Phoma's evolutionary journey

"Two 'sibling' pathogen species have taken very different evolutionary routes to overcoming chemistry."

DR KEVIN KING

Research investigating phoma stem canker in oilseed rape indicates the pathogen continues to mutate, posing a potential threat to the efficacy of fungicides particularly azoles. *CPM* investigates what this could mean for growers.

By Janine Adamson

The fungal species which cause phoma leaf spot and stem canker in oilseed rape are undergoing an evolutionary journey according to scientists, however, they're taking two very different routes in their quest to become less sensitive to chemical controls.

Phoma, a disease which damages brassica crops including OSR, is caused by two related pathogens: *Plenodomus lingam* and *P. biglobosus*. Conventionally, azole-based chemistry has been a go-to solution for combatting incidences of phoma across Europe.

The target of azoles is the CYP51 protein – an enzyme required for biosynthesis of sterols which are required for fungal cell membrane integrity.

However, as well as decreased azole sensitivity already having emerged in Australian and eastern European *P. lingam* populations, as reported last year, the problem has now spread to western European populations too.

Rothamsted Research's Dr Kevin King is leading research into the topic and says resistance to fungicides can occur in two main ways: mutation in the target gene itself, in this case CYP51, or by its over-expression.

"During a study based on in vitro sensitivity testing, we found decreased sensitivity in many modern European populations of *P. lingam*, caused by over-expression of CYP51. While this was worrying, on balance, it was unlikely to cause a control failure.

"Equally, at the time, there was no evidence to suggest sensitivity shifts to azoles in *P. biglobosus* – the genetic sequence identified as responsible for the change in *P. lingam* was absent in the *P. biglobosus* isolates," he explains.

But fast forward a year and the situation has changed significantly, highlights Kevin. In new research published in the journal *Pest Management Science,* he and other scientists have confirmed decreased azole sensitivity in *P. biglobosus.*

However, there is an important difference. Unlike in *P. lingam,* the azole sensitivity shifts in *P. biglobosus* have been linked to a single mutation within CYP51 – representing the first report of target site resistance to azole fungicides in a phoma pathogen.

"So *P. biglobosus* has also now become less sensitive to azoles, but it's been caused by a different evolutionary mechanism – a mutation within the gene itself. In essence, two 'sibling' pathogen species which co-exist in the field have taken very different evolutionary routes to overcoming the chemistry," he explains.

The CYP51 mutation found in P. *biglobosus* is linked to a 7-fold decrease in sensitivity to the azoles tested, and to date, has been confirmed in Polish and UK populations. Kevin believes this could in part help to explain recent findings of *P. biglobosus* becoming an increasingly ▶

Rate of change

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important phoma stem canker pathogen in Europe.

Further surveys are now required to monitor the distribution and extent of the new mutation in European *P. biglobosus* populations and whether such mutations may also now be emerging in *P. lingam*.

"On their own, each individual mechanism – over-expression or mutation – is unlikely to lead to a disease control failure, although it is a worrying step in the wrong direction," raises Kevin. "A bigger concern would be if either of the species were to develop both of the mechanisms in tandem."

He believes the results indicate the importance of understanding pathogen biology. "If one species is less sensitive to a fungicide, it could lead to selection in the field.

"Equally, this work shows how pathogens are undergoing an evolutionary journey and seem to be changing very rapidly. For years it was stable, but now we're finding new things all of the time," he comments.

He's keen to not scaremonger growers, instead stressing that there shouldn't be an immediate disease management failure. "It's more an indicator of what

Growing optimism

Findings from a long-running benchmarking study reveal why last autumn proved one of the best starts in years for oilseed rape

An increase in the popularity of earlier drilling is among the standout findings of this year's Bayer DEKALB OSR benchmarking study.

The work also confirms a decline in cabbage stem flea beetle pressure to the lowest level in the past six years, with more than half of those surveyed reporting little or no autumn challenge from the pest.

This year's study collected responses from 170 growers and agronomists, responsible for around 17,500ha across the UK's main OSR-producing regions.

In a reversal of the recent trend to drill in late August, a much larger proportion of growers planted their current crop before the end of the first week in August, with more than half of crops being planted before 20 August, and just a quarter in the traditional late August slot.

Participants also revealed average soil moisture conditions at sowing were near ideal at 4.7 on a scale of 1-10 (0 = completely dry, 10 = waterlogged). In fact, the majority of growers saw very reasonable soil moisture conditions (68% scoring between 4 and 6), with only 6% reporting very dry and 1% very wet ground.

Perhaps unsurprisingly given the generally low CSFB pressure and reasonable moisture conditions, the average establishment score (where 0 = complete failure, 10 = perfect establishment) was significantly better than the previous season. At 7.4 it was one of the highest scores recorded in the six-year series.

"Just over 10% of growers scored their establishment at less than 5.0 whereas almost 60% rated their original drillings at 8.0 or more, and 10% rated them a perfect 10," explains Bayer technical manager, Ellie Borthwick-North.

"Underlining last autumn's good establishment experience, more than 60% of growers didn't have to redrill and barely 3% re-drilled half or more of their plantings."

could happen in the future.

"Chemistry has a valuable role to play in integrated pest management and is a key tool in the system. That's why monitoring pathogen trends plus observing the principles of good product stewardship such as mixing or alternating modes of action, is critical in protecting the current chemistry for as long as possible."

And while some may perceive phoma as a less critical threat at the moment than the likes of cabbage stem flea beetle, Kevin reminds that in OSR, pressure is often cyclical. "One year it could be an insect pest, the next a fungal pathogen; the situation ebbs and flows.

"Currently, focus is firmly on how to manage CSFB, but phoma is a European and global-wide problem, that in itself should indicate its importance."

Despite this, the research looking at phoma sensitivity shifts has largely been undertaken as a labour of love, with minimal funding, points out Kevin. "Yet the work undertaken by Rothamsted is benefiting UK growers and beyond. However, it's essential that the UK continues to play an integral role in research, providing meaningful, independent data." ●

Survey results

Underlining last autumn's good establishment experience, more than 60% of growers surveyed didn't have to redrill and barely 3% redrilled half or more of their plantings, explains Bayer's Ellie Borthwick-North.

Given the importance of CSFB to crop performance, the majority of growers surveyed monitor the pest in the autumn. In addition to field walking and the use of regional reports, around 30% are also using some form of yellow trap, such as the MagicTrap.

"As well as deciding whether, where and when to employ insecticides, growers find this monitoring valuable for a wide range of other crop management purposes – from planting decision-making to spring crop management and future OSR growing," adds Ellie.

Analysis of crop success by variety type responses reveals that, as in previous years, mainstream 00 hybrids continue to out-perform pure lines, with better establishment, lower CSFB larval levels and slightly higher early spring GAIs, in particular.

According to Ellie, even under the generally better conditions of the current season, the relative weakness of pure lines in dealing with external challenges is reflected in the difference in proportions of plantings being taken to harvest.

"The performance advantage of hybrids is even greater where autumn CSFB pressures were more than marginal, (scores of 3 or more on the 0-10 scale) with the hybrids suffering noticeably less than pure lines."

The survey results also provide an insight into grower sentiment around the future of the crop. At 37%, the proportion of growers intending to reduce their winter OSR area in 2025/26 is the lowest in the past three years, with 63% intending to plant at least as much of the crop in the coming season as they have this year.