



THERMAHIVE

Clean. Safe. Smart. The future of hive health.

2026 FIELD SEASON REPORT

One season. Four apiaries. Sixty-nine treatments.

The complete record of what ThermaHive did to mite loads in 2026: how we measured, what the numbers came back as, what the independent testers found, and the fourteen treatments that did not work.

84%

Average mite reduction from each colony's season peak, 6 of 6 research hives

51%

Average mite reduction per treatment, across 49 paired mite washes

Zero Lost

ThermaHive-treated colonies lost, out of 20 hives

250 lbs

Honey harvested from seven heat-treated hives

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How we measured

The method comes before the numbers on purpose. If you do not agree with how a result was measured, the result is not worth much.

Soapy-water wash

Dawn dish soap against a 300-bee target sample, counted raw over the bees actually sampled. Soapy water is an approved mite-count method in the Honey Bee Health Coalition's Tools for Varroa Management, 9th edition, and Randy Oliver's own testing found it equivalent to an alcohol wash.

Sampled from the brood nest

Bees were taken from frames carrying capped brood and young larvae, which is where phoretic mites concentrate. We logged frames of brood and queen status with every wash, because a colony's own brood cycle moves the count. TH-4 is the one colony we set aside: queen problems left it with nothing but drone brood to sample, so its counts are not comparable.

Paired washes

One wash 0 to 5 days before a treatment and another after it. Both halves are required, which leaves **55 paired washes** out of the 69 logged treatments. The single wash we threw out is the New Jersey tester's, taken after an oxalic acid treatment.

Efficacy read at 14 to 28 days

This follows Randy Oliver's recommendation. A wash taken right after a treatment reads low, because mites still under capped brood have not reached the adult bees yet. **49 of the pairs fall inside that window**, on 16 colonies, and those are the ones behind the 51% figure. The Georgia and New Jersey testers did not wash inside it.

Seasonal mite-load action thresholds used in the 2026 program

SEASON	ACTION THRESHOLD	WHY
Spring	1% or higher	A small mite population entering buildup becomes a large one by July.
Peak summer	Above 2 to 3%	Colony population is at its largest, so the same percentage represents far more mites.
Late summer and fall	2% or higher	This is the window that decides whether winter bees are raised clean.

Down 84% from the season peak

Every colony at our West River research apiary finished the season far below its own worst mite count of the year.

84%

Average reduction from season peak, across 6 of 6 West River colonies ($p < 0.05$). Research apiary only; TH-4 excluded.

51%

Average reduction per treatment (geometric mean), read at a wash 14 to 28 days later. 49 paired washes on 16 colonies. 95% CI 31 to 65%.

Zero Lost

ThermaHive-treated hives lost: 20 treated colonies, 4 apiaries, 69 treatments. Chemical controls lost 1 of 6.

When those reductions happened

Most of the drop came in the back half of the season, once we had worked through the early hardware and firmware problems and moved brood out of the upper honey supers. The early treatments are still counted.

Direction of change, 55 paired washes

Every treatment with a wash on both sides of it, counted by whether the mite load went down or up.



75% of treatments reduced mite load ($p = 0.0002$). 41 of 55 washes came back lower. Fourteen came back higher; section 9 covers why.

Heavily infested colonies

On colonies starting at 5% mite load or higher, mean load fell from **9.2% to 4.6%** across 13 treatments, a 50.3% reduction. 11 of 13 fell (Wilcoxon $p = 0.004$).

Control precision

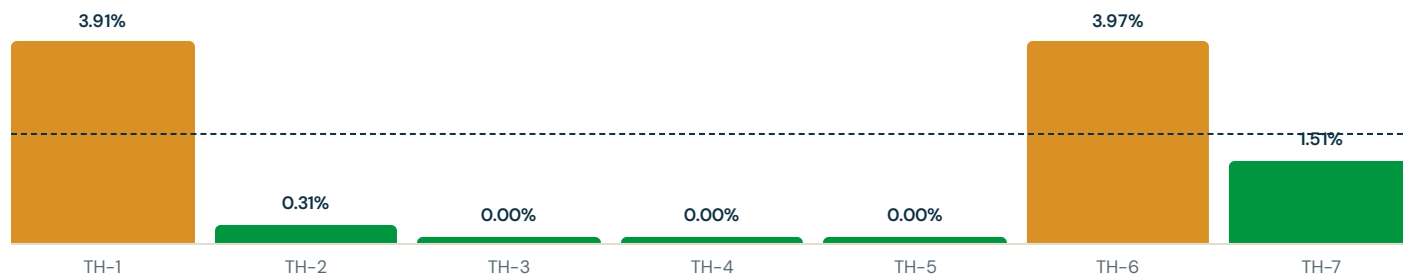
Our best recorded hold averaged **112.03°F** against a 112°F setpoint, with **99.6%** of a three-hour treatment inside **±2°F** and a standard deviation of 0.75°F. Delivery quality varies with the colony.

The biggest takeaway. Every hive is different, so treatment temperature and length depend on the hive. That is why we built ThermaHive as a customizable system. You set the treatment temperature and the treatment length, and adjust both to the colony in front of you rather than running one fixed program on every hive.

Every hive, every month

West River colonies TH-1 through TH-7, tracked from the first wash on April 29 to the last on September 2, alongside the untreated and chemically treated control groups.

Phoretic mite load at season end, against the 2% overwintering threshold



---- 2% overwintering threshold. Amber bars finished above it.

TH-6 peaked near 10.7% in late June and TH-1 near 14.3% in late August before falling. Both came back under 4% after their next treatment. The chemical control colony B-1 is off this chart: it crashed at 71% on August 24.

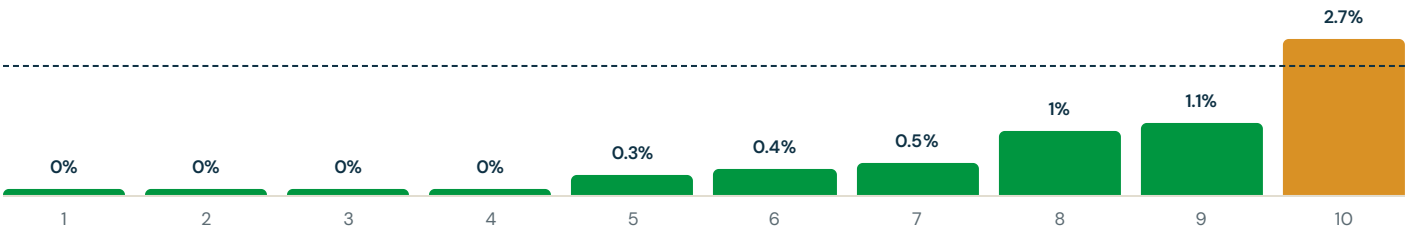
At season end, **five of seven** West River colonies were under the 2% overwintering threshold, and all seven finished under 4% phoretic mite load. Three of them, TH-3, TH-4 and TH-5, finished at zero. The two that finished above 2%, TH-1 and TH-6, are the two that spiked in August.

Independent testers

Three beekeepers in three states ran their own units on their own colonies and kept their own counts. These are their numbers, recorded independently of us.

North Carolina: 10 hives, 23 treatments

71% average reduction per treatment across 23 treatments on 10 hives ($p = 0.00005$). Nine of ten hives finished under 2%. The best single session took a colony from 7.87% to 0.26%, a 97% reduction. Two hives held 0% for three months. No chemicals used.



---- 2% threshold. Nine of ten hives finished below it.

Last-wash mite load on each of the ten hives, ordered low to high. The highest, at 2.7%, is the hive that started the season at 7.9%.

New Jersey: one hive, four treatments

DATE	BEFORE	AFTER	CHANGE
May 12	6%	1%	-83%
July 12	21.00%	8.06%	-62%
July 20	5%	5%	-11%
August 4	9%	7%	-22%

The heaviest hive went from 21.00% to 8.06% after one treatment, then to 4.6% after a second.

Georgia: one hive

A single three-hour treatment at 112°F took the colony from **9.2% to 2.3%** five days later, a 75% reduction. On the first attempt, August 17, 2026, the tester ran into generator problems, so the hive never got one long continuous treatment. His mite count rose.

Outside verification

On September 9, 2026, the National Honey Bee Survey sampled our research colonies.

0 mites

Found in the samples collected in the field

5 of 7

ThermaHive-treated colonies sampled. TH-4 and TH-5 were too small to sample after queen problems unrelated to treatment.

Nov 2026

Full lab analysis expected from the University of Maryland, including a virus screen and pollen evaluation.

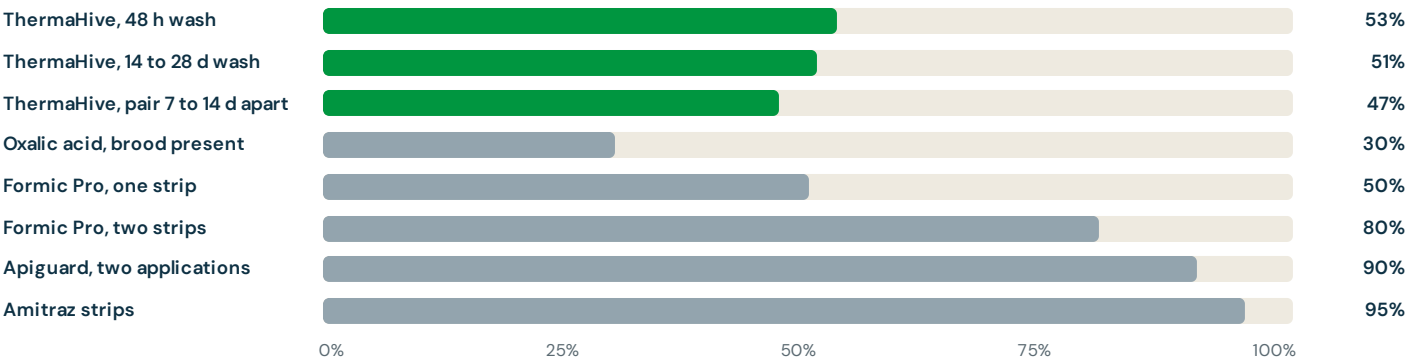


The larval sample taken from one of the ThermaHive research colonies on the day of the inspection.

These are preliminary field results. The samples went to the University of Maryland for full lab analysis. We will publish the complete results when they come back.

How it compares

A 51% kill rate only means something next to the alternatives. About 50% of mites per treatment, comparable to one Formic Pro strip.



2026 field season, all 4 apiaries, 20 colonies. ThermaHive's three bars are measured. The chemical bars are Randy Oliver's published benchmarks (ScientificBeekeeping.com), reproduced for comparison only. ThermaHive is not affiliated with any product named here.

ThermaHive sits roughly level with one Formic Pro strip, below two strips and below Amitraz. What the comparison leaves out is the schedule: **a ThermaHive treatment has no temperature ceiling, no honey-super restriction, no waiting period and no resistance pathway**, so you can repeat it every three to four weeks all season rather than squeezing it into a weather window.

Six treatments at 51% against the chemical plans

Where a colony's wash count would sit on November 1 under each plan, on a modelled colony rather than a measured one.

PLAN	MITES PER 300 BEES ON NOVEMBER 1
Untreated	45 or more
Oxalic acid with brood, 30% x 3 (June 1, July 1, August 1)	20
Formic Pro, 2 strips at 80% (June 1)	12
Amitraz strips, 95% (August 1)	3
ThermaHive, 6 treatments at 51% every 3 weeks, June 1 to September 15	1

The 3% threshold is 9 mites per 300 bees. Built on the logic of Randy Oliver's varroa model with his published kill benchmarks for the chemical plans. Simplified reproduction for illustration, not a prediction for any specific colony. Formic Pro is label-restricted above 85°F, so a June application is the realistic Maryland window. Our field data runs April 29 to September 2, 2026; values after that are projected, and the model assumes no mite immigration. Our actual hives finished the season between zero and 4 percent.

Do heat treatments impact the properties of raw honey?

On the published chemistry, no, not at any realistic number of treatments. Here is the arithmetic.

Invertase is the enzyme used as honey's heat-damage marker. It has a half-life of **9.5 days at a continuous 104°F** (White, Kushnir and Subers, 1964), which works out to 227.5 hours of cumulative exposure. In this trial, the honey super logged **2 hours 20 minutes above 104°F per treatment**. At that rate it would take roughly **98 treatments** to halve invertase activity.

The exposure budget, per treatment

DURING ONE THREE-HOUR TREATMENT	TEMPERATURE	TIME
Brood nest at setpoint	112°F, logged in the cluster	3 h 00 min
Honey super above 104°F	Peak 109.6°F, average 106.9°F while above	2 h 20 min
Treatments to halve invertase	227.5 h at 2 h 20 min each	About 98

The super sits above the treated brood boxes, lags them, and never reaches setpoint. Exposure per treatment is from our own logged super temperature; the half-life is White, Kushnir and Subers (1964). Linear extrapolation, labelled as such.

This is an estimate. The 98-treatment figure is a linear extrapolation from a single published half-life, not a measurement of our honey. We intend to send samples to a third-party lab for enzyme testing.

250 lbs of honey from 7 ThermaHive hives

The practical result, measured rather than modelled: seven colonies heat-treated all summer at the research apiary produced **250 lbs of honey** in 2026. That harvest came off the same colonies whose mite counts are plotted above, in the same season.



Each cell is 10 lbs. 25 cells, 7 hives, one season of heat treatments. West River Research Apiary, 2026.

What did **not** work

Fourteen of 55 washes came back higher. Here is what we know about why.

Two hives: the queen laid in a honey super

ThermaHive regulates to the brood boxes. Heat rises into a super, but a super runs several degrees cooler than the brood nest below it (109.6°F peak against a 112°F hold in our logs), so mites up there got a weaker dose and, depending on the configuration, may never have reached the lethal window. Run a queen excluder, or configure the super as a brood box for the treatment.

TH-4 and TH-5: unrelated queen failures

Both ran small all season after queen problems that had nothing to do with treatment. A treatment does not fix a queenless colony.

Early hardware faults

The first units in the field had failures we have since designed out: a bad RTD probe, a sensor installed backwards, a run that stopped partway. A treatment that never reached temperature is still a treatment in the log, and its wash still counts here.

We were still working out the program

Early in the season we were still settling on setpoint, hold time and how to handle brood in the upper boxes. Several of the early treatments were shorter or cooler than what we now run.

Heat only works at full strength where the system holds it, and no treatment repairs a colony whose real problem is its queen. Some of the fourteen are brood timing rather than treatment failure: a wash only counts mites on adult bees, and a colony sampled mid-emergence releases whatever survived under the cappings into that count all at once. Others have no explanation we can point to. Every hive is different, and sometimes a count simply rises. We report all fourteen as increases regardless.

Methods and references

The 2026 program ran at our West River research apiary in Maryland, with treated colonies TH-1 through TH-7 and six control colonies, under the supervision of Allan Storm, Master Beekeeper and Maryland State Bee Inspector, who serves as our Technical Advisor for Apiculture. Independent testers in North Carolina, New Jersey and Georgia ran their own units and kept their own records.

Our 2026 results are field data from our own trial, not a peer-reviewed study. The underlying science of thermal Varroa control is well established in the peer-reviewed literature, and we cite it below.

What the published hyperthermia studies found

STUDY	METHOD	TEMPERATURE AND DURATION	SAMPLE	RESULTS
Bičik et al. 2016	Thermosolar hive, combs heated in place	40 to 47°C (104 to 116.6°F) for 150 min	5 hives	99.5 to 100% of mites in sealed brood killed; no brood, queen or comb damage observed
Goras et al. 2015	Thermovar, heated hive air	108 to 112°F for 12 to 480 min	27 hives	100% of mites in sealed brood; 6 to 50% of larvae died beyond 4 hours; no impact on adult bees
Porporato et al. 2022	Bee Ethic, coils in the foundation	108°F for 90 min every 3 weeks	21 hives	79.9 to 93.0% of juveniles; no brood, queen or comb damage observed
Sandrock et al. 2024	Vatorex, coils over half the comb	108°F for 130 min every 16 days	35 hives	Held below critical thresholds with 80% overwinter survival; some brood termination observed
Appel and Büchler 1991	Thermal chamber to treat brood frames without adult bees	109 to 113°F for 240 to 360 min	—	100% of mites killed after 4 hours at 44°C (about 112°F); negative impact on brood emergence at 45°C (113°F)

Two things this table settles. Heat in the 108 to 113°F range reliably kills mites in sealed brood. And the colony cost rises sharply with dose: the studies that ran hottest or longest are the ones that reported brood damage, which is why ThermoHive holds a measured setpoint for a fixed window rather than running as hot as the bees will tolerate.

References

Bičik, V. et al. (2016). Thermal tolerance of Varroa destructor and mortality of mites in sealed brood at treatment temperatures.

Goras, G. et al. (2015). Hyperthermia as a Varroa control method, including larval mortality beyond four hours of exposure.

Appel, H. and Büchler, R. (1991). Effects of elevated temperature on brood emergence at 45°C (113°F).

Porporato, M. et al. (2022). Field evaluation of a hyperthermia device with coils in the foundation.

Sandrock, C. et al. (2024). Efficacy and trade-offs of an innovative hyperthermia device to control Varroa destructor in honeybee colonies.

White, J. W., Kushnir, I. and Subers, M. H. (1964). Effect of storage and processing temperatures on honey quality. Invertase half-life of 9.5 days at a continuous 104°F.

Oliver, R. Published treatment efficacy benchmarks and the varroa population model, ScientificBeekeeping.com.

Honey Bee Health Coalition, Tools for Varroa Management, 9th Edition (June 11, 2026).

US Beekeeping Survey, Auburn University and the Apiary Inspectors of America.

EU Directive 2024/1438, honey quality limits for HMF and diastase.

Questions about the method, or want the underlying data? Ask us directly at thermahive.net/contact-us.

Put this season's data to work on your hives.

The ThermoHive V2 Complete Kit ships by January 2027, or pick yours up free at NAHBE 2027. Lifetime warranty, one-time purchase. Pre-order at \$749.99.

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