

Biology of Varroatosis in Bees and Measures for its Control

Shomaxsudov Alisher

Assistant, Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology

Shodmonov Asliddin

Magistr, Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology

Received: 2024, 15, Mar

Accepted: 2025, 21, Apr

Published: 2025, 17, May

Copyright © 2025 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).



Open Access

<http://creativecommons.org/licenses/by/4.0/>

Annotation: The article provides scientific information on diseases that affect the life activities and productivity of bees. It includes details about the development, progression, and damage caused by diseases, as well as measures for combating these diseases and methods for their prevention.

Keywords: Bees can be affected by damage, larvae, cocoons, and varroatosis, which can occur at any time of the year.

During the winter period, when bees are infected with varroatosis, signs such as restlessness, weakness, diarrhea, and death are observed. When examining an infected bee colony, a large number of dead bees (podmor) can be found at the bottom of the hive. Bees often crawl out of the hive and die on the floor of the wintering area (zimovnik). Upon inspecting such diseased bees, mites (parasitic insects) can be seen on their bodies. In the summer season, not only worker bees, drones, and queen bees are affected, but also their larvae, as the mites parasitize the developing brood as well. This disease is not seasonal and can occur at any time of the year.

If it becomes widespread, it can cause significant economic damage to the apiary. The degree of larval infestation depends on the season. The viability of a bee colony is predicted based on the level of infestation. Infestation is categorized into three levels.

Approval is given to the proposal to establish the "Association of Beekeepers of Uzbekistan" (hereinafter referred to as the Association), submitted by the Ministry of Agriculture of the Republic of Uzbekistan, the Ministry of Economy, the State Committee on Forestry, the State Committee for Ecology and Environmental Protection, and the Joint-Stock Commercial Bank "Aloqabank" (hereinafter referred to as JSC "Aloqabank"). Decree No. PQ-3327 of the President of the Republic of Uzbekistan dated October 16, 2017.

A. Mild Level — Up to 2 mites are detected in every 100 adult bees and 100 drone or worker bee larvae cells.

B. Moderate Level — Up to 4 mites are detected.

C. Severe Level — More than 4 mites are detected.

Bee colonies with first- and second-degree infestation levels are conditionally considered healthy and are recorded as healthy in veterinary reports.

If severe infestation is detected in the majority of colonies, the diagnosis of varroatosis is confirmed by a special commission. In such cases, other bee diseases, poisoning, and deficiencies in feeding or hive maintenance are first ruled out through veterinary laboratory analysis. Bee larvae are primarily affected in spring and autumn, while drone (male bee) larvae are usually infected during summer. During summer inspections of bee colonies infested with varroatosis, one may observe immature bee and drone pupae, as well as young bees with deformed bodies—curved abdomens and thoraxes—unable to fly, lying on the entrance board of the hive. These are bees that have been expelled from the colony.

Adult mites parasitize the bodies of queen bees, drones, and worker bees. They are typically located between the head, thorax, and abdomen segments, particularly on the back or sides, extending up to the third abdominal segment. The mites feed on the bee's **hemolymph** (bee's blood-like fluid). **Female mites (each laying about 5 eggs) deposit their eggs in brood cells containing 6-day-old larvae, shortly before the cells are sealed with wax caps.** From these eggs develop the **protonymph, deutonymph, and imago** (adult stage), which parasitize the developing bee larvae.

By the time the young bees emerge from their cells, the mites have matured and attach themselves to the newly emerged bees, exiting the cells with them. At a temperature of **35°C**, the development cycle of the mite takes approximately **8 days**. There is no available data on the mite's resistance to external environmental factors.

Infected healthy bees may become infested with varroatosis through contact with bee colonies or swarms (bee clusters) that have already been affected, as well as through larvae of drones (male bees) that have been removed from the colony.

Drones and robber bees (bees that enter other hives in search of food) act as vectors for spreading the mites. Additionally, by placing frames with bee larvae into healthy hives, the mites can transfer to healthy colonies. The possibility of transmission of this mite species to humans, animals, or other insect species has not yet been studied.

DIAGNOSIS. The presence of mites in bee colonies is determined through the following methods:

Inspecting the brood and drone pupae (by opening the pupae of drones, removing the cocoon, and carefully examining the cocoon and cell).

Observing live bees (with the naked eye).

Examining the debris at the bottom of the hive.

When making a diagnosis, the infestation level of the bee colony is determined. The best time to conduct this examination is during the broodless period (when no larvae are present). To perform the test, approximately **100 live bees** are collected from the central frames of each colony and are poured with hot water. To help separate the mites from the bees, **2-3 grams of laundry powder** is added to the water. The bees are then thoroughly stirred and washed, and placed into a **white-bottomed container** (e.g., a porcelain dish, plate, etc.). The mites that fall onto the white surface can be easily seen. **The infestation level of varroatosis in a bee colony is calculated based on the number of mites.** If the infestation is less than **10%**, it is considered a carrier. If it is above **10%**, immediate treatment measures are necessary. Spontaneous recovery from varroatosis has

not been observed.

In the fight against varroatosis, the following treatment scheme using different medications in rotation can be recommended.

To carefully examine the brood (larvae), the wax cap of the cells where the larvae are located is first cut off. Then, the pupae in the cells are removed by shaking them or using a needle. Next, using a **10x magnifying loupe**, the bottom and walls of the cells, the bee pupae, and the cut wax caps are carefully examined. As a result, **female mites**, which are brown, oval-shaped (1.1×1.6 mm), and **male mites**, which are light-colored and round (1.0×0.9 mm), are identified. All the mites found are collected and destroyed (burned). As new larvae appear in the bee colony, the number of mites increases. They start laying eggs in the spring. **At this stage, the hemolymph fluid of the open (unsealed) bee larvae serves as additional nourishment for them.** During the pupal stage of bee larvae, the mites begin laying eggs. If multiple female mites enter a cell containing a pupa, each of them will lay up to three eggs on the pupa. If only one female mite enters the cell, it will lay 4-5 eggs. Half of the eggs will develop into female mites, and half will develop into male mites. Female mites mature in **8-9 days**, while male mites mature in **6-7 days**.

The development of the mites coincides with the emergence of young bees from their cells, and their growth occurs inside the cell. After female and male mites mate inside the cell, the male mites die within the cell. The older female mites, along with the new, young females, will leave the cell and exit the hive with the emerging young bees.

In the spring, the condition of the female mites deteriorates, and they become intolerant to the climatic conditions. Mites that emerge in summer are quite resilient and adapt to any conditions of the season. However, they cannot survive for more than 3-5 days without food under any conditions. The optimal conditions for mite reproduction occur at a temperature of 30-34°C with 60% humidity. When the oxygen level in the air is sufficient and the atmospheric pressure is between 0.3-0.8 Pa, the mites can remain on bees while withstanding 120-240 vibrations per minute. These mites can endure temperatures of 42-44°C and 0-2°C cold. **In varroatosis, the death of larvae that have entered the pupal stage and the deformities of young bees emerging from the cells are observed.** Based on the number of deformed bees in the colony, the level of mite infestation can be determined. The dead larvae emit a smell, making it easy to remove them from the cells.

Bees infested with mites become restless and crawl out of the cells, eventually falling to the bottom of the hive. Colonies infested with mites become agitated and, when preparing for winter, cannot cluster together properly. Their growth and honey production decrease, and in these colonies, the queen ceases egg-laying by early autumn.

In autumn, weakened colonies are attacked by stronger colonies. The appearance of the affected hives is similar to that of European foulbrood.

Conclusion: Currently, beekeeping and measures to prevent the spread of bee diseases, as well as efforts to combat them, have been strengthened. After bees are infected with varroatosis, various pathological processes occur in the bee organism, with the primary clinical sign being a decrease in the production of bee products.

LIST OF REFERENCES.

1. Zakharchenko, I. P. Use of acaricides to combat Varroosis in bees / I. P. Zakharchenko, E. F. Sadovnikova, I. A. Yatusovich // Scientific notes of the Vitebsk State Academy of Veterinary Medicine: scientific and practical journal. - Vitebsk: OU VGAVM, 2013. - Vol. 49, Issue 1, Part 1. - Pp. 114-116.
2. Colombo, M. Stranova - New international research project on protecting bees from Varroosis and Nosemosis / M. Colombo, R. Eordeg, N. Dobrynin. Beekeeping - 2011.

3. Nasimov, Sh. N., Gerasimchik, V. A., Mamatova, Z. B., Khabibov, F. A. Bee Diseases and Pests: A Textbook. Tashkent - 2021.
4. Sadovnikova, E. F., Gisko, V. N., Pankiv, E. M. Varroosis in Bees: A Manual. Vitebsk - 2019..
5. Isamukhamedov, A. I., Nikadambaev, K. K. Bee Diseases and Pests: A Manual. Tashkent - 2013.
6. Vodnikov, I. Yu. Invasive Diseases of Bees, Veterinary Medicine of Agricultural Animals - 2006, No. 9, pp. 36-38.
7. Sadovnikova, E. F., Gisko, V. N., Panikiv, E. M. Varroosis in Bees: Recommendations. Vitebsk VGAVM, 2019, pp. 4-23.
8. Beekeeping and Veterinary Fundamentals of Bee Diseases: A Study Guide by G. Zelyutkov. Vitebsk State Academy of Veterinary Medicine, Department of Diseases of Small Animals and Birds.