Improved Management Strategies From The Basic Biology of Whiteflies

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ABSTRACT

A series of experiments has been conducted aimed at learning more about whitefly biology. We learned that: 1) whitefly eggs imbibe water from plant tissue; 2) the wax particles on exterior body surfaces may be antifungal; 3) mature lettuce is not a good host for whiteflies and; 4) there is a migrating morph. All these facts are of practical importance.

INTRODUCTION

Conventional pesticide applications do not offer an affordable means of controlling whitefly populations; therefore, we examined alternative methods. We investigated basic aspects of whitefly biology to attack the problem from a new perspective. Viewed independently, some of these projects appear impractical, but quite the opposite is true.

RESULTS

Whitefly eggs are attached to the underside of leaves when the female inserts the egg pedicel (a peg-like projection of the shell) into a slit she has made with her ovipositor. Most observers believed that this pedicel was little more than an anchor. After irrigating young plants with tritiated water ("radioactive" water), we subjected eggs from these plants to a scintillation counter to check radioactivity. More than 50% of the mass of a whitefly egg was accounted for by water imbibed from the plant. We are now determining if systemic insecticides have an impact on whitefly eggs.

My most recent discovery has the greatest potential for changing management techniques for **B. tabaci** in the Southwest. Using the statistical technique of discriminant function analysis, we discovered a migrating morph within populations of **B. tabaci** that is distinct from the trivial flying morph which remains in the habitat of origin. The wings of migrators are constructed differently from those of animals remaining in the field. Therefore, whitefly populations cannot respond immediately to adverse conditions, such as plant deterioration as a result of irrigation shutoff. This finding should enable us to manipulate the time of whitefly flight.

The most probable current scenario in Yuma, Arizona is: 1) irrigation water to cotton is terminated in mid-August; 2) approximately two weeks later, the plants are inhospitable to whiteflies so females in the field deposit eggs which will hatch as potential migrators; 3) 21 days later, these migrators mature and fly out of the field. By this time it is the end of September, so lettuce planted during the early part of the month is out of the ground and receptive to flying hordes of whiteflies. These early lettuce fields become sources of inoculum for later aerial populations.
If we can manipulate the times when either irrigation is terminated in cotton or when lettuce is planted in early fall, the lettuce crop will not be exposed to the massive number of whiteflies it now experiences. These simple cultural techniques will greatly reduce the problems associated with **B. tabaci** and LIYV.

From other studies, I have showed that mature lettuce is not a suitable host for whiteflies. Apparently whiteflies drift into lettuce fields but quickly leave. For that reason, applications of pesticides are killing whiteflies that would be gone the next day anyway. This should dissuade us from using large amounts of unnecessary pesticides.

A study on the lipid particles covering the body surfaces of whiteflies is also proving of great practical significance. Preliminary evidence indicates that these particles retard fungal growth. Information generated for this article should prove useful in a project recently initiated with members of the Plant Pathology and Plant Science Departments concerning the use of fungi to control **B. tabaci** in greenhouses.

I am confident that by coming to a better understanding of how whiteflies conduct their lives, we can discover a way to effectively manage their numbers.