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New highly productive hybrids of mulberry silkworm (*Bombyx mori* L.) of industrial purpose with high technological characteristics of cocoon

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Abstract

This article is devoted to interpretation of experiment results of perspective selection lines №27 and №28, and also industrial hybrids participating in it. Bred selection lines possess by high heterosis ness and exceptionally high technologic characteristics of cocoon. Newly created hybrids of commercial purpose on the basis of these lines are notable by high yielding capacity which contributes to increase volume of producing raw silk and serves to interests and income of silkworm breeders. Increase of qualitative characteristics of hybrid cocoons- raw silk percentage, reelability, very long and thin filament will ensure to increasing of their competitiveness and demand on domestic and international silk markets.

Keywords: Selection of technological features, cocoon granularity, raw silk, cocoons reelability, metric thread number, industrial hybrid

1. Introduction

It is known that in practical sericulture hybrids of mulberry silkworm F1 are bringing up, which are, at the expense of heterosis, display high productivity and viability, and also possess high resistance to unfavorable conditions of environment on comparison with parental forms. Efficiency of hybrids F1 depend on silk productivity, parental breeds and their combinational capacity. Meanwhile, obtaining of the most valuable with combinational capability lines on the basis of inbreeding reproduction are of the utmost interest. For the last years actual tasks on creation of new hybrids of mulberry silkworm, which together with increased productive signs are distinguished on leading technologic characteristics of cocoon particularly on filature thickness, were set in front of selection-silkworm breeders. Such task proceeded from demand to thin raw silk that is higher on world silk market, than to unusual one. Mulberry silkworm became one of the first object, breeding in hybrid form. Cross-breeding hybrids are brought up in a factory condition. Technology of silkworm egg production was based on preparation of hybrid eggs of mulberry silk-worm. Hybrid larvae distinguish by resistance to diseases, unfavorable conditions of environment, high viability and silk productivity. Bulgarian scientists P. Tzenov and D. Grekov ^[1, 2] in their genetic research on 15 stocks of Japanese and 13 stocks of Chinese origin and their hybrid combinations, on study of resistance to unfavorable conditions of bringing up established that two hybrids displayed the highest resistance to unfavorable conditions of bringing up on comparison with control samples. This proved that employment of selection method on resistance to unfavorable conditions of environment in breeding of new highly productive hybrids are of great importance.

M.V. Alexandrov ^[3] recommended a new approach in forecasting of heterosis effect, consisting of determination of different qualitiveness of larvae's formed elements of blood. Long standing research of Sh. A. Abdukadirov ^[4] devoted to determination of advantages of cross- breeding hybrids of mulberry silkworm and early forecasting of their heterosis. It is ascertained by author that heterosis hybrids of mulberry silkworm, surpassing parental breeds, are notable by larvae's greater weight. Heterosis on cocoon's weight in hybrids can be intensify by means of selection of families with big larvae. A great number of hybrids were obtained by scientists of Ukraine and Moldova the heterosis strength of which was established by the method of parthenotesting.

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Hybrids more or less inclining to parthenogenesis, turned out to be heterosis and considerably differed from others [5]. It is necessary to mark that breed selection of mulberry silkworm in Uzbekistan before economic reforms were conducted mainly in the direction- to gain high yield of cocoon. Proceeding from this the purpose of our research is creation of new highly productive breeds and industrial hybrids of mulberry silkworm of commercial purpose, distinguishing by high qualitative characteristics of cocoon.

2. Material and method

As initial stock, 2 breeding selection lines distinguishing by high technological parameters of cocoon and possessing by

high heterosis ness, were used. In the process of creation of these lines together with selection of breeding material on reproductive signs, viability and productivity we used selection on easy defining sign-granularity of silk shell closely correlating with technologic parameters of cocoon. Method of selection on granularity of cocoon for the first time was worked out in the laboratory of breeding silkworm of Uzbek Research Institute of Sericulture [6].

On the basis of recently developed lines two highly heterosis hybrids Line 27 x Line 28 and Line 28 x Line 27 were created.



Line 27 x Line 28



Line 28 x Line 27



Cocoons and larva of new silkworm hybrids

For investigation of viability, signs of hybrids' productivity larvae in 4 replications by 220 in each were brought up. On completion of bringing up cocoons' grading was carried out and by means of miscalculation of cocoons with healthy pupa and ill cocoons larvae (pupa) viability was estimated. From each replications cocoons samples on 15♀ and 15♂ were taken. After weighing of cocoons and shells, cocoon's medium weight, silk shell and percent cocoon shell were defined. For investigation of technologic characteristics of cocoons on every hybrid samples by 400 cocoons were taken and starved. Raw silk percentage, silk products,

cocoons' rewinding, total length and metrical number of filament (thickness) were estimated after cocoons rereeling.

3. The results and discussion

In 2013-2016 test rearing of perspective selection lines №27 and №28 and two created hybrids with their participation were conducted. As yielding capacity of hybrids and lines are of the utmost interest, our research first of all was directed on study of viability and productivity signs. Figures were given in table 1.

Table 1: Indices of viability, cocoon's average weight, silk shell and percent of cocoon shell (2013-2016).

Selection lines and hybrids	Viability $\bar{x} \pm S \bar{x}$, %	Weight of a cocoon $\bar{X} \pm S \bar{X}$, g	Weight of a cocoon shell $\bar{X} \pm S \bar{X}$, mg	Percent cocoon shell $\bar{X} \pm S \bar{X}$, %	Fresh cocoons yield by 1 box silkworm eggs, kg
Line 27	91,4±0,28	1,72±0,014	440±3,3	25,5±0,16	-
Line 28	92,5±0,64	1,76±0,016	451±3,5	25,7±0,22	-
Line 27 x Line 28	94,9±1,02	2,11±0,028	526±5,9	24,8±0,23	89,0
Line 28 x Line 27	92,9±1,26	2,22±0,022	552±7,0	24,9±0,12	89,8
Uzbekistan 6 (control)	90,2±1,44	2,21±0,016	471±6,3	21,4±0,17	87,7

Numerical material of table 1 testified that hybrid combinations perceptibly exceed parental lines on mass of a cocoon and cocoon shell -2,11 g ... 2,22 g as compared with 1,72... 1,76 g; 526-552 mg as compared with 440-451 mg. On percent of cocoon hybrids' shell Line 27x Line 28 and Line 28 x Line 27 were not as good as selection lines (on 0,8-0,9 abs%). It is connected with that cocoon's mass in hybrids was much higher than in initial lines. On viability, silk productivity characteristics and yielding capacity of fresh cocoon, new hybrid combinations displayed high indices on comparison with control hybrid Uzbekistan [6]. Viability of larvae in new combinations of hybrids also rather high 94, 9 %. 92, 9% and exceeded initial selection lines. Exceeding of control standard hybrid Uzbekistan 6 on

viability of hybrids of Line 27x Line 28 made 2,4 - 4,7 abs % (Pd=0,999).

In manufacturing conditions new hybrids thanks to great potential opportunities will ensure obtaining of rather high yield of cocoons and silk and correspondingly silkworm breeders' income - the main producers of mulberry cocoons. In manufacturing conditions significance of hybrids of mulberry silkworm together with yielding capacity, cocoons' grade also increase on technologic characteristics - raw silk percentage from dryer cocoons, filament length and thickness (denier).

We thoroughly studied technologic characteristics of newly created initial line and participating in them hybrids of commercial purpose (table 2).

Table 2: Characteristics of experimental lines and hybrids on technologic properties of cocoons (2013-2016).

Selection lines and hybrids	Weight of a Dryer cocoon, g	Silk		Cocoons reelability, %	Filament length, m	Filament thickness, m/g
		raw silk percentage, %	silk production, %			
Line 27	0,783	47,03	50,94	89,9	1377	3805
Line 28	0,812	46,78	52,74	88,8	1252	3577
Line 27 x Line 28	0,938	48,07	51,34	93,6	1568	3469
Line 28 x Line 27	0,963	46,45	50,76	91,5	1517	3300
Uzbekistan 6 (control)	0,952	43,76	50,27	86,9	1239	2930

As seen from table 2 and histograms on fig. 1,2 raw silk percentage (output) in initial selection lines and in new hybrids is rather high (47,03 ... 46,78%; 46,45 ... 48,07 %). Control hybrid give in to new hybrids for 2,7-4,31 abs.% such kind of thing is observing on cocoons' reelability where index of rewinding in selection lines made 89,9 % - 88,8% in hybrids - 93, 6 ... 91,5%. Exceeding of cocoons' rewinding indices of new hybrids over check made 4, 6 -6, 7 abs. %. Initial selection lines №27 and №28 distinguish by thin filature (3805 ... 3577 m/g). In hybrids with their participation metric number also rather high (3469... 3300 m/g). Their superiority over control standard hybrid made 370-539 m/g. In equal mass of dryer cocoon with check hybrid index of filament length in experimental hybrids longer for 278-329 m. All above-mentioned indices are fully corroborated effectiveness of new industrial hybrids.

4. Conclusion

From obtaining data may be drawn the following conclusion that new selection lines № 27 and №28 possessed by high heterosis ness and good technologic traits of cocoons. Newly created hybrids and Line 27 x Line 28, Line 28 x Line 27, with their participation, together with high yield of cocoons possessed by property to produce cocoons with high qualitative characteristics. Taking into consideration high technologic traits of new selection Lines №27 and №28 it is considered expedient in the future to select them in the

direction of increase of viability, adaptive abilities to unfavorable conditions and apply them in selection process and hybridization.

Adoption of new created high yielding breeds and hybrids of mulberry silkworm, possessing by high technologic characteristics of cocoons in industry, will lead to increase of volume and quality of competitive raw cocoon, producing in the Republic of Uzbekistan.

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