

## Role of *Harithalodes Derogata* in the Leaf Roll and Defoliation of Okra (*Abelmoschus Esculentus*) and China Rose (*Hibiscus Rosa-Sinensis*) Ecosystems of Northern Kerala

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### ABSTRACT

The bioecological study of *Harithalodes derogata* in northern Kerala is scanty. The larval instars of *Harithalodes derogata* feeds on many crops in northern Kerala, especially in okra. It also causes severe damage in *Hibiscus sp.* The study was conducted in the monsoon and post monsoon seasons of 2019 to 2020. Leaf roll was up to 80- 85 % in okra and 35-40 % in hibiscus and the defoliation was observed 70-75 % in okra and 30-35 % in hibiscus under heavy infestation. The field population of larvae was highest in August and December, while it was lowest in June and July.

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### Introduction

*Harithalodes derogata* Fabricius, 1775 (family Crambidae); the cotton leaf roller or bhindi leaf roller, has been reported from India, Comoros, the Democratic Republic of the Congo, Ghana, Mali, Réunion, Madagascar, the Seychelles, South Africa, the Gambia, Australia, Fiji, Papua New Guinea, Samoa, the Solomon Islands, the Andaman Islands, Bali, Sri Lanka, Malaysia, Myanmar, Singapore, Sri Lanka, Vietnam, China and Japan due to accidental import. Sometimes encountered in Europe also. The larvae feed and roll the leaves of their host plant. Pupation takes place in the rolled leaf. The life cycle under natural weather conditions of 25°C-34°C, 79-92% relative humidity was completed from 30 to 34 days (from egg to adult). The life cycle consists of egg, five larval stages, pre-pupa, pupa and adult. The adult moths are about 15-18 mm long with a wingspan of 28-38 mm, having yellowish-white wings with black and brown spots on the head and thorax. The females were significantly larger in size than the males. In northern Kerala, the moth is a pest of *Abelmoschus esculentus*, *Hibiscus rosa-sinensis*, *Abelmoschus manihot*, *Abutilon sp.*, *Celosia argentea*, *Corchorus sp.*, *Thespesia lampas*, *T. populnea*, *Urena lobata*. The present study was to investigate the role of *Harithalodes derogata* associated with the abscission and defoliation of okra and *Hibiscus rosa-sinensis* in northern Kerala.

### Materials and Method

The study was conducted from June 2019 to January 2020 by covering the monsoon and post monsoon seasons. The okra from the okra cultivating regions of northern Kerala used for the study. The life cycle of *H. derogata* in *Hibiscus rosa-sinensis* is observed by continues monitoring from the field. Continues documentation made of eggs laid, number of larvae and pupae. The observations also began to estimate the number of rolled leaves per plant and the abscissions of

leaves, flowers and pods. The losses of the aforementioned exhibits have been recorded. The identification of the specimens were done by the keys developed by Hampson in the Moths volumes of the Fauna of India (1891, 1892, 1893, 1894, 1895 and 1896), Barlow (1982), Pinratana and Lampe (1990), Robinson (1994), Kendrick (2002), Mathew *et al.*, (2004a, 2004b, 2005, 2007, 2018).

### Result and Discussion

It is observed that, in northern Kerala the *Harithalodes derogata* is a major pest (as a defoliator, a leaf roller and a skeletonizer) of okra and occasionally serious pest of ornamental *Hibiscus* (particularly during monsoon months). In okra the larval infestation mainly in the leaves, rarely in flowers and pods. In the *Hibiscus rosa-sinensis* the infestation is mainly in the leaves. Most females used the adaxial side of the okra and hibiscus leaves to lay their eggs rather than the abaxial side. About 25-140 larvae of different ages were recorded on okra and hibiscus leaves during rainy season. The larvae roll the leaves before they pupate, which reduces the photosynthesis of leaves. In order to hide and defend themselves from predators, hot temperature and extreme weather conditions prior to pupation, the last larval instar [5th or 6th instars] exhibits the imprint behavior of rolling leaves. *H. derogata* punctured the okra leaves in the ellipsoidal, irregular, and spherical shapes. The heavy depositions of larval frass in crops cause skeletonisation of leaves. The skeletonisation is comparatively lower in hibiscus. It was observed that any slight wind or any other force aid the dropping of already rolled or skeletonized leaves. Their voracious feeding caused the leaf abscission also. The field population of larvae was highest in August and December (80-84%), while it was lowest in June and July (20-25%).

Adult lay about 80-120 eggs in okra and 70-100 eggs in hibiscus on the underside of leaves, either singly or in groups. The diameter of egg is from 0.30 to 0.35 mm with an average of 0.32 mm. The incubation period is 2 to 3 days with an average of 2.5 days. The 1<sup>st</sup> instar larvae are pale green with a brown head. Larvae reach a length of about 10 mm-11 mm and width of 0.50 to 70 mm. The 2<sup>nd</sup> instar larvae are green with a dark brown head. Presence of two brown spots on the dorsal aspect of the prothoracic segments. The first section of their thorax has two dark dots directly behind the head. Larvae reach a length of about 12mm-13mm and width of 0.80 to 1mm. The 3<sup>rd</sup> instar larvae are dirty pale green and semi-translucent with a pink head. The larvae reach a length of 14mm-15mm and width of 1.2 to 1.3 mm. The 4<sup>th</sup> instar larvae are green with a pink head. The Larvae have a length of 15mm-18mm and width of 1.5 to 1.7 mm. The 5<sup>th</sup> instar larvae are green with a dark pink head. Full-grown larvae reach a length of about 20 mm- 28mm and width of 1.8 to 2 mm. It has three pairs of thoracic legs and four abdominal prolegs. Pupation occurs mostly in the rolled leaf and sometimes in debris on the ground. The pupa has a conical shape with ten abdominal segments that are clearly separated from each other except for the 9th and 10th segments. The

abdomen of the male is more slender than the female. The genital pore occurs ventrally below the 8th abdominal segment in the female and in the male on the 9th segment.

Maximum adult longevity (3-7.5 days) was observed on *Abelmoschus esculentus*. Minimum adult longevity was recorded on *Hibiscus rosa-sinensis* (3-7 days). The Oviposition period of *Haritalodes derogata* was observed 1.5-2 days in *Abelmoschus esculentus* and *Hibiscus rosa-sinensis*. *Haritalodes derogata* laid 80-120 eggs, with an average of 100 eggs in *Abelmoschus esculentus* and 70-100 eggs, with an average of 85 eggs in *Hibiscus rosa-sinensis*. The Percentage of hatching was observed minimum in *Hibiscus rosa-sinensis* (50-55) and maximum in *Abelmoschus esculentus* (55-58). The life cycle observed longer on *Abelmoschus esculentus* (34-46 days) and hence might have longer in *Hibiscus rosa-sinensis* (35-48 days).

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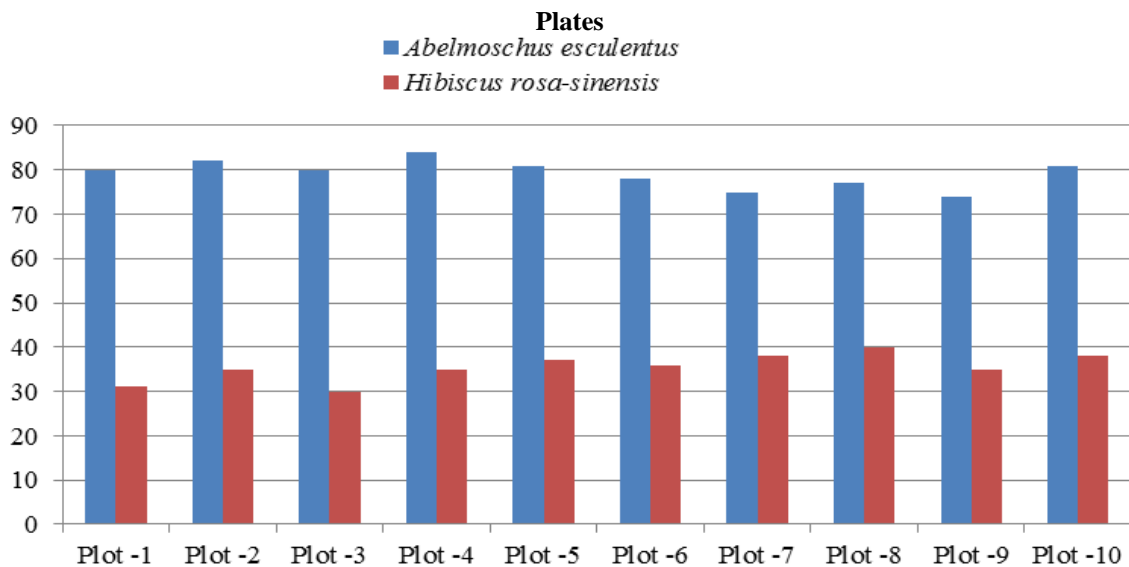


Fig 1. Assessment of Leaf roll in Okra (*Abelmoschus esculentus*) and China rose (*Hibiscus rosa-sinensis*) plots containing *Haritalodes derogata* adults and its developmental stages.

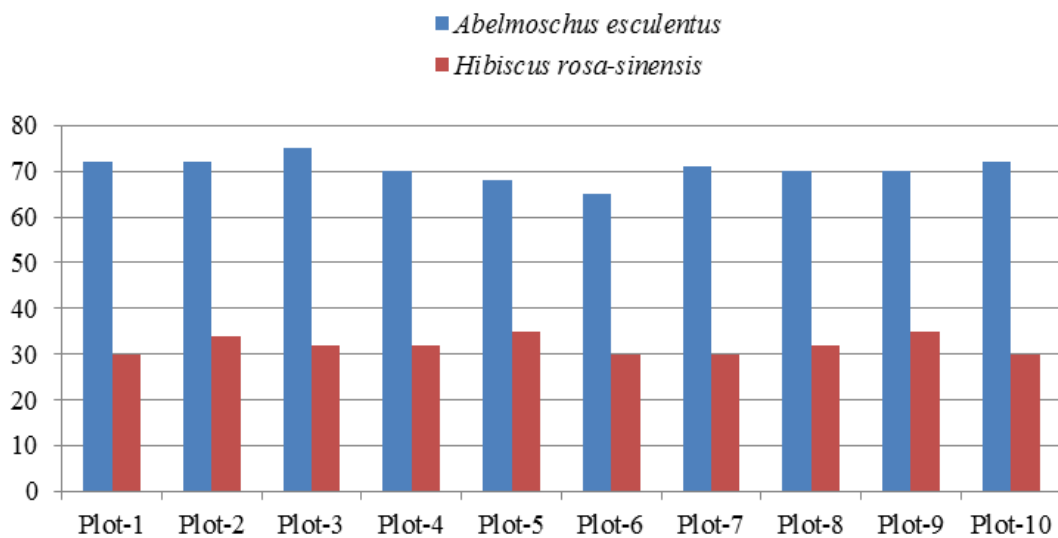


Fig 2. Assessment of Leaf Defoliation in Okra (*Abelmoschus esculentus*) and China rose (*Hibiscus rosa-sinensis*) plots containing *Haritalodes derogata* adults and its developmental stages



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