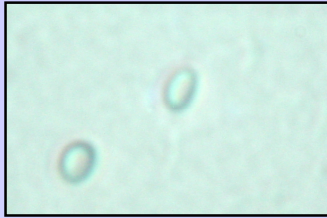


EVALUATION OF THREE DIFFERENT STRATEGIES TO NOSEMA CONTROL

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Spores of *Nosema apis* from fresh honey bee preparation

Introduction

The Microsporidian *Nosema apis* (Zander) is the causative agent of nosema disease affecting of the honey bee intestine, potentially resulting into weak, unproductive colonies and death [Fries, 1993]. Although the outbreaks are usually regarded as depending on adverse climatic conditions, reports of major damages in unexpected areas, like Mediterranean environments, have been accounted for [IBRA Bull., 1993].

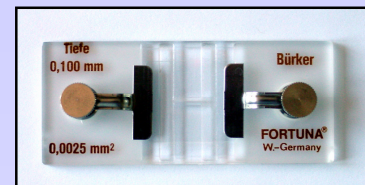
The sole antibiotic acknowledged as effective (fumagillin) is no longer allowed in the EU [Regulation 2377/90], and formulations that accomplish with the organic productions [Regulation 1804/99] are badly needed.

The research aims to evaluate a new formulation against nosema disease based on extracts of plants that are environmentally safe and non-toxic for the humans. This has been given the provisional name "ApiHerb".

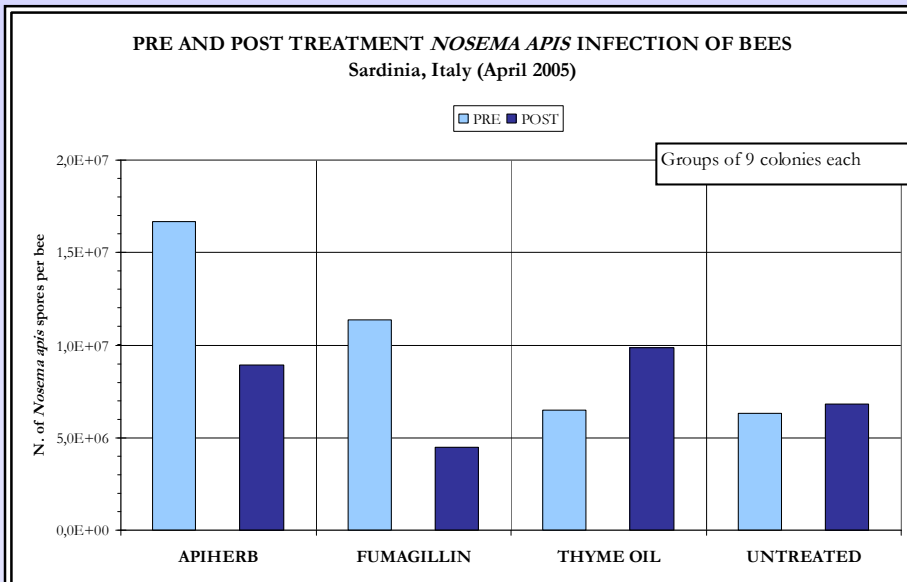
Material and methods

In Sardinia, colonies of two apiaries surviving a heavy nosema infection were gathered in a single location. The ones in worse conditions received ApiHerb or fumagillin, whereas the others were treated with thyme oil or left untreated. Two (fumagillin) or three weekly administrations were made.

The abdomens of old bees sampled pre and post treatment from each colony were squashed in a mortar and suspended into a known volume of water. Counts in Bürker hemocytometer chambers and appropriate calculations allowed to assess the number of nosema spores per bee.



Bürker hemocytometer



Treated groups

A remarkable decrease of nosema spore load was recorded in ApiHerb (-46%) and fumagillin (-60%) treated colonies. The ANOVA (see table) showed a highly significant effect of the treatment on the normalised pre-post treatment increase, which mainly lay in the significant difference between controls and each of the treated groups (SNK test). Conversely, ApiHerb and fumagillin treated colonies did not significantly differ.

Field observations did not show any appreciable colony disturbance in treated and untreated colonies like abnormal bee and brood mortality, queenlessness or bee clustering outside the hive entrance.

Conclusions

In Mediterranean environment, three weekly administrations of **ApiHerb yielded a noticeable decrease in the number of *Nosema apis* spores infecting the honey bee intestines** to an extent that was similar to what occurred with two weekly fumagillin administrations.

The promising results above foster further investigations on ApiHerb. Efficacy against nosema disease and tolerability to the bees are to be confirmed under different environments. Treatment dose and schedule shall be optimised further, with the hope to make an effective and practicable control method based on natural compounds available to the practice.

Acknowledgement

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Results and discussion

Controls

Pre-treatment infections were noticeably lower in thyme oil treated and untreated colonies (see graph). This was somewhat expected, since the need to have all of them surviving until the end of experiment required to include the best ones in the groups where no or weak effect was presumable.

The average number of spores per bee increased during the 3 weeks of treatment in both groups.

The normalised increase was non-significantly different (SNK test). This allowed to pool the data of the above colonies to make up a wider control group.

ANOVA	F	df	P
Treatment	6,754	2	0,004

SNK test	Controls*	Fumagillin
ApiHerb	0,015	0,949
Fumagillin	0,027	-

Statistical analysis of the normalised pre-post treatment increase of intestinal *Nosema apis* spore load.

(*: untreated + thyme oil treated)