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DIVERSITY IN WILD TASAR (*ANTHERAEA MYLITTA* D.) ECORACES OF SIMLIPAL BIOSPHERE RESERVE WITH RESPECT TO COCOON AND ASSOCIATED PARAMETERS

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ABSTRACT

Tropical tasar silkworm *Antheraea mylitta* is represented by 44 different ecoraces in India. Due to urbanisation, mining and other anthropogenic reasons, many of the wild Tasarecoraces either lost or in the process of extinction which warrants their conservation. Similipal Biosphere Reserve in Mayurbhanj, Odisha is considered to be the natural habitat for many economically important tropical Tasar silkworm namely Modal, Nalia, Jata and Bogai etc. All these wild ecoraces are genetic treasures for Vanya sericulture industry, unfortunately, genetic base of all these ecoraces are depleting day by day. Therefore, the present study was undertaken to ascertain the genetic varability between these ecoraces particularly with reference to cocoon and associated parameters. The study indicated that the ecorace Modal is one of the best with highest average Cocoon length 5.40 (5.23-5.48 cm), breadth 3.47 (3.42-3.50 cm), Cocoon volume 30.03 (29.20-31.10 cc), Single cocoon weight 15.57 (13.48-18.48 g), Single shell weight 3.22 (2.90-3.52 g) and Silk ratio 20.80 (19.11-21.52%) when compared to all other ecoraces. However, result depicted that there was considerable statistically significant variation exists with respect to the different cocoon and associated characters amongst the evaluated ecoraces. Further variation in voltinism and choice of food plants were also evident among the studied ecoraces. The range of variation exists among these ecoraces can effectively be utilized in formulating conservation plan and selective breeding programme.

Keywords **:** *Antheraea mylitta*, Conservation, cocoon traits, tasar silkworm, variability

Introduction

Tasar sericulture is an agro-forestry based livelihood avocation with immense commercial importance. Tasar cocoons constitute an important part of silk industry that provides livelihood to the thousands of tribal families in India inhabiting in and around of the forest. Collection of natural tasar cocoons, reeling and spinning of the yarn in Jharkhand, Chhattisgarh, Madhya Pradesh, Odisha, West Bengal and Andhra Pradesh have been a livelihood option for the tribals from time immemorial Bhatia *et al.*(2010). Similipal Biosphere Reserve (latitude $20^0$17' to $22^0$34'N and longitude $85^0$40' to $87^0$10'E) is located in the central part of Mayurbhanj, which is predominantly a tasar growing district of Odisha. The biosphere is surrounded by West Midnapur and West Singbhum districts of West Bengal and Jharkhand at its North-East and North-West respectively, Balasore and Keonjhar district at its East and South-West. It is a part of Chotanagpur plateau with an altitude ranging from 40 to 1166 m ASL and the average temperatures ranges between minimum 2°C in winter to a maximum of 48°C in summer having average rain fall 2200 mm. The biosphere consists of tropical semi-evergreen forest, tropical moist deciduous forest, and dry deciduous with high density of *Shorea robusta* (Sal). The faunal diversity of the bioreserve includes 55 species of mammals, 304 species of birds, 60 species of reptiles, 21 species of amphibians and 38 species of fishes Dutta *et al.* (2009).

The biosphere is also a natural abode for number of economically important wild tasar ecoraces of immense commercial value. Modal, Nalia, Jataand Bogai are the common wild tasarecoraces found in and around Similipal Biosphere Reserve. Unfortunately, the rich wild tasar silkworm biodiversity of Similipal is facing unparallel threat of extinction from their natural habitat due to environmental degradation and other related issues. The alarming decline in ecoraces natural multiplication is hampering due to rampant collection, rapid deforestation and industrialization of their natural habitats Sinha *et al*. (1994) and Nayak *et al*. (2000). Therefore, the present study was undertaken to generate information on the diversity of wild tasar ecoraces of Simlipal particularly with reference to the commercial characters of cocoon and associated traits. Information generated from the study may be useful for future breeding or conservation programme of these economically important insects.

Materials and Methods

Wild tasar cocoons like modal, jata, Nalia and Bogai were randomly sampled from different villages of the areas like *viz*. Thakurmunad, Sarat, Kendujuani, Bangriposi and

Jhargram etc (Fig. 1) comes both under buffer and peripheral areas of Similipal Biosphere Reserve in Mayurbhanj district of the state Odisha. Sampling Sites were selected based on the prevalence and abundance of tasar host plants and tribal tasar cultivators. During the survey, officials of the state at different tasar rearers societies and tribal rearers were also interacted for collection of primary data and other information.

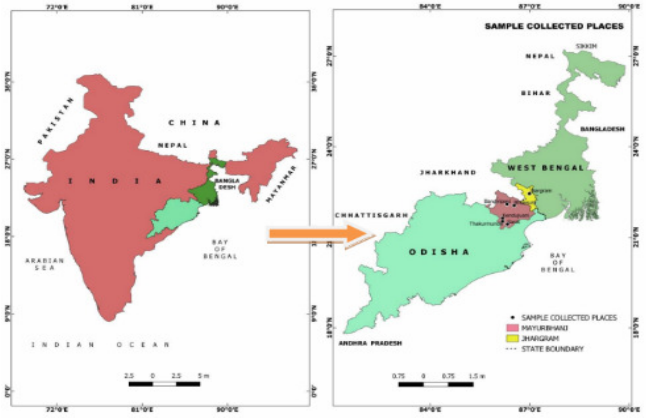

Fig. 1 : Cocoon sampling areas under the study

The collected cocoons were kept separately at Regional Tsar Research Station; Baripada in disinfected wire mesh cages (size 2×2×2 ft) for moth emergence and further studies. The longest axis of a cocoon was taken as length, while width was considered at the widest section of the cocoon perpendicular to its length and measured by using Vernier callipers. While peduncle length and its ring diameter was recorded as per standard procedure.

Fig. 2: Vernier calliper measuring device for cocoon measurement.

Further weight of the cocoons and cocoon shell were recorded in terms of grams by using standard Electronic Balance of Citizen-make. The Shell Ratio is calculated by using the following formula:

$$\text{Shell Ratio} = \frac{\text{Weight of cocoon shell}}{\text{Weight of cocoon}} \times 100$$

Details of sampling site along with their geographical coordinates and host plant type along with the availability of particular eco races are depicted in Table: 1

Table 1: Particulars of cocoon sampling areas:

Localities	Geographical Coordinates		Soil type	Host Plant	Name of the collected ecoraces		
	latitude ^{0}N	longitude ^{0}E					
Sarat	21.44	86.33	Red loamy	*Shorea robusta*	Modal	Nalia	-
Thakurmunda	21.52	86.18	Red loamy	*Shorea robusta&Terminalia tomentosa*	Modal	Nalia	Jata
Kendujuani	21.62	86.17	Red loamy	*Terminalia tomentosa*	-	-	Jata
Bangiriposi	22.06	86.53	Red loamy	*Terminalia arjuna*	Bogai	-	-
Jhargram	22.27	86.59	Red loamy	*Shorea robusta*	Modal	-	-

Results and Discussion

Geographically isolated population adapted themselves in a particular ecololgical conditions can be termed as ecoraces. Odisha is known for presence of 5 ecoraces namely Modal, Nalia, Daba, Sukinda and Bogai additionally presence of Boudh and Omarkote has also been reported by some other authors. Among the ecoraces Modal was found to be the best with regard to the commercial cocoon characters. Most of the cocoon and associated parameters like Cocoon length 5.40 (5.23-5.48 cm), breadth 3.47 (3.42-3.50 cm), Cocoon volume 30.03 (29.20-31.10 cc), Single cocoon weight 15.57 (13.48-18.48 g), Single shell weight 3.22 (2.90-3.52 g) and Silk ratio 20.80 (19.11-21.52%) was found higher when compared to all other ecoraces. While Nalia is having longest peduncle 11.01 (10.07-11.98 cm) compared to all other ecoraces. Similar results were reported by earlier authors also while presenting the appraisal of wild tasar ecoraces of simlipal biosphere reserve Khasrualam *et al.* (2020). Jata which is another prominent wild tasar ecorace shown tremendous potential in its commercial cocoon characters recording cocoon length, breadth, cocoon volume, single cocoon weight, single shell weight and Shell ratio (5.49 cm, 3.54 cm, 29.35 cc, 12.12 g, 2.07 g and 17.36 %) respectively. However, Bogai which is considered to be the variant of the original Modal was found to be comparatively low performer with respect to important cocoon parameters like cocoon length, breadth, cocoon volume, single cocoon weight, single shell weight and Shell ratio (4.66 cm, 2.95 cm, 18.10 cc, 10.13 g, 1.57 g and 15.58%). Even though Bogaiecorace was found to be relatively inferior in cocoon and associated parameters but it is preferred highly by the tasar rearers because of its disease freeness and reliability. But interestingly all these commercially important cocoon characters were found to be significantly different from each other which constitute the genetic variability for further commercial exploitation. Variability exhibited by all these ecoraces may be attributed due to their geographical isolation and adaptation to the particular ecological conditions for their physiological, biological, behavioural and genetical requirements Thangavelu *et al*. (2000). The present study corroborates with many other earlier studies which highlighted the effect of environmental conditions on the variability of tasar cocoons shape, size, peduncle length, shell weight and cocoon weight etc Nayak *et al.*(2000) and Jolly *et al*. (1979).

Table 2: Details of the cocoon and associated parametrs of wild Tasar Ecoraces

Ecoraces	Cocoon Length (cm)	Cocoon Breadth (cm)	Cocoon volume (cc)	Peduncle Length (cm)	Ring diameter (cm)	SCW (g)	SSW (g)	SR%
Modal	5.40	3.47	5.57	0.97	30.03	15.57	3.22	20.80
Nalia	5.20	3.26	11.01	0.86	20.73	13.83	2.45	17.83
Jata	5.49	3.54	5.17	0.85	29.35	12.12	2.07	17.36
Bogai	4.66	2.95	5.97	1.02	18.10	10.13	1.57	15.58
CD @ 5%	**0.47**	**0.36**	**0.82**	**0.09**	**1.63**	**2.77**	**0.32**	**1.85**
CV%	**5.87**	**7.13**	**7.69**	**6.26**	**4.32**	**13.90**	**9.00**	**6.71**

SCW= Single cocoon weight, SSW= Single Shell Weight and SR= Silk Ratio

The present study indicated that considerable and significant variations exist between and among the wild tasar ecoraces of Similipal. The same can be substantiated by the present findings as well as earlier studies on variability of tasar ecoraces and their diversity Thangavelu (1991) Suryanarayana *et al*. (2005) advocating the pattern of expression of phenotypic traits mainly because of the response to environmental effects. Since, these precious genetic resources are facing threat of extinction; they must be thoroughly studied in order to have a conservation plan. Forest conservation needs basic information on ecology, environmental factors, climatology, flora, fauna and their inter-relationship in the proposed site, while the life cycle, reproductive biology, voltinism and population dynamics of tasar insect of the ecozone reveal their critical requirements. The commercial attributes of the insects and their variability in the offered eco-climatic condition suggests their biotic and economic potential. Insects have highly organized sensory and neuro-motor systems more comparable to those of vertebrates and the interactions between insects and plants in case of herbivorous insects, or hosts for parasitic insects are often called co-evolutionary Carlsson *et al*. (2005). They respond to altered conditions by genetic change and this heterogeneity or elasticity within insect species allows persistence to efficiently face the environmental change Edward *et al*. (2002) Kakatia and Chutia (2009). Thus, the present study has come out with basic information on three important ecoraces of Similipal which need to be conserved for posterity. Earlier, Hansda *et al*. (2008) and Ojha *et al*. (2009) have tried to stabilize Jata ecorace ex situ at Ranchi condition, but the ecorace could not be perpetuated over time. Hence, it is very important to conserve the gene pool in its natural habitat and the present study finds its importance to this.

Conclusion

Though the tropical tasar silkworm has 44 ecoraces, yet very few are domesticated; and larger commercial potential is yet to be explored. Owing to habitat fragmentation, rampant collection of cocoons from natural habitat and many other anthropogenic activities all these valuable wild tasar ecoraces are facing severe challenges of extinction. In the present study considerable and significant variations are recorded in the cocoon characters of wild tasar ecoraces of Similipal. These differences are the genetic treasure which can effectively be used for development of new breeds and also to formulate suitable strategy to conserve this valuable insect.

Fig. 3: Representation of different Tasar cocoons

Authors contribution

1. **Kasru Alam:** Concieved, Conceptualized, Investigation, evaluation and original draft
2. **Raviraj VS:** Data analysis and manuscript editing
3. **P.K. Kar:** Critical analysis of manuscript and editing
4. **Satadal Chacroborty:** Evaluation assistance and cross examinations

References

Bhatia, N.K.; Bhat, M.M.; Khan, M.A. (2010). Tropical Tasar: Utilization and conservation of natural resource for tribal development. *The Bioscan.,* 187-198 (2010).

Carlsson, L. and Berkes, F. (2005). Co-management: Concepts and methodical implications. *J.Environ. Manage*., 75: 65-76.

Dutta, S.K.; Nair, M.V.; Mohapatra, P.P. and Mahapatra, A.K. (2009). Amphibians and Reptiles of Similipal

Biosphere Reserve. *Regional Plant Research Centre, Bhubaneswar, Orissa*, 174.

Edward, F.; Connor, E.F.; Hafernik, J.; Levy, J.; Moore, V.L. and Rickman, J.K. (2002). Insect conservation in an urban biodiversity hotspot: The San Francisco Bay area. *J. Insect Conserv.*, 6: 247-259.

Gaviria, D.A.; Aguilar, E.; Serrano, H. and Algeria, A.H. (2006). DNA fingerprinting using AFLP markers to search for markers associated with yield attributes in the silkworm, *Bombyx mori*. *Journal of Insect Sciences,* 6(5): 1-10.

Hansda, G.; Manohar, R.R.; Sinha, M.K.; Ojha, N.G. and Vijaya, N.B. (2008). Ex situ stabilization and utility prospects of Jataecorace of tropical tasar silkworm *Antheraea mylitta* Drury. *Int. J. Indust. Entomol.* 17: 169-172.

Jolly, M.S.; Sen, S.K.; Sonwalker, T.N. and Prasad, G.K. (1979). Non Mulberry Silks, FAO Agri, Ser. Bulb 29, United Nations, Rome.

Kakati, L.N. and Chutia, B.C. (2009). Diversity and ecology of wild sericigenous insects in Nagaland, *India. Trop. Ecol*., 50: 137-146.

Khasru, A.; Debjoy, B.; Kumar, P.; Bhuimali, A. and Saha, S. (2020). Wild Tasar Ecoraces of Simlipal Biosphere Reserve Odisha- an appraisal. Liberal Arts, Humanities & Technology in Digital Age: Few Selected Topics edited by P.K. Paul, A. Bhuimali, K.S. Tiwary and B. Satpathy published by New Delhi Publishers, New Delhi.

Nayak, B.K.; Dash, A.K. and Patro, K.B.G. (2000). Biodiversity conservation of wild tasar silk moth *Antheraea paphia*L. of Similipal biosphere reserve and strategy for its economic utilization. *Int. J. Wild Silk moth Silk*, 5: 367-370.

Ojha, N.G.; Reddy, R.M.; Hansda, G.; Sinha, M.K.; Suryanarayana, N. and Vijaya, N.B. (2009). :Status and potential of Jata, a new race of Indian tropical tasar silkworm (*Antheraea mylitta* Drury). *Acad. J. Entomol.*; 2: 80-84.

Sinha, A.K.; Sinha, R.K.; Goel, A.K.; Sinha, B.R.R.P. and Thangavelu, K. (1994). Proc. Conf. on Cyto. and Genet. 4: 7-16.

Suryanarayana, N. and Srivastava, A.K. (2005). Monograph on tropical tasar silkworm. Central Tasar Research and Training Institute, Ranchi, India pp. 134.

Thangavelu, K. (1991). Wild sericigenous insects of India. A need for conservation. –Wild Silkmoths, Tsukuba: 71-77(1991).

Thangavelu, K.P.; Srivastava, K. and Srivastava, A.K. (2000). Management of Tropical tasar silkworm and host plant; In proceedings of National Workshop on Management of Sericultural Germplasm for posterity. Pp 72-90 Central Sericultural germplasm Resource Center, Hosur, India, 26-27.