Field trials assessing Apivar® efficacy against varroa mites in Spain

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Introduction:

Between 2019 and 2023, a series of field trials were conducted in Spain to evaluate the efficacy of Apivar® (amitraz) against Varroa destructor in honey bee colonies. The studies were carried out in Layens hives in Cáceres, Extremadura, following consistent protocols with annual modifications to explore various management techniques. The primary objective was to assess Apivar®'s effectiveness under different conditions and complementary management strategies.

Figure 1: Cáceres, in Extremadura region, Spain.

Materials and Methods:

The field trials were conducted in Pinofranqueado, located in the province of Cáceres in the Extremadura region of western Spain. This area is known for its beekeeping tradition and diverse flora, providing a representative environment for apicultural studies.

Layens hives were used in this experiment, which are horizontal hives commonly used in Spain during the 3 first years. These hives were specially adapted for the study in 2023, featuring metal covers and insulated interiors ("Actuaria model") to minimize environmental influences on colony functioning and improve insulation. The Apivar® strips were hanged with wire extenders to fit properly within the Layens hive format.

Apivar® efficacy studies were conducted along five consecutive years, allowing for a comprehensive evaluation of its effectiveness across multiple seasons and varying environmental conditions. This extended timeframe provided valuable insights into the consistency and reliability of the treatment over time.

Apivar® strips were applied for 70 days during late summer or early autumn. Continuous mite fall monitoring was performed using sticky boards (specially prepared collection sheets divided into grids and coated with Vaseline).

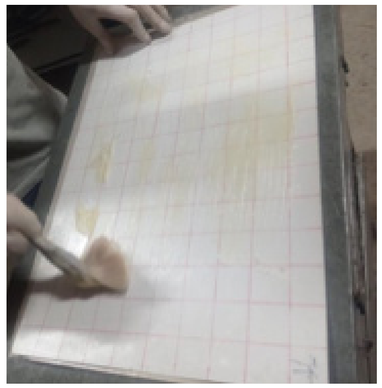


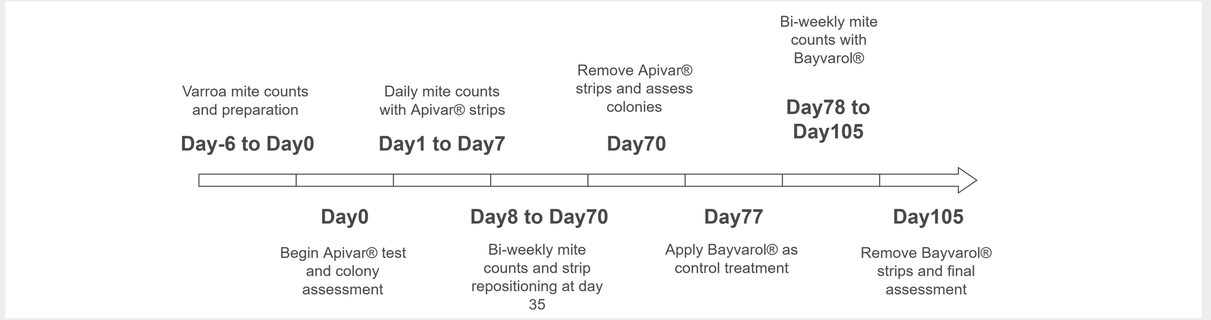
Figure 2: Impregnation with Vaseline on grided sheets (Sticky boards)

Efficacy was calculated using the formula:

$$Efficacy = \frac{Mite\ fall\ during\ Apivar\ treatment}{Total\ mite\ (Treatment\ period + control\ period)} * 100$$

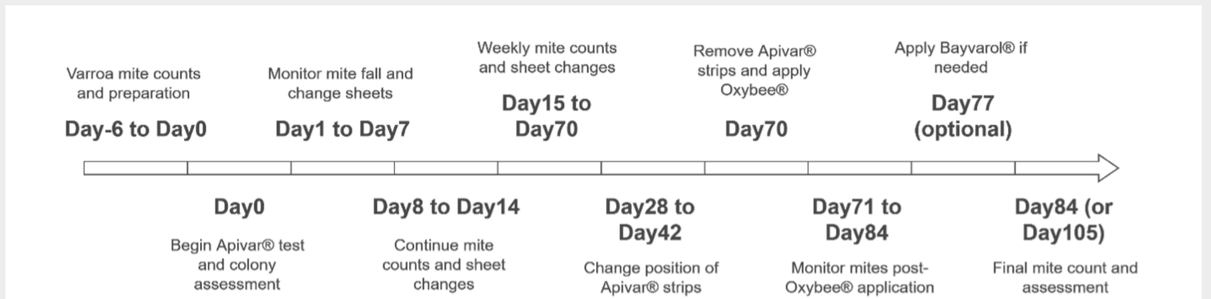
Field Trial Schedule for Apivar® 2019/2020 and Bayvarol® control treatment

In 2019-2020, a standard Apivar® application protocol (70 days) was followed without involving any biotechnical method. Bayvarol® (Flumethrin) was applied as a control treatment after Apivar®.



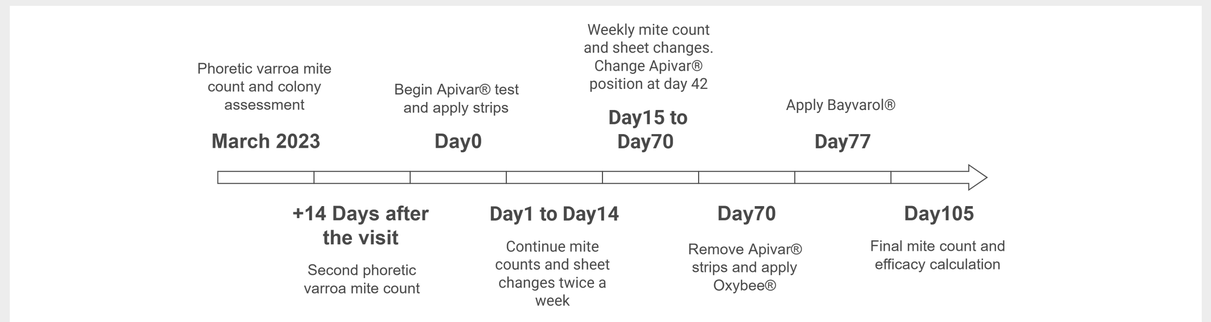
Field Trial Schedule for Apivar® 2021

In 2021, brood removal and Oxybee® treatment were introduced as complementary management techniques. A first group with brood removal between D-6 and D0 in odd colonies with a control group without removing brood frames. At Day 70 of the trial, we removed Apivar® strips and applied oxalic acid by trickling on all colonies (Oxybee®).



Field Trial Schedule for Varroa Mite Management 2023

The 2023 study was extended to compare a group receiving brood removal and Oxybee® treatment in spring to a control group with only Apivar® treatment in summer. The colonies were on the same apiary to avoid outside influences. Phoretic varroa counts were conducted using alcohol washes with Varroa EasyCheck® at multiple points throughout the season. The final Apivar® efficacy trial in September 2023 included a 70-day treatment period followed by a follow up treatment with Bayvarol® and Oxybee® to determine total mite population.



Results and Conclusions:

RESULTS FOR APIVAR® TRIAL IN 2019

Material & methods:
- 7 colonies in Layens hives
- Treatment with 2 strips of Apivar® per hive for 70 days
- Control with a follow-up treatment with flumethrin (Bayvarol®)

Results :
Mite reduction of 99.68%

RESULTS FOR APIVAR® TRIAL IN 2021

Material & methods:
- 10 colonies in Layens hives.
- Brood removal (2 frames) on 5 colonies (odd colonies).
- Treatment with 2 strips of Apivar® per hive for 70 days.
- Control with a follow-up treatment with Oxalic acid (Oxybee®).

Results :

Groups	Removed brood	Control group
Average efficacy	99,81%	99,95%

Varroa infestation monitoring apart from treatment and control periods was carried out with Varroa EasyCheck® from Véto-pharma

RESULTS FOR APIVAR® TRIAL IN 2020

Material & methods:
- 10 colonies in Layens hives.
- Treatment with 2 strips of Apivar® per hive for 70 days.
- Control with a follow-up treatment with flumethrin (Bayvarol®).

Results :
Mite reduction of 99.72%

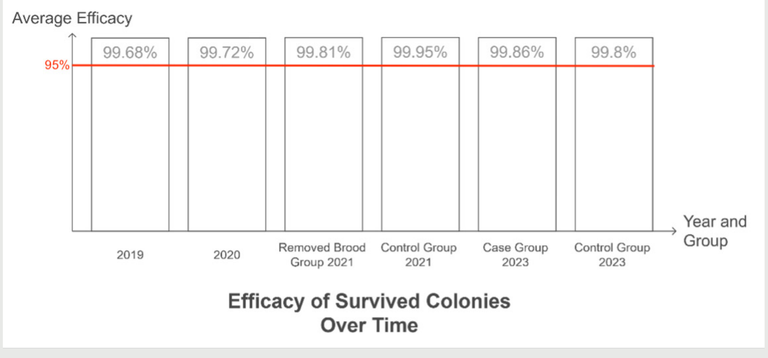
RESULTS FOR APIVAR® TRIAL IN 2023

Material & methods:
- 16 colonies in Layens hives.
- 2 groups:
  - Case group: Brood removal + Oxybee® Treatment on March.
  - Control group: No management or complementary treatments throughout the beekeeping season.
- Treatment with 2 strips of Apivar® per hive for 70 days for the 2 groups in summer.
- Control with a follow-up treatment with Oxalic acid (Oxybee®) on the removal day of Apivar® + Bayvarol® (Flumethrin) application.

Results :

Groups	Case group	Control group
Average efficacy	99,86%	99,8%

Summary:



Efficacy of Survived Colonies Over Time

These 4 years trials, from 2019 to 2023 consistently, demonstrated a high efficacy of Apivar® against Varroa mites in honey bee colonies. The treatment period was generally in September, a timing chosen in collaboration with the local beekeeping association to reflect real-world conditions. However, it's worth noting that this treatment period is relatively late for the Extremadura region, where climatic conditions can be challenging (hot and dry).

Despite these potential challenges, Apivar® showed remarkably consistent results across the years:
- In 2019, a 99.68% mite reduction was observed in 7 colonies.
- The 2020 trial, despite losing 5 colonies due to dry conditions, still achieved a 99.72% efficacy rate.
- The 2021 study introduced brood removal in half the colonies, resulting in 99.81% efficacy in the brood removal group and 99.95% in the control group.
- In 2023, we compared brood removal with Oxybee® treatment during the season to a control group, yielding 99.86% and 99.8% efficacy respectively. However, two colonies in the control group were lost due to robbing late in the season, suggesting these colonies were weak towards the end of the trial.

Discussion & Conclusion

The several year trials in Spain, 2019-2023, on a yearly basis consistently documented the outstanding efficacy of Apivar® against Varroa destructor on honey bee colonies. Treatment manifested stability throughout different years as well as control groups, efficacy levels on an ongoing basis higher than 95% (Guideline on veterinary medicinal products controlling Varroa destructor parasitosis in bees). These outcomes confirm the reliability of Apivar to control Varroa infestation when used according to Label instruction.

The 2023 extended study, brood removal and Oxybee® treatment versus a control group, did not have a significant difference in overall Apivar® effectiveness (99.86% vs. 99.8%).

These findings highlight the importance of integrated pest management (IPM) to varroa management. Although chemical treatments like Apivar® remain extremely effective, beekeepers should consider employing biotechnical methods adapted to their specific operations. Some of these methods may include brood removal, drone brood trapping, or the production of artificial swarms, and can reduce the mite level during the season without chemical control alone (Gregorc et al., 2016).

Timing of treatments is critical to effective varroa control. Treatment in Extremadura was typically done in September, consistent with Extremadura beekeeper tradition. Subsequently, however, it might be considered timely for the very hot and dry local conditions. Treatment protocols require more study in terms of timing and frequency of doses to maximize declines in mite levels and enable bees to finish the season strongly (Rosenkranz et al., 2010).

In conclusion, while Apivar® has demonstrated consistent high efficacy, beekeepers need to have a comprehensive management strategy for varroa. This includes attentive monitoring of the mite counts, strategic treatment timing, and integration of appropriate biotechnical practices into their specific beekeeping context. Further research needs to develop IPM strategies further and explore the potential synergies between chemical treatments and other management strategies.

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