REARING ARBOREAL ANTS IN GLASS TUBING1,2,3

A. P. BHATKAR AND W. H. WHITCOMB

Department of Entomology and Nematology,
University of Florida, Gainesville, Florida 32611

ABSTRACT

Glass tubing, 0.4-0.8 cm ID, at times compartmented, served as nests for rearing 13 species of arboreal ants of the genera *Pseudomyrmex*, *Crematogaster*, *Leptothorax*, *Solenopsis*, *Camponotus*, and *Paratrechina*. Methods of colony procurement and establishment were perfected, including techniques for controlling temperature, light, and humidity. Ants could be satisfactorily marked for night observations by placing fluorescent paint on the ants' dorsal areas and inspecting them with the aid of UV light.

With increased emphasis on the biology, ethology, and biomass studies of ants, development of their rearing techniques has become important. Methods of rearing terrestrial ants are more numerous in the literature (Andrews 1937, Brian 1951, Ettershank 1965, Sweeney 1960, Wheeler 1910, Wilson 1962, etc.) than those of arboreal ants. Natural nests of many arboreal species in the "myrmecophilous" plants have been described by Wheeler (1910) and Sudd (1967).

Carney (1970) maintained *Camponotus herculeanus* (L.), *C. pennsylvanicus* (De Geer), and *C. vicinus* Mayr in pieces of nesting wood as well as balsa-wood layers. Leuthold (1968) held colonies of *Crematogaster ashmeadi* Mayr in hollow mangrove (*Rhizophora mangle*) twigs. Wilson (1971) mentioned holding *Camponotus fraxinicolus* M. R. Smith in glass tubes, but did not elaborate on the technique. Studies on the biomass of *Pseudomyrmex pallidus* F. Smith colonizing *Catalpa speciosa* Warder ex Engelm. twigs, and on the confrontation behavior of this and other arboreal species, with the red import fire ant *Solenopsis invicta* Burm., were made possible by the development of simple, glass tube nests. Plastic, disposable micropipettes were also tried because of their inexpensiveness, but the ants deserted them within a month.

Glass tubing, 0.4 cm ID and 30 cm long, was suitable for the species of Pseudomyrmecinae (*P. pallidus*, *P. brunneus* F. Smith, and *P. mexicanus* F. Smith), Myrmecinae (*Crematogaster minutissima* Mayr, *C. ashmeadi*, *C. atkinsoni* Wheeler, *C. clara* Mayr, *Leptothorax curvispinosus* Mayr, and *Solenopsis pica* Emery) and small Formicinae (*Camponotus impressus* (Roger) and *Paratrechina* spp.). Larger diameter tubing (0.6-0.8 cm) was necessary for *Camponotus floridanus* (Buckley), *C. sayi* Emery, etc. The ants could nest in short pieces of glass tubing (15 cm) closed at the lower end with cotton wool, and narrowed slightly at the entrance by drawing out the tube over a flame. The tubes were held vertical by casting liquid plastic (Castolite, Cope Plastics, Inc., Godfrey, Ill.) around their bases in 395 ml (12 fluid oz.) plastic tumblers.

---

1Partially supported by USDA, ARS Cooperative Agreement no. 12-14-10, 952(33).
2Partially supported by 'Tall' Timbers Research, Inc.
3Florida Agricultural Experiment Station Journal Series No. 5563.
To simulate the natural nests of *Pseudomyrmex* spp., *Crematogaster* spp., *Leptothorax curvispinosus*, and *Camponotus impressus* (Fig. 1), the glass tubes were subdivided into compartments by inserting 0.5 cm end pieces of hollow Q-tip holders (Johnson and Johnson, New Brunswick, N. J.) 6 cm apart. The upper end of each tube was narrowed to a passageway slightly larger than the queen's thorax or abdomen by inserting a 2.5 cm piece of hollow Q-tip holder (Fig. 2). This step was disregarded in making *L. curvispinosus* nests since the workers of this species enclosed their nest opening with loose pieces of cellulose from the reeds or soil particles that were provided.

Arboreal ants were collected by breaking and splitting open, dried twigs of several soft, pithy plants (*Eupatorium altissimum* L., *E. capillifolium* (Lam.))

Fig. 1. Sections of arboreal nests from *Cephalanthus occidentalis* twigs. Cavities of *Pseudomyrmex pallidus* and *brunneus* are cigar-shaped and their nest entrance is oblong (A); cavities of *Camponotus impressus* are cylindrical and the nest entrance, circular (B), and cavities of *Leptothorax* are similar to those of *Crematogaster* spp. but are provided with terminal exits through frass (C).

Fig. 2. Glass capillary nest (A) with RH control apparatus. (B) bottle with salt solution; (C) connection to aquarium pump; (D) water capsule; (E) diet dish; (F) insertion of RH sensor through neoprene tubing, collaring the cut sections of A. Terminals of RH sensor are connected through a shunt, rectifier, galvanometer, and a recorder (Rogers 1957) to measure humidity.
Twigs were observed for entrance holes then tapped with the blunt edge of a knife to establish the presence of ants. Twigs inhabited by ants were separated from living plant tissue and placed over large plastic dish pans. The upper end of each twig was split in half and pulled apart. The ants and the brood were dropped into the dish pan by tapping the split twig with a knife.

The rims of the plastic containers were dusted with talcum powder or sprayed with Fluon GP-I (ICI America Inc., Stamford, Conn.) to confine the ants to the containers. The colonies were left for 24 hr by which time the workers piled their brood in a shaded part of the dish pan. When the glass tubes were placed horizontally into a plastic dish pan, the species of *Crema-togaster* colonized the tubes within 48 hr. In the cases of *Pseudomyrmex* spp., *Camponotus impressus*, *Leptothorax curvispinosus*, and *Solenopsis picta*, the brood and ants were dropped into plastic tumblers containing vertical tubes. Queens as well as workers crawled up the vertical tube, entered, and examined the inside for 1-4 hr prior to colonizing them. In natural nests, such compartments were cigar-shaped, 2-6.5 cm long, and were interconnected through holes 1-2 times the width of the ant's width; only 1 or 2 ants could pass through the passageways at a time. The smaller species were given access to water by means of a 5.5 cm piece of hollow Q-tip holder, passed through the lid of a snap-cap vial. The vial was filled with tap water or 5% honey solution. This method prevented drowning of the foraging ants. The larger species were given water in snap-cap vials with a ball of cotton wool immersed in it to prevent drowning of the ants. Artificial diet (Bhatkar and Whitecomb 1966) was successfully used for arboreal species. The tubes were covered with red cellophane paper or a half sleeve of dark rubber tubing. Individual ants could be painted at their thoraces, petioles, and gasters with fluorescent colors (Day-Glo colors, Switzer Brothers, Inc., Cleveland, Ohio) and their activity could be observed with the aid of UV light in the dark. Brood raised from eggs under partially lighted conditions developed into an F1 generation that was acclimated to indoor lighting. Such colonies were readily raised in lighted rooms.

Insofar as possible, these studies were made at a constant temperature of 27 ± 3°C and 60 ± 5% RH. Whenever indoor temperature suddenly dropped, water vapor condensed on the inner wall of the glass tubes. Water condensation interfered with ant movement and facilitated fungal growth, leading to larval mortality. Humidity inside the nests was corrected by maintaining the tubes vertically over different concentrations of salt solutions in a chamber. A fine gauze enclosure at the lower end of each tube allowed the humidity to change while the ant colonies were held inside. For preparing humidity chambers, readers should refer to Winston and Bates (1960). A small-sized modification of a Dunmore electrical hygrometer was used to measure RH up to 95%. Essentially the instrument consisted of 2 electrodes made of copper wires and a porcelain bead (0.2-0.3 cm diam) holding the tungsten filament in the electrical lamp. One side of the bead and the copper wire endings were sanded to a flat surface and coated with a thin layer of 0.02-1.2% (W/V) lithium chloride solution. Electric circuit and other construction of the instrument was similar to the one used by Rogers (1957). The sensing element was caged with a fine gauze before it was inserted into the nests. A small aquarium pump was used to create air currents and to equate RH inside the glass tubes (Fig. 2).
The ability to rear arboreal ants in glass tubing opens new vistas both in mass rearing and behavioral research. Species confrontation, microclimate, life history, queen production, and pheromone effects of arboreal ants can now be more easily observed.

**Literature Cited**


---

**CHANGE IN WAIVERS OF PAGE CHARGES**

To the responses we have made to meet the present financial pinch (see Vol. 57 p. 368), The Publications Committee must now add a change in policy on waivers of publication charges. Effective with the June 1975 issue, members who are not institutionally or grant supported can be given a waiver of only 50% of publication costs. The request for such a waiver should be made to the Editor at the time the manuscript is submitted. Non members cannot be granted waivers.