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Short Communication

# Effect of pyridoxine on the reproduction of the mulberry silkworm, *Bombyx mori* L. (Lepidoptera: Bombycidae)

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## Abstract

The present investigation reports the effects of vitamin $B_6$, also known as pyridoxine supplemented feed on the reproductive potential of *Bombyx mori* L. All the concentrations of the vitamin significantly reduced the fecundity. Egg-viability was also reduced at all the concentrations, but the differences were not significant in comparison to control.

**Key words**: vitamin; reproduction; *Bombyx mori* L

## Introduction

In silk industry, fecundity and fertility of the *Bombyx mori* L female are two major factors because these are directly correlated with silk-production determining the number of offspring which offers the production of considerable amount of raw silk. Nutrition is an important growth regulating factor in silkworm. It has been reported that the vitamins of B-complex group and certain essential sugars, proteins, amino acids, minerals etc. are responsible for the proper growth and development of the silkworm, *B. mori* (Horie and Ito, 1963; Horie *et al.* 1966; Sengupta *et al.*, 1972; Khan and Saha, 1997a; Faruki, 1998). A number of researchers works on the effects of vitamin enriched food on the reproduction of *B. mori* females (Khalequzzaman and Mannan, 1982; Faruki *et al.*, 1992; Khan and Saha, 1996,; Saha and Khan, 1996, 1999). Pyridoxine also known as vitamin $B_6$, is part of the B group vitamins and is water soluble. It stimulates growth and is important in protein metabolism, and its deficiency in mammals results in a decrease in phosphorylases (Anonymous, 1998).

The present work, therefore, was attempted to determine the effects of pyridoxine on the fecundity and egg-viability of the two strains of *B. mori*.

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## Materials and Methods

To determine the effect of pyridoxine, the eggs of the two multivoltine strains of *B. mori* viz. Nistari-M and Urboshi-1 were collected from the Germplasm Bank of the Bangladesh Sericultura Research and Training Institute, Rajshahi. They were then disinfected with a 2% formalin solution and kept in the rearing room for hatching. The rearing room and other appliances used in the present experiment were disinfected with a 5% formalin solution. Newly-hatched larvae were brushed to wooden rearing trays (40 x 29 x 7.5 cm) and were reared on finely-chopped fresh, tender mulberry (*Morus alba* L.*)* leaves up to the second moult. For this study the source of pyridoxine was Pyrol® (Pyridoxine hydrochloride HCL, 25) supplied by JAYSON Pharmaceuticals Ltd., Bangladesh The concentrations of pyridoxine used in the present experiment, viz. 10, 100, 500 and 1000µg/ml were prepared by adding the requisite amounts of the vitamin in distilled water. The leaves were treated by dipping in these solutions and dried by fanning. Treated leaves were then supplied to the silkworm larvae from the first day of third instar till spinning. The larvae of a control batch was simultaneously reared on fresh mulberry leaves dipping in distilled water only and dried by fanning. From the fourth instar onwards entire mulberry leaves of both treated and untreated groups were supplied to the larvae. Feeding was supplied four times a day at six hour intervals. Three replications, each with 50 larvae, were made for each pyridoxine concentration. The rearing trays were kept in fine-netted cabinets.

**Table 1. Effect of pyridoxine on the fecundity of *B. mori* females (N = 15)**

| Silkworm strains | Concentrations (µg/ml) | Eggs laid Mean ± SD | PRC | F-ratio |
|---|---|---|---|---|
| | 0 (Control) | 365.53 ± 35.62 | | |
| Nistari - M | 10 | 292.33 ± 13.96 | 20.03 | 4.78* |
| | 100 | 300.47 ± 19.90 | 17.80 | |
| | 500 | 316.80 ± 18.79 | 13.33 | |
| | 1000 | 335.00 ± 29.89 | 8.35 | |
| | 0 (Control) | 474.87 ± 49.43 | | |
| Urboshi - 1 | 10 | 361.00 ± 35.83 | 23.98 | 3.73* |
| | 100 | 401.47 ± 17.37 | 15.46 | |
| | 500 | 417.40 ± 37.78 | 12.10 | |
| | 1000 | 429.87 ± 35.56 | 9.48 | |

Note: * Significant at P = 0.05; PRC = percent reproduction control; F = variance ratio

**Table 2. Effect of pyridoxine on the viability (%) of *B. mori* eggs**

| Silkworm strains | Concentrations (µg/ml) | Mean ± SD | PRC | F-ratio |
|---|---|---|---|---|
| | 0 (Control) | 81.31 ± 5.12 | | |
| Nistari - M | 10 | 72.73 ± 3.90 | 10.55 | 1.08 $^{NS}$ |
| | 100 | 75.65 ± 4.14 | 6.96 | |
| | 500 | 77.50 ± 4.33 | 4.69 | |
| | 1000 | 79.39 ± 2.94 | 2.36 | |
| | 0 (Control) | 97.44 ± 1.20 | | |
| Urboshi - 1 | 10 | 90.98 ± 3.45 | 6.63 | 2.09 $^{NS}$ |
| | 100 | 93.97 ± 3.25 | 3.56 | |
| | 500 | 93.37 ± 2.98 | 4.17 | |
| | 1000 | 93.16 ± 1.92 | 4.39 | |

Note : NS = Not significant; PRC = percent reproduction control; F = variance ratio

Mature larvae were transferred to bamboo-made mountages for spinning cocoons. After spinning and pupation the cocoons were harvested and stored according to their sexes. The sex was determined by cutting cocoons with a sharp blade and observing the external genitalia. Freshly-emerged moths of opposite sexes were allowed to mate and the females were retained for oviposition. For each concentration, 15 females were observed for their fecundity. The number of eggs laid by individual female was carefully counted and the eggs were incubated to observe their viability. The number of larvae hatched out from the known number of eggs was carefully counted and viability (%) was calculated. Data on fecundity and egg-viability were subjected to analyses of variance. Here, the variance ratio $F$ was calculated from the ratio between treatment mean square and residual mean square and the value was compared with the tabulated value for significance. The percent reproduction control (PRC) was calculated by the formula of Rizvi *et al.* (1980) as:

PRC = $V_1 - V_2 / V_1 \times 100$, where, $V_1$ = eggs laid/ hatched from untreated control, $V_2$ = eggs laid/ hatched from treated groups.

All the experiments were conducted at a mean room temperature of 26 ± 1$^{O}$C.

## Results and Discussion

The average egg-productivity in the female *B. mori* moths of both the strains resulting from various concentrations of the vitamin was significantly ($P < 0.05$) reduced at the concentration used (Table 1). The egg-viability was reduced at all the concentrations in comparison to control but statistically the result was not significant (Table 2). In present experiment, it was found that lowest number of eggs was produced at the lowest concentration (10µg/ml) and at higher concentrations it was increased but lower than control in case of both the strains. The same trend was also true for egg-viability. The present results are in agreement with the findings of Faruki *et al.* (1992) who observed that para-amino benzoic acid (PABA) significantly reduced the fecundity and egg-viability of *B. mori* females. Pai *et al.* (1988) recorded a reduced reproductive potentials in the females of *B. mori* resulting from PABA treatment. Similarly, Banerjee and Khan (1992) observed that vitamin $B_6$ enhance the oviposition of the *Bacillus thuringiensis var. kurstaki*-infected *B. mori,* but the rate was lower than the controls. Khan and Saha (1997b), Saha and Khan (1997a) and Khan *et al.* (2002) reported that the reproductive ability of female *B. mori* drastically reduced when reared on feed enriched with vertebrate sex-hormones. Saha and Khan (1997b) and Khan and Saha (2003) reported that higher concentrations of vitamins reduced the fecundity and fertility of *B. mori*. The fecundity and fertility of the silkworm females were reduced when they were reared on the feed supplemented with different artificial nutrients (Khalequzzaman and Mannan, 1982).

The present work is a preliminary study on the use of vitamin $B_6$ for the determination of the reproductive ability of the most commercially important insect. Therefore, future more comprehensive works are very much solicited in this line with highest concentrations on this species is required.


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