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Effect of Altitude on some Growth Parameters of Cocoons of *Antherae paphia* Linn. (Lepidoptera: Saturniidae).

Mohanty Rashmita¹ and Dash Amulya Kumar^{2*}

¹Department of Bioscience and Biotechnology, Fakir Mohan University, Balasore, Odisha, India.

Email: mohantyrashmita213@gmail.com

²Department of Zoology, Jhadeswar Science College, Balasore-756056, Odisha, India.

Email: amulyakdash@gmail.com

ABSTRACT

Different growth parameters of cocoon of *Antherae paphia* Linn. grown in different altitudes were studied. It was observed that the length of peduncle of cocoon grown in lower altitude was highest followed by medium and higher altitude. But the thickness of peduncle, loop and shell of cocoon collected from higher altitude was highest. Similarly the weight of peduncle, loop, cocoon and shell procured from higher altitude was highest in comparison to cocoons of medium and lower altitude. The differences in different aspect of growth parameters of the cocoons grown in three altitudes revealed significant differences. The lowest growth in length observed in cocoons of higher altitude might be due to its adaptive feature and also to resist against mechanical shock during high speed of wind at higher altitude. Similarly the highest thickness of peduncle, loop and shell of cocoons endemic in higher altitude indicates its better adaptability to different detrimental ecological parameters. The higher thickness of shell of cocoons grown at higher altitude not only provides adaptive values but also are superior in terms of silk content of the cocoon for which the local tribes have greater fascination for collecting those cocoons as seed cocoon and use it for growing the tasar crop of *A.paphia* called Bogeï locally.

KEYWORDS: Altitude, growth, cocoon, *A.paphia*, peduncle, loop, shell

***Corresponding author:**

Amulya Kumar Dash

Department of Zoology, Jhadeswar Science College,

Balasore-756056, Odisha, India.

Email: amulyakdash@gmail.com

INTRODUCTION

Antherae paphia Linn. is a wild tasar silk insect endemic in high altitude Sal (*Shorea robusta* L.) forests of Mayurbhanj district. The population of species is distributed in different Sal forests located at different altitudes. They primarily feed on Sal leaf and multiplies its population in the nature. The Sal forests of Mayurbhanj district are located at different altitudes of the mountain regions. The voltinism of the species varies in different altitudes and it behaves as univoltine within the altitudes 601-1000 mASL¹. Very few literatures are available on this species which includes oviposition behavior², taxonomic status³, cocoon morphology⁴, crop performance⁵, moth morphology⁶, reproduction⁷, grainage⁸ etc. But no literature is available on effect of altitude on different growth parameters of *A.paphia*. Hence the current study was taken up on different morphological parameters of cocoons growing naturally in different altitudes.

MATERIALS AND METHODS

During summer season the nature grown cocoons of *A.paphia* were collected at random from three different altitudinal zones, i.e. lower altitude(100-300mASL), medium altitude(301-600mASL) and higher altitude(601-1000mASL). The collected cocoons from Sal forest of Mayurbhanj district of Orissa were kept separately in wiremesh boxes in a grainage house. Out of the each lot of cocoons, 1000 cocoons were taken at random in order to measure their morphological characters. The main morphological character considered for study were length, thickness and weight of peduncle, diameter, thickness and weight of loop, diameter, length and weight of cocoon and thickness with weight of shell. Then statistical calculations were carried out in order to find out the mean values and standard deviation of cocoons collected from three altitudinal zones. Subsequently ANOVA test was done to study the interaction of altitudinal variation of different morphological parameters of the cocoons. Further the test of significance was determined by carrying out 't' test and ANOVA test.

RESULTS AND DISCUSSION

The morphological data such as length, thickness and weight of peduncle, diameter, thickness and weight of loop, length, diameter and weight of cocoon as well as thickness along with weight of the shell of the cocoons collected from three altitudinal zones are presented in Table 1. It was observed that the length (cm), thickness(cm) and weight(gm) of the peduncle of cocoons of lower altitude were 6.37 ± 0.14 , 0.23 ± 0.01 , 0.11 ± 0.02 respectively. Similarly the value of diameter(cm), thickness(cm) and weight(gm) of loop of cocoons of lower altitude sequentially were 0.56 ± 0.01 , 0.11 ± 0.01 and

0.10±0.01. The morphological parameters such as length(cm), diameter(cm) and weight(gm) of cocoons of lower altitude were 4.43±0.12, 2.71±0.09 and 11.28±0.37 in the order given. In lower altitude the thickness and weight of shell was 0.19±0.02 and 2.67±0.13.

Altitude (m ASL)	Peduncle			Loop			Cocoon			Shell	
	L	T	W	D	T	W	L	D	W	T	W
	(cm)	(cm)	(gm)	(cm)	(cm)	(gm)	(cm)	(cm)	(gm)	(cm)	(gm)
100-300	6.37 ±0.14	0.23 ±0.01	0.11 ±0.02	0.56 ±0.02	0.11 ±0.01	0.10 ±0.01	4.43 ±0.12	2.71 ±0.09	11.28 ±0.37	0.19 ±0.02	2.67 ±0.13
301-600	5.21 ±0.21	0.31 ±0.02	0.16 ±0.02	0.82 ±0.01	0.15 ±0.02	0.13 ±0.02	5.36 ±0.21	3.56 ±0.11	14.64 ±0.43	0.24 ±0.01	3.12 ±0.12
601-1000	4.06 ±0.14	0.42 ±0.02	0.19 ±0.01	0.99 ±0.03	0.18 ±0.02	0.16 ±0.01	5.87 ±0.32	4.05 ±0.13	16.76 ±0.29	0.31 ±0.01	3.67 ±0.09

TABLE 1: Morphometry ($\bar{x} \pm SD$) of cocoons of *Antheraea paphia* Linn. grown at different altitudes

The measurement of growth in length, thickness and weight of peduncle of cocoons of medium altitude were recorded. It was found to be 5.21±0.21, 0.31±0.02 and 0.16±0.02 respectively. Also the morphometry of diameter, thickness and weight of loop of cocoon were sequentially found to be 0.82±0.01, 0.15±0.02 and 0.13±0.02. The growth of cocoons of medium altitude in terms of length, diameter and weight were also recorded. The values were 5.36±0.21, 3.56±0.11 and 14.64±0.43 respectively. The measurement of thickness and weight of shell of the cocoons procured from middle altitude were 0.24±0.01 and 3.12±0.12.

The cocoons collected from higher altitude were subjected to morphometry in terms of length of peduncle and cocoon, weight of peduncle, loop, cocoon and shell along with the diameter of cocoon. Also the thickness of peduncle, loop and shell were measured separately. It was found that the length, thickness and weight of peduncle of cocoon were 4.06±0.14, 0.42±0.02 and 0.19±0.01 respectively. The length, diameter and weight of those cocoons were found to be 5.87±0.32, 4.05±0.13 and 16.76±0.29 respectively. Similarly the thickness and weight of the shell of cocoons of higher altitude were 0.31±0.01 and 3.67±0.09.

The comparative study of different morphological parameters of cocoons of lower, medium and higher altitude was carried out. It was observed that the length of peduncle was highest (6.37 ± 0.14) in cocoons of lower altitude followed by medium and higher altitude. But the comparison of thickness of peduncle, loop and shell of cocoons of higher altitude was highest (0.42 ± 0.02 , 0.18 ± 0.02 , 0.31 ± 0.01) followed by the cocoons of medium and lower altitude. The weight of peduncle, loop, cocoon and shell of cocoons obtained from higher altitude was found to be highest (0.19 ± 0.01 , 0.16 ± 0.01 , 16.76 ± 0.29 , 3.67 ± 0.09) in comparison to cocoons of medium and lower altitude. The statistical analysis was carried out taking each parameter into consideration in order to verify the level of significance of recorded values. The 't' test indicated that the length of peduncle and cocoon was significantly ($p < 0.05$) different from that of the values of length of cocoons of medium and higher altitude. Similarly the parameter like thickness of peduncle, loop and shell was significantly ($p < 0.05$) highest in case of cocoon of higher altitude as revealed by the 't' test. Further the statistical analysis based on 't' test of weight of peduncle, loop, cocoon and shell was significantly ($p < 0.05$) different in case of cocoons of lower, medium and higher altitude.

The ANOVA test also indicated significant ($p < 0.01$) interaction among each parameter of the cocoons collected from 3 altitudes. The two way ANOVA also indicated significant ($p < 0.01$) interaction between different morphometrical parameters and altitudes.

The analysis of recorded data on different parameters of cocoons collected from different altitudes showed wide fluctuation. The lowest length noticed in case of cocoon of higher altitude might be due to its adaptation to resist against excessive mechanical shock during high speed of wind occurring at higher altitude. The earlier investigations^{4,9,10} indicated similar observation in case of cocoons of *A. mylitta*. The highest thickness seen in respect of peduncle, loop and shell of cocoons of higher altitude might be due to its better adaptation to several detrimental ecological factors happening at higher altitude. The cocoons of *A. paphia* grown at higher altitude were found to have highest value in respect of thickness of peduncle, loop and shell. It might be for better adaptation of the species and especially more protection needed for the pupa living inside the cocoons. Similar observations were recorded by other workers also in case of *A. mylitta*^{11,12}.

The shorter length of peduncle and higher diameter of loop of cocoon indicates its adaptation to resist against high velocity of wind occurring at higher altitude. It will cause less movement of cocoon with less mechanical stress during high speed of wind in comparison to the cocoons of lower altitude having longer length of peduncle and less diameter of loop. The higher thickness of shell of cocoon grown at higher altitude not only provides adaptive features but also supports the economic aspect of the cocoon as because it contains more silk. For this reason the local tribes are interested to collect cocoons of higher altitude of *A.paphia* grown naturally in Sal forest. Besides it is also given first preference for purpose of grainage activities conducted for the autumn crop when the eggs obtained from those cocoons are utilized for cultivating the cocoon crop called Bogei raised at lower altitude. Similar findings were also reported by some earlier authors^{5,10,13,14}.

Further it is reported that the tribal farmers growing cocoon crops have greater fascination for Bogei crop because of its greater resistance to storm and rain occurring during autumn season in comparison to the crops of semi domesticated *A. myllita*. But it is a matter of regret to mention that the farmers face acute shortage of seeds(eggs) necessary for the Bogei crop of *A.paphia*^{9,14,15}.

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