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PJBS

ISSN 1028-8880

# Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 5(11): 1246-1248, 2002


# Seasonal occurrence of Sissoo Plant Infesting Eriophyid Mite, *Aceria dalbergiae* Channabasavanna (Acari:Eriophyidae) and Toxicity of Some Insecticides on it

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**Abstract:** Population density of Sissoo plant infesting eriophyid mite, *A. dalbergiae* and toxicity of some insecticides on it were studied from April to December 2000. The mite population differed significantly in different months ($P< 0.001$) and different collection cites ($P< 0.001$). Highest population (6.4519± 0.19) was observed in the month of May and the lowest (1.8370± 0.29) was in August. All test insecticides were toxic to adult mites. The calculated $LD_{50}$ values of lambda cyhalothrin, malathion, cypermethrin and chlorpyrifos were 0.0541, 0.1760, 0.3249 and 0.6166 μg/cm² respectively. Lambda cyhalothrin was found to be comparatively more toxic. The order of toxicity was lambda cyhalothrin> malathion > cypermethrin > chlorpyrifos

**Key words:** New eriophyid mite, *Aceria dalbergiae*, insecticides, sissoo plant

## Introduction

*Aceria dalbergiae* Channabasavanna is an important eriophyid mite pest on Sissoo plants (*Dalbergia sissoo* Roxb.) in Bangladesh. This is being firstly reported from Bangladesh. Sissoo is a timber yielding plant and found almost everywhere in Bangladesh. Along with other pests this woody crop plant is attacked by *A. dalbergiae*. It is basically like a worm that cannot be seen in naked eye and exclusively plant feeder. The mite population differs from month to month and area to area (Haque *et al.*, 1994). This mite lives on the lower surface of the leaves and feed on the plant cell by inserting piercing mouth parts into the plant tissue (Easterbrook, 1978; Van der Geest *et al.*, 2000). This mite causes pale green or whitish yellow warty patches on leaf surface (Channabasavanna, 1966). Severe infestation causes malformation and degreening of leaves that resist photosynthesis resulting in early leaf fall.

Recent pest control practitioners have recognized eriophyid mite as an important pest for crops, ornamental plants and trees and accordingly control of this pest is frequently uttering in most of the countries of the world. But it is true that for any control measure to be effective an understanding of the peak population of the species is of vital importance. In Bangladesh, research work on this tiny creature is very poor. Considering the economic importance of *A. dalbergiae* as a pest an attempt was made to study its population density and dose mortality response to lambda cyhalothrin, malathion, cypermethrin and chlorpyrifos.

## Materials and Methods

**Seasonal occurrence:** To study the population of *A. dalbergiae* infesting sissoo plant four places were selected at Rajshahi Metropolitan area, Bangladesh. Each plant was visited once in a weak. In each sampling date three types of leaves, viz., old, mature and young were collected and brought to the laboratory. The leaves were then examined under a stereo binocular microscope. Sampling was done at four different places of a leaf and each sampling area was 25 mm². The eriophyid mite was counted by applying counting removing technique. Thus, four weekly samples were collected from four plants from April 2000 to December 2000. Due to the scarcity of leaves on the plant it was not possible to collect the data for the next three months. Analysis of variance (ANOVA) was done according to Zar (1999).

**Toxicity test:** Commercially available lambda cyhalotrin (Kerate 25 EC of ACI Limited), malathion (Limithion 57 EC of ACI Limited), cypermethrin (Cymbush 10 EC EC of ACI Limited) and chlorpyrifos (Dursban 20 EC of Auto Equipped Limited) were procured from the local agent of Rajshahi city. These insecticides were serially diluted with acetone and four dose levels were prepared. Surface film technique (Busvine, 1971) was applied for bioassay. Collected leaves were cut into 4 cm² size and were placed on the water soaked cotton in a petri dish. The cut leaf was placed under a stereo-binocular microscope and all mites were removed from that leaves with the help of a camel hair brush. A fixed amount of (0.05 ml) different doses were dropped on the leaf surface and was allowed to evaporate the acetone. Twelve mites were supplied on each cut leaf. Each dose has three replications and one batch of control was maintained with only acetone.

Mortality of the treated mites was recorded after 24 h. Corrected mortality was calculated using Abbott's formula (Abbott, 1925). Probit analysis was done according to Busvine (1971). This experiment was conducted in the month of November 2001.

Table 1: Monthly mean Population (per 25 mm² leaf area) of *A. dalbergiae* in four different collection cites (CS) of Rajshahi Metropolitan area from April to December 2000

| Months | $CS_1$ | $CS_2$ | $CS_3$ | $CS_4$ | Mean± SE |
|---|---|---|---|---|---|
| April | 4.7295 | 3.9937 | 4.7398 | 5.0125 | 4.6189± 0.22c |
| May | 6.3791 | 5.9846 | 6.5314 | 6.9124 | 6.4519± 0.19a |
| June | 4.1325 | 3.0124 | 4.1653 | 4.8612 | 4.0428± 0.38d |
| July | 2.1234 | 1.8923 | 2.2512 | 2.7625 | 2.2573± 0.19f |
| August | 1.9124 | 1.0479 | 1.9752 | 2.4125 | 1.8370± 0.29g |
| September | 2.5148 | 2.1457 | 2.8123 | 3.5124 | 2.7463± 0.29e |
| October | 4.7165 | 4.2153 | 4.9751 | 5.123 | 4.7575± 0.20c |
| November | 5.7154 | 5.8123 | 5.9841 | 6.3546 | 5.9666± 0.14b |
| December | 3.8841 | 3.1243 | 4.2516 | 4.9913 | 4.0628± 0.39d |
| Mean± SE | 4.0120± 0.52b | 3.4698± 0.57c | 4.1873± 0.53b | 4.6603± 0.51a | |

F value for months 207.87 ($P< 0.001$), F value for collection cite 45.07 ($P< 0.001$),
Means having same letter is not differ significantly by DMRT.

## Results and Discussion

**Seasonal occurrence:** Monthly average populations of *A. dalbergiae* on different types of leaves at 25 $mm^2$ leaf area of sissoo plant and relationship with physical factors viz., temperature, relative humidity and rainfall from April 2000 to December 2000 is presented (Fig. 1). The peak population was prevailed in May (6.4519± 0.19) and the lowest was in the month of August (1.8370± 0.29). Mite population on different months ($P< 0.001$) and on different collection cites ($P< 0.001$) varied significantly (Table 1). Muraleedharan and Chandrasekharan (1981) reported that the population of pink tea mite, *Acaphylla theae* (Watt) reached peak in January-February. Abou-Awad (1981) stated that *Eriophyes mangiferae* (Sayed) population reached peak in late May. Populations fluctuated during June, July and August and then increased again, reaching a peak in late October. In Bangladesh, Alam and Wadud (1963) studied some aspects of bioecology of litchi mite, *A. litchi* and reported that the population reached its peak during April-May. A gradual decrease began from the last week of May and reaches at level in August which is more or less similar to that of the present result.

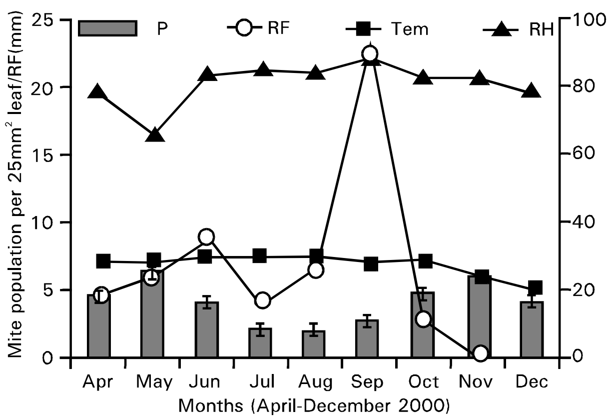


Fig. 1: Month-wise mean population density of *A. dalbergiae* per $25mm^2$ leaf area of Sissoo plant along with physical factors of the environment viz., temperature (Tem.) relative humidity (RH) and rainfall (RF) from April to December 2000

Temperature, relative humidity and rainfall directly affect the oviposition, hatchability mortality and finally the seasonal occurrence of the mite population (Haque *et al.*, 1997). The highest temperature was found in June-July and the lowest was in December but in case of rainfall the highest was in September and the lowest was in November-December. In present investigation, temperature ($r= -0.28$) and rainfall (-0.36) had non significant effect on the mite population but relative humidity had negative impact on mite population ($r= -0.69$). Gonzalez *et al.* (1984) reported that relative humidity had a negative impact on the population of *P. oleivora* in Havana, Cuba which is similar to present study. Moist weather normally are preferred by eriophyid mites. However, in some cases fungal pathogen, *Hirsutella thompsonii* Fisher may abundant moist season which attack eriophyid mites and as a result mite population decreased (Allen *et al.*, 1994).

This eriophyid mite was observed only on the under surface of the leaves. Gibson (1974) and Easterbrook (1978) also reported that eriophyid mites do not prefer dorsal surface of host leaves. Haque *et al.* (1997) observed that the bean mite, *C. purpureusi* was only on the under surface of bean leaflets.

**Toxicity**: The calculated $LD_{50}$ values of lambda cyhalothrin, malathion, cypermethrin and chlorpyrifos were 0.0541, 0.1760, 0.3249 and 0.6166 μg/$cm^2$ respectively (Table 2). Among four insecticides lambda cyhalothrin was found to be the most toxic to the adult mites, followed by malathion, cypermethrin and chlorpyrifos. The $\chi^2$ values indicated a non significant heterogeneity.

Most insecticides act as powerful acetylcholinesterase inhibitors resulting in disruption of nerve activity due to acetylcholine accumulation at the nerve endings which results in excitability, muscular tremors and finally the paralysis (O'Brien, 1967; 1978). Very few research works have been done on the toxicological effect of chemicals on eriophyid mites. Jakab (1984) studied the

Table 2: Toxicological data of lambda cyhalothrin, malathion, cypermethrin and chorpyrifos tested against adult *A. dalbergiae*

| Insecticides | Dose (μg/$cm^2$) | No. used | No. Killed | $LD_{50}$ (μg/$cm^2$) | Regression equation | 95% confidence limits (μg/$cm^2$) Lower | Upper |
|---|---|---|---|---|---|---|---|
| Lambda | 0.3125 | 36 | 32 | 0.0541 | Y= 3.8513+ 1.5669X | 0.03974 | 0.07359 |
| | 0.1562 | 36 | 28 | | | | |
| | 0.0781 | 36 | 24 | | | | |
| | 0.0390 | 36 | 16 | | | | |
| | Control | 36 | 3 | | | | |
| Malathion | 1.14 | 36 | 34 | 0.1760 | Y= 3.1043+ 1.5219X | 0.12745 | 0.2430 |
| | 0.57 | 36 | 28 | | | | |
| | 0.285 | 36 | 22 | | | | |
| | 0.1425 | 36 | 16 | | | | |
| | 0.0712 | 36 | 13 | | | | |
| | Control | 36 | 2 | | | | |
| Cypermethrin | 1.25 | 36 | 30 | 0.3249 | Y= 2.9280+ 1.3705X | 0.23391 | 0.45134 |
| | 0.625 | 36 | 2 | | | | |
| | 0.3125 | 36 | 1 | | | | |
| | 0.1562 | 36 | 1 | | | | |
| | 0.0781 | 36 | 1 | | | | |
| | Control | 36 | 3 | | | | |
| Chlorpyrifos | 5.00 | 36 | 31 | 0.6166 | Y= 4.1072+ 1.1301X | 0.38574 | 0.98569 |
| | 2.50 | 36 | 27 | | | | |
| | 1.25 | 36 | 25 | | | | |
| | 0.625 | 36 | 21 | | | | |
| | 0.3125 | 36 | 14 | | | | |
| | Control | 36 | 3 | | | | |

efficiency of some acaricides and insecticides against vine pest *Calepitrineus vitis* and reported fentoxon (diphenyl diazene 1-oxide) as a good acaricide. El-Banhawy *et al.* (1985) also obtained an excellent result with abamectin and fenvalerate to control *Eriophyes discoridis*. Hill and Foster (1998) worked with some insecticides on apple rust mite and found that spray of insecticides reduced significantly the population of *Aculus schelectendali* (Nalepa). Haque (1997) studied the toxicity of three insecticides i.e., dichlorvos, fenvelarate and cypermethrin against guava mite, *Diptilomiopus guajavae* and reported that cypermethrin was the best insecticide among them. Ying *et al.* (2000) studied the efficacy of Dicofol, carbosulfan clofentizine and mancozeb against citrus rust mite and reported that mancozeb was the most effective compound to control citrus rust mite. This miticide was also good for improving the fruit appearance and quality. Das *et al.* (2002) studied the effectiveness of cypermethrin, carbosulfan and chlorpyrifos against the Jackfruit mite, *Tegolophus indica* Chakrabarti and Mondal and reported that $LD_{50}$ values were 0.1826, 0.1936 and 0.2313 µg/cm$^2$ respectively. Lambda cyhalotrin, malathion and cypermethrin have relatively low mammalian toxicity (Worthing and Walker, 1987). Chorpyrifos is a non-systemic insecticide with potent contact and stomach action. These four insecticides are commonly used to control different insect pests in different crops. The present investigation showed that these insecticides can also be used as acaricides to control eriophyid mite where lamda cyhalotrin was the best.

**Acknowledgments**

The authors are grateful to Dr. S. Chakrabarti, Department of Zoology, University of Kalyani, Kalyani 742235, Nadia, West Bengal, India for the confirmation of this eriophyid species. The authors are also grateful to the Chairman, Department of Zoology, University of Rajshahi for extending laboratory facilities

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