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Study of Rearing Performance of Six Eco Races of *Samia ricini* Donovan in Adverse Abiotic Conditions

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Abstract: ***The present research work was aimed to select an efficient strain of eri silkworm for low production costs of cocoons, adaptation to climatic factors of sub - tropical region like Bihar such as temperature and humidity leading to production of silk in high quantity and of superior quality. Better understanding to behavioural activities and performances of six strains of eri silkworm, Samia ricini D. such as GBP, GBS, GBZ, YP, YS and YZ during adverse abiotic conditions is a requisite in the larger interest of sericulture particularly eri culture development to a desired extent.***

Keywords: Rearing performance, Six eco races, Samia ricini, Abiotic conditions.

1. Introduction

Rearing of silk insects at mass scale to obtain silk for commercial as well as personal use is called as sericulture. Sericulture is in practice since time immemorial especially among tribal people of India. Sericulture is also of commercial importance for people involved in this practice due to short gestation period, low investment and high returns (Sarmah *et al*., 2012). This practice creates family employment to rural and marginal people round the year and now grown as cottage industry in some parts of India and becomes as an important sector of Indian economy. High breeding traits of silk worm is important for increased productivity of silk yarn. Selection of high yielding hybrids of silkworm remain important in increasing the quantity and quality of silk. *Samia ricini* is a polyphagous insect which feeds on the leaves of the plants of different species but *Ricinus communis* (castor) is primary food plant of this silk insect (Brahma *et al*., 2019). The branch of sericulture which deals with rearing of eri silkworm is called as Eri culture. Silkworm research can be defined as the science of improving the rearing practices in relation of silkworm's economic utility. Majority of the genetic traits of silkworm remain qualitative in nature. Phenotypic expression of genetic traits of silkworm is greatly influenced by the environmental factors such as temperature and relative humidity. Thus, the impact of high temperature with low humidity was observed with respect of six eco races of *Samia ricini* to select suitable eco race in adverse climatic conditions.

2. Materials and Method

The materials used for this experimental research study were six strains /eco races of *Samia ricini* and castor leaves were used as host for feeding material. Six strains viz; Greenish Blue Plain (GBP), Greenish Blue Spotted (GBS), Greenish Blue Zebra (GBZ), Yellow Plain (YP), Yellow Spotted (YS) and Yellow Zebra (YZ) of eri silk worm, *Samia ricini Donovan* were evaluated during present study with regard to their rearing, and breeding performances along with economic character (reeling) as well as biological (behavioural) variations under adverse abiotic conditions such as temperature and humidity. All experiments were conducted by standard method mentioned in literature for similar experimental work (Krishnaswamy, 1978) and desirable precautions were also taken.

Samia ricini belongs to family Saturniidae of order Lepidoptera. Both sexes of this insect have pectinate antennae, the rami being longest in the males. Labial palpi are very small and frenulum is wanting. The larvae remain, stout and smooth. The larva pupates in a dense, firm cocoon which yields silk of commercial value.

The impact of abiotic factors (40+1°C temperature and 50+5% relative humidity) on each eco races of *Samia ricini* undertaken during present research study was evaluated separately during above mentioned conditions in controlled environment by observing different parameters such as fecundity (number of eggs per female moth), hatchability (%), life cycle duration (d. h), effective rate of rearing (%), weight of single larval (gm), weight of single cocoon (gm), weight of single shell (gm) and shell ratio (%). Mean data for each parameter was recorded for analysis purpose.

3. Result and Discussion

Impact of different abiotic factors such as high temperature (40+1ºC) with low relative humidity (50+5%) were observed for hatchability (no. of eggs layed per female moth), hatchability percentage, larval duration, larval mortality rate, life cycle duration, effective rate of rearing, weight of single larva, cocoon and shell as well as shell ratio were observed for each six eco races of *Samia ricini* and data obtained (mean) are presented in Table - 1 and 2.

Table 1: Rearing and breeding performance of six eco races of *Samia ricini* under high temperature (40+1ºC) with low humidity (50+5%)

Sl. No.	Eco races of *Samia ricini*	Fecundity (No. of eggs per female moth)	Hatchability (%)	Larval duration (d. h)	Larval Mortality (%)	Life cycle duration (d. h)	ERR (%)
1.	Greenish Blue Plain (GBP)	249	66.82	18.4	12.0	38.5	88
2.	Greenish Blue Spotted (GBS)	260	70.22	17.0	16.0	36.8	84
3.	Greenish Blue Zebra (GBZ)	269	72.38	17.0	14.0	36.0	86
4.	Yellow Plain (YP)	285	72.91	18.6	17.0	37.6	83
5.	Yellow Spotted (YS)	308	67.21	18.0	15.0	37.2	85
6.	Yellow Zebra (YZ)	288	64.78	18.1	18.0	37.0	82

Data obtained after rearing of six eco races of *Samia ricini* under high temperature (40+1ºC) with low relative humidity (50+5%) was presented in Table - 1. Fecundity was observed as 308 per female moth in YS followed by YZ (288) and minimum as 279 in GBP strain. Highest percentage of hatchability was observed in YP (72.91%) followed by GBZ (72.38%) and minimum in YZ (64.78%). Longest larval duration was observed as 18.6 days in YP followed by GBP (18.4 days) and shortest in GBS and GBZ strains as 17 days among all eco races of *Samia ricini* examined during above stated abiotic factors. Longest life cycle duration remained as 38.5 days in GBP followed by 37.6 days (YP) and shortest in GBZ as 36 days. Highest ERR was obtained as 88% in GBP followed by GBZ (86%) and minimum as 82% in YZ strain. Thus, it became clear from the data mentioned in Table - 1 that these abiotic conditions remain somewhat more suitable for GBP strain as compared to other strains (eco races) of *Samia ricini* examined during present research work.

Table 2: Economic (reeling) traits observed for six eco races of *Samia ricini* under high temperature (40+1ºC) with low humidity (50+5%)

Sl. No.	Eco races of *Samia ricini*	Weight of single larva (gm)	Weight of single cocoon (gm)	Weight of single shell (gm)	Shell Ratio (%)
1.	Greenish Blue Plain (GBP)	8.33	2.89	0.26	09.00
2.	Greenish Blue Spotted (GBS)	7.54	2.80	0.24	08.57
3.	Greenish Blue Zebra (GBZ)	8.20	3.14	0.28	08.92
4.	Yellow Plain (YP)	8.38	2.54	0.28	11.02
5.	Yellow Spotted (YS)	7.66	3.00	0.29	09.67
6.	Yellow Zebra (YZ)	7.85	2.87	0.31	10.80

The data related to economic traits of six eco races of *Samia ricini* reared under high temperature (40+1ºC) with low relative humidity (50+5%) observed during present research work is presented in Table - 2. Maximum single larva weight was observed as 8.38 gm followed by GBP (8.33gm) and minimum as 7.54 gm in GBS train. Maximum single cocoon weight was observed as 3.14 gm in GBZ followed by YS (3.0 gm) and minimum as 2.54 gm in YP strain. Maximum weight of single shell was observed as 0.31 gm in YZ followed by YS (0.29 gm) and minimum as 0.24 gm in GBS strain. Highest value of shell ratio was obtained as 11.02% in YP followed by YZ (10.80%) and minimum as 8.57% in GBS strain. Thus, on the basis of above - mentioned observed data it became evident that YP and YZ strains showed better results on the basis of shell ratio as compared to other strains of *Samia ricini* examined during present study under high temperature and low relative humidity conditions.

Lalitha *et al. (*2020) observed optimum valid moth emergence as more than 90% with effective coupling at temperature between 20 - 20ºC and relative humidity between 70 - 80%. Low coupling recovery and non - emergence of seed cocoons were observed by them at temperature above 28ºC. During thermal stress, fertilized female moths could not adhere to Kharika for two days during ovi position process. Sugai and Takashanshi (1981) found during their research work that male moth of *Bombyx mori* became sterile during high temperature.

The fecundity remained lower during 40+1ºC temperature with 50+5% relative humidity level as observed during present research study. The results obtained during present research study also remain in conformity with results obtained by Wongson *et al. (*2015) that fecundity remain higher during optimum temperature and relative humidity conditions. The results obtained during present research work with respect of fecundity also remain in conformity of results obtained by Haila *et al.* (2018).

Hailu *et al. (*2018) recorded maximum number of eggs per female insect of *Samia ricini* as 395.65 under 25ºC temperature. Batham and Yadav (2015), reported that temperature above 30ºC and below 23ºC remain suitable for egg lying by female moths of *Samia ricini*.

4. Conclusion

Thus, it became evident that environmental factors such as temperature and relative humidity affects fertility, ovulation, coupling efficiency and fecundity of different eco races of *Samia ricini*.

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