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# IMPROVING SILK PRODUCTIVITY AND TECHNOLOGICAL TRAITS IN COMPONENT BREEDS OF THE MULBERRY SILKWORM (BOMBYX MORI L.) THROUGH SELECTION

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**Abstract:** The study aimed to improve silk productivity and technological traits in component breeds of the mulberry silkworm (Bombyx mori L.) through selective breeding. The research was conducted during 2023–2025 using AG, Ipakchi-2 and S-12 breeds. Biological and technological traits including cocoon weight, shell weight, silk content and larval viability were evaluated. The results showed a gradual increase in cocoon weight, shell weight and silk content in selected families. The Ipakchi-2 and S-12 breeds demonstrated the highest silk productivity and can be recommended as promising components for developing clone-breed hybrids.

**Keywords:** Mulberry silkworm, Bombyx mori, silk productivity, cocoon weight, shell weight, selection differential, clone-breed hybrids.

## Introduction

The development of high silk-yielding industrial hybrids in mulberry silkworm (Bombyx mori L.) breeding is considered one of the important scientific directions in sericulture [1]. Studies show that cocoon productivity and silk fiber quality mainly depend on technological traits such as cocoon weight, shell weight and silk percentage, which are considered important criteria in the selection process [2–4].

In recent years, the use of parthenogenetic clones in sericultural breeding has become widespread. Although such clones are genetically stable, the silk content in their cocoons usually ranges around 20–21% [5–7]. Therefore, in clone-breed industrial hybrids it is important to increase the silk percentage in component breeds to 24–25% in order to achieve a silk yield of 22–23% [8–10].

The aim of this study was to evaluate cocoon weight, shell weight and silk percentage in component breeds and to determine the possibilities of improving these traits through selection.

## Materials and Methods

The research was conducted during 2023–2025 using the AG, Ipakchi-2 and S-12 breeds of the mulberry silkworm (Bombyx mori L.). After cleaning the cocoons obtained from family nurseries, a separate analysis was performed for each family.

During the experiment, the number of healthy pupated cocoons, cocoon weight, shell weight, silk percentage and larval viability were determined and evaluated.

Technological traits were determined based on selected female and male cocoons from each family, and highly productive families were selected for breeding.

The obtained data were processed using variation statistical methods, and average values were calculated.

The evaluation of the efficiency of the selection process in component breeds requires a comparative analysis of their main biological and technological characteristics. In particular, larval viability, cocoon weight, shell weight and silk percentage are considered important criteria for determining the genetic potential of families selected for breeding. During the selection process, the separation of highly productive families leads to an increase in cocoon quality and silk yield within the population.

For this purpose, a comparative analysis of the main biological traits of reared families, selected breeding families and the breeding cocoons obtained from them was carried out in the studied component breeds. The obtained results for the period 2023–2025 are summarized and presented in Table 1.

**Table 1**

**Biological characteristics of families and cocoons selected for breeding in component breeds (2023–2025)**

| Breeds | | Larval viability, % | Average weight | | Silk content, % |
|---|---|---|---|---|---|
| | | | cocoon, g | shell, mg | |
| Ipakchi 2 | Reared family | 92.7 | 1.61 | 370 | 23.0 |
| | Selected breeding family | 93.6 | 1.67 | 400 | 24.0 |
| | Selected breeding cocoon | - | 1.71 | 420 | 24.6 |
| S-12 | Reared family | 90.1 | 1.52 | 350 | 23.0 |
| | Selected breeding family | 91.9 | 1.55 | 385 | 24.8 |
| | Selected breeding cocoon | - | 1.59 | 401 | 25.2 |
| AG | Reared family | 91.8 | 1.55 | 350 | 22.6 |
| | Selected breeding family | 93.7 | 1.63 | 375 | 23.0 |
| | Selected breeding cocoon | - | 1.70 | 415 | 24.4 |

According to the data presented in Table 1, improvements in biological and technological traits were observed in the families selected for breeding. In the Ipakchi-2 breed, cocoon weight increased from 1.61 g to 1.71 g, shell weight from 370 mg to 420 mg, and silk content from 23.0% to 24.6%. In the S-12 breed, cocoon weight increased from 1.52 g to 1.59 g, shell weight from 350 mg to 401 mg, and silk content reached 25.2%. Similar positive changes were observed in the AG breed, where cocoon weight increased from 1.55 g to 1.70 g, shell weight from 350 mg to 415 mg, and silk content reached 24.4%. These results indicate that the selection process led to improvements in cocoon quality and silk productivity in the families selected for breeding.

The evaluation of silk content in the cocoons obtained during the study is considered one of the most important stages of the selection process. The silk percentage of cocoons determines not only the technological value of the breed but also expands the

possibilities of selecting high-quality progeny. In this process, selecting cocoons with the highest potential from the total collected samples increases the accuracy and efficiency of the selection program. The difference between the selected cocoons and the overall population is important from a breeding perspective, as it determines the direction for further genetic improvement.

Table 2 presents the number of analyzed and selected cocoons, the silk percentage, and the selection differential values describing the efficiency of selection for three studied genotypes.

**Table 2**

**Changes in silk content and selection differential in total and selected cocoons of component breeds during 2023–2025**

| № | Breeds | Year | Number of analyzed cocoons | | Silk content (%) | | |
|---|---|---|---|---|---|---|---|
| | | | total | selected | total | selected | Selection differential (S) |
| 1 | AG | 2023 | 513 | 231 | 23.4 | 24.7 | 1.3 |
| | | 2024 | 453 | 261 | 23.8 | 24.7 | 0.9 |
| | | 2025 | 375 | 194 | 23.9 | 24.4 | 0.5 |
| 2 | Ipakchi 2 | 2023 | 593 | 295 | 23.1 | 24.1 | 1.0 |
| | | 2024 | 543 | 299 | 23.5 | 24.4 | 0.9 |
| | | 2025 | 500 | 348 | 24.0 | 25.2 | 1.2 |
| 3 | S-12 | 2023 | 351 | 184 | 23.6 | 24.3 | 0.7 |
| | | 2024 | 284 | 202 | 24.2 | 24.9 | 0.7 |
| | | 2025 | 443 | 338 | 25.0 | 25.5 | 0.5 |

According to the data presented in Table 2, the silk content in the selected cocoons of the component breeds was higher compared to the overall population as a result of selection. In the AG breed, the silk content in the total cocoons ranged from 23.4–23.9%, whereas in the selected cocoons it reached 24.4–24.7%, with a selection differential ranging from 0.5 to 1.3 units.

Positive results were also observed in the Ipakchi-2 breed. In 2025, the silk content of the total cocoons was 24.0%, while in the selected group it increased to 25.2%, with a selection differential of 1.2 units.

In the S-12 breed, the silk content ranged from 23.6–25.0% in the total cocoons and increased to 24.3–25.5% in the selected cocoons, with a selection differential of 0.5–0.7 units.

Overall, the results indicate that cocoons with higher silk content were consistently selected in all breeds, demonstrating the effectiveness of the selection program.

**Conclusion**

The results of the study showed that the selection process in the component breeds AG, Ipakchi-2 and S-12 led to significant improvements in biological and technological

traits. In the families selected for breeding, increases were observed in cocoon weight, shell weight and silk content. The higher silk percentage in the selected cocoons compared to the general population confirms the effectiveness of the selection process. In particular, the Ipakchi-2 and S-12 breeds demonstrated higher silk productivity and can be recommended as promising components for developing clone-breed hybrids. These findings indicate that selective breeding is an effective approach for improving silk productivity and technological traits in mulberry silkworm component breeds.

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