

Factors affecting pheromone production and release in males of the red flour beetle, *Tribolium castaneum* (Coleoptera: Tenebrionidae)

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DOI: xx.xxxx/xxx.2014.xxx.xxx.xxx

Abstract

Adult males of the red flour beetle, *Tribolium castaneum* (Coleoptera: Tenebrionidae), produce and release an aggregation pheromone when feeding. The pheromone, 4,8-dimethyl decanal, DMD, attracts females for mating and oviposition, while opportunistic males will also respond, presumably due to the potential for finding mates. Recent literature will be reviewed on the nature of the stereochemistry and anatomical localization of DMD production in *T. castaneum*. A series of studies were conducted to determine factors that affect DMD production in male *T. castaneum*. DMD production was assessed in all studies by collecting the pheromone from headspace volatiles from individual feeding males using the solid phase absorbent Porapak-Q. Volatiles were eluted in hexane, and internal standard measure, and the amounts produced over the aeration time determined by quantitative GC-MS. Genetic variation in DMD production was implicated by findings that DMD production differed significantly among geographically divergent populations. The functional genomic bases for DMD production were inferred from transcriptome analyses of feeding males compared to those of unfed males, feeding females and unfed females. Studies with application of insect juvenile hormone, JH-III, and various neuro-peptides provide insights on endocrine control of DMD production and release. Collective information from this work helps to elucidate pheromone production in this and many other beetle species, in addition to provided suggestions for the disruption of pheromone release toward a pest control strategy.

Keywords: aggregation pheromone, 4, 8-dimethyl decanal, functional genomics, endocrine regulation