Varroa mites (Varroatosis or Varroosis)

Summary

Varroa destructor is the mite responsible of Varroatosis (or Varroosis), an external parasitic disease that attacks honeybee colonies (adult bees and especially the brood). V. destructor causes the major economic losses to the beekeeping sector because it is widespread and it has a strong adaptability to the treatments.
This mite affects both the brood and the adult bees. It weakens the adult bees by sucking their hemolymph. The weakened bees are more susceptible to other diseases, especially viral pathologies. The first to suffer are the stronger colonies with more brood because of the higher possibility of the mite to replicate at the brood level.

Description

MORPHOLOGY

V. destructor has a remarkably different morphology between the two sexes. Only varroa females cause the depriving parasitic action on bees. The adult female is reddish-brown with elliptical shape and it is on average 1,1 mm long and 1,5 mm wide. It has four pairs of legs that enable the mite to move very quickly inside the hive (Fig.1). The male of *V. destructor* has only a reproductive role and features a spherical body shape and whitish colour. It is smaller than the female (about 0,8 mm in diameter). It has a soft body, very similar to the immature stage of the varroa female (Fig. 2). Males have a very short life: they are not able to survive outside of the capped brood, in fact they die within a few days and cannot feed themselves because their mouthparts are delegated exclusively to the transfer of sperm into the genital tracts of female varroa.

Fig. 1: Dorsal and ventral view of a *V. destructor* female

Fig. 2: Male and female mating

The parasite at all developmental stages feeds of the adult honeybee hemolymph for sustenance, leaving open wounds on the bees. The quantity of hemolymph ingested by the mites varies depending on the time of year. The compromised adult bees are more prone to infections. Varroa can live up to five days out of the hive if the environment is favourable for its survival (temperature, humidity). The life of the varroa female varies on average from two months in summer to up to five months in winter.

The number of mites that naturally fall every day on the hive bottom board (or diagnostic board) is a good indicator for the infestation rate in the hive. For counting the mites it is important to keep the diagnostic bottom tray clean. Females of varroa are easily detectable on the diagnostic board, especially after anti-varroa treatments as they provide a fair approximation of the actual level of infestation. In case of severe infestation, the mite could be visible directly on adult bees (Fig. 3).

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Fig. 3: *V. destructor* female on a drone chest and on brood

LIFE CYCLE

The varroa life cycle has two stages: the phoretic phase during which they feed on the hemolymph (the equivalent of blood in bees) of adult bees, and the reproductive stage inside the brood cells. In fact, varroa replicates in brood cells and more intensively in male brood due to drones' longer metamorphosis cycle.

In one active season a single varroa female can complete up to a maximum of 10 cycles. During each cycle (every 30 hours) she lays 2 to 6 eggs on the bee's larva or on the cell walls. *V. destructor* eggs are oval, whitish and about half a millimeter long. From the first egg (haploid) will be born the only male; from subsequent eggs (diploid) will emerge only females.

The parasites colonize the brood when the bee larvae have 6 days of life. Within 24 hours an hexapod larva develops; after another 24 hours became a protonymph and emerges from the egg (Fig. 4) The newly born varroa parasites start immediately feeding on the developing bee.

Fig. 4: Protonymph (left), deutonymph (center), adult (right) of Varroa destructor female

The varroa reproduction period is related to the duration of the metamorphosis of the pupae in the brood cells: 12 days for the worker bees and 15 days for the drones. If the varroa male dies before mating, females remain irreversibly sterile and unable to procreate because of an involution of their genitalia.

The varroa feeding site is always located in the abdomen of the pupa in order not to compromise its survival. At the time of the bee's emergence from the cocoon, the varroa offspring is inside the cell. The fertilised varroa adults that have just left the cell will try to get on adult bees, passing to the phoretic phase (stage during which they feed on the hemolymph of adult bees). Varroa immature females and the males are instead unable to survive outside the cell, because they do not have mouthparts that can pierce the integument of bees.

SYMPTOMS

In bees colonies contaminated by varroa it is possible to observe:

- the parasites on the body of adult bees;
- scattered brood (index of high mortality of larvae) (fig. 5);

Fig. 5: Comb with scattered brood

- a typical stench of dead brood;
- smaller bees (Fig. 6);

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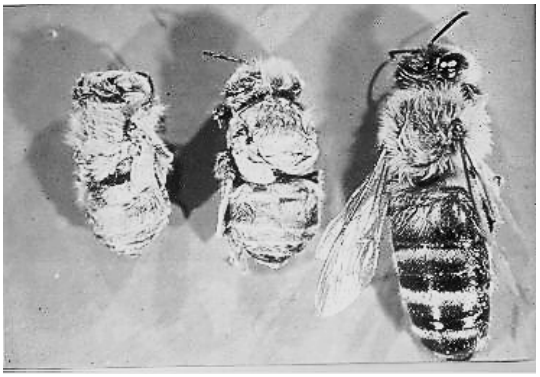

Fig. 6: Smaller bee (left), Healthy bee (right)

- bees with deformed wings (Fig. 7);

Fig. 7: Healthy honey bee with normal wings (left) - Parasitised honey bee with deformed wings (right)

- clusters of bees restless and unable to fly;
- weakening of the colony as it becomes less populated and due to the reduced capacity of the bees in the collection and storage of supplies;
- abnormal swarming (especially at the end of the season) and replacement of the queen.

The average lifespan of adult bees in heavily parasitised colonies decreases ranging from 25% to 50%. Varroa not only sucks the hemolymph of the larvae and adult bees, it also causes little wounds on the body of the bees and makes them more vulnerable to other pathogens such as viruses, fungi and bacteria. This effect is augmented also by the possibility of viral multiplication in the salivary glands of varroa.

TRANSMISSION

This parasitic disease is transmitted very easily by direct contact from infested to healthy bees (e.g. during the visit of a flower, by drones who can freely enter different hives, during robbing of infested hives, as effect of drifting of infested worker bees among adjacent hives, etc.). But the transmission may also occur by the direct action of the beekeeper for example by transferring parasitised brood combs (Fig. 8) from one colony to another or by the migratory beekeeping practice.

Fig. 8: Combs with drones affected by varroa

Moreover, another factor of varroa transmission is linked to migratory beekeeping due to the transfer of heavily infested colonies or due to the delayed application of treatments. In fact this practice increases exponentially the physical contact between healthy and infested colonies.

Hence the importance of simultaneous and co-ordinated anti-varroa treatments both within the same apiary and between closely located apiaries.

MONITORING

Since the evolution of the disease is not very evident, the monitoring of the number of parasites in each hive through periodic inspections is very important. The diagnosis of infestation can be carried out by:

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- checking the number of parasites that fall on the hive bottom;
- checking the number of varroa mites affecting the male brood (which is the most affected);
- checking if the parasites are visible to the naked eye on adult bees, meaning that there are high levels of infestation;
- applying the OIE endorsed method by which adult bees are dipped in alcohol and stirred in order to separate the varroa mites from the bees;
- applying the powder sugar empirical method, which entails sprinkling powder sugar on bees collected in a jar and shaking it to cause the varroa to fall through a mesh as this allows to count the mites easily.

It is interesting to mention that there are some bee subspecies which have the so-called hygienic behaviour by which they groom themselves and are able to contain the varroa infestation level (e.g. *Apis mellifera capensis*, *Apis mellifera intermissa*).

WARNING: Please consult the relevant authorities or expert beekeepers in your country for the most efficient treatments and the authorised products in your region/country. It is important to use the treatments properly and according to the prescriptions to avoid creating resistance of varroa mites to the products. Some products can only be used after the harvesting of honey as they can leave residues in the honey.]

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See also

Strategy for integrated varroa management: healthier colonies through brood removal

Further reading

Comini A., Pietropaoli M., Giacomelli A., Formato G., Varroa destructor: morfologia e ciclo biologico. Published by Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri", Italy, 2013

Formato G., Vari G., La varroatosi. In "Aspetti igienico-sanitari in apicoltura" published by Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri", Italy, August 2007, 11-14

Ellis J., Honey Bee Research and Extension Lab at the University of Florida, Video Field Guide to Beekeeping – Varroa Mites, January 2012, **https://www.youtube.com/watch?v=S5vVrAy6CEU**

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Category

Capacity development
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Region

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Apimondia

Apimondia, the **International Federation of Beekeepers' Associations**, is the world organisation representing the interests of apiculture and aims to facilitate links between beekeepers, scientists and all involved with apiculture. Apimondia stems from the International Committee of Apicultural Congresses created in 1893 holding the first congress in 1897 in Belgium**.** Apimondia in its current institutional form was founded in the Netherlands in 1949 and its core business is the organisation of international apicultural congresses and symposia. Today Apimondia work remains truly international: Apimondia is run on a basis of co-operation between beekeepers and scientists from many countries as well as international organisations. A special feature of Apimondia is the wide range of working languages used in publications and at meetings.

You can also visit **Apimondia** linked websites to find out more:

www.apimondia.org

www.apimondia2013.com

www.apimondia2015.com

www.beethecampaign.org

Apimondia, la **Federación Internacional de las Asociaciones de Apicultores**, es la organización mundial que representa los intereses de la apicultura y su objetivo es facilitar los vínculos entre los apicultores, los científicos y todos los involucrados con la apicultura. Apimondia deriva del Comité Internacional de los Congresos Apícolas creado en 1893 y con la celebración del primer congreso en 1897 en Bélgica. Apimondia, en su forma institucional actual, fue fundada en los Países Bajos en 1949 y su actividad principal es la organización de congresos y simposios apícolas internacionales. Hoy el trabajo de Apimondia permanece verdaderamente internacional: Apimondia realiza su programa sobre la base de la cooperación entre los apicultores y los científicos de muchos países, así como organizaciones internacionales. Una característica especial de Apimondia es la amplia gama de idiomas utilizados en las publicaciones y en las reuniones de trabajo.

Para más informes puede visitar los sitios web de Apimondia:

www.apimondia.org

www.apimondia2013.com

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IZSLT - Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "Mariano Aleandri"

The Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "Mariano Aleandri" (IZSLT) is a public body operating in the frame of the National Health Service with duties related to animal health and welfare and food safety. In such areas it provides services in the diagnosis of animal diseases and zoonoses, microbiological, chemical and physical controls over safety of foods, food production chains and animal feed. In the same areas it performs research, epidemiological surveillance, continuous training and international cooperation activities.

IZSLT's mission is to ensure that animal health and welfare, hygiene of farms, primary productions, safety of foods and animal

feed comply with the relevant legislation.

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To effectively fulfill its mission, the Institute carries out:

- diagnostic service over animal diseases and zoonoses;
- scientific and technical support to veterinary and public health services for controls on animals, food and feed;
- laboratory tests to verify the health status of animals;
- technical and scientific support to monitor veterinary medicines;
- research on animal health and welfare, food safety and hygiene of farming and livestock products;
- studies on animal welfare and development of alternatives to the use of animals in experiments;
- studies to monitor the safety of food of animal origin and feed;
- scientific and technological cooperation with other research institutes;
- epidemiological surveillance on animal health and food safety, on livestock products and on environmental factors affecting the above;
- studies on the health risks for humans linked to animals and animal products;
- support, technical assistance and hygiene information to manufacturers of food of animal origin;
- production of vaccines and laboratory diagnostics for the improvement of animal health.

In the frame of IZSLT activities, the Apiculture Unit's mission (**http://www.izslt.it/apicoltura/**) is to certify and guarantee the health and welfare of bees, and the hygiene and safety of the hive products, through: diagnosis of bee diseases and analyses on hive products, support to Governmental Institutions in drawing up legislation, research activity, collaboration with other laboratories or institutions, technical support and training for operators, pollution environmental monitoring using honey bees and protection of honey bee biodiversity.

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