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Leedarin Teronpi
M. Sc. (Agri.) in Sericulture, Department of Sericulture, Assam Agricultural University, Jorhat, Assam, India

Monimala Saikia
Assistant Professor, Department of Sericulture, Assam Agricultural University, Jorhat, Assam, India

Th. Aruna Singha
Assistant Professor, Department of Sericulture, Assam Agricultural University, Jorhat, Assam, India

Surajit Kalita
Jr. Scientist, Directorate of Research (Agri.), Assam Agricultural University, Jorhat, Assam, India

Hemanta Saikia
Assistant Professor, College of Sericulture, Titabar, Assam Agricultural University, Jorhat, Assam, India

Corresponding Author:
Leedarin Teronpi
M. Sc. (Agri.) in Sericulture, Department of Sericulture, Assam Agricultural University, Jorhat, Assam, India

Impact of mating duration on larval growth of eri silkworm, *Samia ricini* Donovan in autumn and spring season

Leedarin Teronpi, Monimala Saikia, Th. Aruna Singha, Surajit Kalita and Hemanta Saikia

Abstract
The current investigation was carried out to find the impact of mating duration on larval growth of eri silkworm, *Samia ricini* Donovan, in the laboratory of Department of Sericulture, Assam Agricultural University, Jorhat in autumn and spring season during the year 2017-2018. Mating duration had no significant effect on larval growth. However, season had significant effect on larval duration, weight of full grown larvae, weight of matured larvae, ERR (%). Larval duration of eri silk moth was recorded shorter in autumn than spring season. Weight of full grown larvae, weight of matured larvae, ERR (%) of eri silk moth was recorded better in autumn season than spring season. Interaction effect between mating duration and season was significant in larval duration. Larval parameters showed better performance in the autumn season than spring season.

Keywords: Eri silkworm, ERR (%), larval growth, mating duration

Introduction
Eri silkworm, *Samia ricini* Donovan, (Lepidoptera: Saturniidae) is a domesticated non mulberry silkworm and polyphagous in nature. The silkworm is reared feeding primarily the leaves of castor and kesseru plant. The other secondary host plants which are used during scarcity of primary host plants are borpat, barkesseru, tapioca, payam, gulanch, papaya, etc. It is multivoltine in nature and can be reared for 5-6 generations in a year [1].
Ericulture is far behind mulberry and other non-mulberry sericulture due to lack of improved technology except traditional practices. Quality silkworm seed is vital for viable sericulture industry. Quality of silkworm seed depends on the management practices i.e. temperature, humidity, nutrition and genotype of the breed [2]. Seed cocoon quality is greatly influenced by a number of factors such as nutritious leaf, disease free laying, optimum temperature, humidity and hygienic condition. Tanaka (1964) observed that mating duration, activeness of the male moth, temperature and relative humidity in mulberry silkworm essentially affects the silkworm seed quality [3]. The embryonic development stage in silkworm is very susceptible to environmental conditions i.e. light, temperature, humidity, vibration, etc. [4]. Oviposition is one of the most important and vital aspects of seed production technology, which needs an in-depth study [5, 6].
Information pertaining to seed preparation technology of eri silkworm is very scanty. Though various studies have been made on the effect of mating duration on eri silkmoths, but literary information on impact of mating duration on larval growth of eri silkworm, *Samia ricini* is scanty. Hence, the present work is thought worthwhile.

Materials and Methods
The current investigation on impact of mating duration on larval growth of eri silkworm, *Samia ricini* Donovan, was carried out in the laboratory of Department of Sericulture, Assam Agricultural University, Jorhat during the year of 2017-2018. Four different mating durations, *viz*., 2 hours, 3 hours, 4 hours, 5 hours were considered for the study. Eri silkworm rearing method as suggested by Chowdhury (1982) was followed [7]. The rearing of the eri silkworm was done by tray rearing method. This is ideally suited for rearing young as well as late age worms. On the hatching of the larvae tender leaves were given to the egg box. The newly hatched larvae crawl onto the leaves and start feeding. The leaves along with the larvae were

transferred to the already disinfected tray with fresh leaves. In the tray rearing method, worms were reared by providing the leaves on the tray. Here, the trays used were made of plastic and 100 worms were reared in each tray. The trays were placed inside wired cages. Ant wells were provided under each leg of the wired cages. Regular bed cleaning was done along with providing timely feeding to the worms. Larval duration (days), weight of full grown larvae (g), weight of matured larvae (g) and ERR % were recorded. The experiment was carried out in Completely Randomized Design (CRD) for the various estimations of larval parameters of eri silkworm. Each treatment was replicated 5 times. The determination of various experiments was to be subjected to ANOVA in order to separate out all possible errors. The experimental error found while observing the various effect was determined by calculating their respective P values following Panse and Sukatme (1989) [8].

Results and Discussions

The results of the present study have been shown in table 1, 2, 3 and 4 respectively.

Larval growth parameters

The effect of different mating durations on larval duration was found to be non-significant. Irrespective of season the larval period was recorded 29.10 days in 2 hours, 29.40 days in 3 hours, 29.90 days in 4 hours and 29.70 days in 5 hours mating duration of moths. The larval duration was found to be significantly shorter in autumn season (27.50 days) than in spring season (31.55 days). The interaction effect due to mating duration x season was significant. In this aspect, the larval duration was significantly longer in spring at 2 (31.80 days), 3 (31.00 days), 4 (32.00 days) and 5 (31.40 days) hours mating duration than autumn season. The longest larval period was observed in 2 hours (31.80 days) in spring season and shortest was observed in 2 hours (26.40 days) in autumn season.

Table 1: Effect of mating duration on larval duration (days) of eri silkworm during autumn and spring season

Mating duration (hours)	Season		Mean
	Autumn	Spring	
2 hrs	26.40	31.80	29.10
3 hrs	27.80	31.00	29.40
4 hrs	27.80	32.00	29.90
5 hrs	28.00	31.40	29.70
Mean	27.50	31.55	
	S. Ed(±)	CD (5%)	
Mating duration	NS	NS	
Season	0.22	0.45	
Mating duration x Season	0.43	0.89	

Data are mean of 5 replications
Data followed by same letter are non significant (P<0.05)
NS= Non-significant

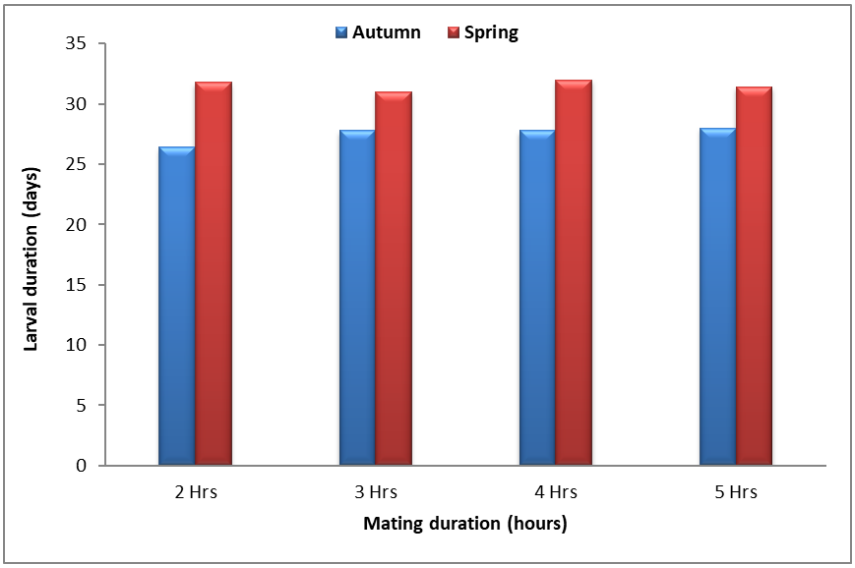

Fig 1: Larval duration (days) of eri silk moth during autumn and spring season

Results showed that the effect of different mating durations on weight of full grown larvae was non-significant. Irrespective of season, highest weight of full grown larvae was recorded as 6.25 g in 2 hours and lowest as 5.32 g in 5 hours mating duration. The weight of full grown larvae was found to be significantly higher in autumn season (6.11 g) than in spring season (5.60 g). The interaction effect due to mating duration x season was non-significant. The highest weight of full grown larvae was recorded as 6.44 g in autumn season at 2 hours mating duration and lowest was 4.85 g in spring season at 5 hours mating duration.

Table 2: Effect of mating duration on weight of full grown larvae (g) of eri silkworm during autumn and spring

Mating duration (hours)	Season		Mean
	Autumn	Spring	
2 hrs	6.44	6.06	6.25
3 hrs	6.28	5.82	6.05
4 hrs	5.92	5.68	5.80
5 hrs	5.79	4.85	5.32
Mean	6.11	5.60	
	S. Ed(±)	CD (5%)	
Mating duration	NS	NS	
Season	0.14	0.29	
Mating duration x Season	NS	NS	

Data are mean of 5 replications
Data followed by same letter are non significant (P<0.05)
NS= Non-significant

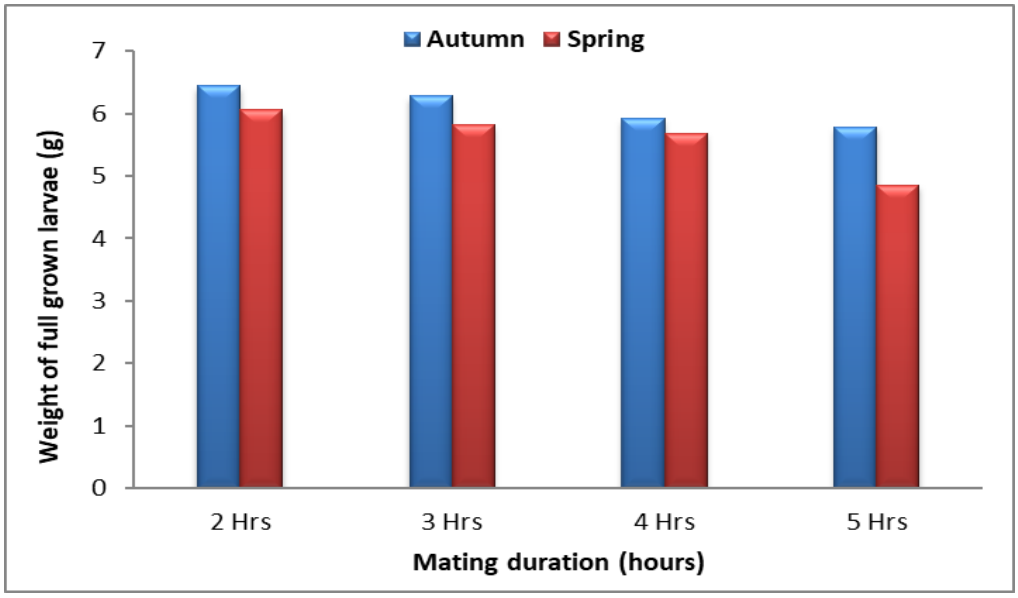

Fig 2: Weight of full grown larvae (g) of eri silk moth during autumn and spring season

Regardless of season, highest weight of matured larva was recorded in 5 hours mating duration (4.49 g) and lowest weight was recorded in 2 hours mating duration (4.26 g). The weight of matured larvae was found to be significantly higher in autumn season (5.32 g) than in spring season (3.48 g). The interaction effect due to mating duration x season was non-significant. It was evident from the results, highest weight of matured larvae was observed in 3 hours mating duration (5.44 g) in the autumn season and lowest weight of matured larvae was observed in 2 hours mating duration (3.25 g) in the spring season.

Table 3: Effect of mating duration on weight of matured larvae (g) of eri silkworm during autumn and spring season

Mating duration (hours)	Season		Mean
	Autumn	Spring	
2 hrs	5.27	3.25	4.26
3 hrs	5.44	3.52	4.48
4 hrs	5.22	3.53	4.38
5 hrs	5.35	3.63	4.49
Mean	5.32	3.48	
	S. Ed(±)	CD (5%)	
Mating duration	NS	NS	
Season	0.09	0.18	
Mating duration x Season	NS	NS	

Data are mean of 5 replications
Data followed by same letter are non significant (P<0.05)
NS= Non-significant

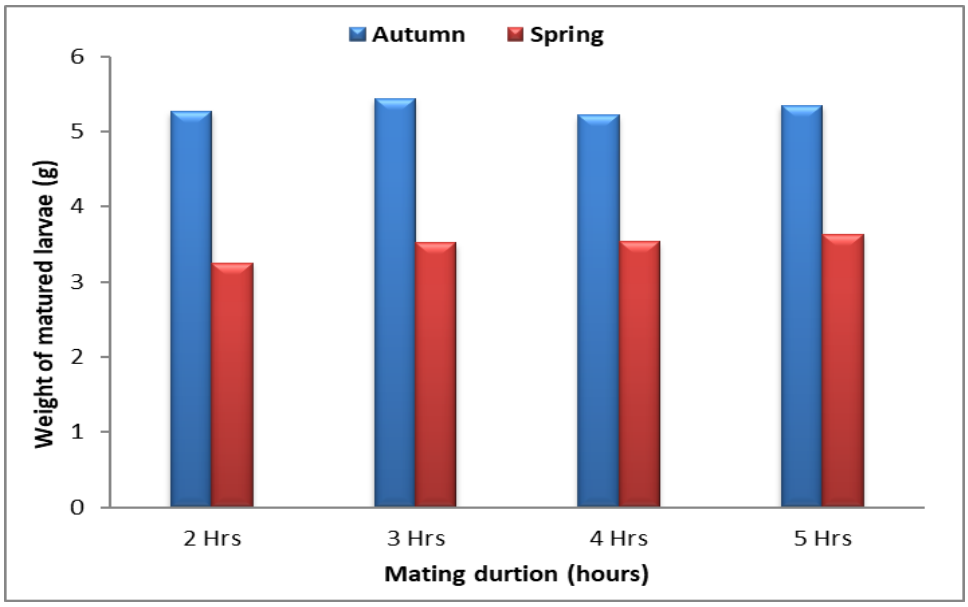

Fig 3: Weight of matured larvae (g) of eri silk moth during autumn and spring season

Results revealed that the effect of different mating durations on ERR % was non-significant. Regardless of season, ERR % was recorded as 79.40% in 2 hours, 79.00% in 3 hours, 79.50% in 4 hours and 80.40% in 5 hours mating duration. The ERR % was found to be significantly higher in autumn season (82.40%) than in spring season (77.20%). The interaction effect due to mating duration x season was non-significant. The highest ERR % was observed as 83.40% in autumn season at 4 hours mating duration whereas the lowest was 75.60% in spring season at 4 hours mating duration.

Table 4: Effect of mating duration on ERR (%) of eri silkworm during autumn and spring season

Mating duration (hours)	Season		Mean
	Autumn	Spring	
2 hrs	81.60	77.20	79.40
3 hrs	81.40	76.60	79.00
4 hrs	83.40	75.60	79.50
5 hrs	83.20	77.60	80.40
Mean	82.40	77.20	
	S. Ed(±)	CD (5%)	
Mating duration	NS	NS	
Season	0.86	1.74	
Mating duration x Season	NS	NS	

Data are mean of 5 replications
Data followed by same letter are non significant (P<0.05)
NS= Non-significant

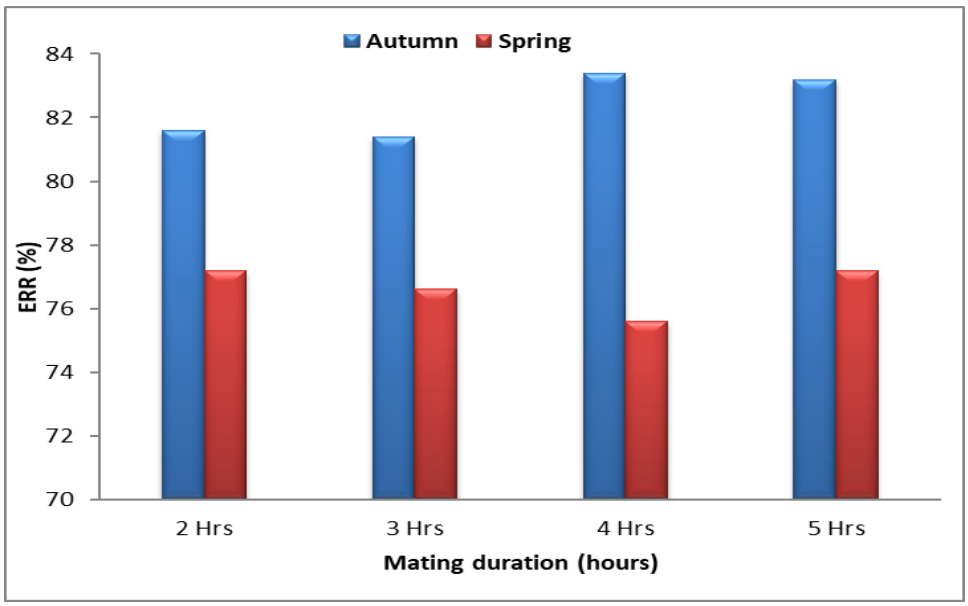

Fig 4: ERR % of eri silk moth during autumn and spring season

Tazima (1978), Jolly (1983) and Yeole *et al*. (1995) observed that the mating duration, activeness of the male moth, temperature and relative humidity in silkworm essentially affects the silkworm seed quality [9-11]. Dynamic environment conditions prevail at different seasons bring about profound changes in physical as well as biotic factors influencing the growth development and the expression of economic characters in different silkworm races [12]. Rearing temperature directly affects the physiology of the silkworm, in nutrient absorption, digestion, blood circulation and respiration. Relative humidity influences the growth and physiology of silkworm which plays a great role in the regulation of body temperature and indirectly affects the larval appetite. Poor ventilation also encourages the growth of fungus in bedding and pathogenic agents of the silkworms [13]. Das and Das (2003) observed that the amount, rate and quality of food consumption of larva influence the growth rate, duration of larval development, body weight, survival rate and reproductive potentials of silkworm [14]. Nutrition which obtained during the feeding period influences the growth and development of eri silkworms throughout their life period [15]. Srivastava *et al*. (2006) reported that the survival rate and rate of metabolism of insects reduced with decrease in water content of the atmosphere [16]. Ahmed *et al*. (2015) recorded lowest larval duration in July-August (18.33±0.58 days), followed by September-October (20.33±0.58 days), April-May (22.67±0.58 days) and January-February (31.00±1.00 days) which showed a similar trend with the present findings [17]. Handique *et al*. (2006) in eri silkworm reported that the occurrence of maximum larval weight during autumn rearing season [18] whereas Ray *et al*. (2005) in muga silkworm observed that during all the seasons, except winter the larval duration varied from 23.60 days to 27.20 days. Both male and female larval weights were higher during Oct-Dec., may be due to longer larval period [19]. However, the present findings contradicts with that of Vaidya and Yadav (2014) who recorded shortest larval duration (19 days) and higher larval weight (7.50 g) and higher ERR (90 %) in spring season in eri silkworm [20]. Ray *et al*. (2005) observed that effective rate of rearing; the ultimate economic output to the farmers, in muga silkworm was better during October-November followed by April-May and minimum during July-August due to low disease occurrence which shows similar results with present findings [19].

Plate 1: Full grown larvae of eri silkworm

Plate 2: Matured eri silkworm larvae on chandraki

Conclusion

Mating duration had no significant effect on larval growth. However, season had significant effect on other larval parameters. Shorter larval duration of eri silk moth was observed in autumn season. Autumn season showed better performance in respect of weight of full grown and matured larvae and effective rate of rearing of eri silk moth. Interaction effect between mating duration and season was found significant only in case of larval duration. Thus, from the present investigation it may be inferred that mating duration and interaction between mating duration and season had no significant effect on larval parameters.

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