

“We’ve seen a switch in predominance from *Fusarium culmorum* to *Fusarium graminearum*.”

A decade for fusarium

Technical Disease

It’s now been 10 years since **Fusarium Ear Blight (FEB)** first became a serious concern for UK cereal growers. Since that spike in 2007, the disease has never really gone away. **CPM finds out why.**

By **Lucy de la Pasture and Rob Jones**

Prior to 2007, data from the Defra Winter Wheat Survey reveals that the 10 year mean for samples infected by FEB was 37%. In 2007, it jumped to 83% as favourable weather combined with mediocre varietal resistance, while a more arbitrary approach to T3 sprays saw the disease take off, explains Fera plant pathologist, Dr Phil Jennings.

Since then, FEB incidence has remained largely high, with only 2015 having infection levels below the pre-2007 average. The wash-out summer of 2012 was a standout year, with over 90% of all Fera samples showing infection. In some ways that doesn’t surprise Phil Jennings.

“Inoculum is a key component for FEB. Once you have high levels of disease one year, then there’s a base for infection in the subsequent season,” he says.

But the FEB story has continued to evolve since 2007 with a change in the two species which produce the mycotoxins, deoxynivalenol (DON) and zearalenone

(ZON). The latter is arguably the most damaging in terms of financial penalty, he explains.

“We’ve seen a switch in predominance from *Fusarium culmorum* to *Fusarium graminearum*. This change was seen in other European countries. It was first noted in 2003 but has progressed since 2007, reflecting Fera sampling in the UK.”

Multiple factors

He believes multiple factors are behind this change. “Certainly, differences in the type of spores produced by the two species have played a part. *Fusarium graminearum* produces perithecia, containing wind borne ascospores which can move over long distances, whereas *Fusarium culmorum* produces conidia which are spread by rain splash and so don’t move as easy.”

Dry weather in the autumn and early spring can result in the establishment of *Fusarium culmorum* and *Fusarium graminearum* inoculum on old crop debris. Warm, dry weather around March and April aids pathogen development. Showery May weather enhances development of the *Fusarium graminearum* pathogen’s fruiting bodies on debris.

But that is being compounded by agronomic practices which favour *Fusarium graminearum* inoculum development over *Fusarium culmorum*, believes Phil Jennings. He cites the move towards min-till or direct drilling in particular as major contributing factors to the increase in FEB, plus the increased area of maize for anaerobic digestion.

“Both these changes have led to an increase in crop debris on the soil surface,



Phil Jennings explains the changes that have contributed to increased FEB levels over the past ten years.

which favours the development of *Fusarium graminearum* perithecia. Our data shows that just over half of all fields are tilled via shallow or non-inversion tillage,” he notes.

Microdochium has also flourished in recent years. It’s not as damaging, yield losses in high disease years typically being in the order of 10% and it doesn’t produce any mycotoxins.

“Symptoms are restricted to an individual spikelet rather than the whole ear, as seen with *Fusarium graminearum* and *Fusarium culmorum*, which is why yield losses are lower. Again, microdochium is a species that favours warm, dry spring weather leading to inoculum developing at the plant base.”

Microdochium has been around a long time but it was testing for fusarium species that identified the incidence of the species.

“The precursor to mycotoxin legislation introduced in 2006 was the high FEB ▶



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Ramularia resistance found in Germany

Bayer is warning UK growers about the threat of resistance development after findings that the barley disease, ramularia, has been found to be resistant to three of the main groups of fungicide chemistry in Germany.

Bayer resistance testing in southern Germany has confirmed the presence of two new mutations, one that impacts the performance of SDHI fungicides, and another that affects azole fungicides. Resistance in ramularia to strobilurins has previously been confirmed.

The mutation discovered in the target site for azoles has been found to severely impact the performance of all actives in this group. This is

unlike the mutations to azoles found in septoria, which incur a loss in sensitivity resulting in a slide in efficacy, rather than a significant drop in performance. In addition, the SDHI mutation has led to full resistance to all members of that group of chemistry.

Where these mutations have been found, no SDHI or azole fungicide will now control ramularia, even when used at full rates. It leaves chlorothalonil as the only remaining effective chemical option for control of the disease. The German authorities are now advising the use of chlorothalonil in all applications in barley.

However, the position in the UK is not clear.

Unlike in Germany where field performance was compromised last season in some cases, no such reported problems were seen in 2016 in the UK. Bayer is awaiting the results of the UK samples from 2016 and will provide a further update once it has received them.

Last season ramularia was particularly severe in mainland Europe, and more of a threat in the UK because of the cold wet June. However, while the disease is often seen in Scotland and parts of England, it isn't usually a big issue for many barley growers.

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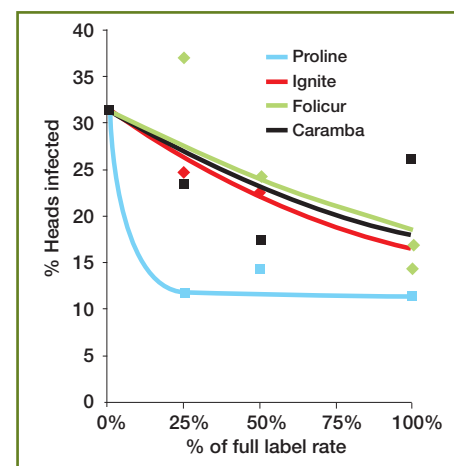
► incidence of 1998. That led to extensive isolation testing, revealing the extent of microdochium infection. But it was the spike in FEB infection in 2007, when we saw a big jump in microdochium severity.

Mainstay at T3

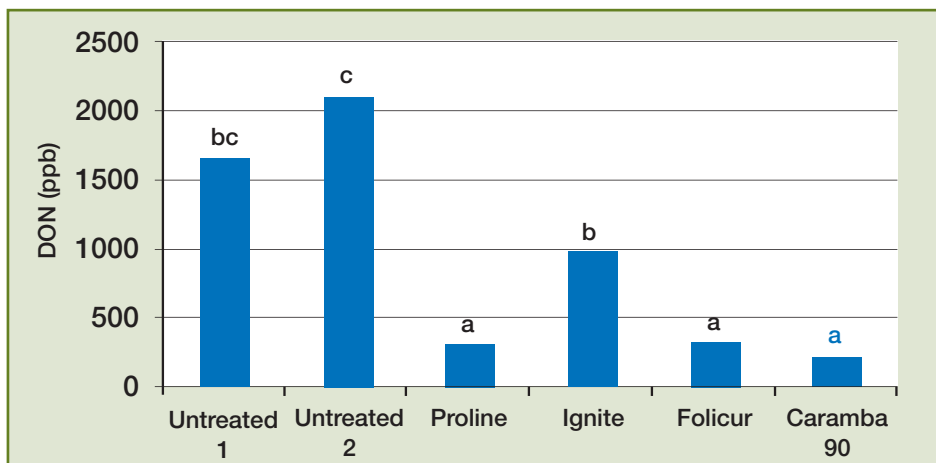
"At that time strobilurins were a mainstay at the T3 timing and known for keeping the ears bright later in the season. It's probably not a coincidence that strobilurin resistance was picked up at the same time," he suggests.

"Yet even now, strobilurins are included in many T3 sprays, along with secondary azoles such as tebuconazole. There isn't anything necessarily wrong with this, but it often comes with a reduced rate of prothioconazole which is the only fungicide with any activity against both the fusarium and microdochium species responsible for FEB."

With five true fusarium species and two species of microdochium capable of



AHDB fungicide performance data for fusarium control in 2016.



AHDB fungicide performance data showing mycotoxin production where different fungicides are used.



With fusarium infection, the spine of the ear or rachis will be bleached. Whereas microdochium infection may bleach many or all of the spikelets, but not the rachis.

infecting wheat ears, identifying which one you have can be tricky. Three of the fusarium species — *F. avenaceum*, *F. poae* and *F. langsethiae* — only have a minimal impact on yield and quality, and are likely to be controlled by most azoles, he points out.

“The bigger issue is whether you have *F. graminearum*, *F. culmorum* or *Microdochium spp.* With *F. graminearum* and *F. culmorum*, the spine of the ear or rachis will be bleached. *Microdochium spp.* may bleach many or all of the spikelets,

but not the rachis,” he explains.

With few FEB-resistant varieties available, control is dependent on foliar fungicides. But timing is critical to get control, highlights Phil Jennings.

“Prothioconazole is the most protective and curative option but even here the window is narrow. Just ahead of mid-flower (GS63) is the best application timing, giving protection for the flowering period and a bit of kick-back. However, the protective activity is less with secondary azoles.”

Looking ahead, he doesn't see changes in the pattern of infection by fusaria but is hopefully that incidence may decline.

“Gradually varietal resistance is improving. For breeders fusaria may not have the same significance as septoria or yellow rust, but we have only four varieties that get less than a six on the AHDB Recommended List,” he says. ■



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