

Testing and Evaluation of New Bulgarian Silkworm, *Bombyx mori*

L. Non Sex-Limited and Sex-Limited Commercial F1 Hybrids

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INTRODUCTION:

- Production of F₁ hybrid silkworm eggs for industrial cocoon production with participation of ordinary genetically non sex-limited races and lines is technologically complex and difficult process.
- Used till now methods and manners for mechanized cutting of cocoons and dividing of pupae manually or mechanized trough apparatus working on the basis of existed biologically dependent differences between weight in two sexes are also expensive and inaccurately
- On the other hand according to Tzenov (2014) in the some sex-limited for cocoon color Bulgarian F1 the filament length and weight were higher in the males than in the females which might be explained with the genetic depression due to the translocation of Y allele on the W chromosome. Therefore the using of silkworm F1 hybrids, having both of parents sex limited breeds may be reconsidered with using only one sex-limited parent for example.

The present study aims to investigate the performance of several F₁ silkworm hybrids, obtained between non-sex-limited and sex-limited Bulgarian pure breeds.

MATERIALS AND METHODS

The study has been conducted during the period 2012 – 2014 at the Thracian University, Stara Zagora, Sericulture and Agriculture Experiment Station, Vratsa and Agricultural university, Plovdiv, Bulgaria. The following silkworm pure breeds were used as parents of the F1 hybrids:

19 and 1013 - Japanese type, non sex-limited silkworm breed, having larvae with markings and white cocoons with peanut shape. The breed was created in the Thracian University, Stara Zagora.

Magi 2 – sex-limited for larval markings silkworm breed, the female larvae are zebras and the males are plain. The cocoons are white and oval.

Lea 2 – sex-limited for cocoon color silkworm breed. The larvae are plain, the female cocoons are yellow, the male cocoons are white and the cocoon shape is oval. The breeds was created in the Sericulture and Agriculture Experiment Station, Vratsa.

MATERIALS AND METHODS

The following F1 silkworm hybrids were created and tested simultaneously:

19 x Magi 2

Magi 2 x 19 (sex-limited for larval markings)

1013 x Magi 2

Magi 2 x 1013 (sex-limited for larval markings)

19 x Lea 2

Lea 2 x 19 (sex-limited for cocoon color)

1013 x Lea 2

Lea 2 x 1013 (sex-limited for cocoon color)

Control - Super 1 x Hesa 2



19 x Magi 2



1013 x Magi 2



Magi 2 x 19



Lea 2 x 19

RESULTS AND DISCUSSION

Table 1. Qualitative characters of the silkworm eggs and larvae in F1 hybrids.

Hybrids	Egg chorion color	Egg shell color	Larvae body color in the 5 th instar	Larval markings
Super 1 x Hesa 2 (control)	gray	white	bluish-white	with normal markings
19 x Magi 2	gray	white	bluish-white	with normal markings
Magi 2 x 19	gray green	yellow	bluish-white	♀zebra, ♂ with normal markings
19 x Lea 2	gray	white	bluish-white	with normal markings
Lea 2 x 19	green	yellow	♂bluish-white and ♀yellowish-white	with normal markings
1013 x Magi 2	gray	white	bluish-white	with normal markings
Magi 2 x 1013	green	yellow	bluish-white	♀zebra, ♂ with normal markings
1013 x Lea 2	gray	white	bluish-white	with normal markings
Lea 2 x 1013	green	yellow	♂bluish-white and ♀yellowish-white	with normal markings

RESULTS AND DISCUSSION

Table 2. Cocoon qualitative characters in F1 silkworm hybrids.

Hybrids	Cocoon shape	Cocoon color	Cocoon size	Cocoon nature of grains
Super 1 x Hesa 2 (control)	oblong	white	medium	medium
19 x Magi 2	oblong	white	medium	medium
Magi 2 x 19	oblong	white	medium	medium
19 x Lea 2	oblong	white	medium	medium
Lea 2 x 19	oblong	♀ yellow; ♂ white	medium	medium
1013 x Magi 2	oblong	white	medium	medium
Magi 2 x 1013	oblong	white	medium	medium
1013 x Lea 2	oblong	white	medium	medium
Lea 2 x 1013	oblong	♀ yellow; ♂ white	medium	medium

RESULTS AND DISCUSSION

Table 3. Biological quantitative characters values in F1 silkworm hybrids.

Hybrids	Hatchability (%)	5 th instar duration (h)	Larval period duration (h)	Pupation rate (%)	Fresh cocoon yield by one box of eggs (kg)
Super 1 x Hesa 2 (control)	98.83	214	724	95.50	36.67
19 x Magi 2	99.27	212	698	96.50	36.93
Magi 2 x 19	99.94	186***	642***	99.50**	35.19
19 x Lea 2	99.16	212	698	99.00**	37.88**
Lea 2 x 19	97.73	186***	642***	98.50*	33.03**
1013 x Magi 2	98.58	212	698	99.00*	36.77
Magi 2 x 1013	97.53	186***	642***	98.50*	31.50***
1013 x Lea 2	98.74	214	700	99.50**	37.13
Lea 2 x 1013	98.09	212	674**	99.50**	32.82**

***P < 5%; **P < 1%; ***P < 0.1%**

RESULTS AND DISCUSSION

Table 4. Fresh cocoon technological characters in new F1 silkworm hybrids.

Hybrids	Females			Males			Mean		
	Fresh cocoon weight(mg)	Silk shell weight (mg)	Silk shell percentage (%)	Fresh cocoon weight(mg)	Silk shell weight (mg)	Silk shell percentage (%)	Fresh cocoon weight(mg)	Silk shell weight (mg)	Silk shell percentage (%)
Super 1 x Hesa 2 (control)	2160	381	17.64	1755	375	21.37	1958	378	19.31
19 x Magi 2	2191	403	18.39	1699	378	22.25	1945	391	20.10*
Magi 2 x 19	1978	359	18.15	1713	428	24.99	1846*	394	21.34***
19 x Lea 2	2048	362	17.68	1722	366	21.25	1885	364*	19.31
Lea 2 x 19	1892	322	17.02	1711	364	21.27	1802***	343**	19.03
1013 x Magi 2	2056	379	18.43	1645	370	22.49	1851*	375	20.26*
Magi 2 x 1013	1837	319	17.37	1594	349	21.89	1716***	334***	19.46
1013 x Lea 2	2118	374	17.66	1687	374	22.17	1903	374	19.65
Lea 2 x 1013	1861	327	17.57	1661	366	22.03	1761***	347**	19.70*

***P < 5%; **P < 1%; ***P < 0.1%**

RESULTS AND DISCUSSION

Hybrid	Dry cocoon weight (mg)	Filament length (m)	Silk filament weight (mg)	Silk filament thickness (denier)	Reelability (%)	Raw silk percentage (%)
Super 1 x Hesa 2 (control)	850	961	285	2.67	94.68	33.53
19 x Magi 2	890*	1044***	307*	2.65	97.46*	34.49*
Magi 2 x 19	770**	1050***	293	2.51	93.61	38.05**
19 x Lea 2	800*	967	291	2.71	94.17	36.38**
Lea 2 x 19	740***	887***	261***	2.65	93.88	35.27*
1013 x Magi 2	830	1121***	319**	2.56	95.80	38.43***
Magi 2 x 1013	710***	755***	263*	3.14**	94.60	37.04***
1013 x Lea 2	790*	781***	272	3.13**	94.12	34.43
Lea 2 x 1013	720***	721***	247***	3.08*	90.48**	34.31

CONCLUSIONS

- - The main qualitative characters some of the new hybrids differ from the control and other hybrids were larval body color during the 5th instar, larval markings and cocoon color.
- - The new silkworm hybrids demonstrated comparatively high hatchability, normal 5th instar and larval period duration, significantly higher than the control pupation rate and near or higher than the control fresh cocoon yield by one box of silkworm eggs. In most of the new silkworm hybrids the silk shell percentage is higher of near to the control.
- - In the non sex-limited F1 silkworm hybrids tested the silk shell weight in the females was higher than the males, while in the sex-limited for larval markings and cocoon color hybrids the males had higher silk shell weight than the females. The non sex-limited hybrids performed a bit higher mean silk shell weight values than the sex-limited ones.
- - The differences between the silkworm hybrids tested concerning reelability were insignificant, but the raw silk percentage in the new hybrids was significantly higher or near to the control.
- - The results obtained from the new F1 silkworm hybrids testing allow us to suggest them for state examination, authorization and certificates protection respectively.

Thank you!

Dear colleagues, you were so kind and patient to listen, for which I thank you very much. Along with this I would like to wish you all a pleasant and fruitful participation in this conference.

Along with this, I believe that with joint efforts will make this conference a pleasant and fruitful event.