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## Studying the Treatment Method for Pebrine (Nosematosis) Disease of Mulberry Silkworm

### Abstract

For the first time in the conditions of the Republic of Azerbaijan, the development of medicinal treatment and preventive methods against pebrin or nosematosis disease of mulberry silkworms, which causes severe damage to silk farms, was carried out. In the research, natural sick and healthy grenae of the Namazli-2 mulberry silkworm breed with pebrin and worms hatched from them were used.

In the spring feeding of the Namazli-2 mulberry silkworm breed, fumagillin DCH, amprolium, coccidiovit and baycox preparations were used against pebrin or nosematosis disease (causative agent - *Nosema bombycis*).

When the naturally diseased grenae with pebrin were treated with ready-made solutions of 1.0% fumagillin DCH and 2.0% amprolium, coccidiovit, and baycox preparations and the worms were fed regular feed (without the preparation) before the first feeding, the mortality during the worm stage from pebrin disease was reduced to 17.36-16.31%, the total death to 22.22-19.99%, and the survival of the worms increased to 19.99-22.22% against the background of the disease. The cocoon yield from one standard box (20,000 pieces) of grenae was 9.2-10.6 kg higher than that of the diseased control.

**Keywords:** *mulberry silkworm, genus, nosematosis, natural infection, grenae, preparations, treatment*

### Introduction

Since ancient times, people have used natural silk as a valuable textile material for the production of carpets, various types of clothing, bedding, and various household items (Garayev, Musayeva, Suleymanova, 2006). In modern times, natural silk, due to a number of valuable and irreplaceable properties - hygiene, elasticity, insulation, strength, fire resistance, etc., is widely used not only in the

textile industry, but also in radio engineering and electronics, musical instruments, precision instruments and cable production, aviation and astronautics, cinematography, surgery, including eye surgery. This requires increasing the production of cocoons and raw silk in our country, along with other sericulture countries. One of the most important sources of supply for intensively increasing the production of cocoons and raw silk is the development of effective methods of combating infectious diseases of the mulberry silkworm (Garayev, Musayeva, 2009).

Like other living organisms, mulberry silkworms can contract various diseases when they are constantly interacting with external environmental factors (food, climate, sunlight, energy, microorganisms, etc.). Mulberry silkworms are susceptible to a number of infectious diseases (flaskeria, septicemia, muscardina, jaundice, pebrine or nosematosis), and the occurrence of these diseases in mulberry silkworm feeds causes a loss of 10% to 100% of cocoon production in sericulture farms (Ahmadov, 2009).

### Research

To date, various levels of physical, chemical, biological and enzymatic complex treatment and sanitary-prophylactic measures have been developed to combat infectious diseases of mulberry silkworms, depending on the degree to which the epizootological and biological characteristics of the diseases have not been disclosed (Ahmadov, 2010; Aliyev, 1986). Pebrin or nosematosis disease of mulberry silkworms is one of the main infectious diseases of mulberry silkworms. The causative agent of the disease (*Nosema bombycis*) is transmitted to the new generation with mulberry silkworm seeds (through the cocoon), and worms emerging from such a conditionally diseased cocoon infect other healthy worms during feeding, causing mass mortality in the feeding, which causes great economic damage to sericulture farms. Although it is flawed in terms of application, some work has been carried out in the field of developing some therapeutic and preventive methods to prevent Pebrin disease. Among the research works conducted in this field in the modern era, the research works conducted by affecting the cocoon and pupae of mulberry silkworms with sublethal temperatures are more important (Hajiyev, 2000; Huseynov, 2003; Garayev, Musayeva, Suleymanova, Rzayeva, 2004).

It is known from the literature (Garayev, Musayeva, Suleymanova, 2004) that the causative agent of pebrin is a spore that leads a latent (anabiosis) lifestyle in the external environment. Its development cycle begins 6 hours after the spore enters the midgut of the worm through digestion and ends in three stages (planont, meront, and spore).

As a result of the influence of external factors, the virulence of pebrin spores persists for one to eight years. In the corpse (pathological material) of a worm that died of Pebrin's disease, *Nosema* spores remain highly virulent for a year, weaken in subsequent years, and disappear completely after six years. The main source of the spread of Pebrin disease is sick silkworms. Because *Nosema* spores are spread in the external environment through the excrement of sick insects, changed shells, dead worm bodies, granule shells, etc. The secondary source of infection is considered to be feed, care items contaminated with Pebrin (spores) (Garayev, Ahmadov, 2005).

**Material and method of the study.** The effect of the preparations on the development of pebrin disease of mulberry silkworms was carried out in the following directions: By affecting naturally sick granae with solutions of the tested preparations; By feeding the worms with solutions of these preparations of different concentrations against the background of natural and artificial infection; By feeding the worms with preparations as a prophylactic measure (Garayev, Musayeva, Suleymanova, Rzayeva, 2004).

In the study, naturally sick and healthy granae with pebrin of the Namazli-2 mulberry silkworm breed and worms hatched from them were used. Some indicators of the Namazli 2 breed, created by breeders of the Azerbaijan Scientific Research Institute of Sericulture: 1. Germination rate – 86.90%; 2. Worm viability – 93.30%; 3. Feeding period – 28.7 days; 4. Mass of live cocoon – 1.73 g; 5. Silkiness of live cocoon – 23.31%; 6. Cocoon yield from one box (20,000 pieces) of granae – 28.1 kg; The

grenae of the Namazli 2 breed is ash-colored, sticky, the worms are spotted, and the cocoons are white and oval (Hajiyev, 2000).

### **Characteristics of the tested chemical preparations**

#### **1. Fumagillin DCH – (fumagillinum)**

*Description:* A yellowish, weakly odorous, water-soluble, microgranulated powder. It is a dicyclohexylammonium salt product formed as a result of the metabolism of the fungus *Aspergillus fumigatus* (Shafer, Williams, Shutler, 2009).

*Composition:* Fumagillin-dicyclohexylamine – 34 g, fillers – 1000 g. It is a specific substance for the treatment and prevention of nosematosis disease of honey bees caused by protozoa (*Nosema apis* Cander).

*Structural formula:*  $C_{16}H_{25}O_3O-CO-(CH=CH)_4 \times COOH$ . Manufacturer: Budapest. Hungary.

#### **2. Amprolium – (amprolium)**

*Description:* White, faintly odorous, crystalline powder, easily soluble in water, methanol and 95% ethanol.

*Composition:* Amprolium hydrochloride – 20-25%. Application: Used against coccidiosis of all types of birds. Effective against individual coccidia: In chickens – *Eimeria tenella*, *E. necatrix*, *E. acervulina*, *E. and E. praecox*; In turkeys – *E. adenoides*, *E. gallapavonis* and *E. meleagrimitis*; In pheasants – *E. phasiani*, *E. colchici* and *E. duodenalis*.

*Structural formula:*  $C_{14}H_{20}N_4CL_2$ . Manufacturer: Poland.

#### **3. Koksidiovit – (coccidiovitum)**

*Description:* White, odorless, sweet-tasting, water-soluble, microgranulated powder. Composition: 1 g of the drug contains 120 mg of amprolium hydrochloride, 2 mg (Vikasol) vitamin K, 10,000 IU of vitamin A and 1 filler. Application: It is used for the treatment and prevention of coccidiosis in poultry. The drug is mainly effective against protozoan diseases caused by *E. tenella*, *E. acervulina*, *E. necatrix*, *E. maxima*, *E. mivati*, *E. brunetti* in chickens. Manufacturer: Poland.

#### **4. Baycox – (baycox)**

Description: Colorless, odorless liquid solution. Composition: 1 liter of the drug contains 25 g of toltrazuril. Application: The most modern and effective substance for the treatment and prevention of coccidiosis in agricultural poultry. Toltrazuril in the composition of Baycox preparation contains eimeria (*E. acervulina*, *E. brunetti*, *E. necatrix*, *E. mitis*, *E. adenoides*, *E. meleagrimitis*, *E. anseris*, *E. truncate*, *E. hagani*, *E. maxima*, *E. mivati*, *E. praecox*, *E. tenella*, *E. dispersa*, *E. gallapavonis*, *E. innocua*, *E. meleagridis*, *E. subrotunda*, *E. anseris*, *E. nocens*, *E. parvula*, *E. stigmosa*, *E. anatis*, *E. danailovi*, *E. Perniciosa*, *E. columbae*, *E. columbarum*, *E. labbeana*) coccidiocytes affect all stages of cell internal development. Manufacturer: Germany.

### **Methodology for studying the effect of preparations on pebrin disease of mulberry silkworm**

Experiments were conducted in the following 2 directions to study the effect of the selected preparations on pebrin disease of mulberry silkworm: Study of the therapeutic effect of preparations against pebrin disease; Study of the prophylactic effect of preparations against pebrin disease; Study of the therapeutic effect of preparations against pebrin disease was conducted in 2 directions: By affecting naturally diseased grenae and worms emerging from this grenae with solutions of the tested preparations (by feeding them); By feeding worms artificially infected with pebrin spores with solutions of various concentrations of these preparations. In order to study the therapeutic effect of the solutions of the tested preparations on natural diseased grenae and worms emerging from these grenae, experiments were conducted in the following order: in order to study the effect of ready-made solutions of 1.0% fumagillin DCH and 2.0% amprolium, coccidiovit and the same percentage of baycox preparations on natural diseased grenae with pebrin, an appropriate amount of natural diseased grenae was taken for each variant (preparation) and placed in pre-prepared sterile bags, taken out of wintering

30 days before spring incubation and kept in the above-mentioned concentrated solutions of the tested preparations at a temperature of 15-18<sup>0</sup> for 2 hours (i.e., exposed). After the diseased grenae were treated in the solution of the corresponding preparations, samples were taken from each variant in 3 repetitions, 100 grenae in each repetition, to study the viability of the grenae (Garayev, Musayeva, Suleymanova, 2008). At the same time, in the experiment, natural healthy grana were treated with ordinary water (distilled) and 3 samples of 100 grenae were taken in each replicate to study their resuscitation ability. After that, the grenae treated in the drug solution were put back in the refrigerator and after 30 days were taken out and the grenae treated with each drug were divided into 10 variants, incubated and revived. The worms that emerged from the diseased grenae were fed with mulberry leaves soaked in different concentrations of each drug solution according to their ages, 1, 2 and 3 times a day (morning, afternoon, evening) (Pasteur, 1870). When the ready-made solution of the drugs was mixed with feed and fed to the worms, 2 ml of the corresponding drug solution was used for every 100 worms per 10 g of freshly chopped mulberry leaves. Mulberry silkworms were fed with preparations starting from the first feeding. The worms were given intermediate feeds in the usual way. Feeding the worms with the solution of the appropriate preparations was continued together until the 2nd day of the III age, and from the 2nd day, in 3 repetitions according to the variants, with 150 worms in each repetition, until the end of the IV age (until the 4th sleep). In the experiment, mulberry silkworms were fed with ordinary feed (without preparations) from the 1st day of the V age to the end (Vereiskaya, Astaurov, Bednyakova, 1958).

### Conclusion

The following conclusions were drawn based on the first-ever medicinal treatment and prophylactic research conducted against pebrin disease of mulberry silkworms in the Republic of Azerbaijan and the biometric analysis of the obtained indicators: Each of the fumagillin DCH, amprolium, coccidiovit and baycox preparations used against pebrin or nosematosis disease (causative agent - *Nosema bombycis*) in spring feeding of the Namazli-2 mulberry silkworm breed, depending on its concentration and daily application intensity, has a therapeutic effect on pebrin disease to one degree or another.

When the naturally diseased grenae with pebrin are affected with ready-made solutions of 1.0% fumagillin DCH and 2.0% amprolium, coccidiovit, baycox preparations and when the worms are given regular feed (without the preparation) before the first feeding, the mortality during the worm stage from pebrin disease decreases to 17.36-16.31 absolute %, the total mortality decreases to 22.22-19.99 %, and the survival of the worms increases to 19.99-22.22 % against the background of the disease. The infection rate in butterflies decreases to 59.52-48.93 absolute %. The cocoon yield from one standard box (20,000 pieces) of grenae is 9.2-10.6 kg higher.

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