



Fig. 1. Wheat stems infected with stem rust strain Ug99 (a); and wheat glume infected with stem rust strain Ug99 (b). Photo credits CIMMYT (International Maize and Wheat Improvement Centre)

Common Name: Wheat stem rust - strain Ug99

Disease: Stem rust of wheat

Classification: K: Fungi, D: Basidiomycota, C: Urediniomycetes, O: Uredinales, F: Pucciniaceae

Puccinia graminis f.sp. *tritici* the causal agent of wheat stem rust (WSR) is endemic to Australia and WA. Strain Ug99 is a new virulent physiological race of WSR which is exotic to Australia and has the potential to threaten global wheat yields. Of the 50 genes known for resistance to stem rust, only 10 work even partially against Ug99. The strain, discovered in Uganda in 1999 (hence the name Ug99) was later found in Kenya in 2001, and then in Ethiopia in 2003. This year it was also detected in Yemen and Sudan and is predicted to spread into Egypt, Turkey, Middle East and India. The majority of all wheat varieties planted in Asia and Africa are susceptible to Ug99. International Maize and Wheat Improvement Centre (CIMMYT) and the International Centre for Agricultural Research in the Dry Areas (ICARDA), together with partners such as the Kenya Agricultural Research Institute (KARI) are leading a global rust initiative to characterize the strain; to track its spread and to find new sources of resistance to the disease and breed them into new wheats.

Host Range:

Like most rust fungi wheat stem rust requires two taxonomically diverse hosts to complete the sexual stages of its life cycle. The primary host is wheat. Some varieties of barley and rye are also susceptible. Common barberry (*Berberis vulgaris*) is the most widely distributed alternate host but is not present in Australia.

Impact:

In monitored test plots of wheat, Ug99 reduced grain yields by as much as 71 percent. The strain combines virulence against several stem rust resistant genes such as *Sr5*, *6*, *7b*, *8a*, *8b*, *9a*, *9b*, *9d*, *9e*, *9g*, *11*, *15*, *17*, *21*, *30* and *38*. Of 72 Australian wheat cultivars tested against Ug99 in Kenya in 2005, seventeen were found to be susceptible. Recent reports indicate that a mutational derivative of Ug99 is also able to overcome *Sr24* which is an important gene for stem rust resistance in Australian wheat varieties.

Further Reading:

CIMMYT (2007). Dangerous wheat disease jumps red sea. http://www.globalrust.org/images/IR2007_002_GRI.pdf

Expert Panel (2005). Sounding the alarm on Global Stem Rust. An assessment of race Ug99 in Kenya and Ethiopia and the potential for impact in neighbouring regions and beyond. http://www.cimmyt.org/english/wps/news/2005/aug/pdf/Expert_Panel_Report.pdf

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The strain is a major concern to Australian wheat growers and significant contributions are being made towards international efforts to minimise its impact and spread.

Key Distinguishing Features:

Symptoms are typical of wheat stem rust. Uredinia generally appear as dark brown pustules on leaf sheaths, stem, spike and occasionally on leaves. On the leaves uredinia generally sporulate on both surfaces. Uredinia can be seen to rupture the host epidermis.

Control:

The main strategy is to promote resistant cultivars in affected parts of the world to reduce disease pressure and further spread. The long-term strategy needs to focus on rebuilding the 'Sr2-complex' (combination of slow rusting gene *Sr2* with other additive genes of similar nature) to achieve long-term durability.