Managing clubroot in oilseed rape

Clubroot in oilseed rape

Clubroot is an increasing problem in oilseed rape crops and has been exacerbated by close rotations. The galls on roots formed by the clubroot pathogen, *Plasmodiophora brassicae*, affect normal root function and reduce the uptake of water and nutrients such that even low levels can reduce yield. Large root galls on the taproot (Figure 1) will commonly break down with secondary rots so that root function is seriously impaired. Plants can wilt in hot, dry weather, be very stunted or can be lost completely.

Risk factors

Clubroot persists in soils for at least 15 years as thick-walled resting spores which germinate in the presence of host crops and weeds in the Cruciferous family and infect via mobile swimming spores. It is spread via water movement in soil and through inadvertent soil transfer on machinery. It can also be spread onto clean land through the dumping of infected vegetables, for example swedes, or in manure from animals fed on infected produce.

Clubroot is widely distributed throughout the UK and has been found in all regions but is more prevalent in Scotland and western regions with a history of mixed farming and high rainfall. It is particularly prevalent in short rotations of oilseed rape.

The disease is worse in acidic soils and is more severe in warm wet autumns and springs as clubroot development ceases below 15°C. Climate change predictions of warmer temperatures mean that disease pressure is likely to increase. Increased numbers of flooding events will also accelerate spread.

Yield losses

Yield loss correlates with clubroot severity and in the recent HGCA clubroot project (Project Report 487) equated to 0.03 t/ha per 1% of plants infected (Figure 2). Losses can, therefore, exceed 50% of yield potential in affected crops and management strategies are required for affected fields. In severe autumn infections plant losses can be so high that the crop has to be abandoned.

\[
y = -0.0292x + 3.6568 \\
R^2 = 0.2371
\]

Figure 2 Yield losses to clubroot in field trials (P = 0.001). Clubroot is given as a weighted index where 1 = slight, 2 = moderate and 3 = severely infected. If every plant were infected to a severe level (3), this would be shown as 100%.

R² is a measure of how much of the variation in yield from site to site could be explained by the level of clubroot (R²=1 would be 100% of the variation explained).
Rotation

Lengthening rotations is the most sustainable long-term strategy for managing clubroot, as both soil amendments and varietal control can be inconsistent. Vegetable brassicas are susceptible and so do not act as a break crop. Cruciferous weeds will also carry infection and reduce the benefits of true break crops like cereals, potatoes or legumes. Rotations of longer than one year in five are likely to be helpful. Annual crop choices are often driven by commodity pricing but thinking longer term about plans for fields and balancing the benefits of longer rotations in infected fields against short rotations with high yield losses may be beneficial.

Soil pH

Clubroot severity is linked to soil pH and crops in acid soils are more at risk of severe symptom development. Although the clubroot pathogen is highly resilient and will survive and infect even at high soil pH levels, soil amendments that raise the pH and calcium content of soils can be effective. A spike in pH and available calcium at drilling has been shown to reduce clubroot infection. A neutral or alkaline pH (ie 7+) will be most effective in reducing clubroot in oilseed rape and vegetable crops, but consider the wider rotation when raising pH over 6.5 as following cereal and potato crops can suffer from nutrient deficiencies.

Field trials in a recent HGCA project where LimeX70 (calcium carbonate) was applied just before drilling at 4-8 t/ha gave average control of 25%, with modest yield benefits. Control across sites was variable, however, from 0 to 90%. The reason for this variability was not clear, but poor control was noted at very severely infested sites and clubroot levels are very high. Not all forms of lime are equal and finely ground forms have been shown to be more effective.

Yield benefits were sometimes cost-effective in the trial series but, even where there is no immediate cost-benefit, liming should be considered as part of a long-term strategy for reducing clubroot build-up in affected fields.

Resistant varieties

The resistant varieties Mendel (Figure 3) and Cracker offer good control (often greater than 95%) in most areas of the UK and gave more consistent trial results than soil amendments, apart from at sites where they had already been repeatedly used in previous rotations.

Trials have shown that varietal resistance to clubroot is under pressure in some areas of the UK, particularly in the north east of Scotland, and has broken down in areas where it has been commonly used. Mendel and Cracker share the same resistance mechanism and, in successive crops, strains of clubroot that can overcome the resistance mechanism can build up. Over-reliance on resistant varieties in short rotations will increase this risk and should therefore be avoided.

(Note: There is a potential yield penalty associated with Mendel and Cracker in the absence of clubroot compared with some other varieties.)

Figure 3 Resistant oilseed rape variety Mendel (background) and susceptible variety Kommando (foreground).

Overview

- Clubroot is widespread in the UK.
- Yield losses in affected crops can exceed 50%.
- Clubroot risk is increased by short rotations, flooding, early sowing and warmer, wetter autumns and springs.
- Lengthening rotations remains the most sustainable long-term strategy on-farm.
- Varietal resistance gives good control at most sites but is often poor at sites where resistant varieties have been commonly used previously.
- Soil amendments that raise soil pH and calcium content can reduce disease severity.

Further information

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Clubroot testing is carried out at Fera and SAC:
www.fera.defra.gov.uk/plants/plantClinic
www.sac.ac.uk/crops
www.hgca.com/diseasecontrol
www.hgca.com/varieties
www.hgca.com/publications

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