

Article

# Image-Based Phenotyping Study of Wheat Growth and Grain Yield Dependence on Environmental Conditions and Nitrogen Usage in a Multi-Year Field Trial

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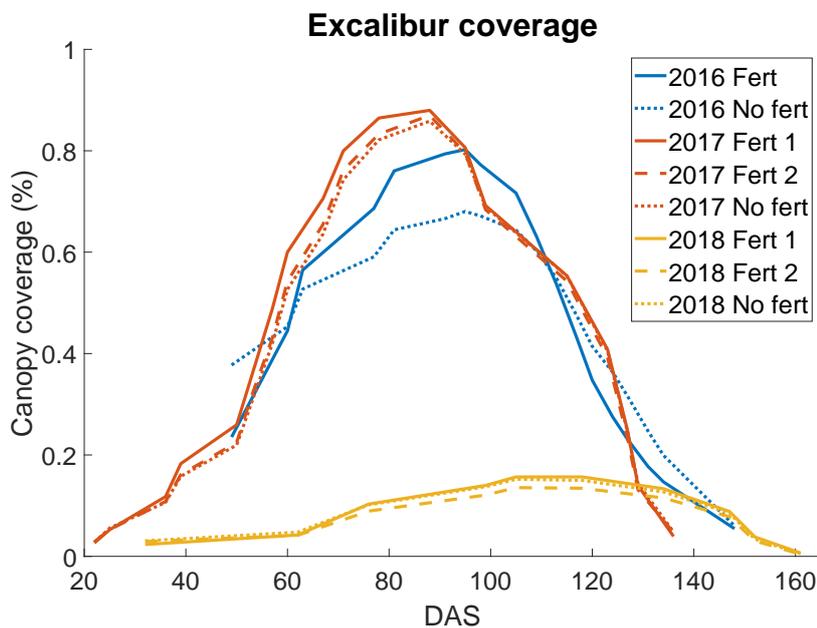
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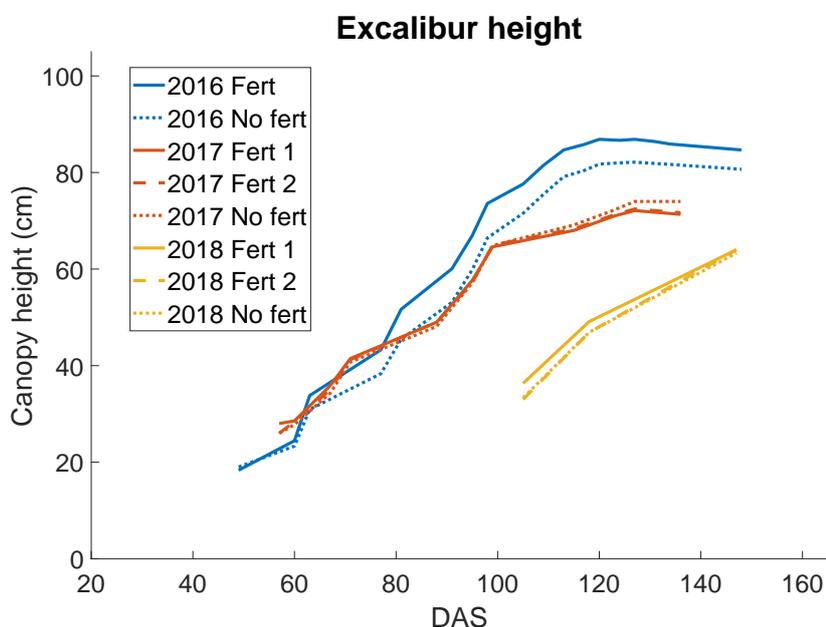
## Supplementary Figures

All results shown in this and the following section are averages over the three replicates for the given variety, growth condition and year.

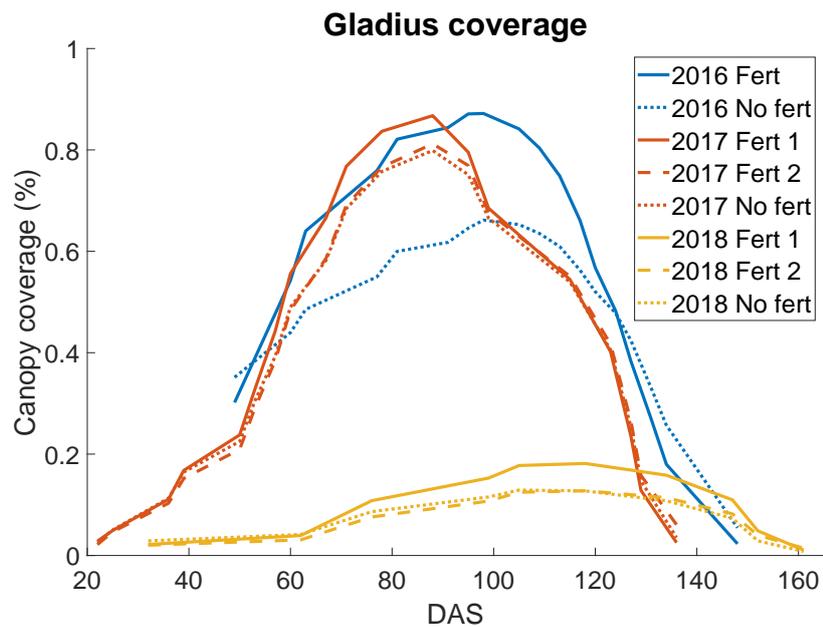
### Canopy Data for Individual Varieties



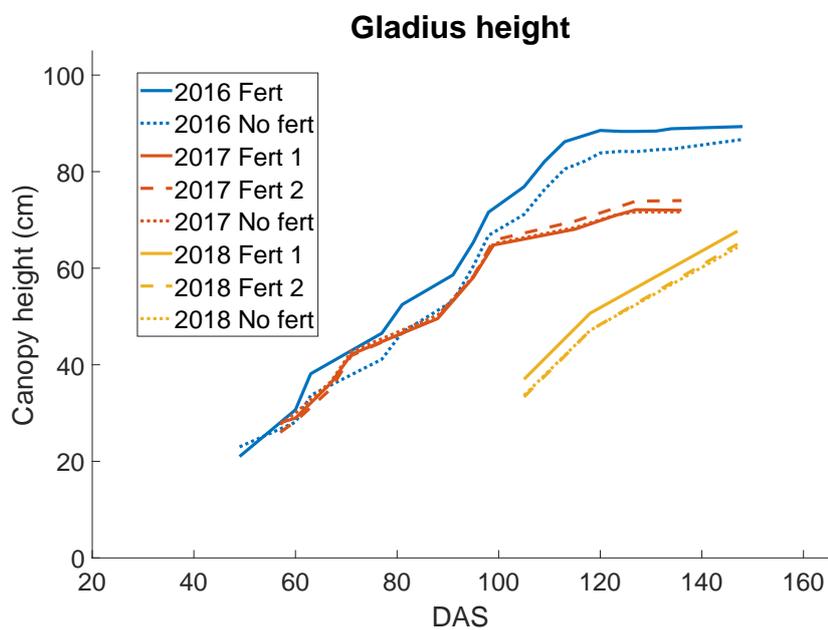
**Figure S1.** Plots of canopy coverage for the variety Excalibur expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



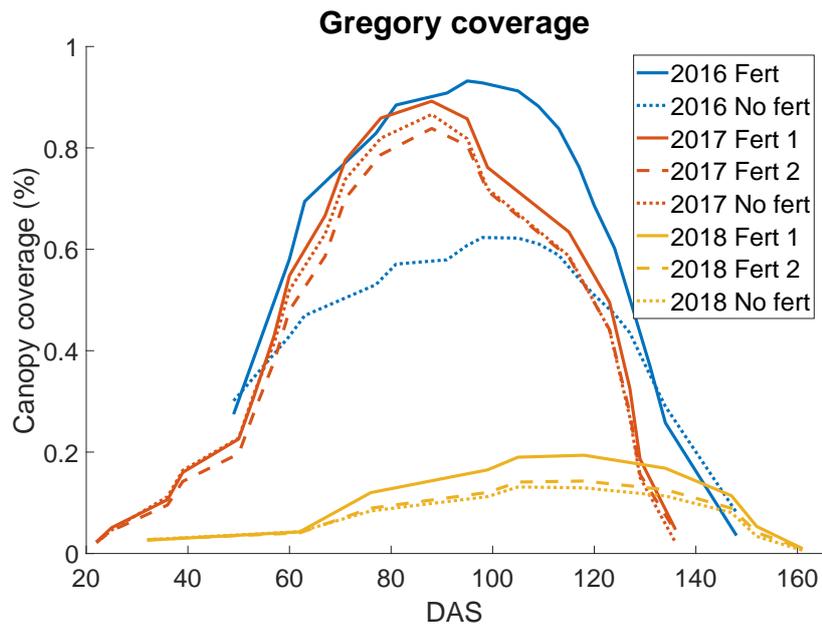
**Figure S2.** Plots of canopy height for the variety Excalibur expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



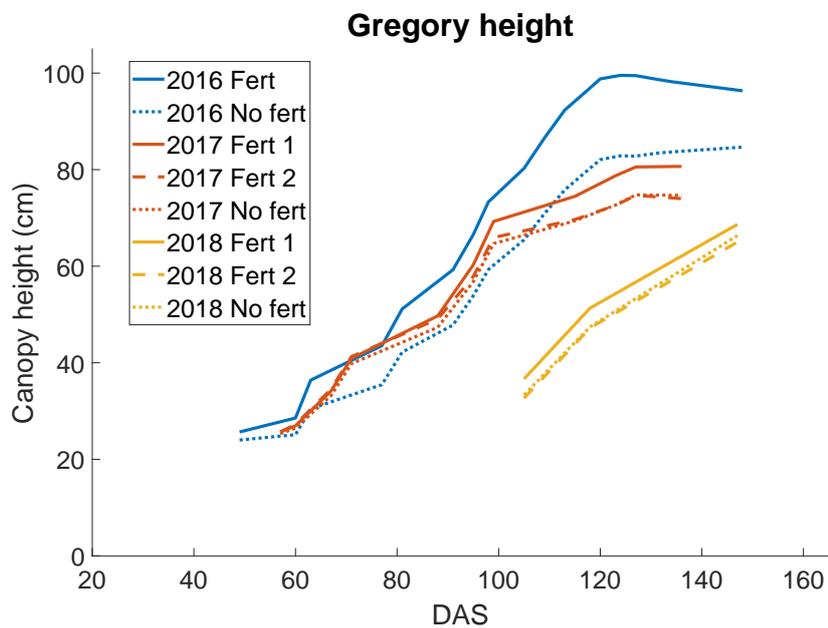
**Figure S3.** Plots of canopy coverage for the variety Gladius expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



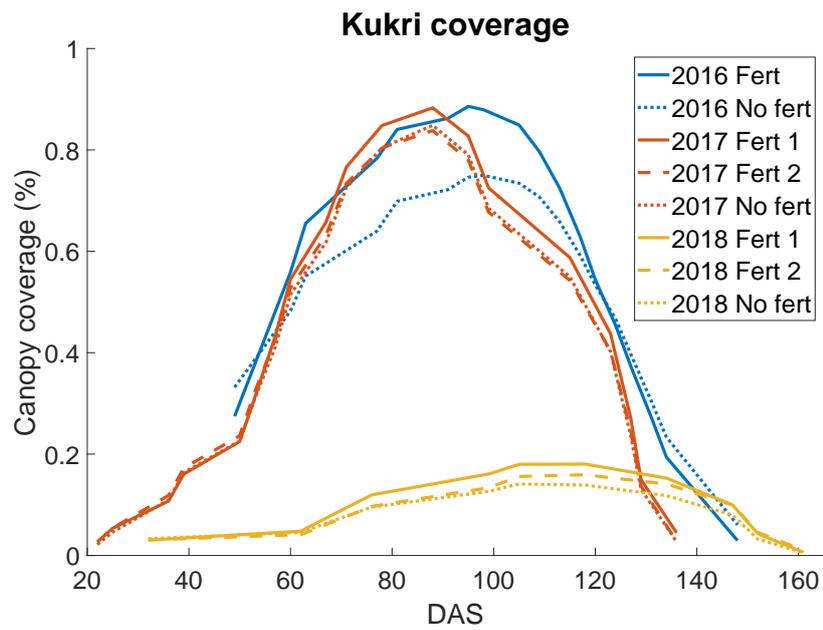
**Figure S4.** Plots of canopy height for the variety Gladius expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



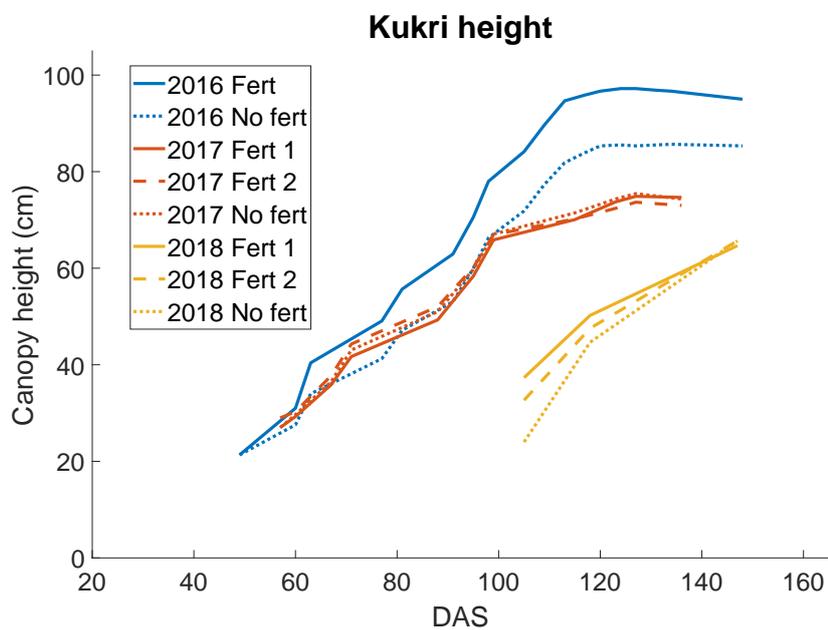
**Figure S5.** Plots of canopy coverage for the variety Gregory expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



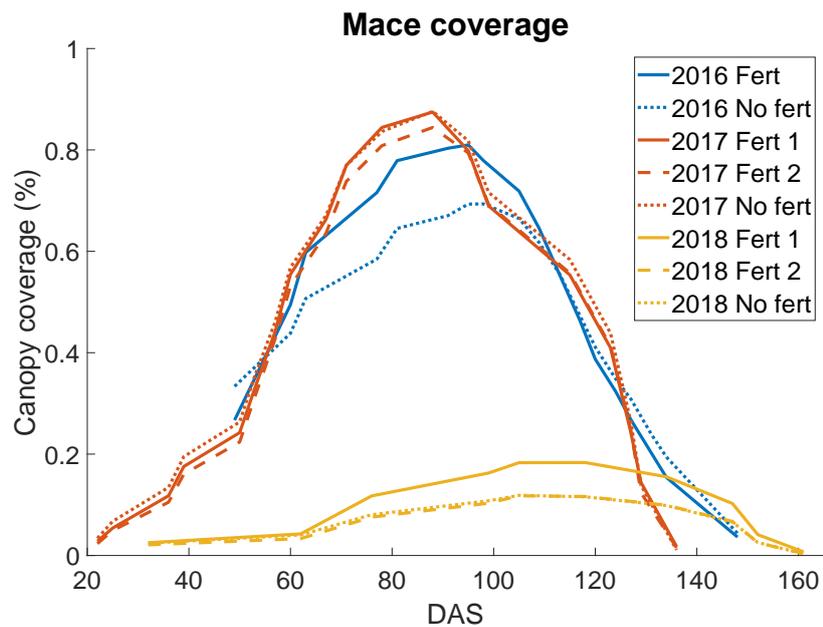
**Figure S6.** Plots of canopy height for the variety Gregory expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



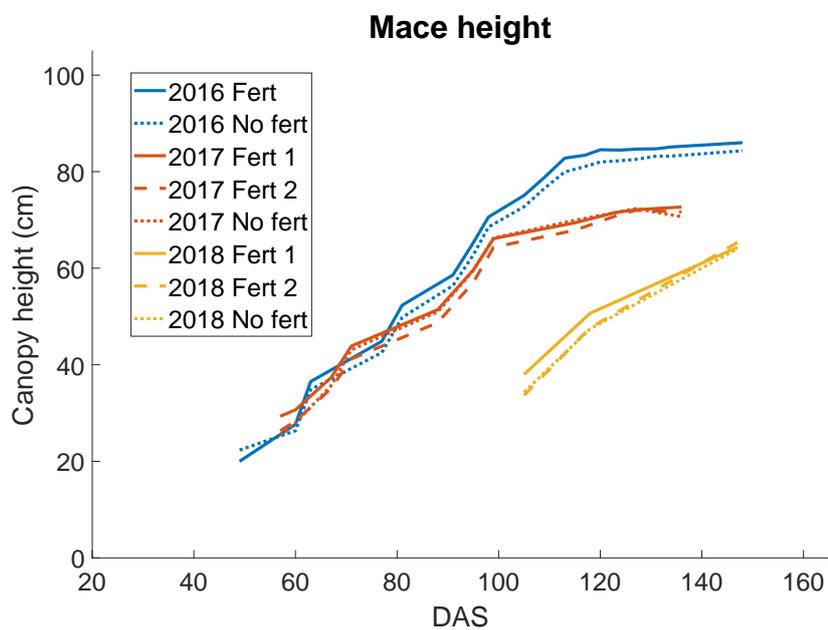
**Figure S7.** Plots of canopy coverage for the variety Kukri expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



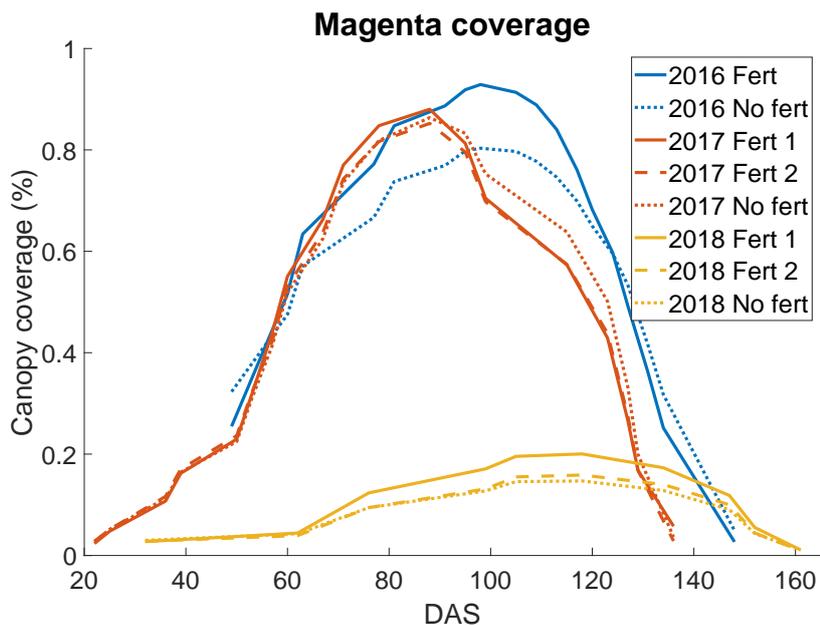
**Figure S8.** Plots of canopy height for the variety Kukri expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



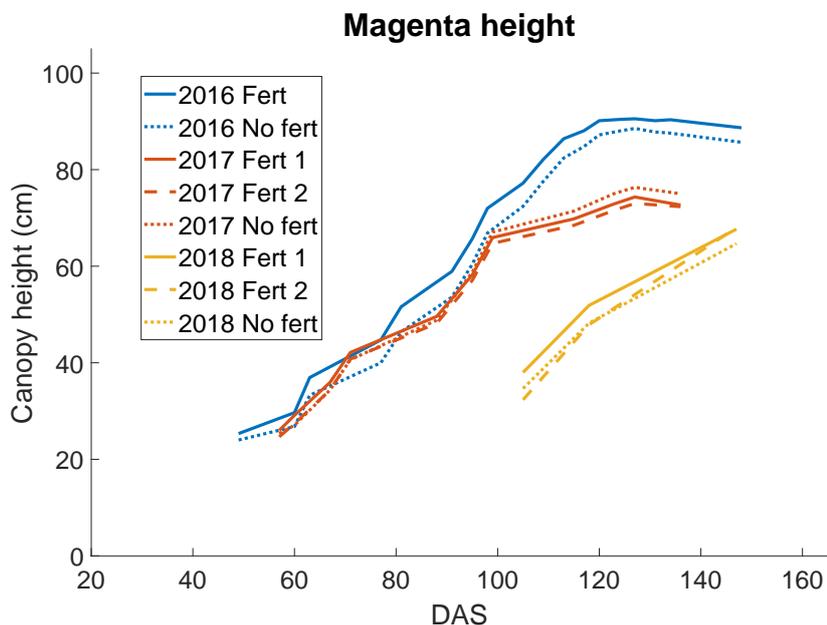
**Figure S9.** Plots of canopy coverage for the variety Mace expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



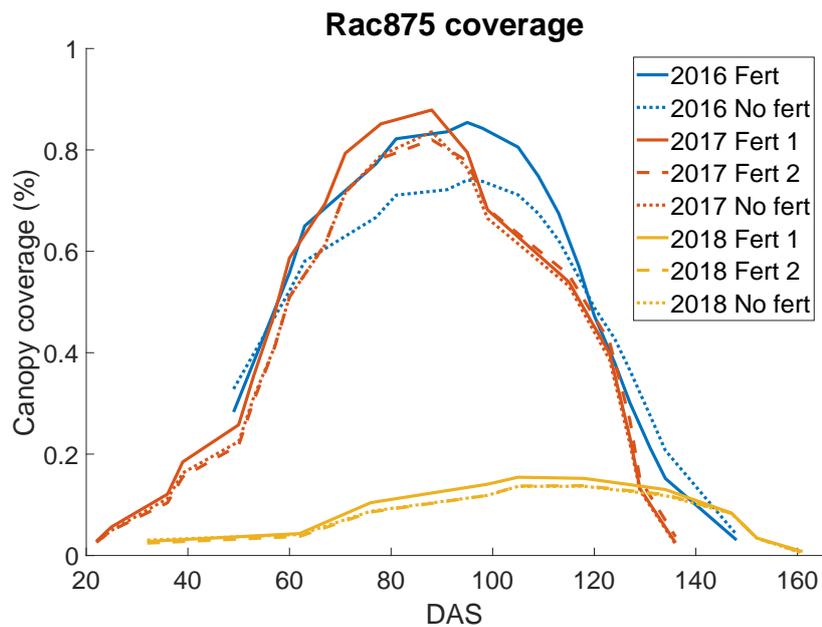
**Figure S10.** Plots of canopy height for the variety Mace expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



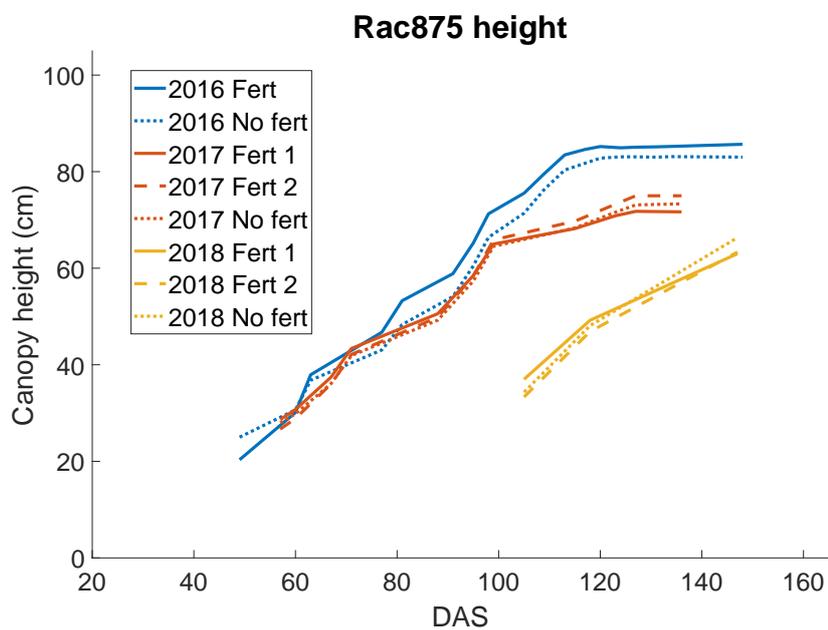
**Figure S11.** Plots of canopy coverage for the variety Magenta expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



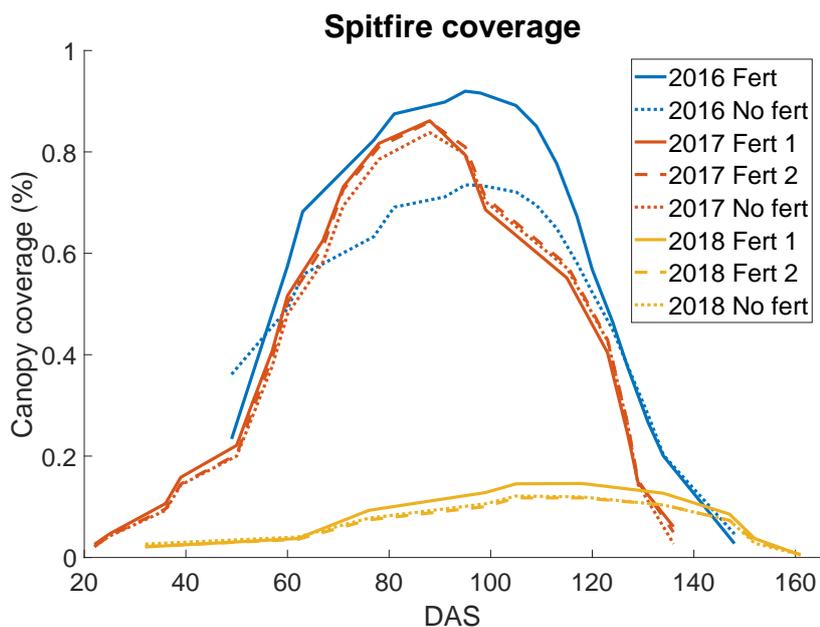
**Figure S12.** Plots of canopy height for the variety Magenta expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



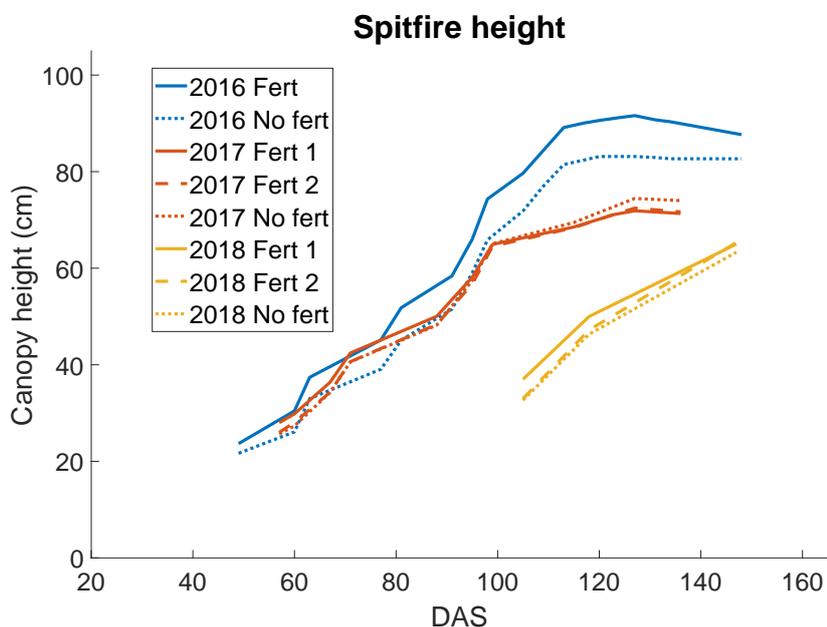
**Figure S13.** Plots of canopy coverage for the variety RAC875 expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.



**Figure S14.** Plots of canopy height for the variety RAC875 expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.

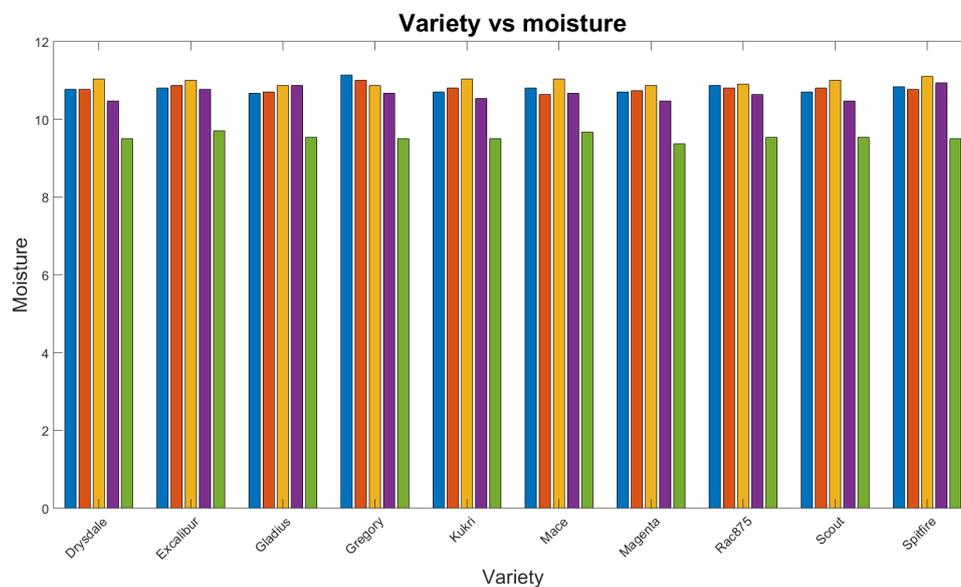


**Figure S15.** Plots of canopy coverage for the variety Spitfire expressed as a fraction of the total *region of interest* (ROI) that is occupied by green (plant) pixels. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.

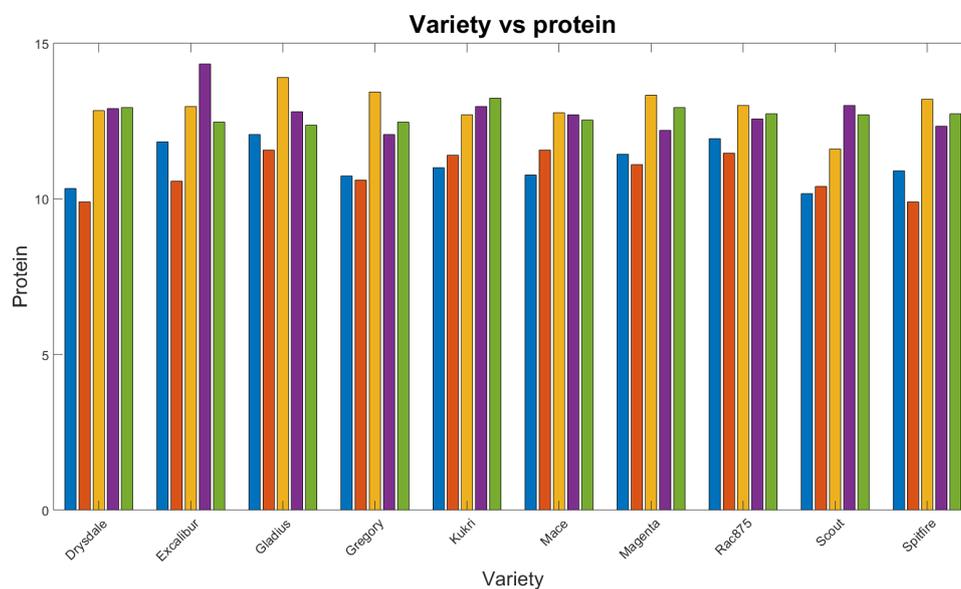


**Figure S16.** Plots of canopy height for the variety Spitfire expressed as a function of days after sowing. The curves show canopy coverage for the 2016 (blue), 2017 (red) and 2018 (yellow) field trials, respectively. Solid curves refer to plots treated early in the season, dashed curves refer to plots treated later in the season; dotted curves refer to untreated plots. In 2016 there was no late treatment of plots.

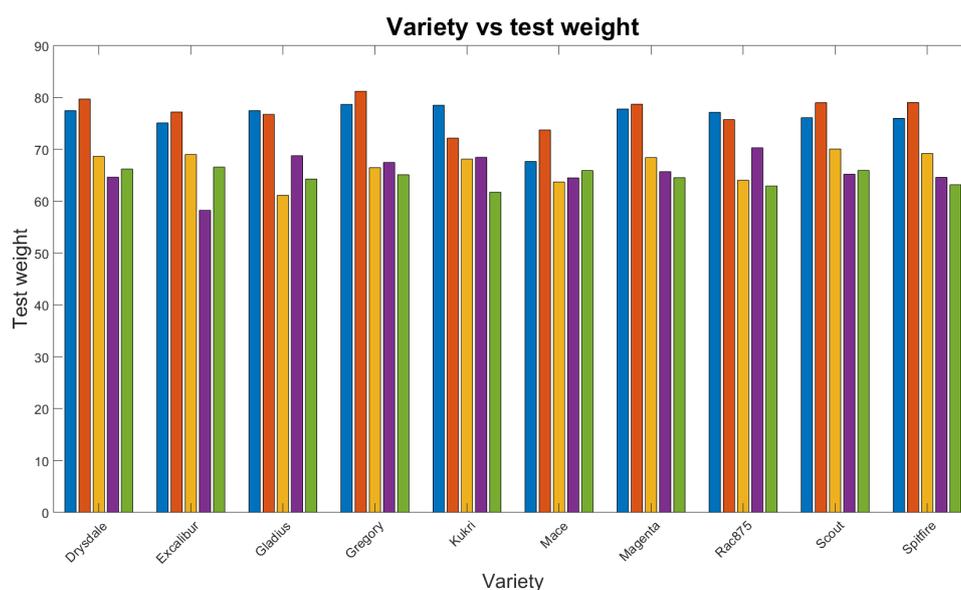
## Grain Yield Data



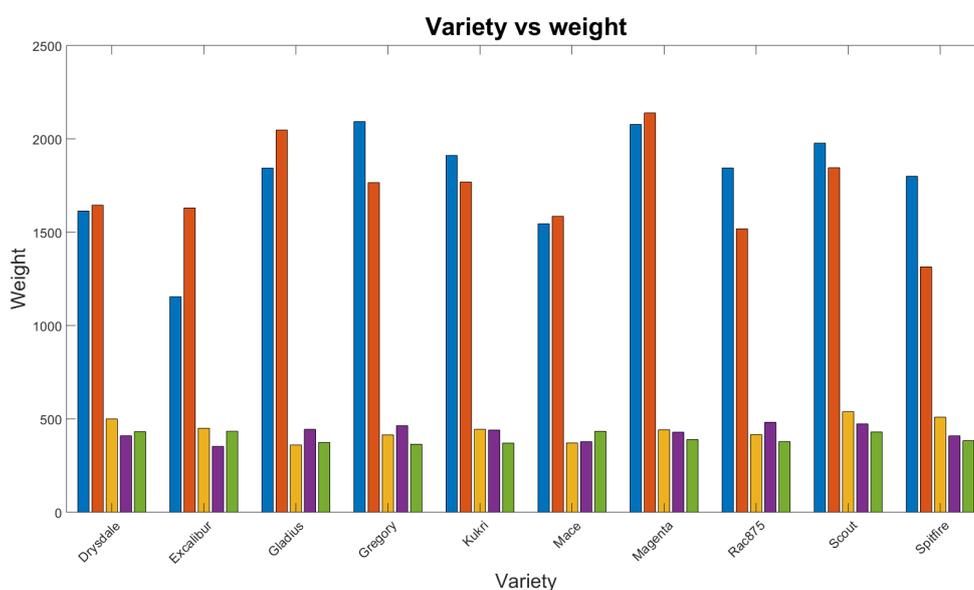
**Figure S17.** Grain moisture content (%). The bars are colour coded as follows; blue is 2016 fertilized plots, red is 2016 unfertilized plots, yellow is 2018 early fertilized plots, purple is 2018 late fertilized plots and green is 2018 unfertilized plots. No grain information is available for 2017 due to a field infection that year.



**Figure S18.** Grain protein content (GPC, %). The bars are colour coded as follows; blue is 2016 fertilized plots, red is 2016 unfertilized plots, yellow is 2018 early fertilized plots, purple is 2018 late fertilized plots and green is 2018 unfertilized plots. No grain information is available for 2017 due to a field infection that year.



**Figure S19.** Grain yield test weight (g). The bars are colour coded as follows; blue is 2016 fertilized plots, red is 2016 unfertilized plots, yellow is 2018 early fertilized plots, purple is 2018 late fertilized plots and green is 2018 unfertilized plots. No grain information is available for 2017 due to a field infection that year.



**Figure S20.** Total grain weight per plot (g/plot). The bars are colour coded as follows; blue is 2016 fertilized plots, red is 2016 unfertilized plots, yellow is 2018 early fertilized plots, purple is 2018 late fertilized plots and green is 2018 unfertilized plots. No grain information is available for 2017 due to a field infection that year.