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Turfgrass Fungicides in Canada

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www.uoguelph.ca/~thsiang/present/2004winfungic.pdf

Fungicide Advertisements

- How to decide if effective?
- First find out what it contains

What makes up a fungicide?

- Active ingredient (a.i.) = the fungicidal portion
- Formulants
 - inert ingredients (emulsifier, diluent, carrier)
 - adjuvants: increase fungicidal effectiveness

Fungicide toxicity

- A compound inhibitory or toxic to fungi
- But how toxic are they to you?
- Animal toxicity measured by LD50 (lethal dose for 50% mortality, usually oral & acute), units of mg chemical per kg body weight (higher LD50, less toxic)

Turf Fungicides - history in Canada

- 1940's thiram & other dithiocarbamates
- 1950's heavy metals (mercury, cadmium)
- 1960's chlorinated rings (chlorothalonil, PCNB)
- 1970's benzimidazoles (benomyl)
- 1980's dicarboximides (iprodione)
- 1990's DMIs (propiconazole, myclobutanil)
- 2000's strobilurins (azoxystrobin, trifloxystrobin)

Turf Fungicides - dithiocarbamates

- dithiocarbamates are still registered and are the highest use fungicides in agriculture
- thiram in Arrest is similar to Antabuse
- inexpensive protectants with multi-site activity (inhibit -SH)

Protectants???

- coat the plant surface and protect against infection
- do not enter the plant cells
- also known as contact fungicides

Multi-site activity???

- the fungicide interferes with more than one function in the fungus, affecting various metabolic pathways

Turf Fungicides - heavy metals

- mercurial fungicides were de-registered in 1995
- persistent protectants with multi-site activity

Turf Fungicides - chlorinated rings

- chlorothalonil (Daconil)
- PCNB = quintozone
- protectants with multi-site activity
- concerns about production contamination

Turf Fungicides - benzimidazoles

- thiophanate-methyl (Easout, Senator)
- systemic (xylem-mobile), bind to tubulin
- fungicide resistance, no fitness cost
- ascomycetes

Turf Fungicides - Dicarboximides

- iprodione (Rovral, called Chipco in U.S.)
- especially good against ascomycete diseases
- locally systemic
- resistance

Turf Fungicides - DMIs

- demethylation-inhibiting fungicides
- propiconazole (Banner) introduced in 1994
- myclobutanil (Eagle) in 2000+
- very potent fungicides against ascomycetes and basidiomycetes (low dose needed), but risk of fungicide resistance is high

Turf Fungicides - Strobilurins

- base structure for this group found in the fungus *Strobilurium* in the 1970's
- azoxystrobin (Heritage) by Syngenta
- trifloxystrobin (Compass) by Bayer
- pyraclostrobin by BASF
- active against many pathogens, but not strong against dollar spot
- some systemic activity, resistance development
- inhibit cytochrome bc1 electron transport

Turf Fungicides - metalaxyl

- metalaxyl (Subdue Maxx) against Oomycetes
- registered for Pythium Blight in 2002
- URMULE for Pythium root rot in 2004
- xylem-mobile, affects RNA synthesis
- resistance

URMULE???

- user requested minor use label expansion
- if chemical is already registered for some crop in Canada, users can request that the label be expanded to include their crop/disease, with the agreement of the company and providing some more data as required by PMRA (Pest Management Regulatory Agency) which is a branch of Health Canada that administers the Pest Control Products Act which governs pesticides

Other Turf Fungicides in Canada

- etridiazole (Truban), protectant for Pythium
- fosetyl-AI (Aliette), ambimobile for Pythium
- boscalid (Cadence), for Dollar Spot only
- chloroneb (Terraneb)
- anilazine (Dyrene)
- captan (Captan, Maestro)

Other Turf Fungicides - in U.S. not Canada

- propamocarb (Banol)
- fenarimol (Rubigan)
- fludioxonil (Medallion)
- flutolanil (Prostar)
- phosphite salts
- polyoxin D (Endorse)
- triadimefon (Bayleton)
- vinclozolin (Curalan)

Why not in Canada???

- turf market much smaller in Canada
- turf fungicide use much less intensive
- Canada: 0-5 applications/yr
- U.S. 5-10 applications/yr
- takes \$,,\$,\$,\$\$ to register a fungicide for the toxicological requirements as well as for the efficacy tests across the country

Why need testing???

- If a fungicide is already registered in the U.S., why do we need more testing in Canada?
- PMRA (Health Canada) requires Canadian data on efficacy to register a pesticide
- EPA (U.S.) does not require efficacy data to be submitted in the registration package

Fungicide Testing

- PMRA usually requires data from 3 location
- annual testing of new fungicides
- Guelph Turfgrass Institute, Ontario
- Prairie Turfgrass Research Centre, Olds
- some testing in BC, Que & Nova Scotia
- Consultants & private testing

References for turf fungicides

Guelph Turfgrass Institute Annual Reports

- www.uoguelph.ca/GTI/research_index.html

Univ. Kentucky, Dr. Paul Vincelli

- www.ca.uky.edu/agc/pubs/ppa/ppa1/ppa1.pdf

PMRA pesticide database

- www.eddenet.pmra-arla.gc.ca/4.0/4.01.asp

- This seminar posted on the web at

www.uoguelph.ca/~thsiang/present/2004winfungic.pdf

Other Statistics

(U.S. Stats from Ayers & Gilmore. 1991. NAPIAP Fungicide Assessment Report for Turf Fungicides.)

US Turf Fungicide Use (1991)

- 14,000 golf courses in U.S.
- 50% area is fairways (20% treated)
- 3% is greens and tees (95% & 45% treated)
- Greens & Tees received 5 to 10 trmts/yr

US Turf Fungicide Use (1991)

Most common fungicides

- Chlorothalonil (670,000 kg)
- Iprodione (130,000 kg)
- Propamocarb (99,000 kg)
- Metalaxyl (55,000 kg)
- Propiconazole (27,000 kg)
- Triadimefon (16,000 kg)
- Others (215,000 kg)

Summary

Protectant Fungicides (older)

- coat the surface of the plant (contact) & protect against pathogen entry
- chlorothalonil (Daconil)
- PCNB = quintozene
- iprodione (Rovral Green)
- mercury (PMAS)

Systemic Fungicides (newer)

- taken up by the plant and moved (translocated) within plant tissues. may also have protectant activity
- thiophanate-methyl (Senator)
- carboxin (Arrest)
- iprodione (Rovral Green)
- propiconazole (Banner)
- myclobutanil (Eagle)
- systemic fungicides (xylem-mobile or phloem-mobile) also have protectant activity

New fungicides

- mostly systemic
- lower rates are used
- protection from within
- chemical moves into new growth
- but generally cost more

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