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**EQUINE GASTEROPHILOSIS IN THE REPUBLIC OF
KARAKALPAKSTAN UNDER ARID CLIMATE CONDITIONS.**

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Annotation: This article presents information on the biological development of Gasterophilidae family members, which are obligatory parasitic insects, in the digestive system of horses raised in the conditions of the Republic of Karakalpakstan. It discusses the impact of arid climate conditions on their lithogenesis, the bioecological characteristics of the causative agents of gasterophilosis, their distribution, invasion intensity, and extensiveness, as well as their resistance to various anthelmintic medications.

Keywords: *Gasterophilida, lithogenesis, arid, humid, bioecological, anthelmintic, abiotic and biotic factors, ecological, intensity and extensiveness of invasion, resistance, migration, cementation, ball-bonitet, incubation, metamorphosis, pupa, imago, piloric and glandular part, cardiac.*

Introduction: Horse breeding is considered one of the important sectors of livestock farming. After being domesticated and trained, horses were primarily used as mounts in military formations and for agricultural work in various countries. Nowadays, they are utilized in border forces and security services, promoted as a national brand in tourism, engaged in equestrian sports, and incorporated into agricultural enterprises for the production of meat and milk.

In our Republic, a number of state reforms have been implemented to develop the horse breeding sector. Notably, on June 15, 2017, the President of Uzbekistan issued Resolution PQ-3057 on “Additional measures for the development of horse breeding and equestrian sports in the Republic of Uzbekistan,” followed by PQ-4194 on February 18, 2019, concerning further measures for the development of horse breeding and equestrian sports, and PQ-5024 on March 11, 2021, which focuses on promoting modern pentathlon and polo sports.

In fulfilling the tasks outlined in these state documents, it is crucial to prioritize the preservation of national horse breeds and to timely identify and address factors affecting their health.

Relevance of the Topic: All living organisms establish a vital and robust connection with their environment throughout their lives. The English scientist Charles Darwin recognized in his 1859 work "On the Origin of Species" that "abiotic and biotic factors in the environment affect the variability of organisms." In 1891, I.M. Sechenov stated that "an organism cannot survive without an external environment, thus it is necessary to consider the environmental factors affecting the organism when studying it." Today, ecological variability continues to exert its influence on the biosphere of the Republic of Karakalpakstan.

One of the barriers to the development of horse breeding is gasterophilosis (gastric myiasis), a disease caused by parasitic infestation in the digestive system. The biology, ecological characteristics, level of infestation, and species composition of gastric myiasis in horses under the humid (moist) climatic conditions of Uzbekistan have been thoroughly studied by M.A. Sultonov, Sh.A. Azimov, N.X. Yenileyeva, and B.R. Eshmirzayev, who have also developed measures to combat it.[1,2,3,4,5] However, the composition of the causative agents of gasterophilosis in odd-toed ungulates, the intensity and extensiveness of the invasion, their resistance to various physicochemical solutions and anthelmintic agents, as well as the impact of the arid (hot-dry climate) ecosystem on different developmental stages of the larvae and imagos (bioecology) in the conditions of the Republic of Karakalpakstan have not yet been studied.

Research Aim: The objective of this study is to identify the biological and morphological, as well as ecological characteristics of the causative agents of gasterophilosis in odd-toed ungulates, particularly horses, in the conditions of the Republic of Karakalpakstan. This includes determining the species composition, the intensity and extensiveness of infestation, and the anthelmintic resistance.

Research Objectives: To identify the species of the causative agent of gastrofilosis and its role in the systematics of the animal world, to study the incidence of the disease in horses maintained in the arid ecosystems of the Republic of Karakalpakstan, and to investigate the survival characteristics, mineralization properties, and antihelmintic resistance of the causative agent in different soil types.

Research Materials and Methods: Using literature sources, the types of causative agents of gastrofilosis and their role in the systematics of the animal kingdom will be analyzed, along with the levels of occurrence in the Republic of Uzbekistan.

According to the "Incomplete Helminthological Dissection Method" by Academic Skryabin, samples will be taken from 2 horses that died from the disease and from 15 horses slaughtered for meat products. The samples will be analyzed in the "Veterinary Medicine and Pharmacology" department of the Samarkand State University of Veterinary Medicine, Animal Husbandry, and Biotechnology at the Nukus branch, focusing on invasion indicators (infection levels, gastrointestinal migration, pathological changes).

To determine the bioecological characteristics of the causative agent, larvae of the third stage of the gastrofil will be incubated in plastic containers filled with soil samples from different types of sand, sandy soil, and agricultural fields with a medium yield. Each container will contain 50 specimens harvested from the stomach and intestines. The rate of metamorphosis (transition to pupa and emergence of the two-winged insect) will be studied.

The second and third-stage larvae of the gastrofil, which firmly attach to the pyloric and glandular parts of the horse's stomach and the mucosal layer of the duodenum with paired hooks, will be placed in a 3% formalin solution, a 0.001% ivermectin solution in water, and a 10% hypertonic NaCl solution to study their viability rates. For this, sections will be prepared from the areas where the larvae are densely located in the stomach and duodenum using scissors, washed thoroughly with clean water, and placed in glass containers sealed with an air-permeable cover, then stored in a warm, dark place.

In April 2024, in the Chimboy district of the Republic of Karakalpakstan, 10 horses raised in households will be treated with a 1% solution of Ivermectin produced by Biveco Company, administered at a dose of 1.0 ml per 50 kg body weight, with two injections given at 15-day intervals. After 30-45 days, when slaughtered for meat products, their digestive systems will be examined for the causative agents of gastrofilosis using the macrogelmintoscopy method to determine the efficacy of the treatment.

Analysis of Results Obtained: The larval stage of the causative agent of gastrofilosis passes obligatorily through the gastrointestinal tract of single-hoofed animals, where it causes myiasis lesions. All harmful insects affecting livestock belong to the phylum Arthropoda (joint-legged animals), subphylum Tracheata

(trachea-breathing), class Insecta, subclass Ectognatha (true insects), and the division Pterygota. Biologically, this division is divided into two parts:

Holometabola - insects that develop through complete metamorphosis.

Hemimetabola - insects that undergo incomplete metamorphosis, which is further divided into groups.[6,7,8,9,10,11,12]

Thus, the causative agents of gastrofilosis belong to the order Diptera (two-winged insects or flies), the family Gastrophilidae, and the genus *Gastrophilus* (Leach), which includes the following species: *G. intestinalis* (De Geer), *G. veterinus* (CL.), *G. haemorrhoidalis* (L.), *G. pecorum* (Fabr.), *G. inermis* (Br.), *G. nigricornis* (Low.), *G. magnicornis*, and *G. flavipes*, totaling 8 species.

According to the data from M.A. Sultonov, Sh.A. Azimov, N.X. Yenileyeva, and B.R. Eshmirzayev, 4 species of imago and 5 species of larvae were found in horses in the Kashkadarya, Jizzakh, and Samarkand regions of Uzbekistan (*G. intestinalis* (De Geer), *G. veterinus* (CL.), *G. haemorrhoidalis* (L.), *G. pecorum* (Fabr.), *G. inermis* (Br.), *G. nigricornis* (Low.)). According to N.X. Yenileyeva, the complete helminthological examination of 419 horses revealed larvae in the stomach (60.7%), the mucosal layer of the duodenum (39.2%), the rectal mucosal layer (0.9%), and the oral cavity (0.09%). Among these, infection with 5 types of larvae was recorded, with the maximum intensity of infection being 1390 specimens in the stomach and 480 specimens in the duodenum.[13,14,15,16,17,18]

Our own helminthological studies have shown that all 17 horses studied were infected with the first and second stage larvae of gastrofilosis, and it was observed that the intensity of infection in the pyloric part of the stomach was stronger than in the glandular part and the duodenum. Myiasis lesions in the pyloric part of the stomach and the duodenum were more numerous compared to the glandular part of the stomach, and the intensity of infection did not depend on the age of the animals, with the invasion intensity ranging from 107 to 2305 specimens.

The second and third-stage larvae of gastrofilosis, which firmly attach to the mucosal layer of the horse's stomach and duodenum with their paired hooks, were found to maintain their viability for longer periods when placed in 3% formalin solution for 5 days, in a 0.001% ivermectin solution in water for 4 days, and in a 10% hypertonic NaCl solution for 15 days.



Figure 1. *The process of examination using the "Incomplete Helminthological Dissection Method."*

The effect of a 1% solution of Ivermectin developed by Biveco on the causative agents of gastrofilosis was studied in 10 horses raised in households in the Chimboy district of the Republic of Karakalpakstan. Starting from the third day after injection, it was observed that gastrofil larvae began to be expelled with the horse's feces. However, after 30-45 days, when the horses were slaughtered for meat, the causative agents of gastrofilosis were found in their digestive systems in quantities ranging from 107 to 523 specimens (macrogelmintoscopy). This indicates that the

efficacy of the preparation in treating the disease is low.

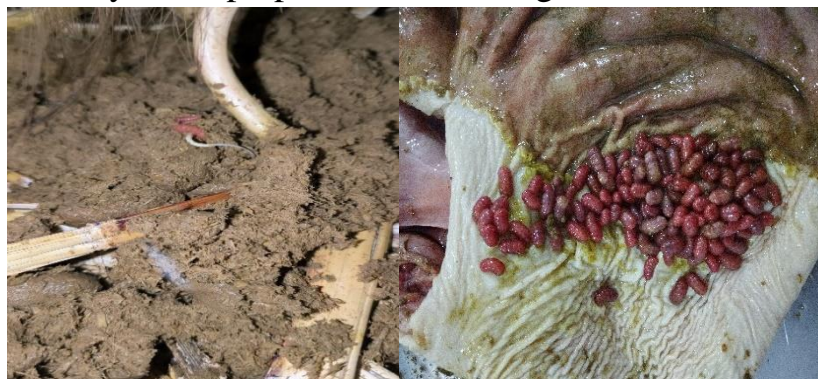


Figure 2. *The process of determining the efficacy of a 1% solution of Ivermectin.*

In determining the bioecological characteristics of the causative agent, the results of incubating 50 specimens of the third-stage gastrofil larvae in plastic containers filled with soil samples of different types—sand, sandy soil, and agricultural fields with a medium yield—are presented in the data of Table 1.

From the table data, it is evident that the larvae cannot penetrate into sticky, hard soils, and their ability to enter low-moisture yellow sand is limited. The metamorphosis process is well manifested in sandy soil, which has a high porosity and moisture level. However, the emergence of imagoes was found to be 7-12% higher in humus-rich and sandy soils compared to yellow sand. This indicates the significant importance of moisture during the pupation period.

Conclusion: Based on the results of the scientific investigations conducted, the following conclusions can be drawn:

In the arid climate ecosystems of the Republic of Karakalpakstan, all 17 horses examined for gastrofilosis were found to be infected. The intensity of invasion ranged from 107 to 2305 specimens, with an average of 1407 specimens.

It was determined that the efficacy of a 1% solution of Ivermectin developed by Biveco in treating the disease is low.

The larvae cannot penetrate into sticky, hard soils; however, the transformation from pupa to imago occurs at a rate of 75%. The penetration depth into low-moisture yellow sand is 2-3 cm, with a pupation rate of 63%, while in porous and moist sandy soil, the penetration depth is 4-9 cm, with a pupation rate of 70%.

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