



Agriculture & Horticulture
DEVELOPMENT BOARD



New Project

SF 135

Genetics of resistance to *Verticillium*
wilt in strawberry

Project Number: SF 135

Project Title: Genetics of resistance to *Verticillium* wilt in strawberry

Project Leader: Dr David Simpson

Contractor: East Malling Research

Industry Representative: John Clark

Start Date: 01 April 2012

End Date: 31 March 2014

Project Cost: £69,111

Subject to Contract

Project Summary:

Verticillium wilt is a serious soil-borne disease of strawberry that is most commonly controlled by soil sterilisation using chloropicrin. It is unlikely that this approach will be sustainable in the long term and varieties with genetic resistance to wilt will become increasingly important. This project aims to develop a marker-assisted breeding strategy for resistance to wilt by exploiting the findings of a BBSRC project that will be completed at EMR on 30 September 2011.

Markers identified in this earlier project will be validated by testing them in a wide range of varieties and breeding lines currently being used by the EMR Strawberry Breeding Club. This will enable multiple resistance genes to be combined to achieve varieties with robust and durable resistance in the future. Existing varieties showing field resistance will also be classified. The relative importance of resistance and tolerance to wilt will also be studied using a protocol developed in the BBSRC project to quantify the pathogen DNA in strawberry plant tissue. It is important to distinguish these and establish their genetic control since varieties that combine resistance and tolerance are likely to be very robust.

Aims & Objectives:

(i) Project aim(s):

- To validate molecular markers for resistance to *Verticillium dahliae* in strawberry
- To distinguish between resistance and tolerance to *V. dahliae* and investigate the genetic control of these two traits

(ii) Project objective(s):

- Screen 96 strawberry genotypes for presence of molecular markers for resistance to *V. dahliae*. This to comprise selections and breeding lines currently in use or under evaluation by the Strawberry Breeding Club
- Screen 24 modern commercial strawberry cultivars for presence of molecular markers for resistance to *V. dahliae*
- Screen 48 accessions from the EMR strawberry germplasm collection for presence of molecular markers for resistance to *V. dahliae*. This to include a range of old cultivars, breeding lines and wild species accessions
- Conduct two glasshouse experiments on a subset of a mapping progeny (Red Gauntlet x Hapil) where the progress and growth of the pathogen within plant tissues is monitored using quantitative PCR
- Determine if resistance and tolerance to *V. dahliae* can be distinguished and whether each is under independent genetic control

Benefits to industry

Wilt, caused by *Verticillium dahliae*, is a widespread soil-borne disease of strawberry that has many alternative hosts. Control can only be achieved by pre-planting soil sterilisation but the most effective fumigant, methyl bromide, is no longer available. Chloropicrin is a useful alternative chemical that is now in widespread use but it is unlikely that this will continue to remain available in the long term. Other treatments, such as Basamid, metham sodium and formalin, are less effective. Many of the currently popular varieties are very susceptible to wilt but in future there is likely to be an increased requirement for resistant varieties that can be incorporated into an integrated control strategy, probably also involving biofumigation.

The HDC holds two membership shares in the Strawberry Breeding Club, which includes breeding for wilt resistance among its objectives. EMR has recently released some resistant varieties, including Fenella and Cupid, but these were developed using an empirical approach based on observation of symptoms in field experiments.

A recent EMR project funded by BBSRC has resulted in the identification of markers for three resistance genes. If these markers can be shown to be widely applicable then they will be used for marker assisted breeding, which will facilitate the development of varieties with stronger and more durable resistance. This can be achieved by using strategies to combine multiple resistance genes in the same variety. Such varieties will be very valuable to the industry in the future and those developed by the Strawberry Breeding Club will be available to all growers, with no proprietary restrictions on access. In addition to using the markers for future breeding, they will also be used to classify existing varieties and advanced selections that show field resistance to wilt. This will inform growers as to which varieties are likely to have the strongest and most durable resistance.

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