



techtalk

Managing take-all

Second wheats remain attractive to growers, being more profitable than winter and spring barley, oats and beans. Maximising second wheat yields and bringing them closer to those of first wheats is a constant challenge, especially when faced with the devastating disease take-all.

Don't yield to take-all

The switch to spring cropping hasn't removed the threat of take-all where cereals are grown in sequence. *CPM* finds out the measures growers can adopt to minimise the damage from this important disease.

By Lucy de la Pasture

Even though it doesn't get as much press these days, take-all is a disease that hasn't gone away. It remains a serious robber of yield, particularly where wheat or barley follow one another in the rotation.

Although second winter wheats aren't grown as widely as they used to be, primarily because of difficulties managing blackgrass, there's been a widespread switch to spring cereals. These are also at risk from take-all if they follow a winter wheat or barley crop.

The take-all fungus is also proliferated by some grassweed species, including blackgrass which is endemic in many parts of the UK. ADAS plant pathologist Jonathan Blake outlines how the

disease affects crops and how best to manage it, while Certis' technical manager, Laurence Power explains the benefits of a take-all seed treatment.

What is take-all?

Take-all is caused by a fungus, *Gaeumannomyces graminis* var. *tritici*, that has a ubiquitous presence in UK soils. It infects the roots of wheat, barley, rye and triticale but not oats, which can be grown as a cereal break crop for the disease.

Although another strain of the fungus does exist which affects oats as well as other cereals, var. *avenae*, it's rarely found in UK soils.

Take-all has two phases of

infection. The primary phase occurs mainly in the autumn when inoculum in the soil infects the roots of susceptible crops. In the secondary phase, infection passes from root to root and this usually occurs in the spring and summer.

High levels of primary infection lead to increased secondary infection, especially when soils are warm and moist, so take-all development is favoured by a warm winter, followed by a wet spring/early summer.

What is its impact?

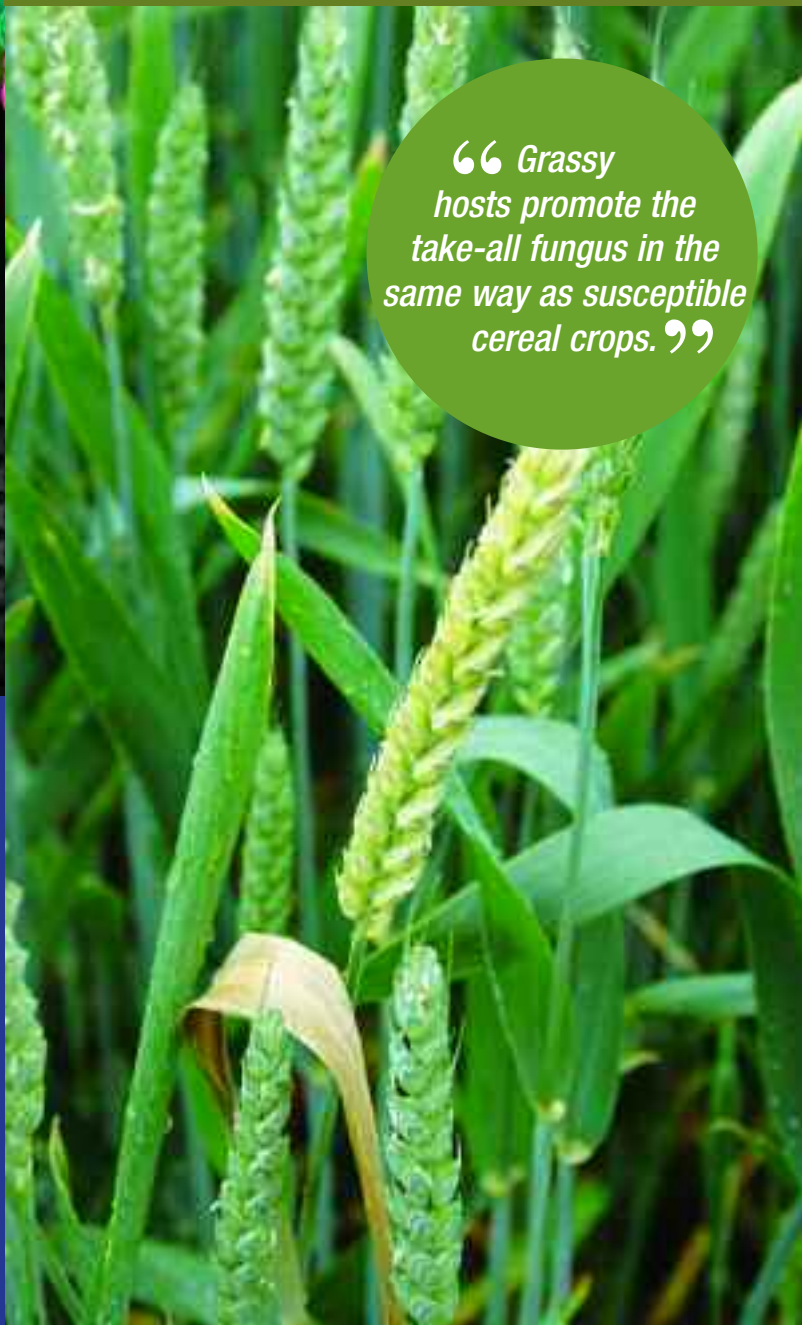
Roots infected by the take-all fungus lose root length density as the season progresses and with it the ability to take-up water and nutrients from the soil. Very early

and severe infection can lead to uneven growth overwinter and occasionally plant death in spring or early summer.

Typical symptoms are patches of whiteheads which may contain shrivelled grain, or no grain at all, and are the result of premature ripening. Infected roots will be blackened with a 'rat-tail' appearance.

After harvest, take-all inoculum on crop debris is returned to the soil and although this declines over time, there's still enough inoculum to cause primary infection of a susceptible crop after a break crop.

Although crop yield in a first wheat situation is unlikely to be affected by this sub-clinical level of



“Grassy hosts promote the take-all fungus in the same way as susceptible cereal crops.”



Untreated seed (left) versus Latitude treated seed, which works by forming a zone of protection around the roots.

infection, inoculum builds to a level where a following cereal may suffer average yield losses of 5-20%, though losses of 50% have been recorded where infection is severe.

Crops grown on light, drought-prone soils tend to be most at risk from take-all and the disease is exacerbated by dry conditions during the grain-fill period.

Most of the research into take-all was conducted in the late 1990's and into the following decade. In 2006, AHDB estimated

the cost of the disease to the industry at £60M per annum but little independent work has been carried out subsequently.

How is it kept in check?

Crop rotation plays a major part in keeping take-all in check, with a one-year break of any broadleaf crop or oats between susceptible crops sufficient to reduce inoculum to sub-clinical levels.

With a break crop it's important to remove any carriers of the disease, such as annual grassweeds and volunteer cereals,

that could undermine the effectiveness of the break. The timing of weed control can also influence the build-up of take-all inoculum, with early removal advisable.

The threat of perpetuating inoculum via grassweeds and volunteers is particularly important if oats are used as the break because chemical removal is at best difficult, if not impossible. However oilseed rape is the more common break.

Grassy hosts include bromes, annual ryegrass, blackgrass and couch and although they may not be affected by the take-all fungus, they promote the disease in the same way as susceptible cereal crops.

A phenomenon known as take-all decline is observed when cereals are grown on a continuous basis. This is due to antagonistic microflora which build up slowly in the soil, so don't exert an effect on the take-all fungus until the third or fourth cereal crop is in the ground. This can cause a reduction in take-all infection of around 20-40% rather than its total removal.

Time of drilling is one of the major factors affecting the impact

of take-all on a crop. Second wheats benefit from delaying drilling until mid-late Oct, which shortens the period where primary infection occurs.

Attention to crop nutrition can help mitigate the effects of take-all in second wheats. Early application of nitrogen is advisable, before pathogen levels increase in the secondary phase of infection and nutrient uptake becomes less efficient due to root damage.

How has its prevalence changed?

The prevalence of take-all hasn't really changed although its impact is possibly less due to the reduction in second wheats sown in the rotation.

However, the switch to spring cropping doesn't act as break from take-all. The disease will also infect spring cereal crops following a susceptible winter cereal crop. Although the degree of infection is less than in a winter crop because of the period between harvest and drilling spring crop, the impact is the same. This is because a spring wheat has a more restricted root system than a winter crop, so any root damage has a greater effect on ►

Taking all the cultural opportunities

Using all the cultural tools available to give susceptible crops the best chance of tackling take-all is the first step in tackling the disease, says AICC member and Indigro agronomist Damian McAuley.

In his region, which covers parts of Lincs, Leics, Cambs, Beds and Herts, second wheats used to form a traditional part of the rotation. But in recent years blackgrass problems have driven a change towards more spring cropping — a switch also helped by the introduction of the three-crop rule, he says.

"Although there's not as much second wheat as there used to be, where it is grown the management for take-all hasn't changed," says Damian. "If you're considering a second wheat then field selection is really important. You have to ask does it have the right nutrient and pH status, will later drilling be possible,

are there background levels of take-all and will it be drought-prone?"

Once the right field has been chosen, the next weapon in the cultural armoury is stubble management between crops. "Grassweed and volunteers management is important because these may harbour the pathogen, so they need to be removed with glyphosate or cultivations," he advises.

Choice of cultivations also plays a part. "Ploughing drops the trash and pathogen below the depth that the new crop establishes," he says.

But Damian tends to prefer a more minimal approach to cultivations because of the benefits it brings to blackgrass control. "When opting for a cultivation strategy it's about finding a balance between managing the different agronomic problems on the farm," he comments.

Another important tactic is to delay

drilling. "The aim where there's a take-all risk is to leave as wide an interval as possible between successive wheat crops."

Because take-all primarily causes damage to the roots of plants, Damian advises that the more you can do to encourage free-rooting the better as it helps plants to resist infection.

"Application of organic amendments sit well in front of a second wheat and because take-all loves low nutrient situations, encouraging soil fertility is a good way of helping susceptible crops.

"Second wheats need their nitrogen early in the spring, as long as you can travel on the ground and application conditions allow, and crops need to be fed extremely well," he says.

Once all the cultural strategies have been thought through Damian turns his attention to Latitude, which is generally a no-brainer decision in



Damian McAuley says that cultivation strategy is about finding a balance between managing the different agronomic problems on the farm.

second wheats, he says.

"Growing costs for a second wheat are usually significant so it's crucial to maximise the yield potential of the crop. Latitude isn't a silver bullet and won't eliminate take-all, but it does help significantly."



These seedling roots infected with take-all and show the typical blackening symptoms.

► crop growth and yield.

Many growers are introducing short-term grass leys into their rotation which acts as a partial break. When ryegrass is sown as a ley it promotes the development of antagonist fungi, causing a decline in take-all inoculum.

What effect does variety have?

There is some evidence from work carried out at Rothamsted

Research that certain varieties are less affected by take-all than others. Current varieties on the AHDB Recommended List which perform well as second wheats include RGT Gravity, KWS Kerrin, Shabras, Gleam and KWS Zyatt. Other varieties, such as Graham and KWS Lilli, are better suited as first wheats in the rotation.

How does chemistry help?

Since the withdrawal of Jockey (fluquinconazole+ prochloraz) seed treatment last year, Latitude (silthiofam) seed treatment is the only seed-treatment available to protect crops from take-all. It has label approvals for use in wheat (winter and spring) and winter barley with EAMU's for durum wheat, rye and triticale.

Latitude creates a protective zone in the soil which protect the roots of seedlings against the primary phase of the pathogen in

the autumn, slowing down development of take-all. This allows the seedlings roots to establish before take-all can take hold.

Trials have shown a yield increase, consistent across a range of sowing date where seed has been treated with Latitude. This effect enables more flexibility in drilling date by providing protection to seeds planted earlier than mid-Oct, extending the drilling window.

How is Latitude best used?

To manage take-all it's important to integrate any chemical treatment with cultural control methods. Variety choice, later drilling and compaction-free soils with good drainage can all form part of a robust control programme for take-all in second cereals.

Seed treated with a single-purpose dressing plus

Manging take-all: top tips

- **Utilise a break crop in the rotation** – make sure any volunteer cereals and grass weeds are controlled to reduce take-all inoculum.
- **Delay drilling second wheat** – planting after until mid-Oct reduces primary infection by take-all.
- **Apply Latitude seed treatment** – it gives consistent yield increases over a range of drilling dates, increasing the flexibility of time of drilling.

Latitude provides an average yield response of 0.55t/ha, in second wheat delivering a return on investment of £55/ha or more. In some high-pressure situations average yield responses of 0.74t/ha have been recorded. Latitude gives a similar yield

Take-all levels in UK winter wheat crops

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Avg Take-all index GS 31	10	10	10	6	12	7	7	17	10	7	6	8	11
Avg Take-all index GS 39	20	11	17	19	26	15	11	30	15	11	7	21	22
Avg Take-all index GS 75	37	17	46	61	54	27	25	69	33	21	25	40	28

Take-all index: 1-10 (Low), 11-20 (Moderate), 21-30 (High), 31-40 (Severe)

National Latitude Take-All Tracking Study 2005-2017
 3-10 untreated crops evaluated by NIAB-TAG from range of second cereal sites each year
 *Take-all index average of 31.4 based on levels found at GS 31 over 12 years

Over 13 years, take-all levels found from GS39 onwards have been at least moderate.

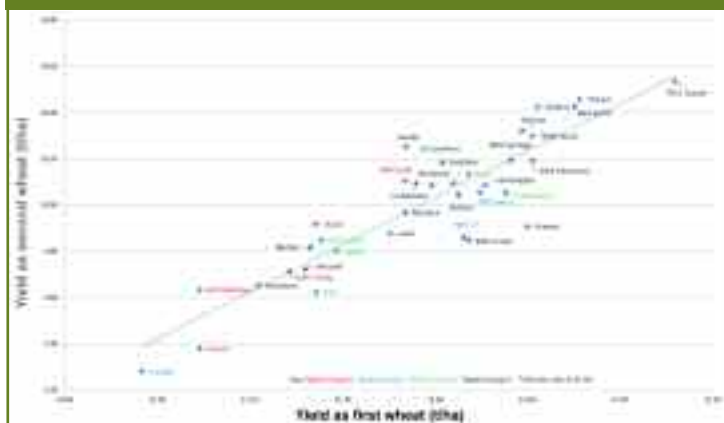
Source: National Latitude Take-All Tracking Study 2005-2017

Untreated crops evaluated by NIAB-TAG from range of second cereal sites each year.

Drilling date yield response



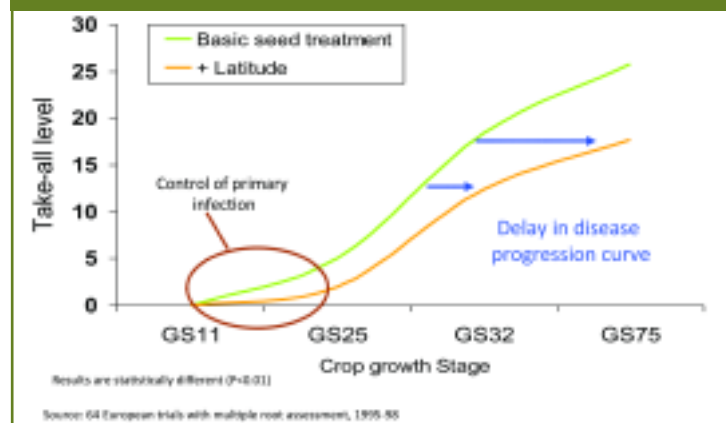
Performance of varieties as second wheats



Choose a high-yielding variety (those lying above the trend line) in second wheat situations for autumn 2018.

Source: Data from AHDB Recommended List 2018-2019

Effect of Latitude seed treatment on take-all



Source: Certis, 64 European trials with multiple root assessment, 1995-1998

response in winter barley, with 0.4t/ha recorded in moderate situations and 0.6t/ha in winter barley in high take-all situations.

Use Latitude in situations where take-all is likely, second and third wheat; winter barley following a cereal; earlier drilled crops; first wheat after non-cropped land or a spring cereal.

How do the finances stack up?

The following figures are based on feed wheat and barley prices as shown in the tables. Margins for milling wheat and malting barley and in very high take-all situations will be greater than those shown. ■

Sponsor message

With take-all considered the top challenge for second wheat growers, Latitude provides an important, economic tool to protect yields and crop health.

Latitude is a unique fungicide that protects each seedling and the root from take-all infection. After sowing, Latitude quickly spreads from the treated seed into the surrounding soil to form a zone of protection. This allows the plant to achieve optimal growth during the critical stages of development and by reducing crop stress from take-all, rooting is promoted and water and nutrient

uptake improves, leading to increased crop health.

Average responses to Latitude treatment are similar, regardless of variety or drilling date, allowing the flexibility required in today's agronomic environment.

Winter barley following a cereal and first wheat after non-cropped land or spring cereals can also be susceptible to take-all and Latitude provides an effective tool to consider in these situations as well.



Cost benefit of Latitude seed treatment in winter wheat

Seed rate		Latitude cost (£/ha)	Yield needed to cover costs (t/ha)	GM from Latitude medium take-all risk (£/ha)	GM from Latitude high take-all risk (£/ha)
No/m ²	kg/ha				
150	75	£14.78	0.10	£64.98	£92.53
200	100	£19.70	0.14	£60.05	£87.60
250	125	£24.63	0.17	£55.13	£82.68
300	150	£29.55	0.20	£50.20	£77.75
350	175	£34.48	0.24	£45.28	£72.83
400	200	£39.40	0.27	£40.35	£67.90

Assumptions

Feed Wheat price £/t	145
Latitude Price £/t	197
Medium take all risk response (t/ha)	0.55
Thousand Grain Weight (gms)	50

Source: Certis

Cost benefit of Latitude seed treatment in winter barley

Seed rate		Latitude cost (£/ha)	Yield needed to cover costs (t/ha)	GM from Latitude moderate take-all risk (£/ha)	GM from Latitude high take-all risk (£/ha)
No/m ²	kg/ha				
				0.4t/ha yield response	0.6t/ha yield response
200	100	£19.70	0.15	34.30	61
(Hybrids)					
325	150	£29.55	0.22	24.45	51
(Conventional)					

Assumptions

Feed Barley price £/t	135
Latitude Price £/t	197
Moderate take all risk response (t/ha)	0.4
High take all risk response (t/ha)	0.6
Thousand Grain Weight (gms)	46

Source: Certis

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