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EFFECT OF LEAVES OF NEW MULBERRY SELECTION NUMBERS ON COCOON YIELD AND MULBERRY LEAF CONSUMPTION OF SILKWORM HYBRIDS DURING THE SPRING SEASON

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Abstract
This study investigated the economically valuable traits of silkworm hybrids reared on mulberry leaves from selection numbers No. 1-21 (Yangi Andijon), No. 2-21, No. 4-21, and No. 5-21 (Vodiy-1), as well as from the comparative variety Tajikskaya Bezsemyannaya. The research was conducted in 2025 at the "IPAK KO'CHAT KLASTER" farm in Marhamat District during the spring silkworm-rearing season. The experiment assessed larval viability, cocoon yield per box of silkworms, and the amount of mulberry leaves required to produce 1 kg of cocoons.

Keywords: Mulberry, silkworm, selection number, cocoon yield, larval viability, mulberry leaves, leaf consumption, cocoon, breeding, economically valuable traits.

Introduction

Cocoon Yield and Leaf Consumption as Key Economic Traits in Silkworm Production. One of the most important economic traits of the silkworm is cocoon productivity. Under commercial production conditions, obtaining the maximum cocoon yield from one box of silkworms requires, first and foremost, that the larvae being reared are 100% pure hybrids and that all recommended rearing and agrotechnical practices are strictly followed. In addition, the quality and varietal characteristics of mulberry leaves, which constitute the principal food source of the silkworm, play a crucial role in determining cocoon productivity.

The productivity of the silkworm (Bombyx mori L.) largely depends on the quality of its feed, particularly the nutritional value of mulberry (Morus spp.) leaves. Feed conversion efficiency, expressed as the proportion of ingested mulberry leaf nutrients converted into cocoon shell, is considered an important indicator for evaluating the nutritional value of mulberry varieties. Previous studies have also demonstrated that mulberry varieties with higher levels of nitrogen and essential amino acids in their leaves provide greater nutritional value for silkworm larvae. Therefore, when evaluating new mulberry breeding lines, it is necessary to consider not only leaf yield but also leaf nutritional quality, its effect on silkworm productivity, and feed utilization efficiency [6].

Literature Review

Under the conditions of Uzbekistan, high leaf yield, leaf quality, silkworm productivity, and adaptability to local climatic conditions are also regarded as important selection criteria in mulberry breeding. Uzbek researchers have evaluated newly developed mulberry breeding lines based on branching characteristics, shoot length, leaf yield, and other economically valuable traits. These studies indicate

that, in the development of new mulberry varieties, high productivity should be considered together with their adaptability to the climatic conditions of different regions [3].

The age and maturity of mulberry leaves have been shown to have a significant effect on the biological and economic characteristics of the silkworm. In a comparative study, silkworm larvae fed tender, medium-aged, and coarse mulberry leaves were evaluated. Larvae fed tender leaves showed a larval weight of 38.82 g, single cocoon weight of 1.94 g, cocoon shell weight of 0.37 g, cocoon shell ratio of 19.21%, cocoon yield of 18.68 kg per 10,000 larvae, mean silk filament length of 922.33 m, and filament weight of 0.28 g. In contrast, larvae fed coarse leaves demonstrated substantially lower values for these traits. The authors concluded that leaf maturity and moisture content are important factors influencing silkworm productivity and the economic efficiency of cocoon production [4].

The use of cocoon shell production efficiency has also been proposed as an indicator for assessing the nutritional quality of mulberry varieties. The nutritional value of mulberry leaves can be evaluated in relation to the amount of cocoon shell produced from the feed consumed by the silkworm. This approach is particularly important for establishing the relationship between leaf quality, feed utilization efficiency, and cocoon shell production [5].

Samami et al. reported that different hybrid lines of Bombyx mori L. exhibited considerable differences in production performance and economic traits when fed Morus alba leaves. Their study demonstrated that, in addition to silkworm genotype, the characteristics of the mulberry feed and the efficiency with which it is converted into larval and cocoon biomass are important determinants of cocoon productivity. The authors evaluated feed intake, feed conversion ratios, cocoon characteristics, and economic efficiency among eight commercial silkworm hybrid lines and identified significant differences among the hybrids.

A group of Indian researchers investigated the effect of organically fertilized mulberry leaves on silkworm productivity. Application of seri-waste bio-digester liquid to mulberry plants resulted in improvements in larval weight, cocoon weight, cocoon shell weight, and cocoon shell ratio. In the most effective treatment, the effective rate of rearing reached 98.28%, while single cocoon weight was 1.86 g, cocoon shell weight was 0.30 g, cocoon shell ratio was 16.60%, and single cocoon filament length was 915.10 m. These findings indicate that improvement of mulberry nutritional status can positively influence the economic traits of Bombyx mori L.

Research Objective:

The main objective of this study was to determine the cocoon productivity and leaf consumption of silkworm larvae reared on the leaves of the mulberry breeding lines №1-21 (Yangi Andijon), №2-21, №3-21, №4-21 (Vodiy-1), and №5-21, using the variety Tajikskaya bezsemyannaya as a comparative standard. Based on these economically valuable traits, the study aimed to identify the most promising genotypes for further use in mulberry breeding programs.

Research Tasks: The objectives of the present study were:

- to evaluate the effect of the tested mulberry breeding lines on the productivity of Bombyx mori L;
- to determine cocoon yield obtained from silkworms fed with leaves of different mulberry breeding lines;
- to determine the amount of mulberry leaf consumed per unit of cocoon production;

- to compare the economically valuable traits of the tested breeding lines with the comparative variety Tajikskaya bezsemyannaya; and to identify the most promising mulberry genotypes for further breeding and production purposes.
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Materials and Methods:

The research was conducted at the "IPAK KO'CHAT KLASTER" farm in Marhamat District, Uzbekistan, with the aim of evaluating the advantages of newly developed mulberry breeding lines in terms of their influence on cocoon productivity and leaf consumption.

Spring silkworm-rearing experiments were conducted using mulberry leaves obtained from breeding lines №1-21 (Yangi Andijon), №2-21, №4-21, and №5-21 (Vodiy-1), together with the comparative variety Tajikskaya bezsemyannaya. The tested silkworm larvae were reared under comparable conditions, while the quantity of mulberry leaves supplied and consumed was recorded to assess feed utilization efficiency and its relationship with cocoon production.

Cocoon yield and leaf consumption were used as the principal economic indicators for evaluating the feeding value of the tested mulberry genotypes. Such an approach is consistent with previous research demonstrating that both silkworm genotype and feed quality influence cocoon production and feed conversion efficiency.

Results and Discussion:

In sericulture, cocoon yield obtained from one box of silkworms and the amount of mulberry leaf required to produce that yield are among the most important economic traits. These indicators directly reflect the productive potential of the silkworm and the efficiency with which mulberry leaf biomass is converted into economically valuable cocoon material.

Based on the above considerations, an experiment was conducted to evaluate the advantages of the newly developed mulberry breeding lines and to determine their effects on cocoon yield and leaf consumption. Silkworm larvae were reared using leaves of breeding lines №1-21 (Yangi Andijon), №2-21, №4-21, №5-21 (Vodiy-1), and the comparative variety Tajikskaya bezsemyannaya. The results obtained from the experiment are presented in Table 1.

The assessment of cocoon yield together with leaf consumption is particularly important for identifying promising mulberry genotypes. A genotype that provides high leaf yield and nutritional quality while requiring less leaf biomass to produce a given quantity of cocoons may have greater practical value for commercial sericulture. Previous studies similarly emphasize the importance of feed conversion efficiency, cocoon shell ratio, and genotype × feed interactions in determining the economic efficiency of silkworm production.

The results obtained in the present study therefore provide a basis for comparative evaluation of the tested mulberry breeding lines and for identifying genotypes with superior feeding value and potential for further selection and variety development.

Table 1. Cocoon yield and mulberry leaf consumption for the production of 1 kg of cocoons in silkworm hybrids reared on leaves of mulberry selection numbers №1-21 (Yangi Andijon), №5-21 (Vodiy-1), №2-21 and №4-21 in (2025 y)

Mulberry selection numbers	Replications	Silkworm survival rate, %	Cocoon yield		Amount of mulberry leaves consumed to produce 1 kg of cocoons, kg	
			Per 1 box	Compared with the control, %	kg	Compared with the control, %
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№1-21, (Yangi Andijon)	n-1	98,0	85,8	120,3	10,2	80,3
	n-2	98,5	84,2	118,1	10,8	85,0
	n-3	99,3	81,5	110,0	10,9	85,8
	$\overline{X} \pm S_{\overline{x}}$	**98,3**	**83,8±0,576**	**114,3**	**10,6±0,178**	**83,7**
№2-21	n-1	97,3	81,6	114,4	11,9	93,7
	n-2	98,7	79,4	111,5	12,4	97,6
	n-3	98,6	78,3	109,8	11,8	95,0
	$\overline{X} \pm S_{\overline{x}}$	**98,2**	**79,7±1,208**	**111,9**	**11,2±0,152**	**92,9**
№ 4-21	n-1	97,5	77,6	108,4	11,9	93,7
	n-2	97,7	79,3	109,8	11,8	92,9
	n-3	99,4	75,0	107,6	12,1	95,2
	$\overline{X} \pm S_{\overline{x}}$	**98,2**	**77,3±0,970**	**108,6**	**11,3±0,152**	**93,9**
№5-21, (Vodiy 1)	n-1	98,6	87,6	123,0	10,2	80,3
	n-2	98,7	81,4	115,2	10,4	81,8
	n-3	98,8	80,6	113,0	10,1	79,5
	$\overline{X} \pm S_{\overline{x}}$	**98,7**	**83,2±1,916**	**117,0**	**10,2±0,251**	**80,5**
Qiyoslovchi (Tadj.bez)	n-1	93,1	70,5	100,0	12,9	100,0
	n-2	95,4	72,1	100,0	12,7	100,0
	n-3	95,2	71,2	100,0	12,4	100,0
	$\overline{X} \pm S_{\overline{x}}$	**94,6**	**71,3±1,020**	**100,0**	**12,7±0,147**	**100,0**

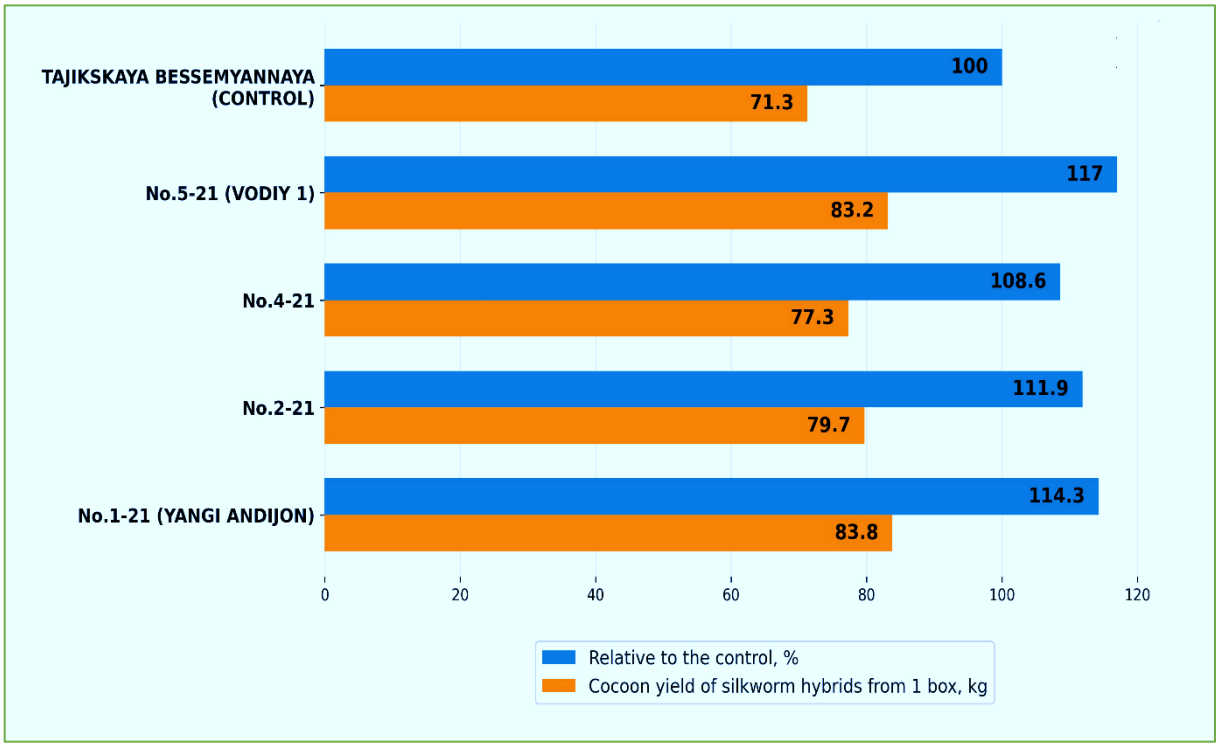
Analysis of Cocoon Productivity Indicators in 2025. An analysis of the cocoon production indicators obtained from silkworms reared in 2025 (Table 1) showed that the average larval survival rate was 98.3% for the silkworms fed with leaves of breeding line №5-21, 98.7% for №5-21, and 98.2% for №2-21. In comparison, the survival rate recorded for the standard variety Tajikskaya bezsemyannaya was 94.6%. Thus, the differences in survival rate among the tested breeding lines were relatively small, whereas all tested lines demonstrated higher survival rates than the comparative variety.

With regard to cocoon weight and cocoon shell weight, all of the tested breeding lines showed higher values than the comparative variety Tajikskaya bezsemyannaya. The highest cocoon yield per box of silkworms was recorded for breeding line №1-21. The cocoon yields obtained from all other tested breeding lines were also higher than that of the comparative variety.

An important indicator of the feeding efficiency of silkworms is the amount of mulberry leaf required to produce one kilogram of cocoons. For the tested breeding lines, the average leaf consumption required to produce 1 kg of cocoons ranged from 10.2 to 11.3 kg. In contrast, the corresponding value for the Tajikskaya bezsemyannaya variety was considerably higher, reaching 12.7 kg of mulberry leaves per kilogram of cocoons.

The data presented in Figure 1 further confirm the results of the one-year comparative analysis of average cocoon productivity. The results demonstrate that feeding silkworm larvae with leaves obtained from selected mulberry breeding lines can have a direct positive effect on cocoon yield. In particular, the higher cocoon productivity observed in the tested breeding lines, together with their lower leaf consumption per kilogram of cocoon production, indicates more efficient utilization of mulberry leaf biomass.

Overall, the findings suggest that the newly tested mulberry breeding lines possess considerable potential for improving the economic efficiency of silkworm production. Their higher cocoon yield, greater cocoon and cocoon shell weight, and relatively lower leaf consumption compared with the standard variety make them promising candidates for further breeding evaluation and practical use in sericulture.



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Conclusion

Overall, the results of the study demonstrated that the highest cocoon yield per box of silkworms was obtained from larvae reared on mulberry leaves of breeding line №1-21 (Yangi Andijon), reaching 83.8 kg. The cocoon yield recorded for breeding line №5-21 (Vodiy-1) was 83.2 kg, while breeding lines №2-21 and №4-21 produced 79.7 kg and 77.3 kg, respectively. In comparison, the cocoon yield obtained

from the standard variety Tajikskaya bezsemyannaya was 71.3 kg. Thus, all of the tested breeding lines demonstrated higher cocoon productivity than the comparative variety.

The amount of mulberry leaf required to produce 1 kg of cocoons was also lower in the tested breeding lines, ranging from 10.2 to 11.3 kg, whereas the corresponding value for the comparative variety was 12.7 kg. These findings indicate that silkworms fed with leaves from the tested breeding lines utilized the feed more efficiently and required less mulberry leaf biomass to produce an equivalent quantity of cocoons.

Therefore, breeding lines №1-21 (Yangi Andijon), №5-21 (Vodiy-1), №2-21, and №4-21 can be considered promising genetic material for further breeding studies and practical use in sericulture, particularly for improving cocoon productivity and the efficiency of mulberry leaf utilization.

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