

Prevalent Rust Races on Sunflower in Manitoba

KHALID Y. RASHID

Agriculture and Agri-Food Canada

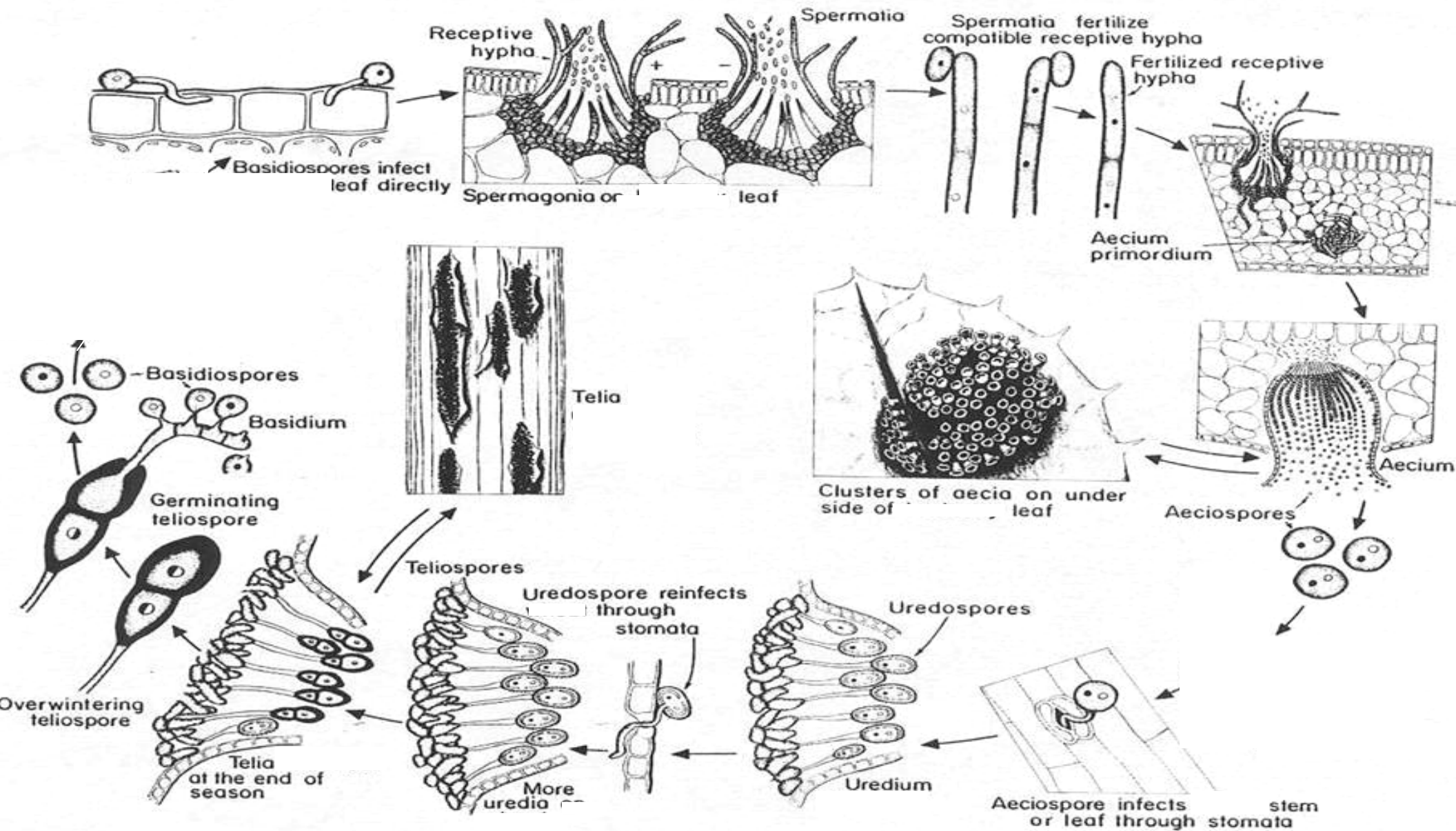
Morden Research Station



- **INTRODUCTION:**

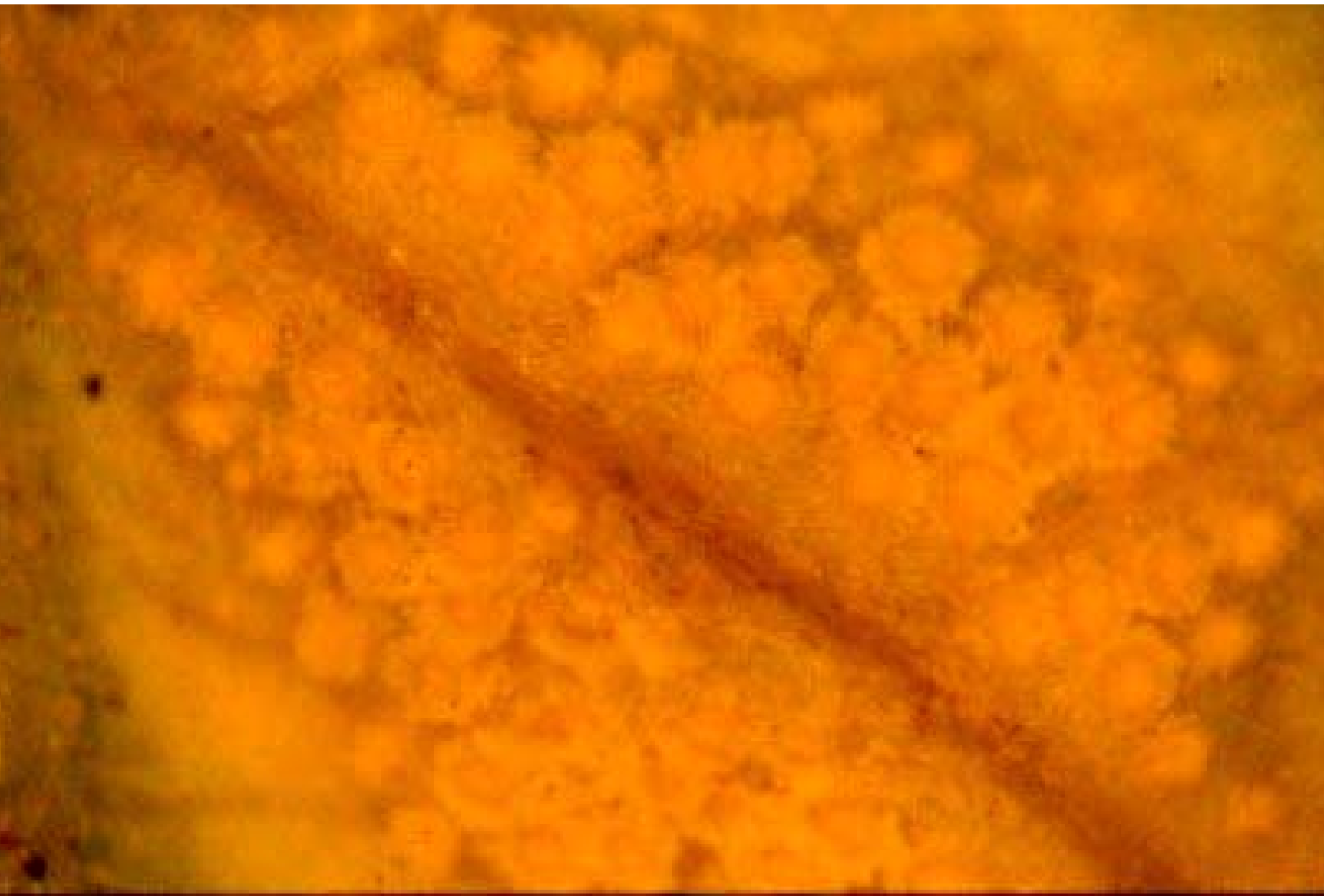
- **Rust caused by the fungus *Puccinia helianthi*.**
- **Major disease affecting sunflower *H. annuus*.**
- **Incidence and severity vary between years and regions depending on the environmental conditions, prevalent rust races, and resistance genes in commercial hybrids.**
- **Several virulent races are present in MB, ND**
- **Local rust epidemics occur and may cause >50% losses in yield and quality of seed.**
- **Resistance to some races in some hybrids**

RUST DISEASE CYCLE

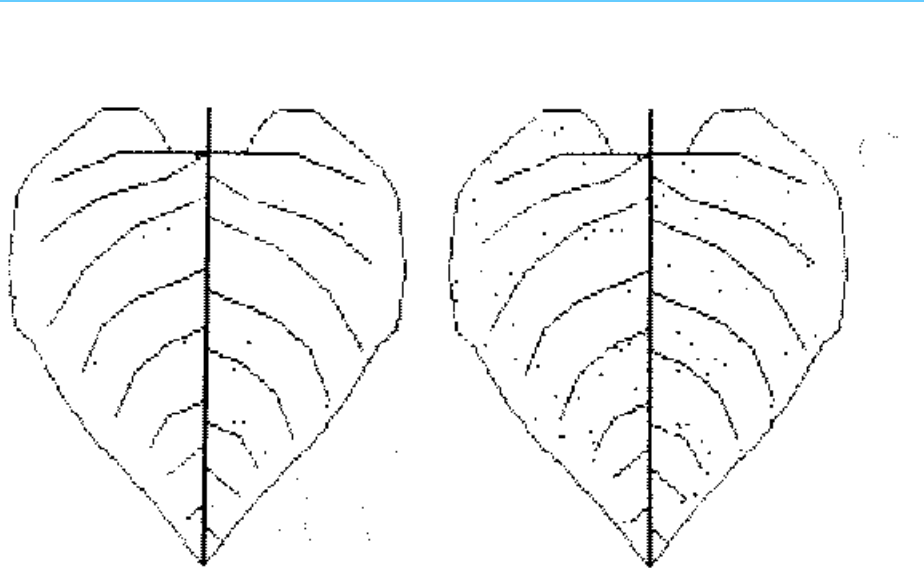


Early Season infections, Seedlings and Volunteer Plants



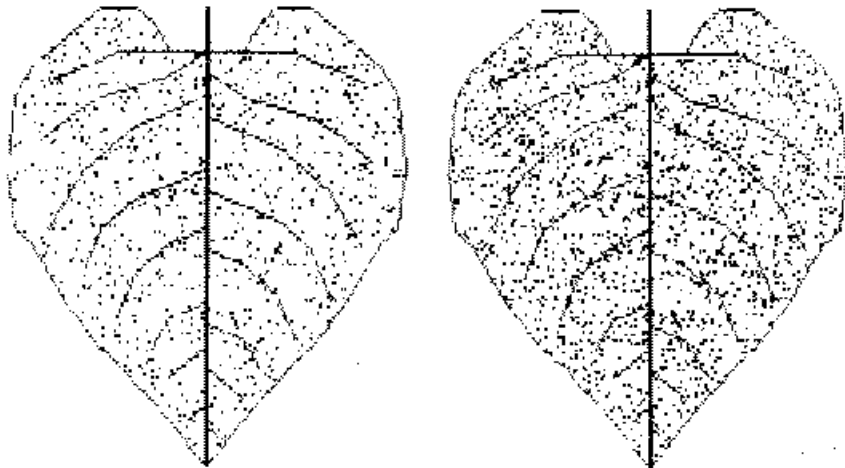


Leaf Area Infected ~ 2-5%, 40% LAI



Leaf Area Affected .1%

Leaf Area Affected .5%



Leaf Area Affected 5%

Leaf Area Affected 10%



k2



Sunflower rust severity

Mid-season

Late-season

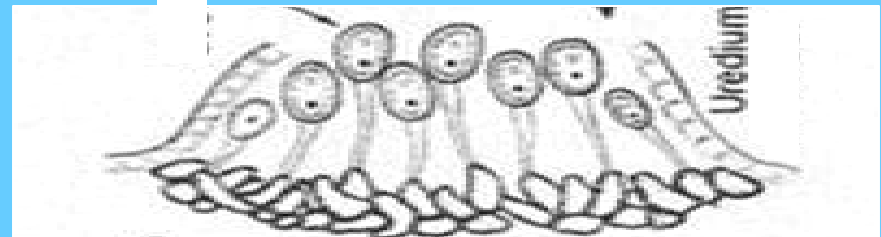
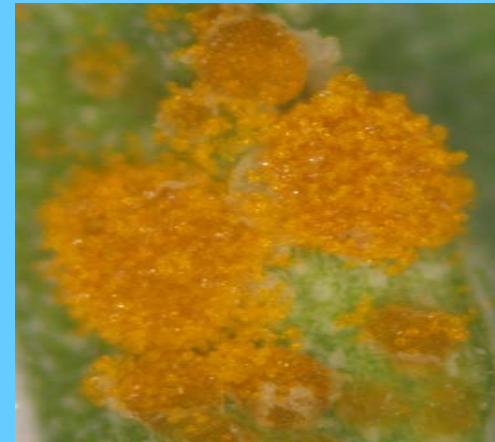
~40% LAI



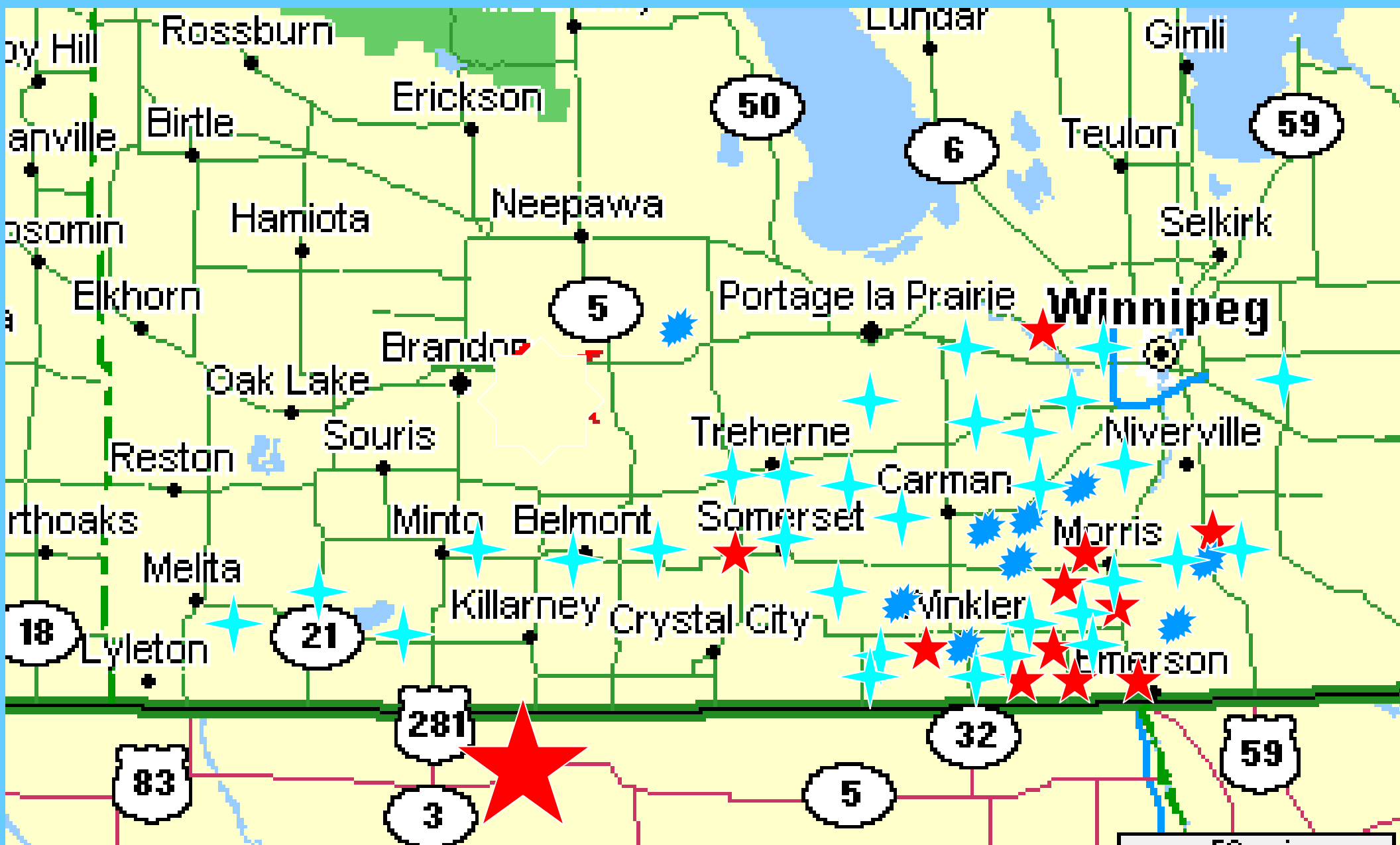


What leads to early rust infection and epidemics

- Infested stubble from previous year (Black spore).
- Susceptible volunteer plants for initial infections aecial stage (orange in colour)
- High humidity (6-15 hr, overnight) or
- Short periods of light rain
 - 7~10 day cycles starting at seedling,
 - Several cycles/season, daily infections after 1st cycle
- Temperature range from 10-30 °C
- Local inoculum often starts 1-2 wk earlier infections than In-coming inoculum, and results in higher disease incidence and severity.



Area Surveyed in Southern Manitoba 2008



Prevalence and Severity of Rust in Manitoba

Year	% Infested Fields	Mean-Dis. % LAI	Range % LAI	Prevalent Races
2008	74%	15%	T-50	3(300) & 4 (700)
2007	57%	10%	T-50	3 (300) & 4 (700)
2006	66%	6%	T-40	3 (300) & 4 (700)
2005	27%	8%	T-40	3 (300) & 4 (700)
2004	60%	8%	T-30	3 (300) & 4 (700)
2003	65 %	20	T->50	3 (300) & 4 (700)
2002	50 %	15	T->50	na
2001	27 %	8	T-20	na
2000	40 %	15	T->50	na
1999	60 %	5	T-20	na

Prevalent Sunflower Rust Races in Manitoba, 2003-08

Year	Race 100 (1)	Race 300 (3)	Race 500 (2)	Race 700 (4)
2003	12%	6%	0	82%
Prevalent Races	120, 126	326	-	726, 702, 736, 737
2004	20%	65%	0	15%
Prevalent Races	126, 106	326, 306, 320, 336	-	726, 727
2005	0	87%	0	13%
Prevalent Races	-	326, 336, 337, 376	-	726, 776, 777
2006	0	84%	4%	12%
Prevalent Races	-	324, 320, 324, 326, 336, 337, 365	520	734
2007	0	80%	4%	16%
Prevalent Races	-	336, 326, 304, 377	536	726, 736, 774
2008	0	62%	0	38%
Prevalent Races	-	336, 326, 320, 324 , 337	-	736, 724, 726, 734

Long Term Objective:

- Improve genetic resistance to major rust races.
- Some commercial hybrids have resistance to some races but not all

Short Term Objective:

Lack of genetic resistance to some rust races necessitates the identification of foliar fungicide applications to reduce the impact of this disease on sunflower yield and quality of seed

Presently no fungicides registered to control rust in sunflower in Canada

Materials & Methods

- **Four years study using a confection sunflower hybrid**
- **11 fungicides with three treatments each:**
 - **One Early application at late flowering**
 - **One Late application 2-wks later**
 - **Two applications, Early and Late**
- **Natural rust Inoculum**
- **RCBD with 4-Reps, 3-row plots, 3 meters long**
- **Leaf Area Infected at 10-day intervals, AUDPC**
- **Stem Area Infected at the end of the season**
- **Green leaves at end of season.**
- **Yield, Kernel density, kernel weight**

Early fungicide application at full flowering



Fungicides used

<u>Fungicide</u>	<u>Chemical % active</u>	<u>a.i / ha</u>	<u>Company</u>
Bravo	Chlorothalonil 50	1 kg	Syngenta
Dithane	Mancozeb 80 Ethyl carbamate	2.25 kg	Dow AgroSciences
Folicur	Tebuconazole 39	0.125 kg	BAYER
Headline	Pyraclostrobin 25	0.15 kg	BASF
Lance	Boscalid 25	0.25 kg	BASF
LEM Exp.	DPX-LEM17	0.35 kg	DuPont
Proline	Prothioconazole 48	0.2 kg	BAYER
Stratego	Propiconazole/Trifloxystrobin12.5E	0.18 kg	BAYER
Tilt	Propiconazole 25	0.125 kg	Syngenta
BASF-516	Experimental	0.2 Kg	BASF
USF-4876	Experimental	0.3 kg	BAYER

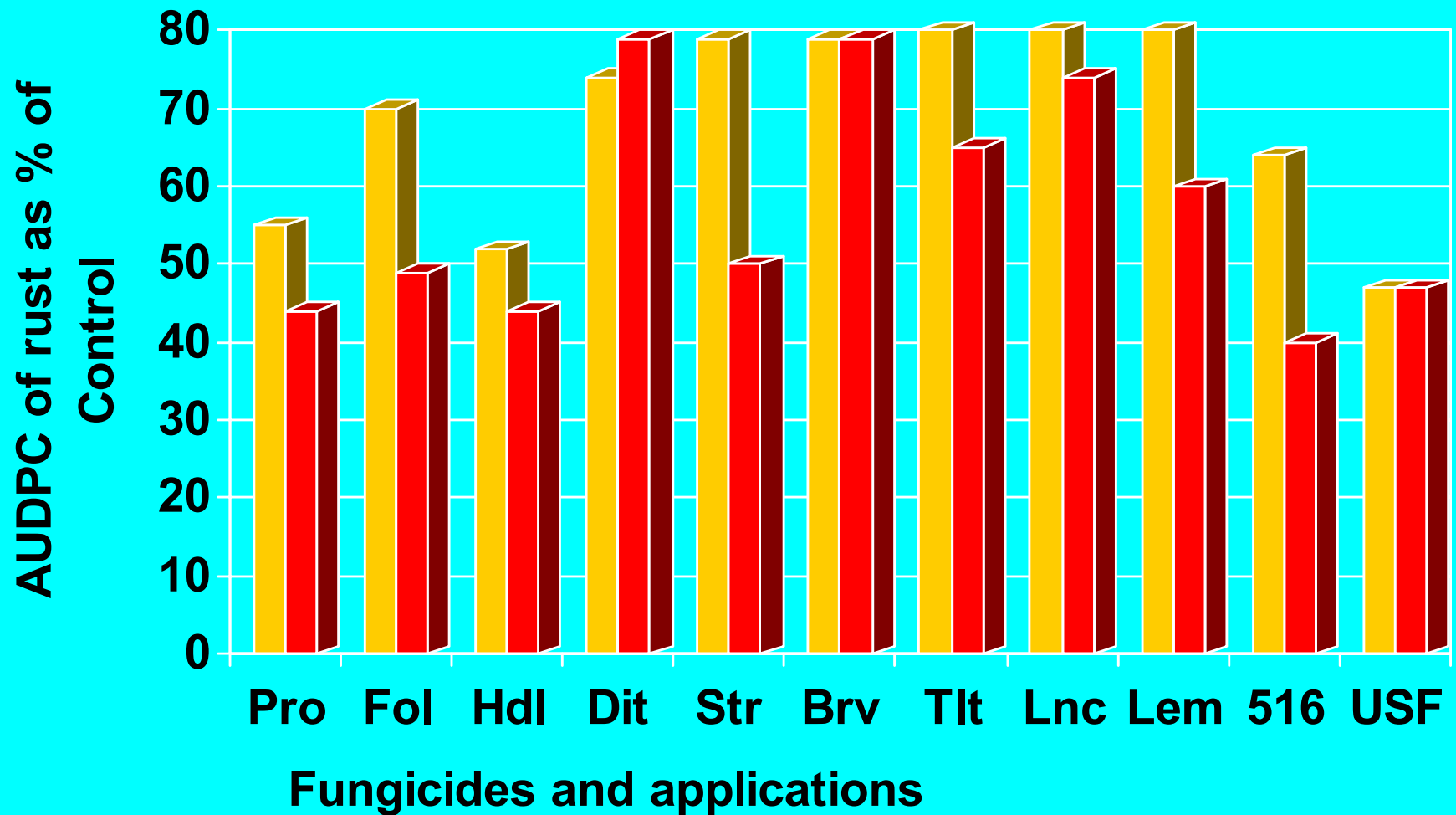
• **RESULTS:**

- All fungicides reduced the rust incidence and severity as expressed in the Area under the disease progress curve (AUDPC) in the four years of the study.
- AUDPC was reduced by 40-50%, and yield was improved by 10-20% with Proline, Folicur Headline, EXP-516 and EXP-USF,
- Stratego, Tilt and Dithane had moderate effects.
- Bravo, LEM and Lance reduced AUDPC but had no significant improvement in yield (at two App.)
- The effectiveness of early and / or late applications varied between years depending on the earliness of the rust infection and disease development.

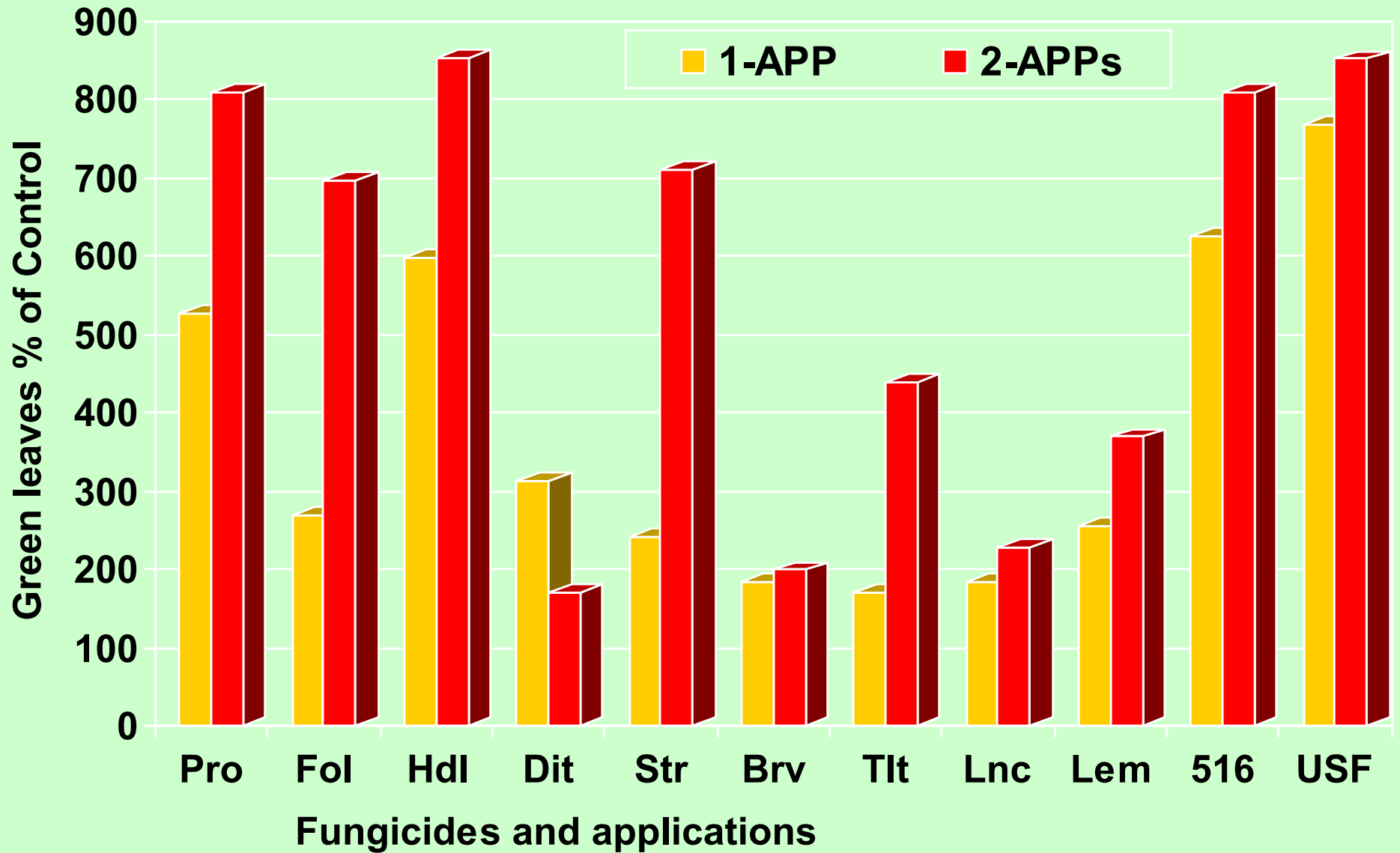
Effects of fungicides on AUDPC of rust, 08

1-APP

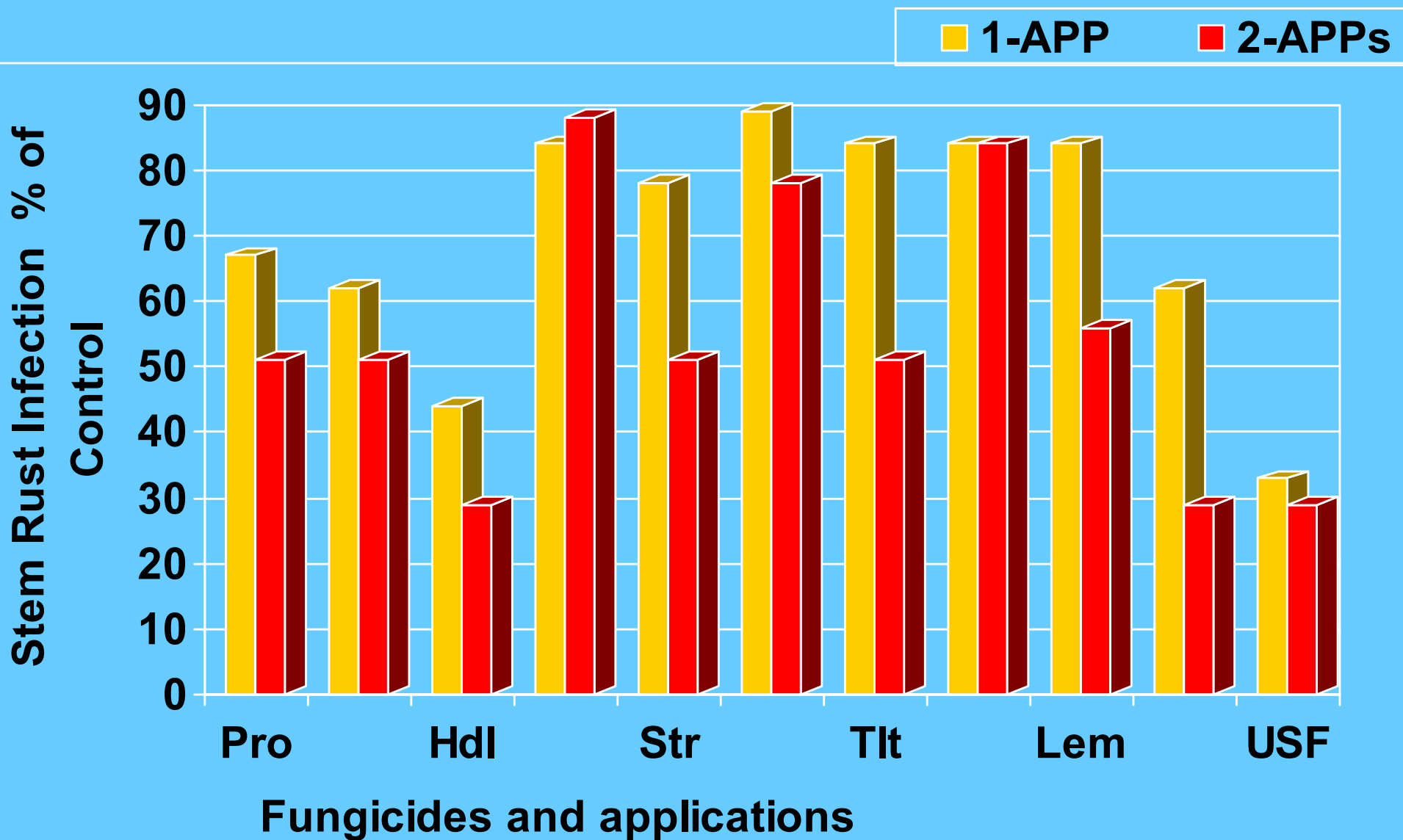
2-APPs



Effects of fungicides on green leaf in rust infected plots, 08



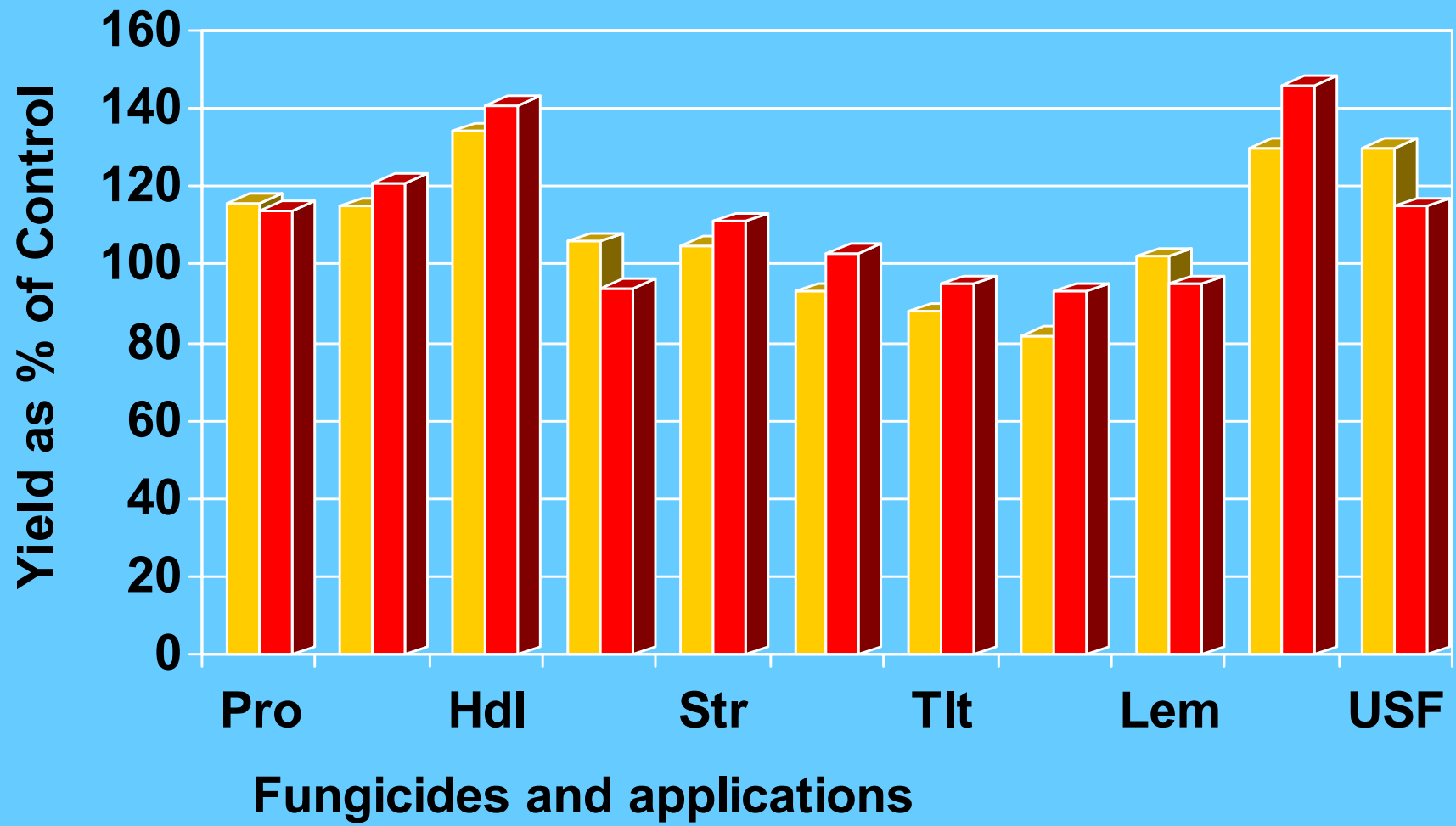
Effects of fungicides on stem infection in rust infected plots, 08



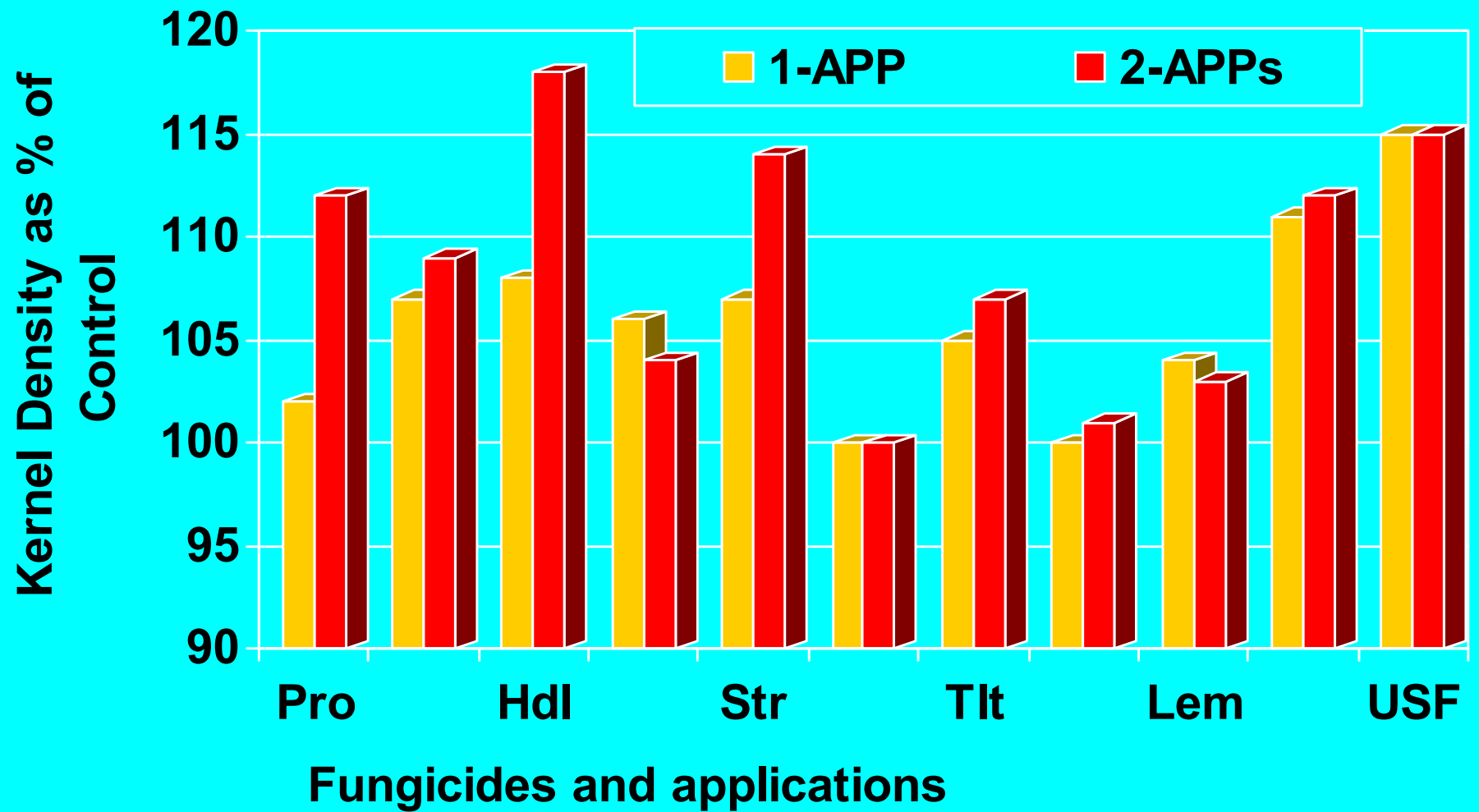
Effects of fungicides on sunflower yield, 08

1-APP

2-APPs



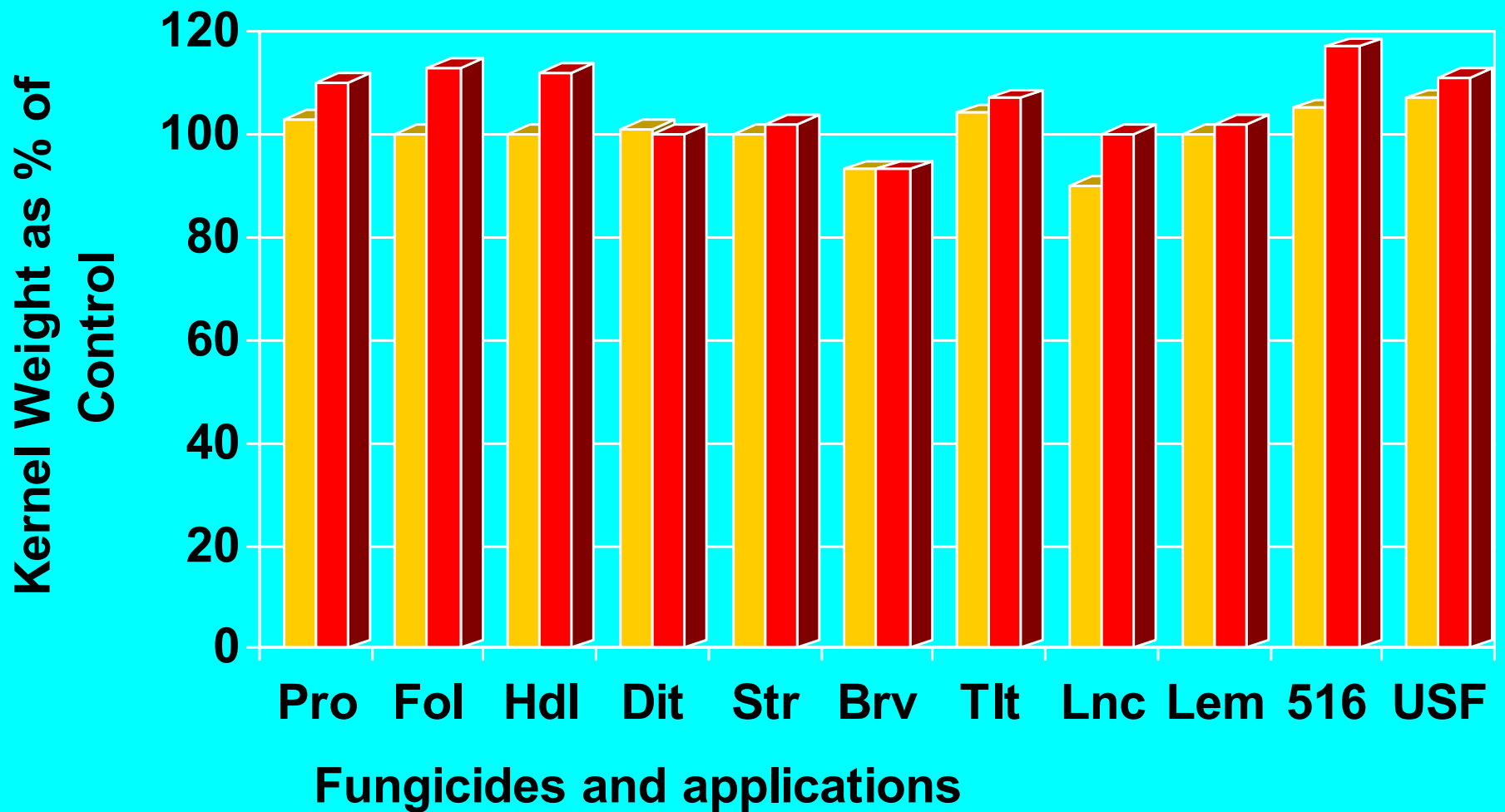
Effects of rust and fungicides on kernel density (g/lit). 2008



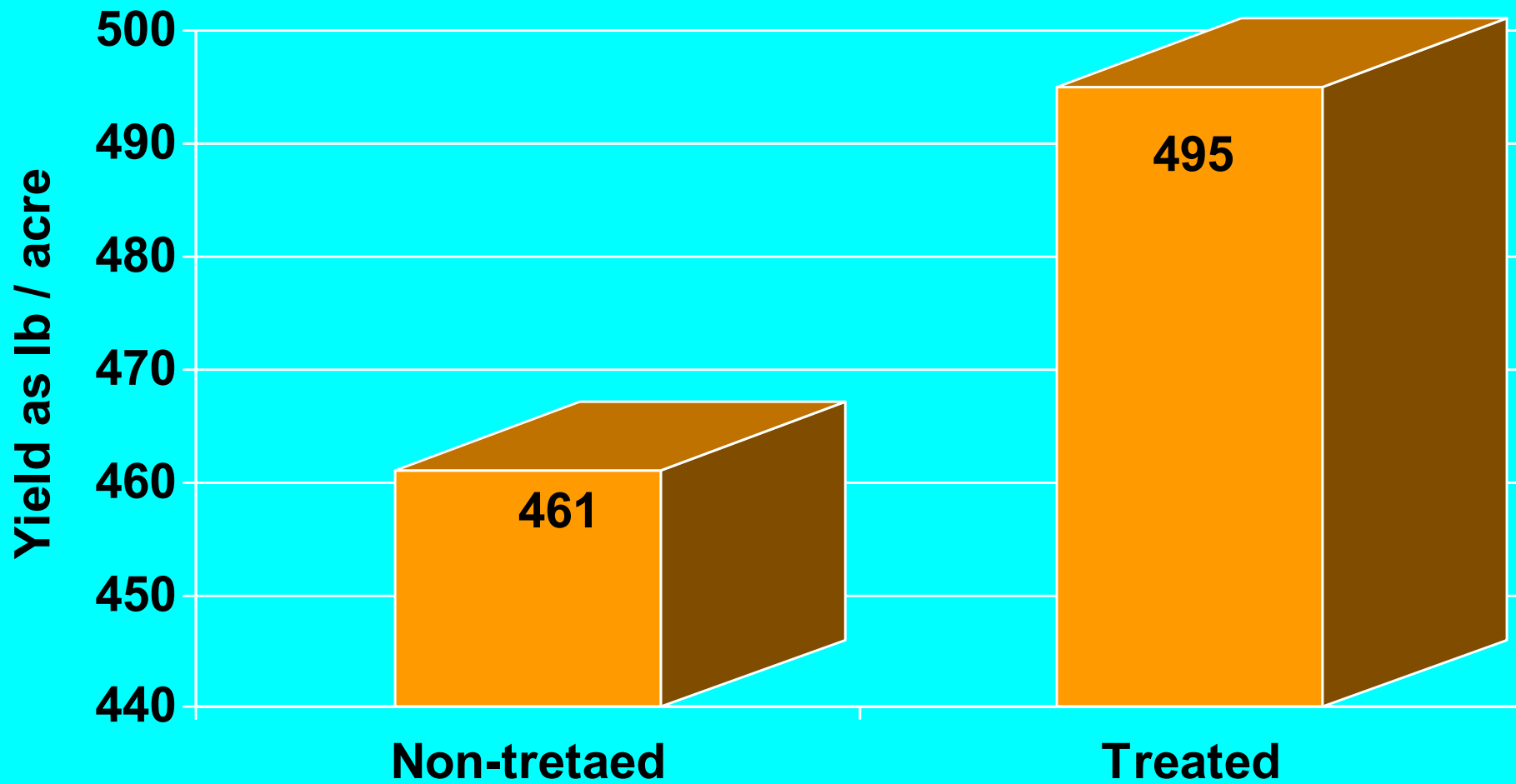
Effects of rust and fungicides on kernel weight (mg), 2008

1-APP

2-APPs



**One application of Tilt in strip trial
at early flowering, St Jean-Baptiste**



CONCLUSIONS

- ⊕ Severe epidemics in 2008, >50% local losses.
- ⊕ Prevalent race 300 (60%), 336, 326, 320, 324, 337; 700 (40%), 736, 724, 726, 734.
- ⊕ Fungicides reduced rust severity (10-50%).
- ⊕ Headline *, 516*, USF*, Proline, Folicur, improved yield (10-40%).
- ⊕ Others reduced rust, NS yield increase.
- ⊕ Early application (late flowering) is the most effective (onset of rust on middle leaves).
- ⊕ Two applications generally better than one.
- ⊕ More work on proper timing, rust monitoring.

MANAGEMENT

- ⊕ **Avoid highly susceptible hybrids**
- ⊕ **Some hybrids are resistant to some races.**
- ⊕ **Stay away from last years rust-infested fields.**
- ⊕ **Control volunteers in and adjacent last years infested fields (in ditches or present crops).**
- ⊕ **Monitor the crop for early seedling infection (orange color rust lesions, and the lower leaves (brown color lesions)**
- ⊕ **Apply fungicide (if registered?) when rust starts moving to middle leaves (late flowering)**
- ⊕ **A second application might be useful if rust moved to upper leaves by early maturity.**

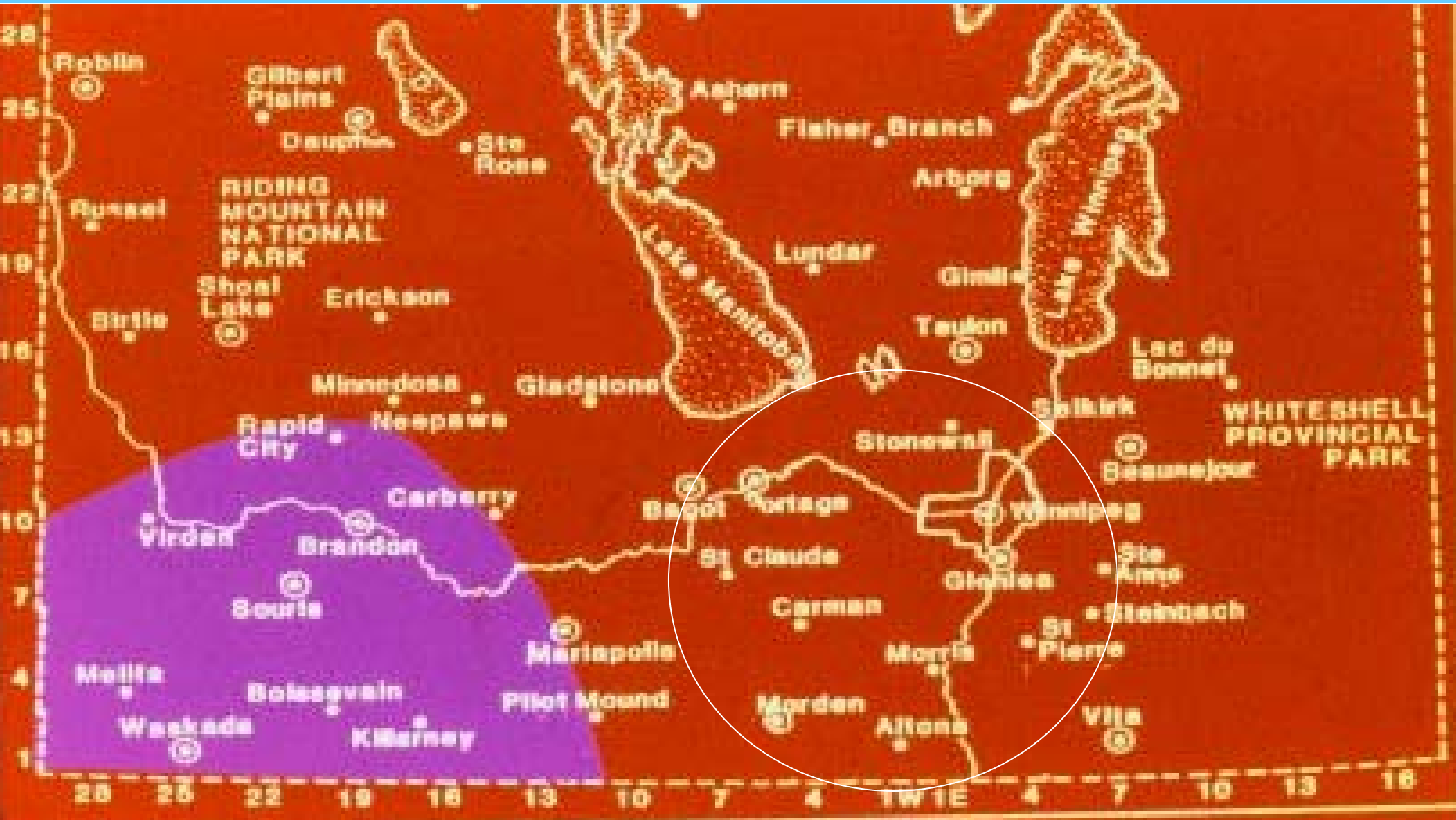
ACKNOWLEDGEMENT

- ▶ **National Sunflower Association of Canada (NSAC)**
- ▶ **National Sunflower Association of USA (NSA)**
- ▶ **Agriculture and Agri-Food Canada (AAFC)**
- ▶ **Agri-Food Research and Development Initiative (ARDI)**
- ▶ **Manitoba Rural Adaptation Council (MRAC)**
- ▶ **Chemical Companies**
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- ▶ **Technical Assistance**
 - Tricia Cabernel**
 - Maurice Penner**

MORDEN RESEARCH STATION



Sunflower Rust Hot Spot 1990 & 2003-04



Fungicides used

<u>Fungicide</u>	<u>Chemical % active</u>	<u>a.i / ha</u>	<u>Company</u>
Bravo	Chlorothalonil 50	1 kg	Syngenta
Carbendazim	Carbendazim-hydrochloride 4.7	1.25 kg	EERTAVAS
Dithane	Mancozeb 80 Ethyl carbamate	2.25 kg	Dow AgroSciences
Folicur	Tebuconazole 39	0.125 kg	BAYER
Headline	Pyraclostrobin 25	0.15 kg	BASF
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