COmponents of Resistance to DISeases in winter Oilseed Rape: CORDISOR

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Introduction

The CORDISOR project is funded by the UK government department for the environment, food and rural affairs (Defra) under their Sustainable Arable LINK programme, with added industrial funding (see below), and aims to investigate components of resistance to diseases in winter oilseed rape. The four-year schedule of research, which started in April 2004, is focussed on producing new methods to improve classification of cultivar resistance in oilseed rape. The project will concentrate on resistance to the two main diseases of winter oilseed rape in the UK; phoma stem canker (blackleg), caused by *Leptosphaeria maculans*, and light leaf spot, caused by *Pyrenopeziza brassicae*.

Figure 1: Phoma stem canker symptoms approximately one month before harvest (left), light leaf spot symptoms on leaf tissue (right)

Phoma stem canker (Fig. 1 left) is considered to be a monocyclic disease (one cycle of infection per season) under UK conditions, arising from a long period of ascospore release over the autumn and winter (West *et al.*, 2001; 2002). Consequently the cultivar resistance ratings currently used to advise UK growers about resistance of cultivars to stem canker are based on observations of visible disease at the end of the growing season. In contrast, resistance ratings for light leaf spot (Fig. 1 right) are based on assessments made throughout the growing season because the disease is polycyclic (Gilles *et al.*, 2000; 2001). Recommended lists produced by the UK Home-Grown Cereals Authority (HGCA) and independently managed by Crop Evaluation Limited

(CEL) are based on information from trials throughout the UK. These include inoculated trials where the environment is manipulated, when necessary, to ensure infection and epidemic progress occurs. However, the resulting disease resistance rating takes into account all forms of disease "resistance", including race specific monogenic and unspecific polygenic resistances plus disease escape due to plant morphology, within a growing season. Therefore, the current resistance ratings cannot explain the relative importance of disease resistances at different stages of disease development or expressed in different tissues of the crop plant – information which is valuable for breeding new varieties with enhanced disease resistance and reduced reliance on fungicides for disease control.

Approach and Methods

A set of 20 oilseed rape cultivars with a diverse range in susceptibility or resistance to *L. maculans* and *P. brassicae* will be used in this project. Studies of natural infection and disease progress on the cultivars will be made in replicated plots at numerous field-sites throughout the UK. This will be supported with detailed investigations of disease development following artificial inoculation by scientists at specific times of the year. In both cases, records of visible disease symptoms (in the field and after a short period of incubation) will be compared with plant tissue samples analysed by real-time PCR to detect and quantify the presence of fungal pathogens in the tissues.

Prospects

The project should bring such benefits to industry, science and the environment as:-

(1) Novel real time PCR-based methods to identify components of resistance stem canker and light leaf spot will improve understanding of the basis of resistance to diseases of winter-sown arable crops.

(2) More efficient methods for assessing resistance to *L. maculans* and *P. brassicae* to decrease costs of identifying resistant cultivars will benefit Defra and the Scottish Executive Environment and Rural Affairs Department (SEERAD), who orgainse National List (NL) trials, plus the HGCA-produced UK recommended list of cultivars. Plant breeders will benefit through more efficient selection of resistant breeding lines. In total, the financial benefits are estimated at £0.5M per season. New methods will be tested directly by breeders and RL and NL contractors during the course of the project.

(3) Benefits to growers include increased gross outputs from improved cultivars recommendations; optimised fungicide use from better disease risk assessments; decreased management time (estimated benefits £10/ha on 500000 ha = £5M per season).

(4) Ultimately the public and environment will also benefit, as exploitation of improved knowledge of disease resistance will decrease reliance on chemical control in winter oilseed rape.

Sponsors and collaborating organisations

The project is sponsored by Defra under the Sustainable Arable LINK programme. Additionally, contributing industrial partners are: HGCA, CPB-Twyford, Nickerson UK Ltd, Elsoms Seeds, Syngenta Seeds, Monsanto, and Saaten Union UK Ltd.

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