From February 25-27, 2010, researchers, growers and other hort professionals met in Orlando, Florida, to discuss some of the most pressing greenhouse problems that affect your crops. We asked two of the presenters, Margery Daughtrey and Raymond Cloyd, to provide highlights from their break-out sessions about controlling pesky insects and undesirable diseases. Margery discusses verbena powdery mildew, INSV and downy mildew; while Ray looks at two topics: plant-derived essential oils; and whether or not sugary soda increases your spray’s efficacy.

Fungus, spot virus, mildew, oh my!

**Disease Management Techniques**

*by Margery Daughtrey, senior extension associate, Cornell University*

Verbena powdery mildew (PM) is caused by a fungus. The production of chains of spores on the plant surface allows this organism to be spread via air currents. Its talent for inoculum development allows this PM to form epidemics rapidly in the greenhouse when temperature and humidity conditions are favorable. The host range of this particular PM includes cucurbits as well as verbenas, which means that squash and pumpkin crops are vulnerable to the spores produced on verbenas and vice versa. This problem has been less common on verbenas in the past two growing seasons, possibly because breeders are taking the more disease-prone cultivars off the market.

Data on cultivar performance in replicated trials at Cornell and Michigan State are available through the American Floral Endowment, which has sponsored much of this research (see http://endowment.org).
Growers who choose cultivars partly on the basis of their disease susceptibility are able to grow verbenas successfully without the added expense of preventive fungicide applications. One finding has been that plants in the same series do not behave similarly with regard to PM: individual members of the same series may be extremely resistant or extremely prone to the disease. Biological and chemical methods may be alternated for effective control of PM on verbena.

Impatiens necrotic spot virus (INSV) is, as a virus, subject to dissemination within the greenhouse courtesy of an insect. INSV achieves even wider distribution by being shipped from one greenhouse to another within plants. This virus makes use of the Western flower thrips to get from plant to plant—across a very wide range of host species.

Roguing out diseased plants is critically important for management, since Western flower thrips are attracted to the sick plants, and will preferentially lay their eggs on them. Eggs hatch into larvae that gradually develop into winged adults capable of spreading the virus.

Growers should be alert to the development of INSV symptoms in new places, with new looks. Some of the crops that have been troubled by INSV in recent seasons are diascia, lobelia, nemesia and torenia. Plants may look injured and stunted in ways that do not at first suggest that a virus is the cause. As resistance to Conserve becomes more widespread in the industry, growers will once again need to be especially careful to watch for symptoms of INSV and throw out infected plants, at the same time that they scramble to achieve control of Western flower thrips.

Downy mildew on coleus continues to plague plants grown from cuttings or seed. Because this is a disease due to a water mold (oomycete), it’s tied to high humidity conditions for the production of inoculum—conditions often supplied during coleus propagation. Keeping greenhouse humidity down is essential, along with avoiding the most susceptible cultivars and protecting plants with effective fungicides. Most cultivars are susceptible, but they vary in the severity of their symptoms, which include leaf spotting, curling and leaf drop. Stature SC, Fenstop and mancozeb sprays have been more effective than strobilurin or Aliette treatments in Cornell trials.

With a disease caused by bacteria, such as the blight of geraniums caused by Xanthomonas campestris pv. pelargonii, it’s the ability of the pathogen to be latent in plant tissue and to spread easily by splashing or other water movement that creates the management challenge for the flower industry. Copper reduces bacterial populations on plant surfaces, and disinfectants reduce populations on inanimate surfaces, but the industry requires zero tolerance for this disease rather than inoculum reduction. The best control measure for bacterial blight of geraniums was the development of enhanced sanitation programs by the geranium propagation industry in response to the outbreaks of Ralstonia solanacearum Race 3, Biovar 2 a few years ago. Using only cuttings from stock that has been carefully culture-indexed is essential. It is also important to realize that this same organism can dwell upon hardy Geranium spp., causing a leaf spot, so absolute separation of perennial production from Pelargonium production is also very important.

Adding pop for those weasels

Alternative Pest Control
Plant-derived essential oils have a broad-spectrum of activity against many different types of soft-bodied arthropod (insect and mite) pests because they appear to have multiple modes of action, including antifeedant and repellent activity, molting and respiration inhibition, growth and fecundity reduction, cuticle disruption, and activity on the octopamine pathway in the central nervous system.

Plant-derived essential oils, used as insecticides or miticides, typically have short residual activity with restricted entry intervals (REI) less than 12 hours because they are susceptible to temperature and ultraviolet degradation. This allows greenhouse producers to enter treated areas within a short time to conduct cultural practices such as watering and fertilizing. However, this short residual activity may mean that repeat applications are required, possibly resulting in phytotoxicity.

Plant-derived essential products have been evaluated in our studies against various arthropod pests, including the twospotted spider mite, aphids, whiteflies and Western flower thrips. Overall, both GC-Mite (cottonseed, clove, and garlic oil) and Bugzyme (citric acid) were most effective against the twospotted spider mite (≥90% mortality).

Monterey Garden Insect Spray (0.5% spinosad) was effective against the Western flower thrips with 100% mortality; however, the plant-derived essential oil products failed to provide sufficient control (<30% mortality) of Western flower thrips. None of the plant-derived essential oil products evaluated provided sufficient control or regulation of the sweetpotato whitefly B-biotype or green peach aphid seven, 14, and 21 days after application.

Greenhouse producers continually to inquire and even indicate that mixing a sugar—such as white or brown sugar—or a soft drink (e.g. Mountain Dew) with a contact insecticide (in the spray solution) enhances efficacy of the spray application against Western flower thrips populations. Furthermore, it’s been suggested that molasses and brown sugar will act as a surfactant or attract thrips from flowers and encourage them to consume or come in contact with insecticides. However, minimal research has been conducted to verify this claim.

As such, we conducted a series of experiments to determine if sugar-based compounds actually improve control of Western flower thrips. In addition to white and brown sugars and sugar-lading soft drinks such as Mountain Dew, there are several commercially available insecticidal products based on certain sugar components. These are SucraShield (active ingredient is sucrose octanoate esters) and SorbiShield (active ingredient is sorbitol octanoate).

Both products are labeled for thrips “control” and are contact insecticides that supposedly dissolve holes in the insects’ cuticle or skin or suffocate insects. We also conducted laboratory choice tests in Petri dishes by visually observing (for five minutes) both adults and nymphs to determine any preferences when exposed to solutions of brown sugar, white sugar, Mountain Dew, Diet Mountain Dew and water.

We found that the addition of Mountain Dew, which contains 31 g of sugar (as high fructose corn syrup) per 20 fl. oz., at the rate of 12 fl. oz./50 gallons failed to enhance the efficacy of any of the treatments. However, it’s difficult to actually assess if mixing Mountain Dew had any real effect since the individual treatments by
themselves [spinosad (Conserve) and abamectin (Avid)] provided nearly 100% control of the Western flower thrips produced from our laboratory-reared colony. Furthermore, since azadirachtin (Ornazin) is an insect growth regulator, the addition of Mountain Dew may not have exhibited the same benefits as compared to mixing Mountain Dew with a contact insecticide.

None of the SucraShield treatments, at the low and high-labeled rates, were effective in “controlling” Western flower thrips with percent mortality less than 60%.

The addition of sugar to spray solutions has been problematic in some cases. Several greenhouse producers, for instance, have actually experienced situations in which black sooty mold fungi started “growing” on the sugar-based spray solution. The results of the laboratory choice tests indicated that most of the Western flower thrips adults and nymphs did not prefer or spend an extended period of time (in seconds) in a specific solution (e.g., brown sugar, white sugar, Mountain Dew, Diet Mountain Dew or water).

In conclusion, pest control materials (insecticides and miticides) derived from essential oils and sugar-based compounds are just becoming available for use in greenhouse production systems. Greenhouse producers need to be aware of the issues related to inconsistent efficacy and potential phytotoxicity. The use of plant-derived essential oils and sugar-based compounds may eventually become feasible options for managing insect and mite pests of greenhouses after we understand how to enhance effectiveness and develop formulations that alleviate problems associated with phytotoxicity. GT