SUMMARY

Implementation of surveillance activities and development of new methods for the control of Aethina tumida in Italy

Key words: *Aethina tumida*, impact evaluation, diagnosis and control

Aethina tumida (Small Hive Beetle - SHB), order Coleoptera, Nitidulidae family, is an exotic bee pest, responsible for a notifiable disease in the EU for which there are specific veterinary policy measures (Decision 2003/881 and subsequent amendments and additions). These measures regulate the movements and bee imports from third countries.
SHB cause damages both directly to hives and honey, and indirectly to environment due to the reduction of the pollination service provided by bees.
In September 2014, SHB has been detected for the first time in Europe, in Southern Italy (Calabria and Sicily). Currently, the parasite is endemic in some provinces of Calabria region.
Diagnostic and surveillance methods, previously adopted in other countries such as USA, Australia and South Africa, have been implemented since the beginning of the invasion, but they resulted very demanding in terms of time and energy and not adaptable to the Italian climatic/environmental conditions.
The objectives set and achieved by this research project were:

- short-term objectives, aimed at improving the control, management and prevention of aethinosis by:
  - the identification and evaluation of innovative methods for SHB diagnosis, both on field and in the laboratory, also with the use of innovative matrices;
  - the study of new products for the attraction and treatment of SHB.

With regard to the aforementioned objectives, the activities carried out were:

- study of molecular biology methods (PCR) for a preclinical diagnosis of the parasite, applied to innovative matrices such as hive debris, soil under the hive, swabs applied on hive bottom and on the frames;
- development of the movable frame divided, a tool to facilitate the beetle detection;
- development of a procedure for the management of sentinel hives positive for *Aethina tumida*;
- in vitro testing of new natural products (Azadirachtin, Neem oil, garlic macerate) for the control of SHB adults and larvae.

- long-term goals included:
  - a feasibility study related to the implementation of a passive surveillance plan, through samplings carried out by the Beekeepers' Associations;
  - a detailed cost-benefit analysis of the strategies adopted in terms of environmental impact with regard to direct damage to beekeeping companies (livestock damage), to ecosystem (biodiversity) and agriculture (reduction of the pollination service).

With regard to the long-term objectives, the activities carried out were:

- beekeepers involvement, in collaboration with FAI Calabria Association, in a study related to the evaluation of the influence of factors (sun exposure and hives strength) on the SHB infestation level. This activity replaced the passive surveillance plan that was not feasible due to the restrictive legislation (Decree 10 September 2019).
- Dissemination of two surveys entitled: "Survey of the risk perception associated with invasive diseases and species that threaten bees, with particular attention to SHB" and "*Aethina tumida*: survey on control measures".

The results obtained by the project allowed to validate the effectiveness of the new diagnostic methods in the field (inspection and confirmation of the presence of SHB in sentinel hives / mobile frame divider) and in the laboratory (PCR methods on innovative matrices) in order to provide

quick and safe answers on the presence of *A. tumida*. Furthermore, a phylogenetic analysis of SHB strains present in Italy was carried out.
Regarding the natural biocides tested for the control of SHB, a disturbing action of azadirachtin on the development of the beetle was observed.
The cost / benefit analysis of the control strategies adopted showed that the transition from an eradication policy to one of disease management is a fundamental condition for restoring the collaboration of beekeepers with the surveillance system and the full efficiency of it. Finally, the proper functioning of the surveillance system is a fundamental condition for controlling the invasion and avoiding the spread of SHB.