

Ramularia and the 4 Rs: Resistance gene causes susceptibility to second disease

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The gene that has provided spring barley with resistance to powdery mildew for over 30 years increases susceptibility to newly-important disease Ramularia leaf spot.

Scientists confirm the trade-off in a paper published in the *Journal of Experimental Botany*. Since 1980, the mlo gene has transformed mildew from the most important disease of barley to an occasional nuisance in wetter areas of the UK.

"Having suspected that one of the most successful and widely-used resistances to an important crop disease has the detrimental effect of increasing [susceptibility](#) to another, we took a closer look," says Professor James Brown from the John Innes Centre.

Its effect on increasing the severity of Ramularia is most keenly felt in spring barley and it was found to be sensitive to environmental conditions.

However, the research also paves the way for [barley](#) lines to be bred that are resistant to both diseases by selecting for multiple genes.

"It has struck us that plant breeding relying on the successful use of a single major [resistance gene](#) can increase susceptibility to another [disease](#)," said R&D breeder Peter Werner from KWS UK.

"We have been observing more Ramularia than in the past and now that

we know what is happening on a genetic level we can do something about it."

Symptoms of Ramularia can appear over as little as one weekend, but are notoriously hard to diagnose because of their similarity to other syndromes. In collaboration with Neil Havis of Scotland's Rural College, Professor Brown came up with a simple new method of scoring Ramularia in field trials:

The "Four 'R's":

- The spots are Rectangular
- They are Reddish brown
- They are surrounded by a Ring of chlorosis
- They go Right through to the other side of the leaf

The guide enabled the scientists to test 100s of lines in several locations while being sure of consistent results. The study also broke new ground for the speed of the genetic analysis carried out at the James Hutton Institute. Using maps of genetic markers, the scientists were able to quickly find the precise location for important traits within days rather than years.

Barley is the fourth most important cereal in terms of global production across temperate regions.

Provided by Norwich BioScience Institutes

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