



techtalk

Managing clubroot in OSR

Clubroot is on the rise across the UK, particularly in Scotland, the Borders, and western regions where there is more mixed farming and higher rainfall. Climate change is bringing warmer, wetter winters nationally – meaning disease pressure will increase. Resistant varieties, along with sensible rotations, are key to combat clubroot.



The resilient invader

Clubroot may be lurking in your fields, and once you have it, it's almost impossible to shake off. CPM gathers expert advice on how to manage its spread and limit its damage.

By Tom Allen-Stevens

There may be many reasons for a stunted oilseed rape crop. Clubroot is one that's often overlooked until it becomes a serious issue.

An acute problem in the northeast of Scotland, it's a disease that's now found in many soils and locations across the UK, notes Prof Fiona Burnett, who warns that a changing climate and tight rotations have made it worse. A recent AHDB-funded project shed light on the pathogen population and how to manage it sustainably.

And this is the positive side of the issue, notes oilseed and pulse breeder with LSPB Craig Padley. Armed with awareness

and understanding of club root, growers should keep in mind the three Rs — rotate, review, resist — to defend against it, he advises.

What is club root?

Clubroot is caused by a soil-borne fungal pathogen *Plasmodiophora brassicae* that produces thick-walled resting spores. These are highly resilient, helping it survive for up to 15 years in the soil and aiding its transfer from field to field or within fields on machinery, transplants, water flows or even muddy footwear. The spores can also pass unharmed through an animal gut, which can be an



“A good rotation forms the bedrock of a sustainable management plan.”

issue if using infected forage, such as turnips, as feed stuffs. Even OSR straw as bedding is a possible source of spread when it goes back out to be spread on land.

Many brassica species are host plants, including vegetable crops as well as OSR, and just a small amount of spores will cause new foci for clubroot. Chemicals, released by the roots of these plants, cause spores to germinate and release new zoospores that move through soil water. Flooding can also spread the disease and the UK's recent milder and wetter winters favour zoospore movement.

The zoospores infect host plants, via the root hairs, and develop into plasmodia. These structures form secondary zoospores that invade the root cortex, causing the cortical cells to enlarge and increasing the rate of cell division, forming the characteristic galls. These reduce nutrient and water uptake in roots, leading to lower yields, then release large numbers of resting spores as they decay.

How do you detect it?

The first sign is often stunted plants and it's common to find these first in field gateways,

which then spread to distinct patches in the field. These tend to elongate with the passage of cultivations. Dig up the roots and you'll find the characteristic gall that gives clubroot its name. The smaller fibrous plant roots tend to wither, and in really bad cases, the entire root will rot away

There is no quick in-field test, but suspect samples can be sent to labs for analysis, and many horticultural growers do this as a matter of course, especially



A changing climate and tight rotations have made clubroot worse, warns Fiona Burnett.



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How do you control it?

A good rotation — the first of the three R's — forms the bedrock of a sustainable management plan. The clubroot pathogen has a half-life of 3.5 years, so bumping OSR out to once every five or ideally seven years will do most to keep it contained.

Bear in mind that some cover crops have brassicae in the mix, which will help multiply the spores. Note also that clubroot cycles more than once in a season, and keeping volunteers greening up after harvest, which can be a way to trap cabbage stem flea beetle and capture excess nutrients, can generate another cycle.

Which brings in the second key part of the strategy — to review it. Mid-April is an ideal time of year to inspect crops and note any suspect patches. Pull up plants and inspect the roots, and if necessary, take samples for testing.

Part of the AHDB-funded project involved using precision farming techniques to map known clubroot patches, which can then be treated differently, forming an effective part of the plan. Just putting the area around

the gateway into grass can squash a problem before it starts. But once you've identified where clubroot is, it's important to do all you can to limit its spread.

Another key consideration is that clubroot likes an acidic soil, which is again a reason why the disease is common in Scotland, where soil pH can naturally drop to around 5-5.5. Monitoring arable soils and keeping them regularly limed to maintain higher pH levels will help. The disease is suppressed at pH7-8 but this ideal may only be achievable for horticultural crops so not a cure-all for the disease in most arable situations.

How can genetics help?

Using varietal resistance forms the third key aspect of a sustainable management plan, but again it's important to note that OSR genetics on their own won't solve a clubroot problem.

The resistant gene was originally isolated in Brassica rapa and introgressed into B. napus (OSR) in the late 1980s, as part of an industry-wide research project. European breeder NPZ, the parent company of LSPB, was involved in the project and



Mid-April is an ideal time of year to inspect crops and note any suspect patches, advises Craig Padley.

before taking on rented land. PGRO and SRUC both offer testing services.

Don't underestimate how easily clubroot is spread, though. Good field hygiene can help enormously, keeping machinery cleaned between fields — up to half a tonne of soil can be carried on some equipment. But just a small amount can bring the pathogen onto your farm, and this could be via fencing or electricity pylon contractors for whom field hygiene is not a priority.

brought the first OSR variety with resistance, Mendel, to the market.

Varieties with the Mendel gene provide very effective resistance to clubroot, especially in situations where they haven't been used before. But the genetics shouldn't be relied on too heavily. One of the aspects highlighted by the AHDB-funded project was that clubroot populations found in the UK are very diverse — more so than across Europe. This may be a reflection of historical ▶

Crome consistently keeps the shine across OSR area

You sense a note of trepidation as Sandy Norrie leans onto the spade and prises up the OSR plant. "I hope this isn't one with clubroot," he says.

Fortunately it isn't and a good, healthy tap root is exposed. That's just as well, as regular monitoring hasn't yet identified the pathogen in this field of OSR, which Sandy's hoping could yield as much as 6t/ha judging from the performance he's currently getting from his best OSR crops.

"We're aiming for a farm average of 5t/ha, and that's what we're achieving throughout most of the crop. But put a non-resistant variety into a field with clubroot and the combine yield monitor shows up the patches where yield can drop below this by more than 1.3t/ha," he says.

Duncan Arable Farms crops a total of 2400ha across 24 farms near Turriff in Aberdeenshire. Soils are generally

sandy to sandy clay loams, some high grade with a history of vegetable production. And it's this past cropping that has left arable manager Sandy with the clubroot issue.

"There have been a lot of turnips grown in the past, too. We monitor areas, testing through SRUC to keep track of where the infection is. But once you have it, it's there for good, and you have to manage it," he reports.

There's a "hard and fast" rule that no OSR crop is grown less than five years after the previous one, and Sandy's aiming to bring the cropping into blocks to ease management. There's currently 485ha of OSR and 65% of this is cropped with Crome.

"We generally look to grow the best genetics across all our crops, and OSR varieties rarely stay in the rotation for more than a couple of years. But Crome has been with us since 2018 — you

cannae beat it where there's clubroot, and it's been the most consistent fixture of all our varieties," he says. This has come from side-by-side strip trials in which Sandy's put the latest varieties to the test.

There's a soil-sampling and liming strategy that sets the pH above 6.4. Having tried min-till cultivations across half the OSR area for 4-5 years, but found no benefit, all the land is currently ploughed and pressed then sown with hybrids aiming to establish the crop by the end of August.

"Autumn vigour is important for us up here, and Crome is up and out of the traps fast, which is what we like. Light leaf spot is our biggest disease worry and the variety seems to hold its own."

Crome is usually one of the first varieties to come into flower for Sandy and the entire area is swathed prior to harvest to reduce pod-shatter losses



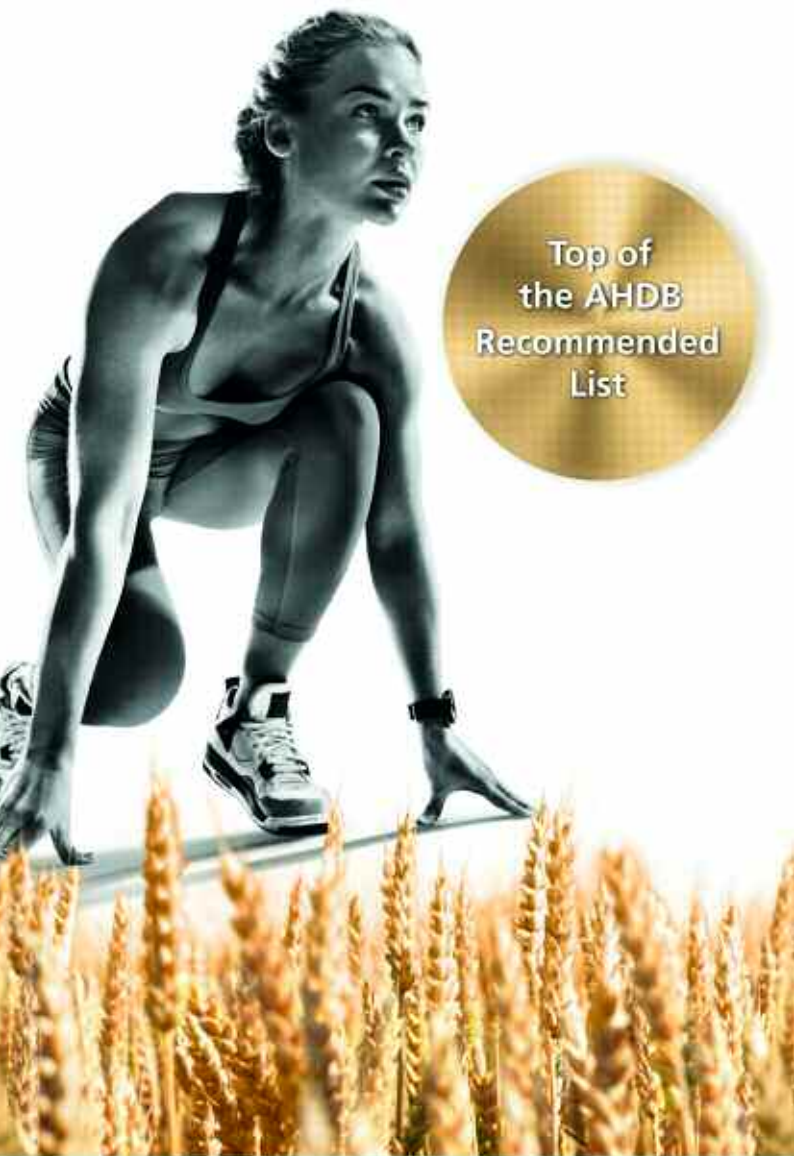
Sandy Norrie has found Crome to be the most consistent performer in side-by-side strip trials.

and then harvested in mid-late August. Once the crop is cleared, fields are topped and then ploughed ready for wheat.

"With Crome in the portfolio, we're getting average yields of 5t/ha, including on clubroot-infected land. That's where we want to be, so I think Crome will stay in the rotation for 2023 harvest," says Sandy.

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► cropping, such as brassicas used as forage crops.

So while clubroot resistance is effective, all varieties with clubroot resistance rely on the same gene. If these are used too frequently within the same field, the population will shift and growers will find genetic resistance is no longer effective.

This means resistant varieties must be used in conjunction with other control methods, in particular wide rotations and good field hygiene. Use them only in fields with a known problem, as part of your OSR variety portfolio.

What's the varietal choice?

The Mendel gene provides effective resistance to clubroot, but the original variety has a considerable yield lag — in situations where the disease isn't an issue, it doesn't yield nearly as well as leading varieties on the AHDB Recommended List. So the variety's rarely grown these days.

The clubroot resistance trait has been introduced across NPZ lines, however, and a number of other breeders have brought the same trait into their OSR portfolio. Over the years, this has allowed the yield gap to close.

Two varieties with specific recommendation on the RL for

Managing clubroot: top tips

- **Make the most of varietal resistance** – it's the most effective way to manage club root but should not be relied on, nor used as a blanket measure.
- **Widen the rotation** – Keeping brassica crops at least five years apart greatly reduces the build-up of the pathogen.
- **Regularly review your strategy** – Monitor suspect areas and exercise good field hygiene to limit the spread. Keeping clubroot out of uninfected fields should be a key priority.

growing on land infected with clubroot are Crome and Croozer, both bred by NPZ and marketed in the UK by LSPB.

Crome is the only one with a UK-wide recommendation and the only clubroot-resistant variety on the RL for the North. It has a 4-5% gross output advantage in the North compared with other resistant varieties and a score of 6.2 for light leaf spot.

LSPB rates it moderate for vigour in autumn and early spring, best sown early, although early drilled crops can exacerbate clubroot. Crome is

Crome and Croozer at a glance

	Crome	Croozer
Scope of recommendation	UK	E/W
Gross output (% treated control)		
UK	99	-
North region	99	-
East/West region	101	98
Agronomic features (1-9, where 9 is high)		
Resistance to lodging	8.0	7.8
Stem stiffness	8.2	8.0
Earliness of flowering	6.8	8.0
Earliness of maturity	5.1	5.5
Light leaf spot resistance	6.2	5.7
Stem canker resistance	3.5	8.2

Source: AHDB Recommended List Winter oilseed rape 2022/23.



Clubroot likes an acidic soil, which is a reason why the disease is common in Scotland, where soil pH can naturally drop to around 5-5.5.

relatively early to flower with good stem stiffness, but is relative late to mature. The variety is noted not only for its yield, but the consistency with which it performs, with a relative high oil content.

Croozer is better suited to growers in southern England, with a respectable yield, *Rlm 7* phoma resistance and a strong score for LLS, according to the RL. It has the edge on autumn vigour over Crome, with a stiff stem and is earlier both to flower and mature.

What's in the pipeline for growers?

LSPB is bringing forward a variety for UK growers that has both clubroot and turnip yellows virus (TuYV) resistance. Currently in its second year of National List trials, it's indicating a 5% yield lift when compared with Crome on comparable sites. Following this are two promising-looking varieties with *Rlm 7* phoma

resistance, along with clubroot and TuYV.

Breeders are working on other sources of clubroot resistance, as well as bolstering background tolerance so that varieties are not so dependent on the Mendel genetics. But these advances are at least five years from growers' fields.

Advances in precision farming hold promise to deliver better management. If clubroot patches are accurately mapped, the technology is now available that can plant different varieties into infected and non-infected zones.

SRUC has also been investigating the use of elicitors encapsulated into seed dressings that "switch on" host-plant defences against clubroot. One interesting twist here is that the daughter crop of plants that use this response to battle the disease develop with an in-built heightened tolerance to clubroot. ■

Sponsor message:

LSPB varieties have led the way in bringing clubroot resistance to UK oilseed rape growers. The latest AHDB RL for 2022/23 features two restored hybrid varieties with a Specific Recommendation (Sp) for growing on land infected with clubroot.

Crome has a UK Recommendation with a high gross output, is early flowering with a high yield, good stem stiffness and resistance to lodging.

Croozer has a Recommendation

for the E/W region with a high gross output, is early maturing with a high oil content and yield, and *Rlm 7* phoma resistance conferring very good resistance to Stem canker.

Next in line, and in second year of NL trials, is an LSPB variety with both clubroot and TuYV resistance — and a continuous pipeline of clubroot-resistant varieties featuring multiple traits, as this sector remains a key priority in our breeding programmes..

RESISTANCE IS IN THE GENES

- High seed yield combined with high oil content
- *RlmS* gene provides excellent Phoma resistance
- Good stem stiffness and resistance to lodging
- Featuring TuYV resistance

