

## Larval feeding and gallery pattern of a single larva of *Hoplocerambyx spinicornis*, a major pest of Sal, *Shorea robusta*

S. Negi and V.D. Joshi

Department of Zoology, Govt. P.G. College, Kotdwar, Uttarakhand

### Abstract

The present study deals with the quantification of larval feeding and gallery pattern of a single larva of *Hoplocerambyx spinicornis*, a severe pest of Sal, *Shorea robusta*. The larva is the destructive stage. They bore into the bark and then slowly moves inwards and upwards through bast and sapwood. Consumption and digestion of wood by a single larva showed that the third instar larva do the maximum damage to the Sal tree as indicated by the size of frass ejected from the tree. During its life time one larva can eject 30.19g (dry wt.) of frass and fecal matter. In view of damage, the bark, bast and heartwood region are of major importance as the attacks is more intense in these region while sapwood region is only a passage way where the larva do not stay for too long. Thus, the size of the fecal matter is the true indicator of larval instars.

**Keywords:** *Quantification, Single larva, Gallery pattern, Fecal matter*

### Introduction

*H. spinicornis* is a major pest of Sal which causes economic damage to the Sal tree. During the past, several outbreaks have been reported from various parts of the country (Beeson, 1941). The larva of *H. spinicornis* completes its development from 1<sup>st</sup> instars to final instar inside the bole of the tree. During its development the larva makes galleries while feeding into the sapwood and bore into the heartwood. The duration of larval period is influenced by the climatic condition mainly rainfall, humidity and temperature. The duration of larval instars varies from 150-152 days depending upon climatic conditions (Bhandari, 2001). The amount of dust ejected from the ejection hole by one larva during its life cycle was also quantified. By separating the dust and fecal matter ejected through the hole by sieve size of 1m, 1.5m etc. of different dimensions. It is concluded from the above findings that the third instar larvae do the maximum damage to the tree. In case of Sal heartwood borer or stem borers the larvae works inside the wood and molting also takes place inside therefore it is difficult to ascertain the duration and size of the larval instars. The examination of frass or fecal matter is the true indicator of larval instars in such cases.

### Materials and Method

To study the feeding behavior of larval instars freshly cut healthy logs of ½ m long (10 nos.) were kept in rearing cages. Freshly hatched larvae were released into the logs and were reared for one generation. Following the emergence after one year, the size of the emergence hole, larval gallery in wood and bark gallery, pupal chamber size were measured. The amount of frass ejected from the log was also recorded during the period. By considering the mean value of each parameter, standard deviation was also calculated.

## Results and Discussion

The insect exhibits enormous size variation in all the life stages (i.e. adults, larvae and pupae). Thus, according to Roonwal (1977), this is probably due to varying degree of woody nutrition available to the developing larvae inside the host tree. The larva of *H. spinicornis* on hatching is about *ca* 4mm in length and before pupation the length of final instar is *ca* 85 mm in length. The larva complete its development from 1<sup>st</sup> instars to final instar inside the bole of the tree. During its development the larva makes galleries while feeding on the sapwood and bore into the heartwood. The length of the larva is generally 33-61mm, but a well-fed larva may reach up to 90 mm (Muir, 1929). The shape of larval gallery and that of the bark gallery is zigzag (Plate-1). The length of larva depends upon the amount of nutrition available. Nutrients play an important role in maintaining the healthy stand of Sal because nutrients are constantly being added or removed from the ecosystem by artificial or natural process. The shape of larval gallery and that of the bark gallery is zigzag. The size of the larval gallery was  $35.15 \pm 8.75$  cm and that of the bark gallery was  $30.1 \pm 9.76$  cm. The size of the pupal chamber was  $5.38 \pm 0.76$  cm and width was  $1.32 \pm 0.24$  cm the mouth of which is guarded by calcareous operculum (Table. 1). According to Beeson (1919), this calcareous substance is produced by two of the six malphigian tubules; this regurgitated calcareous substance is moulded into a helmet-shaped cap named as operculum, which blocks the mouth of the prepupal chamber. The rest of the larval stage is passed here in quiescent stage and is called the prepupal chamber and which on pupation becomes the 'pupal chamber'. Pupation usually takes place in the month of Feb.-April and the pharate beetle is formed in the month of April-June.

**Table:1 Larval food and gallery pattern in *H. spinicornis***

| Parameters  | Mean  |
|---|---|
| Circumference of log (in cm)                        | $53.67 \pm 2.28$                                    |
| Emergence hole size (in cm)                         | Length $2.39 \pm 0.23$<br>Width $= 1.33 \pm 0.15$   |
| Pupal chamber size (in cm)                          | Length $= 5.38 \pm 0.76$<br>Width $= 1.32 \pm 0.24$ |
| Larval gallery (in cm)                              | $35.15 \pm 8.74$                                    |
| Bark Gallery (cm)                                   | $30.10 \pm 9.76$                                    |
| Weight of dust ejected by one larva in one year (g) | $30.19 \pm 3.99$                                    |

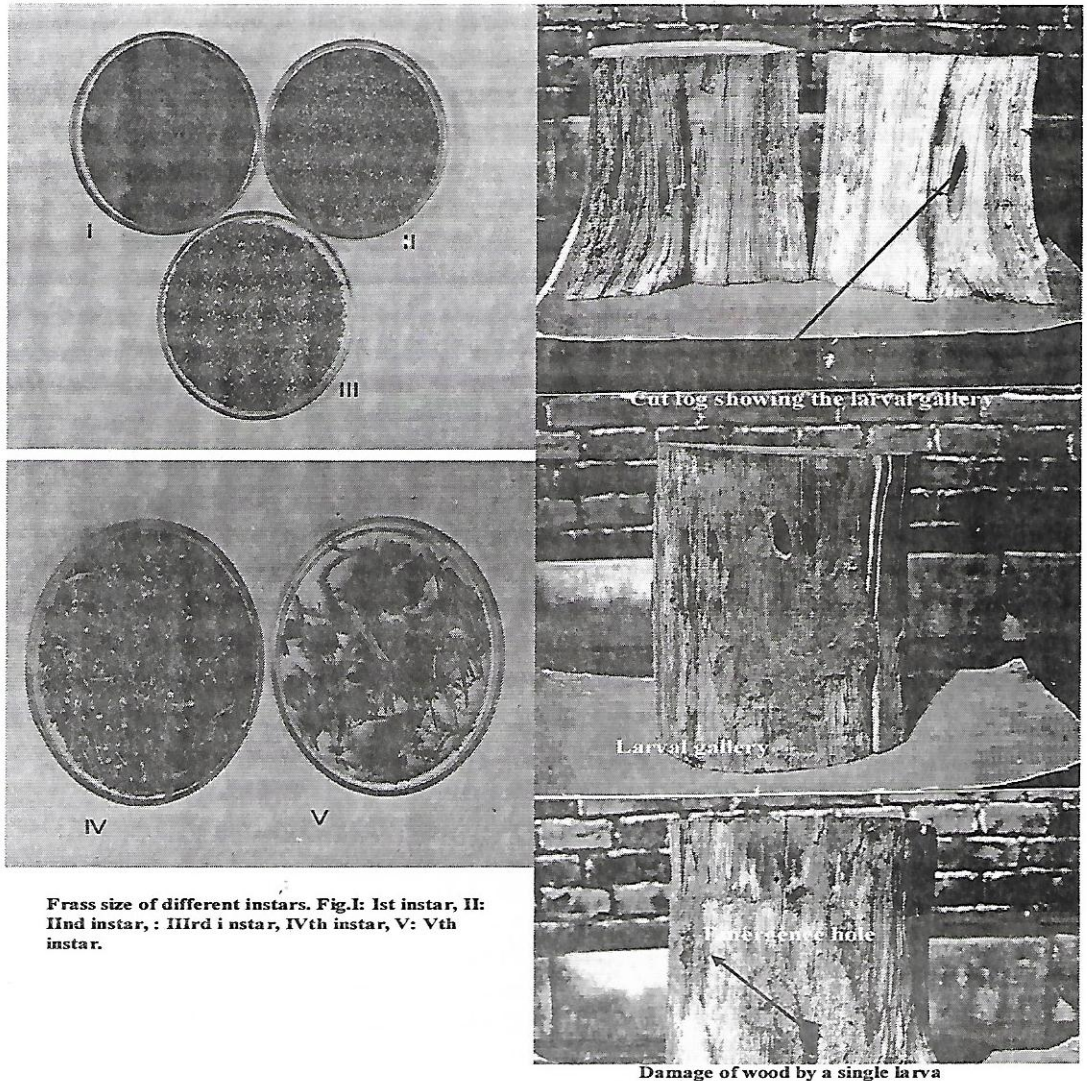
**Table:2 Frass size of different instars**

| Instar size | Frass (gms) |
|-------------|-------------|
| I           | 1.131       |
| II          | 10.287      |
| III         | 10.970      |
| IV          | 4.084       |
| V           | 3.698       |

Emergence hole is nearly excavated entirely by the adult. The size of the emergence hole depends upon the size of the adult. The length and width of the emergence hole is  $2.39 \pm 0.23$  cm and  $1.33 \pm 0.15$  cm. The shape of the emergence hole is somewhat elliptical. The knowledge on consumption and assimilation of bark and wood by an insect is significant to understand its bioecological behavior in formulating suitable advance control measures. Thus, the damage caused by a single larva was quantified. On an average one larva ejects 30.19 gm of dust and fecal matter in one year. The contribution of different instars was 1.13 gm, 10.28 gm, 10.97 gm, 4.08 gm and 3.69 gm for the Ist, IInd, IIIrd, IVth and Vth instar larva respectively (Table. 2). Third instar larva contributes maximum damage, which proves third instar larva as the most destructive larval stage (Plate-1). By collecting the dust thrown at the base of the tree the number of larvae present inside the tree can be quantified. Eckstein (1938) also concluded frass size as a reliable indicator of larval instars than the width of the head capsule; as in saw fly *Diprion hercyniae* (Morris, 1949) and the



armyworm (*Pseudetida unipunctata*). Pond (1961) also suggested the pellet size as the indicator of larval instar. Quantity and quality of food also plays an important role in increasing or decreasing the development period and also on the size of the insect. In case of sal heartwood borer and or stem borers and root borers the larvae works inside the wood and molting also takes place inside therefore it is difficult to ascertain the duration and size of the larval instars. The examination of frass or fecal matter (Gusain, 2004) is the true indicator of larval instars.



**Plate I :-Laboratory studies showing larval feeding and gallery pattern of a single larva of *H. spinicornis* causing damage to the *Shorea robusta***

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