# Limited readiness of European wheat varieties for emerging threats caused by the stem rust pathogen *Puccinia graminis* f.sp. *tritici*.

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Background

Commercially successful varieties need at least moderate levels of resistance to important diseases like yellow rust, leaf rust and stem rust. This study is part of the Horizon 2020 RustWatch project to evaluate the susceptibility of commercially grown varieties and breeding lines to novel stem rust races. For this, paralleled facilities with natural as well as artificial inoculation has been established enabling accelerated breeding of rust resistant varieties. In addition, diverse rust races increases the analytical value and supports breeding efforts.

Field nurseries: a system to test modern cultivars for stem rust susceptibility
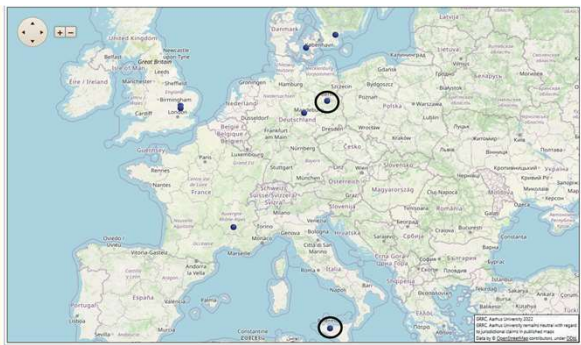
- In parallel 4-year field nurseries, a pan-European breeders panel was accessed
- For this the natural occurring stem rust epidemic in Sicily was used and targeted inoculation with native to Germany rust races in the isolated trial station Berlin-Dahlem
- Both methods yielding a reliable high selection pressure.

Low susceptible varieties with high environmental stability are in the breeders panel
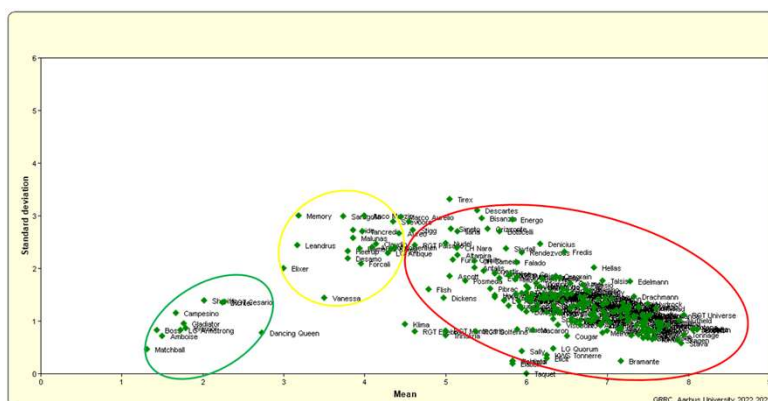
- Analysis revealed that a limited number of cultivars is resistant against all tested races/isolates
- Similar, up to 10% of varieties showed medium susceptibility mostly due to differences in response to the races present in the two test sites
- Vast majority is in Sicily and Berlin fully susceptible to stem rust

Selected testing for 3 major R genes revealed clear correlation with low susceptibility

Within 4 trial years only 4.6% of lines within the panel showed clear and consistent resistance against stem rust irrespective of location and present rust races. Analysing underlying mechanisms PCR genotyping was done to elaborate existence of *Sr24*, *Sr31* and *Sr38* and demonstrates correlation with low rust infection phenotypes.

Infection level of cultivars
9.1
10.3
None Low Mid High Very High