



SHORT NOTE

Adoption of a surrogate artificial queen in a colony of *Atta cephalotes* (L.) (Hymenoptera: Formicidae) in Colombia

G SOTELO¹, DS ORTIZ-GIRALDO², J RODRÍGUEZ², J MONTOYA-LERMA²

1 - Forage Laboratory CIAT, Palmira, Colombia.

2 - Universidad del Valle, Cali, Colombia.

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Corresponding author

Diana Sofia Ortiz Giraldo.

Facultad de Ciencias Naturales y
Exactas, Departamento de Biología,
Universidad del Valle

Calle 13 nº 100-00, Sede Meléndez

Cali, Colombia

E-Mail: dianasofiaog@hotmail.com

Abstract

In nature, *Atta cephalotes* (L.) is a monogynous species. Each colony has a single, permanent queen fed and protected by thousands of sterile workers. At death the queen colony practically disappears. Recently a colony established eight years in the International Center for Tropical Agriculture (CIAT), Colombia, lost the queen being orphaned by three months. Starting from the idea that whether this colony could take a surrogate queen, we collect a field young nest of *A. cephalotes*, which donated its queen to the orphan colony. Overall, there was a slight aggression among workers without attacking the surrogate queen, which was adopted by the orphan colony. Five months later, the surrogate queen was still alive and there was presence of larvae and pupae. The results show that the artificial colony of *A. cephalotes*, after a period of orphanhood, accepts surrogate queen and remains stable and active.

The colonies of *Atta cephalotes* (L.) are monogynous: i.e. has a single queen, fed and protected by thousands of workers. It is estimated that a queen lives for 15 years and is irreplaceable, that is, when it dies, the colony disappears (Hölldobler & Wilson, 2011). The workers, especially the soldiers, are territorial and defend the colony from the presence and or attack of intruders, even those of the same species (Whitehouse & Jaffe, 1995). In the same way, the workers reject winged queens from other colonies that approach their territory. They are attacked, and in most cases, dismembered (C. Giraldo, Foundation Center for Research on Sustainable Farming Systems (CIPAV) personal communication, August 21, 2013). At present, it is unknown whether the foundation of nests of *A. cephalotes* with more than one queen occurs, or if *A. cephalotes* workers have the ability to adopt new queens into their nest without altering the work within the colony and/or affecting the surrogate queen. Recently, the queen of a colony of *A. cephalotes* with eight years of establishment under

laboratory conditions at the International Center for Tropical Agriculture (CIAT) in Palmira, Valle del Cauca, died and the colony spent three months in orphanhood. This allowed us to question whether an artificial colony of *A. cephalotes*, after a period of orphanhood (i.e. without a queen), could accommodate an “intruder” queen and her progeny.

Starting from this question, a laboratory test was conducted in three stages; Step A: Removal and transfer of queen from donor ant colony. A small nest, obtained in the field, was deposited in a transparent plastic container with an airtight lid. This consisted of the queen, workers, and a quantity of symbiotic fungus. Step B: Conditioning, recognition, and acceptance. Migration of small quantities of workers from the orphaned nest (from CIAT) every 30 minutes for a period of four hours into the nest obtained in the field until these workers exceeded the number of workers found in the nest from the field. Step C: Assembly between nests. After four hours of testing, the nest from the field with its new population





Fig 1. Artificial colony of *Atta cephalotes* (CIAT). A - Five months after the adoption of the surrogate queen. B - Live surrogate queen integrated into the orphan colony.

(its own workers and orphan workers) joined the largest nest (orphan) through a communication channel and colony was observed during five months.

In the first step, there was a slow movement between colonies. This was accelerated in the step B, and at the outset of the migration, confusion was observed by orphan workers, and contact was observed between the workers, but without aggression. It is noteworthy that orphaned workers, upon detecting the surrogate queen, tried to remove her from the symbiotic fungus (field colony) and from the donor workers. After five months of adoption, this colony is stable (Fig 1) and shows offspring production. This represents the first record, on the behavior of artificial colonies of *A. cephalotes*, aimed at understanding their social organization and the role of different castes within it, especially under a condition of catastrophe.

De Souza et al. (2003) indicated that *Atta* queens, in order to maintain monogynous colonies, do not tolerate another

queen in their colonies; however, the absence of the queen in this nest supplied evidence of the ability of workers to replace it. It is worth noting that there have been isolated cases of two queens within *Atta* nests: in *Atta texana* (B.) (Moser & Lewis, 1981) and *Atta laevigata* (S.) (Mintzer, 1990). In synthesis, this event shows how a leafcutter ant colony, *A. cephalotes*, can adopt a new queen, thus guaranteeing the continuity of the colony by restoring the production of new individuals who will become a future workforce. The adoption of a queen or even an event of secondary polygyny in nests of *A. cephalotes* is significant because they imply a challenge to the central dogma of nest removal by the extermination of queens.

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