



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

CP 099a

Validation of the clubroot lateral
flow in UK commercial Brassica
cropping systems

Annual 2014

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Project Number:	CP 099a
Project Title:	Validation of the clubroot lateral flow in UK commercial Brassica cropping systems
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Contractor/(s):	University of Worcester
Industry Representative:	Andy Richardson
Report:	Annual Report, April 2014
Publication Date:	5 June 2014
Previous report/(s):	None
Start Date:	1 April 2013
End Date:	31 March 2015
HDC Cost (Total cost):	£66,962

Further information

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GROWER SUMMARY

Headline

- Laboratory and field-based tests have been developed to investigate the level of risk from clubroot.
- Improved methodology has reduced processing times and sample accuracy.

Background and Summary

Brassica crops are of high economic importance in the United Kingdom. One of the main diseases affecting Brassica crops is Clubroot, caused by the soil borne organism *Plasmodiophora brassicae*. Mild clubroot infections lead to slowed growth and delayed harvesting. Severe infections result in total crop failure. Infection is easily recognisable by swelling of root tissue causing galls and club shaped structures. Clubroot resting spores are capable of inducing disease in vegetable Brassica crops years after initial infestation of the soil.

Once soil has been contaminated clubroot spores can remain viable for up to 18 years. In the UK, growers of horticultural crops frequently rent land on a yearly basis, often with limited knowledge of previous cropping histories. The capability to forecast clubroot disease risk would be beneficial prior to contractual agreements made. The concentration of infestation of the soil by clubroot resting spores has been shown to directly affect the degree of clubroot infection. Resting spore concentrations in excess of 100,000 spores per gram of soil have been reported for severe and uniform disease expression on bait plants (Buczacki & Ockendon, 1978). Additional factors such as the conducive or suppressive nature of the soil may also influence the concentration required (Rouxel *et al.*, 1988). The prevailing environmental conditions during key periods of the cropping period will also prove important in the risk and severity of the crop to clubroot disease development.

As the pathogen only grows within living tissues it is not possible to use standard dilution plating techniques to quantify numbers of pathogenic propagules within soil samples. Traditionally the use of bait plants grown under optimal disease conditions is required to assess potential risk of the disease in soils. This process has proved expensive and is carried out over a six to eight week period for disease to be visible on exposed plants. With the development of new detection methods based on molecular approaches the presence or absence of clubroot can be determined quickly in most soil samples. These tests are

laboratory based and require a high degree of precision by the operator. However a competitive lateral flow device (lab on a stick / in-field test) has been developed and evaluated for use in UK commercial soils for the detection of clubroot resting spores. The device has been used by growers to detect clubroot spores within 10 minutes at epidemiological significant levels in artificially infested soils.

The lateral flow device has the potential to be used in soil by field growers and in water based systems such as reservoirs and irrigation lines (vegetable brassica propagators). A quantitative measurement of clubroot resting spore infestation can be made using the lateral flow test device when used in conjunction with a lateral flow reader and standard curve data. This means that a prediction on whether the crop is at risk may be determined and, at what level i.e low, medium or high risk.

Determining the clubroot resting spore number in soils using either a molecular or lateral flow test is an essential component in the development of an integrated disease management programme. Currently only two chemicals (cyazofamid – Ranman and fluazinam – Shirlan) approved for control of disease in potato crops have been demonstrated to have any potential for controlling clubroot in the field. However both these chemicals do not hold approval for clubroot control in vegetable Brassicas as their efficacy against clubroot has not yet been demonstrated. However Limex, a by-product of the British sugar industry (www.limex.co.uk) was found in HDC FV 349 to reduce the effect of clubroot infestation in soils on Brassica crop production over three consecutive years of the project. An application rate of Limex at or above 10 tons Limex ha⁻¹ was found to be optimal in reducing clubroot disease.

The deliverables from this project are:

- Field mapping of clubroot resting spore distribution.
- Quick and cheaper testing of soils prior to planting the crop.
- Increased soil volumes assessed
- A choice of test formats (laboratory or 'do it yourself') and / or combination of both.
- Evaluation of test formats UK wide in different soil types for commercial uptake in 2015

Financial Benefits

- The usage of the detection tests for risk assessment of clubroot will improve the control of this pathogen.
- Knowledge of resting spore concentration in soils will provide cultivators with information on optimal crop rotation patterns, varietal selections and appropriate control measures to prevent yield loss.

Action Points

Specific action points for growers at this stage in the project include:

- HDC levy payers can as part of this project have their soils tested for clubroot disease inoculum concentration. Contact a.wakeham@worc.ac.uk