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## SUMMARY

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The sex pheromone communication and perception system in Rice moth, Corcyra cephalonica, a major stored grain pest, was investigated using standard electrophysiological method added with Electron microscopy and behavior studies. Although, a number of studies are available on the different aspects of pheromone biology and identification of the pheromones in a large number of insects but so far no such study has been reported in Rice moth. The aim of the present study was to find out the presence of sex-pheromone receptors on the male antenna and to see the responsiveness of the receptors (Electrophysiological) as well as whole insects (behavior) to female extract and different synthetic insect sex pheromones of its closely related species. This study was conducted keeping the fact in mind that closely related species may have the same pheromone for their communication and may utilize the two isomers of the same pheromone to secure their reproductive isolation.

The light and electron microscopy conducted on the male antenna for the morphological identification of receptors served as a prerequisite to electrophysiological studies. It was observed that there are many S. trichodeum hairs present on its surface, which is about 20-50  $\mu$  long, smooth and sharply pointed, having

pores on the surface. Under Transmission electron microscope, it was observed that these are two bipolar neurons extending into the hair lumen. Apart from *S. trichodeum*, there are other types of sensillum present on its surface. These are *S. Chaetica*, *S. Styloconica* and *Bolm* bristles. Among these hair types observed in this study, the *S. trichodeum*, which is known to be a sex-pheromone receptor, was used for electrophysiological recording for receptor specificity, however *S. chaeticum* was also taken into consideration to compare the activity.

In order to study the receptor specificity, the single cell recording technique, was used in the present study, which has successfully been employed to elucidate the various aspects of olfactory perception.

In order to study the response patterns of the sex-pheromone receptor (*S. trichodeum*), the single cell recording technique was used in the present study. This technique has successfully been employed to elucidate the various aspects of olfactory perception in insects. The responses of the receptor to pheromone extract and synthetic pheromones were scanned. The basis of this scanning was based on the electrophysiological evidence that excitatory odors induce dendritic polarization of the sense-cell (receptor potential) followed by nervous

impulses in the axon while the inhibitory odors hyperpolarize the cell and depress the impulses.

It was found that among the 15 synthetic sex pheromones used for olfactory stimulation some had excitatory and few inhibitory response. Cis-Cis-9-12-Tetradecadien-1-ol acetate was most responsive to the receptor (*S. Trichodeum*). It was responsive even at .0001  $\mu$ g concentration, but it is likely that they have their threshold value even below this concentration. The other two responsive compounds Cis-9-Tetradecen-1-ol and Cis-11-Tetradecen-1-ol were found to be not at all effective below .001  $\mu$ g concentrations. The receptor showed a marked degree of adaptation when they were repeatedly stimulated by the same concentration of pheromones.

Among the synthetic pheromones used for olfactory stimulation, it was also observed that there are two compounds, Cis-Trans-9-12-Tetradecadien-1-ol (acetate & alcohol) which inhibited the excitatory responses to the most active compounds. These two are the geometrical isomers of the active compounds, cis-cis-9-12-tetradecadien-1-ol (acetate).

The behavioral experiments also supports the electrophysiological studies. The highest male copulatory behaviour was observed in presence of Cis-Cis-9-12-

Tetradecadien-1-ol (acetate) while there was a marked reduction in this behaviour in presence of its geometrical acetate and alcohol pheromone. Apart from this the studies also revealed that the sex pheromone production from virgin females is maximal when they are 3 days old and there is no apparent difference in calling by females in either the light cycle or the dark cycle. There was a marked reduction in the sexual behavior due to pre-pheromonal exposure.

Thus, it is most likely that the sex pheromone receptors are present in *S. trichodeum*. Cis-Cis-9-12-Tetradecadien-1-ol (acetate) is the most responsive compound and seems to be nearest to the natural sex pheromone of this insect. This finding may help in the biochemical task of isolation and identification of the actual pheromone.