Study Of The Effect Of "Violet K" Antiseptic On Local And Introduced Species Of Mulberry Silkworm In Azerbaijan

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Abstract

The study consisted of 3 variants. According to the results obtained from the research, in the control (dry) version treated with 0.001% solution of "Violet K", the mortality rate due to disease agents was 53.30% in the caterpillars of the Vatan breed, while in the "Sverico-yellow" breed it was 41.70%, and in the "Oragase" breed it was 17.00%. The mortality rate of the first experimental variant was 12.50% in the "Vatan" breed, 15.20% in the "Sverico-yellow" breed, and 6.70% in the "Oragase" breed. In the second control (aqueous) variant, 23.50% mortality was observed in the Sverico-yellow breed, and 8.00% in the Oragase breed, but no mortality occurred in the "Vatan" breed.

According to the weight of the silk coat, the weight of the cocoon of the "Vatan" breed in the control (dry) variant was 235.7 mg, 138.2 mg in the "Sverico-yellow" breed, and 218 mg in the "Oragase" breed. The amount of the control (aqueous) variant was 340.5 mg in the "Vatan" breed, 173.5 mg in the "Sverico-yellow" breed, and 139.5 mg in the "Oragase" breed. In the experimental version, the weight of the silk coat of the "Vatan" breed was 460.5 mg, 160.5 mg in "Sverico-yellow", and 169 mg in "Oragase".

In the productivity of butterflies, the number of eggs in the "Vatan" breed was 300 in the control (dry) version, 265 in the control (aqueous) version, and 1,471 in the experimental version. In the "Sverico-yellow" breed, there were 270 eggs in the control (dry) variant, 306 eggs in the control (aqueous) breed, and 1235 eggs in the experimental breed. In the "Oragase" breed, the number of eggs was 239 in the control (dry) variant, 602 in the control (aqueous) variant, and 589 in the experimental variant.

Scientific innovation. Scientific innovation in the research works conducted in the direction of solving 2 problems in the relevant cocoon farms was the development of methods of prevention and elimination of diseases recorded in the eggs and caterpillars of the mulberry silkworm, as well as methods of increasing the viability of eggs and caterpillars.

Keywords. mulberry silkworm, bio-stimulants, physiological response, yield prediction, etc.

Introduction. Like any living organism, the survival of the mulberry silkworm depends on environmental factors as it exists under the influence of environmental factors. As a result of the exogenous influence of various origins, the body of the mulberry silkworm undergoes changes in its physiological state as a response, and the body is directed to continue its development in the direction of the normalization of life activity even after the impact phase. However, the intervention has such consequences that it is difficult for the body to eliminate them. In this regard, the effect of the "Violet K" antiseptic against the diseases caused by pathogenic microorganisms in different breeds of mulberry silkworms was studied in the present research.

In sericulture, for many years, there was an opinion that the technology of producing cocoons by an industrial method, in order to obtain high productivity during the feeding period of mulberry silkworm caterpillars, adding different ingredients to the feed is not appropriate. Therefore, in order to obtain a positive result in the biological indicators of the mulberry silkworm, the influence with ingredients was carried out only in the egg stage in silkworm-breeding farms. However, it has been proven with the actual material obtained experimentally that the processing of mulberry leaves with the ingredients - "Biovit-80" and sodium bicarbonate causes both a decrease in the percentage of diseases of caterpillars and an increase in productivity (Salimjanov S. 2011, p. 10).

It should be noted that modern diagnosis of mulberry silkworm diseases does not deal with the identification of microorganisms located on eggs (Salimjanov S. 2011. p.128). However, the bacterial layer

formed on the overwintering eggs poses a threat during the feeding period of the caterpillars. This is explained by the difficulties in conducting microanalysis of butterflies and state control of prepared eggs. For example, the protection of mulberry silkworm eggs from the pebrine epidemic was carried out by exposure to high temperature (46^0C) and sulfuric acid for 30 minutes immediately after egg laying for 36-48 hours.

It has been found that the caterpillars hatching from the eggs become infected by ingesting small particles of the eggshell, i.e., self-infection occurs. Therefore, since the eggs of the mulberry silkworm can be infected by different microflora, they should be disinfected in breeding centers.

The main goal of the scientific direction of the current research is the development of cocoon farms and the improvement of storage conditions of the mulberry silkworm, which is the primary guarantee of a high-quality cocoon product, and the development of a new, economically profitable, ecologically clean method for high biotechnological indicators.

"Violet K" ($C_{24}H_{28}N_3Cl$) as a bacteriostatic compound does not directly destroy the fungus and any other negative culture, it simply destroys the conditions necessary for the development of microorganisms (Ch. A. Mamedov, 2001, p. 342) and caterpillars' treatment of fodder leaves with a 0.001% aqueous solution of K-violet under feeding conditions has a dual effect (H.F. Guliyeva, G.D. Baghirova, 2021, pp. 260-263). These detected effects of the drug are of great importance in solving problems in sericulture. The analysis of the experimental results proved that the "Violet K" antiseptic, which can be considered the most effective ingredient, can be successfully used in the breeding centers of the local and introduced breeds of the mulberry silkworm in the breeding centers of Azerbaijan during the wintering period, during the storage of eggs and the feeding of the caterpillars.

In the current research, the leaves of the mulberry plant "Zarif" (I.K. Abdullayev), "Arzu" (N.A. Jafarov, L.V. Turchaninova, O.R. Alakbarova), and "Gozal" (N.A. Jafarov, L.V. Turchaninova, O.R. Alakbarova) varieties of mulberry were used for feeding the caterpillars. Noteworthy that the treatment of thousands of eggs with K-violet in breeding centers during the wintering period is accompanied by some technical difficulties, but the expected effect is quite high. Also, processing the leaves by spraying the preparation and feeding the caterpillars (0.001% aqueous solution and spraying with water only in subsequent feedings) is a process that can be carried out at the farm level and will ensure the achievement of high indicators.

Research material and methodology. The research was carried out in 2020-2022 at the newly established Cocoon Training Centre under the Faculty of Soil Science and Agro-chemistry of the Azerbaijan State Agrarian University. The selection and processing of the research material were carried out according to the previously developed methodology [9], [10]. The study of the physiological response of mulberry silkworm eggs to changes in storage conditions was carried out on local "Vatan" and introduced "Sverico-yellow", and "Oragase" breeds. In the experiments, 5 pairs (1♀+1♂) were used in each series, with 100% diapause (dark-coloured, sunken) eggs. Processing with the preparation (A.Z. Zlotin, V.N. Kirichenko, 1980, patent JJ 2895218/30-15/037103/; A.Z. Zlotin et al., 1974, pp. 75-82; A.Z. Zlotin et al., 1976, p. 46-49) was applied based on the methodology.

Statistical analysis of results [Q.F. Lakin, 1990] was carried out, and the arithmetic mean (x), the error of the mean (sx), and the precision index of the difference from the test (tf) were determined.

Discussions. On the eve of the end of diapause, processing with 0.001% aqueous solution of "Violet-K" ($C_{24}H_{28}N_3Cl$), which we determined as the optimal dose, was carried out, experiments (1 experiment and 2 checks - placed on dry paper and treated with distilled aqueous) in 3 series was conducted. The effect of the preparation on eggs was carried out in knots made of paper and gauze under the conditions of +20 -25^0C and 60% relative humidity. The processing, that is, the effect, was realized in 2 series: a) after the darkening of the laid eggs and b) directly when the eggs were put into incubation.

In each series, the duration of development of caterpillars, the weight of the silk layer, the date of flight of butterflies and the fertility per female butterfly, and the date of the beginning of diapause in laid eggs were recorded. Survival of caterpillars was determined by counting their number at the beginning and end of the experiment and was expressed as a % relative to the initial amount.

The presented experimental results prove that the exogenous intervention in the egg and caterpillar stages of the mulberry silkworm with the optimal dose of "Violet K" significantly increases the most important physiological indicators in addition to the pathogenic manifestation. Thus, tests with the optimal dose of "Violet K" that we conducted in local ("Motherland") and introduced ("Sverico-yellow", "Oragase") breeds were recorded with positive results in the elimination of both physiological and pathogenic manifestations. (Figure 1).

Figure 1 shows the experimental data showing the effect of the drug on the viability of the caterpillars of local and introduced breeds of the mulberry silkworm. It has been proven that the mortality rate of caterpillars belonging to introduced species treated with 0.001% solution of "Violet K" is 2.1-2.5 times less than that of local species (17.0%).

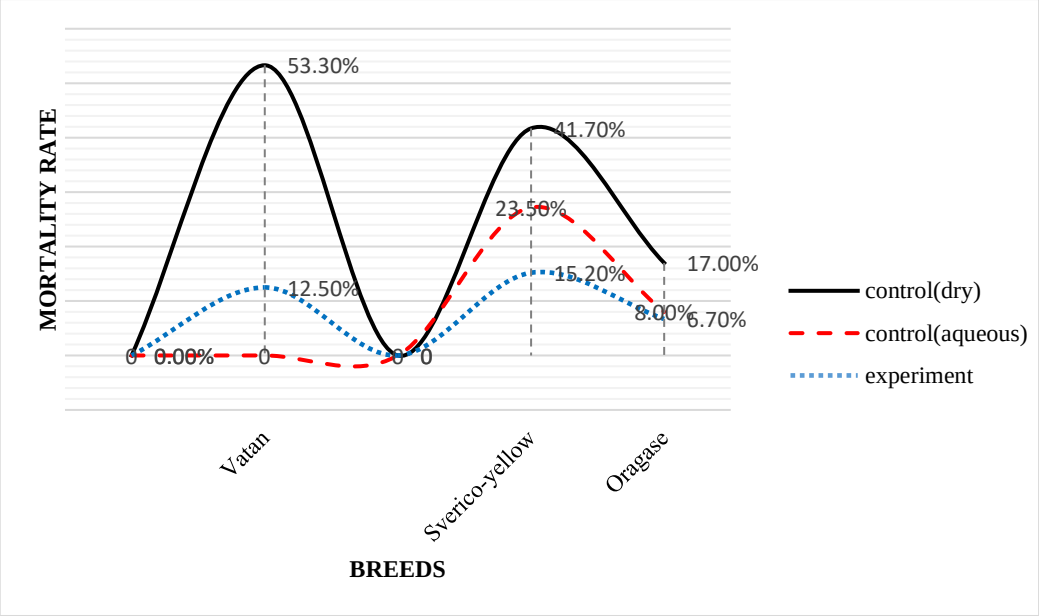

Figure 1. The effect of the optimal dose of "Violet K" antiseptic (0.001% aqueous solution) on the viability of caterpillars in local and introduced breeds of the mulberry silkworm.

The results of the analysis proved that the "Violet K" antiseptic not only increases the viability of caterpillars but also leads to an additional increase of the effect of economic importance - the number of healthy caterpillars.

As the most important effect of the tests, the effect of the drug on the weight of the silk cover of the cocoons can be shown. It was found that the preoral effect with the optimal dose of the drug during the feeding period of the caterpillars (2 times: feeding with leaves sprayed with the drug at the age of II-III and age V) has a significant effect on the formation and weight of the silk cover in the cocoons. It was determined that the local breed of mulberry silkworm "Vatan" has a more clear and sharp response in this regard: the difference compared to the control options was 51.2% (dry) and 73.9% (aqueous), respectively.

Visually, it can be seen that the local breed is significantly different in terms of experience compared to those introduced to Azerbaijan (Figure 2). Thus, after exogenous intervention with the drug during the feeding period, the weight of the silk cover of the cocoons obtained in the local breed ("Vatan") was 2.7 ("Oragase") and 2.9 ("Sverico-yellow") times more than the introduced ones.

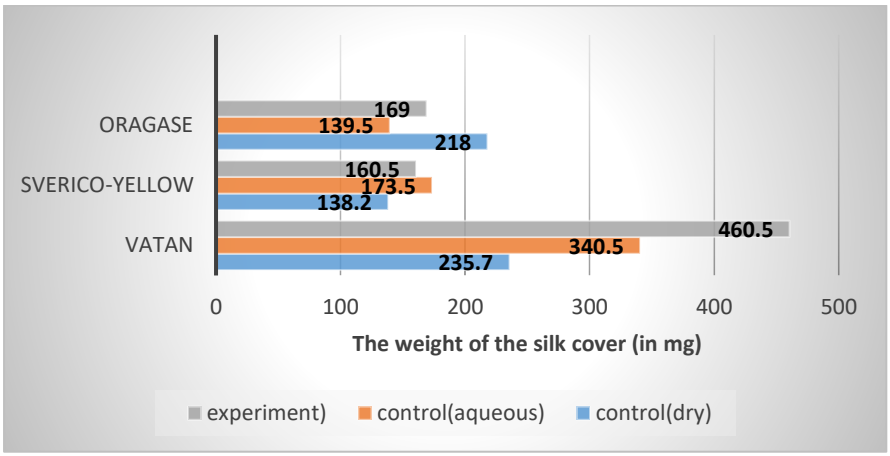

Figure 2. The effect of the optimal dose of "Violet K" antiseptic (0.001% aqueous solution) on the weight of the silk coat in native and introduced breeds of the mulberry silkworm.

One of the most interesting and important physiological effects is the effect of the "Violet K" antiseptic on the productivity of butterflies (Figure 3).

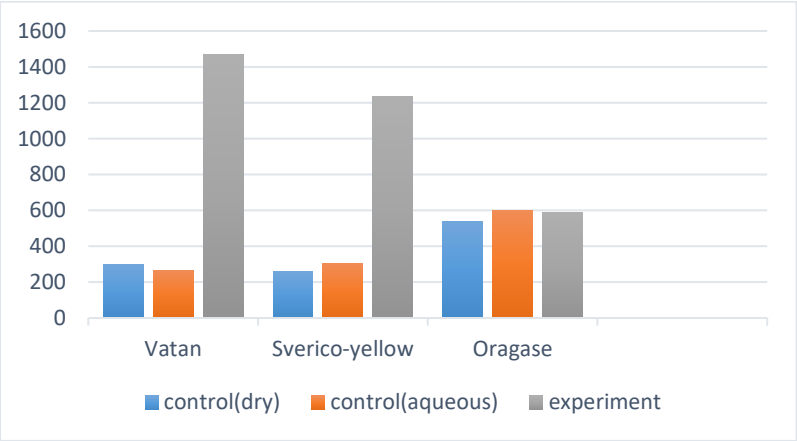

Figure 3. The effect of the optimal dose of "Violet K" antiseptic (0.001% aqueous solution) on the productivity of butterflies in local and introduced breeds of mulberry silkworm (registration; Control - on paper; control - aqueous version)

From the experimental data presented in Figure 3 and the trend expressed according to the experimental option, it is seen that the treatment of eggs with this antiseptic and the manifestation of the response effect in the butterflies of the generation formed from them is inadequate. That is, the strongest response is recorded in the productivity of butterflies belonging to the "Sverico-yellow" breed. It is interesting that the stimulating effect of "Violet K" antiseptic on the viability of caterpillars and the dynamics of the weight of the silk cover is more strongly expressed in the local "Vatan" breed and the productivity of butterflies was characterized by a weak response. In this series, exposure to the drug caused a 1.7-2.0 times decrease in the average number of eggs per 1 ♀ of butterflies compared to controls.

It was found that the response observed in the productivity of butterflies after the treatment of the "Violet K" drug among the introduced breeds is not the same. The results of the research have clearly shown that the maximum stimulating effect of this antiseptic is manifested in the increase in the viability of caterpillars in the "Sverico-yellow" breed, and in the increase in the productivity of butterflies. In general, when comparing the obtained physiological response of the "Sverico-yellow" breed to the exogenous influence with similar effects in other breeds ("Vatan" and "Oragase"), more differences are noticeable, and this is recorded not only in the experimental version but also among the checks. That is, a strong positive reaction of the preparation to the effect of the solvent (water) is determined (pictures 1-4).

The introduced "Oragase" breed of mulberry silkworm was found to have no serious response to exogenous intervention with the drug. Thus, no stimulating effect of this antiseptic was recorded either on the viability of caterpillars or on the productivity of butterflies (pictures 1, 3).

It is known that the mulberry silkworm has an embryonic diapause type (Kuliyeva H.F. 2005, pp. 65-70). As a result of our research, it was determined that the state of physiological quiescence is formed in the eggs of monovoltine breeds of the mulberry silkworm in Azerbaijan in the summer months (July-August). Caterpillars usually do not emerge from diapause eggs, but hybrid breeds are an exception. Thus, when one of the parent lines is bivoltine or polyvoltine (introduced breed), caterpillars emerge and feed in late June-early July.

It was determined that when the eggs of both local and introduced species of mulberry silkworm are treated with "Violet K" antiseptic, not only the pathogenic microorganisms found in the covering layer are destroyed, but also the difference in the date and percentage of diapause formation is also revealed. However, the experimental results presented in Figure 4 clearly showed that the response in the formation of diapause to antiseptic exposure varies depending on gender. It is interesting that there is no significant difference in hydrothermal conditions at this time, that is, embryonic diapause occurs in conditions of high average daily temperature and relative humidity, which is not critical for the mulberry silkworm (Kuliyeva 2003, p. 120).

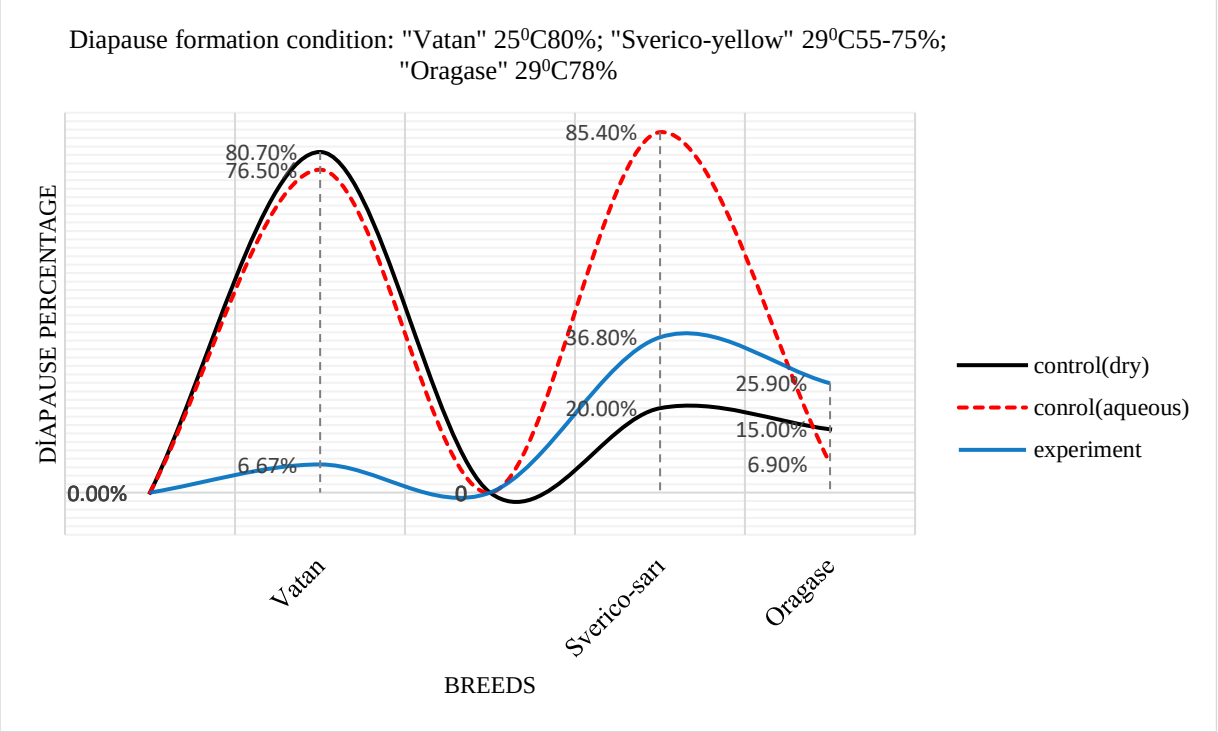

Figure 4. The effect of the optimal dose of "Violet K" antiseptic (0.001% aqueous solution) on the formation of diapause in local and introduced breeds of the mulberry silkworm.

Conclusion and recommendations. The obtained results show that in general, the percentage of eggs in diapause in the experimental version is much lower than in both control versions - the drug eliminates the formation of a state of physiological quiescence and prevents inhibition of the activity of exchange processes.

It was determined that the percentage of embryonic diapause compared to the control variants was lower in the "Vatan" breed by 69.8% (water) and 74.0% (dry), while no difference was detected in the response to the effect of the antiseptic in the introduced breeds. It was noted that the percentage of diapause eggs in the experimental variant was 4.3 ("Sverico-yellow") - 1.7 ("Oragase") times higher, but the response to the effect of the solvent was different between the introduced breeds: in the "Sverico-yellow" variant the highest percentage of diapause - 85.4% was recorded (Fig. 4.).

Thus, according to the results obtained from the experiment, the mortality rate in caterpillars of the “Vatan” breed in the control (dry) variant was 53.30%, while in the "Sverico-yellow" breed it was 41.70%, and 17.00% in the "Oragase" breed. There was 12.50% mortality in the "Vatan" breed, 15.20% in the Sverico-yellow breed, and 6.70% in the "Oragase" breed of the experimental variant. In the control (aqueous) variant, 23.50% mortality was observed in the Sverico-yellow breed, and 8.00% in the Oragase breed, but no mortality occurred in the "Vatan" breed.

According to the weight of the silk coat, the weight of the cocoon of the "Vatan" breed in the control (dry) variant was 235.7 mg, in the "Sverico-yellow" breed- 138.2 mg, and in the "Oragase" breed - 218 mg. The amount of the control (aqueous) variant was 340.5 mg in the "Vatan" breed, 173.5 mg in the "Sverico-yellow" breed, and 139.5 mg in the "Oragase" breed. In the experimental version, the weight of the silk coat of the "Vatan" breed was 460.5 mg, 160.5 mg in the "Sverico-yellow" breed, and 169 mg in the "Oragase" breed.

In the productivity of butterflies, the number of eggs in the "Vatan" breed was 300 in the control (dry) variant, 265 in the control (aqueous) variant, and 1471 in the experimental variant. In the "Sverico-yellow" breed, there were 270 eggs in the control (dry) variant, 306 eggs in the control (aqueous) variant, and 1235 eggs in the experimental variant. In the "Oragase" breed, the number of eggs was 239 in the control (dry) version, 602 in the control (aqueous) version, and 589 in the experimental version.

The results of the current research can be used in the development of issues such as the identification of more sustainable and promising breeds of the mulberry silkworm in Azerbaijan, as a prerequisite for predicting their successful introduction.

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