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Natural Incidence, Biological Study and Control of Some Insect Pests in *Terminalia belerica* Roxb.

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သစ်ဆိမ့်ပင်တွင် ကျရောက်သော အင်းဆက်ပိုးအချို့.၏ ပိုးကျရောက်မှု၊ ဇီဝဗေဒနှင့် ကာကွယ်နှိမ်နင်းနည်းများကို လေ့လာခြင်း

စာတမ်းအကျဉ်းချုပ်

သစ်ဆိမ့်ပင်တွင် ပိုးကျရောက်မှုနှင့် ဇီဝဗေဒလေ့လာမှုများကို အမှတ် (၄)ပျိုးဥယျာဉ် သစ်တော သုတေသနဌာန၊ ရေဆင်း၌ ၂၀၀၄–၂၀၀၅ခုနှစ် မိုးရာသီများတွင် ဆောင်ရွက်ခဲ့ပါသည်။ ဤလေ့လာမှုတွင် လိပ်ပြာ၊ ဖလံမျိုးစဉ်ဝင်များဖြစ်သည့် *Badamia exclamationis* Fab (Hesperiidae)၊ *Orgyia postica* walker (Lymantriidae) နှင့် *Anua coronata* (Noctuidae) အင်းဆက်ပိုး(၃)မျိုး မှတ်တမ်းတင် တွေ့.ရှိခဲ့ပါသည်။ ၄င်းအင်းဆက်ပိုးများအနက် *B. exclamationis* ကျရောက်မှုမှာ အများဆုံးဖြစ်ပြီး၊ *A.coronata* ကျရောက်မှုမှာ အနည်းဆုံးဖြစ်ကြောင်း တွေ့.ရှိရပါသည်။ *B.exclamationis* ဦးရေကို ဇွန်၊ ဇူလိုင်နှင့် သြဂုတ်လများတွင် အပေါများဆုံးတွေ့.ရှိရပြီး၊ *O. postica* ကို စက်တင်ဘာ၊ အောက်တိုဘာနှင့် နိုဝင်ဘာလများတွင် အပေါများဆုံးတွေ့.ရှိရ၍ *A. coronata* ကို သြဂုတ်လမှ အောက်တိုဘာလအထိ တွေ့.ရှိရ ပါသည်။ လေ့လာတွေ့.ရှိချက်အရ *B. exclamationis* မှာ မိုးရာသီတွင် ကျရောက်တတ်ပြီး *O. postica* နှင့် *A. coronata* တို့မှာ ဆောင်းရာသီတွင် ကျရောက်တတ်ကြောင်း သိရှိရပါသည်။ *O. postica* ဥများသည် (၁၀) ရက်ခန့်အကြာတွင် အကောင်ပေါက်လာပါသည်။ ပိုးတုံးလုံး (Larva) အဆင့်တွင် (၂၅.၇) ရက်ခန့်ကြာရှိပြီး၊ ပိုးရုပ်ဖုံး (Pupa) ဘဝဖြင့် (၁၀.၁) ရက်ခန့်ကြာမြင့်ပါသည်။ ဖလံအမ၏သက်တမ်းမှာ (၇)ရက်ခန့် ဖြစ်ပါသည်။ ဥမှဖလံဖြစ်သည်အထိ စုစုပေါင်း (၄၅.၈) ရက်ခန့် ဖြစ်ပါသည်။ *B. exclamationis* မှာ ဥမှ အကောင်ပေါက်ရန် (၇) ရက်ခန့်ကြာပြီး၊ ပိုးတုံးလုံး (Larva) အဆင့်တွင် (၃၀.၄) ရက်ခန့်ကြာ၍ ပိုးရုပ်ဖုံးဘဝဖြင့် (၇.၆၅) ရက်ခန့် ကြာပြီး စုစုပေါင်း ဘဝစက်ဝန်းမှာ (၄၅) ရက်ခန့် ကြာရှိကြောင်း သိရှိရပါသည်။ ဖလံအမသည် (၁၀)ခန့် အသက်ရှင်ပါသည်။ *B. exclamationis* မျိုးစိတ်အား ကာကွယ်နှိမ်နင်းရန် ပိုးသတ်ဆေးဖြင့် စမ်းသပ်ရာတွင် ပိုးသတ်ဆေး Cypermethrin နှင့် Fenpropathrin မှာ ထိရောက်မှုရှိကြောင်း တွေ့.ရှိရပြီး၊ Dimethoate ပိုးသတ်ဆေးမှာ ထိရောက်မှု မရှိကြောင်း တွေ့.ရှိရပါသည်။

Natural incidence, biological study and control of some insect pests in *Terminalia belerica*

Abstract

The natural incidence and biological study of some insect pests was observed in Belaric myrobalan, *Terminalia belerica* (Combretaceae) nurseries at the Forest Research Institute Yezin in rainy seasons of 2004 and 2005. In this study, three species of insect pests - *Badamia exclamationis* Fab. (Lepidoptera: Hesperiidae), *Orgyia postica* Walker (Lepidoptera: Lymantriidae) and *Anua coronata* (Lepidoptera: Noctuidae), were recorded from the nurseries. Among them, *B. exclamationis* was found to be the most abundance and *A. coronata* was found to be the least. *B. exclamations* population was found to be more abundant in June, July and August. *O. postica* was found to be abundant in September, October and November. *A. coronata* was recorded August through October. The results suggest that *B. exclamationis* was rainy season pest and *O. postica* and *A. coronata* were cold weather pests. Eggs of *O. postica* hatched in 10 days, the larval period last about 25.7 days and pupal period about 10.1 days. The total life cycle from egg to adult took about 45.8 days. The female moth lived for about 7 days. Eggs of *B. exclamationis* hatched in 7 days, the larval period last about 30.4 days and pupal period about 7.65 days. The total life cycle from egg to adult took about 45 days. The female moth lived for about 10 days. Among the insecticides tested against *B. exclamationis*, Cypermethrin and Fenpropathrin were found to be effective and Dimethoate was not effective.

Contents

1. Introduction

Oilseed crops are important for Myanmar's daily diet as Myanmar people use large amount of cooking oil compared to neighbouring countries. As the amount of edible oil produced is inadequate for local consumption, several tons of palm oil is being imported annually (MOAI, 2005). Major oil seed crops include groundnut, sesame, sunflower, mustard and niger. Beleric myrobalan, *Terminalia belerica* Roxb. (Combretaceae) is a potential tree to supplement edible oil.

Government has planned to supplement edible oil production by the cultivation of beleric myrobalan plantations throughout the country. To establish new plantations, a regular supply of healthy seedlings is needed. A number of insect pests were reported to have associated with beleric myrobalan (Browne, 1968; CAB International, 2000). The immature fruits are attacked by insects during the rainy season, and may fall to the ground. So far, there was no record on the infestation of insect pest in beleric myrobalan seedlings. Biological studies and control of the potential pests are yet to be explored. It is timely to observe the natural infestation of insect pests in beleric myrobalan seedlings and to evaluate the severity of individual species. It is also needed to initiate the biological study and investigate possible control measure of potential pests.

2. Literature review

Beleric myrobalan, *Terminalia belerica* Roxb. (Combretaceae) is a large deciduous tree attaining a height of 120 ft. and a girth of 10 ft. or more. The tree is found in the deciduous forests throughout the greater parts of India, Myanmar and Sri Lanka below elevations of about 1000 meters (Exell, 1954). It is a common associate of the sal, the teak and other important trees, occurring more or less scattered and not gregariously. In Myanmar, it is fairly common in deciduous forests both of the upper and lower mixed types, with or without teak (Exell, 1954).

Fruits contain a green fixed oil, saponin, tannins, a resinous residue and three amorphous and hygroscopic glycosidal compounds. A non-nitrogenous crystalline substance isolated from the fruit pulp which is identical with phyllenibin (ethyl gallate) an active principle isolated from *Emblica officinalis* (Hindi-amla). Kernel of terminalia contain moisture 6.4, protein 33.5, fat 40.9 and ash 4.8% (Rukmini and Rao, 1986).

It is used as astringent, tonic, expectorant and laxative. It is used in coughs and sore throat. Its pulp is used in dropsy, piles and diarrhoea. It is also useful in leprosy, fever and hair care. It is also used in Oxalic acid and preparation if ink.

Badamia exclamationis Fab. (Lepidoptera: Hesperiidae) was a polyphagous pest causing heavy reduction in the foliage of trees. It is widely occur throughout Myanmar (APPPC, 1982; Waterhouse, 1993). This moth is recorded as a defoliator of *Anogeissus acuminata* and various other trees (Beeson 1994, Mathur and Singh 1954-61).

Small tussock moth, *Orgyia postica* (Walker) (Lepidoptera: Lymantriidae) was listed as a serious pest of forest plantations (CAB International, 2000; Reddy, 1988; Singh, 1991). The larvae cause serious damage to the young leaves of cacao in the Philippines, both in nurseries and plantations. When very numerous, they can cause total defoliation, killing or stunting the tree (Sanchez and Laigo, 1968). The larvae also attack fruits, especially mango, rendering them unsuitable for sale (Fasih et al., 1989). The larvae of *Orgyia postica* are recorded hosts of importance in forestry are *Albizia lebbeck, Anogeissus latifolia, Eucalyptus leucocylon, E. multiflora, Mangifera indica, Pterocarpus marsupium, Shorea robusta, Tectona grandis, Terminalia belerica, Xylia xylocarpa* (Kalshoven 1950-1)

Fruit piercing moth, *Anua coronata* (Fabricius) (Lepidoptera: Noctuidae) is another species commonly infest the seedling of forest trees in the nurseries (APPPC, 1982). The larvae of this moth are polyphagus leaf feeders, but the species has not occurred as a pest of much importance. *Anogeissus latifolia* has been listed as a host species in the Indian area (Mathur and Singh (1954-61) and an instance of slight defoliator of nursery stock of *Eucalyptus* sp.

3. Materials and Methods

A survey was carried out to investigate the number of insect species in *Terminalia belerica* nursery at the Forest Research Institute, Yezin, (latitude 19º10'N and longitude 96º 07'E) in 2004 and 2005 monsoon seasons. Inspection was made at monthly intervals starting from May through November in each year (Fig.1). The number of larvae was counted before they were brought to the laboratory for biological study.

O. postica – about 250 eggs collected from the nursery were used for the biological study. Insect rearing was done under the laboratory condition (temperature about 25±1°C and R.H. 65±5%) at the Forest Protection Section, Forest Research Institute. Egg mass was placed in a Petri-dish with a wet blotting paper over a moistened cotton pad in the bottom.

Newly hatched larvae were transferred into a glass jar with *T. belerica* myrobalan leaves as food (Plate 1). Old leaves were removed and fresh leaves were provided everyday until the larvae pupate. All the developmental stages were noted.

B. exclamationis rearing was started with about 70 eggs collected from the nursery. The detailed procedure was similar to those mentioned for *O. postica*.

Bioassay to evaluate the efficacy of selected insecticides – cypermethrin, dimethoate and fenpropathrin, was conducted at the laboratory of Entomology Department, Yezin Agricultural University. As the number of larvae for the experiment was limited, only a single concentration for each insecticide could be tested. However, they were repeated twice. Mortality was recorded 24 hours after the application of insecticide.

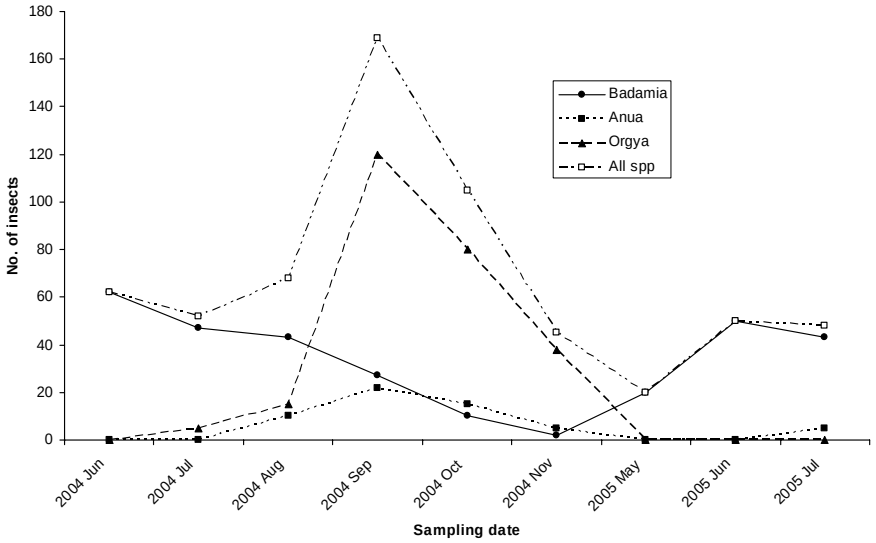

Fig. 1 Natural incidence of insect pests in *Terminalia belerica* nursery

Plate I. Jars for insect rearing

4. Analysis

Duration of individual developmental stage was calculated just to know the life cycle and no statistical analysis was done. The mortality data from the bioassay could not be valid to analyses for two reasons: (1) the number of larvae in each treatment was less than 10 and (2) there were only four treatments and three replications, degree of freedom was only six. So no further analysis was carried out (Sokal and Rholf, 1969).

5. Results and Discussion

In this study, three species of insect pests - *Badamia exclamationis* Fab. (Lepidoptera: Hesperiidae) (Plate II), *Orgyia postica* Walker (Lepidoptera: Lymantriidae) (Plate III) and *Anua coronata* (Lepidoptera: Noctuidae) (Plate IV) were recorded from the nurseries. Among them, *B. exclamationis* was found to be the most abundant (33.78 insects/month and about 49.1% of the whole population) and it was recorded throughout the study period although the number is quite small especially in winter months (Table1). *Anua coronata* was found to be the least abundant (6.33 insects/month sharing about 9.2% of the whole population).

Plate II. ***Badamia exclamationis*** **Fab. (Lepidoptera: Hesperiidae)**

Plate III. ***Orgyia postica*** **Walker (Lepidoptera: Lymantriidae)**

Plate IV. *Anua coronata* (Lepidoptera: Noctuidae)

B. exclamations population was found to be more abundant in June, July and August. *O. postica* was found to be abundant in September, October and November. In contrast, *A. coronata* was recorded August through October. The results suggest that *B. exclamationis* was rainy season pest whereas *O. postica* and *A. coronata* were cold weather pests (Table 1).

Sanchez and Laigo (1968) described the biology of tussock moth as follows: the eggs hatch after about 5-6 days, and the resulting male larvae take 15-26 days to become fully grown; the larger, female larvae take 15-28 days. Pupation takes place in a flimsy cocoon on either leaves or stems. The female and male pupal stages last 4-5 and 6-7 days, respectively.

In a laboratory study, the egg, larval, pupal and adult periods of *Dasychira mendosa* were 44.95 days on *T. belerica*, 42.93 days on *T. arjuna* and 40.99 days on *T. tomentosa* (Reddy et al., 1988).

In this study, eggs of *O. postica* hatched in 10 days, the larval period last about 25.7 days (Plate V) and pupal period about 10.1 days. The total life cycle from egg to adult took about 45.8 days. The female moth lived for about 7 days (Table 2).

Table 1. Number of insect pests recorded from the *Terminalia belerica* nursery at FRI, Yezin.

	2004						2005				
	June	July	Aug	Sep	Oct	Nov	May	June	July	Mean	%
BE	62	47	43	27	10	2	20	50	43	33.778	49.11
AC	0	0	10	22	15	5	0	0	5	6.3333	9.208
OP	0	5	15	120	80	38	0	0	0	28.667	41.68
All	62	52	68	169	105	45	20	50	48	68.778	

Table 2. Biological data of *O. postica* and *B. exclamationis* observed in the laboratory at FRI.

Life stage	***Orygia postica* (mean±SD in days)**	***Badamia exclamationis* (mean±SD in days)**
Egg	**10**	**7**
first instar	3.13±0.743	5.85±0.813
Second instar	4.13±0.64	6.85±0.745
third instar	5.27±0.594	6.9±0.788
fourth instar	6.07±0.704	5.7±0.801
fifth instar	7.13±0.743	5.1±0.641
Larva	**25.7±1.572**	**30.4±0.778**
Pupa	**10.1±1.246**	**7.65±0.745**
Total	**45.8**	**45**
Adult	**7**	**10**

Plate V. *Orgyia postica* Walker (Lepidoptera: Lymantriidae) larvae

Eggs of *B. exclamationis* hatched in 7 days, the larval period last about 30.4 days (Plate VI) and pupal period about 7.65 days. The total life cycle from egg to adult took about 45 days. The female moth lived for about 10 days (Table 2).

Among the insecticides tested against *B. exclamationis*, cypermethrin and fenpropathrin were found to be effective and dimethoate was not effective (Table 3). Although 100% mortality of larvae were recorded, it was very difficult to make a statistical analysis due to a number of reasons. Firstly, only 5 or 3 individual larvae could be used for each treatment: the population was too small. On the other hand, there was no control or check. The problem was mainly based on the scarcity of larvae for the bioassay.

Table 3. Results of bioassay on larvae of *Badamia exclamationis* Fab. (Lepidoptera: Hesperiidae)

Insecticide	Rep I			Rep II			Rep III			Mean % mortality
	Total larvae	Dead larvae	% mortality	Total Larvae	Dead Larvae	% mortality	Total larvae	Dead larvae	% mortality	
Cypermethrin 0.05%	5	5	100	3	3	100	5	5	100	100
Dimethoate 0.5%	5	1	20	3	2	66.7	5	1	20	35.5
Fenpropathrin	5	5	100	3	3	100	5	5	100	100

Plate VI. ***Badamia exclamationis*** **Fab. (Lepidoptera: Hesperiidae) larvae**

6. Recommendation

As the infestation of insect pests on *T. belerica* was mostly in rainy season, seedlings should be regularly inspected before the pest population reaches economic threshold. If the infestation is serious enough, certain insecticide like cypermethrin should be applied.

7. Conclusion

Only three species of insect pests were recorded from *T. belerica* seedling and *B.exclamationis* was found to be the most abundant species. Biological studies of *B.exclamationis* and *O. pastorica* were conducted under the laboratory conditions. Although bioassay was done for the control of *B. exclamationis*, results were not valid for the statistical analysis due to the limited availability of larvae. Further research is needed in this area.

Appendices

Raw data for natural incidence of insect pest in *Terminalia belerica* seedlings

	2004 Jun	2004 Jul	2004 Aug	2004 Sep	2004 Oct	2004 Nov	2005 May	2005 Jun	2005 Jul	Mean	%
BE	62	47	43	27	10	2	20	50	43	33.78	49.11%
AC	0	0	10	22	15	5	0	0	5	6.333	9.21%
OP	0	5	15	120	80	38	0	0	0	28.67	41.68%
All	62	52	68	169	105	45	20	50	48	68.78	

Raw data for bioassay

	Rep I			Rep II			Rep III			
	Total	Dead	%	Total	Dead	%	Total	Dead	%	Average
Cypermethrin 0.05%	5	5	100	3	3	100	5	5	100	100
Dimethoate 0.5%	5	1	20	3	2	66.7	5	1	20	35.5
Fenpropathrin20%	5	5	100	3	3	100	5	5	100	100

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