Grower Summary

FV 422

Improved management of light leaf spot in brassicas by exploiting resistance and understanding pathogen variation

Annual 2015

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Date project commenced:	[30 June 2013]
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GROWER SUMMARY

Headline

This project focuses on the determination of the population structure of the causal agent of light leaf spot, *Pyrenopeziza brassicae*. It will be determined whether the same *P. brassicae* strains can infect both, oilseed rape and vegetables. Gene-for-gene interactions between pathogen strains and plant cultivars will be studied.

Background

Light leaf spot, caused by the fungal pathogen *Pyrenopeziza brassicae*, is currently the major disease problem in oilseed rape (*Brassica napus* L.) production in the UK and also affects vegetable brassicas such as cabbage, cauliflower and Brussels sprouts. The disease was considered a problem in Scotland and North England but has substantially increased importance in all parts of England over the last decade. Due to the polycyclic (fulfils its life cycle more than once in a cropping season) nature of the disease, the pathogen has the potential to adapt to an environment (McDonald & Linde, 2002). Effective control of light leaf spot to reduce yield and economic losses is difficult to achieve. Fungicide control of the disease in crops is difficult since fungicides must be applied when the pathogen is growing asymptomatically (without visible symptoms) in plant tissues (Figueroa *et al*. 1994). Additionally, decreased sensitivity to azole fungicides has been reported (Carter *et al*. 2013). Exploiting plant resistance against the pathogen could help control the disease but current commercial oilseed rape cultivars show poor resistance and more information on resistance of vegetable cultivars would be beneficial. Although light leaf spot affects vegetables and oilseed rape it is not yet clear if the same strains of the pathogen can infect both or are specific to a crop. The potential spread between host species may have an influence on epidemics of the disease.

Summary

The aim of the project is to identify the pathogen population structure, to determine if the same strains are able to infect oilseed rape and other brassicas, and to gain a better understanding of the plant-pathogen interactions. This project will support breeders with regard to breeding better light leaf spot resistance into cultivars and therefore, give farmers and growers better material to choose from in the long term.

In the 2013/14 and 2014/15 oilseed rape cropping seasons, four field trials were established across the UK to distinguish potential differences in the *P. brassicae* population structure between locations. The oilseed rape cultivars have shown varying performance at different locations, which suggested the presence of different pathogen populations at the different locations. Selected oilseed rape cultivars were also tested with *P. brassicae* populations under controlled environment conditions. Interactions between cultivars and pathogen populations were identified and differences between populations from different locations recorded. These findings indicate that the pathogen forms races and may interact in a gene-for-gene manner with cultivars.

Furthermore, cross-infection experiments were done to determine if *P. brassicae* isolates originated from oilseed rape are able to infect Brussels sprouts and other vegetable brassicas (cabbage, broccoli, cauliflower and romanesco) and vice versa. All tested species, oilseed rape and vegetables, showed light leaf spot symptoms for *P. brassicae* populations from oilseed rape and Brussels sprouts. Brussels sprouts were less susceptible to light leaf spot than oilseed rape, broccoli and cabbage (Figure 1, Figure 2). This could be due to thickness of waxy layer of the host plant, other structural differences or secondary metabolites (e.g. higher glucosinolates). More Brussels sprouts cultivars should be tested to confirm the result. Nevertheless, cross-infections are generally possible. With the presented experiments it cannot be excluded that there are *P. brassicae* isolates that are limited to only one or a few hosts.

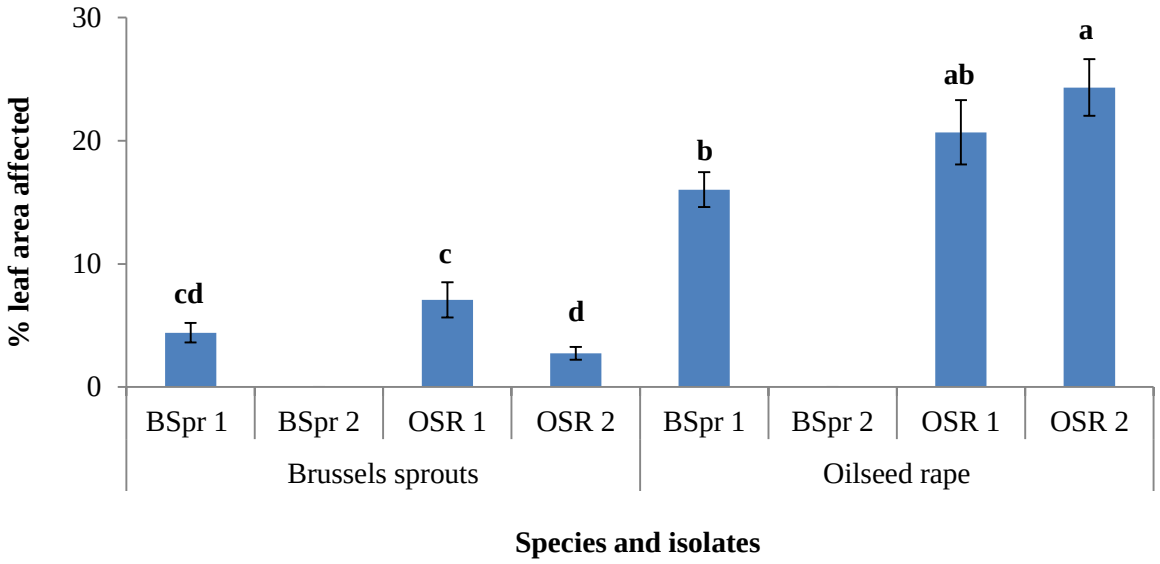

Figure 1. Light leaf spot severity (in % leaf area affected) of Brussels sprouts and oilseed rape with populations of *Pyrenopeziza brassicae*

Populations are originated from Brussels sprouts (BSpr 1, BSpr 2) and oilseed rape (OSR 1, OSR 2). The inoculation with *P. brassicae* population BSpr2 failed. Bars show mean and standard error. Different letters indicate significant differences at α=0.05.

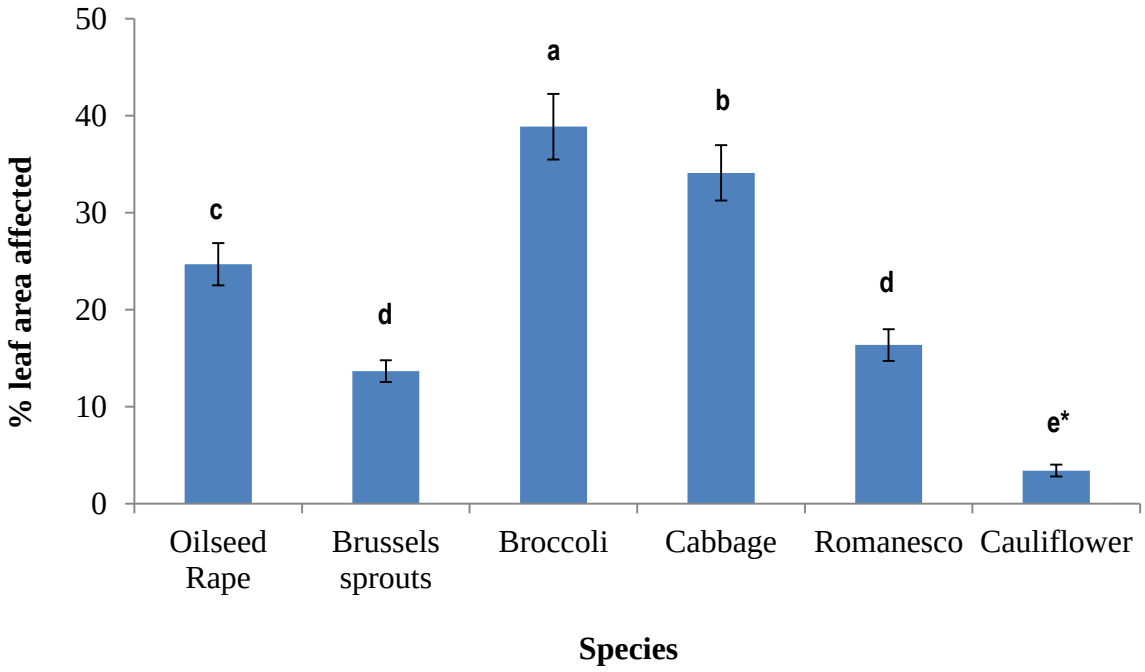

Figure 2. Light leaf spot severity (in % leaf area affected) of different Brassica species with populations of *Pyrenopeziza brassicae*

Bars show mean and standard error. Different letters indicate significant differences at α=0.05. *Result of cauliflower not comparable due to extensive loss of infected leaves

Future work for the determination of the *P. brassicae* population structure includes sequencing of a *P. brassicae* strain, the development of microsatellite (SSR) markers and *in planta* testing of oilseed rape and Brussels sprouts cultivars to study potential gene-for-gene interactions with the pathogen.