Investigating Irish Heritage Barley responses to waterlogging

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Waterlogging is a major constraint to barley production and is expected to become a more significant problem as the frequency of flooding events is set to increase with climate change.

Damage caused by early waterlogging. Waterford Distillery 2019

Interest in **Irish heritage barley** varieties has increased as an Irish whiskey renaissance has rejuvenated the malting industry. A collection of 9 Irish heritage two-row spring barley cultivars has been selected for this project.

The **objective of this project** is to characterise the responses of Irish heritage barley to waterlogging using four different approaches:

Genetic analysis

Collection **genotyped** at the James Hutton Institute using 50K SNP array.

Field trials

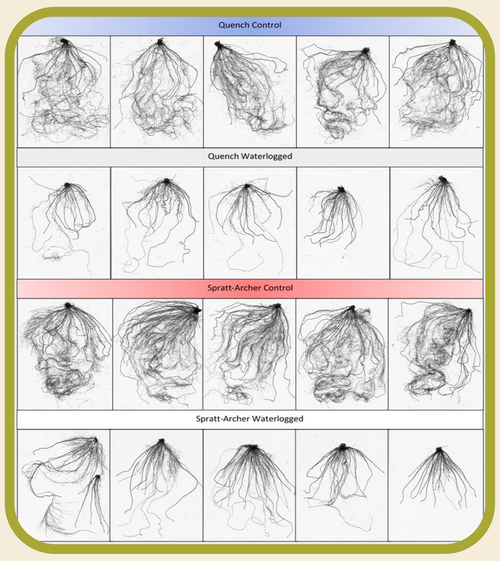
Pilot Trial completed at UCD Lyons farm. Hyperspectral and RGB drone images collected. Yield components currently being processed.

Controlled conditions phenotyping

Currently optimising protocols for modular PlantScreen system recently installed. System produces and analyses **RGB**, **VNIR** and **Chlorophyll fluorescence** images

Root analysis

Preliminary study supports claim that Heritage lines have larger root systems. Further root analysis using x-ray CT planned.



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For what's next

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Waterlogging Pilot Trial 2020
UCD Lyons Farm

Pilot Trial 2020

Three Waterlogging durations simulated using constant irrigation.
Plots lined with Polythene to reduce water requirement.

Image-based Phenotyping

RGB and hyperspectral images captured with regular drone flights.

Growth stage and chlorophyll content measured throughout growing season.

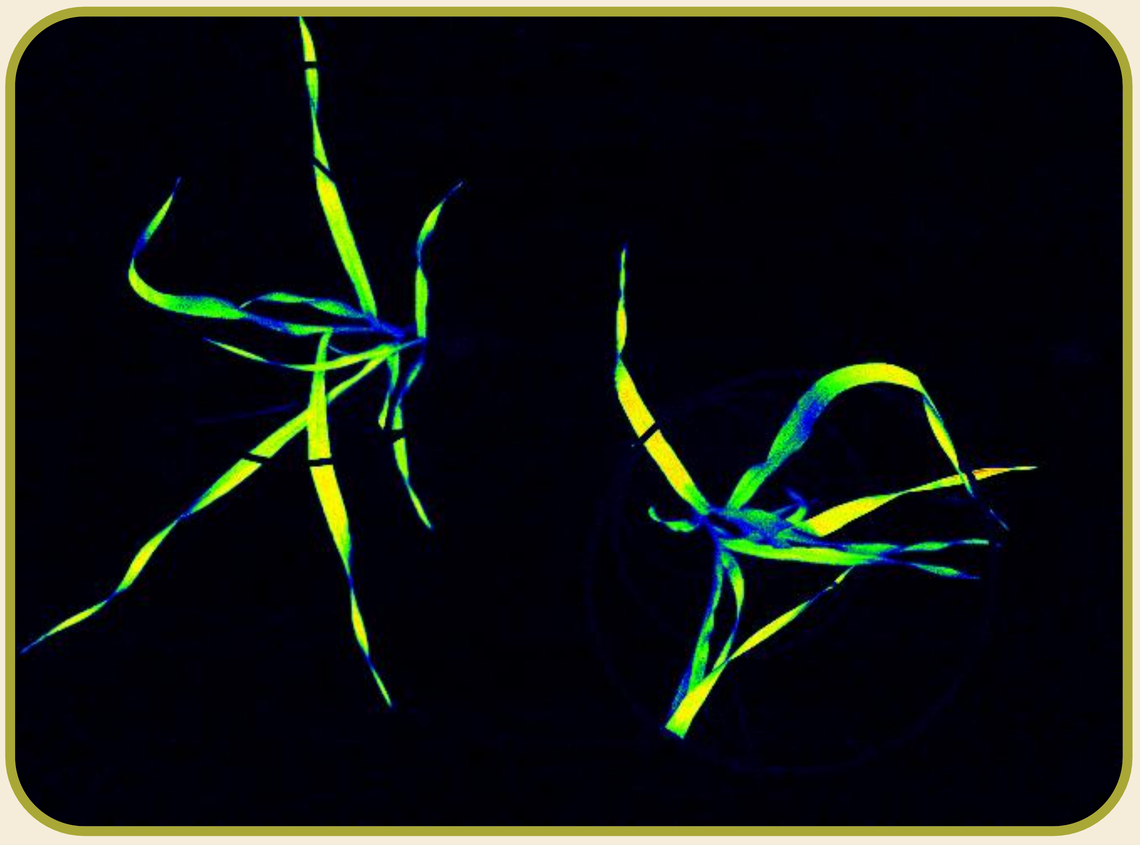
PlantScreen Protocol Optimisation

Glasshouse screening

Response to waterlogging is assessed at a smaller scale using the PlantScreen phenotyping system. Plants are waterlogged within pots and imaged daily over the course of treatment.

Chlorophyll Fluorescence

Measures important photosynthetic parameters such as quantum yield and Non-photochemical quenching.



RGB

Regular Red-Green-Blue cameras allow for morphological and colour segmentation analysis.

VNIR hyperspectral

Hyperspectral imaging can detect changes in reflectance for frequencies in the visible and near-infrared wavelengths (380 – 900 nm).