# A Simple Diet for Rearing Laboratory Colonies of the Red Imported Fire Ant[1,2]

D. F. WILLIAMS[3], C. S. LOFGREN[3], AND A. LEMIRE[4]

ABSTRACT

J. Econ. Entomol. 73: 176–177 (1980)

Newly-established laboratory colonies of *Solenopsis invicta* Buren when fed honey and water (1:1 ratio) in addition to a standard diet of pureed fly pupae, ground beef, eggs, and vitamins, grew faster (2–3 times) and suffered 50% less queen mortality than colonies fed a standard diet.

The establishment of small to medium size laboratory colonies (10,000–50,000 workers) of red imported fire ants (RIFA), *Solenopsis invicta* Buren, from newly mated queens may take 6–9 mo, depending on the size of the colonies needed. Since we use laboratory colonies for numerous purposes, such as biological studies, pheromone bioassays, biological control, and chemical screening tests, we need efficient rearing methods that permit quick production of large numbers of healthy colonies. Thus, we are continually evaluating various diets.

Khan et al. (1967) and Bhatkar and Whitcomb (1970) reported adequate diets for the laboratory rearing and maintenance of RIFA. However, they provided no developmental data, such as numbers of workers or total increase in colony weight over a given time. We used both diets but found that neither was satisfactory for producing laboratory colonies comparable in size and numbers to field colonies. W. A. Banks (unpublished data) developed a diet that was used for several years in rearing RIFA colonies at the Insects Affecting Man and Animals Research Lab., SEA, AR, USDA, Gainsville, FL. While the Banks diet appeared adequate, our observations of colonies reared on this diet led us to believe an additional component was needed since the individual workers were smaller than workers in normal field colonies; the most obvious nutritional deficiency in this diet was carbohydrates. To compensate for this, we offered RIFA colonies honey that had been diluted with water. The ants responded very rapidly and soon consumed all of the honey. Next, we tried adding honey directly to the Banks diet. Response of the ants to this diet was poor; in fact, total intake of food decreased.

Reported here are data obtained when we compared increases in size of small RIFA colonies reared on the Banks diet alone with those of colonies reared on the Banks diet plus a mixture of honey and water (1:1).

## Materials and Methods

In our 1st test we used 10 newly established colonies of RIFA. Each colony contained a queen, a small amount of brood, and a few workers. To weigh the colonies, we first chilled the rearing cells in a cold room (3°–4°C), and then removed the queen, brood, and workers and weighed them on an analytical balance. After replacing the colonies in their original cells, 5 were maintained on the Banks diet and 5 were given a honey-water solution (1:1) each day in addition to the Banks diet. The Banks diet consisted of 350–400 g of fried ground beef, 12 whole eggs, 5 ml multiple vitamins, and 2000 ml of fly pupae pureed in a blender and mixed with 1500 ml hot water and 60 g agar. This mixture was then poured into pans, cooled, and cut into blocks for feeding. The honey-water was placed on cotton swabs which were put in the holding trays containing the colonies. All colonies in the laboratory were maintained at 26°±1°C and 50% RH. Usually, the ants would consume all of the honey-water (5 ml/colony) within 12 h. After 37 days, each colony was weighed and the differences between those receiving the honey-water and those without were recorded.

A 2nd test was set up similar to the 1st, except that 50 newly established colonies of RIFA were used. Of these, 25 colonies were given the honey-water solution in addition to the Banks diet and 25 were fed only the Banks diet. This time, the honey-water was provided in weighing boats (7 ml/colony) instead of on cotton swabs. Colonies were weighed at the beginning of the test and 3 mo later.

A 3rd test was conducted to compare the attractiveness of honey and sucrose when added to water at varying concentrations. This was done by applying the solutions on 2.54 cm (1-in.) square pieces of filter paper and placing them in a laboratory ant colony. After 5 min, the number of ants feeding on each food was counted.

## Results and Discussion

The results of the 1st test showed that the colonies having honey-water available had gained ca. twice as much weight (avg. 6.8 g) as colonies maintained only on the Banks diet (avg 3.1 g).

In the 2nd test, the average weight gain was significantly greater ($P=0.001$, $t$ test) for colonies receiving the honey-water solution (2.0 g) than for those on the Banks diet only (0.9 g). In addition to the colony weight increase, only 4 queens (16%) of colonies given the honey-water died during the 3-mo testing period, as compared with 10 queens (40%) of colonies not given the honey-water.

Honey-water was preferred to sucrose as shown in Table 1. Also, attraction to both solutions increased as we increased the concentration of the honey or sucrose. We also had observed that field-collected RIFA colonies brought to the laboratory in soil in 19-liter buckets initially preferred once-refined soybean oil over honey-water by a 2-fold margin. However, after 4 days, preference for soybean oil and honey-water was the same. The preference of laboratory-reared RIFA colonies was twice as great for honey-water as for soybean oil.

[1] Hymenoptera: Formicidae.

[2] Received for publication Sept. 27, 1979.

[3] Insects Affecting Man and Animals Research Lab., AR, SEA, USDA, Gainesville, FL 32604.

[4] Dept. of Entomology and Nematology, Univ. of Florida, Gainesville 32611.

**Table 1.—Preference of red imported fire ant for honey-water and sucrose solutions (avg of 3 replications).**

| Solution (%) | No. ants feeding after 5 min | |
|---|---|---|
| | Sucrose-water | Honey-water |
| 20 | 94 | 112 |
| 50 | 159 | 310 |
| 80 | 218 | 403 |

It is now standard rearing procedure at this laboratory to make as much honey-water and Banks diet available to the colonies as they will consume. We are presently maintaining 290 laboratory colonies of the RIFA, ranging in size from a few thousand workers to over 150,000. The large colonies compare favorably in size and numbers of ants with mature field colonies. These colonies consume ca. 2 kg of honey and 8 kg of the standard diet/week.

## REFERENCES CITED

**Bhatkar, A., and W. H. Whitcomb. 1970.** Artificial diet for rearing various species of ants. Fla. Entomol. 53: 229–32.

**Kahn, A. R., H. B. Green, and J. R. Brazzel. 1967.** Laboratory rearing of the imported fire ant. J. Econ. Entomol. 60: 915–7.

*Reprinted from the*
JOURNAL OF ECONOMIC ENTOMOLOGY

*Purchased by the*
*U.S. Department of Agriculture, for Official Use*