact was made with video services at Tennessee Tech. Videographer, Rick Wells spent time visiting and recording TTU apiary and local beekeepers. The author attended Cookeville Beekeepers Association to make contact and use footage in the documentary. The entire video was written and narrated by the principal investigator. The completed video was distributed through YouTube and visits to high school classes in Middle Tennessee were made to discuss the importance of beekeeping and pollinators.

Fig. 3: A varroa mite on a honey bee and a larvae

Fig. 4: Emerging queen bee

Fig. 5: A successful queen cell graph

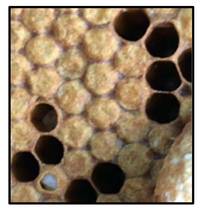

Fig. 6: Capped worker cells

Results

Five different grafting sessions of larvae into queen cell cups were performed over the course of the summer.

The population of honey bees at TTU doubled in number of colonies.

The documentary was well received by professors, teachers, and friends. Many professors and teacher incorporated the documentary into their lessons plans. The documentary had 345 views as of April 4, 2017.

Out of this work a special topics course has been planned and offered at TTU. There are plans to seek approval for the course to be taught every spring.

This work has provided the opportunity for development of relationships and collaborative work with beekeepers in the Upper Cumberland. An apiary management clinic was offered to high school FFA students in the region. High school teachers of agriculture in the area have requested visits from the author to discuss honey bee pollination and apiary management in their respective classes.

Conclusions

Results of this study indicated that genetic selection for varroa mite resistance of honey bees from a single apiary has potential to improve longevity of colonies. There appeared to be considerable interest among teachers and students in secondary education in the plight of honey bees and in learning to manage an apiary, and a scarcity of information and support for such programs among post-secondary institutions. There is a need for further development of methods to meet this need for information and support.

Acknowledgements

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