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EVALUATION OF SEMIOCHEMICALS EXTRACTED FROM HOST BARK ON *PLOCAEDERUS FERRUGINEUS*. L (COLEOPTERA: CERAMBYCIDAE)

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ABSTRACT

Laboratory evaluations were carried out to detect the incidence of semio-chemical attractants in the frass extracts of cashew bark chewed by P. ferrugineus L. The volatiles were extracted using n-hexane as solvent. Analysis was done, among these, longiborneol showed the highest response to antenna of female P. ferrugineus in GC-EAD. The study revealed incidence of semio-chemicals in CSRB infested cashew tree bark. The results indicated the presence of an attractant possibly a kairomone, in the cashew bark frass seen oozing out of infested bark with gum. An infested tree may act as a lure for further infestation in plantations. This will pave a path towards application of the semio- chemical attractants to trap the pest species in cashew plantations.

KEY WORDS: CSRB, semio-chemicals & Attractant

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INTRODUCTION

Currently, management of Cashew stem and root borer (CSRB) infestation is through adoption of post extraction prophylaxis (PEP), wherein the pest stages are extracted by careful chiselling from infested cashew trees and are further treated by swabbing and drenching the infested portions with chlorpyriphos (0.2%) to prevent further egg laying by the pest, (Anonymous, 1997). These approaches led to minimal success as systemic pesticides get accumulated only in the xylem tissues, while, the CSRB larvae which are primarily phloem feeders are not significantly affected.

The recommended integrated pest management (IPM) techniques for managing the CSRB incidence include; (a) removal of various pest stages from infested trees followed by swabbing and drenching of the treated portion of stem and roots with chlorpyriphos (0.2%), (b) uprooting of dead and CSRB infested trees which are beyond recovery.

The present studies are to evaluate the extracts from the host materials for induction of response by *P. ferrugineus L.* under electro antennogram (EAG) to detect presence of semiochemical attractant by using GC-EAD.

MATERIALS AND METHODS

The extracts from healthy cashew bark, fresh frass was tested for eliciting response using EAG, from the adult beetles of both the sexes.

The solvent extracts of cashew frass were obtained from healthy cashew bark and fresh frass from CSRB infested trees using n-hexane for EAG evaluations and diethyl ether for GC-EAD trials. The test plant materials

were collected from cashew plantations of Directorate of Cashew Research (DCR) and were transferred to separate conical flasks, containing 500 ml of solvent and were later incubated in shaking incubator (120 rpm at 37°C) for 60 min. The solvent was later filtered using micro filter equipment and concentrated by rotary evaporator to about 5 ml. Further analysis of response from antennae of male and female beetles was done using GC- EAD (Agilent-7890A). The response was graphically recorded.

RESULTS

The extract of frass from CSRB infested cashew trees revealed the presence of certain hydrocarbons, which were earlier reported to aid in communication in other cerambycid species.

The extracts from cashew frass using n-hexane as solvent, revealed the occurrence of following volatiles which were earlier reported to have role in communication in different species of insects (**Table1).**

Table 1: Spectrum of Compounds identified in the Cashew Frass Extract

S.No.	Compounds identified	Possible role in communication	Reference
1	Longiborneol	Kairomone	El-Sayed (2012)
2	E-13-octadecenal	Attractant and pheromone	
3	1-Docosene	Pheromone	
4	Octadecanoic acid	Pheromone	
5	7-heptadecene	Pheromone	
6	Z-9-octadecenal	Pheromone	
7	Eicosane	Pheromone	
8	E-11-Hexadecenal	Pheromone	

These extracts were evaluated for response using the antenna of males and females of *P. ferrugineus* they displayed moderate response which was higher than the control.

The response of males was higher to the cashew bark extract in comparison to the response to cashew frass extract (**Table 2**). The females however responded strongly to frass extract. This indicated that females had a stronger preference to frass extracts, which may be a stimulus for eliciting oviposition. However, the present study being of a preliminary nature further analysis and bioassay is essential to confirm the present findings.

Table 2: EAG response of *P. ferrugineus* to various Cashew Extracts

Test materials	Mean response levels under EAG using antennae of *P. ferrugineus* (in mv)							
	Male				Female			
	Batch I	Batch II	Batch III	Batch IV	Batch I	Batch II	Batch III	Batch IV
Cashew bark extract	-0.104	-0.218	-0.169	-0.046	-0.025	-0.042	-0.038	-0.034
Cashew bark frass extract	-0.222	-0.055	-0.222	-0.054	-0.099	-0.102	-0.160	-0.051

The peak response of the antenna of female *P. ferrugineus* in GC-EAD to frass extract overlapped with a concurrent peak in the FID. This indicated the presence of a strong kairomone component in the frass extract which could stimulate the antenna of female *P. ferrugineus* **(Fig.1)**.

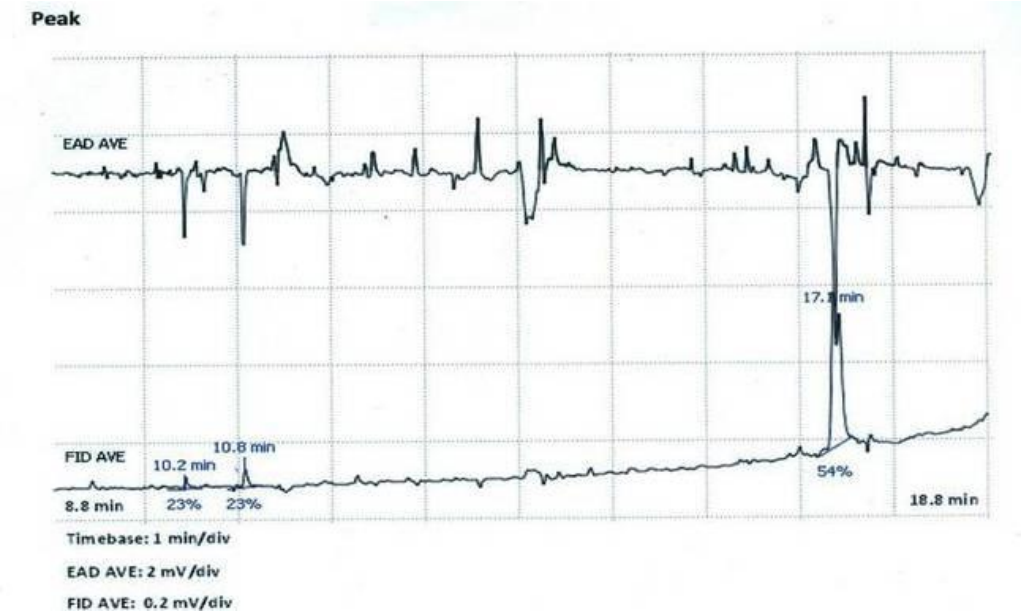

Figure 1: Response of Antenna of Female P. ferrugineus to Host Frass Volatiles

DISCUSSIONS

The volatiles extracted using n-hexane as a solvent from the frass extracts of *P. ferrugineus* fed on cashew bark were identified**.** Among these, longiborneol showed the highest response to antenna of female *P. ferrugineus* in GC-EAD. This was also reported previously in a cerambycid *Monochamus alternatus* pheromone. Joseph and Michael (2000) reported that male beetles of *Anoplophora glabripennis* could detect about 22 compounds among which synthetic alkyl ethers were significantly attractive to both the sexes. The compounds viz., 4-(n-heptyloxy) butanol and 4-(n-heptyloxy) 1- butanol could effectively trap the adult beetles. Among the volatiles identified the above listed compounds occur as pheromones/ kairomones in a variety of insect interactions.

The response of CSRB, *Plocaederus* spp. to host plant derivatives under olfactometer and EAG were reported earlier by Raviprasad and Nagaraja, (2008). They reported that, fresh frass and bark of infested tree elicited significantly high response from the mated and unmated females in olfactometer and EAG observations. The present study is in conformity with the earlier findings. The spectrum obtained in the GC-MS of CSRB infested cashew frass extract indicated the presence of longiborneol, identified to be a kairomone, helping in communication in *Monochamus alternates* (Coleoptera: Cerambycidae) (El-Sayed, 2012), which was identified for the first time in the present study from cashew frass. The management of pests based on behavioral ecology studies has been considered as a new means of control (Allison, *et. al.* 2004). It was reported that EAG response of *Batocera horsefieldi* for some of the compounds differed for unmated male and mated females. The present study also indicated differential responses from mated and unmated beetles which were reflected in the variation in type and density of sensilla in different sexes of both the species.

CONCLUSIONS

The study revealed incidence of semiochemicals in CSRB infested cashew tree bark. The results indicated the presence of an attractant, possibly a kairomone, in the cashew bark frass seen oozing out of infested bark with gum. An infested tree may act as a lure for further infestation in plantations.

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