

EFFECT OF COLD STORAGE OF THE EGGS AND LARVAE OF THE MULBERRY SILKWORM *BOMBYX MORI* L. ON REARING TIME

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(Manuscript received 24 February, 1998)

Abstract

The biology and silk production of the mulberry silkworm *Bombyx mori* L. (hatchability, rate of larval mortality, larval duration, silk content ratio and silk filament size) were insignificantly affected when eggs after 8-10 days of incubation were stored under cooling at (4-7°C) for 6 days. Cooling delayed hatching date for 11-12 days. Cold storage of newly hatched larvae at 12°C for 3 days or at 15°C for 2 days insignificantly affected the above-mentioned aspects of biology and silk production. Cooling treatments delayed the date of initial rearing by 4-5 days compared to the control.

INTRODUCTION

The eggs of the univoltine mulberry silkworm *Bombyx mori* L. are generally laid in June. They are kept at recommended controlled different temperatures for different periods until the next spring (Anonymous, 1992a). Incubation of eggs aims to keep them under controlled conditions in order to hatch uniformly at a desired date. Silkworm seeds are taken out of the storehouse then preserved at 15, 18, 24 and 25-26°C for 1, 1.4 and 6 days, respectively, combined with 80% R.H. (Anonymous, 1992b). Incubation conditions affect hatchability and vitality of the emerged worms and ultimately cocoon crop. After incubation, eggs have to be delivered to the rearers (SooHo Lim *et al.*, 1990).

This work aims to preserve mulberry silkworm eggs or newly hatched larvae under cool temperatures to synchronize the start of rearing time with the appearance of the new mulberry leaves.

MATERIALS AND METHODS

Work was carried out at the Sericulture Research Section, Plant Protection Research Institute, Agricultural Research Centre in 1995 using the Korean hybrid (155 x 156) eggs of mulberry silkworm *Bombyx mori* L.

Cold storage of eggs: At the beginning of the incubation period (zero time), fertilized eggs were divided into 13 groups of 300 eggs each (3 replicates of 100 eggs). Four groups were refrigerated at (4-7°C) after 4, 6, 8 and 10 days of zero time. Every group was divided into 3 subgroups according to cold storage period (3, 6 and 9 days). One group with 3 replicates was left under natural conditions as control.

Cold storage of newly hatched larvae: On the same day of hatching, larvae were divided into 13 groups of 300 each (3 replicates of 100 larvae). Four groups were cool stored in incubators under (6, 9, 12 and 15°C). Every group was divided into three subgroups according to cold storage period (2,3 and 4 days). One group of 3 replicates was left under normal conditions as control.

After the cold storage of the eggs and newly hatched larvae, normal rearing procedures were practiced under laboratory conditions of 20-28°C and 50-80% R.H. Larvae were provided with suitable amounts of clean fresh mulberry leaves. Larvae duration and larval mortality were recorded. To study the effect of cold storage on silk content ratio, the larvae were left to spin cocoons which were collected, cleaned and weighed. Cocoons were carefully cut off and pupae removed, then the cortices weighed. Silk content ratio for the different treatments was calculated according to the following formula given by Tanaka (1964).

$$\text{Silk content ratio (\%)} = \frac{\text{Weight of fresh cocoon cortex (mg)}}{\text{weight of fresh cocoon (mg)}} \times 100$$

To determine the effect of cold storage of eggs and newly hatched larvae on reelable filament characters, ten fresh cocoons from each treatment were oven dried at 40°C then reeled, and the filament length and weight were measured. Filament size (denier) was also calculated according to the following formula given by Tanaka (1964).

$$\text{Size of reelable filament (dn.)} = \frac{\text{Weight of filament (mg.)}}{\text{length of filament (m.)}} \times 9000$$

Data was statistically analyzed according to Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

Effect of cold storage on eggs: Table 1 shows the effect of cold storage of eggs during incubation period on certain biological aspects (% hatchability and % larval mortality) and silk production (Silk content ratio of cocoons and silk filament size). Data refer that such characters were insignificantly affected when eggs were refrigerated for 6 days at 4-7°C. Such treatment delayed hatching by 11-12 days compared to non refrigerated eggs. Other tested cold storage treatments were harmful to both biological aspects and silk production inspite of the fact that they induced relatively longer delays of hatching. These results agree with the previous findings that if the embryos have all developed well, they are physiologically safe for cold storage at 3-5°C and the limitation of time is within the scope of seven days although it is preferable to shorten the time of storage (Anonymous, 1984).

Table 1. Effect of cold storage of mulberry silkworm eggs on some biological aspects and productivity characters.

Days after zero time	Cold storage period (days)	Incubation period (days)	Biological aspects		Production characters	
			% hatchability	% larval mortality	Silk content ratio (%)	Silk filament size (%)
4	3	15	89.33 h	8.00 e	16.83 f	1.45 ghij
	6	17	86.67 i	10.33 cd	15.18 i	1.56 fgh
	9	20	84.00 j	13.67 a	13.75 l	1.32 j
6	3	16	91.33 g	10.67 c	15.63 h	1.62 fg
	6	20	86.00 i	10.00 cd	14.86 j	1.41 hi
	9	23	83.67 j	12.33 b	13.91 l	1.48 ghi
8	3	20	98.33 ab	4.33 hijk	18.80 b	1.98 ab
	6	24	98.67 a	4.67 ghi	18.13 cd	1.96 abc
	9	27	94.67 f	5.33 g	16.72 fg	1.70 de
10	3	21	97.33 abc	4.67 ghij	18.88 a	1.93 abcd
	6	23	97.67 abc	5.00 gh	18.03 cde	1.88 abcde
	9	26	88.33 h	6.33 f	14.62 jk	1.56 fghi
Control		12	97.33 abc	4.33 hijk	18.30 c	2.08 a
L.S.D. (0.01)			1.38*	0.83	0.26*	0.21*

Effect of cold storage on newly hatched larvae: Table 2 indicates that cold storage of newly hatched larvae (before the first feeding) for 3 days at 12°C, or for 2 days at 15°C delayed the starting of rearing date for 4-5 days than the larvae reared under normal conditions. The afore-mentioned cold storage periods and temperatures expressed no harmful effect on larval duration, larval mortality, silk content ratio or silk filament size.

Meanwhile, the same biological aspects and productivity characters were significantly and negatively affected by the other tested cold storage treatments. If the eggs hatched into larvae already, they may be stored in cold conditions (Anonymous, 1984). The length of storage time differed with the storage temperature offered. If the temperature is 15.5°C, storage time should be less than two days and if temperature is 10°C, it should not exceed three days.

Fig. 2. Effect of cold storage of mulberry silkworm newly hatched larvae on some biological aspects and productivity characters.

Storing temp. (°C)	Cold storage period (days)	Incubation period (days)	Biological aspects		Production characters		
			% hatchability	% larval mortality	Silk content ratio (%)	Silk filament size (%)	
6	2	13	36.33	8.00 efg	16.10	badefghij	2.16 bcde
	3	16	36.67	8.33 e	15.72	efghijkl	2.03 defgh
	4	16	36.00	9.33 cd	15.80	defghijk	1.81 ijkl
9	2	17	36.67	8.00 ef	16.53	bcdefg	2.06 cdefg
	3	17	36.00	6.67 ij	16.58	bcdef	2.18 bcd
	4	19	36.00	11.00 a	16.17	bcdefghi	1.97 efghi
12	2	15	35.00	7.00 i	16.43	bcdefgh	2.00 defgh
	3	16	35.67	6.33 ijk	16.93	abc	2.28 abc
	4	17	35.33	10.67 abc	15.61	efghijklm	2.11 bcdef
15	2	17	35.33	6.33 ijkl	17.00	ab	2.33 ab
	3	18	36.00	8.00 efgh	16.80	abcd	1.90 ghijk
	4	18	36.67	11.00 ab	16.60	bcde	1.83 hijkl
Control		12	35.00	5.67 kl	17.66	a	2.42 a
L.S.D. (0.01)		-	N.S.	0.96*	1.02*		0.18*

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تأثير تبريد بيض ويرقات دودة الحرير التوتية علي ميعاد بدء التربية

عبد الحميد علي إبراهيم زنون

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة.

قد يتطلب الأمر تأخير ميعاد بدء تربية دودة الحرير التوتية ليضعة أيام حتي يتوافق ذلك مع توقيت خروج أوراق التوت الجديدة أو لحين وصول البيض إلي المربين. وقد أدي حفظ البيض بالثلاجة عند درجة حرارة (٤ - ٧ م) لمدة ستة أيام بعد ٨ - ١٠ أيام من بداية التحضين الي تأخير الفقس لمدة ١١ - ١٢ يوماً، كما أدي حفظ اليرقات حديثة الفقس علي درجة ١٢ م لمدة ثلاثة أيام أو علي درجة ١٥ م لمدة يومين إلي تأخير موعد بدء التربية لمدة ٤ - ٥ أيام عن اليرقات التي لم تعرض للتبريد. ولم تسبب معاملات التبريد سابقة الذكر أضراراً معنوية في النسبة المئوية لفقس البيض أو موت اليرقات أو في وزن الحرير في الشرنقة أو حجم الخيط الحريري.