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New Races of Sunflower Downy Mildew

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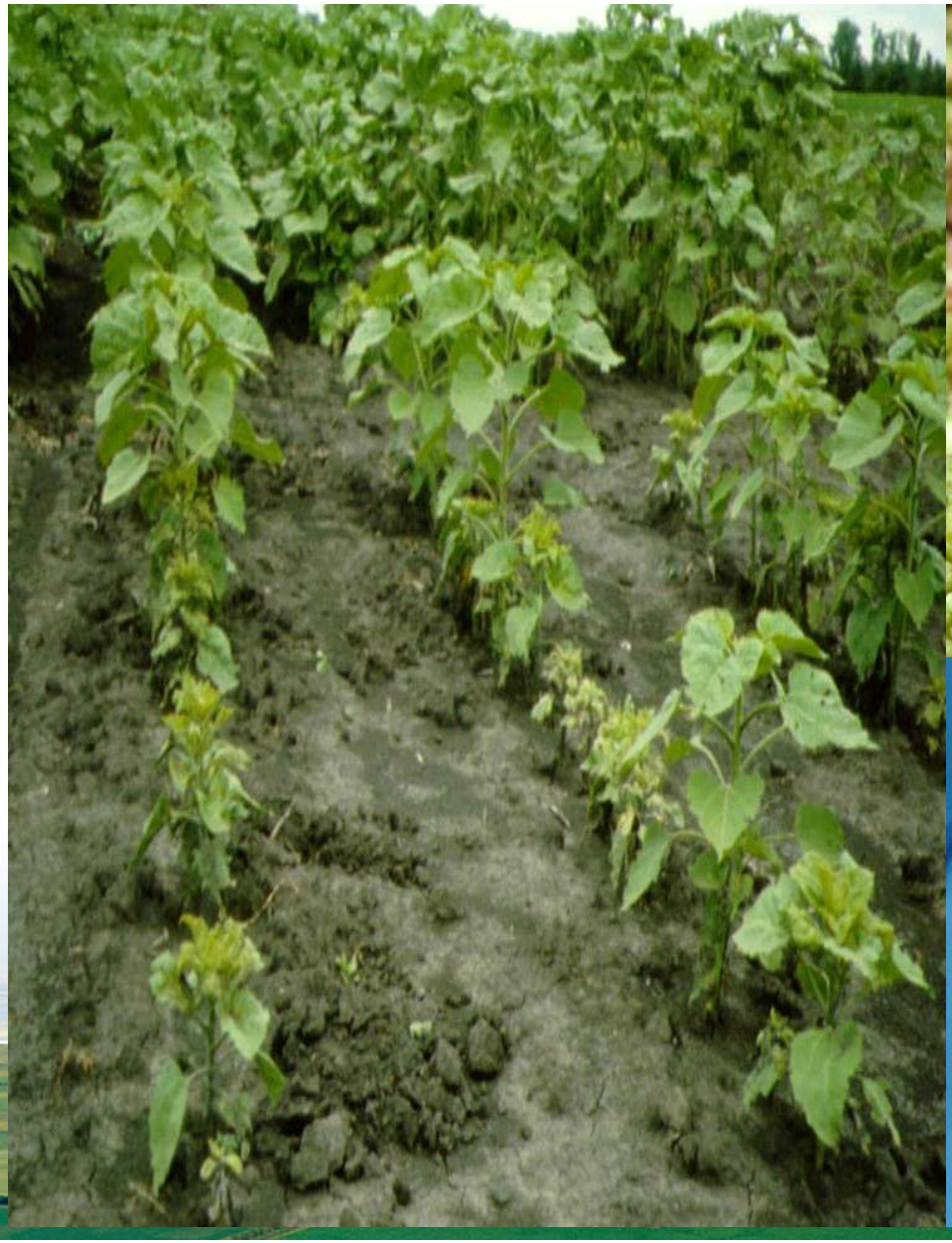
Canada

- Sunflower (*Helianthus annuus* L)
- 80,000 ha mainly in Manitoba
- Mostly confection, in-shell & de-hull
- Oilseed mostly for birdfeed.
- Downy mildew (DM) caused by the fungus *Plasmopara halstedii*
- Major disease in sunflower worldwide
- DM affects 15-80% of sunflower crops annually in Manitoba
- Estimated 10-20% yield reduction in most years, and up to 40% in some crops.

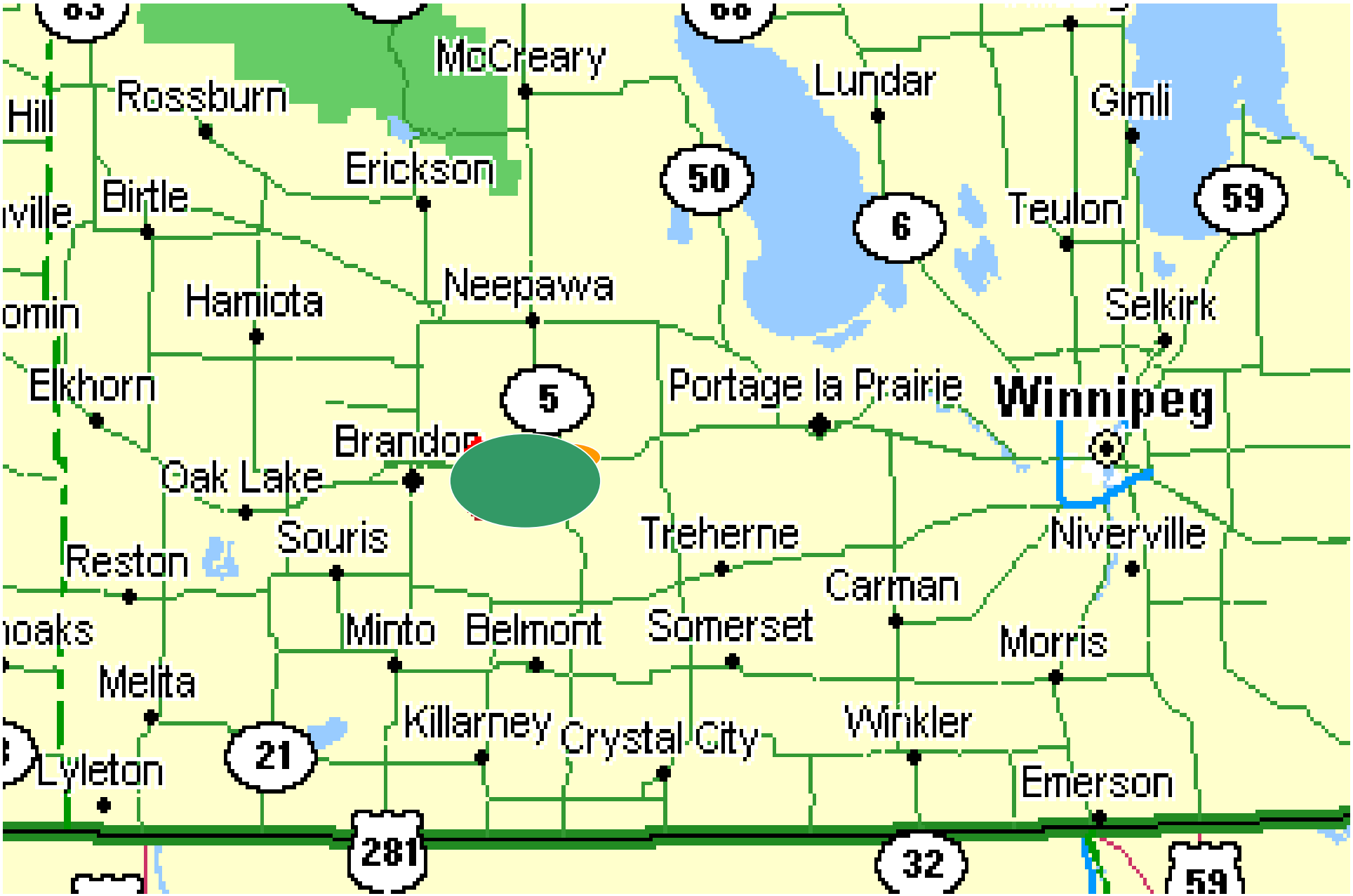
Downy mildew symptoms



Materials & Methods

- Annual disease surveys 30-60 crops
- Two persons walking a 100m following an "M“
- Identify disease, incidences, collect isolates
- Identify races & resistance to the metalaxyl
- DM isolates inoculating 2-days-old seedlings
- 11 sunflower differential genotypes.
- 18 C and a 18/6 h day/night for 14 days
- Incubated at 100 RH for 24 h.
- Virulence based on resistance / susceptibility
- Identify races and sensitivity to the metalaxyl

Sunflower area, southern Manitoba



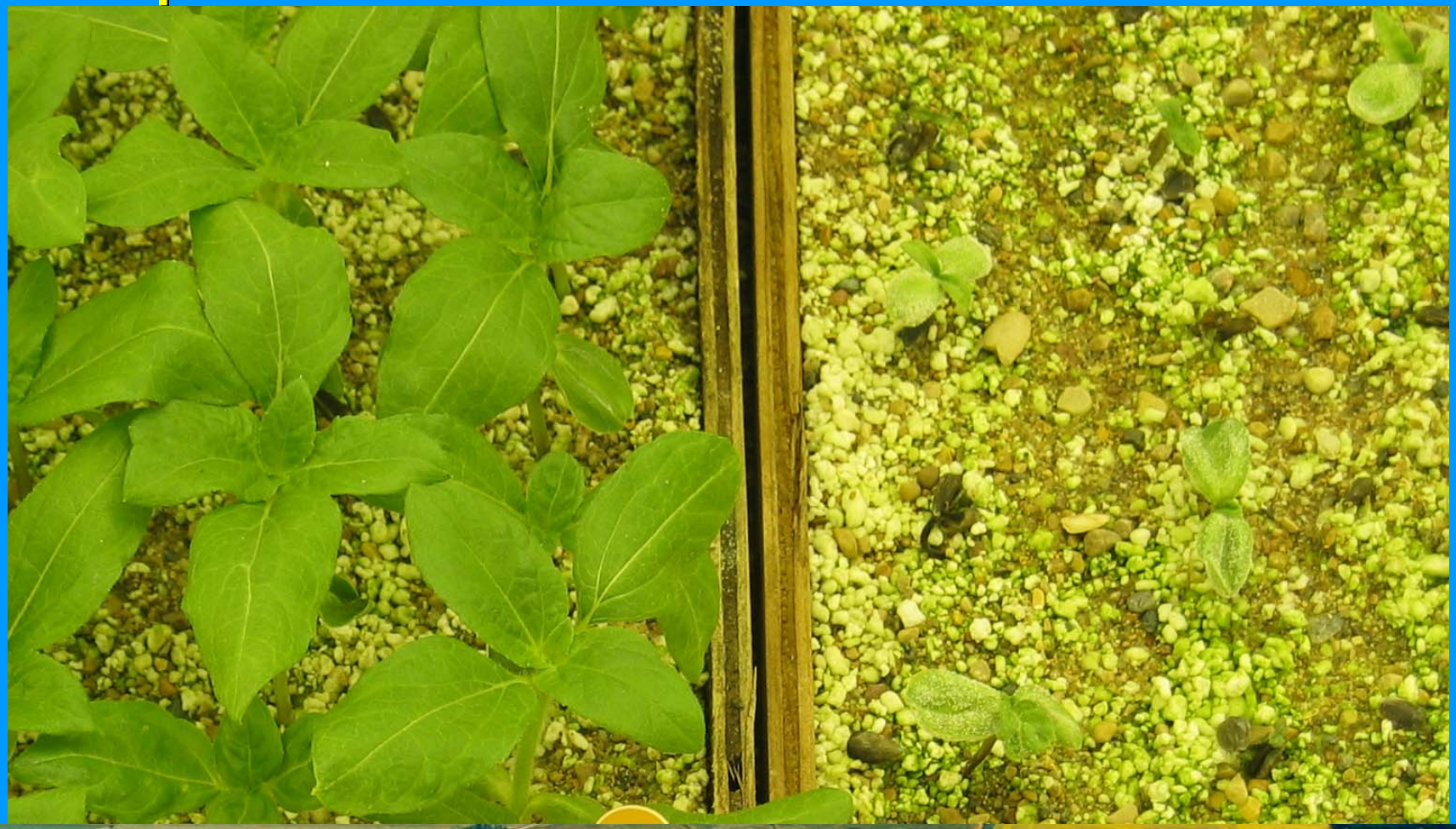
Downy mildew, prevalence, incidence and races

Year	Infested Fields % of Tot.	Mean % inf. Plants	Range % Inf. Plants	Prevalent Races
2010	35	5	T-10	700, 300, 100
2009	50	7	T- 30	730, 330
2008	41	4	T- 15	730, 330
2007	81	8	T- 30	700, 300, 500
2006	42	5	T- 15	700, 500, 300
2005	72	8	T- 40	700, 300, 500

Resistant & susceptible reactions

Fungicide sensitive isolate

Apron treated seed **untreated seed**



Results

- Prevalence of DM ranged from 15-80%
- Incidence ranged from traces to 5% and 40%
- New race-groups 700 and 300 more prevalent than the 100, 200 and 500 groups
- New races are virulent on commercial hybrids
- 50-60% of the DM isolates were resistant to the metalaxyl fungicide seed treatment.
- Prevalence and incidence of DM in 2006, 2008 and 2010 were lower than in 2005, 2007, and 2009

DM races in 2007

Sunflower Differential Lines	Downy Mildew Races, Prevalence, and Virulence							
	130 4%	300 7%	330 18%	510 7%	530 4%	700 2%	710 7%	730 50%
SHA 300	S	S	S	S	S	S	S	S
RHA 266 (265)	R	S	S	R	R	S	S	S
RHA 274	R	R	R	S	S	S	S	S
DM-2 (PM1-3)	S	R	S	S	S	R	S	S
DM-3 (PM1-17)	S	R	S	R	S	R	R	S
DM-4 (803-1)	na	na	na	na	na	na	na	Na
HAR 4	na	na	na	Na	na	na	na	Na
HAR 5 (QHP-1)	na	na	na	na	na	na	Na	na
HA 335	R	R	R	R	R	R	R	R

DM races in 2010

Sunflower Differential Lines	Downy Mildew Races, Prevalence, and Virulence							
	120 5%	320 16%	400 2%	520 2%	700 16%	720 20%	730 33%	770 5%
SHA 300	S	S	S	S	S	S	S	S
RHA 266 (265)	R	S	S	R	S	S	S	S
RHA 274	R	R	R	S	S	S	S	S
DM-2 (PM1-3)	R	R	R	R	R	R	S	S
DM-3 (PM1-17)	S	S	R	S	R	S	S	S
DM-4 (803-1)	R	R	R	R	R	R	R	S
HAR 4	R	R	R	R	R	R	R	R
HAR 5 (QHP-1)	R	R	R	R	R	R	R	R
HA 335	R	R	R	R	R	R	R	R

DM races 2005-2010

Year	Race 100 (1)	Race 300 (2, 6, 7)	Race 500 (4)	Race 700 (3)
2005	12%	21%	5%	62%
Races	100	300	500	700-730?
2006	8%	16%	21%	55%
Races	100	333, 300	500, 560	733, 773, 700
2007	4%	25%	11%	59%
Races	130	330, 300	510, 530	730, 710, 700
2008	NA	41%	NA	59%
Races	NA	330, 320	NA	730, 720, 700
2009	NA	10%	NA	90%
Races	NA	330, 320	NA	730, 770, 773
2010	5%	13%	2%	75%
Races.	110. 120	320. 330	520	720. 730. 770

CONCLUSIONS

- Major race shift from 100/500 to 300/700.
- Races 700s > virulent than races 300s.
- DM epidemics in 2005, 2007, and 2009.
- Resistant to metalaxyl is widely spread.

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Thank you!

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