COVER STORY

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DAVID LEAPER

Ergot: the problem growers can't afford to ignore

According to experts, the past year has been the worst the UK has ever seen in terms of ergot infection levels, leading to an increase in costly grain rejections and pressure on cleaning services. *CPM* investigates the importance of on-farm management in tackling this fungal pathogen.

By Janine Adamson

Despite having little impact on yield, the presence of ergot has a significant impact on a crop's margin due to grain merchants adopting a zero tolerance approach – primarily because it poses a human health risk through the generation of toxic alkaloids.

And with last year's cool, wet spring facilitating increased sporulation, as well as a prolonged flowering period, more farmers than ever have found themselves grappling with this difficult to manage pathogen and therefore potential costly rejections.

But with no registered plant protection products for its control, what actions can growers take to help mitigate the proliferation of ergot on their farms?

UK Flour Millers' Joe Brennan, who chairs the UK Ergot Working Group, says having a deeper understanding of the pathogen and its behaviour is key in breaking what's become a cross-seasonal chain of infection during the past three years. "Some sites have invested in colour sorting or cleaning technology, and while this is welcomed, screening adds an unwelcome cost and doesn't tackle the cause.

"So rather than becoming reliant on these services, there's a much greater emphasis on rectifying ergot at an on-farm level. Although there's no silver bullet – chemical or cultural – what we do know, is there are a series of factors which collectively can contribute to its reduction."

To rewind a step, ergot is caused by Claviceps purpurea and while considered a seed-based problem, isn't a true seed-borne disease because it infects the open, unfertilised flowers of a range grass hosts.

As explained by AHDB, at or near to harvest, ergots fall to the ground where they remain dormant until germination the following spring. Airborne spores are then spread to nearby open flowers which germinate and infect the ovaries.

This infection leads to the production of secondary spores encased in a sticky 'honeydew', attracting insects which carry the spores to other flowers where further infection can occur. The fungus then grows in place ▶

New management practices

According to Agrii's David Leaper, while the effective control of ergot relies wholly on cultural methods, these are slowly being eroded by changes in farm management practices.

of the grain to form hard, purple-black sclerotium, known as an ergot.

Ergots can be very large up to 2cm in length, and are either harvested with the grain or fall to the ground where they remain as a source of inoculum for the following year.

To add a further layer of complexity, the same isolates of Claviceps purpurea can infect both cereal and wild grass species, although the subsequent sclerotia present slightly differently – grassweed ergots being smaller than their cereal counterparts.

According to Agrii's David Leaper, while the effective control of ergot relies wholly on cultural methods, these are slowly being eroded by changes in farm management practices.

"Historically, ploughing was the main way to reduce the disease through burying the ergot fragments, but in recent times, there's been a shift towards min- or no-till. Equally, we're increasing the chance of secondary hosts with the likes of environmental field margins and through the proliferation of grassweeds.

"Whereas for seed-borne loose smut we can target it directly through the application of seed treatments, ergot has such a range of hosts that it's become endemic," he stresses.

David points out that although it's highly frustrating to have ergot-contaminated seed, the problem will be much wider than first meets the eye. "It's not just in the seed; it's likely to be prevalent across the farm. So in those cases, it's learning how to live with ergot through understanding which control measures are most effective on an individual field-by-field basis."

In-field source

Ergots can be very large, up to 2cm in length, and are either harvested with the grain or fall to the ground where they remain as a source of inoculum for the following year.

Eradicating alkaloids

Why it's critical to avoid relying on colour sorting to fix the ergot problem

Ergots contain large amounts of mycotoxins (ergot alkaloids), therefore highly contaminated grain can pose a risk to both animal and human health. Furthermore, as of 1 January 2022, the EU reduced ergot sclerotia limits from 0.05% to 0.02% in unprocessed grain, highlights UK Flour Millers' Joe Brennan.

"It also established maximum levels for ergot alkaloids in processed cereal products such as flour. Although this applies to the EU and NI, many GB customers sell flour or flour-based products into this marketplace, so it affects a significant proportion of food cereal demand."

He says it's very difficult to control ergot alkaloids in grain relative to the very low legal limits in processed cereal products. "So there's a mis-match between the ergot sclerotia limit in wheat and the ergot alkaloid limit in processed cereal products.

"A study found if milling wheat containing ergot sclerotia at the EU/NI legal limit of 0.02% results in white flour with ergot alkaloids of around 350parts/Bn, this is well above the legal limit of 100parts/Bn. The EU regulations don't actually make sense.

"This is why many mills have stricter limits for ergot sclerotia in grain with some having a zero tolerance, which reaffirms the importance of vigilance."

Perhaps concerningly, although removing sclerotia from grain reduces the ergot alkaloid content, this isn't always to zero, as demonstrated through AHDB-funded research by Niab.

The work suggests this is due to various reasons, for one, through the transfer of dust or residue to the grain. "Equally, when you disturb infected grain, this can cause the sclerotia to fragment, making it more difficult to clean. Plus, the efficacy of colour sorting for small ergot pieces and grassweed ergot isn't currently clear," continues Joe.

Secondly, ergot infections have also been proven to lead to ergot alkaloids in 'healthy' grain above and below the infection site, as indicated by Niab's research.

"Both of these forms are effectively invisible to a mill intake and rapid testing for alkaloids isn't currently available. This should prove a strong incentive to tackle ergot at the point of infection to avoid background levels of alkaloids," concludes Joe.

Background alkaloids

UK Flour Millers' Joe Brennan says with invisible forms of sclerotia, and no rapid testing for alkaloids available, this should prove an incentive to tackle ergot at the point of infection.

As well as affecting rye, triticale, wheat, barley and oats, ergot also infects a range of grasses, particularly favouring blackgrass. Key to its development are cool, wet conditions during flowering, while Joe says uneven crops or late/secondary tillering can also make infection more likely.

"This season, reports from our members suggest it's often grassweed ergots that are being picked up, which are smaller and break up easily, making them harder to screen out," he adds.

"There's an emerging friction where farmers are being encouraged to engage with environmental schemes and adopt sustainable approaches, yet this could be contributing to the risk of ergot. The scientific literature suggests this could be the case, exacerbated further by environmental conditions."

He also suggests that with rotations being constricted due to limited break crop options, repeated cereals are another way of creating a chain of infection. "Although anecdotal, our data suggests that levels of grain rejections due to ergot have increased as the hectarage of oilseed rape has declined.

"Remember it isn't just wheat, ergot

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On-farm ergot control

Steps growers can take to minimise the spread of ergot and hopefully reduce its pressure

Collaborative research undertaken with Arvalis research institute in France suggests there are four key on-farm control measures for ergot, shared Niab's Dr Lesley Boyd during a UKCVPS stakeholder workshop earlier this year.

She says the primary tactic is to deploy an effective year-round weed control strategy, particularly aimed at ryegrass and blackgrass management.

Then, research has shown that inoculum in the field can be controlled by deep tillage to bury ergots after harvest. However, she stresses this must be followed by shallow tillage the following year to avoid bringing ergots back to the surface. This is because the work with Arvalis suggests sclerotia can remain viable for up to five years.

Growers should avoid growing straw-cereals for at least two years and thus make adaptations to the rotation accordingly.

Finally, Lesley says ergot-infected areas within a field should be harvested separately and not added to the bulk of the harvested crop to contain the infection.

Seed treatment option

UPL's Tom Wheelhouse reminds that while Rancona iMix doesn't eradicate ergot outright, its label claim does include a 'suppression of the germination of ergot particles'.

can even be found in oats, although this is usually grassweed ergot. Either way, ergot loves a seasonal chain and being carried through."

David adds that by their nature, varieties with open flowering habits are more susceptible, including most spring wheats. He's also noted a geographical ergot 'hot-spot' band. "If you map it out, there appears to be an increase in prevalence right across the Midlands.

"This could be due to a range of factors, but it does make sense given land is often heavier, lending itself to greater blackgrass pressure and reduced ploughing. We also see an increase in milling wheat across the region, and wheat is the crop we screen the most through Agrii's mobile seed cleaning provision."

While it isn't necessarily an option to revert straight back to ploughing, David believes shallow cultivations to around 50mm deep can still help because ergots have a short-term viability of just one year. "I'd certainly advise avoiding second wheats if there's been a historical ergot problem, as well as considering a move to spring cropping to get grassweeds back under control."

He also reminds of the role of seed treatments such as Redigo Pro (prothioconazole+ tebuconazole), Beret Gold (fludioxynil) and Rancona iMix (ipconazole+ imazalil), as DMI chemistry can offer a level of suppression of fruiting bodies within the soil.

According to UPL's Tom Wheelhouse, while Rancona iMix doesn't eradicate ergot outright, its label claim does include a 'suppression of the germination of ergot particles'. "Previous work indicates this can reduce the incidence of ergot by 40-60%; UPL has instigated a new study at its Shray Hill research station near Shrewsbury to investigate this further and expand our datasets.

"This is in direct response to the increasing prevalence of ergot – it hasn't been such a big issue until now," he says.

Tom comments that he believes the use of untreated farm-saved seed may also be contributing to the problem. "With a range of seed-borne diseases as well as the threat of ergot, opting for a seed treatment is a very direct way to target a pathogen."

> ***"Although anecdotal, our data suggests that levels of grain rejections due to ergot have increased as the hectarage of oilseed rape has declined."***

St Neots-based farm manager, Ian Lutey, says ergot is something R H Topham and Sons has had to learn to live with for a number of years, having had crops rejected in the past. "We try and keep ahead of the game, but can find ergots in wheat, spring barley and spring oats can often be covered in it. Some farmers say they don't have it, but if you look hard enough, it's there."

According to Ian, the problem tends to reside more on the headlands, whereas he believes the cutting restrictions of stewardship schemes can often exacerbate the problem.

In a bid to combat overall disease pressure, he says the farm stopped growing milling wheats, focussing on soft and hard feed wheats. As for ergot specifically, he segregates affected crops at harvest and has these screened through a colour separator.

"Up to 30% of our tonnage might require processing in a bad year. I know ploughing can have some effect, but this isn't always an appropriate option."

As the farm saves a lot of its own seed, Ian says this means avoiding using seed crops which have had an ergot contamination. "If we have no other choice I'll use them along with a fungicide seed treatment, but I accept that it might not completely control it.

"All-in-all, ergot is another economic cost that we have to carry; it's all very frustrating," he adds.

If growers do suspect an ergot-related problem and believe they'll require seed cleaning, David urges thinking ahead. "With the boom in ergot this past year we've found there can be a wait for the service which of course will have an impact on subsequent grain marketing options.

"If you're in a high-risk area or on a farm with a historical problem, book your colour sorting early as it's impossible to service everyone at once."