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INFLUENCE OF FEEDING IN DIFFERENT WAYS ON THE MASS OF SILKWORM AND COCOONS

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Abstract
In silkworm rearing in Uzbekistan, one of the main problems is the maintenance of a hygrothermal regime. Scientific research has been carried out to create optimal air temperature and relative humidity for rearing hybrid silkworms from the 1st instar to the 5th instar. In the experiments, the silkworms were fed in two different experiments and in the same comparative method. In silkworm rearing, the use of fabric and polyethylene film to retain humidity in a special device has been found to save mulberry leaf consumption by 15,3-18,7%, and to shorten the worm cycle by 2,7-4,0 days and due to maintaining the hygrothermal regime, a significant increase in silkworm growth and weight was observed.

Keywords: silkworm, silk, mulberry leaves, temperature, humidity, cocoon.

Аннотация
Ўзбекистон шароитида ипак қуртини боқишда гиротермик режимни сақлаш асосий муаммолардан бири бўлиб ҳисобланади. Парваришланаётган дурагай қуртларга 1-ёшдан 5-ёшгача бўлган даврда оптимал ҳаво ҳарорати ва нисбий намликни яратиб бериш борасида илмий ишлар олиб борилди. Тажрибаларда икки хил тажриба ва бир хил қиёсловчи усулда қурт боқилди. Қурт боқишда махсус мосламада намликни сақлаш учун мато ва полиэтилен плёнкадан фойдаланиш тут барги сарфини 15,3-18,7% га иқтисод қилиши, қуртлик даврини 2,7-4,0 кунга қисқартириши исботланди ва гигротермик режимни доимий сақлаш ҳисобига, қуртларни ўсиб ривожланишида ва қурт вазнида сезиларли даражада ўсиш кузатилди.

Калит сўзлар: тут ипак қурти, ипак, тут барги, ҳарорат, намлик, пилла.

Аннотация
В шелководстве Узбекистана одной из основных проблем является поддержание влаготермического режима. Проведены научные исследования по созданию оптимальной температуры воздуха и относительной влажности для выращивания гибридных тутовых шелкопрядов с 1-го по 5-й возраст. В опытах шелковичных червей кормили в двух разных опытах и одним и тем же сравнительным методом. Установлено, что при выращивании тутового шелкопряда использование ткани и полиэтиленовой пленки для сохранения влажности в специальном устройстве позволяет сэкономить расход листьев тутового дерева

на 15,3-18,7%, сократить цикл червей на 2,7-4,0 дня и за счет поддержания влаготермического режима. , наблюдалось значительное увеличение роста и массы тутового шелкопряда.

Ключевые слова: тутовый шелкопряд, шелк, тутовый лист, температура, влажность, кокон

Introduction

Certain successes have been achieved in the production and processing of cocoons in our republic, the creation of high-yielding varieties and industrial hybrids adapted to our different regions, as well as highly nutritious mulberry varieties. However, the development and scientific justification of methods for the proper storage of domestic and foreign silk ribbons, providing them with a constant and relative humidity in the specific dry climate of Uzbekistan is given little attention.

Currently, more than 20 countries of the world are engaged in the processing of silk and the production of finished silk fabrics, the main share of cultivated cocoon raw materials belongs to the People's Republic of China. Demand for cocoon raw materials, which is a source of natural silk, is increasing on the world silk market. The main demand of the leading industrial complexes for the production of products from silk is focused on thin silk carpets. In the period of modern market relations, the competitiveness of products for export on the world market is a priority for any industry. In the silk industry, the high quality of silk is directly related to the quality of the cocoon and its technological features. To improve the quality of raw silk, in first of all, it is necessary to create breeds and hybrids that produce high-quality silk, and then, of course, it is necessary to use innovative technologies that have a scientific basis.

While scientists in the field of sericulture have done a lot of research on shortening silkworm rearing period and producing abundant and quality cocoons, the advanced cocoon producers have also introduced a number of innovations into silkworm rearing processes in their practical experiments. As a result, several methods have been developed in silkworm rearing, such as simple method, intensive method and the method of silkworm breeding at changeable temperature, as well as an improved method. Today, an improved intensive method is being used widely. For this, it is required the temperature to be 26-27 0C and relative humidity to be 65-75% in the 1st, 2nd and 3rd instars of silkworm, in the 4th instar to be 25-26 0C, in the 5th instar 24-25 0C, while in cocooning stage 25 0C, with humidity 60-65 percent (Akhmedov, 2014). In the result of rearing silkworm under this improved intensive rearing method, larva stage of reared silkworms reduced by 1-1,5 days, cocoon yield, mean weight of cocoon and silk-fiber yield increased by 4-5 percent.

In this regard, in countries with developed cocoons, manual labor is gradually being abandoned. The role of innovative technologies in the era of silkworm care is of great importance. Based on this, the mechanization of sericulture and the use of innovative techniques and technologies during the fattening period of worms make it possible to grow high-quality raw materials under production conditions and silk fibre.

The amount of the food given to the silkworm, eaten and digested by the worm body depends on the amount of water in the leaf, the moisture and freshness of the leaf. In cocoonery where the silkworms are reared, when the temperature is 25-270C, the mulberry leaves lose freshness within 1,5 hours and get dried. Young larva of silkworm consume the leaves slower than the larva of older instar. In the rearing of young larva, the care under polyethylene film is much more effective. As a result of this, if

the larva are fed at regular intervals, i.e 3 times a day with chopped leaves, the growth of worms is accelerated and the freshness of mulberry leaves remains more, getting less dried. The most part of the given feed, that is mulberry leaves are saved to be wasted. It was found that when a mulberry silkworm is fed in a simple way, 100-1200 kgs of leaves are consumed per box of worms, and when fed under film, an average of 750-800 kgs of food is consumed per box of worms (Khomidy et al. 2004).

When silkworms are reared under ordinary conditions, the moisture of the mulberry leaf quickly decreases and begins to dry out. By considering the worm's need for humidity, it has been suggested that young larva can be fed 4-5 times a day instead of 9-10 times a day if they are fed under a damp sheet/blanket cover or polyethylene film (Akhmedov, 2014).

Mulberry silkworms need to be fed on special shelves to protect them from pests and floor (ground) moisture. Folding shelves and permanent stillages (racks) are used to rear the silkworm of all instars. They can be installed vertically in 2,3,4 and 8-10 layers (Akhmedov, 2014).

In the method that is used in India, it is recommended to rear mulberry silkworm larvae in young and adult instars in special boxes measuring 2 x 3 m (Bharat and Satish, 2014). In the rearing process of the silkworm in these stillages the work can be accelerated and get easier. For feeding and thinning the silkworm larva, it has been noted that the time is saved by 23 percent to 60 percent. Furthermore, the damage that can be caused to larva reared in these stillages while changing their place, or transferring somewhere has been found to be decreased.

At the stage of cocooning of silkworm, the quality of cocoon, its calibre, i.e large or small sizes, shape, weight, shell mass, silkiness, cocoon hardness and technological indicators not only depend on silkworm breed, but also on cocooning condition too (Akhmedov and Murodov, 2004; Akhmedov, 2014). The authors reported that the temperature, humidity and light in cocooning condition, as well as the amount and quality of mulberry leaves may affect considerably to cocooning.

The cost of growing mulberry silkworm and producing cocoon products is increasing. This is due to the fact that as a result of the decline in the quality of the cocoons grown, the fineness of the silk fiber is not at the level required by world standards. That is, non-recommended materials for silkworm rearing are used in the production process. It leads to defective formation of cocoons which are double, spotted and have a rack trace. The use of the proposed artificial trays of polyethylene, cardboard and other materials has been proven to improve the quality and technological performance of cocoons (Lavrentyev, 1973; Mirzakhodjaev et al., 2009).

Research materials and methods

Many factors influence the growth and development of the silkworm and the production of high-quality cocoons. These include the quantity and quality of feed, hydrothermal conditions, and agricultural practices. All activities and techniques are aimed at providing the worms with a sufficient amount of high-quality, moist mulberry leaves. It is also important to maintain a constant temperature air and the level of relative humidity. Many scientists have conducted a number of scientific studies on the effect of temperature and humidity levels, the quantity and quality of food on the silkworm. The results of the studies provide scientifically sound recommendations. However, in the theory and practice of sericulture, the development of methods for maintaining a constant optimal hygrothermal regime and its scientific justification is a topical issue.

Research Results and their Discussion

At the next stage of our research work, the effect of feeding worms under wet cloth and film on the growth of worms, the mass of worms and the amount of gana produced during the feeding period was studied. Tables 3.5.1-3.5.4 indicate the number of worms, the number of worms remaining in the worm (stunted) and the weight of 100 worms and 1 worm on the 7 th day of V-age by 5 different ways of feeding the worms.

Table-1 Litter and caterpillar weights for different rearing methods (2018 y.)

№	Feeding method	Manure quantity gr	Number of caterpillar under	Weight of 100 of caterpillar on the 7th day of age V, gr	Weight of 1 caterpillar on the 7th day of age V, gr
1	With the sheet open	1103	26	364,38	3,64
2	With the film open	976	19	367,41	3,67
3	With the sheet closed	1218	23	378,35	3,78
4	With the film closed	1004	21	391,89	3,91
5	In a simple way (comparator)	1361	27	323,76	3,23

Table-2 Litter and caterpillar weights for different rearing methods (2019 y.)

№	Feeding method	Manure quantity gr	Number of caterpillar under	Weight of 100 of caterpillar on the 7th day of age V, gr	Weight of 1 caterpillar on the 7th day of age V, gr
1	With the sheet open	1171	31	362,21	3,62
2	With the film open	1005	27	371,38	3,71
3	With the sheet closed	1108	29	381,12	3,81
4	With the film closed	1226	27	396,43	3,96
5	In a simple way (comparator)	1415	38	323,76	3,23

Table-3 Litter and caterpillar weights for different rearing methods (2020 y.)

№	Feeding method	Manure quantity gr	Number of caterpillar under	Weight of 100 of caterpillar on the 7th day of age V, gr	Weight of 1 caterpillar on the 7th day of age V, gr
1	With the sheet open	972	28	386,21	3,86
2	With the film open	1072	15	393,61	3,98
3	With the sheet closed	1000	23	429,12	4,29
4	With the film closed	986	31	438,91	4,38
5	In a simple way (comparator)	1634	38	364,3	3,64

Table-4 Litter and caterpillar weights for different rearing methods (average indicators for 2018-2020)

№	Feeding method	Manure quantity gr	Number of caterpillar under	Weight of 100 of caterpillar on the 7th day of age V, gr	Weight of 1 caterpillar on the 7th day of age V, gr
1	With the sheet open	1082*±58,4	28,3±1,45	370,9±7,66	3,71±0,08
2	With the film open	1017,6±28,4	20,3±3,53	377,5±8,15	3,79±0,10
3	With the sheet closed	1108,7±62,9	25,0±2,0	396,2±16,5	3,96±0,17
4	With the film closed	1072±77,2	26,3±2,91	409,1±14,9	4,09±0,15
5	In a simple way (comparator)	1470±83,5	34,3±3,67	337,3±13,5	3,37±0,14

From the figures in tables 1-4 it can be seen that all indicators are higher when feeding worms under cloth and film.).Next, you can specify the method of keeping the worms in the closed state of the film and the methods of feeding the beds in the open state (1072 g; 1082 g). For comparison, with a simple method, 1470 g was obtained, that is, the largest residue.

The effectiveness of the method of feeding worms can also be assessed by the number of worms remaining in the seeds (lagging behind in development). The more correctly agrotechnical measures are selected and applied, the more uniform the growth and development of worms, the less the number of worms lagging behind in development. In our experiments, the number of worms was determined remaining in the ganache. According to the results, the smallest number of worms in the grain was observed with the film method of feeding (20.3 pcs.), while in other variants of the experiment it was found that 25.0-28.3 worms remained in development. .The number of remaining helminths was significantly higher (34.3 units) with normal care.

The weight of the silkworm is a key factor in the production of a high-quality, heavy cocoon. Only when worms are provided with sufficient and nutritious nutrition, the mass of worms and, accordingly, the biosynthesis of a sufficient amount of silk fluid in the silk gland increases. Therefore, we determined the mass of worms with different feeding methods at the last stage of the 5th century .On the 7th day, out of 100 worms, the heaviest worms by weight were obtained with a closed version of feeding under a film (409.12 g). In other options, this figure was 370.9-396.2 g. significantly less (337.3 g). Based on the individual weight of the worms, it was observed that in the closed state under the film, the worms gained 0.72 g in weight compared to the control.

The results discussed above show that the method of feeding worms under full film and wet cloth is effective and can be recommended for production.

The mass of the cocoon is the most important indicator in determining the yield of a cocoon from 1 box of silkworm. The mass of the cocoon depends primarily on the breed and hybrid of the silkworm, and then on the quantity and quality of the feed. Here, the amount of natural moisture in the feed and how much it is retained, is also one of the factors on the basis of which we analyzed the mass of cocoons, mass of the shell, silkiness and productivity of cocoons obtained in the course of our experiments.

Table-5

Cocoon performance in different methods and sets (average for 2018-2020)

№	Method of feeding and type of bunch	Percentage of cocoon $\overline{X} \pm S_{\overline{x}}$, %	Weight of cocoon $\overline{X} \pm S_{\overline{x}}$, г	Weight of shell $\overline{X} \pm S_{\overline{x}}$, г	Neto weight of cocoons $\overline{X} \pm S_{\overline{x}}$, г
1	Accumulative bunches placed on caterpillar raised under sheets at a young age (Mulberry shoot)	87,7 ± 0,67	1,51 ± 0,12	0,331 ± 0,03	914,6 ± 184,01
2	Bunches with yachts placed, on caterpillar fed under a film (Mulberry shoot)	87,7 ± 0,90	1,54 ± 0,16	0,329 ± 0,03	934,7 ± 0,82
3	Folded bunches, placed in caterpillar, which are fed under sheet in their young and older years (cardboard)	86,7 ± 0,88	1,50 ± 0,11	0,330 ± 0,03	937,2 ± 147,34
4	Under a film placed on caterpillar fed In their young and older years, bunches with yachts, (cardboard)	87,7 ± 0,33	1,55± 0,16	0,334 ± 0,04	968,7 ± 194,63
5	Straw bunches placed on caterpillar fed in a simple way (comparator)	82,3 ± 1,20	1,37 ± 0,12	0,287 ± 0,04	818,8 ± 166,33

Before presenting the numerical analysis data in tablitsia 5 it should be noted that in this experiment, along with the method of feeding the worms, in each variant, grouping and bundles of cells of mulberry varieties were used. Straw bales were used in the comparative variant.

A careful study of the three-year results shows that the cocoonness of worms grown under sheets and films was almost the same in all experiments and amounted to 86.7-87.7%. In the comparative variant, this figure was 82.3 percent.

The same trend was observed with an average cocoon weight of 1.50-1.54 g compared to 1.37 g for the comparison. A significant difference in the weight of the cocoon between the control and experimental options is visible (0.329-0.334 g; 0.287 g). The highest level of net the mass of cocoons obtained by the variants was determined by feeding the worms 5 times under a film at a young age and placing a bunch of mulberry cells on them (968.7 g). The same indicator was equal to 818.8 g in the comparative variant, and the cocoon yield was 95.8-149.9 g less than in the experimental variants.

All these given details definitely prove the advantage of the method of feeding worms under sheets and film in special hatches

Conclusions

If we consider climatic conditions of Uzbekistan, a sharp change is noted in air temperature and humidity in silkworm rearing seasons. Under such conditions, it is required to create an optimal hygrothermal regime for silkworms in order to grow the maximum cocoon yield. Otherwise, it will not be possible to take full advantage of the genetic potential of industrial hybrids. In this research, mulberry silkworms were reared in three different methods, and the method of rearing silkworm

under a damp cloth and polyethylene film was recommended for optimal silkworm rearing. The data obtained proved that the leaf needed to care for the silkworm could be significantly saved and the temperature and humidity could be kept at a level normal for silkworms by shortening the larva period.

The following conclusions can be drawn from our research for 2018-2020:

- mulberry leaf consumption can be saved by 15,3-18,7% when silkworms are reared under cloth and film;
- as a result of the use of cloth and polyethylene film to retain high humidity, the number of feedings the larva with leaves at 1-5 instars decreased by 81,4-90,0, and the larva period was reduced to 2,7-4,0 days;
- most importantly, as a result of rearing silkworms under the fabric and film, a significant increase in the growth and weight of larva was observed due to the constant maintenance of the hygrothermal regime;
- in the conditions of Uzbekistan in silkworm-breeding farms, it is recommended to rear silkworms under cloth and polyethylene film.

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