Aphanomyces Root Rot in the UK

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Why grow peas?

• Pulses in general are economically valuable, contributing to farm profitability, and the food supply chain

• Contribute to sustainable intensification

• Do not require organic nitrogen fertiliser, help reduce greenhouse gas emissions from agriculture and are a low carbon source of protein

• Provide residual nitrogen for the following crop
Issues affecting pea production in UK

• Increasing volatility of UK weather patterns – Peas are highly affected by both dry and wet spells of weather

• Crop protection against viral and fungal diseases, and insect pests

• Soil health and soil borne diseases

• The growing threat of *Aphanomyces euteiches* in the UK
Aphanomyces euteiches

- *Aphanomyces* root rot, caused by *Aphanomyces euteiches* is one of the most damaging diseases of pea (*Pisum sativum*)

- Host range includes dry bean, field pea, lentil, faba bean, and various forage legumes

- Oomycete and a strict soil borne pathogen surviving as oospores, for up to 10 years in the soil. It completes its entire lifecycle in the host roots and surrounding soil.
Aphanomyces euteiches

- The disease is spread through the movement of infected plant material and infected soil by heavy machinery
- The pathogen favours high soil moisture content and poor drainage
- Favours heavy clay soils of between 35% and 40%
- High degrees of compactness will also enhance the development of A. euteiches
- Results in reductions in pod weight and seed numbers
- Yield losses due to infection range from 42% to 86%
Symptoms

• Peas are susceptible at any point in their development and life-cycle, and infection can develop anywhere from the roots to the epicotyl.

• The disease becomes apparent roughly 3 to 4 days after the infection has taken place, especially if the soil moisture is high.

• These lesions spread rapidly, resulting in a honey/straw coloured root system.

• Leading to stunted growth, wilting symptoms and chlorosis of the leaves, leaving a patchwork of yellow crops across the field.
Disease Management

• To date there is no effective fungicides nor fully resistant pea

• *A. euteiches* may also maintain on alternative hosts, such as weeds and pasture legumes

• Currently only cultural methods of control to exist such as crop rotations – These rotations should be long 6-8 years

• The use of bioassays to detect any potential inoculum in the soil
1\textsuperscript{st} Aim

• Development of a molecular detection method – faster turn around, higher throughput, potentially less false negative
2\textsuperscript{nd} Aim

• Determine the distribution of \textit{A. euteiches} across the pea growing regions of the UK
Baiting Experiment

• Germinated peas were baited using soil collected from 68 different field locations across the pea growing region

• Peas are left in soil for between 2-9 days

• Peas were visually scored (scale of 0 – 5) and the presence/absence of oospores was determined
In total, 68 fields were sampled over 2 seasons.

*A. euteiches* was found in over 60% of fields sampled.

The results shown here indicate that *A. euteiches* has spread across all pea growing regions of the United Kingdom.

The distribution of *A. euteiches* across a 600 km growing region may indicate that it has been present in soils for several years.

This preliminary result indicates that *A. euteiches* is present in commercial field pea crops in the UK and is not restricted to fields with a history of frequent field pea cultivation.

Red markers fields in which peas should not be grown for at least 10 years.
• One of the biggest factors affecting the build-up of *A. euteiches* inoculum levels within a given field is the cropping history of the field, more importantly, the number of pea crops in recent history.

• With every pea crop in a rotation, the chances of *Aphanomyces* root rot infection increases
Current Research – Targeted Approach

• A further 17 field sites across the UK

• Sampled from fields pre-drilling and during flowering

• Comparing areas with high disease burden and low

• Comparing; compaction, water content, disease score, weather data, particle analysis
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