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Record of *Dysmicoccus brevipes* Cockerell (Hemiptera: Pseudococcidae) as pest in mangroves of Maharashtra and its management

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Abstract

Dysmicoccus brevipes Cockerell commonly known as the Pink Pineapple mealy bug is a polyphagous pest reported to attack mostly on agricultural crops. Observations made on the occurrence of pest problems in the mangroves of Airoli and Vashi creek of Thane district of Maharashtra revealed the infestation of *D. brevipes* on mangrove species viz: *Avicennia marina*, *A. officinalis*, *Sonneratia alba* and *S. apetala*. Though this pest was reported on more than 100 plant species placed in 53 families of agriculture and horticulture importance and one plantation forestry species *Casuarina equisetifolia*, there was no report of its infestation on mangrove species except one report on *Xylocarpus* sp. This mealy bug causes severe damage to the plants both in nursery, plantation and in natural mangrove eco-system. Considering the severity of the pest and their epidemic nature of the infestation, experiments were carried out to study the possible control measures by using neem based botanicals in laboratory condition. It revealed that Azadirachtin (0.03%) at 1% concentration was very effective causing 99.6% mortality in 72 hours and 5% of Neem oil (crude) was effective and causing 74.8% mortality in 72 hours.

Keywords: *Avicennia marina*, *Sonneratia alba*, mangrove, occurrence, eco-system

Introduction

In India, Mangroves cover an area of about 4921 km² which is 0.15 percent of the country's total geographical area. Mangroves are distributed in the States of Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu, West Bengal and in the Union territories of Andaman and Nicobar Islands, Daman and Diu and Puducherry. In Maharashtra state about 52 creeks were present across the 720 km coastline, have developed mangrove habitats of which 18 are major ones [1]. Though more than 19 species of mangroves found in Maharashtra, *Avicennia marina*, *A. officinalis*, *Sonneratia alba* and *S. apetala* are the four species dominated much in Airoli and Vashi creek of Thane district. Mangroves are associated with insects of both beneficial and destructive. Surveys conducted to assess the pest problems of mangrove species in Airoli and Vashi creek revealed the infestation of the Pink Pineapple mealy bug *Dysmicoccus brevipes* Cockerell on *A. marina*, *A. officinalis*, *S. alba* and *S. apetala*. So far *Xylocarpus* sp. is the only mangrove species recorded as a host of *D. brevipes* [2]. This pest was reported on more than 100 plant species placed in 53 families of agriculture and horticulture importance and one plantation forestry species *Casuarina equisetifolia*. The important plant species attacked by this pest include *Anacardium occidentale*, *Annona muricata*, *Arachis hypogaea*, *Canna indica*, *Capsicum annum*, *Cocos nucifera*, *Coffea Arabica*, *Cucumis sativus*, *Daucus carota*, *Ficus* sp., *Hibiscus* (rose mallows), *Ipomoea batatas*, *Malus domestica*, *Mangifera indica*, *Psidium guajava*, *Saccharum officinarum*, *Solanum tuberosum*, *Theobroma cacao* and *Zingiber officinale* etc. [3]. This pest was reported on purple nut grass *Cyperus rotundus* and *C. esculentus* [4]. It was reported as pest for the first time on the root nodules of red gram *Cajanus cajan* and ground nut *Arachis hypogaea* from South India [5]. It was noticed attacking on the fruit bunches of oil palm at Palode, Kerala [6]. The seasonal abundance of this pest was studied on *Areca catechu* in Karnataka and reported a higher population during December to July [7]. This pest also acted as vectors in transmitting Cacao Mottle Leaf virus (CMLV), Cacao Trinidad Virus (CTV) [8], mealy bug wilt disease in Srilanka [9], and Banana Streak Virus (BSV) in Uganda [10]. Considering the importance of this pest, laboratory experiments were carried out to study the

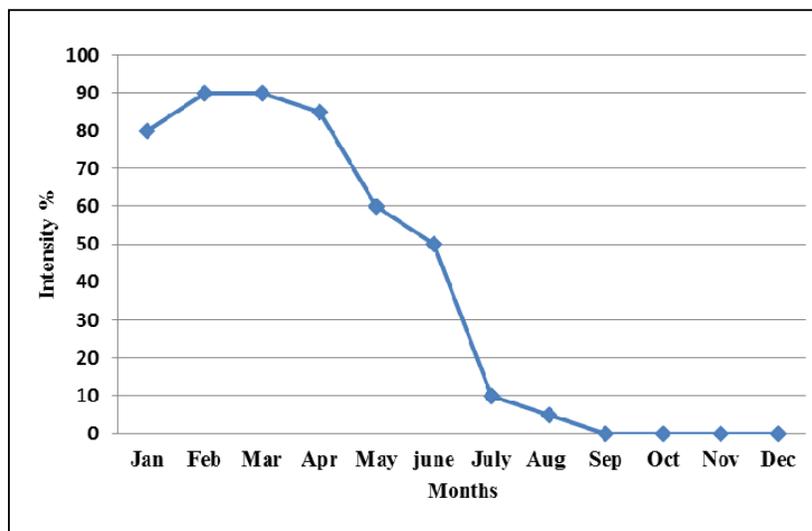
possible control measures by using neem based botanicals.

2. Material and methods

Periodical survey at various mangrove areas in Thane district was undertaken in 2018 to record the insect pest attack. (Airoli Natural mangroves -N 19° 14'76.5" E 072° 98'43.9", Gothivali Plantation - N 19° 14'07.9" E 072° 99'38.5", Ghansoli Plantation- N 19° 11'50.9" E 072° 99'17.3"). The insect pests collected were authentically identified by the subject expert. Intensity of attack was assessed by the level of incidence of the insect pests and percentage of the damage/extent of damage caused. Laboratory bioassays were conducted by using the Neem products and Neem oil by using different concentrations. Different concentrations of Neem oil (crude) 1%, 2%, 3%, 4% and 5% and Azadirachtin (0.03%) at 0.10%, 0.25%, 0.50%, 0.75% and 1% were prepared and tested on the targeted pest. Thirty insects were used for each concentration tested with five replications. Control was maintained separately.

3. Results and Discussion

The mealy bug *D. brevipes* is observed as a seasonal and a major pest in Airoli and Ghansoli mangrove areas. It attacks *A. officinalis* (Fig.1a), *A. marina* (Fig.1b), *S. alba* and *S. apetala* (Fig.1c). The bugs suck the sap on the soft tissues of the leaves and inject saliva that causes curling and contortion of leaves. The entire plant was stunted and the shoot tips appeared dried. The adult mealy bugs are very small, about 1mm wide. They appear fuzzy with white wax, with pink or pink-orange hue underneath the wax. It forms colonies on the lower side of the leaves. Adult females reproduce parthenogenetically (no males fertilize the eggs). Every egg results in a female mealy bug. Shape of the body corresponds to a width oval type (2 x 2 mm). Antennae eight segmented. The average duration required to complete a life cycle ranged from 60 to 70 days. This pest incidence occurred from January to August in which January to April the intensity was severe and from May to June the intensity level was moderate (Graph.1). In February and March the mangroves looks dried due to this mealy bug attack (Fig.1d).



Graph 1: Intensity percentage level of *Dysmicoccus brevipes* during the year 2018

3.1 Management of sap feeders

Botanicals: Bioassay of Azadirachtin (0.03%) at 0.10%, 0.25%, 0.50%, 0.75% and 1% and Neem oil (crude) at 1%, 2%, 3%, 4% and 5% against the pest revealed that 1% of Azadirachtin (0.03%) was very effective causing 99.6% mortality in 72 hours and 5% of Neem oil (crude) was effective causing 74.8% mortality in 72 hours. Azadirachtin at 0.10% to 0.75% and Neem oil at 1% to 4% were not much effective (Table. 1).

Predatory lady bird beetles are one of the agents most commonly employed to control sap sucking insects. *Menochilus sexmaculatus* is an effective predator of a range of sap sucking coccidae which can be reared and released in to the field to control the infestation of the pest [11]. Entomopathogens of *M. anisopliae* and *B. bassiana* at the concentration of 1×10^9 spores ml^{-1} was reported as a microbial pesticide to control the sap sucking pests [12]. *Verticillium lecanii* was reported as a biocontrol agent against the first and second instar nymphs of *Maconellicoccus hirsutus* [13]. *Lecanicillium lecanii* was reported as the best

entomopathogen to control the pest *D. brevipes* at the concentration of 1×10^9 spores ml^{-1} resulted 90.04% mortality [14]. Therefore the application of botanical pesticides and entomopathogens are the methods to control the sapsucking pests both in laboratory and field conditions.

4. Conclusion

Though a reasonable literatures on the insect diversity of mangrove species are available, not much information on the status of insect pests and its impact on mangrove species in the state of Maharashtra is available. In recent years infestation by different types of insects was recorded on the mangrove species in Thane district and the infestation of *D. brevipes* on *A. marina*, *A. officinalis*, *S. alba* and *S. apetala* form first record. The observations revealed that *D. brevipes* is an important sap sucking pest causing severe damage to the mangrove plants and it can be controlled by using botanical biopesticides particularly the neem based products. Further research required to study the effectiveness of this products in the field condition also.

Table 1: Bioassay of Neem products against *Dysmicoccus brevipes* 30 insects were used for each concentration. Values are means \pm SE of 5 replications

| Neem product | Duration | Percentage of adult mortality with different concentrations | | | | |
|---|----------|---|-----------------|-----------------|-----------------|-----------------|
| | | 1% | 2% | 3% | 4% | 5% |
| Neem oil (different concentrations) | | 1% | 2% | 3% | 4% | 5% |
| | 24 Hrs. | 0 | 12.6 \pm 0.54 | 16.8 \pm 0.83 | 27 \pm 0.70 | 29 \pm 1.00 |
| | 48 Hrs. | 0 | 17 \pm 1.58 | 27 \pm 2.12 | 39.8 \pm 1.48 | 51.4 \pm 1.94 |
| | 72 Hrs. | 0 | 27.2 \pm 1.92 | 31.6 \pm 1.67 | 62 \pm 2.73 | 74.8 \pm 2.28 |
| Azadirachtin (0.03%) (different concentrations) | | 0.10% | 0.25% | 0.50% | 0.75% | 1% |
| | 24 Hrs. | 6.6 \pm 0.54 | 17 \pm 1.00 | 32.2 \pm 0.83 | 39.2 \pm 1.09 | 43.6 \pm 1.51 |
| | 48 Hrs. | 10.4 \pm 0.54 | 21.6 \pm 1.34 | 43.6 \pm 0.89 | 69 \pm 0.70 | 98.4 \pm 1.51 |
| | 72 Hrs. | 14.6 \pm 1.14 | 31.6 \pm 1.14 | 66.4 \pm 1.14 | 77.8 \pm 2.16 | 99.6 \pm 0.89 |
| | Control | 0 | 0 | 0 | 0 | 0 |

**Fig 1:** *Dysmicoccus brevipes* attack on mangrove plants in the study area (a) *D. brevipes* attack on *Avicennia officinalis* (b) Mealybug attack on *A. marina* (c) *D. brevipes* attack on *Sonneratia apetala* (d) Dried look of mangroves due to *D. brevipes* attack

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