1995 American Phytopathological Society (APS) Meeting

by Larry Stowell, Ph.D.

This Insights will cover the happenings at the 1995 APS meeting held in Pittsburgh between August 12th and 16th. One of the events that you probably won't hear about any other place is that the American Phytopathological Society has voted to retain its name. This tongue-twister-spelling-bee-winning name has been a part of the society since 1908. Every few years, someone gets motivated to change the name to a more understandable and pronounceable form. It doesn't look like that will happen this century--tradition wins out.

Paper submissions to the Turf and Ornamentals sections were limited this year probably due the 50th anniversary of the American Society of Agronomy (ASA) C-5 Division, Turfgrass Science, which will be held at the ASA meetings at the end of October and first week of November. With tight travel budgets, many researchers must select only one national meeting to attend and the ASA meeting provides an extensive turfgrass research program. In addition, several university turfgrass field days were scheduled within days of the APS annual meeting. The result was only six oral presentations in the paper sessions, and one was a PACE Turfgrass Research Institute (PTRI) presentation.

Nematode Problems in Turf: This discussion session was well attended. Speakers included Leon Lucas from North Carolina State University, Raleigh, speaking on damage thresholds of nematodes in turf; Robert Dunn, University of Florida, Gainesville, speaking on the role of nematicides in turf nematode management; Ole Becker, University of California, Riverside, speaking on West Coast problems - West Coast solutions; and Milt Engleke, Texas A&M University, Dallas, describing a turf breeder's perspective—needs and directions.

The bottom line: Sting nematode (*Belonoliamus longicaudatus*) is the only nematode species that causes extensive turfgrass damage. Fortunately, this Southern and Southeastern nematode only occurs in the Coachella Valley in Southern California, and not elsewhere in the state of California. If you are in an area where sting nematode occurs, the threshold population that would trigger a nematicide application is 20 sting nematodes per 100 grams of soil. None of the other nematode species have a solid threshold that will result in turf damage if a nematicide is not applied. This confirms the results of the 1992 PTRI Nematode Survey which showed that nematodes were causing little if any damage on Southern California golf courses (Coachella Valley courses excluded).

PTRI participated in the meetings with a presentation by Larry Stowell titled: *Management of temporal variations in stress inducing factors at Southern California golf courses*. The presentation described PTRI's efforts to develop management practices that reduce seasonal fluctuations in soil salinity and sodicity that result from summer irrigation. Key points focused upon monitoring soil salinity using the Cole Parmer TDS-4 meter and leaching when salts reach damaging levels (0.7 on the meter, 2.7 dS/m saturated paste extract equivalent). In addition, sodicity data from Mesa Verde Country Club and Reed Yenny revealing the benefits of gypsum injection were presented. The talk was the last one of the day but there were still a plenty of people hanging around to ask some questions.

Practical Aspects of Fungicide Resistance Management was a Colloquium topic that received a lot of interest from the meeting participants. Speakers included W. Koeller from Cornell University, presenting a general

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overview and introduction; P. Lewis from the USEPA, presenting fungicide resistance management from the regulatory perspective; M. Schwarz from Miles Inc., discussing fungicide resistance from the FRAC (Fungicide Resistance Action Committee) perspective; B. Bassi, Ciba-Geigy, discussing fungicide resistance management from the fungicide registrant perspective; and D. Gubler, University of California, Davis, presenting fungicide resistance management from the research perspective. A few of the highlights are listed below:

Not all fungicides encounter problems with resistance. For example, the EBDC (ethylenebisdithiocarbamate) fungicides, such as Fore (a combination of manganese and zinc EBDC) have no reported cases of resistance in over 40 years of their use. However, other fungicides with more site specific activity have not been as fortunate. For example, Benomyl, belonging to a class of fungicides known as the benzimidazoles, encountered reports of resistance after only four years of use. Included within the benzimidazole group of fungicides is the thiophanate methyl fungicides (Cleary's 3336, Fungo Flo, Fungo 50, Systemic Fungicide) that are widely used in turfgrass disease control. Due to environmental and non-target impact concerns, more highly site specific fungicides are being developed and these fungicides have a greater risk for resistance development than the older products, such as the EBDCs.

Site specificity of a fungicide refers to the location within the fungus that the fungicide reacts with to result in death of the fungus. Non-site specific products, such as the EBDCs, attack and interfere with several structural and enzyme systems of the fungal cells. In order for resistance to develop to the EBDCs, many cellular functions will have to be altered at the same time. The likelihood of many "mutations" occurring at once is remote as evidenced by the lack of resistance being reported in more than 40 years of use. Alternatively, a site specific fungicide, for example, the benzimidazoles, attack tubulin formation, preventing cell division. This site specificity causes a vulnerability because only a single trait of the fungus must "mutate" to result in a resistant strain of the pathogen. There are various models of how resistance develops, and there are a variety strategies to help prevent development of resistance. Several of those strategies are listed below:

1. Reduce disease pressure by improving plant health using improved cultural practices

2. Use site-specific fungicides in mixtures with non-site-specific fungicides

3. Use of site-specific fungicides in combinations or rotations with other site-specific fungicides that have different modes of action

4. Use site-specific products in a preventative program and do not apply high rates of site-specific fungicides alone (use combinations with non-site-specific fungicides) once a high level of disease has been established.

An example of a mixture that is commonly recommended in Southern California is a combination of the site-specific fungicide metalaxyl (Subdue) and the non-site-specific fungicide mancozeb (Fore or Dithane) for *Pythium* control. In this case, the companion fungicide, mancozeb, has activity against *Pythium* but it is not as effective as metalaxyl. The combination protects metalaxyl from development of resistance.

The background information below was extracted from: Delp, C.J., ed., 1988, Fungicide Resistance in North America, APS Press, St. Paul, MN. There are four groups of fungicides that are site-specific and therefore at-risk of pathogens developing resistance. Companion fungicides have been identified which when combined with the at-risk fungicide, the likelihood of resistance developing is greatly reduced. The companion fungicide systems have not been

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evaluated in many cases. Caution should be used when mixing fungicides. Call a technical support representative for the manufacturer to be sure the combination is compatible prior to evaluating the mixtures. Always test a new product or combination of products on a small turf area before spraying larger areas. In most cases, turfgrass companion fungicide systems have not been developed. The systems listed below are for agricultural crops but they are a starting point for evaluating the value of companion fungicide systems in turfgrass systems. The at-risk groups of fungicides are:

Dicarboximides (iprodione-Chipco 26019, vinclozolin-Vorlan, Curalan) were discovered in 1971 and resistance was reported within three years of their introduction. Dollar spot resistance to the dicarboximides was identified in some strains in 1983. This group of fungicides act by inhibiting spore germination and mycelial growth. Its specific site of action remains unclear. Some companion fungicides that have been identified to reduce the risk of resistance development include the benzimidazoles (see below) and chlorothalonil (Daconil 2787).

Benzimidazoles (Benomyl-Tersan 1991, Thiophanate-methyl-Cleary's 3336, Fungo Flo, Fungo 50, Systemic Fungicide) were discovered in the 1960s and resistance was identified in 1969. The benzimidazoles act by binding tubulin, a key protein in mitotic structures that pull the chromosomes apart during cell division, and therefore they inhibit mitosis. Companion fungicides include the dicarboximides and mancozeb (Fore, Dithane).

Phenylamides (metalaxyl, Subdue) were first labeled for use in 1980 and *Pythium* resistance to this group of fungicides was discovered in turfgrass systems in 1984. The phenylamides inhibits RNA (a key nucleic acid necessary for protein synthesis) synthesis and results in cell death. Companion fungicides include fosetyl-Al (Aliette), mancozeb and chlorothalonil (Daconil 2787).

Demethylation inhibitors DMIs (sterol biosynthesis inhibitors, propiconizole-Banner, fenarimol-Rubigan, triadimefon-Bayleton) were developed in the mid 1970s and tolerance to these fungicides was first reported in 1984 from Mediterranean countries where the DMIs were used for years. The DMIs inhibit sterol biosynthesis and thereby damaging cell membrane integrity. companion fungicides include the benzimidazoles, mancozeb and chlorothalonil.

A new fungicide with novel activity was evaluated in a poster by J. R. Godwin from Zeneca's Jealott's Hill Research Station, Bracknell, Berks. England, titled ICIA5504-A Novel, Broad Spectrum Systemic Fungicide For Wheat. Although this poster discussed wheat, we have been following development of ICIA5504 for several years. It is under development for release in the turfgrass markets with the trade name, Heritage by Zeneca. Heritage represents a new class of fungicide called the β-methoxyacrylates. The active ingredient of ICIA5504 is a synthetic chemical that is based upon naturally occurring product called strobilurin. The activity of Heritage spans a wide range of fungal groups including *Rhizoctonia*, *Pythium*, *Leptosphaeria* (necrotic ring spot), *Magnaporthe* (summer patch), *Microdochium* (pink snow mold), *Colletotrichum* (anthracnose) and others. The mode of action of this new class of fungicides is inhibition of mitochrondrial respiration by binding at a specific site on cytochrome b which is not shared by any other known class of fungicides. Stopping respiration results in death of the fungus. Even though this is a site-specific mechanism of control that is likely to encounter resistance development, combinations of this new technology with those described above will provide another valuable tool in the battle against turf diseases. Resistance management for this new product will be important because it can

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be used to control all of the major diseases that we encounter in California (except *Sclerotium*, southern blight and *Sclerotinia*, dollar spot). When will it be registered for use in California? Calls to the company suggest that it is too early to speculate at this point. We'll keep you informed.

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