What will we do without quintozene?

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Background

- In Canada, the registration of Quintozene as a turfgrass fungicide ended in December 2010
- The major use, either alone or in fertilizer combinations, was for winter diseases
- Why was Quintozene deregistered?
- What can we use now?

Outline

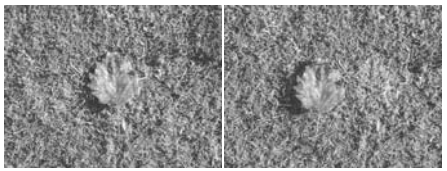
- Snow mold diseases
- Cultural controls
- Chemical controls
  - What is quintozene & why deregistered?
  - Snow mold fungicides
- Other/Biological controls
  - Brassica/radish/canola
  - Civitas & Harmonizer
  - Nivalis

Snow molds - cultural controls

- minimize thatch
  - thatch decreases turf vigor
  - binds pesticides & fertilizers
  - sclerotia/hyphae oversummer/feed there
- avoid succulent, lush growth in late fall
  - nonhardened tissue susceptible to cold & disease

Snow molds - cultural controls

- rake up leaves in fall (and spring)



Snow molds - cultural controls

- avoid snow compaction
- prevent drifts & accumulation in sensitive areas
- snow removal (when spring has arrived)

Snow molds - cultural controls

- cultural techniques may reduce the severity of snow mold diseases, but cannot entirely prevent their occurrence

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)

What is Quintozene?

PCNB

pentachloronitrobenzene

protectant with multisite activity

- impurities?
  - hexachlorobenzene

Hexachlorobenzene (HCB)

- probable human carcinogen
  from www.epa.gov/oppsrrd1/REDs/factsheets/0097fact.pdf
- "HCB is present in chlorothalonil and at least nine other pesticides" (including PCNB)
- "The estimated dietary cancer risk for food from HCB in pesticides is 1.8 x 10^{-6}"
- compared to benzene
  www.oehha.ca.gov/air/toxic_contaminants/html/Benzene.htm
  - known human carcinogen (up to 2% in gasoline)
  - lifetime risk 100 to 780 x 10^{-6}

PCNB and the U.S. EPA

- 2006 Aug 2 - "Most uses of PCNB have been found to be ineligible for reregistration"
  http://www.epa.gov/fedrgstr/EPA-PEST/2009/March/Day-30/p7043.htm
- 2006 Sep 29 - comment period to 06/11/1
- 2006 Nov 30 - comment period to 07/01/08
- 2009 Dec 30 - retain use on tees/greens/fairways but not on roughs, lawns, yards
- 2010 Aug 12 - stop order on AmVac PCNB because of impurities

PCNB and the PMRA

- 2009 Feb 13 - "Phasing out all turf uses"
  http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_prvd2009-02/quintozene-eng.php
- 2009 Feb 09 - Turf Industry Steering Committee, spearheaded by WCTA composed of industry, government & researchers to address PCNB loss
- 2009 & 2010 teleconferencing/consulations
- 2010 Dec 31 - All turf uses of PCNB cancelled
  http://www.turfandrec.com/index.php?option=com_content&task=view&id=2753

CDN Fungicides for snow mold control

- Daconil
- Rovral, Fungicide X
- Banner, Propiconazole
- Eagle
- Heritage
- Arrest
- Premis
- Insignia
- Instrata

US Fungicides for snow mold control Wisconsin & Ohio suggestions

http://tdl.wisc.edu/pdf/PCNB%20status.pdf

- Supreme:
  - Instrata (single higher or two lower apps) ch,fl,pr
  - Interface (iprodione & trifloxystrobin)
- Best:
  - iprodione + chlorothalonil + propiconazole
  - propiconazole + fludioxonil
- Better:
  - iprodione + chlorothalonil
  - iprodione + triticonazole

US Fungicides for snow mold control Michigan suggestions

http://iaturf.blogspot.com/2010/09/more-pcnb-information.html

- Excellent for gray snow mold (& 3-way mixes)
  - chlorothalonil or fludioxonil
- Good for gray snow mold
  - myclobutanil, propiconazole
- Excellent for pink snow mold (& 3-way mixes)
  - azoxystrobin, iprodione, thiophanate-methyl, trifloxystrobin
- Good for pink snow mold
  - chlorothalonil

Snow mold fungicides (OTRF funded)

based on 124 reports and 936 different tests, using Vincelli's PPA1 rating system out of 4, L=uncertain

Common Name	Product Names	Grey	Pink
~~PCNB~~	~~Terraclor, Turfcide, Quintozene, ScottsFFII~~	4	4
~~mercury chloride~~	~~Mersil, Caloclor~~	4	4
~~mancozeb~~	~~Dithane, Fore~~	4	4
~~fluazinam~~	~~Fluazinam~~	4	4
chlorothalonil+iprodione	Daconil + Rovral	4	4
~~cadmium~~	~~Cadminate~~	4	3
~~triadimefon~~	~~Bayleton~~	4	2
Iprodione	Chipco 26GT, Chipco 26019, Rovral Green	3-4	4
propiconazole	Banner, Tilt	L-4	4
chlorothalonil	Daconil, Thalonil	L-3	4
myclobutanil	Eagle, Nova	3	3
~~chloroneb~~	~~Teremec, Terraneb, Demosan~~	3	
~~flutalonil~~	~~Prostar~~	2	L
~~anilazine~~	~~Dyrene~~	2	L
azoxystrobin	Heritage	2	3
carbathiin+oxycarboxin+thiram	Arrest	2	2

www.otrf.ca/Portals/0/Research/090219snowmold_fungic.pdf

Fungicide prices 2008 (snow molds)

Fungicide	Chemical	Volume	Price $	Rate/100m2	$/100m2
Quintozene 75WP	pcnb	15 kg	$425	250 g once	$7.08
Premis 200F	triticonazole	3.2L	$762	32 mL once	$7.62
Daconil 2787	chlorothalonil	10L	$230	500 g once	$11.50
Daconil Ultrex	chlorothalonil	2.27 kg	$89	303 g once	$11.88
Insignia EG	pyraclostrobin	1kg	$594	25 g once	$14.85
Arrest 75W	thiram+	5 kg	$390	250-375 g once	$24.38
Daconil2787+RovralGT	Dac/Rov			240 mL+250 mL	$20.90
Quali-Pro Propiconazole	propiconazole	5L	$616	206 mL @ 28 d	$25.38
Banner MAXX	propiconazole	3.78L	$550	206 mL once	$29.97
Heritage MAXX	azoxystrobin	3.78L	$1,033	126 mL once	$34.43

Other products for snow mold control

- Brassica/canola/radish tissues
  - glucosinolates convert to isothiocyanates
- Civitas & Harmonizer from PetroCan/Sungro
  - induce resistance in plants
- Nivalis (*Typhula phacorrhiza*)
  - biocontrol agent competes with snow molds

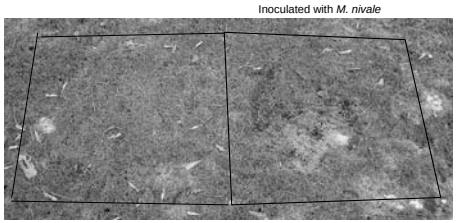
Radish seed results

Amount of Winter Injury & Disease (%)

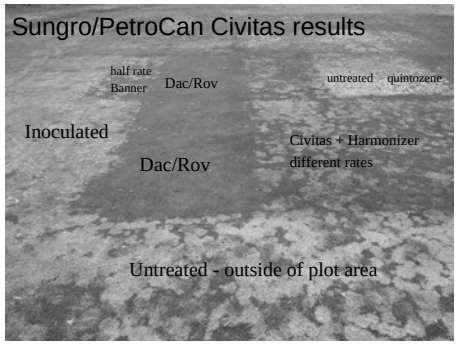
Treatment (g/m^2)	Pink (Mn)	Gray (ish)	Gray (inc)
Inoculated control	67.0	75.3 a	82.0 a
Canola meal (50)	15.5	34.0 b	49.0 bc
Canola stubble (50)	23.8	50.0 b	57.3 ab
Nutri-Q (22.5) (5% quintozene)	23.0	25.8 b	39.0 bc

Means followed by a letter in common are not significantly different

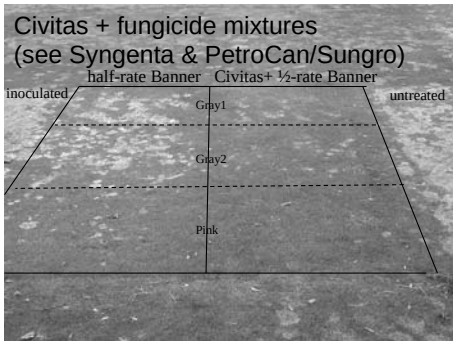
Radish seed results



Sungro/PetroCan Civitas results

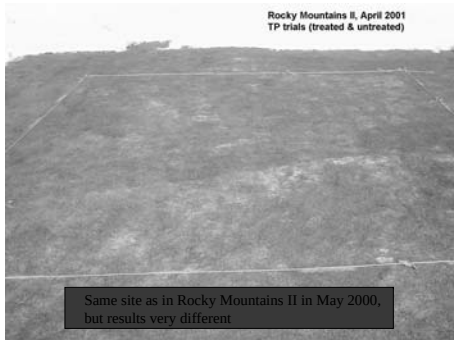


Civitas + fungicide mixtures (see Syngenta & PetroCan/Sungro)



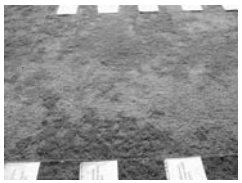
Snow mold biocontrol: TP/Nivalis

- 1980's - researchers in Japan & Canada find that *Typhula phacorrhiza* can suppress snow mold (but both left for warmer places without snow)
- 1993 - We started the project on TP control with CTRF & ON gov't money, and found that it could suppress gray snow mold
- 1995 - found good results against pink s.m.
- 1997 - NuGro & CTRF & CDN govt money for more research on biology and further development across country



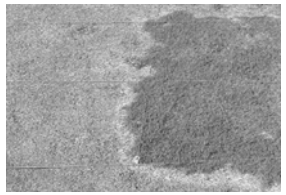
TP/Nivalis Summary of Results

- 28 trials across Canada from 1999 to 2002
  - in 10 trials, there was insufficient disease pressure or too much abiotic winter injury



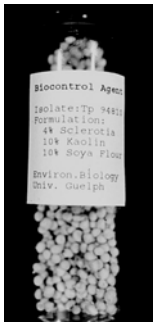
TP/Nivalis Summary of Results

- in 12 trials, the biocontrol agent suppressed snow molds as well as or better than fungicides



Summary of Results

- in 6 trials, the biocontrol did not suppress snow molds as well as the fungicides



Nivalis was approved for registration in the U.S. and Canada in Jan 2011

For more details, see your Agrium Rep (next speaker?)