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STUDIES ON REARING PERFORMANCE OF STRAINS OF ERI SILKWORM, *SAMIA RICINI* (DONOVAN) (LEPIDOPTERA : SATURNIIDAE) DURING TWO SEASONS IN MANIPUR

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ABSTRACT

The eri silkworm, *Samia ricini* (Donovan) is a domesticated, multivoltine, polyphagous insect, producing spun silk. It is mostly found throughout north eastern India. The present study is focused mainly on performance of six morphologically distinct strains of the silkworm on the basis of larval markings and colour which reared in two seasons. The present study was conducted with the aim to evaluate the rearing performance of these six strains of eri silkworm in two seasons. The data on fecundity, hatching%, larval wt., larval period, effective rate of rearing, cocoon wt. shell wt. and shell ratio were evaluated in spring and autumn. It was observed that Yellow plain (YP) and Greenish blue plain (GBP) were found better with all the economic characters. There is seasonal effect on these parameters and autumn season was found to be better than spring. Present study revealed that Yellow plain and Greenish blue plain strains of eri silkworm showed highest ERR and other characters. These strains are considered as good in terms of rearing performance and autumn season is the favourable season for rearing of all the strains.

Keywords: Rearing, Eri silkworm, Strains, Characters, Season.

Introduction

The eri silkworm, *Samia ricini* (Donovan) is a domesticated, multivoltine, polyphagous silkworm which can be raised 5-6 crops in a year. This insect has been exploited commercially for its silk since time immemorial (Choudhury, 1982). The North eastern region of India is rich in silkworm genetic resources and their food plants. There are twenty six eco-races of *Samia ricini* distributed in different parts of north east India and six homozygous strains which can be identified by their larval markings and color (Sharma and Kalita, 2017). The eri silkworm feeds on castor (*Ricinus communis* L.) which is the primary food plant and other food plants also like kesseru (*Heteropanax fragrans*), tapioca (*Manihot utilissima*), payam (*Evodia flaxinifolia*) etc. The people of North east region of India practiced eri rearing for production of silk as well as eri pupae which is an alternative source of protein (Sarmah, 2011). Presently, eri culture is spreading in different non-traditional states like, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Jharkhand, UP, Chhattisgarh, etc. Ericulture has a great potential to grow into a big industry if meticulous planning and strategies are adopted. Debaraj *et al.* (2001, 2002) studied field trial of elite crosses of eri silkworm and further reviewed crop improvement of eri silkworm. Rearing studies revealed that eri silkworm reared on castor produced best quality cocoons with higher fecundity, effective rate of rearing and shell ratio (Debaraj *et al.*, 2013). Although, several workers attempted evaluation of best eri silkworm strains under different climatic conditions in India, no works have so far been done in this line under climatic condition of Manipur. The present

study was undertaken in order to evaluate the performance of six larval strains of eri silkworm on castor in two seasons.

Materials and Methods

Experiment was conducted at Regional Sericultural Research Station, Imphal during two selected seasons *i.e.*, Spring (March-April) and Autumn (September-October). Geographically Imphal is situated at 24.8170° N Latitude, 93.9368° E Longitude and altitude of 786 m (MSL). Six pure line strains of eri silkworm were isolated from the promising eco-races, *viz.*, Borduar and Titabar. The eri silkworm strains are yellow plain (YP) yellow spotted (YS), yellow zebra (YZ), greenish blue plain (GBP) greenish blue spotted (GBS) and greenish blue zebra (GBZ) (Photoplate a-f). The worms are reared on the primary food plant, *i.e.*, castor, *Ricinus communis* L. following tray rearing method (plastic trays of size 2' x 3'). After completing four generations per year for two years, the pure line strains were isolated to obtain homozygous population. The rearing of the each strain was conducted maintaining 200 worms in each treatment with 3 replications.

The data on rearing parameters like fecundity (no), hatching (%), larval weight (g), larval duration (days), cocoon weight (g), shell weight (g), SR% and ERR% was recorded for two seasons for two years (2020-2022). First instar larvae of eri silkworm were given equal amount of tender castor leaves twice in a day, and then thrice a day up to II and III instar with semi mature leaves. The IV and V instar larvae were given equal feeding with mature castor leaves four times a day. The temperature and relative

humidity were recorded during the complete rearing period. Cocoons were harvested after 4th and 5th day of spinning depending on the season. Data on growth, rearing and cocoon quality parameters were recorded, assessed and statistically analyzed. The hatching %, shell ratio % and effective rate of rearing were calculated by the following formulae,

1. Hatching % = $\frac{\text{Worms hatched}}{\text{Total no. of eggs}} \times 100$
2. ERR % = $\frac{\text{No. of cocoon harvested}}{\text{No. of larvae brushed}} \times 100$
3. Shell ratio % = $\frac{\text{Weight of shell}}{\text{Weight of cocoon}} \times 100$

Results and Discussion

The eri silkworm strains maintained in the homozygous population were considered for rearing in the experiment. The six different strains were isolated from the promising eco-races, *i.e.*, Borduar and Titabar. The salient features of the three promising eco-race and one breed, C2 are presented in the Table-1. The yellow plain (YP) and greenish blue plain (GBP) strains are common in both the ecorace, whereas yellow zebra and greenish blue zebra strains are with Borduar and yellow spotted and greenish blue spotted strains are with Titabar.

Table 1 : Salient features of the promising eco-races, breed and strains of eri silkworm

Eco-races/ Breed	Locality	Strains	Cocoon colour	Shell weight	Silk yield
Borduar	Assam	YP, YZ, GBP, GBZ	White	Higher	Higher
Titabar	Assam	YP, YS, GBP, GBS	White	Higher	Higher
Manipur	Manipur	YP	White	Moderate	Moderate
C2	-	YP	White	Higher	Higher

The results of the present investigation showed variation in the economic characters of the strains of eri silkworm during two seasons. The results are presented in Table-3 & 4. The meteorological data recorded during the study are presented in Table-2.

Table 2 : Abiotic factors during rearing season

Season	Temp. (°C)		Relative humidity (%)	
	Maximum	Minimum	Maximum	Minimum
Spring	26.45	17.60	83	68
Autumn	29.50	21.40	89	74

Fecundity

The fecundity ranged from 315 to 359 nos. during spring crop where highest was recorded in yellow plain (YP) followed by greenish blue plain (GBP). During autumn highest fecundity was also recorded in yellow plain (417 nos.) and lowest in yellow zebra (365 nos.) (Table-3 & 4).

Hatching (%)

During spring season, hatching was ranged from 86.65 to 91.47 % and it was ranged from 87.55 to 94.01 % in autumn crop. The highest hatching % was recorded in yellow plain and greenish blue plain in both the crops.

Larval weight and larval period

The result indicated that highest larval weight was recorded in autumn crop (10.55 to 11.27 g) and slightly lower in spring crop (9.83 to 10.26 g). The larval period was more or

less similar in both the seasons among the strains and about one day shortened during autumn crop (Table 3 & 4).

Effective rate of rearing (ERR%)

The highest ERR was recorded in yellow plain (93.11%) and greenish blue plain (93.26%) during autumn crop ranging from 61.97 to 93.26 % and during spring crop it ranged from 67.99 to 87.03 % with higher value in yellow plain and greenish blue plain (Table-3 & 4).

Cocoon weight

The highest cocoon weight was recorded in yellow plain (3.98 g) during autumn crop ranging from 3.67 to 3.98 g whereas in spring crop it ranges from 3.52 to 3.78 g where highest value was recorded in greenish blue zebra (3.78 g).

Table 3 : Rearing performance of eri silkworm strains during Spring crop

Eri silkworm strain	Fecundity (Nos.)	Hatching (%)	Larval wt.(g)	Larval period (days)	ERR (%)
Yellow plain	359±36.01	91.47±3.13	10.13±0.59	18.33±0.33	85.92±3.82
Yellow spotted	306±32.12	87.64±4.23	10.01±0.53	18.52±0.28	73.37±5.21
Yellow zebra	315±16.69	89.53±3.38	9.83±0.41	18.52±0.28	76.90±1.77
Greenish blue plain	347±37.42	88.63±4.33	10.04±0.68	18.33±0.33	87.03±3.29
Greenish blue spotted	318±27.38	86.65±4.49	10.26±0.62	18.17±0.18	67.99±1.95
Greenish blue zebra	336±31.39	88.69±5.43	10.22±0.69	18.17±0.18	81.81±3.18
SE (d)	15.97	1.94	0.16	0.39	4.62
CD (0.05%)	36.04	NS	NS	NS	10.42

Pupal weight

The pupal weight ranges from 3.11 to 3.40 g during autumn crop and highest value was recorded in yellow plain (3.40 g) whereas in spring crop it ranges from 3.04 to 3.29 g and highest value was recorded in greenish blue zebra (3.29 g).

Shell weight

The shell weight ranges from 0.55 to 0.59 g during autumn crop and highest was recorded in yellow spotted (0.59 g). In spring crop it ranged from 0.48 to 0.54 g and highest was recorded in greenish blue plain (0.54 g).

Shell ratio (%)

The shell ratio % was ranged from 13.55 to 14.43 % in spring crop and it was recorded highest in greenish blue plain (14.43 %) whereas it ranged from 14.21 to 15.47 % in autumn crop and highest value (15.47 %) was recorded in greenish blue spotted.

Fig. 1 and 2 showed the graphical representation of the economic parameters of the six different strains of eri silkworm in spring and autumn crops. The data was recorded higher in all the parameters during autumn crop compare with spring crop. Renuka and Shamitha (2014) reported better cocoon characters during winter crop in Andhra Pradesh which is slightly different from the present finding and it might be due to different geographical location.

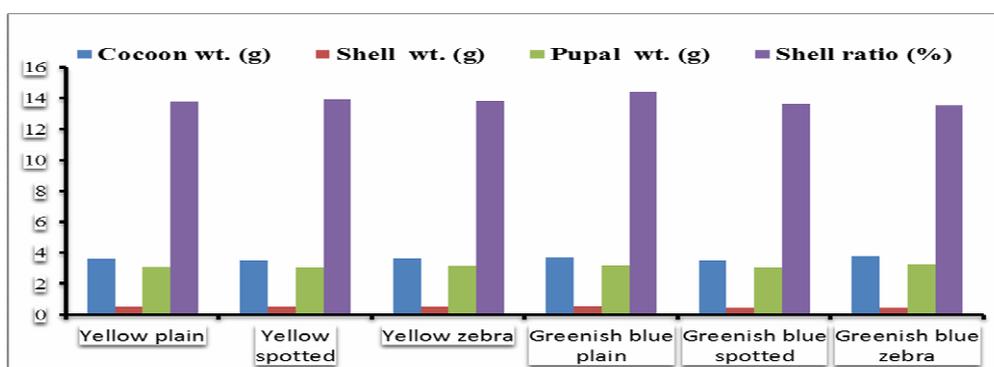


Fig. 1 Economic parameters of different strains during spring crop

The overall study on the performance of the eri silkworm strains during two seasons revealed that yellow plain and greenish blue plain strains showed better performance with distinct characters in both the seasons. The

analyzed data also revealed that autumn season was found to be appreciably good compared with spring season. Similar observation on the performance of Borduar eco-race and season was also reported (Sarmah *et al.*, 2012).

Table 4 : Rearing performance of eri silkworm strains during Autumn crop

Eri silkworm strain	Fecundity (Nos.)	Hatching (%)	Larval wt.(g)	Larval period (days)	ERR (%)
Yellow plain	417 ±18.03	93.07±1.27	11.27±0.18	17.33±0.33	93.11±1.46
Yellow spotted	387±6.81	89.78±1.18	10.55±0.34	17.50±0.29	61.97±8.14
Yellow zebra	365±7.21	91.51±1.09	10.79±0.28	17.50±0.29	83.47±1.89
Greenish blue plain	413±12.91	94.01±0.14	11.09±0.35	17.33±0.33	93.26±1.01
Greenish blue spotted	380±7.64	87.55±0.61	11.00±0.57	17.33±0.33	62.33±9.44
Greenish blue zebra	407±13.68	93.01±1.01	11.13±0.51	17.17±0.16	86.17±0.44
SE (d)	7.25	1.50	0.22	0.42	6.42
CD (0.05%)	16.36	3.39	NS	NS	14.49

Sharma and Kalita (2017) also reported that greenish blue plain (GBP) and greenish blue spotted strains are better performer and both spring and autumn seasons are favourable for rearing eri strains in Assam. This is in conformity with the present findings.

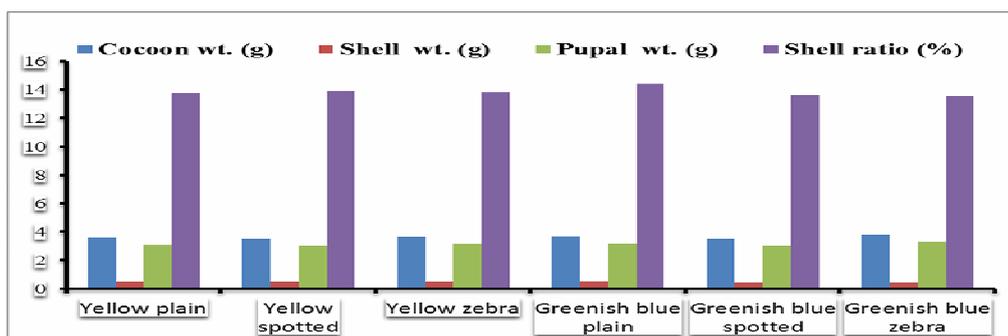
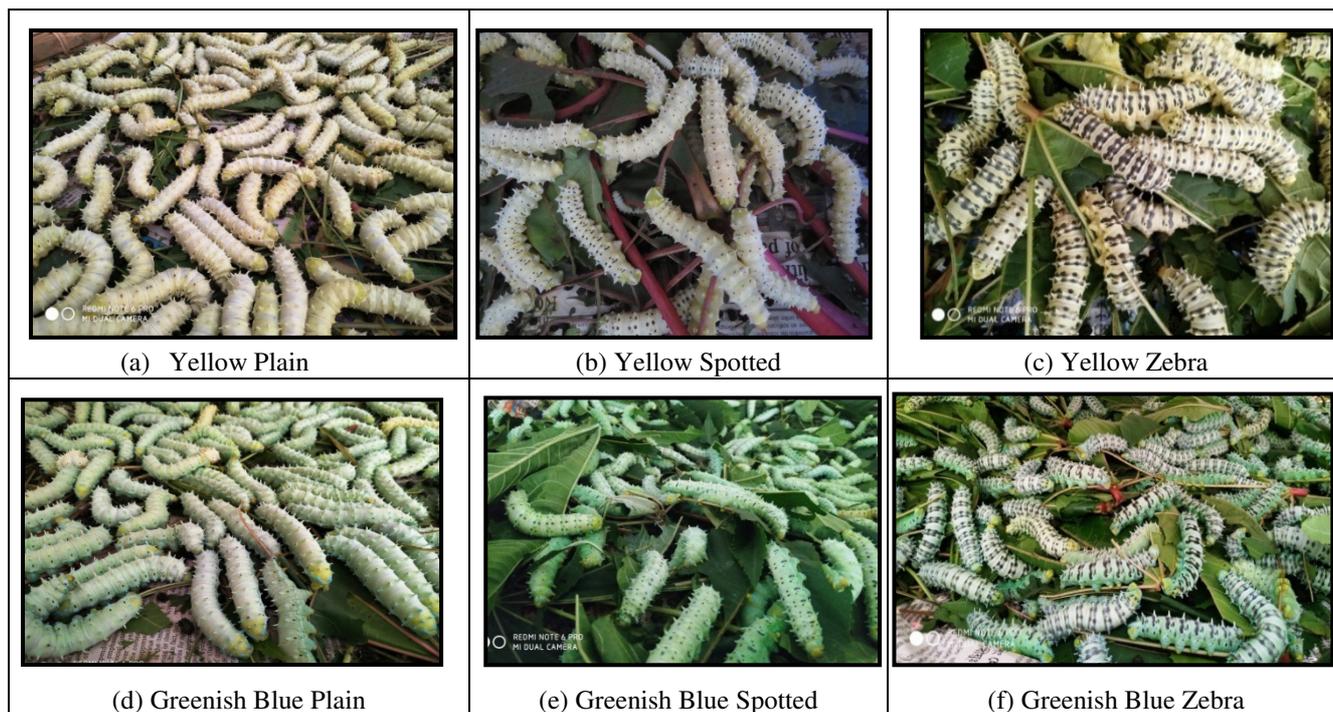


Fig. 2 Economic parameters of different strains during autumn crop



Photoplate: (a) Yellow plain, (b) Yellow spotted, (c) Yellow zebra, (d) Greenish blue plain, (e) Greenish blue spotted, (f) Greenish blue zebra

Conclusions

From the present study, it was found that, the yellow plain (YP) and greenish blue plain (GBP) strains of eri silkworm are better performer among the strains in the characters like fecundity, hatching and effective rate of rearing. Of the two seasons, autumn season was the best for rearing all the eri silkworm strains followed by spring season. Other characters were at par among the strains, however higher value was observed in yellow plain and greenish blue plain strains in autumn crop.

References

- Choudhury, S.N. (1982). Eri Silk Industry. Directorate of Sericulture and Weaving, Govt. of Assam, Guwahati, Assam.
- Debaraj, Y.; Sarmah, M.C.; Dutta, R.N.; Singh, L.S.; Das, P.K. and Benchamin, K.V. (2001). Field trail of elite crosses of eri silkworm, *Philosamia ricini*, Hutt. *Indian Silk*, 40(2): 15-16.
- Debaraj, Y.; Datta, R.N.; Das, P.K. and Benchamin, K.V. (2002). Eri silkworm crop improvement – A review. *Indian J. Seric.*, 41(2): 100-105.
- Debaraj, Y.; Singh, R.; Biswas, T.K. and Bindroo, B.B. (2013). Eri culture with special reference to rearing and seed technologies. *Sericologia*, 53(1): 1-9.
- Kumar, R. and Gangwar, S.K. (2010). Impact of varietal feeding on *Samia ricini* Donovan in spring and autumn season of Uttar Pradesh. *J. Agric. Bio. Sci.*, 5(3): 46-51.
- Sharma, P. and Kalita, J.C. (2017). A comparative study on the rearing performance of six strains of eri silk worm, *Samia Ricini* Donovan in four different seasons. *J.Ph.Bio.Sci.*, 12(3): 13-18.
- Sarmah, M.C. (2011). Eri pupa: a delectable dish of North East India. *Current Science*, 100(3): 10.
- Sarmah, M.C.; Ahmed, S.A.; Sarkar, B.N.; Debaraj, Y. and Singh, L.S. (2012). Seasonal variation in the commercial and economic characters of eri silkworm, *Samia ricini* (Donovan). *Mun. Ent. Zool.*, 7(2): 1268-1271.
- Renuka, G. and Shamitha, G. (2014). Studies on the economic traits of eri silkworm, *Samia cynthia ricini*, in relation to seasonal variations. *Int. J. Adv. Res.*, 2(1): 315-322.