

**Air mass trajectories and land cover map
reveal cereal crops as major local sources of
Alternaria spores in Worcester & Leicester,
UK**

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Introduction

- *Aim*: To understand the relative contribution of local sources versus long distance transport to *Alternaria* spore concentrations
- *Alternaria* is a known plant pathogen. Approx. 300 species identified, causing diseases to nearly 400 plant species and can reduce crop yield up to 80%.
- *Alternaria spores* are well known allergens of humans.
- Rotational crops previously identified as source of airborne *Alternaria* spores in Worcester and Leicester, UK¹
- A SW wind direction has been associated with high spore counts²

1. Skjoth et al, 2016. *Aerobiologia* , 32, 3-22

2. O'Connor et al, 2014. *Aerobiologia*, 30, 397-411

Methods

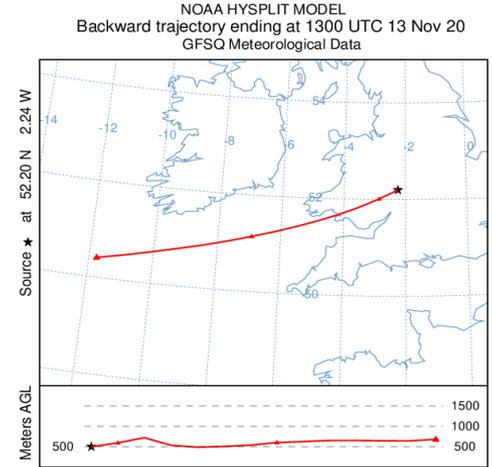
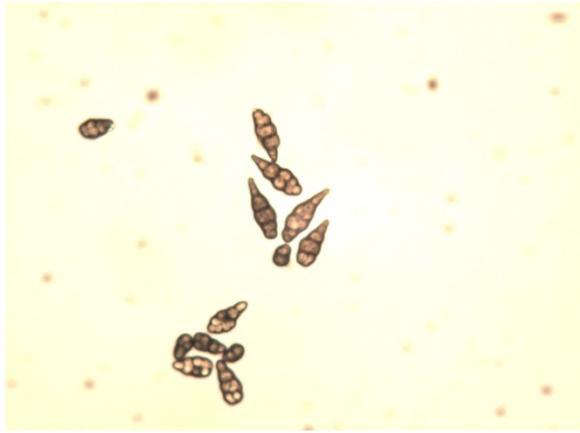


Fig. 1 *Alternaria* spores (left), Hirst-type Burkard trap (middle) and HYSPLIT model output (right).

- Spore sampling: Burkard trap, 2016-2018.
- HYSPLIT back-trajectory calculations analysed alongside crop land cover map.
- Crop harvest data
- Meteorological data

Results of the study

- Leicester (151) recorded considerably more days of clinical significance (>100 spores/m³) compared to Worcester (61).
- Higher daily and bi-hourly *Alternaria* spore concentrations at Leicester than at Worcester (Fig. 2).

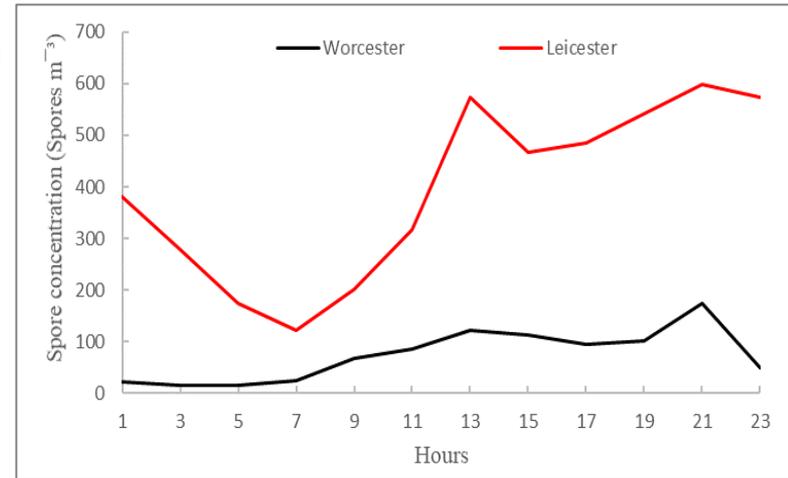


Fig. 2: Bi-hourly *Alternaria* spore concentrations during episode: 27 Jul-07Aug 2017

Results...

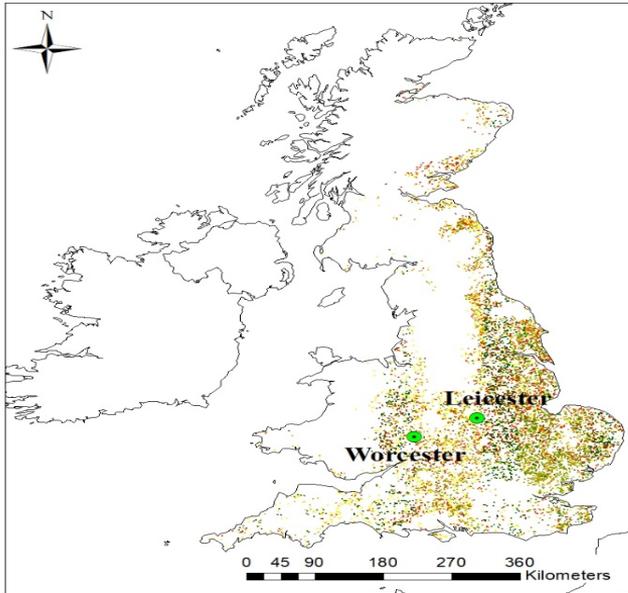


Fig 3: Crop density map for Great Britain 2017
 Leicester registered more hectares of cereals and oilseed rape (73, 312 Ha) than Worcester (54, 164 Ha) (Fig. 3).

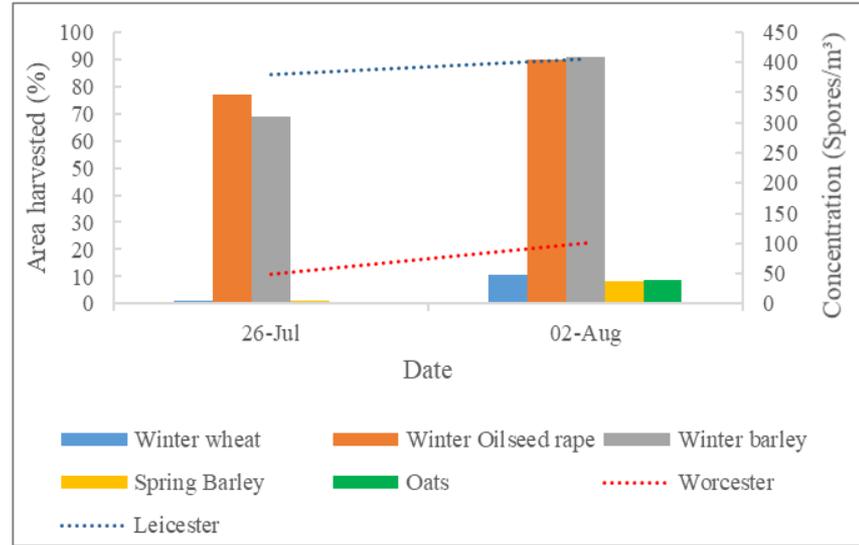


Fig. 4 Cumulative percentage of crop harvest and corresponding mean *Alternaria* spore concentrations at Worcester (red dots) and Leicester (blue dots) during episode 27 Jul-07 Aug 2017.

Harvesting of winter barley and oilseed rape coincided with high spore counts at Worcester than at Leicester (Fig. 4).

Results...

- Air masses arriving at Leicester and Worcester originated from the Atlantic Ocean and Ireland (Fig. 5).
- During the episode, no precipitation was recorded at Leicester while light rain (0.05-1.6 mm/h) was observed in 11 days of the episode in Worcester.

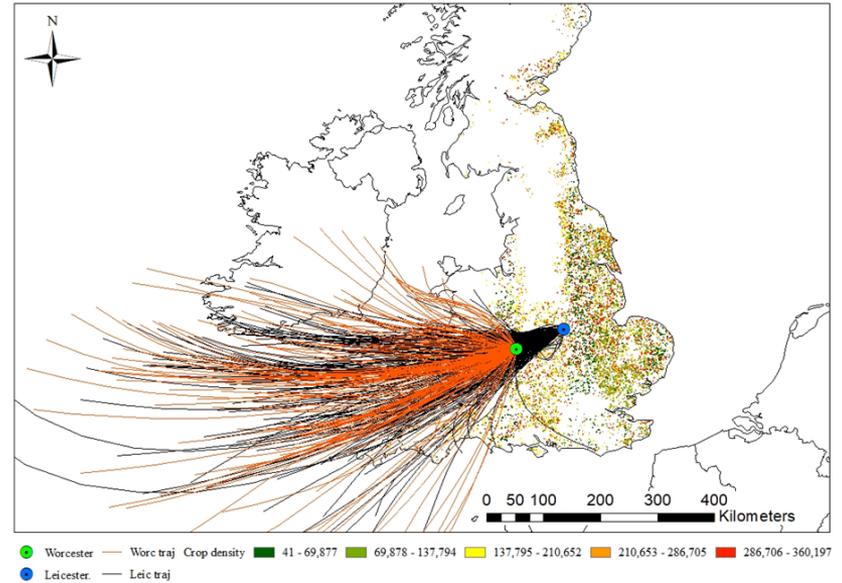


Fig. 5 Back-trajectories during episode (27 Jul-7 Aug 2017) when air masses passed within 30 km radius of Worcester and Leicester traps.

Discussion & Conclusion

- The larger hectares of cereals and oilseed rape at Leicester were a possible source to the high spore counts at Leicester compared to Worcester.
- Harvesting of winter barley and oilseed rape likely greatly contributed to the high *Alternaria* spore concentrations at Leicester.
- Long distance transport had a small but equal contribution to total spore load at Leicester and Worcester.
- Rains recorded at Worcester during the episode possibly hindered massive harvesting of the crops and hence less spore counts.

Acknowledgement

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Thank you!
Questions



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