

## Lepidopteran insect pests of *Elaeocarpus angustifolius* Bl. in nursery

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### Abstract

*Elaeocarpus angustifolius* is a sacred tree species in India with a poor regeneration capability. It produces a moderately hard timber generally of various end uses. The present study is a report on infestation of three insect pests namely *Hyposidra talaca* (Lepidoptera: Geometridae), *Spodoptera litura* (Lepidoptera: Noctuidae) and *Homona coffearia* (Lepidoptera: Tortricidae) damaging the plant at its nursery stage. The infestation intensity of *H. talaca* and *S. litura* was observed to be in the range of 60-70% leading to 80-90% defoliation of the seedlings. However, *H. coffearia* has lesser damage potential. All the three insect pests are polyphagous in nature, reported to damage many agriculture, horticulture and forestry crops. However, all the three insect pests are being reported as pest of this plant at nursery stage for the first time. The characteristics of larvae, pupa, adult and their feeding pattern have been discussed in the present article.

**Keywords** *Elaeocarpus angustifolius*; *Hyposidra talaca*; *Spodoptera litura*; *Homona coffearia*; nursery insect pest.

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### 1 Introduction

*Elaeocarpus angustifolius* Bl. (Syn. *E. ganitrus* Roxb. ex G. Don) occur naturally in India in the moist evergreen forests between 1500 and 2000 m in the states of Bihar, West Bengal (Darjeeling), Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur and Maharashtra (Murti, 1993). This species has also been reported from other parts of the world like Temperate Asia, Tropical Asia including Australia and Pacific regions, Indian sub-continent (India, Bangladesh, Bhutan, Nepal, Sri Lanka), Indo-China (Cambodia, Myanmar, Thailand) and Malaya regions i.e. Malaysia, Indonesia, Philippines and Papua New Guinea (Murti, 1993; Coode, 1984, 2010).

This plant is commonly known as Rudraksha in India and has been considered very sacred and pious for devotees in Hinduism (Seetha, 2005). Rosaries made up of beads (endocarp) of this plant are used for prayer to the god. Several medicinal values of this plant have also been reported (Joshi and Jain, 2014; Hardainiyan et al., 2015; Tilak et al., 2017). Beads of this species have commercial value and therefore it is being traded

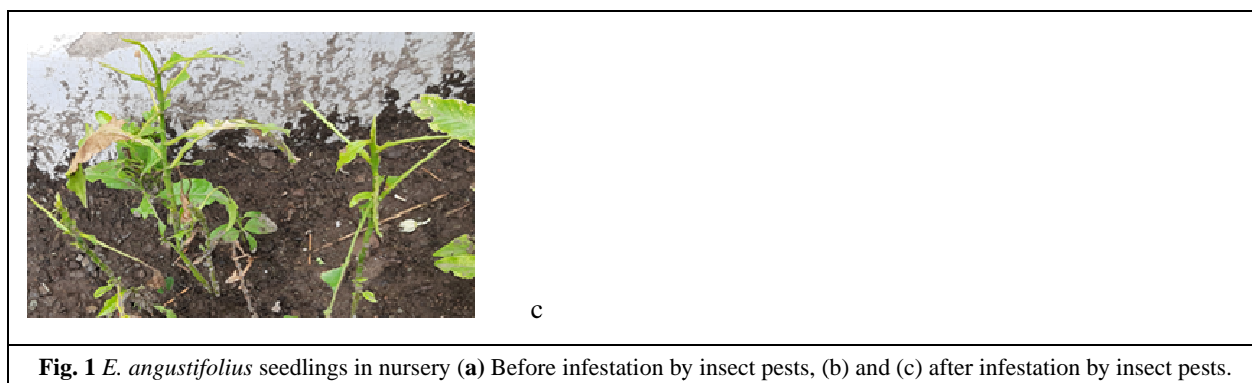
within the country and to various other countries from the India (Singh, 2018). Apart from religious and medicinal values, the timber of this plant is used for various end uses like making of match splint and boxes, wooden boxes for packing, wood crates for fruit and vegetables, housing general, shutter boards, furniture and cabinets, plywood and veneer, faces, cores, turning, packing, pallets, naval construction, boats, boat oars, other and musical instruments, handicrafts, matches, moldings, particle board due to its inherent features (ITTO, 2024). Considering immense religious, medicinal and timber value, seedlings of this plant are in great demand and are being sold @Rs.500-900/- per seedling, as are evident from various websites dealing with trade of Rudraksha seedlings (Seed2plant, 2024; Shrigram organics, 2024). This plant is being raised in various nurseries at Dehradun, Uttarakhand and elsewhere in India. Approach for cultivation of this plant in India has also been reported (Vikaspedia, 2024). Some Southern Australian accessions are being cultivated in temperate areas, often under the synonym *E. grandis*. It is popular as a garden tree in Australia, where it is valued for its evergreen foliage, turning scarlet as it senesces, and abundant marble-sized blue fruits. This plant is cultivated as avenue plantation in the Indo-Malayan countries.

In India, this plant has poor regeneration in the wild and is considered as a threatened species in the north-eastern region of India (Rao and Haridasan, 1983). The plant has very low fruit set even after high rate of flowering (Bhuyan, 2002; Khan et al., 2003). Phenology and morphometric attributes of flowering and fruiting of this species under cultivation has recently been reported (Singh, 2021). Only limited studies have been carried out on insect pests of this species. A foliar pest of mature tree (Singh and Singh, 2019) and a fruit pest of this species have recently been reported (Singh et al., 2021). Infestation of this plant at nursery stage by three insect pests is being reported for the first time. Symptoms of infestation and characteristic of larvae, pupae and adults have been discussed briefly along with photographs.

## 2 Field Survey for Infestation of Insect Pests

A nursery of this plant having one-year old seedlings was surveyed at Forest Research Institute Campus, Dehradun (Fig. 1a). Infestation of some foliar insect pests was seen during the month of June, 2023. The larvae of different insect pests were found voraciously feeding on the leaves of almost all seedlings leaving only mid rib of the leaves (Fig. 1b and c). The different larval stages encountered were collected and reared in covered plastic boxes, where they were provided fresh leaves as food, as and when needed. Observations were made on morphological features of different stages of the insect pests. Photographs were also taken for further study purpose.





**Fig. 1** *E. angustifolius* seedlings in nursery (a) Before infestation by insect pests, (b) and (c) after infestation by insect pests.

### 3 Observation and Results

During the present survey, a total of three insect pests were recorded, which were found feeding on foliage of seedling in nursery. These were identified as *Hyposidra talaca* Walker, *Spodoptera litura* Fabricius and *Homona coffearia* Nietner with the help of available literature based on characteristics of larva and adult.

Intensity of infestation and extent of damage was observed to be similar in case of *H. talaca* and *S. litura*. The infestation by both the species ranged from 60 to 70%, while foliar damage ranged from 80 to 90%. It was noted that the early instar larva of these species cut small holes along the margin, whereas the full grown larva fed voraciously on matured leaves, initially from the margin and then move towards the mid rib. Ultimately, whole of leaf lamina was eaten by the larva except only midrib and then larva moves to another leaf of same seedling or other seedlings. The larvae were observed to feed during night time or early in the morning. The *H. coffearia* has lesser infestation intensity and damage extent, where larva enrol the upper tip of comparatively younger leaf making web like structures. Infestation ranged from 10 to 15% only, while foliar damage ranged to 30 to 40% of leaf area from the margin to midrib.

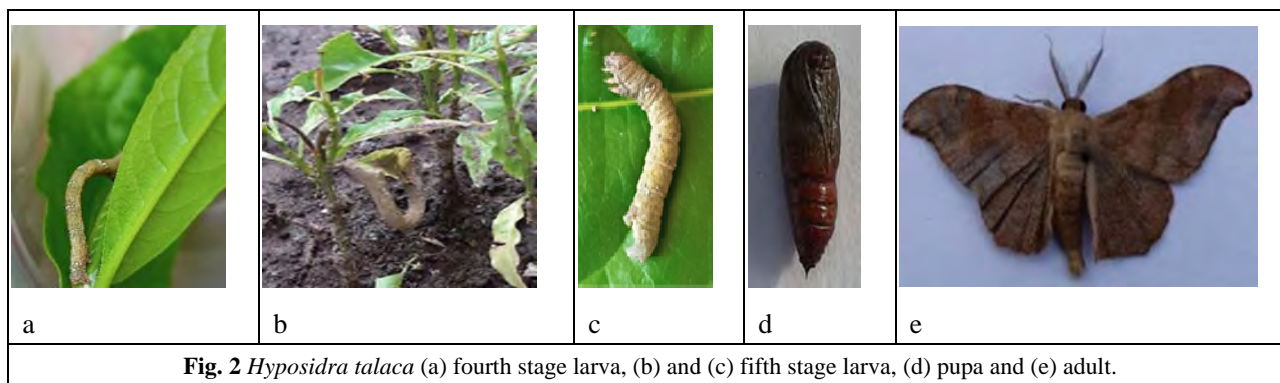
All the three insect pests recorded in the present case are polyphagous in nature and are reported to infest various agriculture, horticulture and forestry species. These have been reported as serious pests causing significant losses to their hosts. Description of each insect pest has been provided here in brief.

#### 3.1 *Hyposidra talaca* (Walker) (Lepidoptera: Geometridae)

*Hyposidra talaca* (Walker) is commonly known as the black looper or black inch worm. It is a moth of the family Geometridae. It has been reported as a major defoliating polyphagous pest infesting over 100 of agriculture and forestry crops across its wide distribution (Robinson et al., 2010; Roy et al., 2017). It has earned an immense importance as a pest of tea in India (Basu Majumdar and Ghosh, 2004). *Hyposidra talaca* has been reported as pest of *Quercus incana* Roxb. from Uttarakhand (Singh and Singh, 2004). However, infestation of this pest on *E. angustifolius* is a new host record and being reported for the first time under the present study. Larva has 05 stages that feeds on the foliage, where 5<sup>th</sup> instar larva has been reported to be most damaging (Roy et al., 2017).

Infestation of this pest on seedling of *E. angustifolius* was recorded during first week of June, 2023, where 4<sup>th</sup> instar larvae measuring up to 32mm in length were observed feeding voraciously on the margins of leaves of seedlings of this plant. The larval stage was light brown in colour with characteristic 7 transverse white strips on its body. The larva was reared for further observations, where fresh leaves were provided as food. On day 3<sup>rd</sup> of collection, the larva underwent moulting and turned into 5<sup>th</sup> instar stage. It measured about 40 mm in length and appeared light brown to greenish in colour with faded transverse white strips. The larva stopped feeding and turned to obtect and blackish red pupa in next 4 days. The pupa measured about 16 mm in length. An adult male emerged after about 8 days of pupation. The wingspan of the adult was 30 mm in length. Body

dark olive fuscous, more or less irrorated and suffused with grey. Both wings faint traces of medial and crenulate postmedial lines. Antennae pectinated. Hindwings with outer margin angled at vein 4. The cilia are dark. Forewings with traces of antemedial line and more or less distinct sub-apical patch. Underside with crenulate postmedial line to both wings. These characteristics matches with earlier descriptions (Hampson, 1895). Photographs of different stages are provided in the Fig. 2.



**Fig. 2** *Hyposidra talaca* (a) fourth stage larva, (b) and (c) fifth stage larva, (d) pupa and (e) adult.

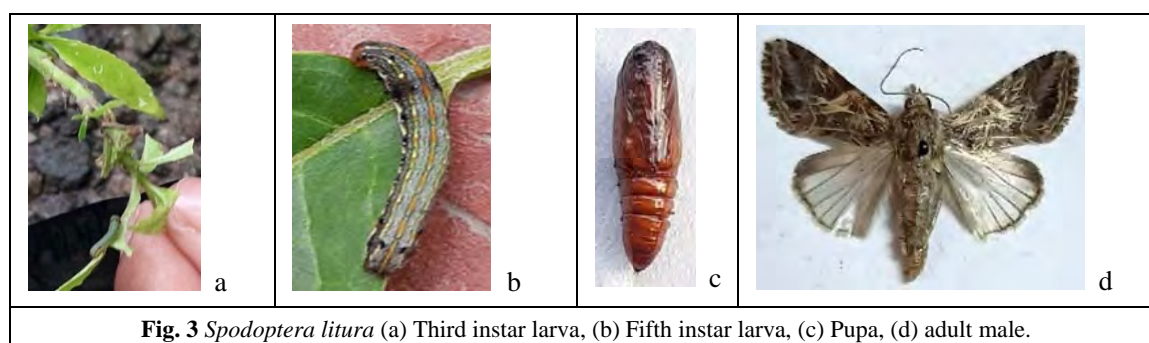
### 3.2 *Spodoptera litura* (Fabricius) (Lepidoptera: Noctuidae)

The *Spodoptera litura* (Fabricius), commonly known as tobacco cutworm/ cotton leafworm/ taro caterpillar is a nocturnal moth in the family Noctuidae. It is a serious polyphagous pest of economic significance in Asia, Oceania and the Indian subcontinent and over 120 plant hosts belonging to agriculture, horticulture and avenue plantation are reported to be affected by this pest (CABI, 2020). Based on damage potential, this pest has been treated as Quarantine Category A1 and A2 pest in various parts of the world (EPPO, 2015). Among forestry and shrub species, it is reported to affect *Terminalia tomentosa*, *Populus* sp., *Casuarina equisetifolia*, *Artocarpus integra*, *Hevea brasiliensis*, *Cassia tora*, *Mangifera indica*, *Diospyros montana*, *Lantana* sp., *Morus alba*, *Randia dumetorum*, *R. uliginosa*, *Tectona* and *Thuja orientalis grandis* from India and its adjoining countries (Beeson, 1941; Browne, 1968). It has also been reported as major or minor pest of *Jatropha curcas* (Meshram and Joshi, 1994), *Butea monosperma* (Kulkarni and Joshi, 1995), *Acacia mangium* (Intachat and Kirton, 1997), *Paulownia fortune* (Kumar, 2004) *Ginkgo biloba* (Khan et al., 2017). It has also been reported as a new foliar pest of Indian Rudraksha tree from India (Singh and Singh, 2019). Apart from forestry species, it has also been reported as pest of various agricultural plant species (Ramaiah and Maheshwori, 2018) and weeds (Kumar and Ray, 2007) in India and many other Asian countries. However, this has not been reported as nursery pest of *E. angustifolius*. Therefore, *S. litura* as nursery pest of *E. angustifolius* is being reported for the first time.

Infestation of this pest on seedling of *Elaeocarpus angustifolius* was recorded during first week of June, 2023, where 3<sup>rd</sup> and 4<sup>th</sup> instar larvae were found voraciously feeding on foliage. The larvae were found eating the whole leaf blade and leaving only the midrib. These larvae were reared for further observations. Fresh leaves were provided to the larvae as and when needed. During the process of rearing, cannibalism was also observed where one 4<sup>th</sup> instar larva fed upon the 3<sup>rd</sup> instar larva. The 4<sup>th</sup> instar measured about 21 mm in length, blueish-green body bearing dorsal yellow spots and mid orange line on its body. The 4<sup>th</sup> instar larva turned into 5<sup>th</sup> instar stage measuring 28 mm in length on the 3<sup>rd</sup> day of rearing. At this stage larval body colour changed to brown. In next two days the larva stopped feeding and underwent pupal stage with dark brown in colour measuring up to 15 mm in length. On the 7<sup>th</sup> day a male adult emerged from the pupa. The orbicular marking



on the forewing was quite pronounced. The wingspan was 20 mm in length. Photographs of different stages are provided in the Fig. 3.

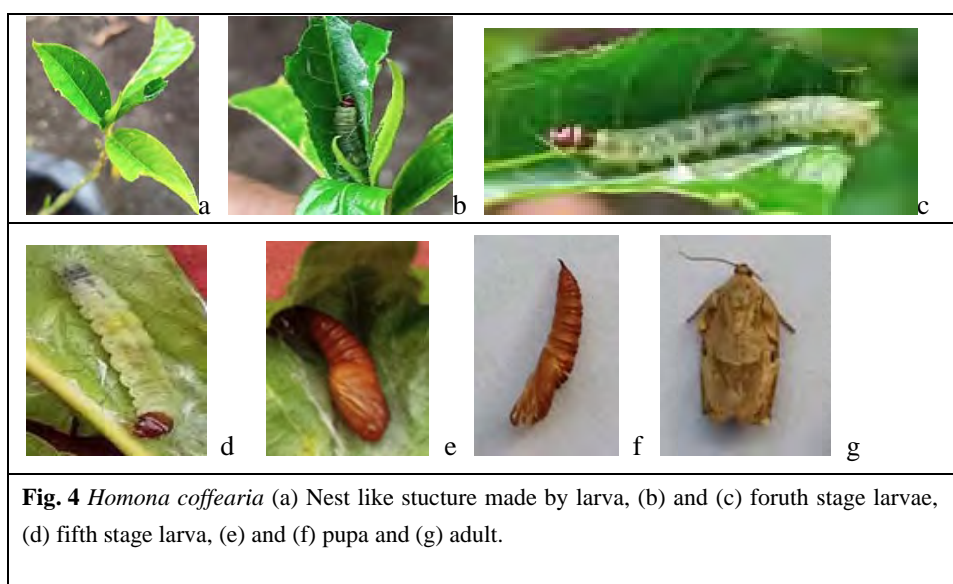


**Fig. 3** *Spodoptera litura* (a) Third instar larva, (b) Fifth instar larva, (c) Pupa, (d) adult male.

### 3.3 *Homona coffearia* (Nietner) (Lepidoptera: Tortricidae)

It is a polyphagous moth species commonly called as Tea Tortrix and belongs to the family Tortricidae. The larvae have been reported to feed on *Bauhinia*, *Cajanus cajan*, *Acacia auriculiformis*, *Arachis hypogaea*, *Calophyllum inophyllum*, *Cinnamomum*, *Camellia sinensis*, *Citrus*, *Coffea* (Diakonoff, 1982) and *Eugenia polyantha*, *Crotalaria*, *Derris*, *Eucalyptus alba*, *Glochidion*, *Gossypium*, *Nephelium*, *Linum*, *Melochia indica*, *Pluchea indica* and *Pyrus* (ICAR, 2024). It has also been reported as a pest of tea and coffee (Reddy et al., 2022; Rahmah et al., 2023).

In the present study fourth instar stage larva was observed feeding the seedlings of this plant. The larva has shiny brown colour head and light green coloured body with yellowish appearance on posterior end. This stage measures 11 mm in length. During the rearing of this insect, larva web the leaves in such a way that it forms nest like protective structure towards tip of the leaf, which is a peculiar character of this species and the larva feeds within the nest. The larvae were found feeding only the young leaves. After 3 days, the larva turned into fully grown matured larva measured about 16 mm in length. In another two days, pupation occurred in the folded leaf. The length of pupa was 7.5 mm. Adult emergence took about 5 days. The wingspan measures about 16 mm in length. Photographs of different stages are provided in the Fig. 4.



**Fig. 4** *Homona coffearia* (a) Nest like structure made by larva, (b) and (c) fourth stage larvae, (d) fifth stage larva, (e) and (f) pupa and (g) adult.

#### 4 Discussions

*Hyposidra talaca*, *Spodoptera litura* and *Homona coffearia* being reported here are well established polyphagous pests of various economically important agriculture, horticulture and forestry species. However, these are being reported for the first time infesting *E. angustifolius* at the nursery stage. Considering the poor regeneration ability, immense religious and economic value of this plant species, management of these pests in *E. angustifolius* is warranted. The control of these pests through biological and chemical means may be tried which have been reported to be effective by various workers in the past in case of other plant species. Field experiment performed by Amalendu et al., 2008 reveals that treatment with novaluron insecticide can reduce larval population of *S. litura* upto 95.75% in chilli crop. *S. litura* may also be biologically controlled by using egg parasitoids like *Trichogramma chilonis*, *Tetrastichus* sp. and *Telenomus* sp. (Sharma et al., 2014). For the management of *H. talaca*, *Tetraponera rufonigra* has been effective as biocontrol agent (Sinu et al., 2011a). Field experiments conducted with alkaline aqueous extracts of *Annona squamosa* L., *Argyria speciosa* Bojer, *Leucas aspera* (Willd.) Link, *Polygonum hydropiper* L. and *Clerodendrum infortunatum* L. have shown negative impact on growth rate, efficiency of conversion of instar of *H. talaca* (Roy et al., 2015). For the management of *H. coffearia*, parasitoid *Phytodietus spinipes* has been reported to play a significant role in regulating its population (Muraleedharan and Selvasundaram, 1991). Pesticides such as Chlorfluazuron, Tebufenoziden can also be used to control *H. coffearia* (Sidhakaran, 2006). It is suggested to carry out regular monitoring of the insect pests in case of *E. angustifolius* and best available management practice may be employed for their control at nursery stage.

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