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A defoliating pest of Akashmoni (*Acacia auriculiformis* A.) seedlings in Bangladesh and its management

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Abstract

Akashmoni (*Acacia auriculiformis* A. Cunn. ex Benth) is an economically important forest tree species that is seen everywhere in Bangladesh. There is no available report on Akashmoni defoliator in the country but recently huge damage was caused by an insect [*Cryptothelia crameri* Westwood (Psychidae: Lepidoptera)] in the Seed Orchard nursery of Bangladesh Forest Research Institute (BFRI), Chattogram was recorded. The larva of the insect starts infestation both in the nursery and young plantations and feeds on young leaves and tender barks. Insect larvae build a special portable bag of leaves and other parts of the plants and live within this bag. The statistical test of Pearson's correlation between the heights of plants with the percentage of plants attacked for each age group indicated that there is moderate to high positive correlation at 12, 6 and 3 months age-old seedlings. One-year-old seedlings are highly susceptible to infestation (53%) for the pest. The biology, host range, infestation and ecology of the pest have been discussed in this paper. Chemical pesticides Ecomac 1.8 EC (@1ml/L), Acimix 55 EC(@1ml/L), Ripcord 10EC (@2m;/L) and botanical pesticide Neem oil (@5ml/L) were applied to control the pest in the nursery. Among these Acimix 55 EC showed the best performance killed 100% larvae of the insect followed by Ecomac 1.8 EC, Ripcord 10 EC and Neem oil killed 45%, 30% and 5% larvae respectively.

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Introduction

Acacia auriculiformis (Akashmoni) is an evergreen exotic tree species in Bangladesh. It is 8-20 meters in height, heavily branched and with a short, bent, or forked bole. On favorable sites, it grows up to 25-35 meters tall and 80-100 cm. diameters with a straight single stem. It has dense foliage and an open, spreading crown. The bark is grey or brown, sometimes black end at the base, smooth in the young trees (Hossain, 2015). The tree is planted for commercial purposes. It has wider uses in India and other neighboring countries for timber, pulp, fuelwood, veneer, furniture, particleboard and charcoal (Joshi, 2008).

A. auricoliformis seedlings and young plants suffer from many insect pest infestation and diseases. The flowers, seeds, pods and even stored seeds of *A. auricoliformis* are also considerably damaged by many species of insects (Joshi, 2008). Bhasin and Roonwal, 1954. Summarized a list of insect pests of *Acacia* spp. in India. The insects feed on the species as borers, defoliators, foot feeders and sapsuckers in forest nurseries and plantations.

The beetle *Adoretus bimargintus* (Scarabaeidae: Coleoptera) was recorded as a major pest and the weevil, *Hypomeces squamosus, Anomala bengalensis* are recorded as minor pest feeding on the leaves of *A. auricoliformis*. Adults defoliates making irregular holes form a lacey network. (Baksha, 2008). The larvae of bagworm, *Cryptothelia crameri* (Phychidae: Lepidoptera) feed on foliage and prune the leading shoots, twigs and throns of *A. catechu* and *A. nilotica* forming larval cases. They are polyphagous and found throughout India (Joshi, 2015).

In Bangladesh, there is no record of a severe infestation of *A. auriculiformis* by bagworm. But recently in the nursery of Seed Orchard Division of Bangladesh Forest Research Institute (BFRI), Chattogram seedlings of *A. auriculiformis* are infected seriously by the bagworm (*Cryptothelia crameri*). It is newly record of the bagworm pest attacks on the *A. auriculiformis*. So the present study was carried out to know the nature of damage, infestation, biology and control measures of the pest.

Materials and methods

The study was conducted at the nursery of Seed Orchard Division of BFRI Chattogram from October 2013 to November 2014. During this time seedlings of *A. auriculiformis* were seriously infested by bagworm (*Cryptothelia crameri* Westwood) larvae. The experiment was laid out in a Completely Randomized Design (CRD) with three replications and four treatments. The data was collected on the seedling's height (ft.), the number of branches of the seedlings. The number of insect's infestation in a different age of *Accacia auriculiformis* seedlings were also recorded. Data on insect infestation, age and height of seedlings are collected at the same time. Nature of damage, characteristics of the cage and host range, etc were also collected. The larva of bagworm (*Cryptothelia crameri* Westwood) was collected from the infested seedlings and reared in the laboratory of the Forest Protection Division (FPD). To control the pest Ecomac 1.8 EC (@1ml/L), Acimix 55 EC(@1ml/L), Ripcord 10EC (@2m;/L) and Neem oil at (@4ml/L)concentration were tested in the laboratory by feeding the larva with insecticide sprayed leaves and data were recorded.

Data were analyzed by Statistical test of Pearson's Correlations between the height of plants and percentage of plant attacked for each age group. ANOVA followed by Turkey's HSD method was performed to test the effect of chemical treatment after application against insect pest attacked which chemical treatment was statistically significant. All comparisons and statistical operations were performed in MS Excel 2010 and SPSS 16.0.

Results and discussion

Nature of damage

The pest starts infestation in the nursery whenever a new flash of leaves is available. Newly hatched larvae feed voraciously on tender leaves and the soft part of the shoot. Usually, they are fond of feeding the upper surface of the leaf. The entire leaf including the major

veins and vein-lets is eaten (Fig. 1). Maximum damage occurs when the larvae collect green leaves, twigs, growing shoots, or buds which are required for making the bag within which they live. In a severe attack, the leaves dry up and fall off. During an epidemic, a large area of a plantation may be completely leafless. As a result, the growth of the plants is affected.

Table 1. Relationship between the age and height of plants with the number of plants attacked by insects.

Age of plants (months)	Average ht (m)		Percentage of trees attacked		Correlation between height and plant attacked percentage
	Mean (m)	SE (±)	Mean percentage (%)	SE (±)	
12	2.60	0.06	45	20.62	0.75
6	2.43	0.25	55	16.33	0.81
4	2.77	0.13	60	9.57	0.29
3	2.56	0.21	65	20.62	0.67

Description of the bag

At the larval stage, the insect lives and stays in a self-mediated portable bag. It collects dry barks and small dead branches of the plant and attached those by their sticky saliva secreted from their mouth. The bag looks like a bundle of sticks of shape and size. The insect makes a middle pore at the top of the bag. The anterior and posterior ends of the bag are open (Fig. 2). The larva carries this bag as it moves upward and downward. When it moves only the head and thorax come out of the bag. During the resting period, it attaches the rim of the bag to a twig using silk thread so that it hangs suspended. The larva retires inside the bag and draws together the mouth entirely closing it. The bag becomes larger and heavier as the larva grows.

Table 2. Percentage of death insects at different times after application of the applied treatments.

Treatment	Percentage of death insect at different times after application of treatment							
	24 hours		48 hours		72 hours		96 hours	
	Mean (%)	SE (±)	Mean (%)	SE	Mean (%)	SE	Mean (%)	SE
Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ecomac 1.8 EC (@1ml/L)	30.00	4.08	40.00	4.08	45.00	2.89	75.00	5.00
Acimix 55 EC (@1ml/L)	50.00	5.77	77.50	4.79	100.00	0.00	0.00	0.00
Neem oil(@5ml/L)	0.00	0.00	0.00	0.00	5.00	2.89	20.00	4.08
Ripcord 10EC (@2m/L)	0.00	0.00	25.00	2.89	30.00	4.08	60.00	4.08

Egg

The female lays on an average of 900 eggs at a time. After egg-laying the female lost weight and became smaller in size. Eggs are small and vary in size. Many eggs are attached looking likes a basket of eggs. The incubation period is 10-15 days.

Larva

The newly hatched larva is 1.5±0.2 mm long, whereas the mature larva is 17±0.2 mm long. Larva's head is dark brown (Fig. 3). The anterior part of the larva is big and flat. The posterior part is narrow and ended tail point. After hatching from eggs the larvae disperse and spine silken threads quickly within a few hours make a protective bag around the body for protection. The larva inhabits this portable bag.

Pupa

At the end of the larval stage, the insect attaches its portable bag strongly with a branch of the host plant and undergoes pupation. During pupation silky threads are spun by the larva which covers the body. About two weeks later adult moth comes out from the posterior parts of the pupal case (Fig. 4).

Fig. 1. Nature of damage by *Cryptothelia crameri.*

Adult

There is a great sexual dimorphism in the adult stage. The male with bipectinate antennae is a normal winged moth whereas the female is creamy yellow, wingless and without appendages.

The male moth has a wingspan of 6.5± 0.5 mm. The wings are reddish-brown streaked with black, with the middle of the forewings translucent (Figure 5). The male takes rest for some time, walks and then eventually flies mating is facilitated by the male flying on the hanging bag bearing the female and inserting its protrusible abdomen through the posterior opening of the bag (Figure 5). On the first day of the emergence, the male attempts to mate. Both the adults have short longevity, about 2.5 ± 0.5 days. During this time they do not take any food. After lying of eggs the female dies.

Fig. 2. A portable bag of bagworm (*Cryptothelia crameri*).

Relation of infestation with seedlings age and height

The statistical test of Pearson's correlation between the heights of plants with the percentage of plants attacked for each age group indicated that there is moderate to high positive correlation at 12-, 6- and 3-months age.

Fig. 3. Larvae of *C. crameri.*

The data indicate that the highest infestation (53%) observed in one-year-old seedlings whose average height was 8.35 feet, followed by six and three months age-old seedlings considerably 44%, 20% with average height 3.15 and 1.58 feet respectively. The lowest infestation occurred in four months old seedlings whose average height was 0.63 feet (Table 1).

Fig. 4. Pupa of *C. crameri.*

Control of the pest

Physical

At the preliminary infestation stages, it is easy to collect and destroy the larvae of the pest by direct handpicking and shaking the plants or branches.

Chemical

Chemical pesticides Ecomac 1.8 EC (@1ml/L), Acimix

55 EC (@1ml/L), Ripcord 10EC (@2m;/L) and botanical pesticide Neem oil (@5ml/L) were applied to control the pest in the nursery. Among these Acimix 55 EC showed the best performance killed 100% larvae of the insect followed by Ecomac 1.8 EC, Ripcord 10 EC and Neem oil killed 45%, 30% and 5% larvae respectively.

Fig. 5. Adult of *C. crameri*.

One-way ANOVA indicated that the number of insects that died varied significantly with the treatments after 24h.

The Tukey HSD post-hoc test showed that Ecomac 1.8 EC caused has a significantly higher number of insect's death in 24h time after the treatment. The larval mortality of *Cryptothelea crameri* increased over time (Table 2).

This finding is fully different from (Baksha, 2000), who found that Malathion 57 EC was the most effective against *Cryptothelea crameri*. The cause may be the difference in ingredients of the two pesticides.

Conclusion

There is no record of *Cryptothelia crameri* as a defoliator of *Acacia auriculiformis* in Bangladesh and other neighboring countries such as India, Indonesia and Srilanka. This is a new pest of *A. auriculiformis* in our country. So it needs further detailed and elaborate research.

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