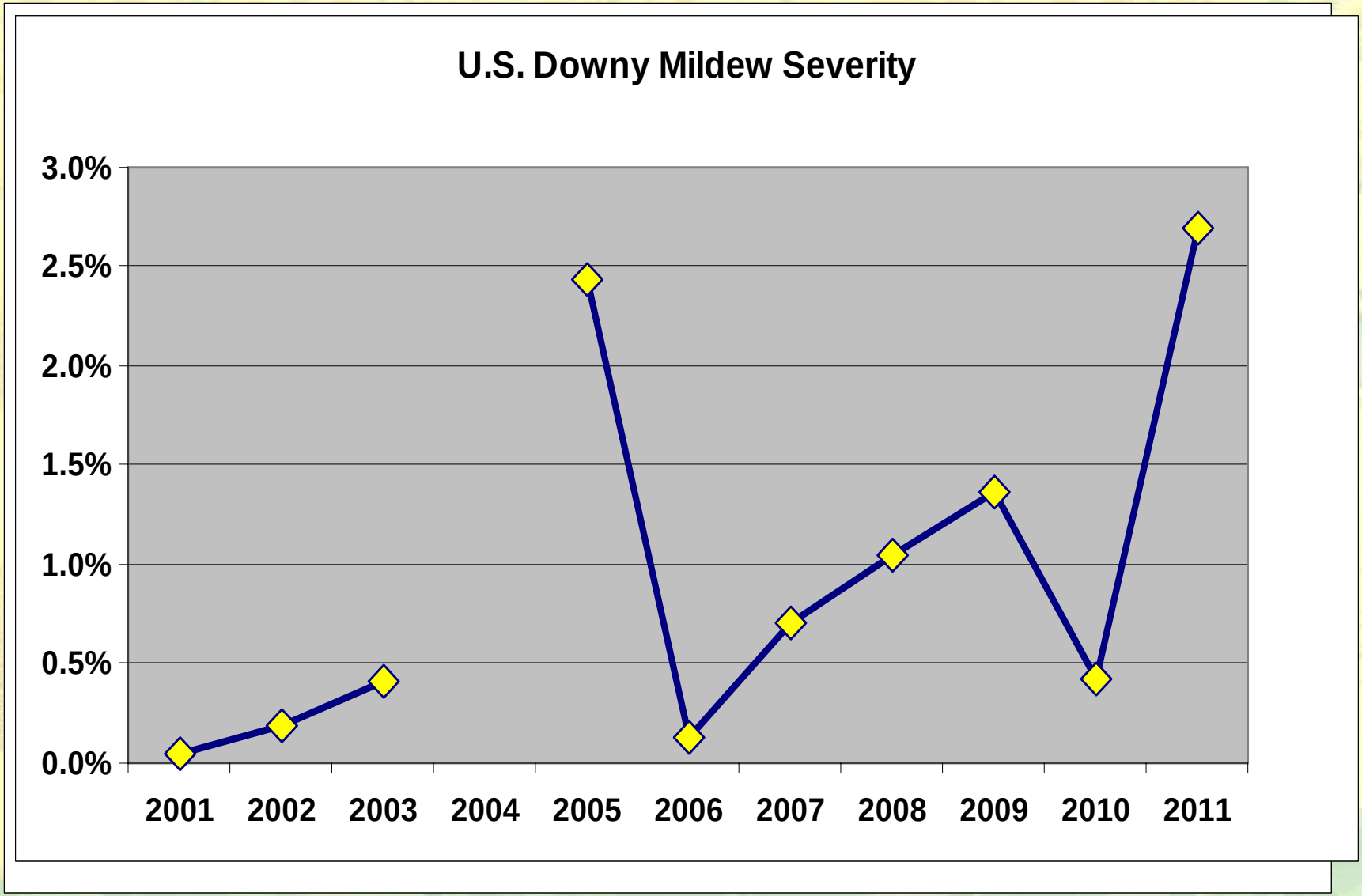
New Virulent Races of Downy Mildew: What's new in 2011

Tom Gulya, USDA-ARS-NCSL, Fargo ND
Marcia McMullen, NDSU Plant Pathology, Fargo ND

Background

- In the U.S., 11 races have been identified (2000-2008) from ~ 350 samples processed by the USDA unit.
- Race 730 dominant (42%), and with race 770, comprise two-thirds of all isolates.
- In 2009, the first instance of DM attacking the Pl_6 gene was found in Bottineau county, ND - designated as race 734.
- In 2009 and 2010, the distribution of “hot” races was studied, and found in all states (ND, SD, MN, NE).
- Prevalence of hot races was ~ 10-15%.

DM Status in U.S.



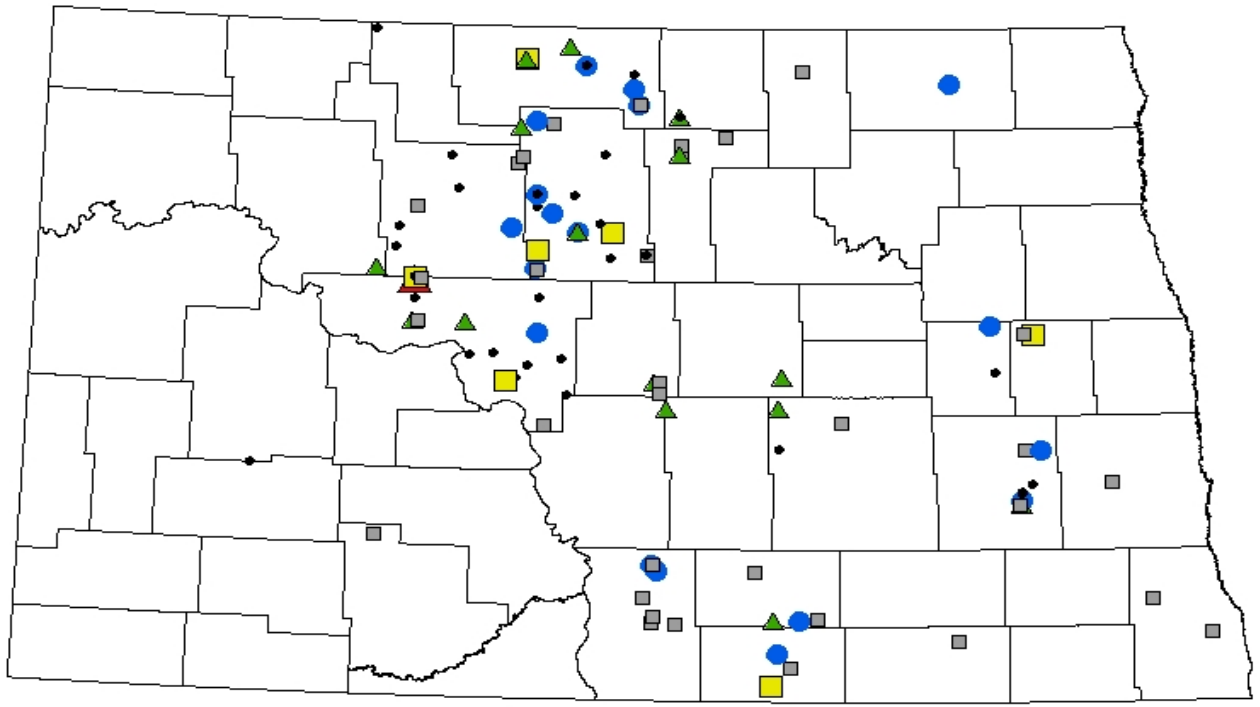
NDSU –IPM 2011 – DM data

(Marcia McMullen – overall supervisor)

- 78 of 112 fields had downy mildew (70%, vs 26% in 2010)
- Severity within fields ranged from 1- 54%.
- Averaged over all fields, DM severity was 7% of the ND crop (vs 1% in 2010).
- NSA survey data for ND- 31 of 78 fields with DM (40%) in Sept.(vs. 9% in 2010), with statewide severity of 3% of crop

Sunflower Downy Mildew Percent Incidence

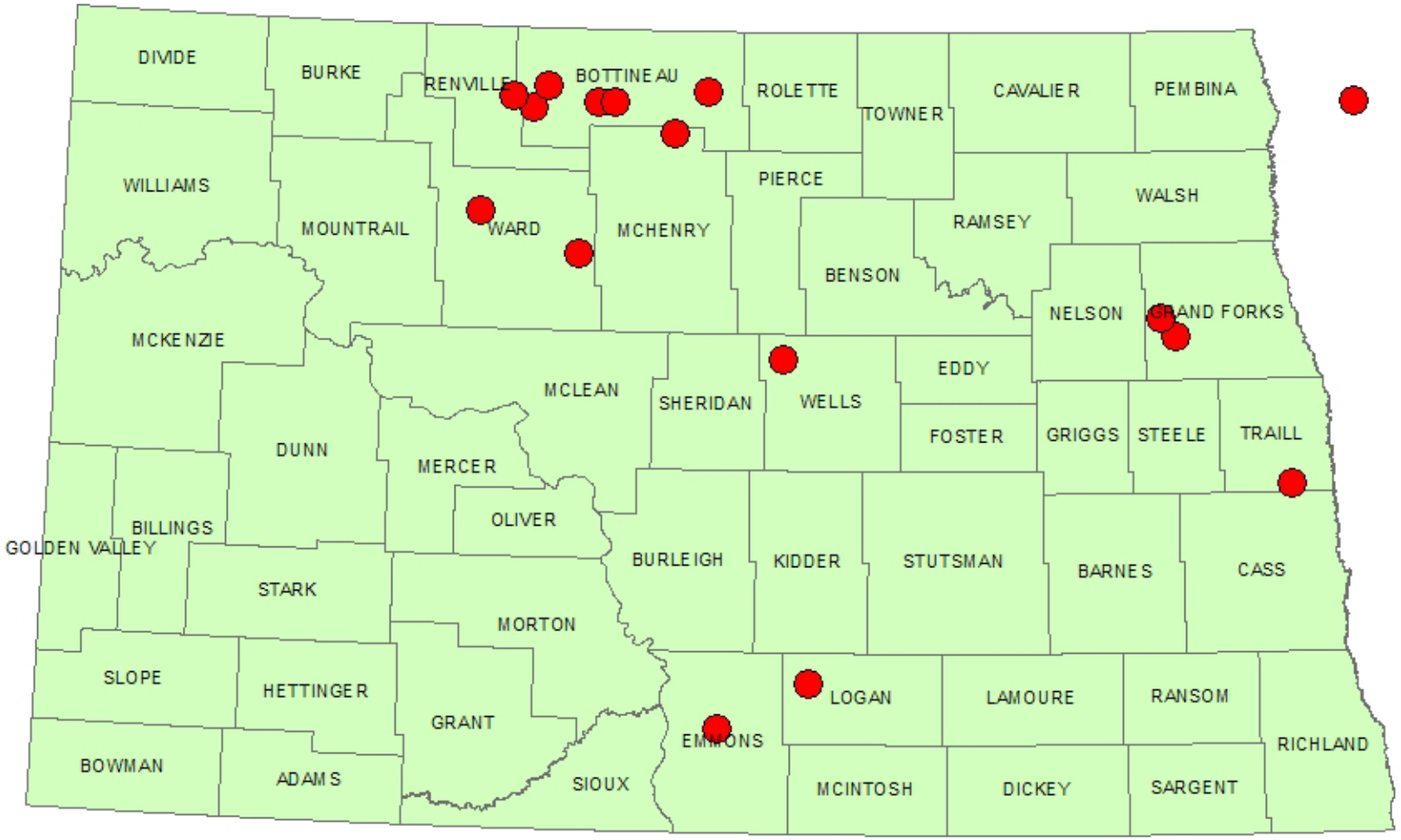
Season Final, 2011



Percentage of plants infested with Downy Mildew

- 0
- 1-5
- 6-10
- 11-25
- 25-50
- 51-100

Downy Mildew Locations



16 isolates of 160 collected in 2010 were ‘hot’ races attacking the PI6 gene. Found in ND, MN and NE. Not in SD, KS or CO.

2011 Studies

- Continue race typing samples coming from fields with DMR hybrids to identify any “hot” races
- Assess possible mildew resistance to Dynasty/Idol fungicides
- Assist NDSU pathologists in field testing of new, experimental fungicides for DM control.

Reaction of New Races on Differentials – 2009/2010

Differential	**DM 314**	**DM 704**	**DM 714**	**DM 734**	**DM 774**
Susc	S	S	S	S	S
RHA 265	S	S	S	S	S
RHA 274		S	S	S	S
DM-2	S		S	S	S
PM-17				S	S
803					*S*
HAR-4					
HAR-5					
HA-335	***S***	***S***	***S***	***S***	***S***

Reaction of New Races on Differentials – *2011*

Differential	**DM 334**	**DM 735**	**DM 737**	**DM 774**
Susc	S	S	S	S
RHA 265	S	S	S	S
RHA 274		S	S	S
DM-2	S	S	S	S
PM-17	S	S	S	S
803				*S*
HAR-4		*S*	*S*	
HAR-5			*S*	
HA-335	***S***	***S***	***S***	***S***

Reaction of New Races on Other "DMR" USDA Germplasm

Differential	DM 314	DM 714	DM 734	DM 737	DM 774
HA 337 (Pl 7)	S	S	S	S	S
RHA 340 (Pl 8)	R	R	R	R	R
HA 419 (Pl arg)	R	R	R	R	R
HA 458	R	R	R		R
HA 428	R	R	S	S	S
TX 16 - reselection	*Seg*	*Seg*	*Seg*	*Seg*	*seg*

Summary of 2009-2011 Downy Mildew Hot Races

(# isolates recovered each year)

	314	334	704	714	734	735	737	754	774	Total
2009 (2)	-		-	8	4				-	12 of 49 = 24%
2010 (5)	3		1	6	4				3	17 of 160 = 11%
2011 (7)		1		1	5	2	3	1	2	12/39 = 31%
TOTAL # & (%)	3 (7)	1 (2)	1 (2)	15 (37)	13 (32)	2 (5)	3 (7)	1 (2)	5 (12)	41/248 = 17%

Summary – 1

- Nine races able to overcome the Pl_6 gene (HA-335, 336) and the Pl_7 gene (HA-337, 338, 339) comprised 17% of 248 samples tested from 2009 and 2011, and thus infect many “DMR” commercial hybrids.
- Some “hot” races can infect USDA lines RHA 428, HA 458.
- New ‘hot’ races found in ND, SD, MN & NE.

Summary – 2

- Nine lines current used to differentiate DM races are now insufficient
- The current set of 3 “triplets” should be expanded to 5 “triplets,” to include lines used by industry for DM resistance.
- Probable lines as new differentials could include RHA 340, RHA 419, HA 458, RHA 458, TX16, RHA 464.
- New differentials should be coordinated with DM researchers in other countries to adopt a universal set of lines used internationally, and thus may include lines from other programs (i.e. INRA).

Summary – 3

- No DM isolates with tolerance to IDOL or DYNASTY have been found to date…. but -

- DM incidence, even with universal seed treatments, is higher than experienced with APRON, and more complete DM control is sought. Syngenta, BASF and DuPont field testing experimental fungicides for DM control


Thank you !
eclectech.co.uk
eclectech.co.uk