



Bunt Resistance Breeding Projects at IFA Tulln

International Workshop on Bunt and Smut Diseases
online, hosted by BOKU

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A variety of research projects dealing with common bunt resistance in wheat is in progress at IFA Tulln:

- 1 **Introgression** project (*Digibreed*) combining MAS and GS
- 2 **Mapping** bunt resistance gene *Bt11*
- 3 **Association panel** from USDA National Small Grains Collection
- 4 **TILLING** populations targeting 4 different resistance loci
- 5 **Isolate testing** - comparison of virulence patterns

Aim: Combine marker-assisted and genomic selection into an optimal selection scheme for populations with introgressed exotic resistance alleles

Key Points

- two back-cross populations: $BC_2F_{2:3}$ and BC_3F_2
- resistance donors: **Blizzard**, **Bonneville** and **PI119333**
- marker-assisted selection via KASP-markers for bunt resistance QTL in F_1 and F_2
- genomics-assisted background selection in BC_2F_1 via GEBVs
- field testing with artificial inoculation in generations $F_{2:3}$ and $F_{2:4}$

Mapping the *Bt11* resistance gene

Aim: Fine-mapping of common bunt resistance gene *Bt11* on chromosome 3B.

Key Points

- Mapping populations: *PI166910* × *Rainer/Lukullus* and *M822123* × *Mulan*
- 400 lines in *PI166910*-population and 105 lines in *M822123*-population
- two seasons of field phenotyping in Tulln, Austria
- genotyping of parental lines and RILs with 6K and 25K SNP-chip

Association panel from germplasm collection

Aim: Detection of marker-trait associations in a wheat diversity panel

Key Points

- 246 accessions from the USDA National Small Grains Collection
- genotyped with the 90K SNP-chip
- GWAS for dwarf bunt has been conducted by Tyler Gordon et al. (2020, <https://doi.org/10.1007/s00122-020-03532-0>)
- three seasons of field phenotyping with artificial inoculation in Tulln, Austria

TILLING populations

Aim: Characterization of common bunt resistance genes by the reverse genetics approach **TILLING** (Targeting Induced Local Lesions in Genomes)

Key Points

- lines possessing single *Bt*-genes or QTL mutagenized by EMS
 - ① *Bt9* on chromosome **6D**
 - ② *Bt12* on chromosome **7D** (Muellner et al., 2020:
<https://doi.org/10.1007/s10681-020-02614-w>)
 - ③ locus on **1AL** against common and dwarf bunt (Muellner et al., 2021:
<https://doi.org/10.1007/s00122-020-03708-8>)
 - ④ locus on **1BS** against common bunt (Muellner et al., 2021)
- phenotyping of TILLING-populations in progress

Virulence testing of bunt isolates

Aim: Evaluation of the aggressiveness of different Austrian common bunt isolates

Key Points

- set of eight different isolate mixtures collected on several locations in Austria
- each tested on 40 lines including the bunt differential set
- first season of field testing in Tulln, Austria
- project in cooperation with Michael Oberforster, AGES

Collaborators and Funding Agencies

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- ECOBREED¹ - *improving crops*



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Thank you for your attention!