Ovipositional Response of Mulberry Silkworm *Bombyx mori* L. (Lepidoptera : Bombycidae) Female Moths on Different Substrata

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ABSTRACT

The present study aimed to evaluate the effect of different kinds of textured substrata on the response of female moths of silkworm *Bombyx mori* L. (Lepidoptera : Bombycidae) for egg laying from point of view of deposited eggs and fertility. Three different types of cloth materials (cotton, wool and silk) and four different textured papers (carton, craft paper, aluminum foil and paraffin paper), in addition to plastic and wood board were evaluated. Craft paper, carton and cotton textile gave the maximum mean values of deposited eggs (343.8, 342.6 and 299.2 eggs/female, respectively) and fertility (99.536, 99.497 and 99.353% in respect). Wool and silk textiles gave the minimum mean values. The plastic board gave a maximum mean value for eggs laid per female (347.9) with a moderate mean value of fertility (81.013%). Concerning, the wood board, it has a moderate mean value of laid eggs, (298.5) with a high percentage of fertility (94.754%).

INTRODUCTION

The Lepidopteran *Bombyx mori* is an insect of considerable scientific and economic importance which is represented by Sericulture. In fact, the most important step in silkworm rearing is the production of silkworm eggs required for commercial rearing in which it should be of high quality and free from diseases. The production of silkworm eggs is highly specialized work involving technical and scientific skills.

Fecundity and fertility are physiological phenomena depend on hormonal, environmental and behavior factors.

Fecundity varies with nutrition, atmosphere, mating and egg laying conditions (Yakoyama, 1963 and Siddhu *et al*., 1967) and also due to mating duration (Askari and Sharma, 1984 and Rahman and Khan, 2005). In addition, number of eggs laid by a female is affected by the material of substratum or eggs laying site, (Gupta *et al*., 1990 and Singh and Saratchandra, 2004), texture of substratum (Nangia and Ramakumar, 1997 and Bajwa and Miskeen, 2005).

Fertility and fecundity have affected by different substrata (Bajwa and Miskeen, 2005).

Therefore, this work was carried out to study the effect of different substrata on the number of deposited eggs and fertility of the silkworm *Bombyx mori* L. female moths as a trial for evaluating different egg laying sites.

MATERIALS AND METHODS

The Chinese F1 hybrid 9F7X mulberry silkworm *Bombyx mori* larvae were reared according to the improved method of Krishnaswamy (1978) and fed with suitable amount of fresh mulberry leaves under the laboratory hygrothermic conditions of 25 ± 2ºC and 75 ± 5% R.H.. The hybrid moths were used to evaluate the number of deposited eggs and fertility response on different textured surfaces during spring rearing season.

Three different textured cloth materials (cotton, wool and silk) four different textured papers named (carton, craft paper, aluminum foil and paraffin paper) in addition to plastic and wood board were evaluated as sites for eggs deposition. The mean number of eggs per female and number of fertilized eggs per female were considered.

Coupled males and females were collected from the trays directly after mating. Each substratum contained ten couples and a mating time of 24 hrs was given to every couple, and then these couples gently were separated. After oviposition process was completed, the number of deposited eggs as well as the number of fertilized eggs per female was counted.

Fertilized egg percentage was calculated according to the following equation:

$$\text{Fertilized eggs \%} = \frac{\text{number of deposited eggs} - \text{non fertilized eggs}}{\text{number of deposited eggs}} \times 100$$

Data were statistically analyzed using "F" test and least significant differences (L.S.D.) at 5% probability level to check the significance between treatments (Snedecor, 1956).

RESULTS AND DISCUSSION

Effect of cloth materials texture on deposited eggs and fertility.

Results in Table 1, indicate that the mean number of deposited eggs/female and fertility were at maximum response on cotton cloth (299.2 eggs/female and 99.353%, respectively). The lowest mean number of eggs was recorded on silk cloth (36.2 eggs/female), while the wool cloth gave an intermediate value of (111.5 eggs/female).

Most of female moths refuse to lay eggs on both textures of silk and wool. These results are in agreement with the findings of Nangia and Ramakumar (1997) who found that there was various ovipositional response of *Bombyx mori* on different textures such as muslin cloth and rexine cloth. Also, Bajwa and Miskeen (2005) which showed a negative

effect of too coarse and glossy texture on fecundity and egg fertility which also supported the present results. This might be due to the disturbance attributed by coarser surface and glossy texture. Ripe eggs may be retained in female abdomen if oviposition is interrupted (Deseo, 1976).

Effect of paper texture on deposited eggs and fertility.

Table 2, shows an over all highly response of female moths on laying eggs on those tested substrata. No significant differences recorded between the mean number of eggs deposited in all used textures while for egg fertility, craft paper and carton gave the highest values (99.536 and 99.497%, respectively).

Identically, Bajwa and Miskeen (2005) showed that the highest values of fertilized eggs were recorded on craft paper. So, the use of both carton and craft paper gave the same results.

Aluminum foil and paraffin paper gave the lowest mean percentage of fertilized eggs per female (97.608 and 96.709 %, in respect) with insignificant difference between them.

Effect of texture of substratum on deposited eggs and fertility.

The included results in Table, 3 show significant effect of the all used textures. The highest mean numbers of deposited eggs/female were obtained using plastic board, craft paper and carton (347.9, 343.8 and 342.6 eggs/female, respectively). The lowest mean number of deposited eggs/female were given by aluminum foil and paraffin paper as oviposition sites with values of 337.8 and 336.6 eggs/female, in respect, while wool and silk textiles drastically affected egg deposition. Concerning the inspected eggs fertility percentage, the included result, in Table, 3 showed the highest fertility percentages that given by the different substrata i.e. craft paper, carton, cotton textile, aluminum foil, paraffin paper and wood board (99.536, 99.497, 99.353, 97.608, 96.709 and 94.754%, respectively). The lowest fertility percentage of 45.40% was given by wool textile. The plastic board gave a maximum mean value for eggs laid per female (347.9) with a moderate mean value of fertility (81.013%).

Concerning, the wood board, it has a moderate mean value of laid eggs, (298.5) with a high percentage of fertility (94.754%).

Comparing the abovementioned results with the rest of the used texture substrata in the same Table, it could be concluded that craft paper, carton and cotton textile are the best substrata for the silkworm *Bombyx mori* female moth for laying eggs, as they gave the maximum mean value of deposited eggs and fertility.

These results are in accordance with Gupta *et al*. (1990) Nangia and Ramakumar (1997) and Bajwa and Miskeen (2005) as they found variation in fecundity and egg fertility response of *Bombyx mori* according to different textures.

Table 1: Effect of certain types of textile on deposited eggs/female and fertility.

substrata / character	Textile				
	Cotton	Wool	silk	L.S.D.	"F" calculated
Mean no. of deposited eggs/female	a 299.2	b 111.5	c 36.2	68.185	**
Fertilized eggs %	a 99.353	b 45.401	ab 67.117	35.963	*

Table 2: Effect of paper texture on deposited eggs and fertility.

substrata / character	Carton	Craft paper	Al. foil	Paraffin Paper	L.S.D.	"F" calculated
Mean no. of deposited eggs/female	342.6	343.8	337.8	336.6	–	N.S.
Fertilized eggs %	a 99.497	a 99.536	ab 97.608	b 96.709	2.211	*

Table 3: Effect of the all tested substratum on the deposited eggs and fertility.

Substrata	Mean no. of deposited eggs/female		Fertilized eggs %	
Cotton	299.2	b	99.353	a
Wool	111.5	c	45.401	c
Silk	36.2	d	67.117	b
Carton	342.6	a	99.497	a
Craft paper	343.8	a	99.536	a
Aluminum foil	337.8	ab	97.608	a
Paraffin paper	336.6	ab	96.709	a
Plastic	347.9	a	81.013	ab
Wood	298.5	b	94.754	a
L.S.D.	42.695		20.308	
"F" calculated	**		**	

Each value represents the mean ± S.D. of 10 replicates.

- No significant differences among the means with the same letters.
- ** = highly significant. * = significant.
  N.S. = not significant.

REFERENCES

Askari, S. and R.K. Sharma (1984). Studies on different copulating duration on pre-oviposition, fecundity and fertility of mulberry silkworm, *Bombyx mori* L. (Bombycidae : Lepidoptera). J. Adv. Zool., 5 : 114 – 119.

Bajwa G.A. and A. MisKeen (2005). Fecundity, egg fertility and hatchability response of silkworm, *Bombyx mori* on different substrata. Pak. J. Forest., 55(2): (ISSN – 0030 – 9818).

Deseo, K.V. (1976). The oviposition of the Indian meal moth (*Plodia interpunctella* Hbn., Lep., Phyticidae) influenced by olfactory stimuli and antennectomy. Symp. Biol. Hung., 16 : 61 – 65.

Gupta, V.K.; V.K. Kharoo and N.K. Sahani (1990). Effect of different laying – sheets on number of eggs laid by silkworm (*Bombyx mori*). Bioved., 1 : 79 – 80.

Krishnaswamy, S. (1978). New technology of silkworm rearing. Bull. Central Board India, (2) 1 – 23.

Nangia, N. and S.R. Ramakumar (1997). Ovipositional response of two new breeds of mulberry silkworm to substrata. Indian Jour. Seric., 36 (2) : 167 – 168.

Rahman, W. and M. Khan (2005). Effect of mating duration on the fecundity and egg fertility of silkworm. *Bombyx mori*. Pak. Jour. Forest., 55 (1) : 45 – 49.

Siddhu, N.S.; Sreenivasan and R. Shamachary (1967). Fertility performance of female moths depends on their male mates. Indian J. Seric., 6 (1) : 77 – 82.

Singh, T. and B. Saratchandra (2004). Principles and techniques of silkworm seed production. Discovery Pub. House, New Delhi, pp. 128 – 132.

Snedecor, G.W. (1956). Statistical methods 5th ed. Iowa State University Press, Iowa. pp. 534.

Yakoyama, T. (1963). Sericulture. Ann. Rev. Entomol., 8 : 287 – 306.

الملخص العربى

إستجابة إناث فراشة ديدان حرير القز لوضع البيض على بعض الأسطح المختلفة

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تناول البحث دراسة استجابة إناث فراشة ديدان حرير القز لوضع البيض على بعض الأنسجة و الأسطح المختلفة. تمت الدراسة على ثلاثة انواع من الأقمشة (القطن، الصوف و الحرير) و ايضا على اربعة انواع من الورق (الكرتون، ورق كرفت، الومنيوم فويل و ورق البارافين)، بالإضافة إلى الواح من البلاستيك و الخشب. أظهرت النتائج ان إناث فراشات ديدان الحرير إستجابت لوضع البيض بأعلى قيمة لها على ورق كرفت، الكرتون و قماش القطن (343.8، 342.6 و 299.2 على التوالى) كذلك النسبة المئوية لخصوبة البيض فكانت القيم كالتالى (99.536، 99.497 و 99.353% على التوالى). اما أقل استجابة فكانت على أقمشة الصوف و الحرير. و تواجدت ايضا اعلى قيمة لوضع البيض على ألواح البلاستيك ولكن بنسبة خصوبة متوسطة (347.9 و 81.013% على التوالى). اما الواح الخشب فقد اعطت قيم متوسطة بالنسبة لعدد البيض الموضوع (298.5) بأعلى نسبة خصوبة (94.754%).