

The 2011 stripe rust epidemic in western Canada

Kutcher, H.R.¹, Randhawa, H.S.², Puchalski, B.², Wogsberg, S.², Graf, R.², Gaudet, D.²

¹ Crop Development Centre, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK (randy.kutcher@usask.ca)

² Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB



Introduction

- ❖ Stripe rust of wheat, caused by *Puccinia striiformis* Westend. f.sp. *tritici* Eriks. & Henn., is one of the most widely destructive diseases of wheat (*Triticum aestivum* L.) in the world.
- ❖ Traditionally, stripe rust was only considered a problem for production under irrigated conditions in southern Alberta.
- ❖ Major stripe rust epidemics in the past five years have shown that it can cause significant economic damage in all parts of the prairies.
- ❖ In western Canada, stripe rust races mostly originate from the Pacific Northwestern U.S. but recently it has overwintered in western Canada which has permitted the development of epidemics in 2006 and 2011.
- ❖ The factors responsible for the occurrence of the stripe rust epidemic in 2011 were investigated.

Materials and methods

- ❖ Stripe rust field surveys were conducted starting from fall 2010 and throughout the 2011 growing season.
- ❖ Disease incidence and severity were recorded from 103 commercial fields as well as stripe rust nurseries.
- ❖ Data from Coop trials in various stripe rust nurseries, including two seeding dates for winter wheat at Lethbridge, three seeding dates for spring wheat at Lethbridge, and one seeding date for Spring wheat at Creston, BC were analysed from 2009-2011.
- ❖ Disease severity on a set of cultivars were used to understand the progression of the stripe rust epidemic from May to mid August.

Results & Discussion

- ❖ Winter wheat var. Radiant, carrying *Yr10*, succumbed to new virulent stripe rust races in 2010 (Fig. 1). Radiant and other susceptible winter wheat varieties became heavily infected in fall 2010. Over-wintering of the pathogen in a number of commercial fields in the counties of Warner, Lethbridge, Taber and Bow Island was observed, and attributed to the presence of a more persistent, protective winter snow cover.
- ❖ In the spring, severely infected winter wheat fields were observed 40 days earlier than in previous years. A cool, wet spring favoured high infection levels in winter wheat leading to subsequent infections of juvenile spring wheat varieties where the resistance to stripe rust is imparted by *Lr34/Yr18*, an adult plant resistance gene that occurs in varieties such as 5701PR, CDC Teal and Laura (Fig. 1). Note that environmental conditions in 2011 were not conducive for *Lr34/Yr18* expression.
- ❖ By mid-July, most susceptible varieties of spring and winter wheat were severely infected. Progression of the disease was slower north of Highway 1 and west of Alberta Highway 36 where severe stripe rust levels were not observed until mid-August (Fig. 2). High stripe rust infection levels were observed throughout southern Alberta and in western and central Saskatchewan during the 2011 growing season.

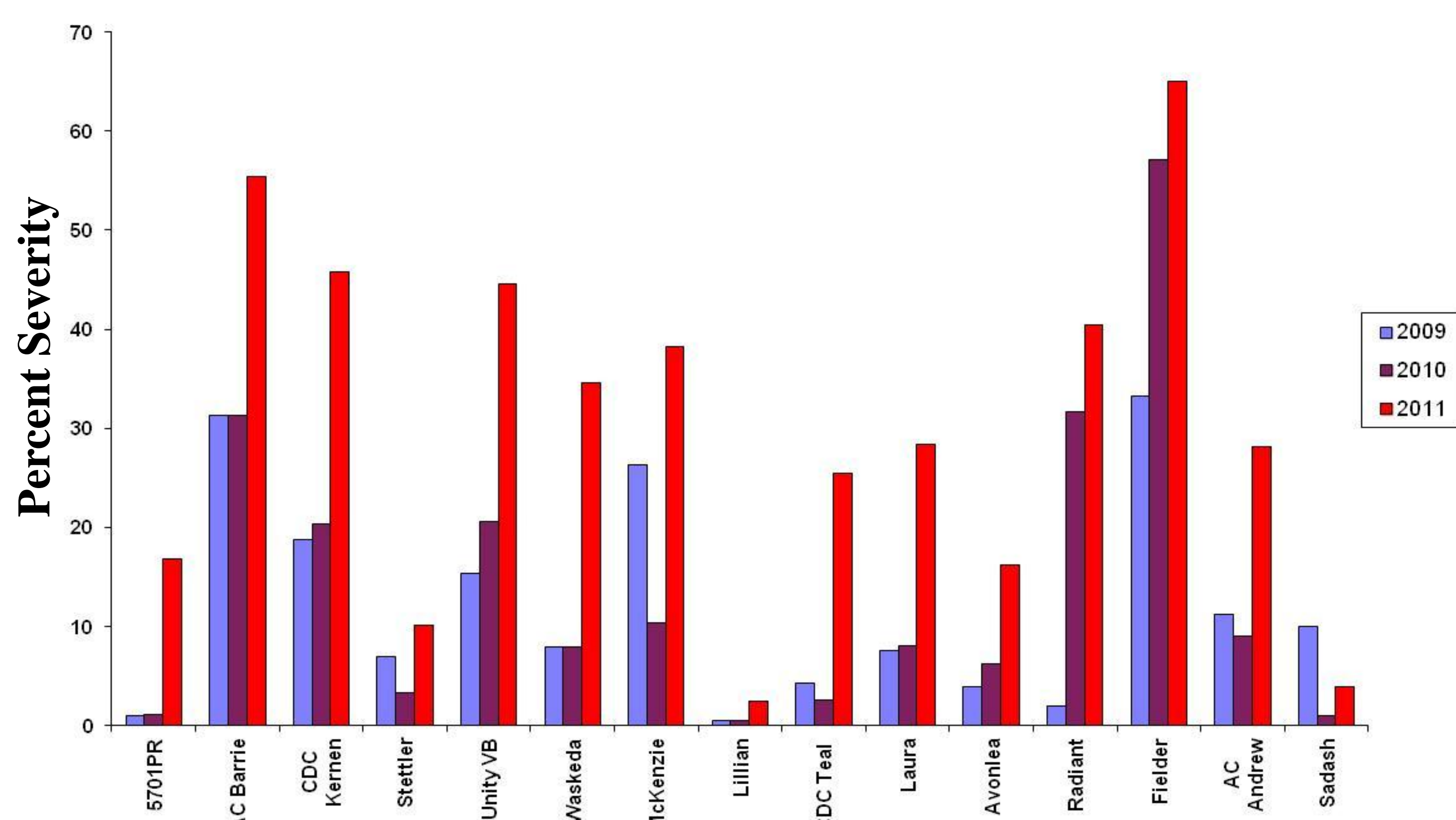


Figure 1. Reaction of selected wheat varieties to stripe rust from 2009-2011.

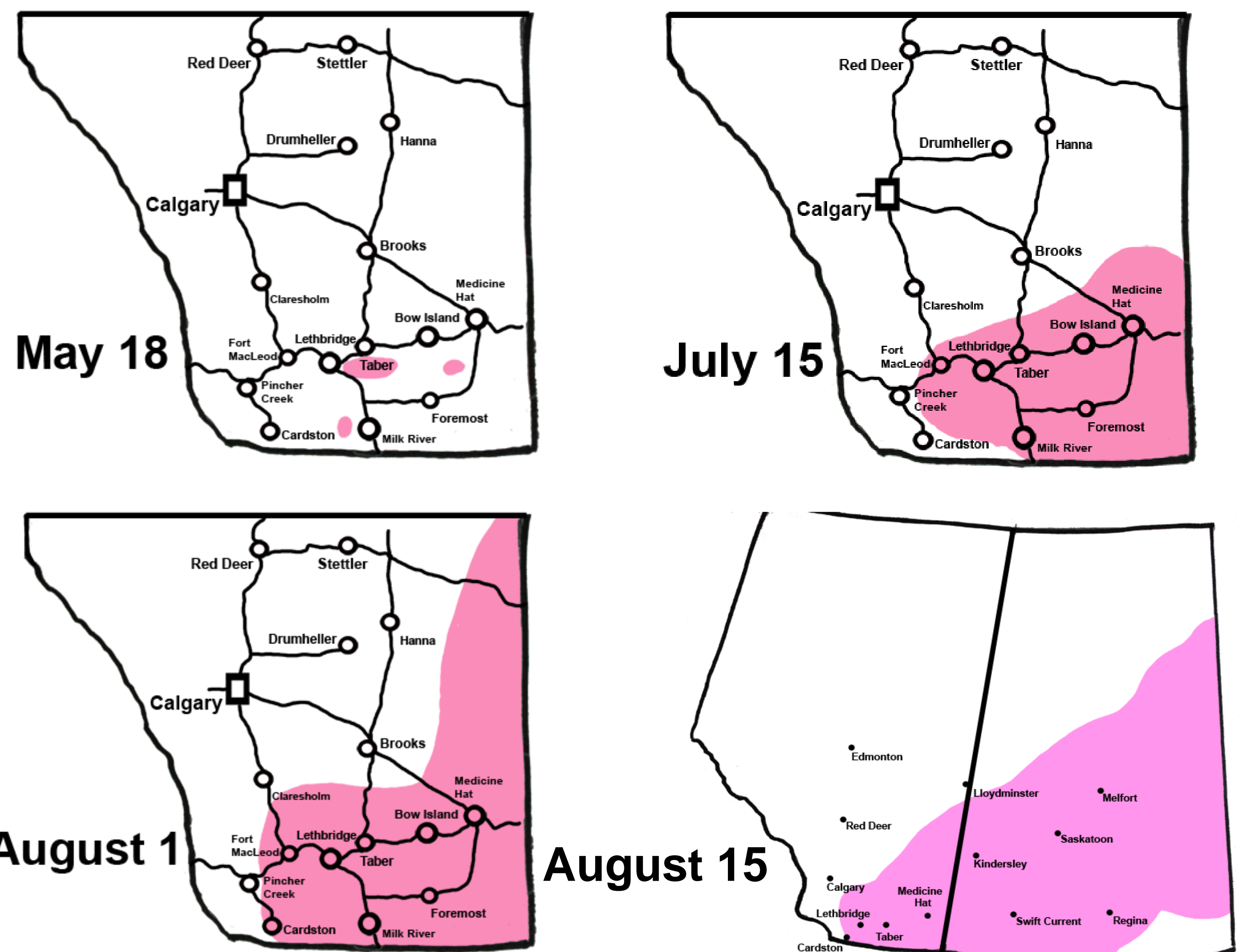


Figure 2. Incidence of stripe rust in western Canada in 2011.

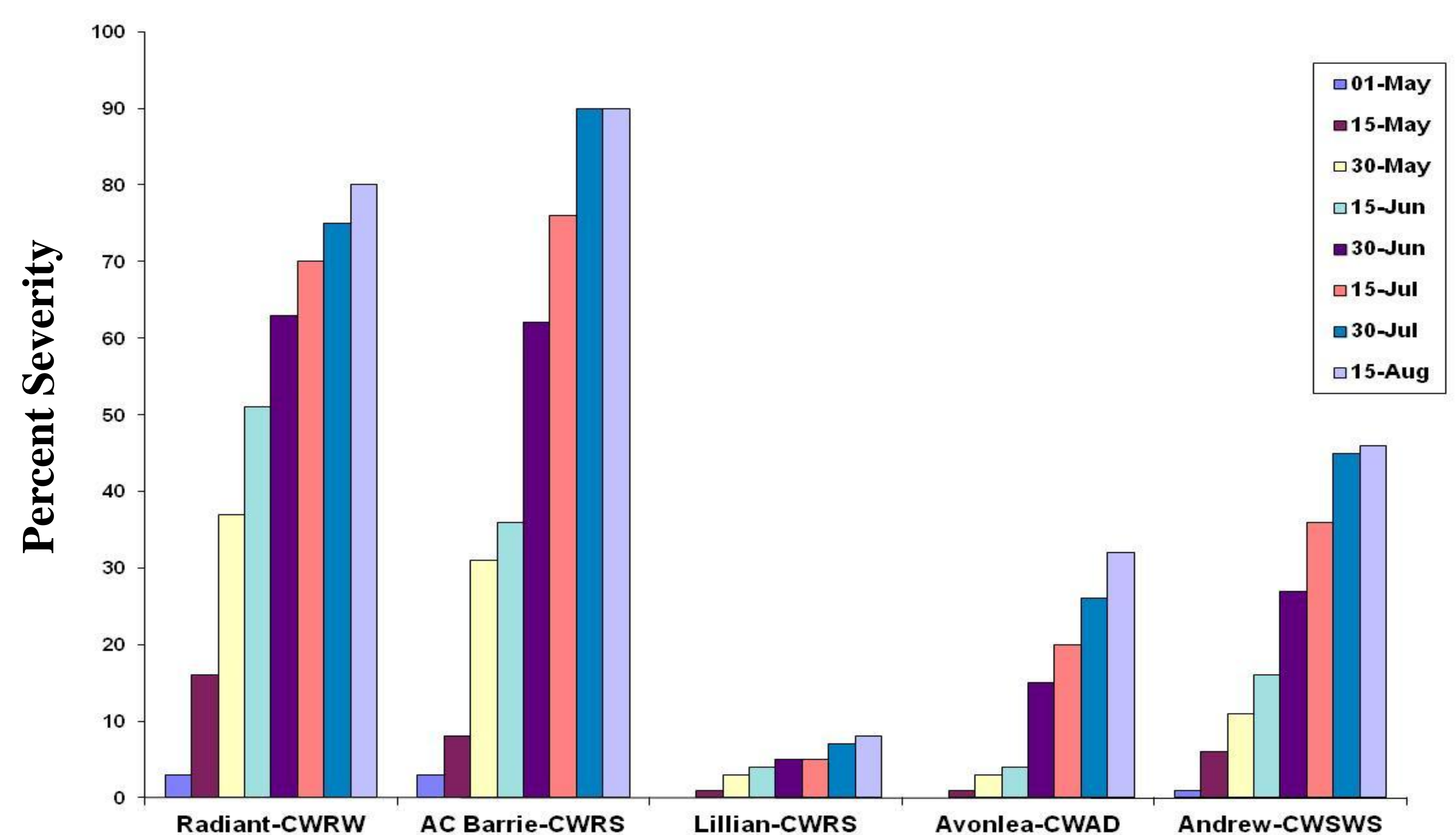


Figure 3. Levels of stripe rust severity on set of cultivars from May to mid August in 2011.

- ❖ High levels of infection were observed on winter wheat variety Radiant (Fig. 3), which carries *Yr10* and began to succumb to new virulent races in 2010 (Fig. 1). The spring wheat variety AC Barrie is susceptible, the soft white spring wheat variety AC Andrew and the durum variety Avonlea had intermediate levels of infection, and the CWRS variety Lillian had low levels of infection (Fig. 3).
- ❖ Stripe rust observation and pedigree data from Coop trials suggested that much of the resistance can be attributed to the presence of *Lr34/Yr18*, with a small number of cultivars possessing the *Yr36* gene, which is linked to the high grain protein gene *Gpc-B1*. The variety Lillian carries a combination of both *Lr34/Yr18* and *Yr36* which provides solid resistance (Figs. 1, 3). Some cultivars likely possess several uncharacterized stripe rust resistance genes.
- ❖ Yield losses ranged from 15-35% on susceptible varieties, 5-20% on those expressing intermediate levels of resistance, and 2-10% on resistant varieties.

Acknowledgements

- ❖ Financial support through WGRF-AAFC wheat cluster is gratefully acknowledged.