Effects of plant age and inoculum concentration on light leaf spot disease phenotypes on oilseed rape

Sapelli, L.[1], Karandeni Dewage, C. S.[1], Ritchie, F.[2], Fitt, B. D. L.[1], Huang, Y. J.[1]
[1] School of Life and Medical Sciences, University of Hertfordshire, UK [2] ADAS Boxworth, Cambridge, UK

Introduction

Oilseed rape (*Brassica napus*) is the second most produced oilseed in the world and the third most important arable crop in the UK.

Light leaf spot, caused by the fungal pathogen *Pyrenopeziza brassicae*, is the most economically damaging disease of winter oilseed rape in the UK. Disease control is challenging because it is a polycyclic disease, with epidemics starting in autumn by ascospores. Subsequently, conidia produced through asexual sporulation on infected leaves cause secondary infections on all aerial parts of the plant (Fig. 1).

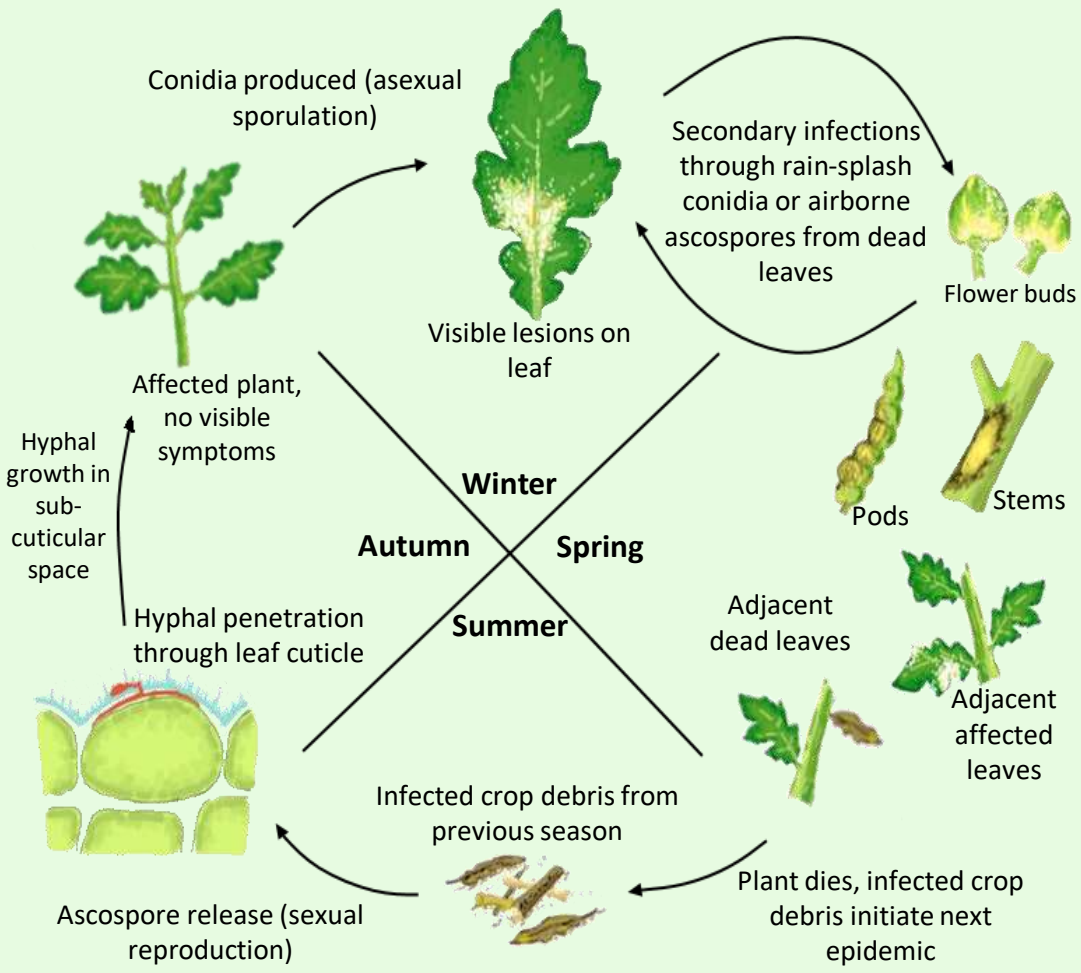

Figure 1: *Pyrenopeziza brassicae* (light leaf spot) life cycle.

Current disease control mainly relies on fungicides; however, insensitivity development highlights the need for non-chemical controls like host resistance. However, host resistance against *P. brassicae* is poorly understood. The aim of this project is to improve our current knowledge by researching virulent races in pathogen populations, identifying candidate resistance genes and investigating mechanisms of host resistance.

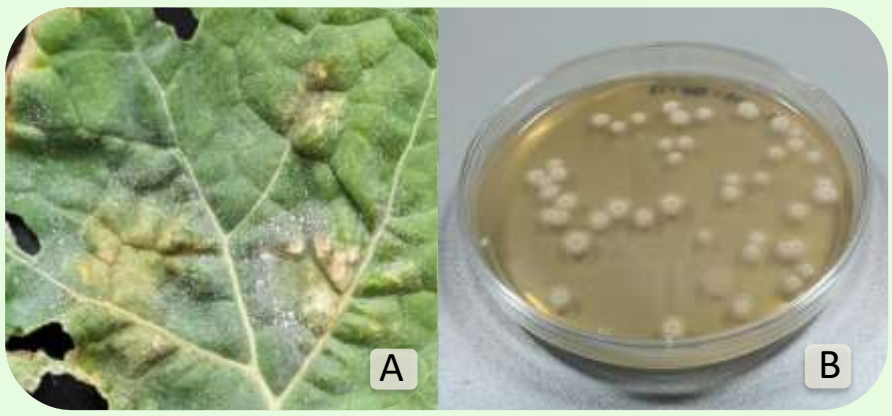

Figure 2: Leaf of oilseed rape cv Charger with light leaf spot (white *P. brassicae* acervuli containing conidia) (A). Single conidial colonies derived from the same acervulus grown on a malt extract agar plate (B).

Results

- Plants that received higher inoculum concentration (10^5 spores/ml) developed more severe disease (Fig. 3) and were significantly shorter by up to 5 cm than those with the lower inoculum concentration (10^4 spores/ml) (Fig. 4).

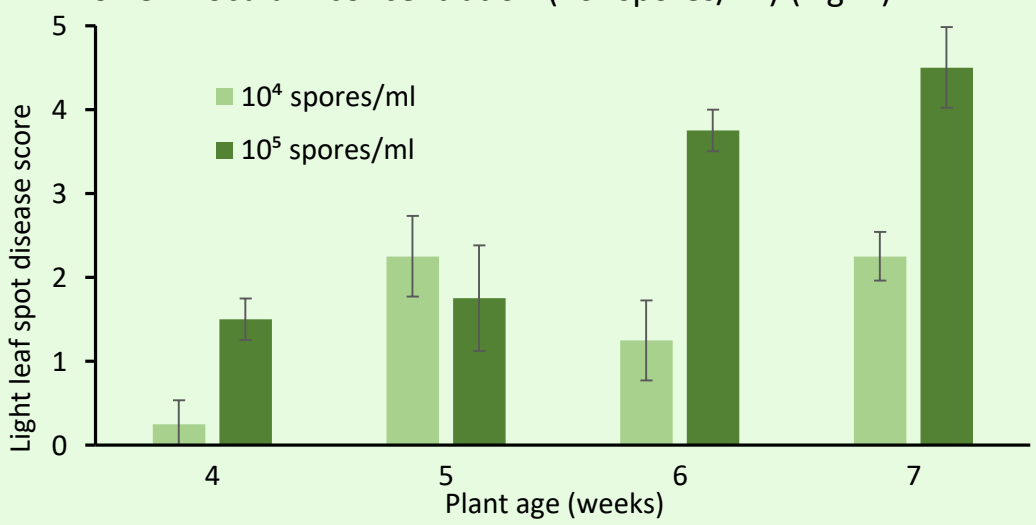

Figure 3: Disease scores on plants inoculated with different inoculum concentrations at different growth stages. Error bars are standard error of the mean.

Figure 4: Comparison of the height of plants that received 10^4 spores/ml (1) or 10^5 spores/ml (2) inoculation at 21 dpi.

- Over 25 *P. brassicae* isolates from the 2021 season were obtained from oilseed rape and kale cultivars across England. Another 60 isolates from continental Europe were obtained through Rothamsted Research.

Materials and Methods

- Plants of cultivar Charger at different ages (1, 2, 3, 4 weeks old) were inoculated with different concentrations (10^4 and 10^5 spores/ml) of *P. brassicae* conidia in controlled environment. Severity of light leaf spot and plant height were assessed at 21 days post-inoculation (i.e. when plants were 4, 5, 6, 7 weeks old).

- Leaves with light leaf spot symptoms were sampled from oilseed rape crops and *P. brassicae* isolates were obtained by single-spore isolation (Fig. 2).

Conclusions and Discussion

- Higher inoculum concentration produced higher disease severity and significantly reduced the height of plants, suggesting a possible correlation between inoculum concentration and plant growth. This is the first record of growth stunting observed in controlled conditions. There is a need of further investigation to test this hypothesis.

- The isolates obtained from different cultivars and different regions in England and Europe will be tested for virulence to understand *P. brassicae* population structure.

Acknowledgements

This work is part of a four-year HKEP (Hertfordshire Knowledge Exchange Partnership) funded PhD project at the University of Hertfordshire in collaboration with the Perry Foundation and the industrial partner ADAS.

Email: l.sapelli@herts.ac.uk