

MAJOR AND TRACE ELEMENT ANALYSIS IN RED
IMPORTED FIRE ANT QUEENS BY ION
INDUCED X-RAY FLUORESCENCE¹

R. LEVY², H. A. VAN RINSVELT³, AND H. L. CROMROY²

ABSTRACT

Analysis of red imported fire ant queens, *Solenopsis invicta* Buren, by ion induced X-ray fluorescence indicated that concentrations of P, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Pb, Rb, Sr, and Mo could be detected in their tissues. In general, results indicated that red imported fire ant queens contained lower total body levels of P, S, Cl, K, Ti, Cr, Fe, Ni, Cu, Zn, Pb, Rb, Sr, and Mo than major and minor workers. However, higher concentrations of Ca and Mn were noted in queens when compared to workers.

Ion induced X-ray fluorescence data have been presented showing the relative total body concentration of major and trace elements (P, S, Cl, K, Ca, Ni, Cr, Ti, Mn, Fe, Cu, Zn, Pb, Sr, Mo, Rb) in the tissues of major and minor workers, larvae, and pupae of the red imported fire ant, *Solenopsis invicta* Buren (Levy et al. 1974). Their results indicated that adult red imported fire ants contained a higher total body concentration of major and trace elements than the immature stages, with the following trend being noted: workers > pupae > larvae. The aim of the present paper is to determine the total body concentration of major and trace elements in red imported fire ant queens. This data could then be used to compare the relative major and trace element content among several developmental stages of a single ant species, i.e. the red imported fire ant.

METHODS AND MATERIALS

Field collected red imported fire ant queens (i.e. 2-3g collected during a mating flight) were obtained from the Insects Affecting Man Research Laboratory, ARS-USDA, Gainesville, Florida. These queens were freeze-killed and dried by lyophilization, ashed in a low temperature radiofrequency furnace, and analyzed for total body major and trace element concentration according to the ion induced X-ray fluorescence techniques of Van Rinsvelt et al. (1973).

RESULTS AND DISCUSSION

Results of ion induced X-ray fluorescence indicated that significant concentrations of P, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Pb, Rb, Sr, and Mo can be detected in the tissues of red imported fire ant queens (Fig. 1). In addition, stage-specific concentrations of these major and trace elements have been shown between major and minor workers, pupae, and larvae of the red imported fire ant (Levy et al. 1974). Data by Levy et al. (1974) indicated that P, S, Cl, K, Ti, Cr, Fe, Ni, Cu, Zn, Pb, Rb, Sr, and Mo were less concentrated in the tissues of queens than in major and minor workers. How-

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²Department of Entomology & Nematology, University of Florida, Gainesville, Florida 32611. Present address of R. Levy: West Florida Arthropod Research Laboratory, P. O. Box 2326, Panama City, Florida 32401.

³Department of Physics & Astronomy, University of Florida, Gainesville, Florida 32611.

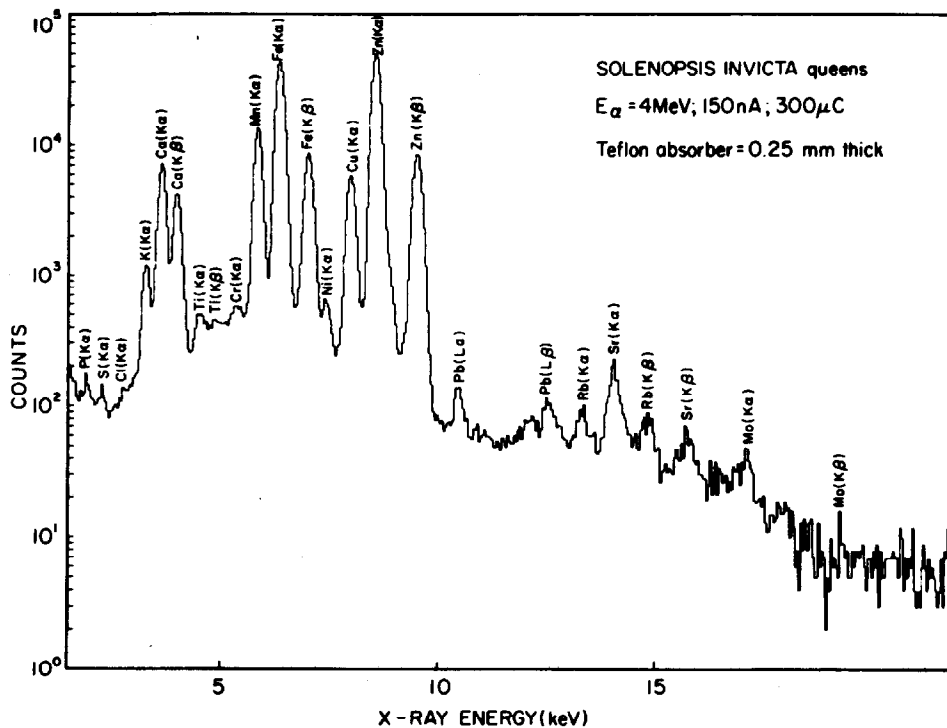


Fig. 1. Analysis of red imported fire Ant queens by ion induced X-ray fluorescence.

ever, total body levels of Ca and Mn were found to be greater in queens than in workers. The generally high concentration of major and trace elements in the workers when compared to queens could indicate the importance of major and minor workers in supplying nutrients to the colony. Furthermore, the greater concentration of Ca and Mn in imported fire ant queens could reflect egg development and metabolic activity of the female reproductive system.

In general, ion induced X-ray fluorescence is an excellent tool for studying the relative concentration of biologically active elements (e.g. Ca, K, Cu, Fe, Zn) as well as environmental contaminants (e.g. Pb, Sr) which have accumulated in insect tissues.

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