

## M2.4

### Multiple functions of the fire ant, *Solenopsis invicta*, Alarm Pheromone

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As with most social insects, the red imported fire ant, *Solenopsis invicta*, utilizes complex chemical signals to regulate the activities of the colony. Several of these pheromones, including the trail pheromone and queen recognition pheromones, have been identified. However, the isolation and identification of the alarm pheromone has proven to be more elusive. Laboratory bioassays suggest *S. invicta*'s alarm pheromone performs several functions, from signaling the presence of a threat, to inducing worker activity during mating flights, and attracting eavesdropping parasitoids. Ant alarm pheromones have been identified from several glandular sources, e.g. Dufour's, mandibular, and anal glands. Behavioral studies point to the mandibular gland as the source *S. invicta*'s alarm pheromone. In *S. invicta*, the mandibular gland consists of only a few cells. This along with the ephemeral nature of the active components has complicated the identification of this pheromone. We employed solid phase micro extraction (SPME) and purge and trap techniques to collect and analyze headspace contents above workers exhibiting alarmed behavior. We identified a tri-substituted pyrazine as a component of the fire ant alarm pheromone. The lowest significant alarm response to the pyrazine was at a headspace concentration of 0.03 pg/ $\mu$ L. This pyrazine has now been isolated from the mandibular glands of workers, as well as female and male sexuals, who use the alarm pheromone to initiate mating flights. Additionally, the alarm pheromone serves as a kairomone – attracting phorid fly parasites.

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