Horticultural Development Company

Grower summary

FV 349

Brassicas: further development of “in field” tests for resting spores of clubroot and the development of clubroot control based on detection.

Annual Report 2010

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The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

Limex applied at 7.5 – 10 tonnes Limex/ha controlled clubroot in broccoli crops planted on heavily infected land and resulted in higher levels of marketable yield.

Background and expected deliverables

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 the swelling of the root tissue causing galls and club shaped structures. Clubroot resting spores are capable of inducing disease in vegetable Brassica crops years after initial infestation.

Once the soil has been contaminated, clubroot spores remain viable for up to 18 years. In the past, information on whether clubroot is present or absent in the soil has been difficult to obtain because the traditional methods cannot detect low levels of clubroot in soils. These methods were based on using the reaction of bait plants. However, large numbers of plants were required in these tests if small amounts of clubroot were to be detected. With the development of new detection methods based on molecular approaches, the presence or absence of clubroot can be determined 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 for rapid testing and detection of clubroot resting spores in the field has been developed. The device was clearly able to detect clubroot spores at close to epidemiological significant levels (10,000 spores/gram of soil). The device can be optimised for use in soil (for field growers) and in water based systems such as reservoirs and irrigation lines (for vegetable Brassica propagators). The accuracy of the test device can be increased if used in conjunction with a lateral flow reader device. This means that it could detect clubroot at very low levels.

Determining the number of clubroot resting spores in a soil test (either molecular or lateral flow based detection) would be an essential component if control regimes for clubroot were to be successfully developed. Cyazofamid (Ranman) and fluazinam (Shirlan) which are approved for disease control in potato crops have been demonstrated to have some potential for controlling clubroot in the field. However, neither are currently approved for clubroot control in vegetable Brassicas as their efficacy has not yet been demonstrated. Alternative control measures are still urgently needed.

The expected deliverables from this project are:

- Better detection of clubroot in the field before planting the crop.
- Detection tests which can be used “in field” to determine the level of risk to the vegetable Brassica crop posed by clubroot.
- Investigation of alternative products for clubroot control in the field.
- Investigation of the economics of Brassica production under different levels of clubroot risk.

Summary of the project and main conclusions

Year One

Detection Tests

A competitive lateral flow has been reconstituted which can determine resting spore numbers in the liquid phase. Visual discrimination is limited to determining resting spore presence when in excess of 10,000 resting spores/ml. Quantitative measurement of resting spore numbers is possible using an electronic reader, in conjunction with a standard curve. However, the current test is limited by the instability of the test line antigen. This means that the test results could change depending on when the tests were used. Studies currently in progress are looking to resolve this problem. The development of an alternative protocol for the test which incorporates a *P. brassicae* polyclonal antibody (PAb) at the test line has enabled a detection sensitivity comparable to that observed with the competitive lateral flow. However, in the soil, this approach has yet to prove effective. An innovative procedure to extract resting spores directly from soil is currently being investigated and incorporated within the lateral flow system to allow soil analysis to be carried out in the field.

Field Trials for Clubroot Control

The results of field trials at Crail (East of Scotland Growers) in 2009 demonstrated that Limex can be used to control clubroot in heavily infested land while maintaining marketable yields of broccoli crops. This was because the plots treated with Limex reduced the clubroot gall formation compared with the untreated plots. The optimum application rate was observed between 7.5 – 10 tonnes of Limex/ha (Figure 1) although this would need to be confirmed in additional trials located in other production areas.

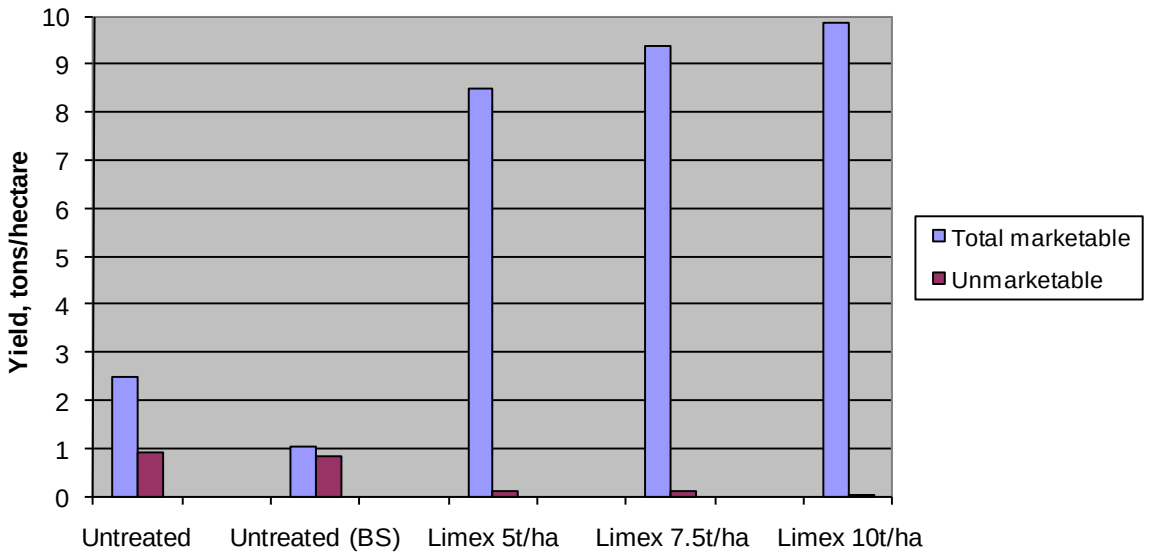

Figure 1: Marketable yield of broccoli grown in heavily clubroot infested soil at Crail 2009 treated with Limex

However, there was no effect of Limex on clubroot resting spore content of plots in comparison to untreated plots. Clubroot numbers in all plots decreased after transplanting before increasing towards the end of the growing season at harvest. The results suggest that the clubroot could possibly be migrating between plots. Limex treated plots had higher amounts of clubroot present during November 2009 (end of the trial period) in comparison to untreated control plots. Overall, the clubroot content in the plots increased over time from the time of planting to the time of harvest in October/November 2009.

Anticipated practical and financial benefit

- The use of the detection tests for risk assessment for clubroot will improve the control of this pathogen.
- More information will be available on the appropriate timing and rate of Limex for clubroot control with different planting dates and in different soils in the next year of the project.

Action points for growers

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

- Growers can use laboratory molecular tests for clubroot to determine the initial risk from the pathogen in fields until the “on site” test is available.
- Limex can be used to control clubroot in affected land. However, it will not reduce clubroot risk in subsequent seasons.
- The optimum level of Limex required for clubroot control appears to be 7.5 – 10 tonnes of Limex/ha.