

*Influence Of Induction Of The Latent Nuclear Polyhedrosis Virus On Reproductive Characteristics Of The Silkworm *Bombyx Mori L**

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Abstract – This article presents the results of the effect of cold induction of latent nuclear polyhedrosis virus on the reproductive performance of silkworm. It has been established that as a result of the induction of latent nuclear polyhedrosis virus and strict selection for all reproductive indicators, fertility increases. An analysis of the physiological defects in clutches showed that the breed Ipakchi 2 has a significant decrease in comparison with the years in 2018 (4,6 %), in 2019 (0,9 %) and in 2020 (1,9 %). All other experimental breeds and lines have a fairly low physiological defect rate – 1,7-2,0 %. According to the results of the analysis of the initial clutches (F3), the grains of the rocks and lines were selected for the tribe all the analyzed clutches. In subsequent generations, a more rigorous selection by reproductive indicators will be carried out.

Keywords – Sericulture, Silkworm, Nuclear Polyhedrosis, Cocoon, Viability, Resistance.

I. INTRODUCTION

Today, more than 20 countries around the world breed silkworm caterpillars. Every year, 22-24 million boxes of industrial silkworm are harvested. From cooked silkworm grains, 840 - 860,000 tons of live cocoons are produced worldwide. Among them: the People's Republic of China - 650 thousand tons, the yield from one box of greens (85 kg), India - 150 thousand tons (80 kg), Uzbekistan – 20,0 thousand tons (59,6 kg) and 40,0 thousand tons falls on the share of other countries.

The production of living cocoons is increasing throughout the world, while infectious diseases, especially nuclear polyhedrosis, cause damage in the amount of 15-20% of the cocoon harvest. To solve this problem, research is being carried out in leading scientific centers of the world.

In this regard, the recognition of genes resistant to nuclear polyhedrosis of the silkworm, the identification of productive forms from populations of various origins, the creation of biological and chemical agents against diseases, the development of preventive measures are one of the most important tasks.

The republic has achieved high results in the production of living cocoons. However, during the feeding season, various types of silkworm diseases appear.

The spread of diseases in industrial feedings leads, first of all, to a sharp decrease in yield, grade, textile properties of cocoons and produced cocoon raw materials.

The strategy of actions for the further development of the Republic of Uzbekistan for 2017-2021 provides for the intensive development and modernization of agriculture, in particular animal husbandry, including the development of silkworm breeding and a gradual increase in the harvest of cocoon raw materials by developing effective measures to prevent and combat especially dangerous diseases of the silkworm, with the purpose of preserving the yield and quality of the cocoon is of great scientific and practical importance.

In our republic, the study of the epizootic of infectious diseases, the development of measures for the control and prevention of their occurrence on industrial feedings, scientists were engaged in E.N.Mikhaylov [8], L.F.Kashkarova [6], E.N.Troitskaya [17], N.A.Akhmedov [1], D.A.Ismatullaeva [4], S.Sabirov [14].

On a global scale, scientific research was carried out by a number of leading scientists of the world on the study of host-parasitic relations in protozoa diseases, the use of drugs, the search for disinfectants, the study of hereditary factors of silkworm resistance at the genetic level: E.I.Baburashvili [2], N.Baramidze [3] I.A.Kirichenko [7]; and S.Salimzhanov [15] and positive results have been achieved.

To date, scientific research has been epizootic and unsystematic. Therefore, there is still no coherent program of consistent and reasonable application of preventive and therapeutic measures to combat diseases of the silkworm in silkworm production in Uzbekistan.

Based on this, the creation of new and improvement of existing methods for the prevention and control of diseases of the silkworm, the search for genetically resistant to nuclear polyhedrosis and nosematosis of the silkworm breeds and the construction of a scientifically based system of preventive and therapeutic measures when keeping the silkworm is considered one of the urgent tasks.

At present, the identification of breeds and hybrids genetically resistant to nuclear polyhedrosis, the creation of new disease-resistant lines or breeds are the main directions in the development of measures to combat especially dangerous infectious diseases of the silkworm [2].

The possibility of creating silkworm breeds with high disease resistance was noted by the International Sericulture Commission [16].

One of the approaches to solving this problem was recommended to use signs of very high disease resistance in polyvoltine breeds with a high silk yield in monovoltine breeds. It was also noted that, in the future, the compilation of a molecular gene map, the isolation of genes and their transfer from polyvoltine breeds to monovoltine ones using genetic engineering methods will be carried out.

In recent years, Georgian breeders have created new breeds with high biological and technological indicators, as well as resistant to high-temperature summer conditions - Nina, Tbilisuri-2 and Kvatsikhe.

These breeds tolerate a high-temperature environment well, they also have a stable immunity to diseases, both in the open season, the stimulation of its cyclic development is due to both, and daily changes [5].

II. MATERIALS AND METHODS

2 lines and 2 breeds (Line 27, Line 28, Japanese 120, Ipakchi 2) obtained from the laboratory of breeding and selection of the silkworm NIISH were used as material for the study.

The incubation and feeding of caterpillars of all lines and breeds was carried out in accordance with the experimental feeding methodology approved for white-beaked breeds.

In accordance with the same methodology, all data obtained as a result of incubation, feeding, papillonnage and storage of green, as well as a result of microscopic analysis of the experimental material, were collected and statistically processed. The following techniques were used in the work:

- selection of 4 breeds and breeding lines, the best in biological and technological characteristics;

- traditional selection and breeding selection at all stages of development of the silkworm (green, caterpillar, cocoon, butterfly) to study the stability of experimental breeds and lines [9];
- the assessment of the resistance of the above breeds and lines to nuclear polyhedrosis was carried out using the stress method
- the method of cold induction [11];
- the method of individual analysis and selection of breeding individuals for obtaining offspring from them in order to create breeding material resistant to nuclear polyhedrosis.

III. RESULTS AND DISCUSSION

To carry out research work on the creation of an initial breeding material for breeding resistant silkworm lines to nuclear polyhedrosis, the institute's breeders in 2018 recommended 2 alternative breeds that differ from each other: Jap-120, Ipakchi 2 and 2 breeding lines: Line 27, Line 28. The choice of these rocks and lines as a source material is justified by the following considerations, i.e. at present, the production mainly feeds highly silky-bearing foreign industrial hybrids.

In the long term, it is envisaged to completely stop the import of industrial grains into the republic from abroad by 2022, and by this time competitive industrial silkworm hybrids should be introduced by domestic breeders.

Therefore, we considered it necessary to create an initial breeding material resistant to nuclear polyhedrosis on the basis of promising breeds Jap-120, Ipakchi 2 and lines Line 27, Line 28.

Clutches F_2 , cooked last year and in each clutch was determined by the number of eggs, weight of eggs, weight of one egg and physiological marriage. The average indicators of the number of eggs in a clutch, weight of eggs in a clutch, weight of one egg and physiological marriage were determined (Table 1).

Table 1. Reproductive indicators of breeds and lines
(in 2018-2020)

Breeds and lines	Number of eggs in clutch, pcs		Mass of eggs in clutch, mg		Weight of one egg, mg		Physiological marriage, %	
	$\bar{X} \pm S \bar{x}$	C_v	$\bar{X} \pm S \bar{x}$	C_v	$\bar{X} \pm S \bar{x}$	C_v	$\bar{X} \pm S \bar{x}$	C_v
2018 year (F_1)								
Japanese 120	643±1,35	0,01	314±5,2	7,07	0,489±0,001	1,2	0,7±0,49	123,5
Ipakchi 2	619±2,12	0,01	330±4,8	6,55	0,534±0,001	1,3	4,2±0,90	97,6
Line 27	562±10,3	7,95	308±8,0	11,63	0,550±0,001	1,2	1,7±0,08	27,2
Line 28	551±14,3	11,6	266±9,7	16,30	0,505±0,001	1,4	2,6±0,16	27,7
2019 year (F_2)								
Japanese 120	657±2,2	1,8	340±1,6	2,6	0,520±0,001	1,2	1,9±0,04	10,5
Ipakchi 2	699±1,9	1,6	386±1,1	1,7	0,542±0,001	1,3	0,9±0,6	12,2
Line 27	555±2,2	2,3	280±0,6	1,4	0,508±0,001	1,2	1,8±0,03	10,0
Line 28	586±1,0	8,5	274±1,9	3,2	0,500±0,001	1,4	2,0±0,04	10,0
2020 year (F_3)								
Japanese 120	741±1,5	0,08	372±4,4	3,1	0,523±0,001	1,4	1,5±0,04	11,0
Ipakchi 2	763±1,8	0,05	418±6,5	2,3	0,555±0,001	1,6	1,8±0,03	12,4
Line 27	563±2,3	5,91	258±3,6	1,7	0,458±0,001	1,2	1,9±0,06	10,9
Line 28	541±4,1	8,3	273±7,4	2,6	0,495±0,001	1,3	6,4±0,70	22,0

The data in Table 1 shows that the breeds are more fertile than the breeding lines. The number of eggs in a clutch in the Japanese 120 and Ipakchi 2 breeds in 2018 varied from 643 to 619, and in the Line 27, Line 28 breeding lines - from 562 to 551.

The same indicators in 2019 are significantly higher than the previous year that is, for the Jap-120 and Ipakchi 2 breeds ranging from 657 pcs to 699 pcs, and for the Line 27, Line 28 breeding lines - from 555 pcs to 586 pcs.

In 2020, the number of eggs in clutch for the Japanese 120 and Ipakchi 2 breeds ranged from 741 pieces to 763 pieces, and for the Line 27, Line 28 breeding lines - from 563 pieces to 541 pieces.

For clarity, the fertility of ovipositions of breeds and lines are shown in the form of a histogram (Fig. 1).

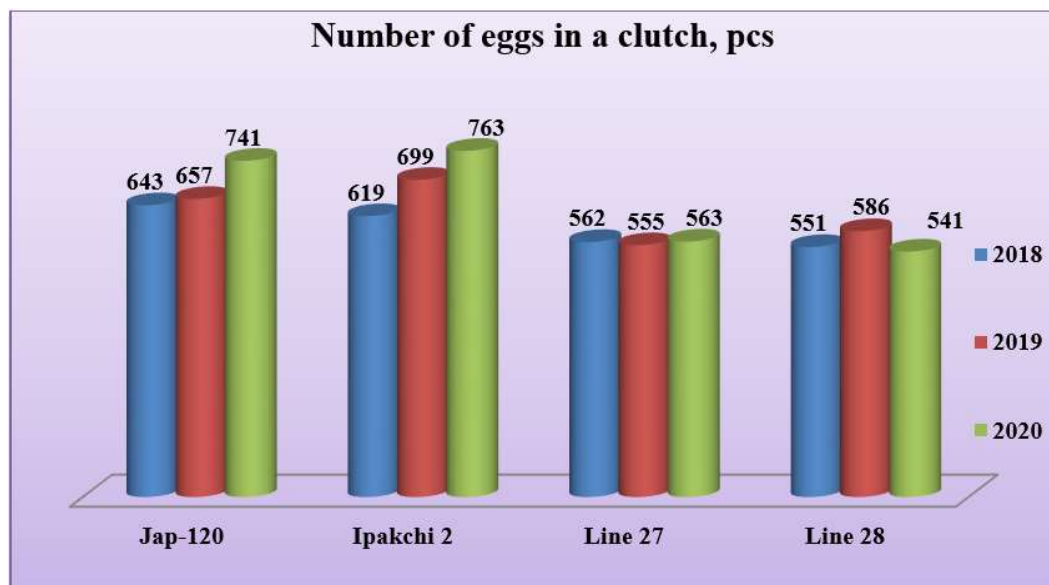


Figure 1. The number of eggs in the clutch of the studied species and lines
(2018-2020 yy.)

As can be seen from Figure 1, the number of eggs in a clutch in 2020 is higher in breeds than in 2018 and 2019. For example, the breed Jap-120 has 84 pieces, Ipakchi 2 has 64 pieces. And for breeding lines, this indicator is almost the same than the indicators obtained in the previous year.

Based on the analysis of the original clutches (F_3), all the analyzed clutches were selected for the tribe. In subsequent generations, a more rigorous selection will be carried out for reproductive indicators.

IV. CONCLUSIONS

The clutches (F_3) of breeds (Jap-120, Ipakchi 2) and lines (Line 27, Line 28) prepared in 2018-2020 reproductive indices were calculated. As a result of the analysis of the number of eggs, physiological defects in clutches, it was found that they are more fertile in comparison with the indicators of the previous year.

1. The number of eggs in a clutch in the Japanese 120 and Ipakchi 2 breeds in 2018 varied from 643 to 619, and in the line 27, Line 28 breeding lines - from 562 to 551.

2. The same indicators in 2019 are significantly higher than the previous year, that is, for the Jap-120 and Ipakchi 2 breeds ranging from 657 pcs to 699 pcs, and Line 27, Line 28 - from 555 pcs to 586 pcs. In 2020, the number of eggs in a clutch for the Japanese 120 and Ipakchi 2 breeds ranged from 741 pieces to 763 pieces, and for the Line 27, Line 28 breeding lines - from 563 pieces to 541 pieces.

3. Analysis of physiological marriage in clutches showed that the Ipakchi 2 breed has a significant decrease in comparison with the years in 2018 (4,6 %), in 2019 (0,9 %) and in 2020 (1,9 %) those, selection for reproductive characteristics favorably affects the fertility of the population. All other experimental breeds and lines have a fairly low rate of physiological marriage – 1,7-2,0 %.

4. Indicators of variability of reproductive traits in breeds and lines in 2019 show that the lowest coefficient of variability was shown by breeds Jap-12 (Cv = 1,6 %) and Ipakchi 2 (Cv = 1,8 %), while Lines 27 and 28 variability in fertility is at the level of Cv = 2,3-8,5 %.

These coefficients of variability give reason to conclude that the experimental breeds and lines have low variability in the leading reproductive traits, which is the result of individual selection for the fertility of female butterflies.

5. It has been established that as a result of selection for all reproductive parameters against the background of induction of the latent nuclear polyhedrosis virus, the fertility of breeding populations increases.

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