Research Paper

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Developmentof fifth instar female larva ofAntheraea mylitta D.(Saturniidae) ondifferent food plants atdifferentaltitudes during rainy season

Zoology

KEYWORDS : Antheraea mylitta, fifth instar, food plants, altitude, rainy

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ABSTRACT

Antheraea mylitta Drury, theIndian tropical tasar silk insect is polyphagous in nature and feeds on a number of food plants available in the natural forests. The fifth instar larva is the most crucial stage for growth and post larval life of the insect. So, the growth parameters like length, breadth and weight of fifth instar female larva were evaluated in the rearing fields at, Mayurbhanj, Odisha, India duringrainy season at different altitudes. Significantly the highest values of growth parameters were recorded in case of the larvae raised on Sal (Shorea robusta Gaertn) food plant at all the altitudes during rainy season. In view of comparatively superior performance of all the growth parameters of the mature female larva, the eight species of food plants considered for study were graded in the order Sal> Asan > Arjun > Ber > Sidha > Dha > Bahada >Jamun.

Introduction

Antheraea mylitta Drury is a semi-domesticated foliovore species that feeds on a variety of food plants, such as Asan (*Terminalia alata* W. & A.), Arjun (*Terminalia arjuna* W. & A.), Sal (*Shorea robusta* Gaertn), Ber (*Ziziphus jujube* Gaertn), Sidha (*Lagerstoemia parviflora* Roxb.), Dha (*Anogeissus latifolia* Wall.), Bahada (*Terminalia belerica* (Gaertn) Roxb.) and Jamun (*Syzygium cumini* (L.) Skeels). But as a general practice Asan and Arjun are considered as the important food plants for rearing of the larva of *A. mylitta*. However, huge population of Sal, Ber, Sidha, Dha, Bahada and Jamun are available in natural forests located at different altitudes. These food plants can be exploited sustainably by the local tribes for rearing of larva of *A. mylitta*. Since these insects are reared under natural conditions in open rearing fields located at different altitudes in hilly districts, studies on its growth ecology in different food plants at different altitudes is quite essential to know the suitability of food plants and assess the commercial parameters of tasar culture in each food plant.

Studies have already been made on the cocoon crop performance of *A. mylitta* reared on few more food plants like Ber (*Ziziphus jujube* Gaertn), Sidha (*Lagerstroemia parviflora* Roxb.) and Dha (*Anogeissus latifolia* Wall.) at lower altitude (Dash *et al*., 1992), effect of starvation on larva (Dash *et al*., 1988), evaluation of Novel Tasar Silkworm Feed (Kumar *et al*., 2013), voltinism of *A. mylitta* (Nayak *et al*., 1992), effect of Feeding Trial (Singh *et al*., 2011), comparative Study of the Effect of Different Food Plants (Deka and Kumari, 2013), larval energetics in different food plants (Dash and Dash, 1989 – 90; Dash *et al*., 1996; Dash, 2001). But no literature is available on growth performance of fifth instar larva of *A. mylitta* in different primary and unutilized secondary food plants at different altitudes in different seasons. So the present investigation was taken up to evaluate the growth trend of mature female larva of *A. mylitta* in order to make a proper gradation of the food plants.

Materials and Methods

A number of food plants having identical growth and age were selected at random from each of the eight categories mentioned above for rearing of female larva of *A. mylitta*. The food plants were chosen at three different altitudes i.e. lower altitude (50 – 300 m ASL), medium altitude (301 – 600 m ASL) and higher altitude (601 – 1000 m ASL). The rearing of the larva was conducted during rainy season on each food plant at lower, medium and higher altitudes. The growth of female larva at mature fifth instar stage was evaluated in terms of length (cm), breadth (cm) and weight (g) in each food plant. The data so obtained were subjected to calculation of Mean and Standard Deviation ($\bar{x} \pm$ SD) values for each growth parameter in each type of food plant at different altitudes. Further, for interpretations the data were analyzed by using standard statistical methods like 't' test and ANOVA test (Sokal and Rohlf,1969). By use of the data a graphical presentation was also prepared to study and establish the correlationship of growth tendency between different food plants and altitudes.

Results

At lower altitude during rainy season the growth of fifth instar female larva of *A. mylitta* in terms of length (cm), breadth (cm) and weight (g) was observed to be the highest in Sal food plant followed by Asan, Arjun, Ber, Sidha, Dha, Bahada and Jamun (Table1). The larval growth in length was the highest (11.92 ± 0.05) in case of Sal food plant and the lowest (7.81 ± 0.05) in case of Jamun plant. Similarly, the growth in terms of breadth was noted to be the highest (2.02 ± 0.01) in the female larva reared on Sal and the lowest (1.01 ± 0.02) in Jamun grown larva. The growth in terms of weight was found to be the highest (34.18 ± 0.64) in case of the larva grown on Sal food plant. The lowest larval growth in weight (17.26 ± 0.89) was recorded from the female larva reared on Jamun food plant at lower altitude during rainy season.

The 't' test indicated significant ($p < 0.05$) difference in growth in terms of length, breadth and weight of the mature female larvae raised on different food plants. The ANOVA test showed significant ($p < 0.01$) interaction between the food plants and the growth parameters of fifth instar female larvae reared at lower altitude during rainy season. The gradation of the food plants in terms of performance of growth parameters of larvae of *A. mylitta* during rainy season at lower altitude was in the order Sal> Asan > Arjun > Ber > Sidha > Dha > Bahada >Jamun.

At medium altitude during rainy season, the growth of fifth instar female larva in terms of length (cm), breadth (cm) and weight (g) was also the highest in the Sal food plant followed by Asan, Arjun, Ber, Sidha, Dha, Bahada and Jamun (Table 2). The larval growth in terms of length was observed to be the highest (13.76 ± 0.06) in Sal food plant and the lowest (8.92 ± 0.06) in Jamun food plant. Similarly, the larval growth in breadth was the highest (2.36 ± 0.04) in Sal food plants. This growth value was the lowest (1.01 ± 0.04) in case of the larva reared on Jamun food plant. The growth in terms of weight was the highest (38.54 ± 0.81) in case of the larva raised on Sal food plant and the lowest (19.27 ± 0.83) in Jamun grown larva.

Significant ($p < 0.05$) difference in growth in terms of length, breadth and weight of mature female larvae reared on different food plants was observed from 't' test. The ANOVA test also indicated significant ($p < 0.01$) interaction between the food plants and the growth parameters of fifth instar female larvae raised at medium altitude during rainy season. Considering the overall growth performance of mature female larvae during rainy season at medium altitude the gradation of the food plants was in the order Sal> Asan > Arjun > Ber > Sidha > Dha > Bahada >Jamun.

Likewise, at higher altitude during rainy season, the growth in terms of length (cm), breadth (cm) and weight (g) of fifth instar female larva was recorded to be the highest in Sal food plant followed by Asan, Arjun, Ber, Sidha, Dha, Bahada and Jamun (Table 3). The highest growth in terms of length (15.68 ± 0.06), breadth (2.66 ± 0.02) and weight (43.51 ± 0.82) was observed in case of fifth instar female larva reared on Sal food plant. The larva raised on Jamun food plant exhibited the lowest growth in terms of length (10.04 ± 0.07), breadth (1.21 ± 0.01) and weight (22.29 ± 0.93) at higher altitude during rainy season.

The 't' test indicated significant ($p < 0.05$) difference in all the growth parameters of mature female larvae grown on different food plants. The ANOVA test also showed significant ($p < 0.01$) interaction between the food plants and growth of fifth instar female larva at higher altitude during rainy season. On the basis of comparatively higher values of growth indices of mature female larvae during rainy season at higher altitude, the utilized food plants were ranked as Sal> Asan > Arjun > Ber > Sidha > Dha > Bahada >Jamun.

From the above findings it was observed that the growth of mature fifth instar female larva in terms of length, breadth and weight during rainy season at all the three altitudes was the highest in Sal food plant and the lowest in the Jamun food plant (Fig. 1, Fig. 2 & Fig. 3).

Discussion

Jolly *et al.* (1974) reported superior growth parameters of tasar cocoon crop raised on Sal food plants. Dash *et al.* (1992) recorded superiority of Sal for cocoon crop parameters (weight of cocoon, pupa & shell) at lower altitude during rainy season only, where as superiority of Asan was observed during autumn and winter seasons at the same altitude. In the present study the growth of fifth instar female larva in terms of length, breadth and weight during rainy season at all the three altitudes was observed to be the highest in Sal food plant. This shows the superiority of Sal plant among all the food plants. It might be due to better nutritional supplement obtained from Sal leaf for larval growth which can be confirmed by biochemical analysis of content of foliar nutrients.

The present investigation showed considerable results of larval growth parameters on food plants like Ber, Sidha, Dha and Bahada. Jolly (1966) reported that Asan, Arjun and Sal food plants are of primary importance. But this study indicates consideration of Ber, Sidha, Dha and Bahada for rearing activities of *A. mylitta* larva when there is inadequacy of primary food plants like Asan, Arjun and Sal in the rearing field. Dash *et al*. (1992) reported cocoon crop performance in the food plants such as Asan, Arjun, Sal, Ber, Sidha and Dha only. The present report also indicates encouraging results from the rearing on food plants like Ber, Sidha and Dha, although they are graded as secondary food plants by Jolly (1966). This study further indicates much encouraging growth results on Ber for which it can be also included under primary group of food plants of *A. mylitta,* since the overall performance on it remains very much at par with Arjun and Asan. Here the growth performance on Bahada food plant indicates encouraging results for its utilization at the time of scarcity of food plants. But the larval growth performance was unsuitable in Jamun food plants at all the three altitudes during rainy season which indicates the commercial non viability of this food plant for rearing activities. Further investigation on the above growth parameters at other stages of the insect may be carried out in order to draw complete conclusion.

Tab. 1: Growth ($\bar{x}$ ± SD) of mature fifth instar female larva of *Antheraea mylitta* reared on fferent food plants at lower altitude during rainy season

Food Plants	Length (cm)	Breadth (cm)	Weight (gm)
Asan	11.78 ± 0.03	1.93 ± 0.03	31.76 ± 0.67
Arjun	11.63 ± 0.04	1.89 ± 0.02	29.34 ± 0.72
Sal	11.92 ± 0.05	2.02 ± 0.01	34.18 ± 0.64
Ber	11.54 ± 0.03	1. 84 ± 0.02	24.87 ± 0.63
Sidha	11.04 ± 0.04	1.52 ± 0.03	23.71 ± 0.71
Dha	10.92 ± 0.02	1.45 ± 0.02	21.48 ± 0.54
Bahada	09.96 ± 0.06	1.28 ± 0.01	17.26 ± 0.89
Jamun	07.81 ± 0.05	1.01 ± 0.02	28.53 ± 0.56

Tab. 2: Growth ($\bar{x}$ ± SD) of mature fifth instar female larva of *Antheraea mylitta* reared on different food plants at medium altitude during rainy season

Food Plants	Length (cm)	Breadth (cm)	Weight (gm)
Asan	13.43 ± 0.04	2.23 ± 0.03	36.27 ± 0.92
Arjun	12.98 ± 0.03	2.06 ± 0.02	32.73 ± 0.86
Sal	13.76 ± 0.06	2.36 ± 0.04	38.54 ± 0.81
Ber	12.76 ± 0.03	1.94 ± 0.03	30.92 ± 0.74
Sidha	11.91 ± 0.05	1.58 ± 0.04	27.69 ± 0.68
Dha	11.33 ± 0.04	1.33 ± 0.02	24.66 ± 0.71
Bahada	10.87 ± 0.03	1.18 ± 0.03	22.48 ± 0.62
Jamun	08.92 ± 0.06	1.01 ± 0.04	19.27 ± 0.83

Tab. 3: Growth ($\bar{x}$ ± SD) of mature fifth instar female larva of *Antheraea mylitta* reared on different food plants at higher altitude during rainy season

Food Plants	Length (cm)	Breadth (cm)	Weight (gm)
Asan	5.32± 0.06	2.44± 0.03	1.17± 0.58
Arjun	4.90± 0.04	2.29± 0.02	37.34± 0.63
Sal	15.68± 0.06	2.66± 0.02	43.51± 0.82
Ber	13.46± 0.05	2.08± 0.03	34.68± 0.74
Sidha	12.93± 0.03	1.72± 0.04	30.72± 0.51
Dha	12.49 ± 0.04	1.54± 0.01	28.47± 0. 67
Bahada	11.67± 0.06	1.43 ± 0.02	26.63± 0. 76
Jamun	10.04 ± 0.07	1.21 ± 0. 01	2.29 ± 0.93

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Fig.1 : Growth in length (cm) of mature fifth instar female larva of *A. mylitta* reared on different food plants at different altitudes during rainy season

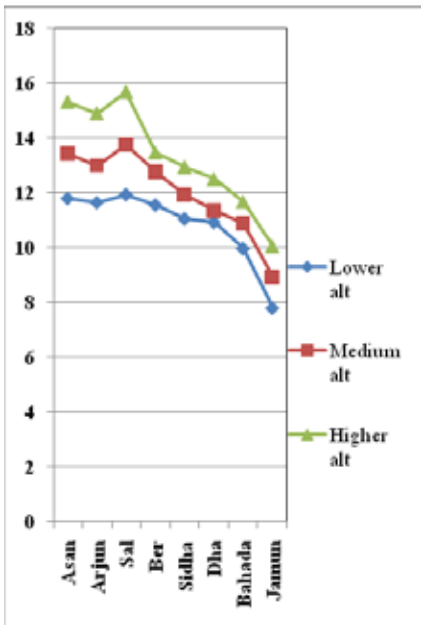


Fig. 2: Growth in breadth (cm) of mature fifth instar female larva of *A. mylitta* reared on different food plants at different altitudes during rainy season

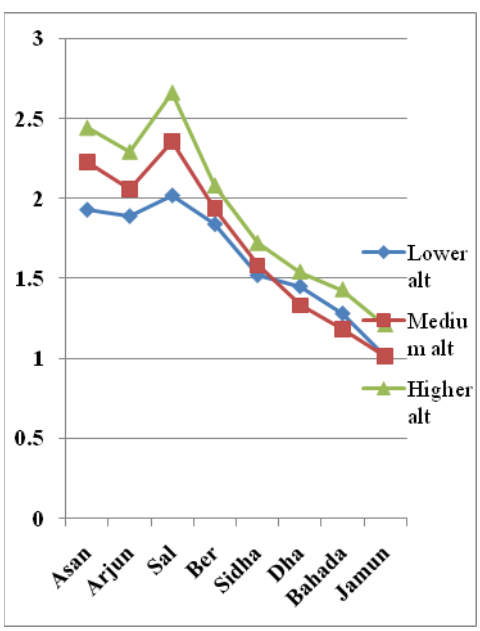
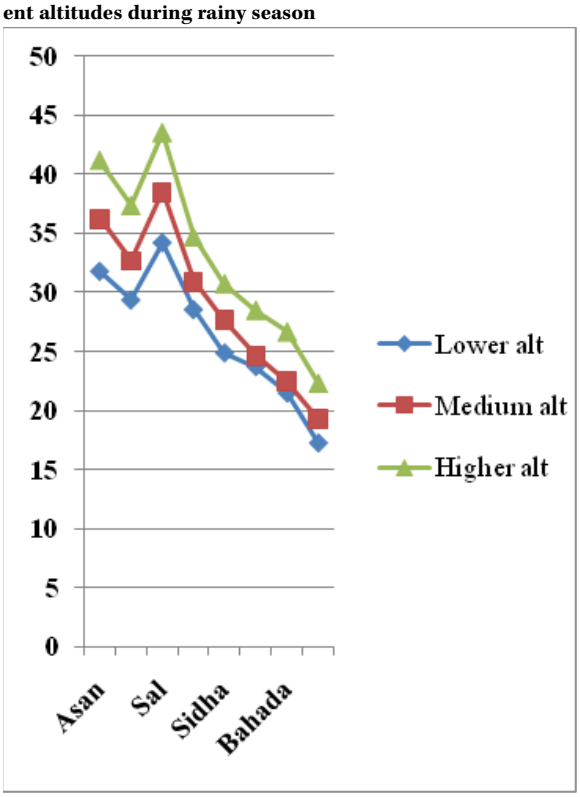


Fig. 3: Growth in weight (g) of mature fifth instar female larva of *A. mylitta* reared on different food plants at different altitudes during rainy season



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