Deciphering the molecular mechanisms controlling grain length and width in wheat

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Final grain yield is a highly complex and polygenic trait.
Dissecting Grain Size: Grain Width and Grain Length

Grain Size

Grain Width

Grain Length

Grain Filling

Grain weight (TKW)
### Spark (-) vs. Rialto (+)

- **Rialto (+)**
- **Spark (-)**

#### 20 grains

Simmonds et al. *BMC Plant Biology* 2014
Is TaGW2 a candidate gene…?

…Probably not!
Dissecting Grain Size: **Grain Width** and **Grain Length**

**A genome**

- **Spark** (-)
- **Rialto** (+)

- **Charger** (-)
- **Badger** (+)
Can we combine these traits?

**Graph:**
- **TGRWT_08:**
  - 5A+
  - 6A+
  - TGW (g)
- **TGRWT_07:**
  - 5A+
  - 6A+
  - TGW (g)

The graph compares the TGW (grain weight) between two wheat lines, TGRWT_08 and TGRWT_07, for different genotypes (5A+, 6A+). The bars show the average TGW with error bars indicating the standard deviation.
TILLING populations: a forward genetics resource
TILLING populations: quantitative phenotypes
TILLING populations: quantitative phenotypes

Mutant 1
Mutant 2
Mutant 3
Mutant 4
Mutant 5
Cadenza (WT)

10 x
TILLING populations: quantitative phenotypes

WT

arrow

WT
TILLING populations: quantitative phenotypes

WT

Average Width (mm)

15%

164 lines

n = 1749
TILLING populations: quantitative phenotypes

WT

Average Width (mm)

15%  164 lines

Average Length (mm)

20%  314 lines

n = 1749
TILLING populations: quantitative phenotypes

Cadenza (WT)

Grain Length (mm)

Density

4 6 8 10 12

0.0 0.2 0.4 0.6 0.8 1.0

77.2

Grain Length (mm)
TILLING populations: quantitative phenotypes

- Cadenza (WT) vs. Mutant 1
- Cadenza (WT) vs. Mutant 2
- Cadenza (WT) vs. Mutant 3
- Cadenza (WT) vs. Mutant 4

Grain Length (mm)

Density

Cadenza (WT)

Mutant 1

Mutant 2

Mutant 3

Mutant 4
TILLING populations: identifying genes

Mutant 1

Mutant 2

Mutant 3
TILLING populations: identifying genes

Mutant 1

Length

Mutant 2

Length

Mutant 3

Length
TILLING populations: identifying genes
TILLING populations: identifying genes

Mutant × Cadenza (WT)

F_1

F_2 population
In Summary...
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[Logos and names of institutions]