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# A Threshold for Timing Applications of IGRs to Manage the Silverleaf Whitefly and Irregular Ripening on Tomato[1]

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The silverleaf whitefly, *Bemisia argentifolii* Bellows & Perring, has been the major pest of tomatoes in South Florida since 1988 (Schuster et al. 1989). The insect causes losses indirectly through the transmission of plant viruses, including *Tomato mottle virus* and *Tomato yellow leaf curl virus* in Florida (Simone et al. 1990, Polston et al. 1999). Feeding, primarily by nymphs, has been associated with an irregular ripening (IRR) disorder of fruit (Schuster et al. 1990, Schuster 2002). The disorder is characterized externally by inhibited or incomplete ripening of longitudinal sections of fruit and internally by an increase in the amount of white tissue. No foliar symptoms are apparent.

Management of the whitefly and associated diseases and disorders includes the rigid adherence to cultural practices supplemented with insecticidal applications (Schuster et al. 1993). The systemic, nicotinoid insecticide imidacloprid (Admire 2F, Bayer CropScience) is applied to seedlings 7-10 days prior to transplanting and is supplemented with a soil application of either imidacloprid or another nicotinoid insecticide, thiamethoxam (Platinum 2SC, Syngenta Crop Protection, Inc.), at transplanting. Insecticides of different chemical classes then are applied as needed as the effects of imidacloprid and thiamethoxam diminish, usually after about 8 weeks. Two insect growth regulators (IGRs), buprofezin (Courier 70WP, Nichino America, Inc.) and pyriproxyfen (Knack 0.86EC, Valent Agricultural Products), have received authorization by the EPA for whitefly management on Florida tomatoes. Neither IGR kills adults; however, both sterilize eggs of treated adults, although the effect is much greater for pyriproxyfen. Buprofezin prevents successful molting at all nymphal stages while pyriproxyfen only prevents adult emergence following the last nymphal stage. Research was undertaken to identify the nymphal density at which these IGRs should be applied to avoid IRR.

Five experiments were conducted during the spring and fall of 1997 and 1998 and the spring of 1999 at the Gulf Coast Research & Education Center, Bradenton, FL. In each experiment, three row plots were established and were sprayed when predetermined thresholds of 5 to 20 sessile nymphs and pupae ($2^{nd}$-$4^{th}$ instars) per 10 leaflets were reached. Nymphal counts were completed in the laboratory using dissecting microscopes on the terminal leaflet of the $7^{th}$ to $8^{th}$ leaf from the tops of

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the 10 middle plants in the middle row of each plot (Schuster 1998). Red ripe fruit were harvested weekly and were rated for severity of external and internal symptoms of IRR. The extent of irregular ripening on threshold-treated plots was compared to that on plots treated with imidacloprid applied at the highest labeled rate of 24 ozs/acre. The relationship between the numbers of nymphs counted in the field using a hand lens and those counted in the laboratory using a dissecting microscope was defined by linear regression analysis.

Although there were seasonal effects on the results of the experiments, only plots treated when nymphal densities reached 5 per 10 leaflets consistently had both external and internal IRR ratings and marketability similar to the imidacloprid standard. Results were similar for buprofezin and pyriproxyfen even though the modes of action differ. The numbers of applications required to attain season-long control at the 5 nymphs per 10 leaflets threshold exceed the two applications per IGR currently permitted by EPA; however, in most seasons whitefly control would be needed only for 4-6 weeks following the time imidacloprid is no longer effective. Therefore, growers should be able to maintain whitefly control satisfactorily by rotating buprofezin and pyriproxyfen at the above threshold. Scouts would not be able to spend the time collecting leaflets in the field and counting whitefly nymphs in the laboratory as was done in these experiments. The relationship between nymphal counts completed with a microscope and with a hand lens was significant and linear and, therefore, it is unnecessary for scouts to transport leaflets to the laboratory for microscopic examination. The same leaf used for counting whitefly nymphs can be used for counting *Liriomyza* spp. leafminer larvae (Schuster 1998). As a result, little additional scouting time is required to assess whitefly densities. Therefore, growers are encouraged to adapt the threshold of 5 nymphs per 10 leaflets for managing the silverleaf whitefly and irregular ripening in their tomato crops.

## References

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