Biology, Ecology and Control of Gamar Defoliator, *Calopepla leayana* Latr. (Chrysomelidae : Coleoptera) in Banagladesh

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Abstract

Gamar defoliator, *Calopepla leayana* Latr. (Chrysomelidae : Coleoptera) is a major defoliator of gamar *(Gmelina arborea* Roxb.) in Bangladesh. Both the larva and the adult feed on the leaves making irregular holes on them. The distribution, description and biology of various developmental stages of the pest are provided. The pest has three generations in a year, hibernating as an adult from November to May. A common pupal parasite, *Brachymeria* sp. and an egg parasite, *Tetrastichus* sp. were recorded. Biological, chemical, physical and mechanical method for the control of the pest have been discussed.

সারসংক্ষেপ

বাংলাদেশ *Calopepla leayana* Latr. নামক পাতাভোজী পোকা গামার গাছের প্রধান ক্ষতিকর পোকা। প্রাপ্ত ও অপ্রাপ্ত বয়স্ক পোকা গাছের পাতা ছিদ্র করে খায়। এ পোকার বিস্তৃতি, বর্ণনা ও জীবন বৃত্তান্ত এ প্রবন্ধে আলোচিত হয়েছে। এ পোকার বছরে তিনটি প্রজনন সময় বিদ্যমান। প্রাপ্ত বয়স্ক পোকা নভেম্বর হতে মে পর্যন্ত সময়ে শীত নিদ্রায় থাকে। পুত্তলি অবস্থায় এ পোকার *Brachymeria* sp. নামক একটি পরজীবি ও ডিম অবস্থায় *Tetrastichus* sp. নামক আরেকটি পরজীবির সন্ধান পাওয়া গেছে। এ পোকা দমনের জন্য জৈবিক, রাসায়নিক, ভৌত ও যান্ত্রিক ব্যবস্থা সম্পর্কে আলোকপাত করা হয়েছে।

Key words : Bangladesh, *Calepepla leayana*, gamar defoliator, *Gmelina arborea*, pest biology, pest control, pest ecology

Introduction

Gamar *(Gmelina arborea* Roxb.), a fast growing medium sized deciduous tree, is well known as furniture species in Bangladesh and elsewhere. For pulpwood production large scale plantations of this species have been raised by the Forest Department in Kaptai, Bandarban and other forest Divisions. Some plantations, mainly for timber, have been raised by private planters in the hilly areas and also by farmers in their homesteads.

About 40 insect species are known to attack *G. arborea* in the British commonwealth (Browne 1968), of which 23 have been specifically reported from India (Mathur and Singh 1960). *Calopepla leayana* Latreille (Chrysomelidae : Coleoptera) is known to cause major defoliation of gamar in Bangladesh (Baksha 1990, 1997). Some notes on this pest were provided by Stebbing (1914), Chaudhuri (1925) and Browne (1968). Garthwaite (1939) and Beeson (1941) gave a sketchy account of its life history in Myanmar and India. However, very little is known on this pest in the prevailing climatic condition of Bangladesh. This study attempts to fill up the lacuna.

Materials and methods

Studies were conducted in the laboratory as well as in the field. The eggs and larvae were collected from gamar plantation at Rauzan, Chittagong, and reared up to adults in the laboratory of the Bangladesh Forest Research Institute (BFRI), Chittagong. The adults on emergence were kept in pairs in glass jars covered by muslin cloth at the top. Fresh leaves of gamar were provided as food to adults and replaced daily. Fecundity, oviposition period and longevity were recorded. On hatching the young larvae were transferred to small petridishes containing some fresh and tender leaves. The leaves were changed daily. After each moult the larvae were transferred to bigger petridishes with leaves. Observations on the larval development, measurement, colour, moulting and feeding habit were recorded. Field observations were made by periodic vistis to gamar plantations in and around Chittagong and Kaptai. Notes were also taken during field visits made in connection with other research activities. Isolated trees in the BFRI campus were kept under observation for the pest incidence. The pest and its natural enemies were identified with the help of Beeson (1941), Stebbing (1914), Browne (1968) and Chatterjee and Misra (1974).

Results and discussion

Distribution

The pest is prevalent in the eastern part of Bangladesh particularly in Chittagong, Cox's Bazar, Bandarban, Rangamati, Khagrachari and Sylhet districts. Besides Bangladesh, the pest is known to occur in India and Myanmer (Browne 1968).

Nature of damage

Both the larvae and the adults feed on the leaves making irregular holes on them (Fig.1).

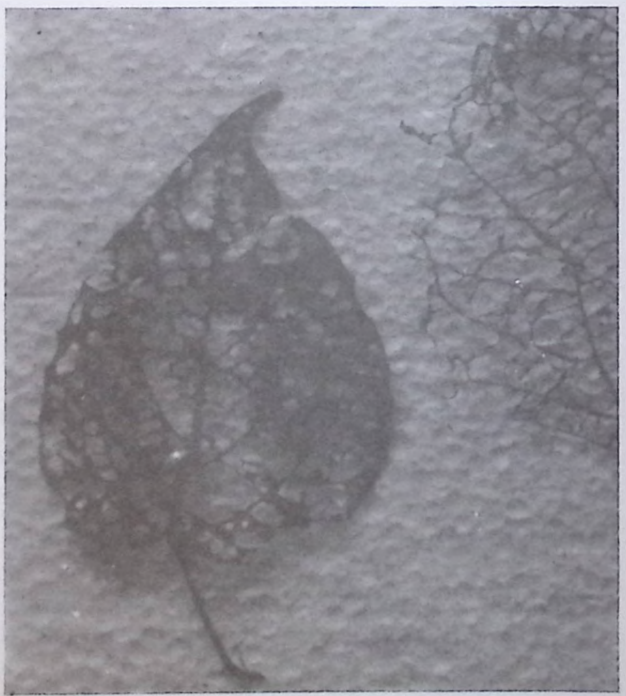

Figure 1. Damage symptom caused by *C. leayana*.

They prefer to feed on the underside of the leaves. Mature larvae make extensive holes leaving only portions of mid-rib and larger veins intact. When leaves are not available they sometimes chew surface layer of leaf petioles, buds and young shoots. They eat more voraciously on warmer sunny days than on rainy days. Feeding and movement usually do not take place during the night. When population was found high complete defoliation occurred. This resulted in the death of affected shoots. However, after two or three weeks new leaves came out. After heavy defoliation epicormic branches usually appeared making the tree bushy in appearance. Repeated defoliation sometimes caused death of the tree.

Life history

Egg : The eggs are laid in masses on the underside of leaves or on shoots. A female lays 16.7 ± 2.4 egg masses. Each egg mass is embedded in a frothy secretion which hardens to form a domed, light brown mass called ootheca, each containing 65.7 ± 5.2 eggs. Each ootheca is 6.0 ± 1.2 mm in height and 13.2 ± 2.3 mm in diameter. The egg is yellow and elongate being 1.5 ± 0.2 mm in length and 0.55 ± 0.03 mm in width with a pedicel at the posterior end, and is laid vertically. The incubation period is 6.1 ± 1.7 days.

Larva : The larva is elongate narrowing towards the posterior end. There are eight lateral spines on the prothorax, two on the meso- and metathorax and on each abdominal segment. The spines are nearly straight, the anterior pairs directed forward and the remaining laterally. All spines bear dark brown spinules. The larva carries a bunch of delicate black supra-anal filaments of excretory matter and cast larval skins (Fig.2). When disturbed, the larva flicks these filaments up and down in a defensive or frightening action. There are five larval instars. Each instar differs in size and colour from yellow in younger stage to dark black in older stage. The first instar larva feed gregariously, but in later instars they disperse not further from the leaf on which they emerge. The full-grown larva is 12.2 ± 1.6 mm long. The total larval period is 19.2 ± 2.5 days during May to October. The duration of 1st, 2nd, 3rd, 4th and 5th instar larvae are 4.0±0.7, 3.5±0.5, 3.1 ±0.6. 4.2±0.7 and 5.1 ± 1.2 days respectively.

Figure 2. Larvae of *C. leayana*.

Pupa : Pupation takes place on the leaf. Before pupation the larva sheds its anal filaments. The legs are tucked under the body and the last abdominal segment is glued to the leaf surface. The larva pushes gradually its skin backwards until it forms a crumpled mass at the anal end and remains motionless. The pupa being

12.6 ± 1.2mm long shows variously coloured markings of silver, yellow and black (Fig. 3). The pupal period is 7.3 ± 1.8 days.

Figure 3. Pupa of *C. leayana*.

Adult : The adult beetle emerges through an anterior split on the pupal skin. The beetle is oblong being 12.3 ± 1.7 mm long and 7.8 ± 1.5 mm wide. The antennae are black excepting two basal joints which are yellow or brown. The pronotum is pale yellow in younger stages and reddish brown in older stages. The elytra are coarsely wrinkled and deep bluish green in young beetle and violet blue to black in old beetle (Fig. 4). The underside colour of the body is always that of the pronotum. Though the beetles are capable of strong flight they usually feed walking over the leaves and branches. When the trees on which they are feeding were shaken the beetles dropped to the ground rather than took to flight and remained motionless. At that time it was easy to catch them. The longevity is 53.2 ± 3.5 days during May to October. Mating takes place during the day 16.8 ± 2.3 days after emergence. Oviposition starts a day after mating. Oviposition period is 40.4 ± 3.0 days. The sex ratio is 0.5. The beetles are attracted to white colour during the days of bright sunshine after heavy rains in August. The adults hibernate usually in congregations in bark crevices, clumps of grass, soil litter, and other sheltered places during November to April. They return from hibernation in May. Oviposition starts in June.

Figure 4. Adults of *C. leayana*.

Host plants

The pest feeds on leaves of *G. arborea*. It has not been recorded to feed on other food plants.

Number of generation

The pest has been generations annually. The first generation starts in late May and lasts up to

early August. The second generation starts in August and lasts up to September. The third generation starts in October, undergoes hibernation as adult in November and reappears in the following May. The preoviposition period in third generation is prolonged up to 194.8 ±10.4 days. In Maynmar, Garthwaite (1939) recorded two generations and a partial third, whereas in India Ahmed and Sen-Sarma (1990) recorded three generations, the latter corresponds with the present study.

Control

Biological : The pupa were found to be prasitized by the wasp, *Brachymeria* sp. (Chalcididae : Hymenoptera). The wasp was also recorded from Maynmer and India (Garthwaite 1939, Joseph *et al.* 1972). Parasitism was higher in the months of August and September taking a toll of 32.5 ± 5.7%. An egg parasite, *Tetrastichus* sp. (Eulophidae : Hymenoptera) was also recorded, but its effect was not quantified. The predatory bug, *Canthecona furcellata* Wolff. (Pentatomidae : Hemiptera) took 80% toll of the larvae during September in India (Garthwaite 1939). A fungus *Beauveria bassiana* was reported to be highly pathogenic to the pest (Sankaran *et al.* 1989).

Chemical : Application of malathion (Malathion 57 EC) at the rate of 23 ml/10 littres of water on the foliage gave effective control of the pest (Baksha 1997). Gupta *et al.* (1989) found, among others, malathion to be effective in controlling the pest in India.

Physical and mechanical : It was possible to collect and destroy beetles by hand after shaking the trees or branches. White circular cloth or sheet of metal set in the plantation yielded large catch of beetles in sunny days after rains in August (Garthwaite 1939). In Myanmar, felling of all dead and dying trees in and around plantations resulted in the destruction of a good number of hibernating beetles (Garthwaite 1939).

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