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TENDING OF DEAD QUEENS BY WORKERS OF *SOLENOPSIS INVICTA* BUREN (HYMENOPTERA: FORMICIDAE)—(Note). As part of our normal research activity, we rear and maintain several hundred colonies of *Solenopsis invicta* Buren, the red imported fire ant. If the mother queen or her workers die they are normally discarded on the refuse pile within a few days. However, recently, while conducting laboratory tests with chemicals for toxic baits, we noted that worker ants from some colonies tended their queen for many weeks after she had been killed by exposure to the bait toxicant AC 217300 (tetrahydro-5,5-dimethyl-2(1H)[pyrimidinone (3-[4-(trifluoromethyl)phenyl]1 (2-[-(trifluoromethyl)phenyl]ethenyl)-2-propenylidene)hydrazone). This compound was reported (Williams et al. 1980. *J. Econ. Ent.* 73: 798-802.) to be selectively toxic to the queen and that in large colonies the queen died within 2 to 4 wks even though thousands of workers survived exposure to the chemical. The queens of these colonies were physogastric and ovipositing at the time of exposure to the bait. In 13 of these colonies the surviving workers maintained the gaster of the queen for 3 to 9 weeks (Fig. 1), but in 4 others the workers quickly discarded the queen. The workers were also observed with the entire queen or the thorax and gaster, but they never maintained only the head or thorax alone or the head and thorax together.

The behavior of workers to the dead queen's gaster was typical of that observed with live queens, i.e., they clustered around the corpse with almost constant grooming and licking of the cuticle. With one exception, efforts to induce the workers to accept a new queen (2 to 4 wks old) were futile as long as they kept the dead queen. New queens were killed just as they would have been if a healthy queen had been present. However, once the body of the dead queen was discarded, a new queen was usually accepted. In 1978 two of our coworkers (A. Glover and B. M. Glancey, personal communica-

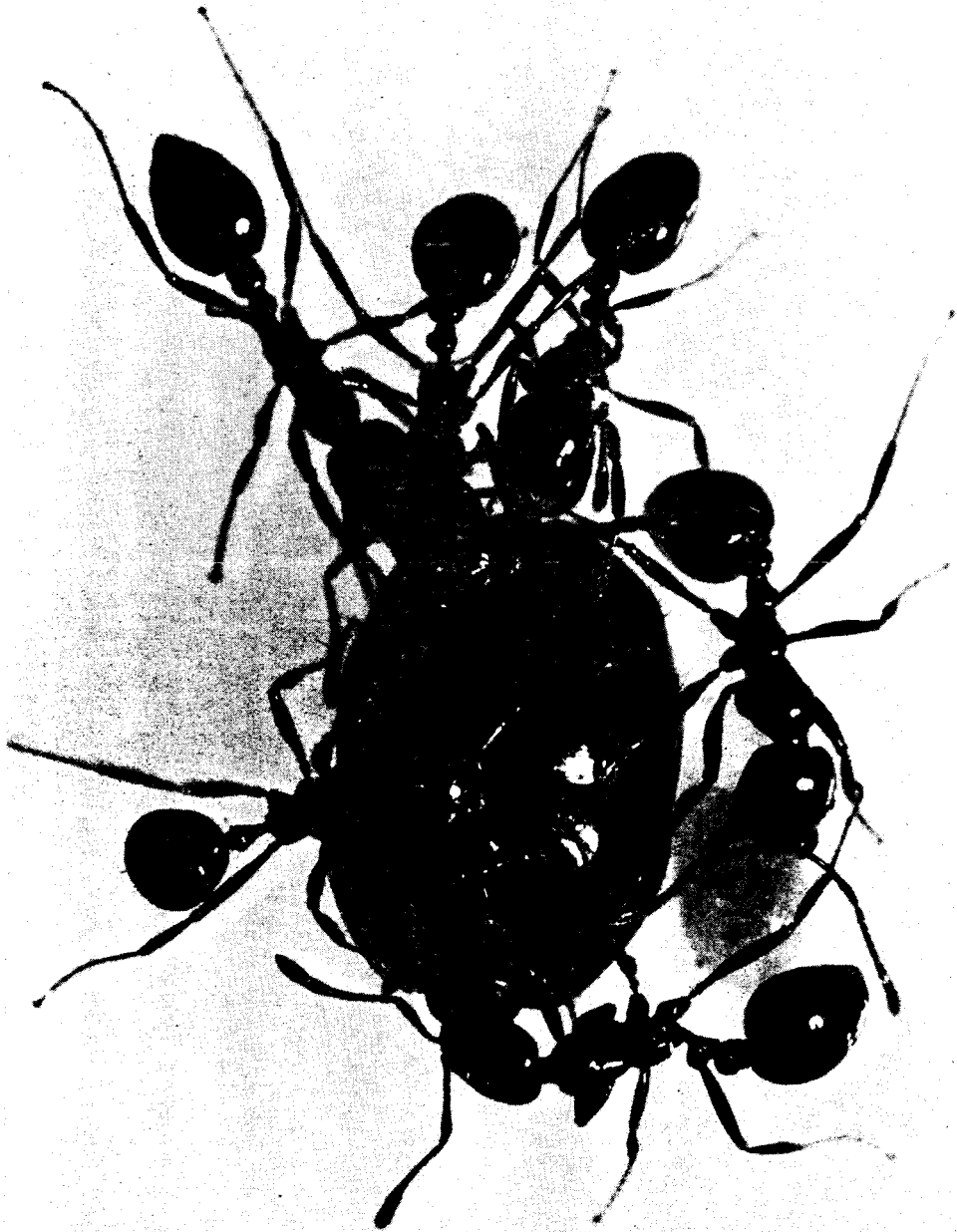


Fig. 1. Abdomen of dead queen of *S. invicta* tended by worker ants.

tion) also observed a colony of *S. invicta* that maintained the gaster of their dead queen for 7-8 months at which time ca. 100 workers remained alive. Several attempts to re-queen this colony resulted in execution of the new queen.

The observation of Glover and Glancey suggested that the tending behavior we observed was not related to some property of the toxicant, but rather to the physiological condition of the queen at the time of death. This hypothesis was strengthened when we killed 4 previously healthy queens by freezing. One queen was discarded after 8 days, another after 14 days. The 2

remaining queens were still being maintained at 15 days when they were removed for other tests.

Tending of dead queens by daughter worker ants for long periods of time (many weeks) has not been reported previously. Recently, Fletcher and Blum (1981. *J. Georgia Ent. Soc.* 16(3): 352-6.) reported on the use of dead queens of *S. invicta* as bioassay units to assay for the presence of a dealation inhibitory pheromone in mated queens. The length of time the dead queens were maintained during these studies was not specified. E. O. Wilson (1958. *Psyche* 65: 41-51.) noted that queens and some large major workers of *Pogonomyrmex badius* Latreille were kept within the nest under laboratory conditions for 3 days after death during which time they were licked and moved about. After this time, they were moved to the refuse pile. T. C. Schnierla (*Army Ants: A Study in Social Organization*, 1971.) while observing a trail of *Eciton hamatum*, found the headless body of a dead queen within a tight little ball of workers. Because of her dismembered and dried condition, he assumed that she had been dead for many days. Workers clung to the body when he moved it with tweezers.

Our observations suggest that the gaster-tending behavior is mediated by a pheromone produced by the queen while she is alive, but which remains on the cuticle or in some other organ or tissue after death. Jouvenaz et al. (1974. *Ann. Ent. Soc. America* 67: 442-4.) and Glancey (1978. *Proc. Tall Timbers Res. Sta.*, No. 7, 173 p.) have reported that *S. invicta* queens produce a pheromone that attracts workers and Vander Meer et al. (1980. *Ann. Ent. Soc. America* 73: 609-12.) have shown that a queen-tending pheromone(s) can be extracted from the poison sac. The behavior induced by this pheromone is similar to that toward dead queens and can be mimicked with surrogate queens (small pieces of rubber septa) treated with extracts of the poison sac. The variability in retention time of the dead queen could be related to the condition of the poison sac after death. If it remains intact, the pheromone could be released slowly over a period of many weeks. Since the venom alkaloids possess antimicrobial activity, they could delay deterioration of the poison sac. On the other hand, decreases in pheromone production related to aging or senility or accidental destruction of the poison sac at the time of, or shortly after death, could account for early rejection of the dead queen.

The tending of dead queens by worker ants could be significant in planning control programs with bait-toxicants such as Amdro® because requeening of field colonies from mating flights by newly-mated queens may not occur as rapidly as expected. Thus, fewer treatments would be required to maintain control. Mention of a commercial or proprietary product in this paper does not constitute an endorsement or recommendation of this product by the USDA.—DAVID F. WILLIAMS, CLIFFORD S. LOFRGEN AND ROBERT K. VANDER MEER, Insects Affecting Man and Animals Research Laboratory, ARS, USDA, P.O. Box 14565, Gainesville, FL 32604 USA.