The Wheat Rust Toolbox: Management and visualization of global wheat rust data

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In most recent years the UG99 stem rust race has moved out of East Africa. This poses a threat to other regions in Africa, Central and west Asia, and other regions where this pathogen is not yet found. In Europe a new population of stripe rust (Warrior and Kranich races) replaced less diverse pathogen populations during the years 2011-2014 (Figure 1). To enable the tracking and monitoring of the evolution of pathogen populations, a new web/database management and display system was developed, called the Wheat Rust Toolbox (Figure 1). This platform, hosted by the Global Rust Reference Centre, supports two major initiatives, 1) the Durable Rust Resistance in Wheat project (DRRW), for managing and visualizing wheat rust pathogen data - mainly about stem rust (\textit{Puccinia graminis}) from Africa, Central and West Asia and 2) the ENDURE stripe rust network for managing and visualizing stripe rust (\textit{Puccinia striiformis}) race, virulence and genotype data for Europe. The presentation will provide an overview of data and tools available in the Wheat Rust Toolbox, the research infrastructure behind and how data are disseminated via several information platforms such as wheatrust.org, eurowheat.org and http://rust-tracker.cimmyt.org/. Opportunities for analyzing genotypic data (SSR and SNP) online via a web based version of the POPPR integrated with the Wheat Rust Toolbox will be presented. Overall the results show that the collation of data in a standardized way across many countries leads to more robust and fast conclusions and it stimulates collaboration between partners. Future directions for improvements of the Wheat Rust Toolbox and the need for a global virtual research environment are outlined.

\begin{figure}[h]
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\includegraphics[width=\textwidth]{wheat_rust_toolbox.png}
\caption{Race frequency map of the European stripe rust population 2011-2014.}
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