

Biology, Ecology and Management of Kadam Defoliator, *Arthroschista hilaralis* Walker (Pyralidae : Lepidoptera) in Bangladesh

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Abstract

Kadam [*Anthocephalus chinensis* (Lam.) Rich ex. Walp.], a fast growing multipurpose tree species, is grown in the homesteads and planted in the forest areas of Bangladesh. The plantations of this species often suffer from the attack of the defoliator, *Arthroschista* (= *Margaronia*) *hilaralis* Walker (Pyralidae : Lepidoptera). This paper describes distribution, host plants, nature and impact of damage, life history, number of generation, population fluctuation, natural enemies and management of the pest. The pest completes its life cycle within 23.0 ± 3.0 days. It has 9-10 generations in a year. Younger trees, usually 2-5 years of age, were found most heavily infested. The peak infestation occurred during August-September. Two parasites, *Apanteles balteatea* Lal. (Braconidae : Hymenoptera) and *Brachymeria lasus* Walk. (Chalcididae : Hymenoptera), caused a mortality of about 40% of the pest population. Application of Thuricide (*Bacillus thuringiensis*) 40 WP or Malathion (malathion) 57 EC @ 0.1% concentration was effective in controlling severe infestation. Hand collection and destruction at the initial stage of infestation could suppress and provision of overhead or side shade for the tree could prevent the attack of this pest.

সারসংক্ষেপ

বহুবিধ ব্যবহারোপযোগী দ্রুত বর্ধনশীল বৃক্ষ প্রজাতি হিসেবে বসতবাড়ির আশে-পাশে এবং বনাঞ্চলে কদম (*Anthocephalus chinensis*) রোপিত হয়ে থাকে। *Arthroschista* (= *Margaronia*) *hilaralis* Walker নামক এক প্রকার পাতাভোজী পোকা কর্তৃক এ প্রজাতির বাগান আক্রান্ত হয়। এ প্রবন্ধে এ পোকার বিস্তৃতি, পোষক গাছ, ক্ষতির প্রকৃতি ও প্রভাব, জীবন বৃত্তান্ত, প্রজন্ম সংখ্যা, জনসংখ্যা হ্রাস-বৃদ্ধি, প্রাকৃতিক শত্রু ও ব্যবস্থাপনা বিষয়ে আলোকপাত করা হয়েছে। পোকাটি 23.0 ± 0.3 দিনে জীবনচক্র এবং বছরে ৯-১০ টি প্রজন্ম সম্পন্ন করে। সাধারণত ২-৫ বছর বয়স্ক নবীন গাছ মারাত্মকভাবে আক্রান্ত হয়। আগস্ট-সেপ্টেম্বর মাসে আক্রমণের মাত্রা বেড়ে যায়। *Apanteles balteatea* Lal. এবং *Brachymeria lasus* Walk. নামক দু'প্রজাতির পরজীবী প্রায় ৪০% পোকার মৃত্যু ঘটায়। পোকার ব্যাপক আক্রমণ নিয়ন্ত্রণে থুরিসাইড ৪০ ডব্লিউপি অথবা ম্যালাথিয়ন ৫৭ ইসি নামক কীটনাশক ০.১% হারে প্রয়োগ করে ভাল ফল পাওয়া গিয়েছে। আক্রমণের প্রাথমিক পর্যায়ে হাত দিয়ে মেরে ফেলে পোকার সংখ্যা হ্রাস এবং গাছে উপরি-অথবা পার্শ্ব-ছায়ার ব্যবস্থা করে পোকার আক্রমণ প্রতিহত করা যেতে পারে।

Key words : *Arthroschista hilaralis*, Bangladesh, kadam defoliator, pest management

Introduction

Kadam, *Anthocephalus chinensis* (Lam.) Rich ex. Walp., is a large deciduous tree found scattered in the homesteads and in moist, deciduous and evergreen forests of Chittagong and Sylhet. Its timber is used for making tea chests, packing boxes, safety matches, bobbins, toys, picture frames, shoe heels, etc. As a fast growing, multi-purpose and soft wood tree species it has been grown in the homesteads, and widely planted by the Forest Department in hilly areas of Bangladesh, especially for pulpwood production. These plantations have frequently been found infested by the defoliator, *Arthroschista* (synonyms: *Margaronia*, *Diaphaina*) *hilaralis* Walker (Pyralidae: Lepidoptera). Defoliation occurs as a regular annual phenomenon causing light to severe damage. Though a number of insect pests on kadam were reported by Mathur and Singh (1961) and Browne (1968), Rahman *et al.* (1997) recorded it as an important pest of kadam in Bangladesh. Beeson (1941) and Thapa (1970) gave a short account of this pest occurring in India and Malaysia respectively. However, little is known of its biology, ecology and management in Bangladesh. It is, therefore, felt necessary to undertake a study on this pest in Bangladesh. This paper presents the result of this study.

Materials and methods

The study was conducted during 1992-1995 in the laboratory and nurseries of the Bangladesh Forest Research Institute (BFRI), Chittagong and in kadam plantation of Karerhat Forest Range, Chittagong Forest Division, Chittagong, Bangladesh. The immature stages of the pest were collected from the field and reared in the laboratory. The adults on emergence were kept in pairs in separate glass jars, the mouths of which were covered with muslin cloth. They were fed with 15% sugar solution. Fresh kadam leaves were provided for egg laying and replaced daily. Fecundity, oviposition period and longevity of the adults were recorded. On hatching the young

larvae were transferred to separate petridishes containing fresh and tender leaves which were changed daily. After each moult, the larvae were transferred to bigger petridishes containing fresh leaves. Observations were made on larval development, size, colour, moulting and feeding habit. Field notes were also taken on the distribution, host plants, nature and impact of damage, population dynamics and natural enemies of the pest. The bacterial insecticide, Thuricide (*Bacillus thuringiensis*) 70 WP and Malathion (malathion) 57 EC, each at 0.1% concentration, were sprayed on the infested plantations and their effects were assessed 15 days after the application.

Results and discussion

Distribution

The pest is most prevalent in the eastern hilly areas of Bangladesh particularly in Chittagong, Cox's Bazar, Bandarban, Rangamati, Khagrachari, and Sylhet Districts. It is also reported to occur in the Oriental region extending from India to New Guinea (Browne 1968).

Host plants

Besides *A. chinensis*, the pest was found to defoliate *Duabanga grandiflora* (Roxb. ex DC) Walp. However, the latter was found lightly attacked.

Nature and impact of damage

The young larvae feed on the green epidermal layers of leaves. As they grow, they feed on the tissues between the veins. As a result, the leaves turn brown and start drying. Yellowing of the leaves is a common sight in areas of severe infestation. The affected leaves fall off prematurely, and the plant may become completely leafless. In that event the larvae migrate to soft terminal tissues of the shoots and bore into them as far as 2-3 cm down. Younger plantations, usually of 2-5 years old, were found most heavily infested.

Severe defoliation affects the growth of the plant. Repeated defoliation results in stunted growth, die back of leading shoots, and forked or branchy bole. The affected plants rarely die even in case of severe defoliation as new flush of leaves appears within a fortnight or so.

Life history

Egg: The egg is oval being 0.7 ± 0.1 mm long and 0.4 ± 0.1 mm wide. The freshly laid egg is pale white but later it becomes pinkish. Incubation period is 3.5 ± 0.5 days. The eggs are laid on leaves or on webs of silk thread spun on half leaf-folds by the larvae of the previous generation.

Larva: The larva with sparse hairs is pale green and 2.6 ± 0.2 cm long when full-grown. The head is dark brown. Thoracic and abdominal segments are provided with dark brown sclerotized plates on the dorsal side (Fig. 1). There

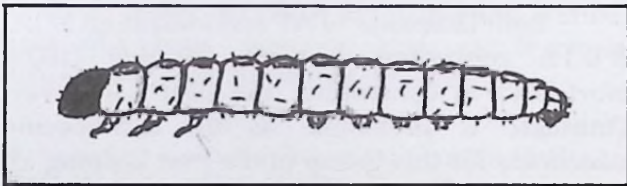


Figure 1. Larva of *A. hilaralis*.

are five larval instars, the total larval period being 14.0 ± 2.0 days. The duration of the 1st, 2nd, 3rd, 4th and 5th instar larvae are 2.5 ± 0.5 , 2.0 ± 0.4 , 3.0 ± 0.5 , 3.0 ± 0.3 and 3.5 ± 0.5 days respectively. The 1st instar larva feeds on the soft green tissue making shallow depressions on the leaf surface under the protection of silk strands spun openly. The 2nd instar larva constructs another shelter elsewhere on the leaf. The subsequent instars feed on leaf tissues between the veins making protective shelters by folding part or whole of a leaf for feeding inside. There may be more than one fold on a leaf. The entire leaf or distal half of the leaf may be folded along the mid-rib with the upper edges spun together. Folds of two separate leaves may sometimes be formed at their point of

contact. Each leaf-fold is inhabited by a single larva. When disturbed the larva retreats to the opposite end of the fold or drops to the ground by a silk thread.

Pupa: The pupa is dark brown with eight curved hooks at the posterior end. It is 1.4 ± 0.2 cm long and 0.5 ± 0.1 cm wide (Fig. 2). Before pupation the larva turns pinkish. Pupation takes

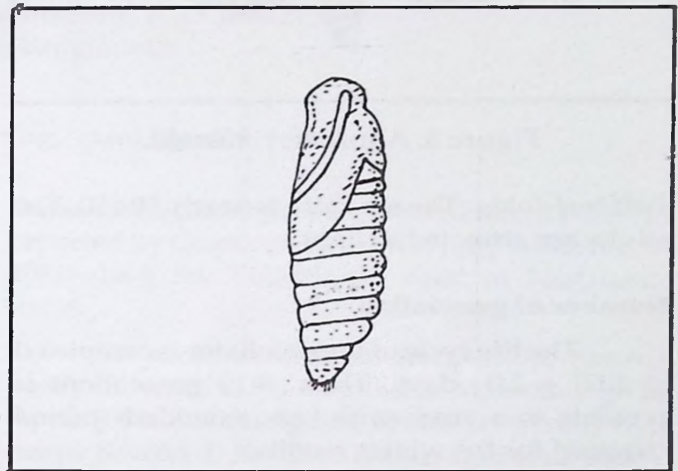


Figure 2. Pupa of *A. hilaralis*.

place inside the silken web. The pupa remains attached to the web with the help of curved hooks at its posterior end. The pupal period lasts for 6.0 ± 1.0 days.

Adult: The adult is a bluish green moth of 1.5 ± 0.3 cm long. The wings are provided with a series of small black marginal spots and fringed with white hairs (Fig. 3). The forewings are provided with two small black spots near the middle, and the costal margins golden brown. The hind wings are lighter. In male, the abdominal tip bears a tuft of black hairs, while in female it is golden brown. The adult longevity is 6.0 ± 2.0 days. The preoviposition period is 2.5 ± 0.5 days and the oviposition period is 2.5 ± 1.0 days. Each female lays 65.0 ± 5.0 eggs, singly or in groups of 2 or 3, either on leaves or on webs of silken thread spun by the larvae of the previous generation on

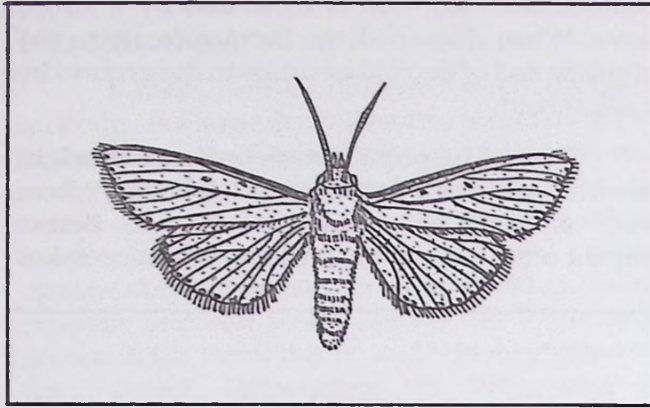


Figure 3. Adult of *A. hilaralis*.

half leaf-folds. The sex ratio is nearly 50 : 50. The adults are attracted to light.

Number of generation

The life cycle of the defoliator is completed in 23.0 ± 3.0 days. Thus 9-10 generations is possible in a year with an extended period required for the winter months.

Population dynamics

Population build up of the pest commenced in July coinciding with the onset of heavy rains. The peak population build up occurred in August-September. By October the population declined to light or negligible. In the remaining months the population was maintained in low level.

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Natural enemies

Two major hymenopteran parasites of *A. hilaralis* were recorded. One of them is *Apanteles balteatea* Lal. (Braconidae : Hymenoptera) which lays eggs on the young host larvae. The larvae of the parasite feed inside the host body until their maturity and form a bunch of white cocoons outside the host's body. Another parasite, *Brachymeria lasus* Walk. (Chalcididae : Hymenoptera) parasitizes the pupal stage of the pest. From the parasitized pupa a single adult parasite emerged. The two parasites together caused a mortality of about 40% during the peak infestation period of the pest. In addition, an unidentified reduviid, a carabid (both the larva and the adult), few spiders and ants were found preying on the larvae and/or pupae of the pest.

Management

Both Thuricide 70 WP and Malathion 57 EC @ 0.1% concentration were effective (100% mortality) in controlling the pest. However, Thuricide is preferable as this is a specific insecticide for this group of the pest keeping all predators and parasites unharmed. The physical method of control such as hand collection and destruction and providing overhead and side shade at the initial stage of infestation could prevent the attack of this pest (Rahman *et al.* 1997).