Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Stripe Rust In Western Canada

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Canada

Outlines

- What is stripe rust & how to recognize it
- Why it is so damaging
- World wide situation and in Canada
- How to manage it
- Questions

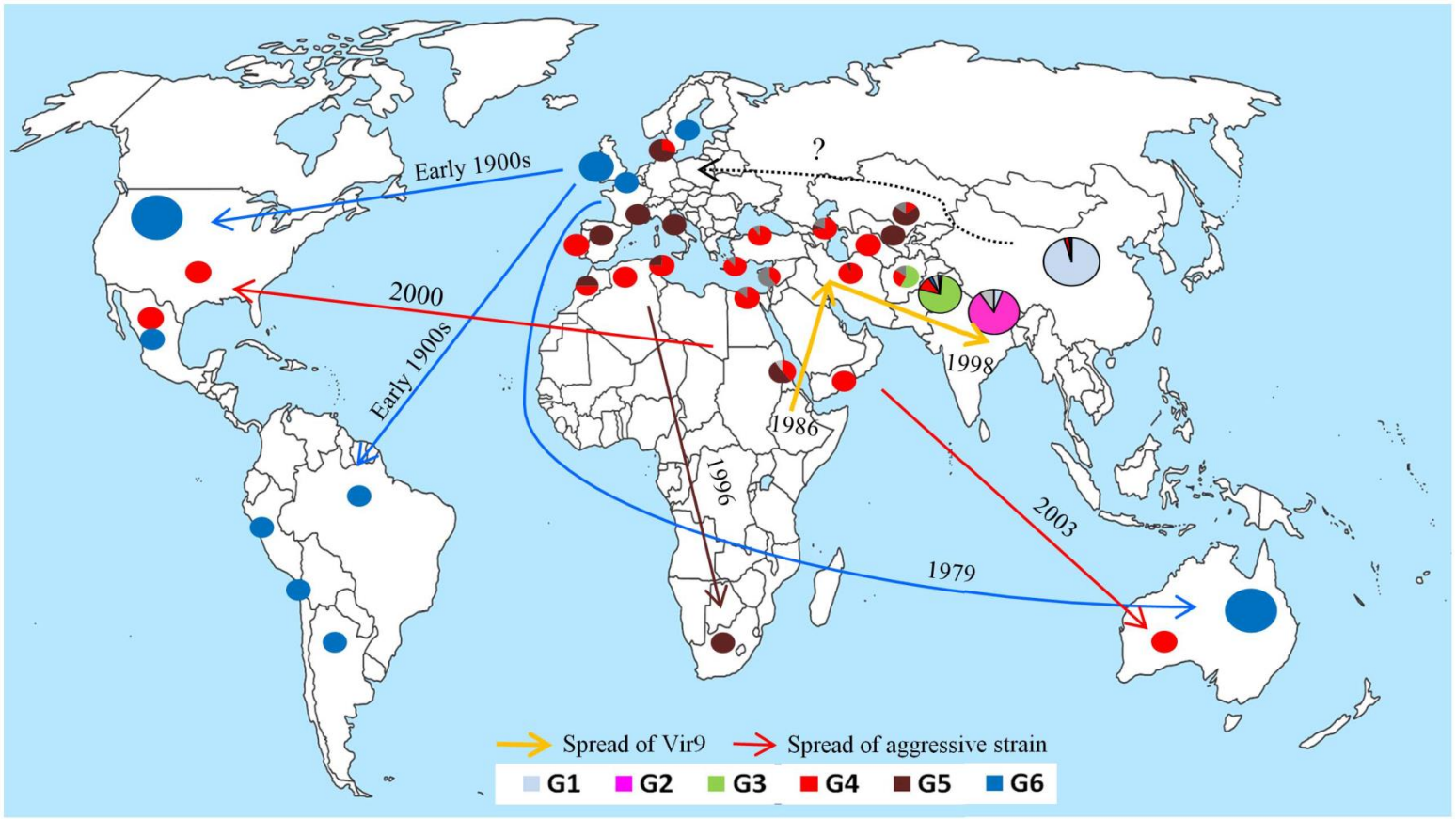
Stripe (yellow) rust of wheat
Puccinia striiformis f.sp tritici (Pst)

Pst can infect the host at any growth stage from seedling to maturity

Stripe rust is explosive in nature

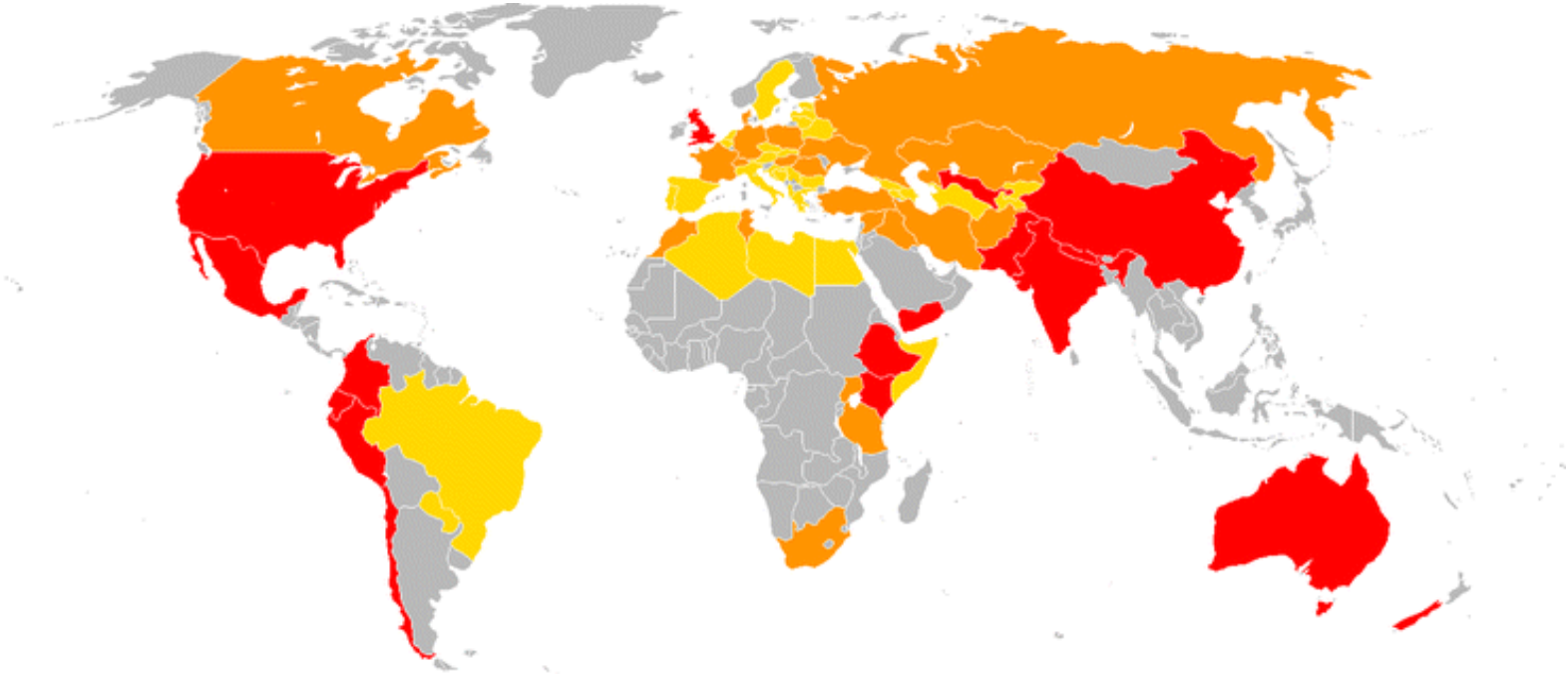
- Millions of spores travel long distances at high altitude
- Infection on the plant can spread very fast
- Can infect the plant at any growth stage
- No much physical damage needed to destroy the plant
- Change in virulence is very rapid

Origin and migration routes of Pst



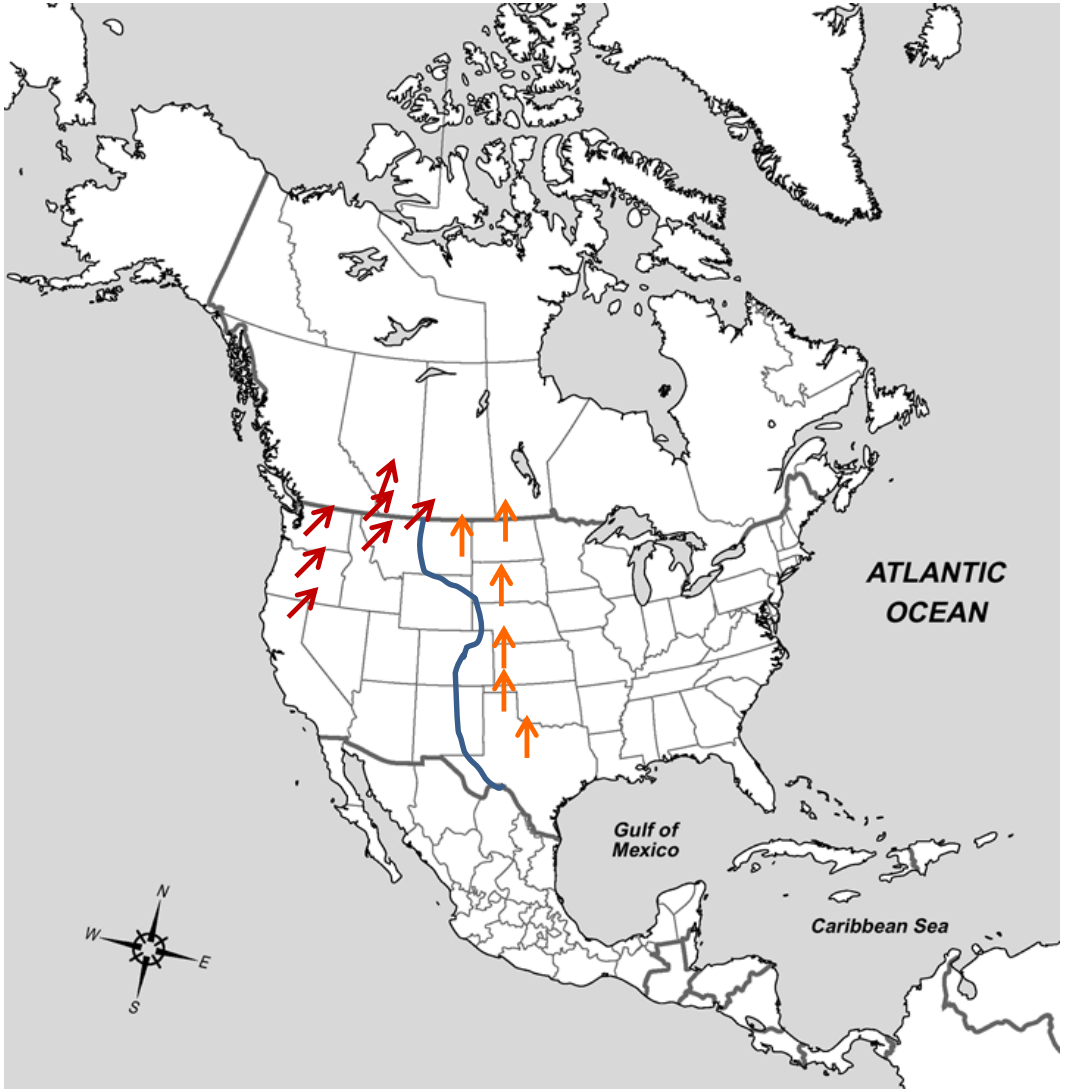
Ali et al., 2014

Global status of stipe rust (2000-2010)



Code	Incidence	Severity
	Rare	negligible losses
	Localised, 2 in 5 years over 25% growing areas	1-5% crop losses
	Widespread 2 or 3 years in 5 over whole production region	5-10% crop losses

Wellings, Euphytica. 2011



http://www.globalcitymap.com/north-america/north-america-blank-map.html

Alberta is hot spot for the pathogen

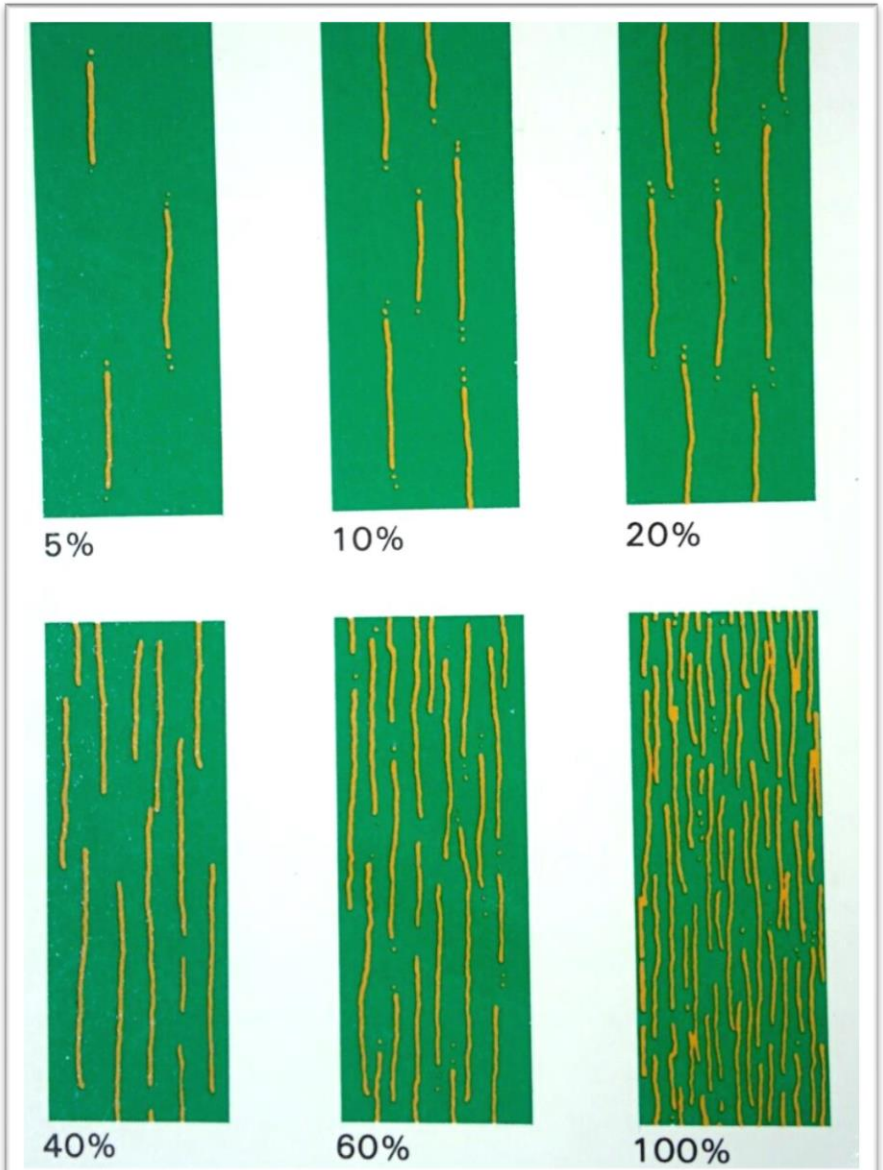
- close to PNW
- mild winter, cool wet spring & summer
- green bridge
- Epidemics in 2005, 2006, 2012

Conditions for infection

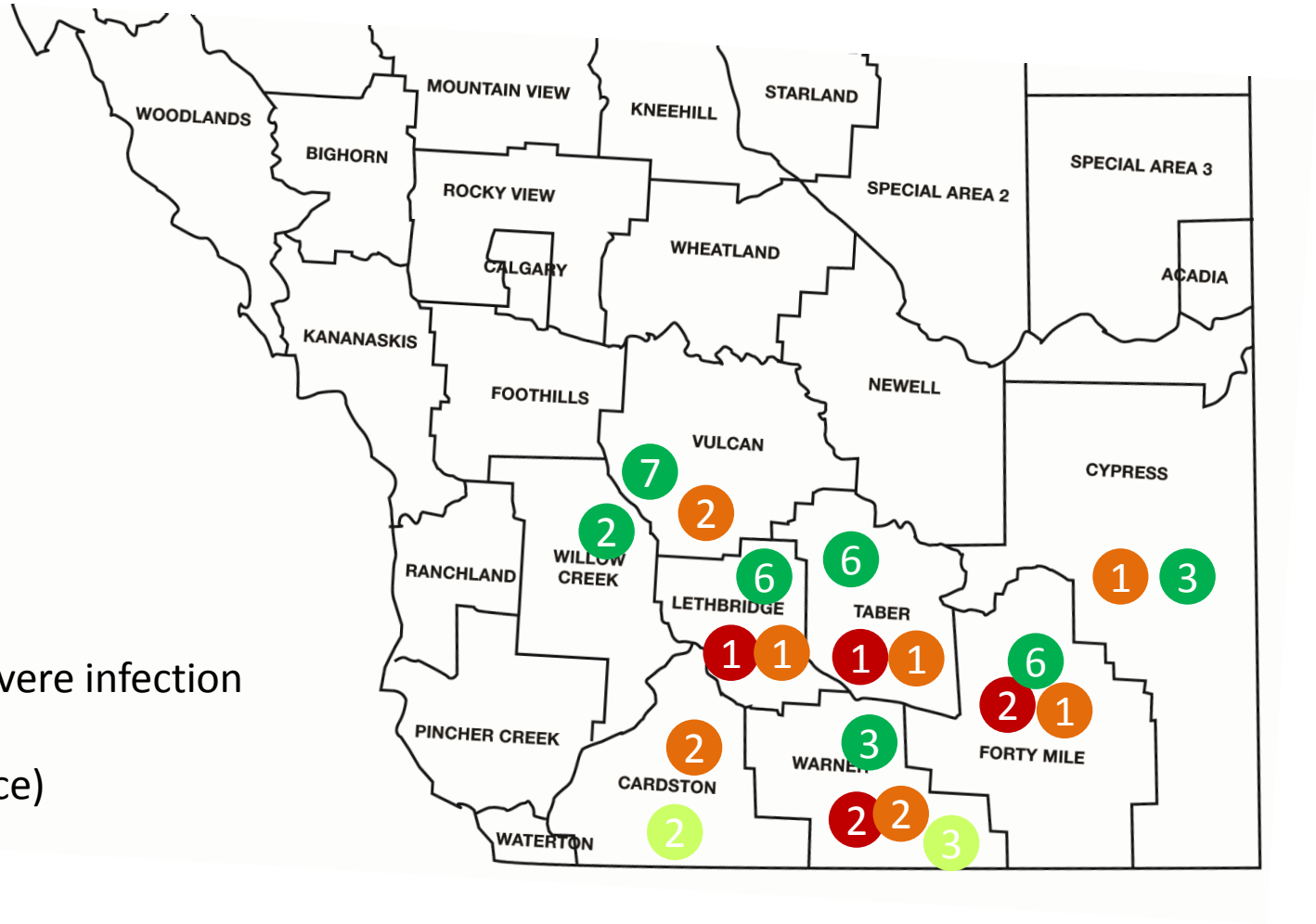
- Cool wet weather
  - Spores require at least 3h continuous moisture on plant surface
  - Old isolates germinates at 8-12 ˚C, new at 18 ˚C
  - Survive dormant mycelia in infected leaves
- Wind: reduce on site spore germination, but increase spore viability and spreading

The disease this year in Southern AB

Infection	Incidence	Severity
Clean	0	0
Trace	1-2	1-3
Light	>2-5	>2-5
Moderate	6-15	6-19
Severe	≥15	≥ 20

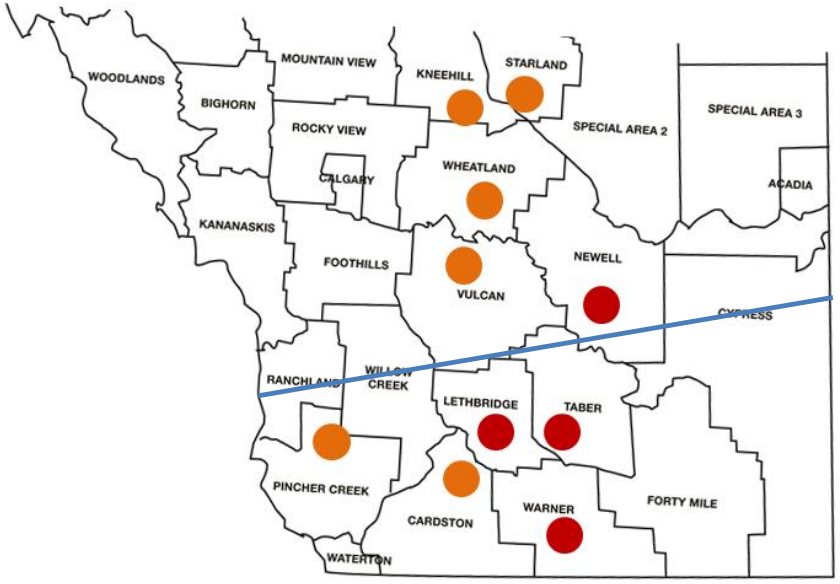

5%
10%
20%
40%
60%
100%

Stripe rust incidence & severity in 2016



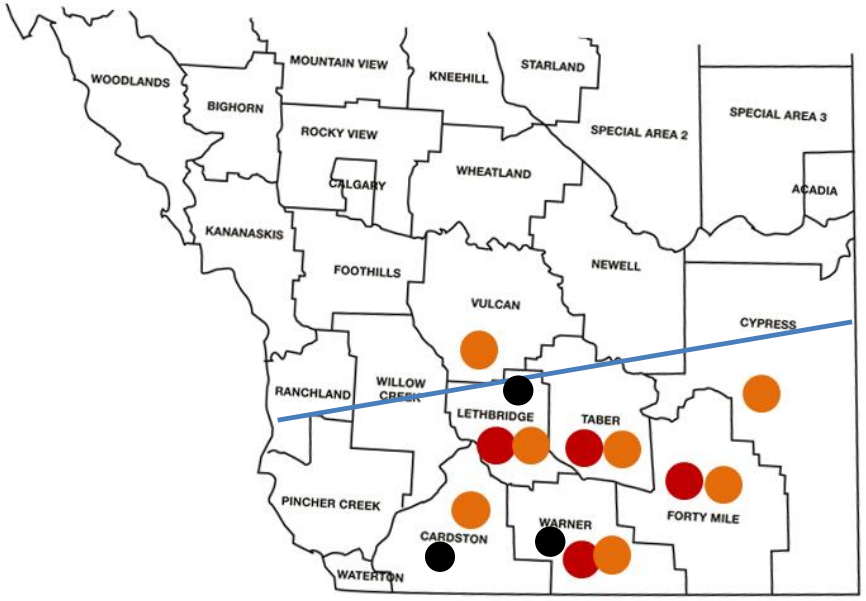
6 fields with severe infection
10 moderate
5 (light and trace)
33 clean

2012 Survey



13% severe

2016 Survey



11% severe

YR genes in differential vs in wheat cultivars in Western Canada

YR in differentials

YrA, Yr1, Yr2
Yr4, Yr5, Yr6, Yr7
Yr8, Yr9, Yr10, Yr15
Yr17, Yr24, Yr26, Yrsp,
Yr32, Yr28, Yr29, Yr31,
Yr18, Yr 30, Yr36, Yr2
etc…

In Western Canadian lines:

WW: Yr10, Yr17
CWRS: Yr18, Yr36, Yr50?

?

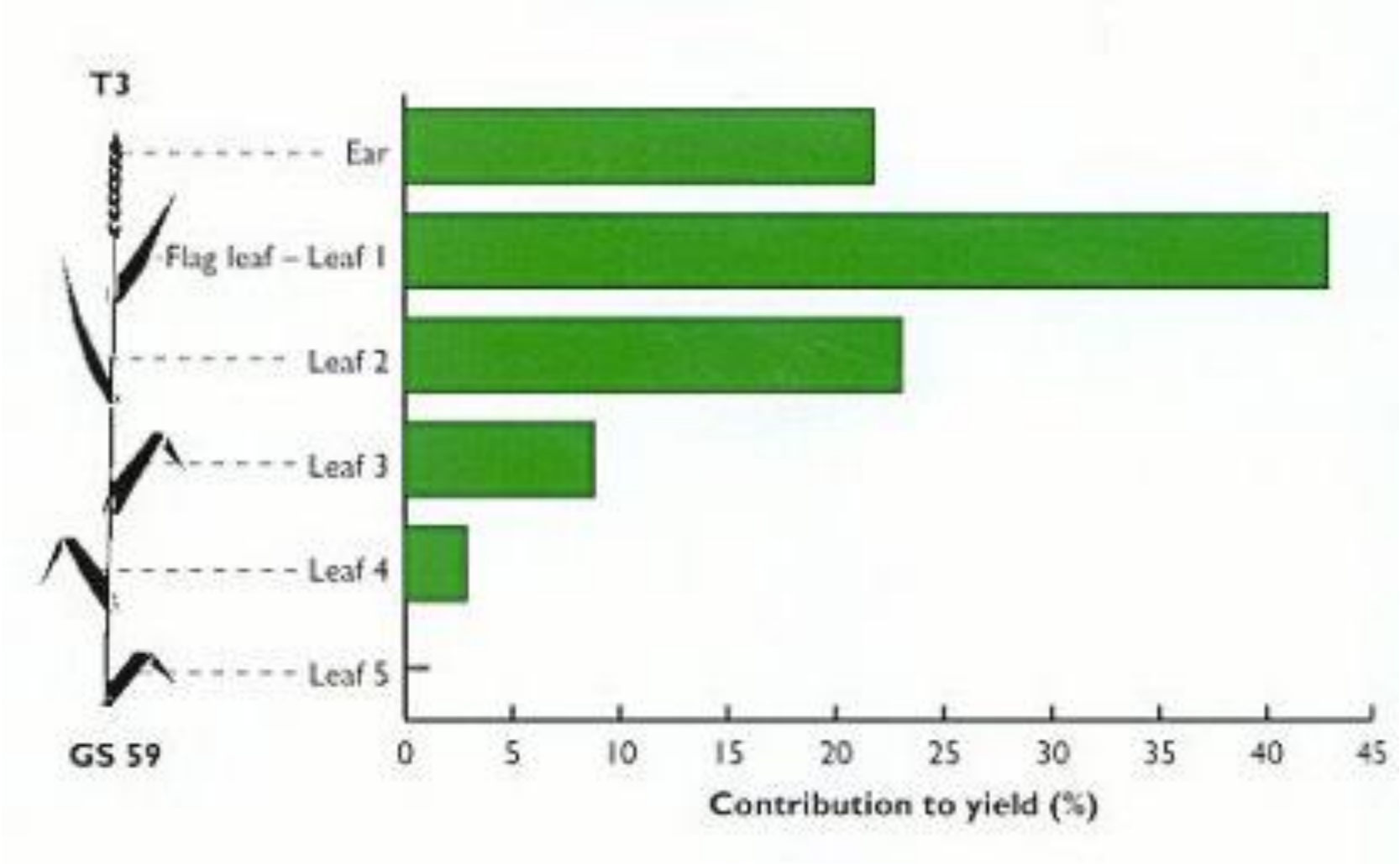
Pl tices

Resistance rating	Definition	Potential yield loss from stripe rust (%)
Very susceptible (VS)	Early high disease build-up; can promote epidemic development	80
Susceptible (S)	High disease build-up	60
Moderately susceptible (MS)	Develops disease less quickly and so reduces loss risk	40
Moderately resistant to moderately susceptible (MRMS)	Some partial resistance; losses depend on disease pressure	30
Moderately resistant (MR)	High partial resistance; generally few losses	0

https://www.agric.wa.gov.au/grains-research-development/managing-stripe-rust-and-leaf-rust-wheat-western-australia?nopaging=1

Management Practices

- Avoid early planting of winter wheat
- Reduce volunteer plants and grasses
- Avoid excessive irrigation
- Avoid excessive fertilization
- Appropriate use of fungicides



http://adlib.everysite.co.uk/adlib/defra/content.aspx?id=000HK277ZW.09UO2XGUUTMK96

Challenges

- The pathogen ability to change its virulence
- 20 differential lines can classify 1 million races (2^n= no of races)
- Some of the res-genes are temperature or light dependent
- Res or Sus is not black and white
- Huge area is dominated by few Yr-genes
  selection pressure to defeat resistance
- Climate change

Thank You!

Agriculture and Agri-Food Canada

National Wheat Improvement Cluster

Alberta Crop Industry Development Fund