Mighty Mite Thermal Treatment Case Study

Coronado Honey Bee Farm – Paris Texas

July17, 2018

The case study documented below was done so for the purpose of product sharing and discovery with the owner of Coronado Honey Bee Farm in Paris Texas. The intent was to use conventional methods of testing while producing field trial study to determine the viability of Bee Hive Thermal Industries Mighty Mite Killer to kill varroa destructor mites in honey bee hives (apis mellifera). This is a thermal treatment product which uses a patent pending design to balance an application of heat within a conventional honey bee hive. The goal is to kill Varroa Destructor mites that have been a burden within the USA for many years. The owner of the farm and I discussed the my many test treatments that I had conducted prior to arrival at his farm. Willing to see for himself, he volunteered a hive to take the challenge.

My field testing up to this point has been a success but resulted in findings contradictory to established scientific research findings and we needed to understand why. According to my research, this product shouldn't work but should harm the bees. To do this, we created testing standards indicated below. We were needing before and after readings of mite counts that were reliable so we washed nurse bees three times in alcohol. Monitored all stages of eggs and brood for potential damage.

Goals

1. Does the product do what it says?
2. If so, how can this be accomplished when the text books indicate it cannot?

Testing standards

1. Samples of bees must be taken from brood frames with open larvae
2. Using the half cup standard for an assumed 300 nurse bees.
3. Count the bees
4. Washing in 91% Isopropyl Alcohol
5. Agitating the wash
6. Removing mites and placing on white paper towel 6. Conducting the wash 3 times.
7. Counting the alcohol wash dead bees for mathematical accuracy

Date: June 15th, 2018
Time: 9:03 A.M. start time
Ambient temperature: 81 degrees Fahrenheit
Location: Paris Texas
Triple alcohol wash mite count: 14 Varroa destructor mites
4.666 mites per 100 or 4.66%
Hive size was a strong double deep Langstroth hive (see photos)
Solid bottom on pallet
Selected hive had not been treated this calendar year
A single deep of honey was removed the day prior to treatment.
Italian open mated daughter of II Italian breeder queen.
A number of small hive beetles were observed in the hive.

Link to live posting:
https://www.facebook.com/groups/1715926058641095/permalink/2143525059214524/

Facebook posting to club page

Sebastian Coronado *to* Lamar County Beekeepers Association
June 16, 2018 ·
Today we perform a heat stress treatment with the Migthy Mite Killer.
We did an alcohol wash and counted 14 mites on a 300 bees sample. 4.66% infestation. I'll keep you posted with the results
Thank you Darwyn Flynn for spending your time showing me the treatment.
The main benefit of this treatment is that varroa is killed inside the closed brood, at any time of the year (honey flow too).

Treatment day, a hive was selected at random within a large apiary containing roughly 100 hives that had been untreated to date in 2018, 15 of which were immediately near the selected hive for treatment. Mite count was taken and verified by myself and the owner. *It is important to note, the brood box contained plenty of eggs, larvae, and capped brood. This is especially important because text books teach us that eggs, larvae and brood cannot survive even small temperature changes without drying out and or dying.* A small 2 cycle generator was used for power in the apiary. The mighty Mite Unit was installed in the hive entrance and the sensor was placed center of the top of frame in lower deep brood box. Upper deep box was returned to the top and the insulation board was placed on the top. Lacking a super to place on top of the insulation board, one cinder block was used. The insulation board did not sit flat so we added another equally spaced and that sealed the box top. The entrance closure stick was placed reducing airflow through the hive during the warm up cycle. The unit was permitted to run the full cycle till it timed out.

Run time observations:

Bees initially were irritated at installing the thermal unit. As soon as it was plugged in and started, bees immediately focused on fanning to call bees into the hive. Approximately 15 minutes into the warm up cycle, bees began exiting the hive and bearding on the front. As the treatment unit reached mite kill temp, the flashing blue light transitioned to flashing greed light. The entrance closure stick was removed. At this point, moment by moment more bees would leave the hive. We noticed bees reentering the hive as well. Without unique markings, it is difficult to say how long bees remained exposed to the temperature inside the hive but they continued to enter as some left. We assume they were attempting to cool the hives as bees do. At some point, the bees seemed to give up on cooling the hive and more bees exited and bearded onto the front. Some bees exited and gathered around the upper vent in the insulation board. We never observed the queen bee leave, she could have and we didn't notice. The queen was marked clearly in the years red paint. *This is important to note because science has taught us that queens cannot tolerate the heat. They die, loose fertility, and or have short useful life thereafter. I must also be note that even though the queen didn't leave the hive during this treatment, we have found a queen crawling outside a hive during a treatment later in the summer. Only once but she quickly re-entered the hive. This could have just been a fluke event. This was the only instance this has been noted in thousands of treatments that have occurred.*

Once the thermal treatment unit cycle terminated, it was removed from the hive. Initial examination yielded about 10 dead bees and lots of dead small hive beetles on the

heater board. Closer examination of the underside of these bees revealed varroa attached to them. Numerous dead mites were identified on the thermal unit but not counted due to the number of bees rapidly cleaning the board and removing dead bees. A mite fall monitoring board was placed under the hive.

June 18th through June 22nd – Daily hive observations were made. The colony was busy with house cleaning, uncapping brood that were infected with mites. This brood was picked up and visually verified to contain dead varroa d. mites. Days 3-7 post treatment only. During these observation days, eggs turned to larvae, larvae evolved to pupae and the queen laid eggs in cells that bees were uncapping and disposing of Varroa infected larvae as well as emerging brood cells. *This finding also is contrary to documented lab findings of eggs and larvae being terminated with minor changes in temperature*. *It is important to note, this is suspected to be due to the influx of air flow due to the chimney effect generated by heat rising and bringing fresh into the hive. It is safe to assume if this airflow was blocked, harm could be done to the bees. See conclusion for explanation theory.*

Mite fall was not counted on the board but visually inspected day 10. The number of dead mites was so great on the board, counting would have been impossible so no count was made. *This is especially important to note. The number of mite fall from mites feeding on bees was interesting observation. The SARS study of 1996 indicated that mites required a significant exposure to be killed. Here, we are learning that even though our target is terminating mites under capped brood, we are observing massive kill of loose parasitic mites evidenced by the monitoring board. This finding suggests that as bees are exposed to the temps inside the hive, they are dying in the limited exposure prior to bearding outside the hive and presumably during the bearding process as heat escapes the hive and washes over the bearding bees. Perhaps even during the colony attempt to thermo-regulate the hive. It stands to reason that they may have only been damaged and subsequently died.*

June 25th, 2018 at approximately 11am, the test hive was opened. Colony was very vigorous. Again, all stages of eggs, larvae and capped and emerging brood were observed indicating not only continued success but highlighting the queen's ongoing performance. Again, brood frames were selected to harvest nurse bees. A half cup was again selected and triple washed with alcohol to ensure all mites were removed. Results yielded 2 mites in 279 bees for .71% in the presence of all remaining untreated hives at day 10. Again, no small hive beetles were observed at this inspection date. https://www.facebook.com/groups/1715926058641095/permalink/2153992388167791/

Facebook Posting to club page 10 days post treatment

Sebastian Coronado *to* **Lamar County Beekeepers Association**
June 26, 2018 ·
10 days after the heat stress treatment, the alcohol wash showed 2 mites in 279 bees, that is 0.71% (it was 4.66% before the treatment).
Other observations:
There are 15 untreated hives next to this one, so I satisfied with the results.
No SHB was observed inside the hive. Those usually hiding in small places were killed.

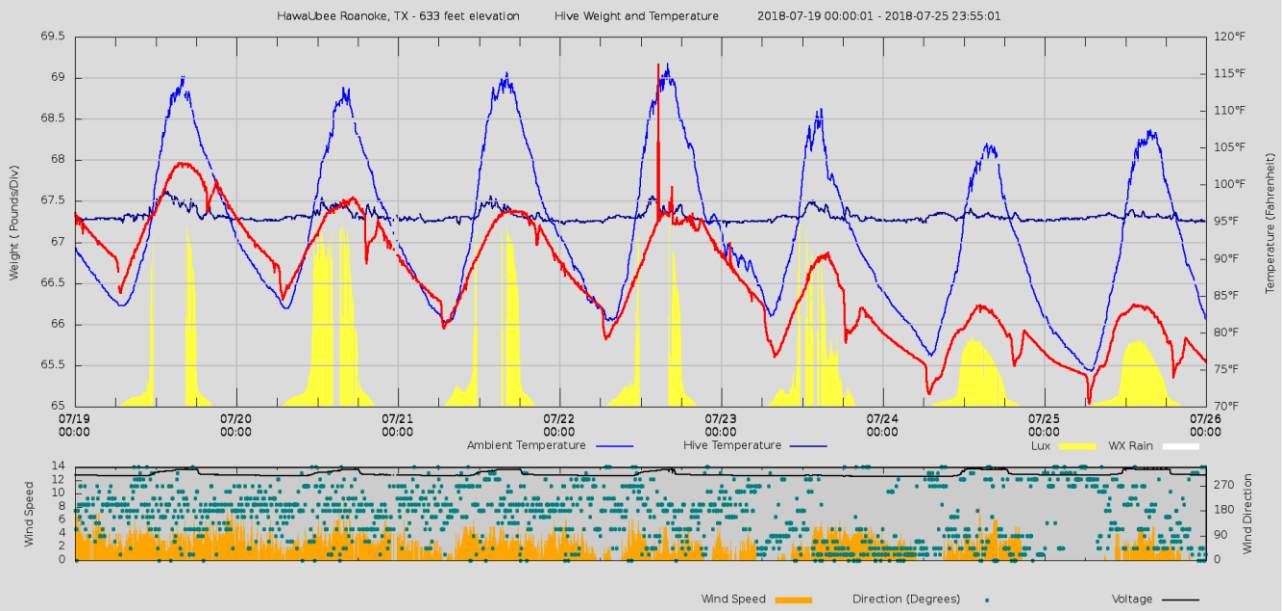
July 6th, 2018 – Hive observation was noted as vigorous and noticeably expanding into 3rd box. This queen continued her diligent work and was used to graft queens the remainder of the year

Conclusion:

This treatment was considered a success. It is obvious the heat the unit creates is more than capable of overcoming the bees ability to cool the hive. The termination of mites under capped brood appears to be effective. The termination of any and all small hive beetles inside the hive appears to be effective. The termination of mites feeding on bees appears to be effective on bees exposed some amount of time to the internal hive temp during treatment. The termination of mites roaming freely around inside the hive appears effective.The queen remained productive post treatment. All stages of eggs, larvae and pupating brood progressed as expected. Colony expansion was well underway. A telephone follow up was made at day 45 – advised colony was rapidly expanding. The colony was used for queen grafting service the remaining summer.

Observational & Application theory:

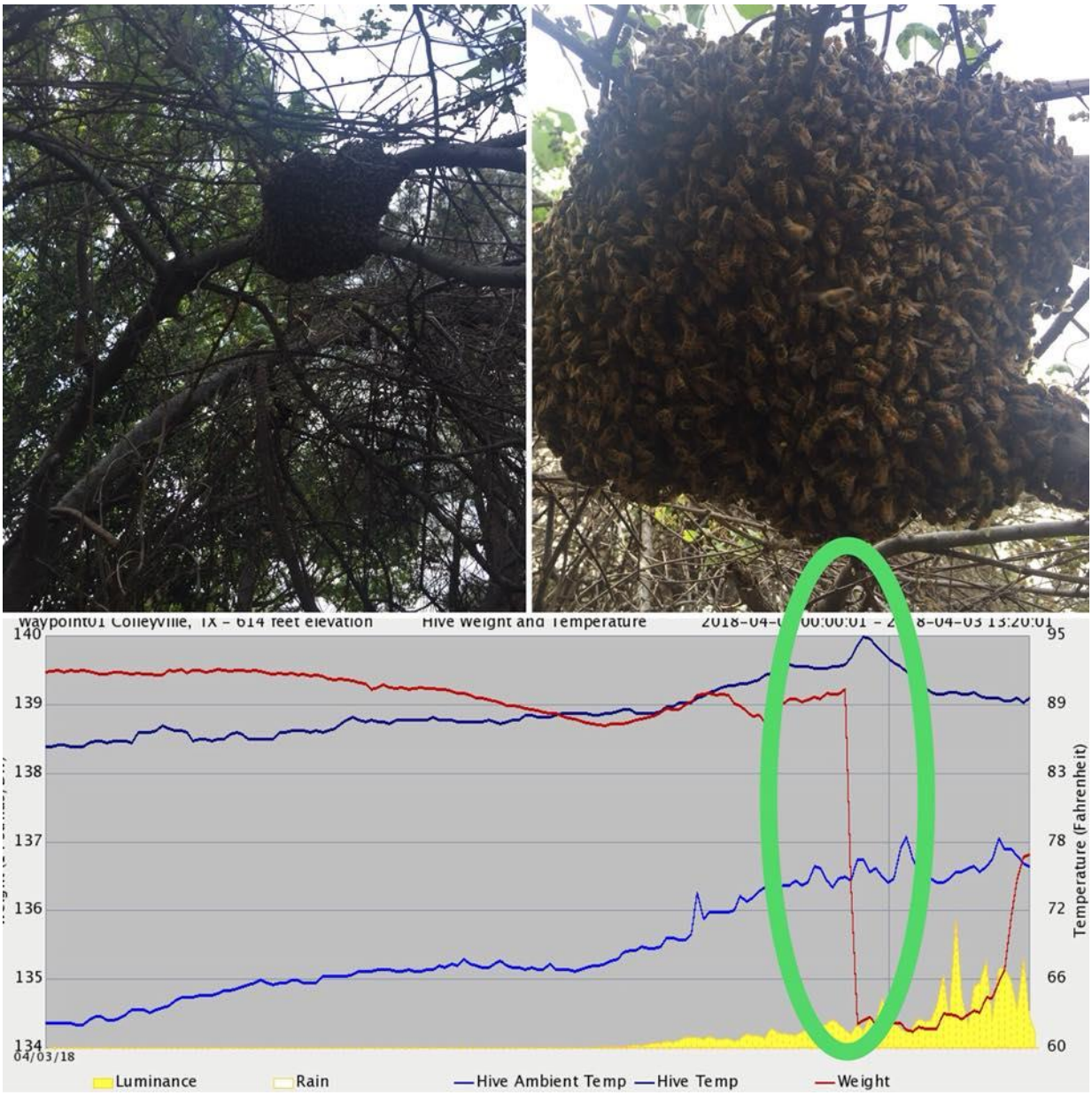
It appears that the field application of heat to treat honey bee colonies in the USA conflicts with scientific studies in the application of heat and its effects on honey bees. I have read a number of published studies indicating harm would be done. Closer review of documented lab conditions in reviewed studies indicates queens were caged while bees were placed in sealed boxes likely deprived of oxygen. What is absent in these lab settings is real life conditions. During thermal treatment with this Mighty Mite Unit, air is taken in at the lowest points of the hive box. As heat rises to escape the box through the insulation board vent, this brings a constant fresh air into the hive replenishing oxygen and atmospheric humidity. The warmer air has greater capacity to hold moisture supporting theory that this eliminates risk of drying larvae and eggs. To validate this theory regarding higher temperature exposures of honey bees, I acquired information from the The HiveTool Project, a global hive monitoring platform accessible online at www.HiveTools.org. I consulted David Hawa, a Senior Developer with The HiveTool Project and the Southwest Regional Director of the Center for Honey Bee Research (centerforhoneybeeresearch.org) for further explanation as to what he has noticed over several years of beehive monitoring.



	Weight	Temp	Humidity	Temp	Humidity	Lux	Rain	Temp	Humidity
Last	65.550 lb.	95.00 °F	41.8 %	81.86 °F	68.6 %	0	in	78.8 °F	65.0 %
Max	69.170 lb.	99.50 °F	79.8 %	116.42 °F	97.2 %	34948	in	112.5 °F	80.0 %
Min	65.040 lb.	94.28 °F	34.6 %	74.84 °F	26.2 %	0	in	72.5 °F	20.0 %
Avg	66.536 lb.	95.8 °F	50 %	93.7 °F	53 %	3554	in	94 °F	44 %
	Inside Hive			Outside Hive					

The table and graph above represent some of the readings from the beehive HawaUbee, for a period spanning several days in July 2018. During this time temperatures exterior to the hive reached 116 degrees Fahrenheit while interior temperatures neared 100 degrees Fahrenheit during peak heat times. Mr. Hawa confirmed that during this time the beehive was in good health and the queen was still viable and actively laying after the summer heat wave despite the elevated interior hive temperatures.

Mr. Hawa also supplied additional information regarding increased temperature patterns during the process of swarming. According to his observations, bees have a tendency to raise the interior temperature of their hive prior, during, and after the moments of a swarm. This phenomenon is not limited to the bees in the United States. One evening, Mr. Hawa emailed a beekeeper of a monitored beehive in Italy after noticing the swarm sign while scanning the online graphs, alerting him of the possible swarm. The beekeeper in Italy responded and confirmed he had harvested queen cells several days earlier but could have missed one and that a swarm had likely occurred. To provide a visual representation of what a swarm sign looks like, pictures of two swarms and the data the monitored hives produced can be seen below.



Pictured above is the Hive: Waypoint01 located in Colleyville, Texas in which hive temperatures spiked (dark blue line) and the weight dropped roughly 5 pounds (red line) during the swarming process.

	Weight	Temp	Humidity	Temp	Humidity	Lux	Temp	Humidity	Wind	Gusts	Direction	Dewpoint	Pressure	Rain	Battery
Last	82.58 lb	78 °F	65 %	80 °F	66 %	84	79 °F	74 %	6 mph	-999 mph	338	69 °F	1014 mb	0.05 in	V
Max	89.05 lb	97 °F	76 %	81 °F	79 %	3821	82 °F	90 %	8 mph	-999 mph	338	73 °F	1016 mb	0.05 in	V

Pictured above is the Hive: Pace Bees located in Southlake, Texas displaying elevated temperatures during a swarm. The massive drop in weight after was due to a complete hive inspection, excess queen cells were removed to prevent additional after swarms.

The information provided above may be a consequence of preparation to swarm via rapid food consumption or it could be an intentional act, the true cause is unknown but noteworthy. Regardless, this further challenges temperature sensitivity claims as documented in past lab studies. We all know that once a swarm occurs, queens are in development and all stages of brood continue to develop through emergence. Additionally, we know that a brood break occurs during the period of time absent a laying queen. Could this be nature's way of dealing with Varroa d. in the wild? This discovery along with others warrant deeper research into further understanding hive processes in the field as the swarm sign is just one of mysteries yet to be entirely explained. In closure, this case study was considered a success by all involved. Much research is needed to understand from a more scientific setting to move from theory to factual data explaining the differences between lab experiences and field experiences that contradict them.

Accolades:

Upon learning more of the Non-Profit efforts that the Center for Honey Bee Research is conducting, I have committed to invest and contribute in their work. I have shared my findings freely throughout the USA and with many research projects internationally in pursuit of answers. If you are interested in learning more of the Center for Honey Bee Research, please go to their website https//centerforhoneybeeresearch.org and consider a donation to empower their continuing efforts. Additional information involving monitored beehives can be accessed by the general public at HiveTools.org, monitored hive information, interpretation, and photographs were provided by David Hawa. Additional photographs, videos, and works can be found on his Instagram account #honeybeeresearch or website HawaUbee.com.

If you're interested in learning more about Thermal Treatment product, the subject of this case study you can visit beehivethermalindustries.com

A special thanks to Sebastian Coronado at the Coronado Honey Bee Farm LLC, https://coronadohoneybeefarms.com/ for his participation in making this study possible. Coronado Honey Bee Farms is a Commercial Beekeeping and Commercial Queen breeding company located in Paris Texas. Mr. Coronado is a lifelong beekeeper from a multi-generation family of beekeepers.

Disclosure:

At the time of this testing and case study, I was in no way affiliated with the manufacturer and distributor of the Mighty Mite Thermal Treatment Unit, The Center for Honey Bee Research, nor was I a participant in the Hive Tool Data Collection project. At the time of finalizing this study, I have agreed to represent the Mighty Mite unit in my home state and actively do so via Facebook and abroad sharing with clubs and beekeepers. I am actively engaged in bringing hives online as a volunteer contributor for the Hive Tool Monitoring Project. I have also started a Facebook Group for the users of the Mighty Mite Product under the name of "Mighty Mite Thermal Treatment Users"

where users of the product help one another with tips and tricks and share success stories in the use of this organic product. I encourage any and all users of this product to share case studies and use the testing standards used here. This is certainly not a scientific study but a record of just one of thousands that have been done on this product. Non-users interested in interacting with those who use this product are also welcome in the group. I can be contacted at Darwyn.flynn@gmail.com and I am happy to discuss thermal treatment and ongoing research with anyone pursuing additional studies on thermal hive treatments for varroa. I am currently engaged in several field studies with others in the industry expanding our knowledge in hopes of improving colony heath, nutrition and hive pest controls. Swarm studies are ongoing as well as emerging product testing's.