ers C. E., 1977. Environ. Ent. 6:833-838) and both deposit eggs within stems, axils of leaves, or leaf petioles. Larvae work their way to the stems where the larvae are among a large complex consisting of members of the families Cerambycidae, Curculionidae, and Olethreutidae that bore in the pith and xylem.

We believe that both *R. tredecempunctatus* and *D. texanus* are recent arrivals in the Everglades. Since the relationships of weeds to both phytophagous insect species and parasites and predators have been of long standing interest to the senior author, the most likely hosts of the 2 species within the area have been under frequent inspection by him and various associates and it is believed that even low level populations would otherwise have been previously revealed. Insects and other pioneering animals and plants new to the Everglades Agricultural Area have been penetrating the area at rather variable rates of time since the drainage of these lands and we know of several species that have become established in the area only over the last 3 decades. (Authors unpublished observations on penetration of the Everglades by species native to Florida, but exotic to the organic soils area).

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## FACTORS AFFECTING THE ORIENTATION OF *DIALEURODES CITRI* (HOMOPTERA: ALEYRODIDAE) ON PERSIMMON LEAVES—

Adults of the citrus whitefly, *Dialeurodes citri* (Ashmead), on Japanese persimmon, *Dyospyros kaki* L.f., congregate almost exclusively on the bottom sides of leaves. The purpose of the present tests was to determine whether *D. citri* adults orient themselves on leaves of *D. kaki* in response to light, gravity, or factors in the leaves.

The test apparatus consisted of a whitefly-infested green leaf cut from *D. kaki* and suspended by its petiole in a 0.9 liter (1 qt) clear glass canning jar. The original 47 whitefly adults were replaced midway through the ca. 1 h experiment with ca. 100 fresh whiteflies. The first set of tests was conducted out-of-doors in an open shade that also covered the infested plant. The second set of tests was performed under laboratory conditions, either in darkness or with vertically oriented incandescent light shining up from the floor (ca. 1 m below insects).

In both sets of tests, the same general procedure was followed. The jar (with whiteflies and leaf inside) was gently shaken for several seconds to unsettle the whiteflies. Following that, the jar was not moved for 5 min, during which time the whiteflies generally assumed stable distributions on the leaf and on the surface of the jar. After 5 min, the distributions of the

TABLE 1. WHITEFLY ORIENTATION ON PERSIMMON LEAF UNDER VARIOUS CONDITIONS OF LIGHTING AND LEAF POSITION.

| | Light From Above | | | | Light From Below | | In a Dark Room | |
|---|---|---|---|---|---|---|---|---|
| | Leaf Surface Parallel to Earth | | Leaf Surface Perpendicular to Earth | | Leaf Surface Parallel to Earth | | Leaf Surface Parallel to Earth | |
| No. of Whiteflies on: | Leaf Top Up | Leaf Bottom Up | Leaf Stem Down | Leaf Stem Up | Leaf Top Up | Leaf Bottom Up | Leaf Top Up | Leaf Bottom Up |
| 1) Top of Leaf[1] | 0 | 5 | 1 | 5 | 1 | 20 | 2 | 4 |
| 2) Bottom of Leaf | 6 | 0 | 3 | 6 | 10 | 4 | 15 | 1 |
| 3) Upper ½ of Jar[2] | 40 | 42 | 80+ | 80+ | 80+ | 60+ | 80+ | 80+ |
| 4) Lower ½ of Jar | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 1 |

[1]"Top of Leaf" refers to the adaxial surface; i.e. that surface normally facing away from the earth, when the leaf is on the tree.
[2]"Upper/Lower ½ of Jar" refers to the momentary orientation of the jar; rather than to a fixed part of the jar.

whiteflies were recorded. The test was run with the leaf in different orientations in respect to the light source and gravity.

Some whiteflies landed on the persimmon leaf under each of the experimental conditions (Table 1), but no preference was detected ($\chi^2=0.6$; df=1; $P>0.5$) for one leaf surface over the other. When the leaf was horizontal, significantly ($\chi^2=39.8$; df=1; $P<0.001$) more whiteflies were always found on the surface toward the ground, regardless of which leaf surface that was. When the leaf was vertical, no significant ($\chi^2=0.6$; df=1; $P>0.5$) difference was found between the numbers of whiteflies on the 2 sides of the leaf. Most of the whiteflies were found on the surface of the jar, on the side away from the earth, under all experimental conditions.

In all tests, almost all of the whiteflies oriented so that their dorsum generally faced downward, apparently a geotaxis. This behavior was not significantly ($\chi^2=2.4$; df=2; $P<0.25$) modified by the presence, absence, or direction of origin of light. Probably more whiteflies alit on the surface of the jar than on the leaf simply because of the jar's greater surface area.

Geotactic orientation by whiteflies onto leaf bottoms has considerable adaptive significance. Among other things, it positions them so that gravity removes each individual's copious liquid excrement from its own vicinity while the leaf acts as an umbrella against the excrement of whiteflies higher on the plant. ROBERT L. CROCKER, Department of Entomology and Nematology, 3103 McCarty Hall, University of Florida, Gainesville, FL 32611 USA (Present address: Texas A&M University Research and Extension Center, 17360 Coit Road, Dallas, TX 75252 USA), and AVAS B. HAMON, Division of Plant Industry, Florida Department of Agriculture, P. O. Box 1269, Gainesville, FL 32602 USA.