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A Study on Effect of Different Ecological Conditions on Laboratory Culture of Tasar Silkworm

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Abstract – The present communication provides a relative picture concerning the effect of different ecological factors viz., temperature, photoperiod and relative humidity on the laboratory culture of Indian tasar silkworm. Results of the experiment have shown that the ecological factors viz., 30ºC temperature, 16 hr. photoperiod and 80% R.H. provide conductive environment for the laboratory culture of tasar worm. However, the application of all the three factors together in a combination has been found to be the most significant in relation to better qualitative manifestation of tasar worm under laboratory condition. It appears that the said factors are required as optimum condition for the proper acclimatization of tasar worms under Indoor condition. The Significant increase in the characters of tasar due to the application of three factors in a combination is probably due to the cumulative effect of all the suitable factors.

Key Word : Tasar Silk Worm, Cocoons, Temperature, Humidity Ecological Condition.

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1. INTRODUCTION

The Indian traditional tasar silk produced by Antheraea mylitta is represented by many ecotypes, which are available on different food plants under different ecological conditions (Ghosh and Sengupta 1979). Infact tasar silk, so named as “a golden fibre” is really the most beautiful gift of nature which is produced by different species of Antheraea belonging to family saturniidae of order Lepidoptera. The popular tasar producing species viz, Antheraea pernyi (Tasar of china) Antheraea yamamai (Tasar of Japan) and Antheraea mylitta (Tasar of India) are usually reared in the forest areas on different tasar host plants by the poor section of the society as a frtuitful source of their income. However, the export of tasar silk brings handsome amount of much needed foreign exchange. Antheraea mylitta, which produces traditional Indian tasar silk is distributed over the dense tropical forest belt of our country, particularly in the states of Bihar, Madhya Pradesh, Orissa and Maharashra in the forms of nearly nineteen ecotypes and four mutant strains (Jolly 1966). The different ecotypes of Antheraea mylitta are usually reared on primary tasar host plants viz; Termianlia arjuna, Terminalia tomentosa and Shorea robusta by of originals during seed crop (July-August) and commercial crop (Sep-Oct) season. Nearly two dozen food plants of secondary importance have been reported for A. mylitta silkworm (Sinha and Jolly, 1971). The traditional method of tasar culture involves considerable loss of crop due to pests, predators and natural calamities resulting into a poort harvest of 15 to 20% (Jolly, Ahsan and Khanna, 1974). In order to overcome the hazards of outdoor rearing a new technique of Indoor rearing for tasar silkworm has been proposed, which aims at protecting the initial younger larvae from natural vagaries (Jolly, 1971, 1974). An alterantive method for the successful laboratory culture of tasar silkworm till cocoon formation stage has been worked out (Pandey, 1989). The laboratory culture of Antheraea mylitta has been successfully carried out on gamala grown Terminalia arjuna plants (Pandey and Sharma, 1990). However, the search for the ideal Indoor environmental condition required for the healthy growth and development of indigenous tasar silkworm had not yet been investigated thus the present laboratory experiment has been designed to examine the effect of some ecological factors viz; photoperiod, temperature and relative humidity on the laboratory culture of tasar silkworm, which aims at finding out the ideal ecological condition or conducive environment for raising the tasar crops under Indoor condition in the larger interest of tasar industry. Some other workers in this likes are kumar and Bajpai (2015), Devagan (2018), Roy and Sarkar (2015), Sharma (2005) and Sharma (2015)

2. MATERIALS AND METHODS

The healthy Indoor grown cocoons of Antheraea mylitta were collected from tasar research laboratory G. J. College, Bihta (Patna). The cocoons were assorted and analysed as per the requirement of the

experiment. The disease free laying were prepared and all the grainage operations were carried out as per the method suggested (Krishnaswamy, 1973). The Indoor rearing were conducted on gamlagrown Terminalia arjuna plants as per the technique workedout (Pandey, 1989).

The Indoorreaning of tasar larvae at three different constant temperature (25^0C, 30^0C and 35^0C), four different photoperiodic conditions (0 hr. 8 hr. 16 hr and 24 hr. and three different relative humidities (70%, 80% and 90%) were carried out separately by proper adjustment and maintenance of environmental factors under laboratory conditions (Pandey, 1989), A lot of 100 first stage tasar larvae divided into five replivation were mounted on gamala grown tasar host plants separately as per the requirement of the experiment. The data in relation to rearing performances and their subsequent breeding performances were carefully recorded and presented in the table 1.

TABLE – 1

Table showing effects of temperature, photoperiod and relative humidity on the Laboratory culture of Antheraea my litta

	Factor	Temperature				Photoperiod			Relative humidity		
	Character	25°C	30°C	35°C	Ole	0hrs	16 hrs	24 hrs	70%	80%	90%
1	E.R.R.(%)	60.0	68.00	61.00	59.3	62.30	65.00	61.0	62.00	70.00	63.00
2	Cocoon Wt. (g)	11.1	12.40	11.89	10.38	10.59	12.30	10.21	10.51	12.30	11.20
3	Shell Wt(g)	1.60	1.80	1.65	1.51	1.65	1.75	1.60	1.69	1.72	1.65
4	Shell ratio (%)	11.90	12.90	12.00	11.54	11.64	12.80	11.38	11.45	12.75	11.76
5	Emergence	60.00	70.00	65.00	60.00	65.00	20.00	35.00	65.00	75.00	70.00
6	Coupling	50.00	65.00	60.00	65.00	68.00	45.00	50.00	53.00	68.00	58.30
7	Egg laying	65.00	80.00	61.00	65.00	61.00	35.00	50.00	60.00	80.20	60.00
8	Hatching	45.00	62.50	50.00	65.00	65.00	40.00	45.00	65.00	68.00	62.00

The suitable environmental factors as resulted from the present experiment were considered in a combination for knowing the cumulative effect of combined factors on the biology of **Antheraea mylitta.** Apart from this a combination of suitable ecological factors viz; (30^0C temperature + 16 hr. 'photoperiod and 80% R.H.) were subjected to the laboratory culture of tasar larvae during seed' crop (July-August) and commercial crop (Sep-Oct) seasons. The data in relation to rearing performances of tasar silkworms were collected, analysed and finally presented in the table 2, A separated control was also maintained at normal laboratory condition.

Table – 2

Table showing combined effects of suitable ecological factors 30ºC Temperature+16 hrs. Photoperiod +80% R.H. on quantitative and qualitative characters of Antheraea mylittle under laboratory culture

EN	Replication	E.R.R. (%) (g)	Cocoon wt. (g)	Shell wt. (g)	Shell ratio (g)	Average length of raw silk	Average size of raw silk reeled
1.	20 × 5	75.62	12.80	1.93	12.98	6930	60.0D
2.	20 × 5	74.92	12.79	1.94	12.94	6929	61.9D
3.	20 × 5	75.13	12.82	1.92	12.98	6931	59.8D
4.	20 × 5	75.09	12.75	1.92	12.99	6928	60.1D
5.	20 × 5	74.24	12.84	1.93	12.99	69.28	60.1D
Average	20 × 5	75.00	12.86	1.93	12.98	69.30	60.4D
Control	20 × 5	35.60	10.30	1.43	11.30	5845	49.32D
C.D. level	at 0%	**	**	**	**	**	**

** = Highly Significant

3. OBSERVATIONS AND DISCUSSION

The Indoor rearing performances of Indian tasar silkworm in relation to three constant temperatures (25^0C, 30^0C, and 35^0C), four different photoperiodic conditions (0 hrs. 8 hrs. 16 hr and 24 hrs) and three different relative humidities (70%, 80% and 90%) have been recorded in table 1. The table clearly reveals that a constant temp. of 30^0C (E.R.R. 68.0%), cocoon weight 12.40 g, shell weight 1.80g, shell ratio 12.90%) a photoperiodic treatment of 16 hr (E.E.R. 65%, cocoon weight 12.30g, shell weight 1.75 g arid shell ratio 12.80%) and a relatively are relatively humidity of 80% (E.R.R. 70%, cocoon weight 12.30g, shell weight 1.72g and shell ratio 12.75%) are relatively better effective ecological factors than the constant temperatures of 25ºC and 35ºC photoperiodic of 0 hr. 8hr. and 24hrs. and relative humidities of 70% and 90% for the laboratory culture of tasar slilk worm. The average breeding performances of tasar silks moths at 30ºC temperature (emergence 70%, coupling 65%, egg laying 8.0% and hatching of egg 62.5%) and 80% relative humidity (emergence 75%, coupling 68%, egg laying 80% and hatching 68%) have also shown their supremacy over two others constant temperatures and relative humidities considered for the present experiment. However, observations have futher shown that tasar moths prefer short day photoperiod of 8hr. for most of the breeding performances as against 0 hr. 16 hrs. and 24hrs. photoperiodic conditions.

The cumulative effects of a combined suitable factors viz, 30ºC temperature + 16 hr. photoperiod 80% R.H. on the Indoor rearing performances of Antheraea mylitta have been recorded in the table 2. It is very interesting to observe that a combination of suitable factors is highly significant in relation to average quantitative (E.R.R. 75.0%) and qualitative (cocoon weight 12.8g, shell weight 1.93g, shell ratio 12.98% length of raw silk (6930 and size of raw silk reeled 60.4D) characters of tasar, than the control (E.R.R. 35.6%, cocoon wight 10.30g, shell weight 1.43 g, shell ratio 11.30%, length of raw silk 5845

and size of raw silk 49.32D). The results obtained thus confirm the effectiveness of combined ecological factors.

The effectiveness of ecological factors viz, 30ºC temp against 25ºC and 35ºC 16hrs. photoperiod against 0hrs, 8hrs. and 24hrs. and 80% R.H. against 70%and 90% on the Indoor rearing performances of tasar silkworm appear to be related with the adjustment and acclimatization of tasar silkworm with their optimum environmental conditions.

The aforesaid factors provide ideal and suitable conditions for the survival and adjustment of tasar silkworm. Jolly, et. al., (1970) and Sharma et. al, (1993), have reported that a temperature range of 26ºC-30ºC, long day photoperiod of 16hr. to 18 hr. and relative humidity of 80% to 85% are the optimum conditions for tasor culture. The results of the experiment has led us to believe that when the optimum ecological factors are provided in the laboratory condition for larval rearing of tasar worm the qualitative and quantitative characters get increased. The evident increase in the ommerical characters of tasar is probably due to the fact that the younger larvae are protected from natural vagaries (Jolly, 1971). However, the long day photoperiod of 16 hr, is not effective for the breeding performances, since tasar moths prefer shor day photoperiodic condition for most of the breeding results (Pandey, 1989). The highly significant Indoor rearing performances of Antheraea mylitta in relation to the effects of suitable factors in combination is perhaps due to the cumulative effect or additive effect of factors acting together for healthy growth and development of tasar silkworm. It is thus desirable to rear to tasar larvae under Indoor condition by providing a combination of the said factors for boosting the production of tasar to a desired extent.

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