



## International Journal of Biology Sciences

ISSN Print: 2664-9926  
ISSN Online: 2664-9934  
Impact Factor: RJIF 5.45  
IJBS 2022; 4(2): 175-177  
[www.biologyjournal.net](http://www.biologyjournal.net)  
Received: 18-09-2022  
Accepted: 19-10-2022

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# Population levels of grub and adult of *D. Ater* at different locations of cocoon Market/Grainage in Tamil Nadu

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### Abstract

Investigations were carried out to study the dermestid beetles associated with silkworm grainages in different locations of Tamil Nadu during 2015-2016. As a part of the study, initial surveys were carried out in various government grainage centres of western and northern zones of Tamil Nadu and the observations indicated that the higher percentage of *Dermestes ater* incidence ranged from 5 to 10% in Dharmapuri and Hosur districts respectively. Adult population was found higher in both top layers of Pure Mysore (10.8%) and CSR2 (10.5%) cocoons and the grub population was higher in bottom layers of Pure Mysore (75.4%) and on CSR2 cocoons (60.3%) while stored in gunny bags.

**Keywords:** *Dermestid ater*, grainage and pure races

### Introduction

Sericulture is both an art and a science of raising silkworms for silk production. It is a farm-based, labour intensive and commercially attractive economic activity. In India a loss of about 20% of the silk production was recorded in a Mysore grainage (Thiagarajan and Govindaiah, 1987) [6]. The major cause of the loss was the feeding activity of the larvae, which bored into the cocoons in order to feed on the pupae and thus rendered the cocoons unfit for reeling. The most important losses to the sericulture industry are undoubtedly due to the habit of dermestid grubs boring through the cocoons in order to feed on dead (or) injured pupae, thus rendering cocoons unfit for reeling. Among various natural enemies which pose threat to silk production, the dermestid beetles are of particular importance. The dermestids mainly damage stifled and stored cocoons, raw silk and silk fabrics in stores. In grainages, the dermestids damage live cocoons kept for production of new generation of moths, seed (silkworm eggs) and live caterpillars (Vijayveer and K.M. Rao, 1996). Immature carpet beetles feed on dried animal products such as wool, silk, felt, hair, fur, feathers and dead animals. Dermestids are among very few insects that produce enzyme keratinase, which allows them to digest Keratin, the protein in animal hair. For managing the dermestid beetles several management methods viz., cleanliness, wire-mesh barriers have been suggested earlier (Geetha Bai and Mahadevappa, 1994) [2].

### Materials and method

Periodical surveys were carried out during the month of October to December (2015) at Government Cross Breed (GCB) grainages viz., Coimbatore (GCB), Erode (GCB), Sogathur (GCB), Krishnagiri (GCB), Dinnur (GCB) and Vaniyambadi (GCB) and Central Silk Board (CSB) grainages viz., Dharmapuri (CSB) and Hosur (CSB) of Tamil Nadu. The population levels of *D. ater* grub and adult in moth emergence room of different grainages viz., Dharmapuri, Krishnagiri, Hosur and Vaniyambadi. The population level of *D. ater* adult in different layers of pierced cocoons (ten days stored) gunny bags on bivoltine (CSR2) and multivoltine (Pure Mysore) races.

### Results

#### Population levels of *D. ater* grub and adult in different layers of gunny bags in Multivoltine (PM) and Bivoltine (CSR2)

The population level of *D. ater* adult in different layers of pierced cocoons (ten days stored) gunny bags on bivoltine (CSR2) and multivoltine (Pure Mysore) races

inferred that the adult population was higher on the top layers of gunny bag, however the grub population was higher in bottom layers in both races. Top zone (45 cm) recorded 10.5 and 10.8 adult population for CSR2 and Pure Mysore respectively. In CSR2 stored gunnies, the adult population recorded in between middle and bottom layers was 6.3 and 6.8 adults respectively. Similar trend was noticed on CSR2 stored in the gunnies with 6.8 and 7.6 adult populations.

The grub population of *D. ater* was recorded to be higher in bottom layers irrespective of the races. A density of 60.3

and 75.4 grubs were recorded in CSR2 and Pure Mysore. Least grub population level was registered in the middle layer of gunny bags. In the middle layer, CSR2 recorded 14.31 grubs against 19.54 in the top layer.

In Pure Mysore, middle and top layers showed mean population of 17.21 and 24.32 grubs respectively while in CSR2 a marginal increase in the grub population between top and middle layer. The order of distribution of adult population in stored structure was in the decreasing order of top < bottom < middle. The distribution of grub population was in increasing order from bottom to top layers (Table 1).

**Table 1:** Population level of *D. ater* in different layers of gunny bags in Multi voltine race (Pure Mysore) and Bivoltine race (CSR2)

Different layers in gunny bags	*Adult (numbers present on each layer)		*Grub (numbers present on each layer)	
	Pure Mysore (PM)	CSR2	Pure Mysore (PM)	CSR2
Top	10.5	10.8	17.21	24.32
Middle	6.3	6.8	14.31	19.54
Bottom	6.8	7.6	60.3	75.4

\*Mean of three observations

### Population levels of *D. ater* grub and adult in Multivoltine (Pure Mysore) and Bivoltine (CSR2) room at different locations

The population levels of *D. ater* grub and adult in moth emergence room of different grainages viz., Dharmapuri, Krishnagiri, Hosur and Vaniyambadi revealed a higher level of damage to Pure Mysore than that of CSR2 cocoons. The population levels of *D. ater* adult in CSR2 was ranged from 130.1 to 185.3 / m<sup>2</sup> whereas the grub population was noted to be 8.1 to 29.4 grubs/ m<sup>2</sup>. The population level of adult was higher in Krishnagiri (185.1/ m<sup>2</sup>) followed by Vaniyambadi (160.3/ m<sup>2</sup>), Dharmapuri (148.2/ m<sup>2</sup>) and

Hosur (130.1/ m<sup>2</sup>) locations. The population levels of grub was higher with a mean of 29.4/ m<sup>2</sup> in Hosur followed by Dharmapuri (23.21/ m<sup>2</sup>), Vaniyambadi (15.3/ m<sup>2</sup>) and Krishnagiri (8.12/ m<sup>2</sup>).

The population levels of adult dermestid beetles on CSR2 ranged from 69.34 to 90.21/ m<sup>2</sup> and it was recorded to be a minimum (69.34/ m<sup>2</sup>) in Hosur followed by Krishnagiri (74.31/ m<sup>2</sup>), Vaniyambadi (81.3/ m<sup>2</sup>) and Dharmapuri (90.21/ m<sup>2</sup>) locations. The grub population was noticed to be minimum in Dharmapuri (9.13/ m<sup>2</sup>), Krishnagiri (12.54/ m<sup>2</sup>), Vaniyambadi (15.18/ m<sup>2</sup>) and Hosur (17.21/ m<sup>2</sup>) areas (Table 2).

**Table 2:** Population level of *D. ater* adults and grubs in cocoon emergence room in Multivoltine (Pure Mysore) and Bivoltine (CSR2) races

Locations	*Adult (Population/m <sup>2</sup> )		*Grub (Population/m <sup>2</sup> )	
	Pure Mysore (PM)	CSR2	Pure Mysore (PM)	CSR2
Krishnagiri	8.12	12.54	185.1	74.31
Dharmapuri	23.12	9.13	148.2	90.21
Hosur	29.4	17.21	130.1	69.34
Vaniyambadi	15.3	15.18	160.3	81.3

\*Mean of three observations

### Discussion

The dermestid adult population was recorded to be higher in top layers of CSR2 (10.5) and Pure Mysore (10.8) whereas the grub population was more in bottom layers of CSR2 (19.5) and Pure Mysore (24.3) in the gunny bags of both races (Fig 1). The present study is in concordance with the findings of Arulmozhi *et al.* (1999a)<sup>[1]</sup> who reported that the adult population was higher in top layer (10.9) and grub (23.2) population prefer to be in bottom zone.

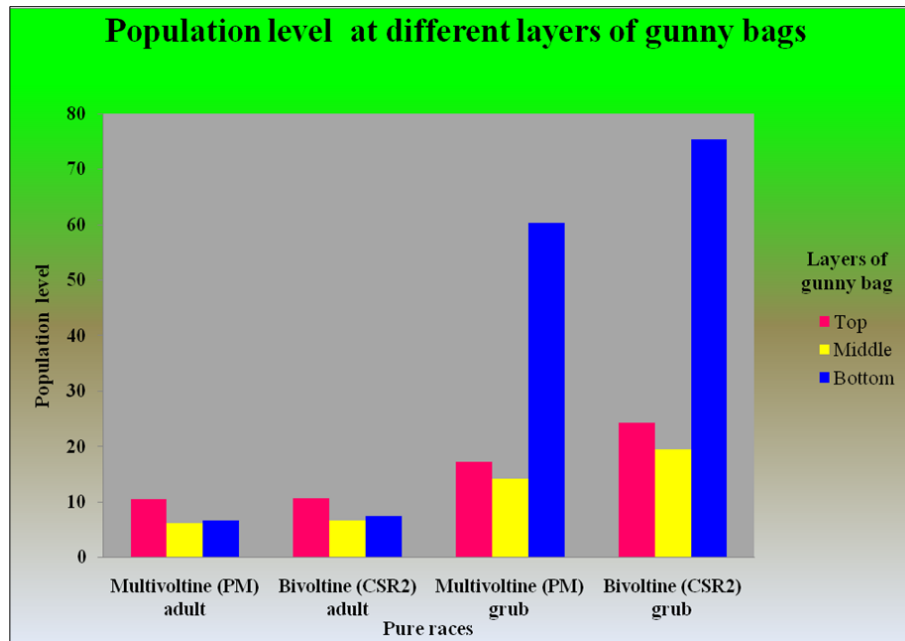
Distribution of storage pests is determined by type of storage, storage structure, inter cocoon space, oxygen and carbon dioxide gradient, light, temperature and relative humidity (Price, 1975)<sup>[3]</sup>. In the biotic factors, organisms associated at the next tropic level also influence the population level. Besides the above tropism exhibited by storage pests plays a major role and is more relevant in respect of dermestid beetles. The adults are positively phototrophic (Mohan *et al.*, 1994) and grubs exhibit negative tropism (Roth and Willis, 1950)<sup>[5]</sup>. This differential

response to tropism might have favoured the colonization of more adults in the top layer and higher population of grub in the lower zone.

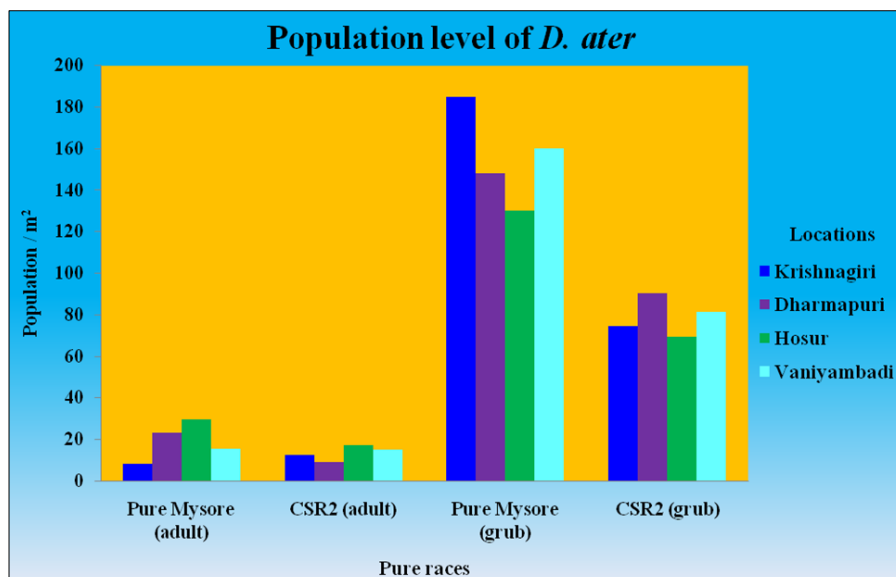
The population levels of adult *D. ater* was higher on CSR2 cocoons in grainages of Krishnagiri (185.1/m<sup>2</sup>) followed by Vaniyambadi (160.3/m<sup>2</sup>) and Dharmapuri (148.2/m<sup>2</sup>) whereas, grub population was lower in Krishnagiri (8.12/ m<sup>2</sup>) followed by Vaniyambadi (15.3/ m<sup>2</sup>), Hosur (17.21/ m<sup>2</sup>) and Dharmapuri (23.21/ m<sup>2</sup>) (Fig 2).

The present finding corroborates with the findings of Arulmozhi *et al.* (1999a)<sup>[1]</sup> who reported that the adult populations in CSR2 race were more in Dharmapuri and Krishnagiri grainages and grub populations were witnessed to be more in Dharmapuri and Hosur.

The findings are in conformity with the findings of Rajashekargouda and Devaiah (1985) that severe incidence was observed on the cocoons having high floss content and the beetles preferred to lay more eggs on the Pure Mysore cocoon than CSR2 cocoon.



**Fig 1:** Population level of *D. ater* in different layers of gunny bags in Multivoltine race (Pure Mysore) and Bivoltine race (CSR2)



**Fig 2:** Population level of *D. ater* adults and grubs in cocoon emergence room in Multivoltine (Pure Mysore) and Bivoltine (CSR2) pure race

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