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PP-124 [Bee Health]

Hive type and genetics for improved varroa survival and resistance

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The untreated MENA population in Galicia

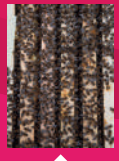
In Galicia (North Spain), Iberian genetic lines have been managed without treatment since 2015, following the MENA programme.

MENA hive design:
- Frames arranged "hot" (parallel to entrance)
- No artificial wax sheets
- Extra frame to reduce spacing

Management:
- Minimal interventions
- Monitor natural varroa fall
- Treat only if infestation exceeds threshold

Selection of genetic lines:
- New queens bred annually from untreated survivors

Conventional hive



Hive entrance

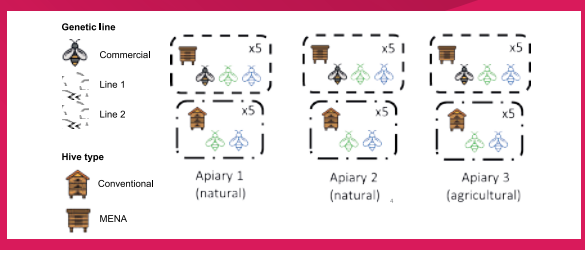
"MENA" hive

Hive entrance

Experiment (2023 – 2024)

- 3 genetic lines (MENA selected Line 1, MENA selected Line 2, unselected commercial line)
- 2 hive types (MENA, convencional)
- 3 apiaries
- 5 colonies per group = Total 75 colonies

Evaluation and monitoring of colonies over 2 years
- Natural varroa fall over 4 days (hygienic bottom board)
- Varroa infestation on adult bees (powdered sugar roll method)
- Hygienic behavior test (pin test)
- Number of brood frames
- Number of adult bee frames



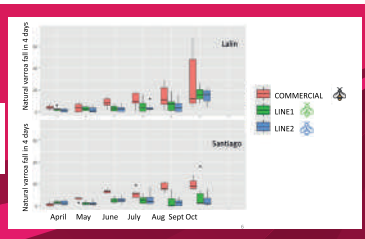
Results

Hygienic behaviour

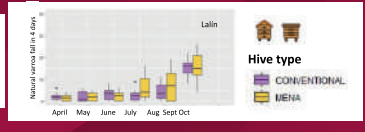
Higher hygienic behavior in lines 1 and 2 compared to the commercial line (F=68,153; p<0,001)

Natural varroa fall

Line 1 and Line 2 have significantly less varroa than the commercial line (~40% less!)

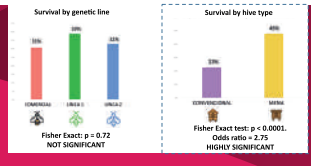


In contrast, hive type has no effect on natural varroa fall. No differences between conventional and MENA hive.



Survival

- **High colony loss across all experimental groups (72%)**
- No survival differences between genetic lines
- **Hive type matters : Colonies in MENA-type hives are 2.75 times more likely to survive**



Conclusions

Genetic Lines
Lines 1 and 2 show lower varroa loads and higher hygienic behavior than commercial lines.
Selection potential for these traits exist in the Iberian honey bee.

Hive Type
No difference in varroa load between MENA and conventional hives. Colonies in MENA hives showed higher survival, despite similar varroa levels.

A combination of genetics, management, and hive type enhances varroa resistance and colony survival.

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A long-term sustainable solution to varroosis is the selection and breeding of varroa-resistant lines. In Galicia (North Spain), Iberian genetic lines have been managed without treatment since 2015, following the MENA programme. This programme aims to control varroa by creating optimal in-hive conditions. This includes putting frames in 'hot arrangement' (parallel to the hive entrance), using no artificial wax sheets, and adding an additional frame so as to reduce the distance between frames (=MENA hive type). Beekeepers do minimal interventions so as not to disturb colony homeostasis, continuously monitor natural varroa fall, and treat only if necessary (if infestation is above a certain threshold). Each year, new queens are bred from the untreated survivor colonies. The ECOAPI project (MICINN-TED 2021) aims to elucidate the role of genetics, hive type and environmental factors in the resistance of colonies to varroa. To this end, in 2023-2024, we conducted a field experiment comparing the type of hive management (MENA vs conventional) and three genetic lines (two lines originating from the MENA programme and one commercial) in three apiaries with different environmental conditions (n=75). Varroa infestation was monitored by counting natural mite fall on the bottom boards and in adult bees with icing sugar. Colony strength (number of brood frames/adults) and hygienic behaviour (pin test) were assessed. Colonies were equipped with internal temperature and humidity sensors, as well as with a scale. All colonies were left untreated. The results revealed that the two genetic lines originating from the MENA programme had superior hygienic behavior and lower varroa loads compared to the commercial line, however, no difference in overwinter survival was observed. In regards to the hive type, colonies housed in MENA hive types had a higher survival rate than bees in conventional hives, despite similar varroa levels. A possible explanation could be that colonies in MENA hives could better maintain homeostasis in winter, as we recorded that they had a higher internal temperature compared to conventional hives. ECOAPI (TED2021-131393B-I00) is funded by the Spanish Ministry of Science and Innovation and the State Research Agency.