Pheromone modulates plant odor responses in the antennal lobe of a moth

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Résumé: In nature, male moths are exposed to a complex plant odorant environment when they fly upwind to a sex pheromone source in their search for mates. Plant odors have been shown to affect responses to pheromone at various levels but how does pheromone affects plant odor perception? We recorded responses from neurons within the non-pheromonal “ordinary glomeruli” of the primary olfactory center, the antennal lobe (AL), to single and pulsed stimulations with the plant odorant heptanal, the pheromone, and their mixture in the male moth Agrotis ipsilon. We identified 3 physiological types of neurons according to their activity patterns combining excitatory and inhibitory phases. Both local and projection neurons were identified in each physiological type. Neurons with excitatory responses to heptanal responded also frequently to the pheromone and showed additive responses to the mixture. Moreover, the neuron's ability of resolving successive pulses generally improved with the mixture. Only some neurons with combined excitatory/inhibitory, or purely inhibitory responses to heptanal, also responded to the pheromone. Although individual mixture responses were not significantly different from heptanal responses in these neurons, pulse resolution was improved with the mixture as compared with heptanal alone. These results demonstrate that the pheromone and the general odorant subsystems interact more intensely in the moth AL than previously thought.

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