Production Strategies that Optimize Floricultural and Ornamental Horticulture Cropping Systems Management Practices

PRINCIPAL INVESTIGATOR:
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PROJECT OBJECTIVES:
1. Evaluate impact of reduced fertilizer inputs on the quality of commercially grown crops.
2. Investigate impact of reduced fertilizer inputs on biological and chemical control of thrips and spider mites.
3. Determine the degree to which nitrogen inputs influence host plant resistance in gerbera.
4. Develop recommendations for insecticide resistance management and use of both conventional insecticides and reduced-risk insecticides against thrips, whiteflies, and aphids.

ACCOMPLISHMENTS:

1) **Impact of fertilization reduction on crop quality of potted roses:** We have demonstrated in field trials the feasibility of significantly reducing fertilization while still producing a high-quality, potted rose crop. We found that a 50 percent reduction of slow-release fertilizer rates did not reduce market quality, but generated $10,000 – $12,000 U.S. in production costs savings for a typical crop of 160,000 to 500,000 potted roses.

2) **Impact of fertilization on biological control of western flower thrips and two spotted spider mites:** *Tropicana* roses fertilized with either 30 percent or 100 percent of the recommended rate produced similar numbers of harvestable flower stalks, but plants fertilized with the low rate had, on average, 30 percent fewer thrips than plants fertilized with the high rate. Lowering fertilization enhanced control of *F. occidentalis* with *Amblyseius swirskii*; plants with predatory mites and fertilized with the high rate had twice as many thrips as did plants with predatory mites and fertilized with the low rate. Combining *Orius insidiosus* and *A. swirskii* slightly improved control of *F. occidentalis*, but thrips control was most cost-effective with *A. swirskii* alone. In a field trial conducted in a commercial greenhouse operation, we determined that halving the standard fertilization rate did not compromise growth of *Mandevilla splendens* 'Alice Dupont' during the first 10 weeks of crop growth prior to transplanting. However, we found no impact of reduced fertilization rates on biological or chemical control of spider mites during 6 weeks of treatment before the crop was transplanted from 1-gal. to 2-gal. pots. Savings to the grower were estimated to be $420 U.S. for a crop of 35,000 potted *Mandevilla*

3) **Influence of nutrient availability on western flower thrips abundance, plant growth, development, and quality of *Gerbera jamesonii*:** This research focused on the influence of fertilization on plant growth and development, overall quality, western flower thrips (WFT) abundance, and host plant resistance characteristics of gerbera (*Gerbera jamesonii* 'Festival Salmon'). We tested three fertility levels (0X, 0.3X, or 1X 200 mg L^{-1} N) of the recommended fertilization rate for gerbera. WFT feeding did not affect phenolic content, but did induce the accumulation of the phytohormone, jasmonic acid—which is known to

regulate inducible defenses against insect herbivory. Flower production and the number of days to pollen shed were similar for gerberas receiving 0.3X and 1X the recommended fertilization, and 0.3X and 1X plants without WFT were rated as marketable. WFTs reduced the overall plant quality (marketability) of gerberas receiving 0.3X and 1X fertilization, but had no apparent affect on vegetative and reproductive growth, photosynthesis, or stomatal conductance. In conclusion, reducing fertilization in gerbera production can increase resistance to WFT, and may be a useful pest management tactic when integrated with other pest management practices.

4) **Enhancing insecticide efficacy against selected pests:**
   - Effectiveness of a biological insecticide (BotaniGard®) based on the fungus *Beauveria bassiana* was not influenced by mixing with the insect growth regulator Novaluron (Pedestal®) or with an insect lure (Lure®) based on mono and polysaccharides in a small plot experiment on western flower thrips feeding on potted chrysanthemums.
   - Contact products containing abamectin, spinosad, tolfenpyrad, and chlorfenapyr provided excellent control of *Scirtothrips dorsalis*. Pyrethroids had little impact in controlling populations. Flonicamid and all five of the active ingredients in the neonicotinoid class provided excellent systemic control of *S. dorsalis* when applied as foliar sprays. When these products were applied as drenches they provided poor control.
   - The novel insecticide Spirotetramat which belongs to the chemical class of ketoenols, was highly effective against *Solanum mealybug* (*Phenacoccus solani*) as a drench treatment 30 days after treatment.
   - Significant levels of tolerance to imidacloprid were detected in two *Bemisia tabaci* populations in commercial greenhouse operations in Texas.
   - Treating ornamental kale seeds with flonicamid provides the resulting plants with protection against aphids.

TECHNOLOGY TRANSFER/IMPACT:

Our research/extension/and industry team has conducted cropping systems-based laboratory, greenhouse, and nursery experiments, and targeted demonstration trials that have: 1) provided grower-specific protocols for effective management of insecticides that maximize product efficacy and worker safety while minimizing environmental risk; 2) developed protocols for practical integration of non-chemical based methods for management of insect, mite, and disease pests; 3) drafted grower-tested IPM plans that may be adopted by greenhouse and nursery production facilities in Texas, the South, and elsewhere; and 4) to insure long-term applicability of research results, delineated economic boundaries (easily characterized by growers or industry groups) for the recommended protocols.

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COLLABORATORS:

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