

ABSTRACT

**of the dissertation work by Berik Satybayev entitled
«Common infectious, parasitic diseases of bees in the West Kazakhstan
region and measures to combat them», submitted for the degree of Doctor of
Philosophy (PhD) under the educational program 8D09101-Veterinary
Medicine**

Relevance of the research topic. The President of the Republic of Kazakhstan, Kassym-Jomart Tokayev, has repeatedly emphasized the need to develop agriculture, including environmentally sustainable directions. According to him, agriculture is one of the key pillars of the country's economy and should be developed using modern technologies, innovations, and principles of environmental protection.

The President pays special attention to improving the quality of agricultural products, producing environmentally friendly products, and strengthening the economic potential of rural areas. In this context, sectors such as beekeeping, which are closely connected to nature, are of great importance. Bees contribute to increasing the yield of agricultural crops through plant pollination and help maintain biodiversity.

In recent years, certain negative trends have been observed in the development of beekeeping. An inadequate management structure within the industry; improper housing, feeding, wintering, and transportation conditions; and violations of veterinary standards for the maintenance of bee colonies, processing, disinfection of equipment, and placement of apiaries lead to a decrease in productivity and the death of bee colonies. Infectious and invasive bee diseases, including American rot, European rot, ascospherosis, aspergillosis, varroaosis, braulosis, nosematosis, and acarapisosis, cause significant economic losses to beekeeping. Of these, the most common infectious diseases are American rot and European rot, while the invasive diseases are varroaosis and nosematosis, which weaken bee colonies, reducing the bees' ability to collect honey and pollinate, and ultimately resulting in the death of bees. Therefore, it is necessary to study methods for the prevention and treatment of bee diseases and develop technological methods for improving the development of bee colonies to protect them and increase their resistance to invasive and infectious diseases. Obtaining environmentally friendly beekeeping products is becoming an important task.

The ongoing research monitors the epizootic situation of infectious and invasive bee diseases in the West Kazakhstan region. For this purpose, laboratory diagnostic methods are used, including microscopic and mycological examination of affected brood.

Parasites in live bees are detected through coprological studies, post-mortem microscopy, and visual inspection.

Thus, the development of scientifically based methods for the diagnosis, prevention, and treatment of bee diseases, aimed at increasing the resilience of bee colonies and producing environmentally safe bee products, is of great importance.

The study includes a comprehensive analysis of the epizootic situation of infectious and invasive bee diseases in the West Kazakhstan region, as well as the development and implementation of effective veterinary, sanitary, and technological solutions to ensure the sustainable development of the industry.

The purpose of this dissertation is to study the prevalence of varroatosis, nosematosis, ascospherosis, acarapisosis, and American rot in apiaries in the West Kazakhstan region, conduct diagnostics, and develop control measures.

Research objectives:

- assess the epizootological and veterinary-sanitary status of beekeeping in the West Kazakhstan Region for varroatosis, nosematosis, ascospherosis, and American rot;
- determine the extent of damage to bee colonies by various pathogens in apiaries in the West Kazakhstan Region and conduct species identification of pathogens using microscopic and molecular genetic studies;
- develop a new, highly effective herbal product based on medicinal plants for the treatment of diseased apiaries, determine its pharmacological properties, and determine the optimal therapeutic dose;
- develop a set of veterinary-sanitary treatment and preventive measures for the prevention of bee diseases and develop scientifically based recommendations;
- evaluate the cost-effectiveness of using the proposed herbal products in beekeeping.

Research methods. The main experimental portion of the study was conducted at apiaries in the West Kazakhstan region. To determine the epidemiological situation, epidemiological monitoring was conducted to assess the apiaries' condition for infectious and invasive diseases.

To identify pathogens and characterize their morphological properties, microscopic and laboratory methods were used.

Microscopic and molecular genetic methods were used to assess the level of infection of honey bees (*Apis mellifera*) with spores of microsporidia of the genus *Nosema*.

To determine the most effective methods for treating bee diseases, the effects of various medicinal preparations, including herbal ones, on pathogens will be studied.

As a result of experimental development, therapeutic doses of the drug have been scientifically substantiated and experimentally proven, and the most effective methods of its use have been determined.

Key topics to be defended:

- For the first time, the spread of varroatosis, nosematosis, ascospherosis, and American rot in apiaries in the West Kazakhstan region, the characteristics of epizootics, and their relationship to natural, climatic, and economic factors were comprehensively studied.
- Using microscopic and molecular genetic studies, the species composition of nosematosis, varroatosis, and other pathogens in apiaries was determined, and a system of specific diagnostic methods was proposed.

- An environmentally friendly complex herbal preparation based on local medicinal plants with a pronounced therapeutic effect was developed, and its optimal dosage and administration regimen were scientifically substantiated.
- A system of preventive and therapeutic veterinary and sanitary measures for use in beekeeping was developed, and its effectiveness in preventing and reducing bee colony diseases was proven. - the economic efficiency of herbal preparations has been substantiated, their competitiveness with foreign medicinal products and their role in increasing the productivity of apiaries have been confirmed.

Description of the main research findings.

Epizootic monitoring conducted in the West Kazakhstan region of the Republic of Kazakhstan revealed that bee colonies are affected by invasive, bacterial, and mycotic diseases. The recorded incidence rates were as follows: varroatosis – 47.6% of bee colonies, nosematosis – 29.5%, ascospherosis – 11.4%, acarapidosis – 6.3%, and American foulbrood – 2.7%.

Microscopic examination of honey bees for nosematosis showed a low level of infection with *Nosema* spores. Spores of *Nosema* were detected in 5 out of 12 studied colonies (41.6%), while *Varroa* mites were found in 7 colonies (58.3%).

Molecular-genetic studies conducted to identify the causative agents of nosematosis and varroatosis in bees confirmed the presence of two pathogens: *Nosema ceranae* and *Varroa destructor*.

A new highly effective phytopreparation was developed, containing medicinal plants: yarrow (*Achillea millefolium*), wormwood (*Artemisia absinthium*), and pine bud inhalator (*Pinus sylvestris*). The therapeutic dose of the phytopreparation was determined as 10 and 15 ml per 1 liter of 20% and 50% sugar syrup.

Based on the results of the dissertation, the following patent application was filed: “Phytopreparation for the Prevention and Treatment of Varroatosis and Nosematosis in Bees,” registration number 2024/0908.1, with the application submitted on November 1, 2024.

Justification of the novelty and significance of the obtained results.

For the first time, the epizootic situation with bee diseases in the West Kazakhstan region was comprehensively studied, identifying the natural, climatic, and economic factors influencing the spread of ascospherosis, varroa, nosema, and American rot. The incidence of bee colonies and the species composition of nosema pathogens in various areas of the region were determined. Laboratory and research experiments demonstrated the therapeutic efficacy of herbal preparations compared to traditional chemical treatments. The antimicrobial properties of medicinal plants from the West Kazakhstan region were studied, and a complex herbal preparation for the treatment of infectious and invasive diseases common among bees was developed based on these properties. The therapeutic dose of the new herbal preparation was determined (10 and 15 ml per 1 liter of 20% and 50% sugar syrup). Practical schemes for the use of herbal medicine in beekeeping were developed, scientifically based recommendations were given, and their economic effectiveness was proven.

Connection of the work with research programs.

The study was conducted in accordance with the research plans for the active project topic: "AP23489173 'Development of a set of veterinary and sanitary measures against bee diseases in the West Kazakhstan region and a technology for producing environmentally friendly beekeeping products' for 2024-2026. State registration No. 0124PK00640".

Description of the doctoral student's contribution to each publication.

Based on the dissertation materials, 10 scientific publications have been published.

1 article published in a high-impact international journal (Scopus-indexed):

- Therapeutic Efficacy of Phytopreparation for the Prevention and Treatment of Varroosis and Nosemosis of Honey Bees in Western Kazakhstan. - International Journal of Agriculture and Biosciences.-2025, 14(6): 1168-1177. <https://doi.org/10.47278/journal.ijab/2025.087> (Q2, 67 – процентиль).

4 articles published in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan:

The Effect of Natural and Mineral Feeds on Egg Production of Queen Bees // "Gylym zhane bilim", No. 1-2 (70) - 2023. - pp. 132-139. <https://doi.org/10.52578/2305-9397-2023-1-2-132-139>

pizootological monitoring in bee farms of the West Kazakhstan region // "Gylym zhane bilim", No. 3-1 (76) – 2024, pp. 163-173. DOI 10.52578/2305-9397-2024-3-1-163-173. <https://doi.org/10.52578/2305-9397-2024-3-1-163-173>

osemosis of honey bees in West Kazakhstan region // "Gylym zhane bilim". 1-бөлім. - № 2-1 (79). -2025.-pp. 54-61. <https://doi.org/10.52578/2305-9397-2025-2-1-54-61%20>

Current epizootic situation of with ascospherosis in beekeeping: evidence from West Kazakhstan». // "Gylym zhane bilim". -2025. -№3 (80). <https://doi.org/10.52578/2305-9397-2025-3-1-47-55%20>

5 articles published in the proceedings of international scientific and practical conferences:

- General Characteristics of Organic Beekeeping and Development Prospects // Republican Scientific and Practical Conference "Current State, Traditions, and New Technologies for the Development of Pasture Livestock Farming and Sericulture", Samarkand, 2023. - pp. 89-96.

- The role of the honey bee in biodiversity conservation // Actual environmental problems and environmental safety in modern conditions: Collection of articles from the II international scientific and practical conference October 25, 2023 – October 25, 2023. Saratov. – Saratov: Vavilov University, 2023. - pp. 198-202.

- Varroatosis of bees in the West Kazakhstan region // “World and Russian trends in beekeeping and apitherapy: realities and challenges of the future” \ Proceedings of the International scientific and practical conference, November 14-16, 2024, Rybnoye \ edited by A.I. Shestakova, A.P. Savin, L.N. Savushkina, N.V.

Budnikova, I.N. Kolchaeva. - Rybnoye: Federal Scientific Center for Beekeeping, 2025. - pp. 128-132.

pizootic situation of bee diseases in the West Kazakhstan region // Collection of the III All-Russian scientific and practical conference (with international participation) “Topical issues of development of agricultural sectors in the context of digitalization”, November 13, 2024. Makhachkala. - pp. 394-405.

rganic materials in Kazakhstan. “Gylymga Zhol-2023” Takyryby bolim alushylarga arnalgan khalykaralyk gylymi tazhiribelik conferenceson materialdar zhinaga. – 2023 – 12 sauir. Volume 1. – 60-65 p.

Based on the results of the dissertation, the following patent application was filed: “Phytopreparation for the prevention and treatment of varroaosis and nosematosis of bees”, registration number 2024/0908.1, application filing date - 01.11.2024.

Scope and structure of the dissertation. The dissertation follows a generally accepted format. Its content includes an introduction, literature review, research materials and methods, results of individual studies, analysis of research results, conclusion, practical recommendations, and additional materials. A list of references includes 171 titles. The dissertation is written in accordance with required standards, totaling 126 pages, and includes 7 tables and 22 figures.