

Wheat stripe rust in Saskatchewan and Alberta: race dynamics and pathogen population



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SASKATCHEWAN
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Soils and Crops - 2016

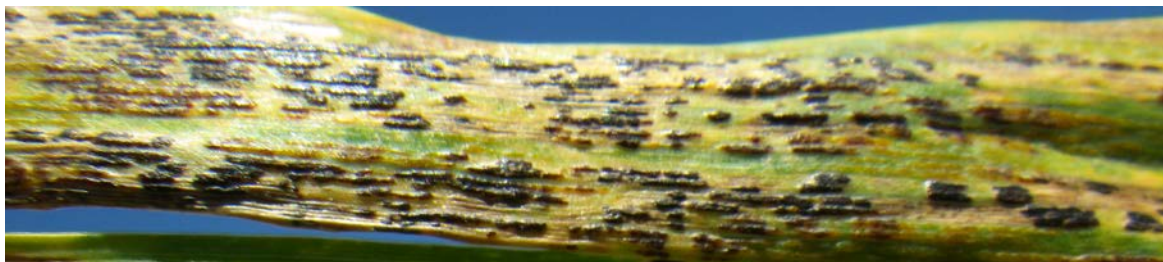
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Wheat stripe rust

- Disease of worldwide importance
- Caused by obligate biotrophic fungus *Puccinia striiformis* f. sp. *tritici* (*Pst*)
- Also called 'yellow rust'

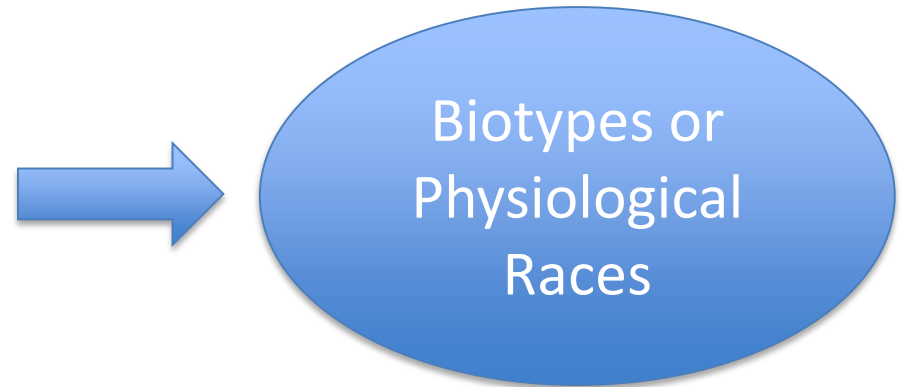


Photos Credit: Gurcharn Brar



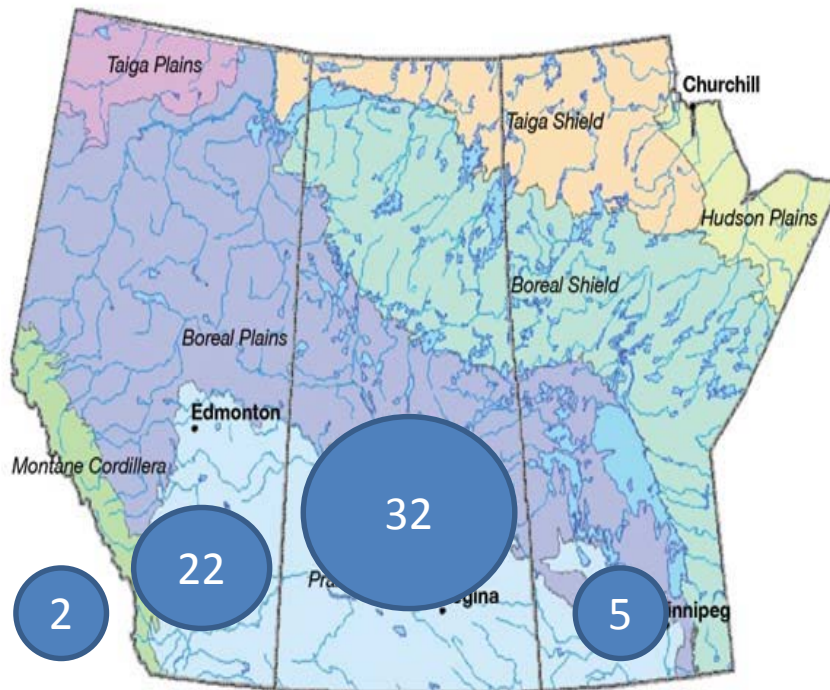
Variation in the pathogen population

- Mutation
- Selection
- Somatic recombination
- Sexual recombination



Materials and methods

- Near-isogenic wheat lines: 28
- Supplemental wheat and triticale lines: 4
- 61 *Pst* isolates from western Canada



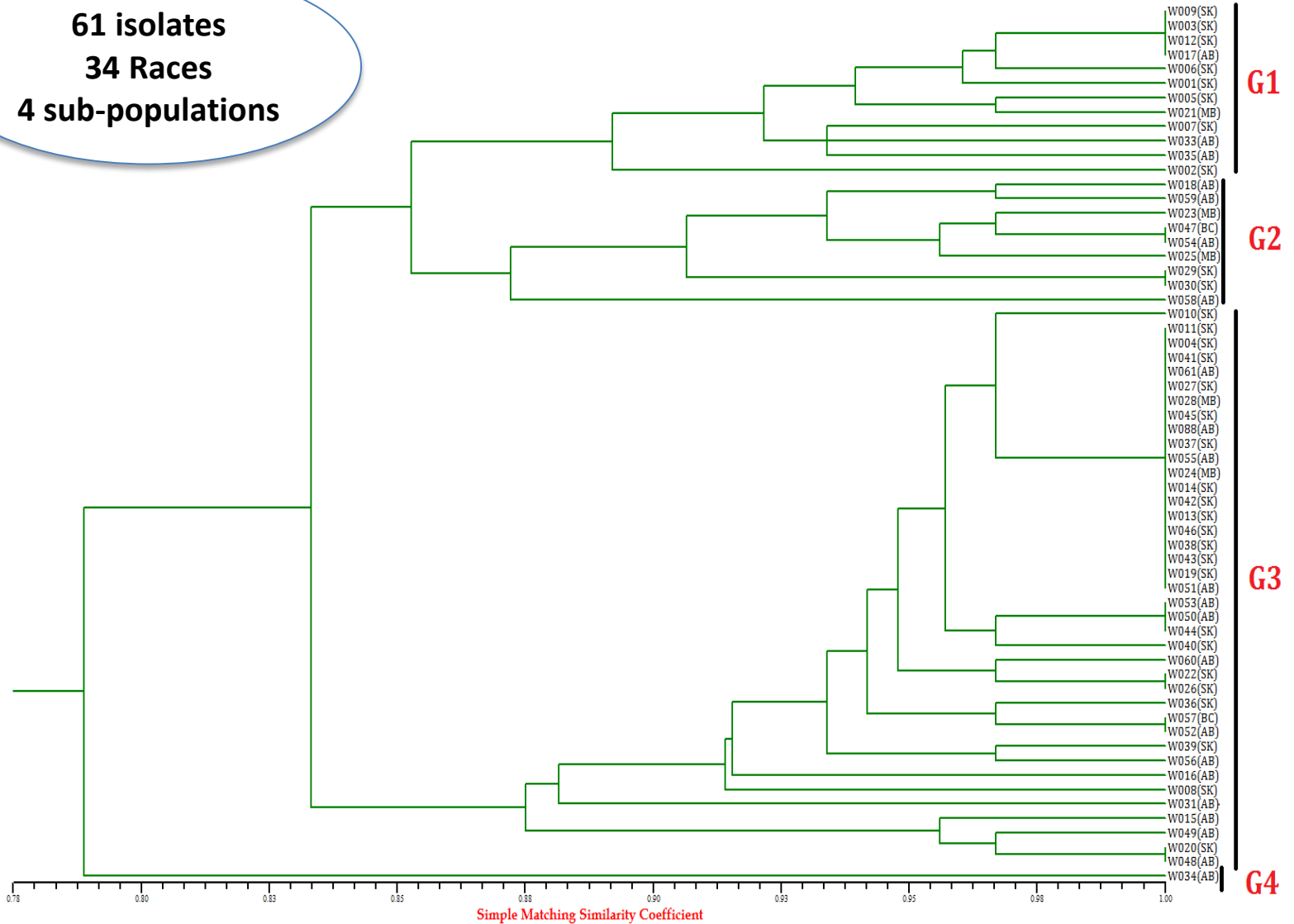
Methodology contd..

- Rating Scale: Modified from Line & Quayoum (1992) and McNeal et al. (1971)
- Baseline for classifying isolates as 'virulent' or 'avirulent'
0-4: Avirulent (-)
5-9: Virulent (+)
- Data analysis: SAHN program of NTSYS software



Results

61 isolates
34 Races
4 sub-populations



- **C-PST-1** (most common race): avirulent on *Yr1*, *Yr4*, *Yr5*, *Yr10*, *Yr15*, *yr24/26*, *YrSP*, *YrTye*
- AC Barrie, AC Avonlea and, CDC Teal varieties are susceptible to all races
- Triticale: Susceptible to 1/3 of the races
- Lillian: *Yr18+Yr36+Yr30*, but still resistant to 36% isolates
- Virulence to *Yr10*, *Yr24*, *Yr26* and *YrTye* was absent in SK until 2013

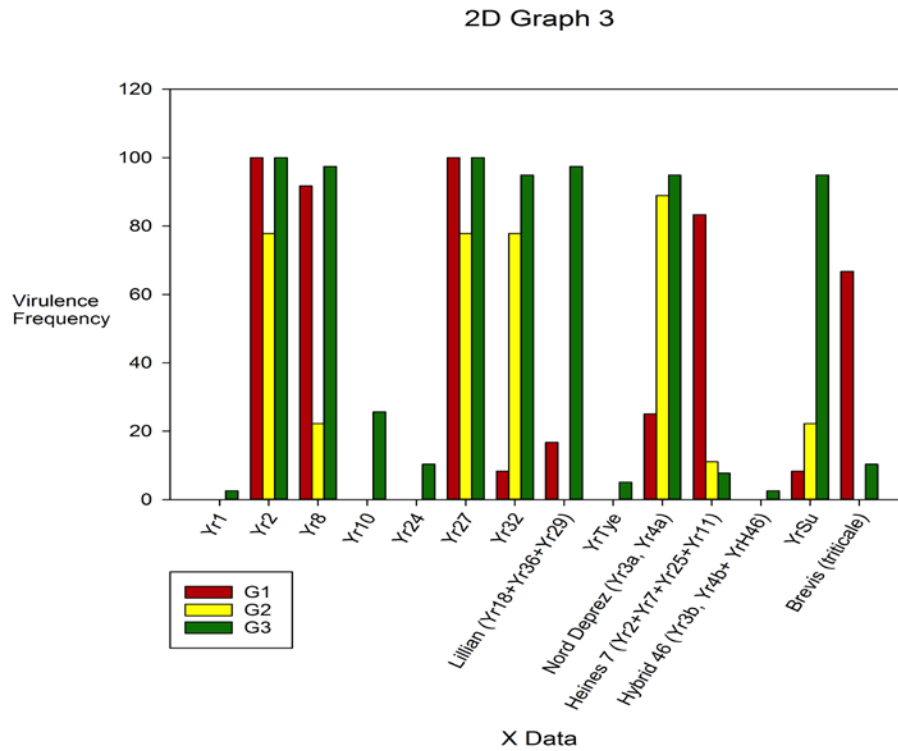


“Kranich race” in Alberta

- First reported in Europe in 2011
- Virulent on *Yr1*, *Yr2*, *Yr3*, *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr25*, *Yr32* and a recombinant race
- Also identified in our study with similar virulence phenotype and showed recombination, sampled from Alberta in 2011



Population division and virulence difference



How races differ in Canada and the USA

Yr gene	USA Pacific Northwest	USA Great Plains	Alberta	Saskatchewan
Yr1	62	0	17	0
Yr6	87	88	100	100
Yr7	79	88	100	100
Yr8	78	88	88	100
Yr9	92	88	100	100
Yr10	5	0	30	6
Yr17	82	88	100	100
Yr24	3	0	20	3
Yr27	86	79	100	100
Yr32	3	0	100	72
YrSP	12	0	2	0
YrTye	64	0	15	0
Correlation	with AB= 70%*** with SK= 74%***	with AB= 85%*** with SK= 93%***	with SK=97%***	



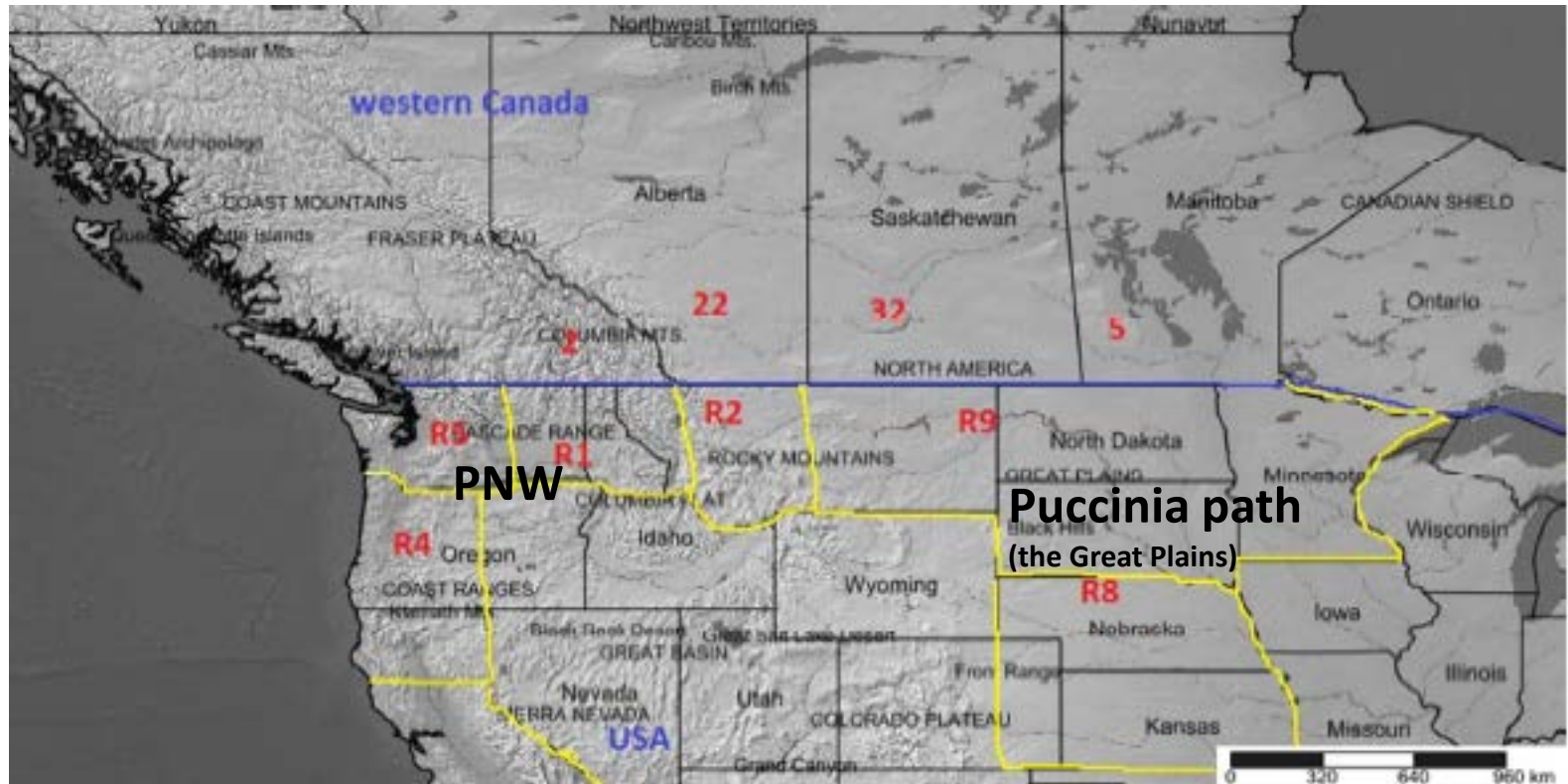
Virulence dynamics and diversity in Canada

Year (Number of Pst isolates examined)	Yr1	Yr10 (AC Radiant)	Yr24/26	Yr27 (Selkirk)	Yr32	YrTye
2007 (24)	0	4	17	83	75	--
2008 (9)	0	0	22	100	56	--
2009 (9)	0	22	11	100	89	--
2010 (24)	0	18	4	100	95	0
2011 (54)	15	19	11	100	78	11
2013 ^b (26)	0	20	12	100	100	4

Kosman diversity index for **AB: 0.21**
SK: 0.10



General conclusions: pathogen arrival in AB and SK



General conclusions

- *Pst* population in western Canada has high race diversity
- Population in AB is more diverse than SK
- Host resistance plays role in virulence evolution



Acknowledgements

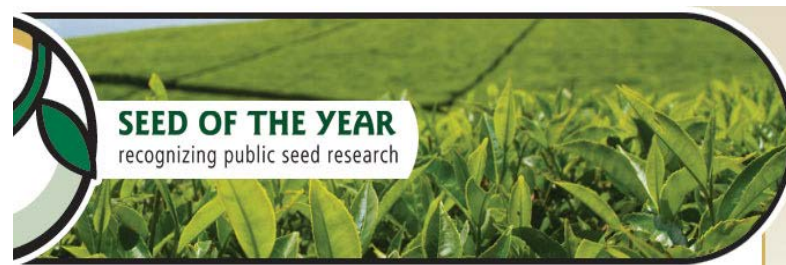
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