Sources of resistance to wheat stem rust from the Danish breeding company Agrologica and gene banks.

5. Crop and tree improvement

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Abstract text

In a project supported by the Danish Foundation for Organic Farming, we tested the resistance against wheat stem rust in the Danish plant breeding company Agrologica's wheat breeding program. Additionally, we investigated potential sources of new resistance in plant material sourced from international gene banks.

Wheat stem rust is potentially the most yield-reducing disease in wheat, with losses of up to 100% in case of severe outbreaks. For many years, wheat stem rust was of minor importance in Europe, but since 2016, it has made a comeback as a significant disease.

We tested approximately 600 wheat lines from Agrologica and found that 22 lines had a high level of resistance against five recent and highly virulent stem rust strains, including those responsible for recent epidemics in Europe. Genetic markers indicated that 14 of these lines most likely contain resistance genes already known to confer resistance to the tested strains. The remaining lines may contain previously undiscovered resistance, but further testing is necessary to confirm this.

In addition, we tested 508 lines of various wheat species, including durum wheat and emmer wheat, from the IPK and Czech gene banks. 136 lines showed effective resistance and in a selection of 26 lines, genetic markers revealed that 13 most likely contain known resistance genes. The remaining lines may be potential sources of new resistance.

In selected lines from both Agrologica and the gene banks, we also found indications of adult plant resistance, including detection of the Sr2 gene. Our discovery of broad-spectrum resistance in Agrologica's breeding program and the gene bank material is encouraging for the protection of European wheat production against stem rust.