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PP-118 [Bee Health]

Development of a starch-vaseline formulation for controlled release of thymol as acaricide in beehives

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Thymol: antioxidant plant-derived volatile monoterpene-phenol authorized for varroosis control in organic beekeeping.

Thymol dissipates rapidly, impacting bees' behavior and requiring re-application.

Controlled-release thymol formulations are needed:

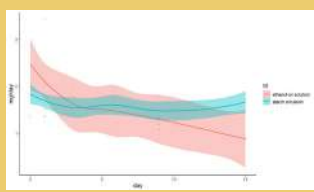
- ensure prolonged exposure to effective doses
- minimize the risks of overexposure
- reduce application frequency

Starch, particularly **amylose**, can form **inclusion complexes** with small molecules such as **thymol**

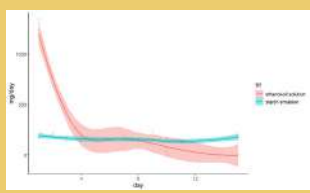
In this study we evaluated a starch-vaseline-based formulation for varroosis control

Treatments
- Thymol in oil-ethanol solution applied to cardboard strips (4 g/strip) — included for comparison purposes
- Thymol in starch-vaseline matrix applied to cardboard strips (4 g/strip)

Emission profiles characterization:
- gravimetry
- volatile collections



Volatiles collecitons



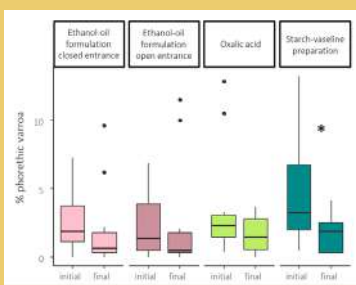
Weight loss

Apiary trial

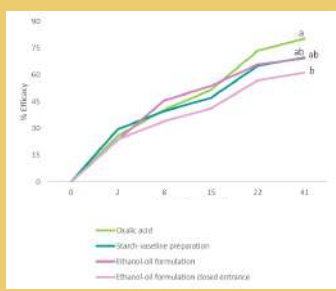
april 2024
Sarandí Grande - Uruguay

- Oxalic acid in glycerol applied on cardboard strips (12 hives)
- Thymol in oil-ethanol formulation on cardboard strips in hives with an open entrance (11 hives)
- Starch-vaseline thymol formulation on cardboard strips in hives with an open entrance (14 hives)

8g/hive in thymol treatments
all treatments re-applied after 15 days



* indicate significant differences Mann-Whitney $p < 0.05$



*Different letters indicate significant GLM, LSD Fisher $p < 0.05$

These findings suggest that starch-vaseline based thymol formulations show promise as a sustained alternative for Varroa control in beekeeping

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Development of a starch-vaseline formulation for controlled release of thymol as acaricide in beehives

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Thymol is a volatile monoterpene-phenolic antioxidant of plant origin, authorized in organic beekeeping for varroosis treatment. Beyond commercial products, beekeepers often use homemade oil-ethanol solutions applied on cardboard strips. However, these formulations dissipate rapidly, impacting bees' behavior and requiring re-application. Controlled-release thymol formulations offer a promising alternative by ensuring prolonged exposure at effective doses, while minimizing the risks of overexposure and reducing application frequency. Starch, especially its amylose component, can form inclusion complexes with various small molecules including thymol. In this work we evaluated a starch-vaseline-based formulation for varroosis control, applied on the same cardboard strips used for ethanol-oil solutions. The emission profile of both formulations were characterized by gravimetry and periodic volatile collections. The starch-based formulation exhibited a more consistent release rate, averaging 192 mg/día for 23 days (slope of emission curve: -5), compared to the reference formulation which dissipates rapidly at 458 mg/día for 10 days (slope -100). To assess efficacy, the formulations were tested in a 45-day field trial (March 2024) across 3 apiaries. Varroa infestation levels were estimated in samples (300-400 bees/colony) at the beginning and the end of the assay. The trial included 3 treatments: oxalic acid in glycerol applied on cardboard strips (12 colonies) as a positive control; thymol in an oil-ethanol solution applied on cardboard strips in colonies with an open entrance (11 colonies); and thymol in the starch-vaseline matrix on cardboard strips in colonies with an open entrance (14 colonies). Both thymol treatments incorporated 8g/colony were incorporated; and all treatments were re-applied after 15 days.

Comparing initial and final infestation levels, preliminary data indicate a 2.3-fold reduction in varroa infestation for oxalic acid, a 2.5-fold reduction for the starch-based thymol formulation, and no reduction for the oil-ethanol thymol solution.

These findings suggest that starch-based thymol formulations may be an effective alternative for sustained Varroa control in beekeeping.