



# New Races of Sunflower Downy Mildew

## Khalid Y. Rashid

AAFC, Morden Research Station, Morden, MB



New virulent downy mildew races cause local epidemics but genetic resistance reduces the risk of major yield losses

### Introduction

Sunflower (*Helianthus annuus* L) is grown in western Canada on 30,000-100,000 ha mainly in Manitoba. Confection hybrids occupy 70-80% of the Canadian production and oilseed hybrids occupy the rest. Downy mildew (DM) caused by the fungus *Plasmopara halstedii* is a major disease affecting sunflower worldwide (Figure 1). DM affects 30-80% of sunflower crops annually causing an estimated 10-20% yield reduction, and up to 40% in some crops.

### Materials and Methods

Annual disease surveys are conducted in the sunflower growing areas in Manitoba (Figure 2). Crops were assessed by two persons walking a 100 m in opposite directions following an "M" pattern. Infected plants were identified and incidences were estimated (Table 1). Fungal isolates were collected to identify the races and the resistance to the fungicide seed treatment. DM isolates were tested by inoculating 2-days-old seedlings of the set of nine universal sunflower differential genotypes (Table 2). Infected seedlings were transplanted into a soil mixture and kept under 18 C and a 18/6 h day/night for 14 days, then incubated at 100 RH for 24 h. Virulence of each isolate was assessed based on resistant and susceptible reaction to identify races and the sensitivity to the fungicide seed treatment (Figure 3).

### Results and Discussion

Figure 1. Downy mildew symptoms



Figure 2. Surveyed region in Manitoba

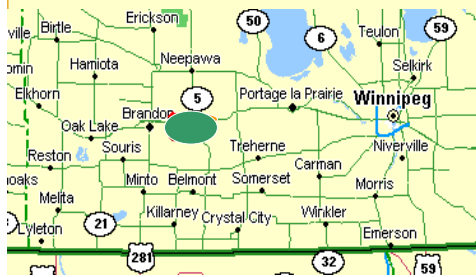


Table 1. DM prevalence, incidence, and races

Year	Infested Fields % of Tot.	Mean % inf. Plants	Range % Inf. Plants	Prevalent Races
2011	82	7	T-10	730-720-700
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

Figure 3. Resistant / susceptible reactions



Table 2. DM Races in 2010

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

Table 3. DM races in 2011

Sunflower Differential Lines	Downy Mildew Races, Prevalence, and Virulence						
	100	300	334	500	700	720	730
SHA 300	S	S	S	S	S	S	S
RHA 266 (265)	R	S	S	R	S	S	S
RHA 274	R	R	R	S	S	S	S
DM-2 (PM1-3)	R	R	S	R	R	R	S
DM-3 (PM1-17)	R	R	S	R	R	S	S
DM-4 (803-1)	R	R	S	R	R	R	R
HAR 4	R	R	R	R	R	R	R
HAR 5 (QHP-1)	R	R	R	R	R	R	R
HA 335	R	R	S	R	R	R	R

Table 4. DM races 2005-2011.

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
2011	3%	19%	3%	75%
Races	100, 120 ?	334, 300	500	730, 720, 700

Prevalence of DM in the last seven years ranged from 35-82% infested fields while incidence ranged from traces to 10% and 40% infested plants (Table 1). New race-groups 700 and 300 became more prevalence than the 100, 200 and 500 groups traditionally reported in Canada and USA. The new races are virulent on most commercial sunflower hybrids. Additionally, 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, 2009, and 2011 due perhaps to annual variation in soil moisture levels and temperatures at the seedling stage.

### Conclusions

- Prevalence of virulent races 700s & 300s.
- Races 700s more virulent than races 300s.
- DM epidemics: 2005, 2007, 2009 & 2011.
- Resistant to metalaxyl is widely spread.

### Acknowledgements

Technical assistance by Tricia Cabernel and Maurice Penner is appreciated