Focus Group : Bee Health and Sustainable Beekeeping

MINI PAPER 02 # DESEASE CONTROL AND EMERGENCY SITUATIONS

eip-agri
AGRICULTURE & INNOVATION

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funded by European Commission

#beehealth #sustainable #beekeeping

Focus Group: Bee Health and Sustainable Beekeeping

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All started with an email from a colleague, saying:
You might find this interesting.!.!.!

Experts wanted for EIP-AGRI Focus Groups: deadline 11 Febru

Do you have practical experience or specific knowledge on:

- Bee health and sustainable beekeeping
- Diversification opportunities through plant-based medicinal and cosmetic products
- Soil salinisation
- Protecting agricultural soils from contamination
- Reducing antimicrobial use in poultry farming

Read the call text and apply for the five new Focus Groups (you can find the link to t
application form in the PDF call text)

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MINIPAPER 02: Disease control and emergency situations

September 2020

Authors

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This aim of this paper was to summarize and highlight the best beekeeping practices and the innovative methodologies available
in order to improve disease prevention, diagnosis and control
under the pressure of conflicts such as migratory beekeeping, resistance to chemicals, climate change.
At the same time, we highlight that any control measures should also maintain the quality and safety of hive products as they are used not only as human food but also as cosmetics and medicines.

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- ❑ Key points and info in a table

- No details on pathogens biology

But short description

- Key messages on their virulence and monitoring tools and detection methods
- An inventory of relevant European projects addressing them (research/ monitoring/ control)

	Description	Monitoring/ detection / diagnosis	Recent projects
Varroa destructor (Varroa mite, a, b)  	• The female feeds on the fat body and haemolymph • It reproduces in the capped brood cells • Is known to be a vector	- Debris at the bottom board - Adult varroa mites on adult bees (using icing sugar, ether, alcohol, CO2)	SMART BEES http://www.smartbees-
Nosema apis/ Nosema cera (Nosema desea 	 snatching and killing returning bee foragers, the colony responds by closing foraging efforts so that is weakened by predation levels and may starve to death by lack of food. • Limited scientific assessment of the overall impact of *V. velutina* (Monceau et al, 2014). • Protein supplementation and slight energy supplementation of the colonies might be necessary	at the European level - Detection methods for nests radio-telemetry (Kennedy et al. 2018) or drones (unmanned aircraft system or UAS) - - Establish traps filled with different substances (mainly sugar, but also fish or proteins) in the surrounds of the bee yards	**BeeBase** http://www.nationalbeeunit.com/index.cfm?pageid=206 **COLOSS** https://coloss.org/

Recent projects *

SMART BEES
http://www.smartbees-fp7.eu/

EurBeST
https://eurbest.eu/

BeeScanning
https://beescanning.com/

BPRACTICES
http://www.izslt.it/bpractices/the-project/

NOLESSBEES
https://www.eurostars-eureka.eu/project/id/5928

Bee Aware
https://beeaware.org.au/archive-pest/nosema/#ad-image-0

POSHBEE
http://poshbee.eu/

EPILOBEE
https://www.anses.fr/en/content/european-epilobee-programme

DeBiMo
https://ag-biene.uni-hohenheim.de/en/debimo

APENET/ BeeNET
https://www.izsvenezie.com/bee-health-in-italy-national-monitoring-results/

STOP VESPA
https://www.vespavelutina.eu/en-us/

BeeBase
http://www.nationalbeeunit.com/index.cfm?pageid=206

COLOSS
https://coloss.org/

The Good Beekeeping Practice suggests sampling varroa infestation before any treatment.

As an example, we present here the illustration of the icing sugar method (Fig. 1).

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Fact No 1.

VARROA MITE IS THE ONLY PEST OF THE HONEY BEE FOR WHICH CHEMICAL TREATMENTS ARE ALLOWED!

Varroa control through beekeeping practice

- For over 25 years, a number of "hard' chemicals has been used to fight varroa, with their success diminishing as resistance of varroa is increasing. This type of varroa control is also leading to residues in beeswax, honey, pollen, propolis, royal jelly and bees larvae. As these are also consumer products for humans, the residues will finally end up in human organism. To limit these effects, or even prevent them, the management of varroa control is one of the keys for sustainable food products from honey bees. Several 'soft' chemicals or organic substances such as organic acids and essential oils, namely formic acid, oxalic acid, lactic acid and thymol have also been used with increasing frequency, mainly aiming at controlling varroa resistance to chemicals and reducing chemical residues in wax and honey. However, with the use of all the above substances (although at not at the same level) one cannot avoid the weakening of the colony and partly the destruction of the flora and fauna in the beehive.
- Extension for varroa control also calls for synchronised control in terms of period of the year, and type of application, which can minimise the risk of reinfestation in permanent / non migratory apiaries. Training is also very important in varroa monitoring or control schemes, as good beekeeping practice also includes measurements of infestations level and then control of varroa if infestation is above a certain threshold. Especially young beekeepers should be trained to use all sampling methods available and recognise early symptoms of apparent virus.

Varroa is the only pest that chemical control is allowed

- Hard chemicals against varroa diminished natural resistance of bees
- Often use of hard chemicals caused varroa to be resistant
- This type of varroa control is also leading to residues in beeswax, honey, pollen, propolis, royal jelly and bees larvae.

- the management of varroa control is one of the keys for sustainable food products from honey bees.
- Several 'soft' chemicals or organic substances such as organic acids and essential oils,
- All should be used with caution!
- calls for synchronised control which can minimise the risk of re-infestation,
- Training is also very important in varroa monitoring or control schemes.

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Alternative Varroa control

- Alternative ways to control varroa have also been developed such as trapping of mites in worker or drone brood, complete brood removal, caging of the queens, making artificial swarms, use of wire netting bottom boards or specialized bottom boards, use of 'energy waves', heat and powder sugar, reduce cell size, rotation of combs (Rosenkranz, et al, 2010).

- Breeding for resistance: *Varroa* resistant colonies are however thought to be the best solution in eliminating the problem of colony losses due to this parasite, but it seems that global beekeeping and varroa management need to be controlled and advised in a way, that will allow for the resistant bees to thrive. Recent European projects address this issue in detail (SMART BEES, EurBeST)

Example from Finland!
Use of cell size of 5.1mm instead of 5.4.
This management practice together with the removal of capped drone brood keeps varroa levels very low. It is important that varroa has always open brood at her disposal

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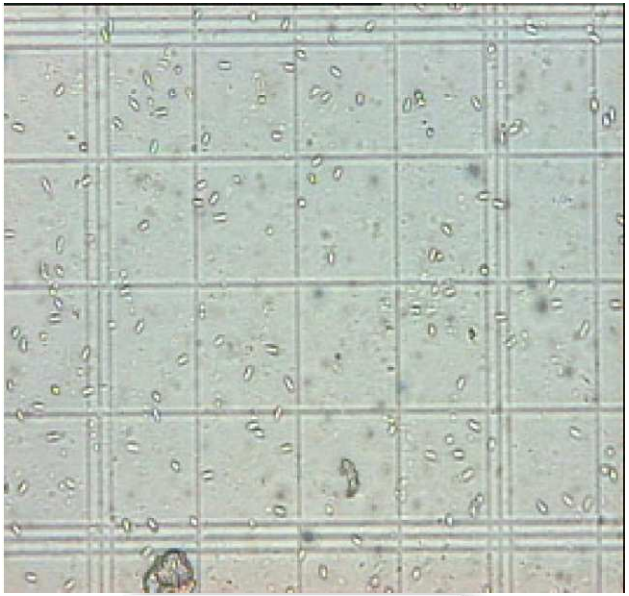
Fact No 2.

NOSEMA CERANAE SPORES DO NOT GERMINATE AFTER THEY HAVE BEEN SUBJECTED TO COLD!

Fight against Nosema !

- Negative effects on queen survival and egg-laying of newly emerged queens in queen-breeding apiaries should be prevented to assure good quality of queens.
- Nosema shortens bee honey bee lifespan and survival may be dependent on the level of infection.
- Selective breeding for Nosema resistant bees could also become an important tool in reducing the incidence of nosema infections in honey bee colonies.
- It is crucial for the beekeeper to minimize the negative effects of potential nosema infestation on colonies development and also their survival.
- The vast negative effects of nosemosis on individual honey bees and whole colonies call for effective and accurate diagnosis, preventive methods and therapy without the use of antibiotics.
- Extension/ training including 'good beekeeping practice' and colonies management need to be carried out.
- Fresh running water is essential and the colony density in an apiary needs to be controlled. Training of beekeepers in good beekeeping practice, nutritional aspects and early diagnosis is needed, especially for young beekeepers.



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Fact No 3.

THERE ARE SEVERAL GENES IN THE HONEY BEE RESPONSIBLE FOR RESISTANCE AGAINST AFB AND EFB !

Eradication of the two bacterial diseases

- **EFB**

✓ As there is no treatment for bacterial diseases, burning of infected combs, is the best solution so far. Furthermore, all that apply to AFB can be regarded as important also for EFB.

- **AFB**

✓ There is no easy method to control AFB, apart from burning the infected beehives. In some countries, the antibiotic oxytetracycline (OTC) has been used for decades but there are several studies now showing resistance to it. In any case antibiotics do remain in the honey for years and do not kill the spores or destroy the AFB scales. However, the best method for controlling it is prevention by testing and keeping resistant populations, using the hygienic behaviour test (Spivak and Reuter, 2001). Buying second-hand material or colonies must be done after careful examination. Old hives should be thoroughly disinfected prior to reuse.

- **Extension/ training**

✓ There is still a great need for intensive educational courses and training sessions for young beekeepers in this infectious disease. All beekeepers should be able to recognise the symptoms immediately, and most importantly they should know how to look and recognise the scales in empty frames.

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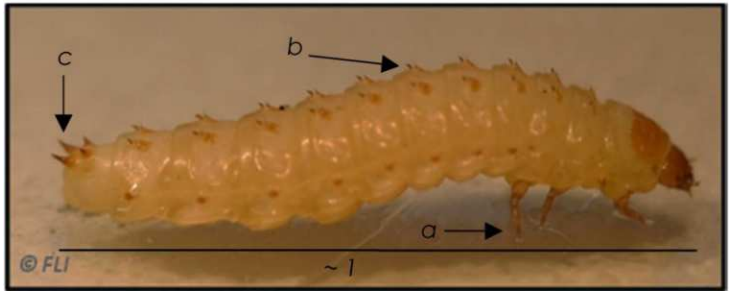
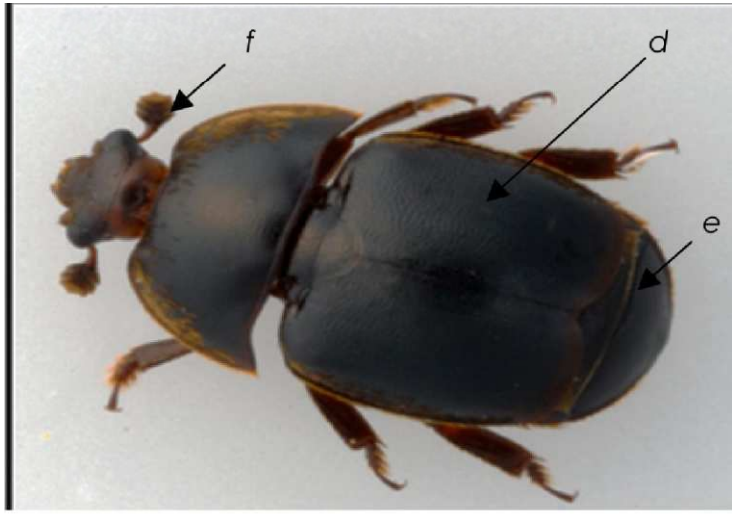
Fact No 4.

IF AETHINA TUMIDA ESTABLISHES IN AN AREA IT IS IMPOSIBLE TO GET RID OF IT!





Measures against Small hive beetle

- Avoid over-supering hives, which increases the area that the honey bees must patrol.
- Maintain a clean apiary and honey house to reduce attraction to beetles.
- Avoid tossing burr comb onto the ground around hives, which may attract pests. Adult beetles tend to prefer shady locations.
- Good beekeeping management practices in the bee yard and in the honey house are sufficient to contain hive beetle problems in most cases.
- Making splits from heavily infested hives can cause a serious outbreak.
- The use of grease patties for tracheal mite control, or the addition of protein supplement patties for spring build-up, may attract more the SHB
- Adult beetles tend to prefer shady locations.
- Wax cappings are an attractive food for beetles. Cracked and rotten hive bodies provide beetles with many places to hide.
- Unnecessary complicated hive systems might also offer an ideal habitat for SHB in the honey bee colonies.

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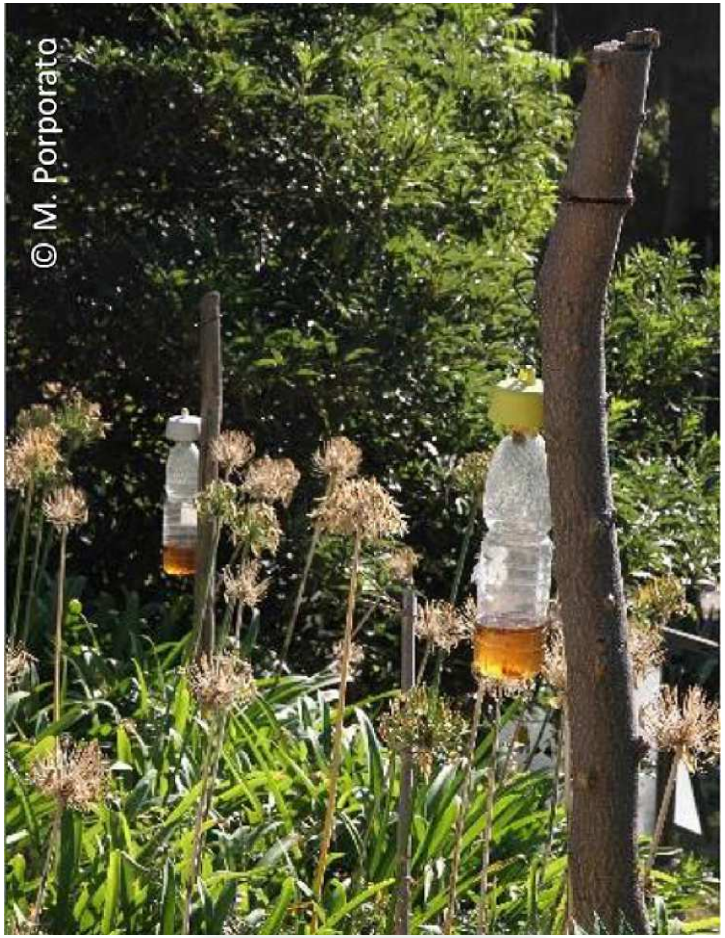
Asian hornet : Management of apiaries

--- Maintain strong colonies and the viability of the colonies with focused and regular breeding programes. Here, the importance of good-quality queens arises. It is important to ensure the balance of the population/ reserves, so that there is no longer a stress factor, as well as ensuring an adequate relation space and volume of the hive / population.

--- Nest destruction (mechanically or chemically in using insecticides or biocide gas like sulphur dioxide injected in the nest). Hornets can be trapped using food baits (carbohydrates or proteins). Those traps can be used for monitoring or for reducing the predation pressure. (mass trapping or traps baited with insecticides).

--- After chemical destruction (if any) the nests should be removed.

---Traps decrease predatory pressure in the bee's apiary and 'defensive' behaviour. The placement of traps should be the target of adapted scheduling in each country, depending on the phenological stages of the wasp, bees and other pollinating insects. They should be as selective as possible and should be monitored.



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Alternative control aspects

--- Some colonies tend to adopt strategies to fight against *Vespa velutina*. A behaviour of adaptation? For example, they form a kind of mat of honey bees covering the entrance board in order to disturb the hornet from knowing from which point the forager would fly. This behaviour is known as "honey bee carpet".

--- Other honey bees adopt the "shimmering" behaviour : they are moving their abdomens thus creating specific patterns said to frighten the hornet.

---Still others do the "heat balling": to trap the hornet in order to heat up its body temperature up to lethal limit.

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Emergency situations

❖ The honey bees are in need!

A honey bee health emergency occurs when a beekeeper is confronted with direct events related to the health of their bees that need urgent intervention, otherwise risking massive losses of their colonies and/or endangering neighbouring ones. In such a situation the beekeeper needs urgent advice from bee health experts. Coping with an emergency should follow the following steps:

1. The beekeeper makes a correct, comprehensive and relevant description of the situation and relays it to the expert;
2. The expert attempts to understand the emergency and advises the beekeeper;
3. The beekeeper acts according to the advice of the expert;
4. The expert monitors the situation after the action of the beekeeper and, if needed, advises him on further action.

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5. IDEAS FOR INOVATION

The "Bee Ambulance"

A Smart phone application could provide a valuable help in emergency situations.

1. Description by the beekeeper of the situation.
   - 1.1 The App must provide the beekeeper with basic information on the symptoms specific to several bee diseases. In this way they can provide the most relevant information to the expert in the attempt to identify or confirm the bee health issue that is suspected. In this stage the beekeeper should be able to see a list of symptoms and check the ones that they recognise. According to their response, the App will take them to the required information they have provided to the expert.
   - 1.2 Information automatically sent by the App: the GPS location and the phone number of the beekeeper
   - 1.3 Information sent by the beekeeper via the App:
     -taking photos of honey bees, hives, frames, surrounding vegetation, etc;
     -recording short videos or at least sounds;
     -checking menus provided by the App;
     -providing written text.
2. After receiving information from the beekeeper, the expert may have a positive diagnosis or need more information, in which case they can contact the beekeeper via the App. In the end the expert identifies the nature of the emergency and gives proper advice to the beekeeper.
3. The beekeeper performs the actions recommended by the expert.
4. According to the nature of the emergency, the App reminds the expert at the adequate interval of time to contact the beekeeper in order to monitor the development of the situation. If needed, the expert may inform the competent authorities via the same App.

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❖ Intoxication incidents

Pesticide toxicity is a complex issue, with new debates emerging regularly. Intoxication incidents occur mainly by the use of synthetic phytosanitary products due to the bees behaviour to collect nectar and pollen from flowers. Exposure to pesticides can impact foraging honey bees, nurses and larvae as well as reproductive individuals. Intoxication incidents have also been documented due to some substances of botanical origin used in organic farming. However, several chemicals used by the beekeepers against Varroa can also cause intoxication.

Direct effects / dead bees?
Behavioral changes –
indirect effects, later effects

APIMONDIA
www.apimondia.org

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Proposing directions for further research

- Holistic approach on the effects of veterinary medicines and the buffer capacity of the colony to recover.
- Use of standardization data and tools (such as HSI) for identifying the fate of the colonies
- Good beekeeping practices for different beekeeping topics (honey bee health, honey production, hygiene, preventive, etc) need to be further tested in field conditions. Special attention should be given to the testing and development of simple and accurate varroa diagnosis and controls as well as their application into practice in the different European countries.
- Establish the biological and economical thresholds of varroa infestations in several countries, according to the climatic conditions.
- Test and determine the size of the cells in combination with the capped drone brood removal in maintaining colonies without therapy for varroa
- Studies of the understanding of the role of all the potential environmental pollutants and their synergy with pathogens.

THANK YOU TEAM!
And thank you all!

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