ATTEMPTS TO ARTIFICIALLY PROPAGATE THE FIRE ANT PARASITE
Solenopsis daguerrei (Hymenoptera: Formicidae) IN ARGENTINA

JUAN A. BRIANO¹, LUIS A. CALCATERRA¹, DAVID F. WILLIAMS² AND DAVID H. OË³
¹USDA-ARS South American Biological Control Laboratory, Bolivar 1559 (1686) Hurlingham
Buenos Aires Province, Argentina
²USDA-ARS Center for Medical, Agricultural, and Veterinary Entomology
P.O. Box 14565, Gainesville, FL 32604, U.S.A.

Since the 1960s, the workerless (permanent) parasitic ant Solenopsis daggerrei (Santschi) has been considered part of a complex of potential candidates for introduction into the United States for the biological control of the red and black imported fire ants, Solenopsis invicta Buren and S. richteri Forel respectively (Lofgren et al. 1975, Jouvenaz 1990, Wojcik 1990). Pioneering work on S. daggerrei was conducted in Uruguay and Argentina by Silveira Guido et al. (1973; unpublished reports). More recent studies have been conducted at the USDA-ARS-South American Biological Control Laboratory (SABCL) since 1988 and more intensively since 1995. Studies included records on its occurrence and abundance in southern South America (Briano et al. 1997) and field and laboratory observations on its specificity, biology and behavior (Calcaterra et al. 1999, 2000, 2001). Also, many fire ant colonies from Argentina parasitized with S. daggerrei were shipped into quarantine at the USDA-ARS-Center for Medical, Agricultural, and Veterinary Entomology (CMAVE), Gainesville, FL, where complementary studies were conducted (unpublished information).

Although detrimental effects on fire ants were reported in Argentina (Calcaterra et al. 1999), further progress on the project was not achieved because of (1) the difficulty in rearing S. daggerrei under laboratory conditions and (2) the failure to introduce and establish the parasite into new host colonies.

A number of attempts to introduce and propagate S. daggerrei in laboratory and field host colonies were conducted in Argentina from 1996 to 1999 following different approaches. Some of this work was reported by Calcaterra et al. (2001). Although some tests showed limited success, S. daggerrei did not establish permanently in any of the target host colonies. Despite this failure, we believe that reporting the different approaches used in our studies will contribute to future research efforts.

Parasitized and nonparasitized colonies used in the tests were mostly multiple-queen colonies of S. richteri collected in four areas of Buenos Aires Province: (1) San Eladio (60 km W of Buenos Aires), (2) Saladillo (180 km SW of Buenos Aires), (3) Mercedes (100 km W of Buenos Aires), and (4) Suipacha (125 km W of Buenos Aires). The colonies were excavated in the field, brought to the laboratory in 10-liter buckets dusted with talc, separated from the soil by flotation (Banks et al. 1981) and placed in trays.

The basic approaches used in the laboratory tests were: #1) Transference of queens: Target host colonies were fragmented into microcolonies (n = 34) composed of one host queen, 50 workers and approximately 1 gr. of brood. These microcolonies were maintained in artificial nests (Bishop et al. 1980) in plastic rearing trays (40 × 25 × 7 cm) coated with Fluon® and fed adult house flies and/or canned Vienna sausage. A water source was always present. One active S. daggerrei queen separated from a parasitized colony was transferred to each microcolony. For about one month, the colonies were kept at different temperatures as follows: 10°C (five colonies), 10-15°C (eight colonies), 15°C (11 colonies), and 30°C (10 colonies). In five of these colonies kept at 30°C, the S. daggerrei queens were sprayed before transference with an extract of macerated workers from the target (receptor) host colony. The tests were monitored daily for the presence of the parasite in the receptor microcolonies. #2) Transference of sexuals: Similarly, target host colonies were fragmented into microcolonies (n = 22) as above and kept in trays at 15°C. A total of 92 sexuals (alates) of S. daggerrei (3-9 per microcolony) was transferred and monitored daily. #3) Transference of pupae: Test 1. Target host colonies were fragmented (n = 6) as above and kept at 15°C. Six pupae of S. daggerrei were transferred to each microcolony. Test 2. Host colonies were fragmented into microcolonies (n = 4) composed of six host queens and 1 gr. of workers and maintained between 19-30°C. A total of 200 pupae of S. daggerrei was transferred to the microcolonies (six pupae per colony every 3-4 days for three weeks). #4) Entire colonies in contact: Test 1. A small plastic tray (40 × 25 × 7 cm, coated both inside and outside with Fluon®) with a parasitized colony was placed in a larger tray (50 × 40 × 12 cm) with a parasite-free colony. The colonies were monitored daily to observe the short flights of S. daggerrei sexuals into the larger tray and their survival. Test 2. Two trays (50 × 40 × 12 cm), the first with a parasitized colony and the second with a parasite-free colony were interconnected through plastic tubes (1 cm in diameter) to a third.