

Symptomless Infection of Barley: Resistance breeding and integrated crop protection Strategies (SIBLINGS) Project

What is the project about?

Rhynchosporium Secalis is the most problematic and economically damaging disease of barley worldwide. 'Rhynchosporium' causes annual yield losses of 1.4% (~ £7m) despite fungicide applications valued at over £25m.

Disease control is achieved in part by deployment of major resistance (Rrs) genes in barley. However, in both susceptible and resistant barley plants, Rhynchosporium is able to complete its infection cycle asymptotically. After infection (which can start with infected seed), sporulation can occur with or without the development of visible symptoms.

Current breeding has introduced some resistance, but this has been limited to resistance factors that affect the visual symptoms. The current recommended list only looks at symptomatic disease to assess varietal resistance. This project will use gene markers and microscopy to characterise sources of resistance to Rhyncho in barley. Once identified different sources of both symptomless and symptomatic resistance will be combined to improve the resistance mechanisms and durability of varieties, without reducing yield.

Existing varieties currently on the recommended list will be characterised for a response to fungicide for both symptomatic and symptomless infection. This classification will help to determine the risk and aid the management of appropriate fungicide programmes to improve yield.

A previous LINK project (3017) tested mechanisms by which fungicide treatment affected the growth of barley to better target spray applications. Although decisions about the control of foliar disease are usually based on a consideration of the amount of visible disease present and the risk of further epidemic development, the average yield response to fungicide was poorly related to disease severity. Across 24 field trials the addition of an autumn fungicide application increased the yield and grain number, suggesting that controlling symptomless pathogen infection can lead to increased yield.

Who is involved in the project?

The project consortium has 6 members, KWS (lead), JHI (James Hutton Institute from 1st April 2011), Mylnefield Research Services, Rothamsted Research, DuPont and Masstock. The project is scheduled to last five years, starting in October 2010 and has been awarded a grant of £416,360 from the Technology Strategy Board (TSB).

How will the project help the industry?

In the short term the fungicide response characterisation of existing varieties currently on the recommended list for both symptomatic and asymptomatic Rhynchosporium will allow better targeting of fungicides for varietal response. The subsequent genomic mapping and breeding of varieties which are more durable to Rhyncho infection will help reduce the yield loss to Rhyncho.

A greater understanding of the Rhyncho infection cycle, combined with the results from field experiments investigating spray application timing and product choice will help to give an all round approach to barley disease management.

Using both genetics and fungicides the aim is to increase barley yields by a conservative 1%, which would produce added value for the UK arable economy of over £5m/annum.

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