

Egg productivity and viability of larvae of promising breeding systems obtained based on foreign silkworm breeds

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Abstract. This article comparatively analyzes the viability as well as the fertility of silkworms of local breeds and promising breeding systems during the egg and larval periods. Based on the results of the study, average indicators of eggs hatchability, viability and the morbidity degree of larvae of new breeding systems were identified. At the same time, according to the results obtained, new promising systems in the combination Parvoz 1 x foreign and Parvoz 2 x foreign showed an average degree in terms of fertility characteristics. Uzbek-Chinese breeds are important in the rearing of high-quality cocoon raw materials for sericulture in Uzbekistan in the future, and therefore it is advisable further development of scientific research in this direction and bring it to a new level.

1 Introduction

According to the decision of the fifth meeting of Chinese-Uzbek interstate scientific and technical cooperation, the implementation of a bilateral scientific and technical project in agriculture, in particular in the field of sericulture, has begun. The main goal of this project realization is to modernize the silk industry of Uzbekistan, study advanced technologies and apply the results obtained in production. If we consider sericulture as an integral system, then silkworm seed production, mulberry growing and disease prevention, as well as technologies for controlling them, should be considered as factors determining the effectiveness of this system. If these three areas are improved, if new methods and technologies are correctly introduced, then the harvest of cocoons will be weighty and of high quality.

As the main direction of the above-mentioned international scientific cooperation, new monovoltine breeds of silkworms, suitable for the spring-summer season of our country were taken, and the creation of hybrids with their participation is a relevant direction from a scientific and practical point of view. U. N. Nasirillaev and B. U. Nasirillaev emphasize that the cocoon yield and its quality depend on the breed and hybrids of silkworm, and consider it necessary to develop an effective selection method for creating a new breed and hybrid that has an advantage in a specific economic characteristic [1]; [2]. The climate of our republic is sharply continental, and weather factors often change during the spring and summer silkworm breeding seasons. In terms of creating breeds that adapt to these changes and the

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stressful conditions encountered in production, through provocative breeding work, the researchers managed to obtain 4 new systems that are resistant to unfavorable conditions [2]. As a result of these systems breeding in Fergana and Samarkand regions, positive results have been achieved. In research conducted by scientists, a method for assessing the life expectancy of moths of silkworm breeding systems was developed. Based on the results obtained, it was proven that the longer a female moth lives, the more viable and productive her offspring will be [3]; [4].

Chinese scientists [5]; [6] are conducting research on obtaining hybrid male offspring as a result of effect of various physical rays in order to create low cost and fine-fibered breeds of silkworm. In their opinion, the use of male hybrids in production has great economic benefits at present. In this case, the larvae consume less food, mount a cocoon in a shorter time, and the cocoon has the same caliber and produce filature that meets the 6A requirement.

Scientists such as [7] at the Jiangsu University of Science and Biotechnology of China, as well as in the Silkworm Biotechnology Laboratory, are conducting research on identifying genes resistant to viral diseases in silkworm chromosomes and creating highly viable breeds.

Scientists [8] analyzed various factors affecting on the cocoons productivity and the silk quality of a new industrial silkworm hybrid. Laboratory tests were carried out to include newly created silkworm hybrids in the state list during 2015-2019. Taking into account the coefficients of variation of Jin Xiu x Xiao Xiang breeds, the viability of larvae, the productivity of cocoons, the length of silk fiber in relation to the number of healthy eggs in the laying of these breeds, the stability of these breeds was compared in comparison with the control hybrid Qiufeng x Baiyu, and the number of eggs in experimental hybrids made for 12.07% more compared to the control hybrid.

Scientists [9] conducted research on obtaining pigment-forming mutants from individuals with purple coloration found in the population of silkworms of common breeds 932VR and 0223JH. As a result of the research, a number of scientific and theoretical data for fundamental research were identified.

2 Materials and methods

The study was conducted in 2022-2023 in Uzbekistan, in the city of Tashkent, at the Scientific Research Institute of Sericulture. Two types of breeds, "Japanese" and "Chinese", and industrial hybrids were brought from China. Breeds and hybrids were hatched under the same hygrothermal conditions, having determined the hatching rate, the larvae will be counted and bred in 3 replicates (250 pieces) from each breed and hybrid.

The indicators of the following most important economic characteristics have been determined:

- egg hatchability, %;
- larvae viability, %;
- disease incidence, %;
- cocoon mass, %;
- mass of the cocoon shell, mg;
- silkiness, %;
- yield of cocoons, which can be obtained from 1 seed box, kg;
- percent cocoon shell, which can be obtained from 1 seed box, kg;
- leading technological parameters.

Based on the indicators of economic characteristics presented above, a conclusion was made about the adaptability of Chinese breeds and crosses. The experimental larvae were fed by mulberry leaves from the institute's food supply. Seeds of the breeding material were individually counted and analyzed each year, and the best egg-laying eggs in each generation

were selected, hatched, and kept for larvae breeding. Hybrid Uzbekistan 5 was taken as a control.

3 Research results

Breeders from China and Uzbekistan have significant experience in creating silkworm breeds and hybrids. In general, the Uzbek and Chinese breeds differ from each other. Breeds and hybrids of both countries have their positive and negative sides. One thing is clear: a breed created for certain climatic conditions cannot fully demonstrate its genetic potential in other conditions. But good results can be obtained by adapting a new breed to different climatic conditions or by saturating breeding it with local breeds. Based on this, at the Sericulture Research Institute the basis for two promising silkworm systems was laid, the genotype of which contains the genes of an elite breed brought from China. Table 1 shows the viability of F2 generation of domestic breeds and new breeding lines.

Table 1. Viability of local breeds and new silkworm systems

Breed and system	Eggs hatching, %	Larvae viability, %	Disease incidence, %
Guzal	90.9±2.35	92,1±1.57	3.3±0.72
Marvarid	93.6±1.41	88.3±0.21	5.5±1.04
Gulshan	92.7±1.23	93.0±1.18	2.6±0.44
Nafis	94.0±1.03	92.7±0.84	2.3±0.27
L-500 (F2)	87.8±1.55	91.0±2.46	3.3±1.39
L-501 (F2)	87.9±1.71	88.3±±1.37	3.7±0.71

Based on the data in Table 1, we can conclude that three indicators of the viability of new promising lines Line-500 and Line-501 are at the same level as the breeds currently in production. Egg hatchability in two systems is 87.8-87.9%, larvae viability is 88.3-91.0 %, and disease incidence is 3.3-3.7 %. The fact that these indicators differ from our local breeds by only 1-2 % is a positive result for the second breeding generation.

The tasks of the next stage of our research work are planned to obtain new breeding systems based on elite breeds brought to Uzbekistan from China and adapt them to the conditions of our country. In this scientific article, we pay special attention to the reproductive characteristics of new systems obtained with the participation of domestic new breeds Parvoz 1 and Parvoz 2, as well as Chinese and Japanese breeds at the Sericulture Research Institute. In these breeding experiments, foreign and local breeds were primarily compared in terms of egg production, egg mass in a clutch, and the percentage of dry and unfertilized seeds. The results obtained are presented in Table 2.

Table 2. Reproductive indicators of breeds and hybrids brought from China and related to Uzbek selection (2022-2023)

Breed and hybrids	Years	Number of eggs in laying, pcs.	Oviposition mass, mg	Physiological defect, %
Marvarid	2022	665±8.4	396±5.4	1.04±0.009
	2023	776±12.5	478±7.5	0.9±0.1
Guzal	2022	681±10.6	391±6.2	1.05±0.09
	2023	795±10.4	477±6.2	1.0±0.1
Japan	2022	554,4±11.0	269±4.5	1.88±0.5
	2023	578±9.8	276±5.8	1.4±0.5
Chine	2022	484±2.0	242±9.5	2.0±0.4
	2023	674±11.9	361±64	1.8±0.4
Line 500	2022	5,33±15.1	261±9.2	1.7±0.3
	2023	570±10.4	286±5.8	0.7±0.2
Line 501	2022	524±11.5	267±6,1	1.2±0.2
	2023	589±9.2	289±6.4	0.9±0.2
Parvoz 1 x Xorij	2022	639±21.1	365±13.6	0.52±0.1
	2023	707±19.8	375±9.7	1.5±0.3
Parvoz 2 x Xorij	2022	643±24.0	341±13.6	1.3±0.3
	2023	731±31.2	386±12.6	0.83±0.2
Uzbekistan 5	2022	740±15.6	450±8.7	1.2±0.2
	2023	768±15.5	486±11.7	0.4±0.07

According to the data given in Table 2, the most productive breeds in terms of the number of eggs include the local breeds Guzal (681-795 pcs.) and Marvarid (665-776 pcs.). In the foreign breeds “Japanese” and “Chinese” the number of eggs in the laying made 484-674 pieces. Hybrid combinations involving domestic breeds Parvoz 1 and Parvoz 2 and foreign breeds also showed high fertility rates (639-731 units). One of the most important indicators of egg laying quality, analysis of the physiological defect index, shows that the percentage of dry and unfertilized seeds in our local breeds and foreign breeds is very low, and as a result of synthetic selection with foreign breeds, this figure was 0.52-1%.

4 Conclusion

Thus, new promising systems will serve as the starting material for creating breeds specializing in the preparation of cocoon raw materials that produce fine fibers and are suitable for the light industry of our country. According to preliminary results, the viability indicators in F2 population of the new promising systems “Line-500” and “Line-501” showed an average level. If in the future these systems are subjected to family-family complex selection, then viability and other economic characteristics can be brought to the required level, and most importantly, these systems will adapt over the years to the conditions of Uzbekistan.

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