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EFFECT OF ENVIRONMENTAL FACTORS ON THE LABORATORY CULTURE OF TASAR SILKWORM, ANTHERAEA MYLITTA D. (SATURNIIDAE: LEPIDOPTERA)

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ABSTRACT

The present communication accounts for the relative impact of different environmental factors viz; temperature, photoperiod and humidity on the laboratory culture of indigenous tasar silkworm, *Antheraea mylitta* D. in relation to its behavioral manifestations. Results obtained are indicative of the fact that the indigenous tasar silkworm prefers optimum 30^0c temperature, 16hrs. photoperiod and 80% R.H. for its desired rearing and breeding performances influencing the productivity and quality of tasar cocoons. Results further reveal that when all the three optimum environmental conditions 30^0c+16hr. photoperiod+80%R.H. are applied together in a combination on the laboratory culture of *Antheraea mylitta*, the quantitative and qualitative outcome of Indoor tasar culture in respect of effective rate of rearing, cocoon weight, shell weight and shell ratio evidently get increased on account of cumulative effects of optimum conducive and desired environmental factors. The said optimum environmental factors have also resulted into relatively better breeding activities of *Antheraea mylitta*. The results obtained are very much inconfirmities with the earlier investigations carried out by Jolly et.al. (1973), Thangavelu (1990), Shamitha (2007), Kumar et.al.(2013) and Sharma et.al.(2013).

KEYWORDS: Lepidoptera, R.H.(Relative Humidity), E.R.R.(Effective Rate of Rearing), photoperiod, *Terminalia tomentosa*, *Terminalia arjuna*, *Shorea robusta.*

INTRODUCTION

Antheraea mylitta D. an indigenous tasar silkworm belonging to family Saturniidae of order Lepidoptera is very popular and famous for producing the tasar silk so named as “a golden

fibre" of great commercial importance. It is usually reared in the forest areas under outdoor conditions on the foliages of tasar host plants such as *Terminalia tomentosa*, *Terminalia arjuna* and *Shorea robusta* during the seed crop (July-August) and commercial crop (September-October) seasons in tropical tasar producing non-mulberry belts of our country. Tasar culture being practical outdoor suffers great loss of crop (15-20%) due to pest, predators and natural vagaries resulting in to poor harvest (Jolly, 1971). In order to overcome these hurdles an idea for indoor rearing or controlled rearing under the laboratory conditions has been conceived which aims at protecting the tasar larvae during the stages of desired growth and development. Jolly et.al. (1973) attempted a new technique of indoor rearing of tasar larvae on the cut branches of the host plants hanging on wire, dipping of cut ends inside water container, use of polythene cover and spraying of water over the foliages and found better productivity without affecting the quality of tasar cocoons. Pandey (1989) successfully carried out rearing of tasar silkworm on gamala grown bushes of *Terminalia arjuna* under controlled laboratory conditions. Choudhary etal. (1987) studied the indoor rearing performances of the tender worms under indoor conditions resulted in lessening of mortality rate and betterment in the cocoon characters Sharma et.al. (2013) mentioned that tasar larvae essentially require conducive environment under the indoor laboratory culture for desired rearing performances in respect of productivity of tasar cocoons. Shamitha (2007) carried out total indoor larval rearing of tasar silkworm with better productivity of tasar cocoons. Thangavelu et.al. (1990) also reported successful indoor rearing of tropical silkworm, *Antheraea mylitta* D. Anonymous (2006) presented detailed bionomics of Vanaya silk produced by non-mulberry insects under wild conditions. Mishra (2014) studied the role of foliar constituents of primary and secondary tasar host plants on the growth and development of tropical tasar silkworm. Krishnaswamy (1973) developed new techniques of silkworm rearing under different conditions. Kumar et.al. (2017) worked on the coupling behavior of tasar moths under different artificial conditions. Shamitha et.al. (2013) studied the protein and proteolytic activities of indigenous tasar silkworm under the controlled indoor conditions influencing the biological manifestations of *Antheraea mylitta* D.

However, the investigations in respect of ideal environmental conditions needed for the laboratory culture of tasar larvae for desired growth and development have not yet been carried out as a result we fail to understood the optimum environmental factors needed for the laboratory culture of tropical tasar silkworm *Antheraea mylitta* D. In-view, of the fact the present investigation has been designed to evaluate the relative indoor rearing performances

of tropical tasar silkworm under different environmental factors related to temperatures, photoperiods and relative humidities.

MATERIALS AND METHODS

The healthy and disease free uniform tasar cocoons of *Antheraea mylitta* D. were collected from seed supply station of Chaibasa (Jharkhand) and brought to research laboratory at Gaya College, Gaya. The collected tasar cocoons were put for acclimatization for a week and thereafter properly assorted as per the requirement of experiments. The grainage operations were carried out as per the method suggested by Krishnaswamy (1973). The laboratory culture of tasar larvae were carried out on gamla grown bushes of *Terminalia arjuna* under the controlled conditions as per the new indoor technique of larval culture worked out by Pandey (1989).

The laboratory culture of tasar larvae of *Antheraea mylitta* was carried out at three different temperature (25^0c, 30^0c & 35^0c), four different photoperiods (0hr.; 8hr.; 16hr.; and 24hr.) and three different relative humidities (70%, 80% & 90%) separately by the proper adjustment and maintenance of laboratory conditions. A lot of 100 larvae divided into five replications were mounted on separate bushes of *Terminalia arjuna* as per the different factors of environment applied to evaluate the relative rearing and breeding manifestations of tropical tasar silkworm. The data were collected, analysed and presented in table 1. Apart from this the cumulative effect of optimum environmental factors together in a combination in respect of laboratory culture of *Antheraea mylitta* in relation to indoor rearing performances of tasar silkworm was also evaluated and results obtained in respect of quantitative and qualitative characters of tasar were presented in table 2.

RESULTS AND DISCUSSION

Results obtained in relation to laboratory culture of indigenous tasar silkworm, *Antheraea mylitta* D. at three different temperatures, four different photoperiods and three different humidities have been recorded in table 1. It reveals that a constant temperature of 30^0c (E.R.R. 68.0%, cocoon weight 12.40gm., shell weight 1.80gm., and shell ratio 12.90%), photoperiodic treatment of 16hr. (E.R.R. 65.0%, cocoon weight 12.30gm., shell weight 1.75gm., and shell ratio 12.80%) and a relative humidity of 80% (E.R.R. 70.0%, cocoon weight 12.30gm., shell weight 1.72gm., and shell ratio 12.75%) create relatively better environmental conditions during the laboratory culture of tasar larvae as compared to constant temperatures of 25^0c and 35^0c, photoperiods 0hr., 8hr. and 24hr. and relatively

humidity of 70% R.H. and 90% R.H. as far as the productivity and quality of tasar cocoons are concerned.

The results obtained are also indicative of the fact that the relative breeding performances of tasar moths in respect of emergence of moths, coupling, egg laying and hatching of eggs at a temperature of 30^0c with 80% R.H.(emergence 70%, coupling 65%, egg laying 80% and hatching 68%) are better than the two other temperatures and relative humidity evaluated for the present experiment. However, the observations have shown that tasar moths of *Antheraea mylitta* by and large prefer dark or diffused light for its desired breeding performances. Further the cumulative impact of optimum factors together (30^0c temperature + 16hr. photoperiod +80%R.H.) on the indoor rearing performances of *Antheraea mylitta* have been recorded in table 2. It indicates that the impact of all the optimum factors of environment together during the laboratory culture of tasar silkworm is highly significant in respect of quantitative (E.R.R. 75%) and qualitative (cocoon weight 12.80gm., shell weight 1.93gm., shell ratio 12.98%, length of tasar yarn 6930mtr. and size of raw silk). Characters of tasar than its control (E.R.R. 35.6%, cocoon weight 10.30gm., shell weight 1.43gm., shell ratio 1.30%, length of tasar yarn 5845mtr. and size of raw silk 49.32D.).

The better indoor rearing performances of *Antheraea mylitta* in course of its laboratory culture at 30^0c temperature as compared to 25^0c and 35^0c temperatures, 16hr. photoperiod as compared to 0hr., 8hr. and 24hr. and 80% R.H.as compared to 70% and 90% R.H. appear to be the outcome related to desired adjustment and acclimatization of tasar silkworm with essentially required optimum factors of environment create ideal, suitable and condusive conditions for better biological manifestations of tasar silk producing sericigenous insects (Sharma etal. 2013). The results obtained further indicate that the indoor rearing performances of *Antheraea mylitta* in respect of its quantitative and qualitative results get significantly increased as compared to its control, when the laboratory culture of tasar larvae is carried out on a combination of optimum factors (30^0c temperature + 16hr. photoperiod + 80% R.H.) applied together. It is perhaps due to additive or cumulative impact of optimum factors supporting the desired metabolic manifestations as well as growth and development of tasar silkworm (Jolly, 1973).

It is known that tasar silkworm on account of its wild nature prefers outdoor environmental conditions for its various biological activities. However, when the essentially needed environmental factors are regulated and maintained under the controlled conditions of

laboratory culture, the tasar larvae are protected from natural vagaries resulting into better productivity of tasar cocoon without affecting its quality (Pandey 1989., Anonymus 2015 and Shamitha 2007).

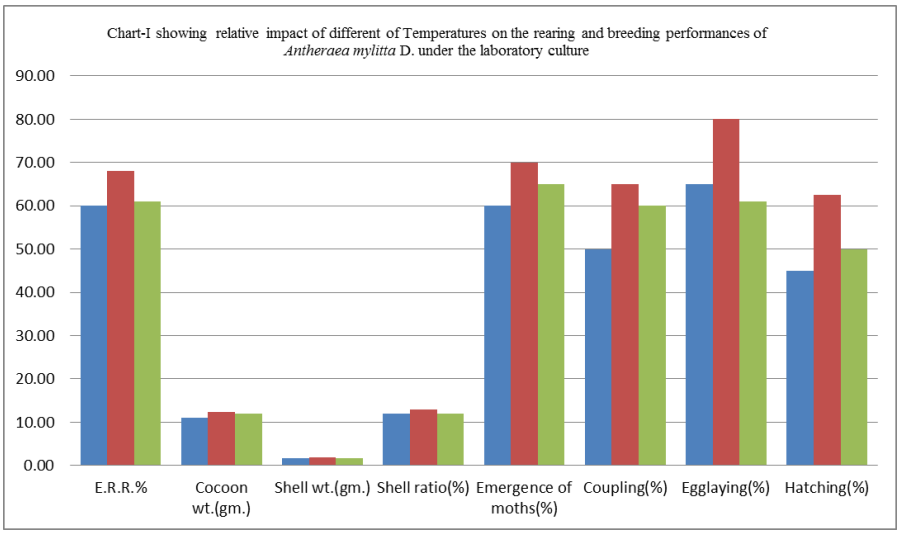
CONCLUSION

The present studies reveal that the laboratory culture of tasar larvae of *Antheraea mylitta* on regulated optimum factors of environment is an effective and useful technique for better productivity of tasar cocoons. But the quality of tasar cocoons are not at par with outdoor rearing and needs to be improved.

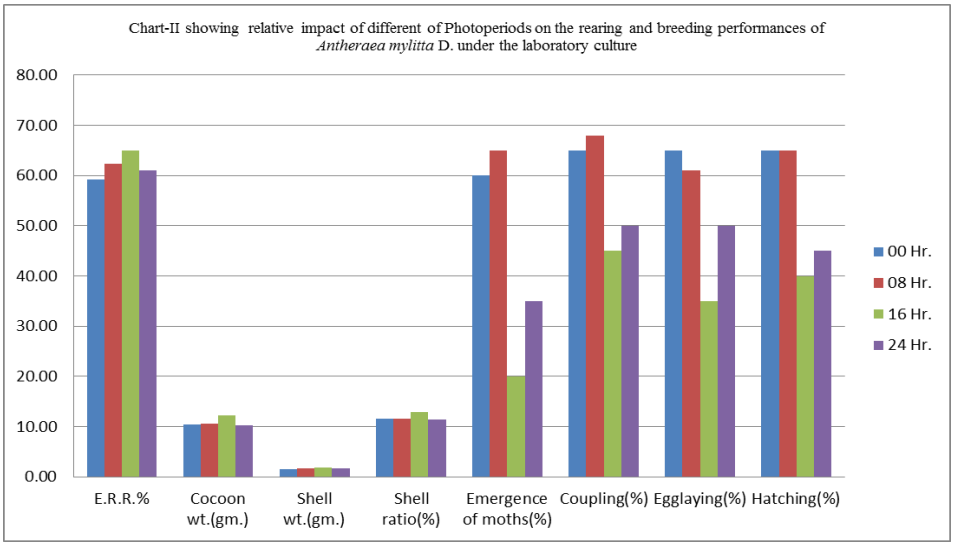
TABLE-1

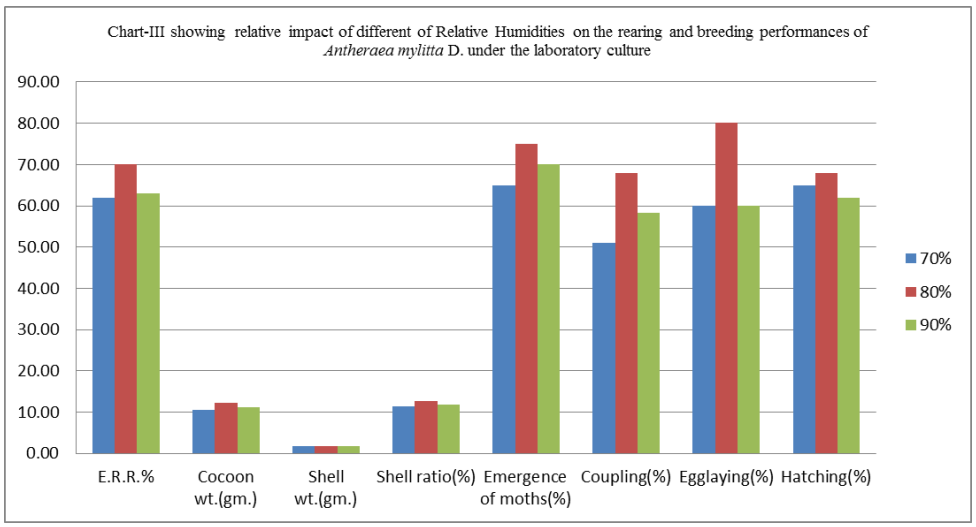
Table showing relative impact of different temperatures, photoperiods and relative humidities on the rearing and breeding performances of *Antheraea mylitta* D. under the laboratory culture.

Sl. No.	Rearing and breeding parameters	Different Temperatures			Different Photoperiods				Different R.H.		
		25^0c	30^0c	35^0c	0hr.	8hr.	16hr.	24hr.	70%	80%	90%
1	E.R.R. %	60.0	68.0	61.0	59.3	62.30	65.0	61.0	62.0	70.0	63.0
2	Cocoon wt. (gm.)	11.1	12.40	11.89	10.38	10.59	12.30	10.21	10.51	12.30	11.20
3	Shell wt. (gm.)	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	12.0	11.54	11.64	12.80	11.38	11.45	12.75	11.76
5	Emergence of moths(%)	60.0	70.0	65.0	60.0	65.0	20.0	35.0	65.0	75.0	70.0
6	Coupling (%)	50.0	65.0	60.0	65.0	68.0	45.0	50.0	51.0	68.0	58.30
7	Egglaying (%)	65.0	80.0	61.0	65.0	61.0	35.0	50.0	60.0	80.20	60.0
8	Hatching (%)	45.0	62.50	50.0	65.0	65.0	40.0	45.0	65.0	68.0	62.0
	C.D. of 0.5% level for characters	**Highly Significant			**Highly Significant				**Highly Significant		



30^0C
35^0C





Histogram Chart-I, Chart-II & Chart-III showing relative impact of different temperatures, photoperiods and relative humidities on the effective rate of rearing of *Antheraea mylitta* D. under indoor laboratory culture.

TABLE-2

Table showing cumulative impact (30^0c Temp.+ 16hr. photoperiods + 80% R.H.) of environmental factors on the indoor laboratory culture of *Antheraea mylitta* in respect of its quantitative and qualitative manifestations.

Sl. No.	Replications	E.R.R. (%)	Cocoon wt. (gm.)	Shell wt. (gm.)	Shell ratio (%)	Length of raw silk (mtr.)	Size of raw silk reeled. (D)
1	20x5	75.62	12.80	1.93	12.98	6930	60 D
2	20x5	74.92	12.79	1.94	12.94	6929	61 D

3	20x5	75.13	12.82	1.92	12.98	6931	59 D
4	20x5	75.09	12.75	1.92	12.99	6928	60 D
5	20x5	74.24	12.84	1.93	12.99	6928	60 D
	AV.	75.0	12.80	1.93	12.98	6930	60 D
	Control 20x5	35.60	10.30	1.43	11.30	5845	49 D
C.D. at 0.5% level for characters		**H.S.	**H.S.	**H.S.	**H.S.	**H.S.	**H.S.

HS: Highly Significant

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