

Final Project Summary

Project title	Maximising the potential for <i>Pch1</i> eyespot resistance and increased grain protein content in commercial wheat		
Project number	21130018	Final Project Report	PR614
Start date	31 July 2014	End date	30 June 2019
AHDB Cereals & Oilseeds funding	£62,000	Total cost	£618,303

What was the challenge/demand for the work?

Introduction of a portion of chromosome 7D from *Aegilops ventricosa* into wheat can provide resistance to eyespot, in the form of *Pch1* resistance.

Unfortunately, it has long been considered that the use of this resistance leads to reduced yield. This has prevented the widespread use of *Pch1* in varieties to protect against eyespot. Some breeders, however, believe that lines carrying *Pch1* exhibit an increase in the percentage of protein in grain.

This project aimed to establish the relationship between the positive traits of *Pch1* eyespot resistance and grain protein content and the negative trait of reduced yield.

Given the potential linkage between the positive and negative traits conferred by the introduction of the portion of *Ae. ventricosa* chromosome, a second challenge was to identify molecular markers to enable breeders to select for the positive traits and against the negative one.

How did the project address this?

The project used novel genetic lines differing in the region of *Ae ventricosa* DNA present within them to establish the relationship between the three traits. It involved close collaboration with breeding company partners with a large number of field trials.

The position of the *Pch1* gene(s) was established through close collaboration with Biogemma to screen their large DNA insert size library of the *Pch1*-containing wheat variety Renan.

What outputs has the project delivered?

The project has:

1. Found that the presence of a region of *Ae. ventricosa* DNA resulted in a reliable increase in grain protein content.
- 2) Discovered that a region nearby (but probably distinct from) the grain protein effect occasionally caused a reduction in yield. Although, this was not consistent.

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- 3) Found that the potent *Pch1* eyespot resistance is far from the regions for either of these traits. Selection for *Pch1* should not have any negative effect on yield.
- 4) Developed DNA markers for each of the three traits for use by plant breeders.
- 5) Identified potential candidate genes for the *Pch1* gene. Further validation will help identify the actual gene(s).

Who will benefit from this project and why?

Breeders will benefit through the assurance that selection for *Pch1* eyespot resistance will not compromise yield. They will also benefit from the new molecular markers that can be used to track the three traits in breeding programmes.

If the challenge has not been specifically met, state why and how this could be overcome

N/A

Lead partner	John Innes Centre
Scientific partners	
Industry partners	RAGT, Limagrain, Biogemma
Government sponsor	BBSRC

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