FUNGAL SPORE DISPERSAL IN UK ARABLE CROP SYSTEMS UNDER CURRENT AND FUTURE ENVIRONMENTAL CONDITIONS

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Introduction

Airborne spore dispersal is vital for economically significant plant pathogens. Monitoring this pathway is integral to disease management. Climate change alters environmental conditions, influencing fungal spore dispersal across ecosystems. Changes in temperature and moisture impact fungal growth, reproduction, and spore production, potentially prolonging active spore dispersal periods and increasing host infections. Climate-induced stress weakens plant defences, heightening susceptibility to fungal diseases. Understanding these climate-driven changes in spore dispersal dynamics is crucial for disease prediction and management.

Methods

Spore collection will utilise Burkard & Rotarod samplers, obtaining air samples from wheat and OSR field plots (Figure 1). MinIon sequencing will be used for Metagenomic analysis (Figure 2). Quantitative PCR will be used to study abundance and timing of airborne spores (Figure 3).

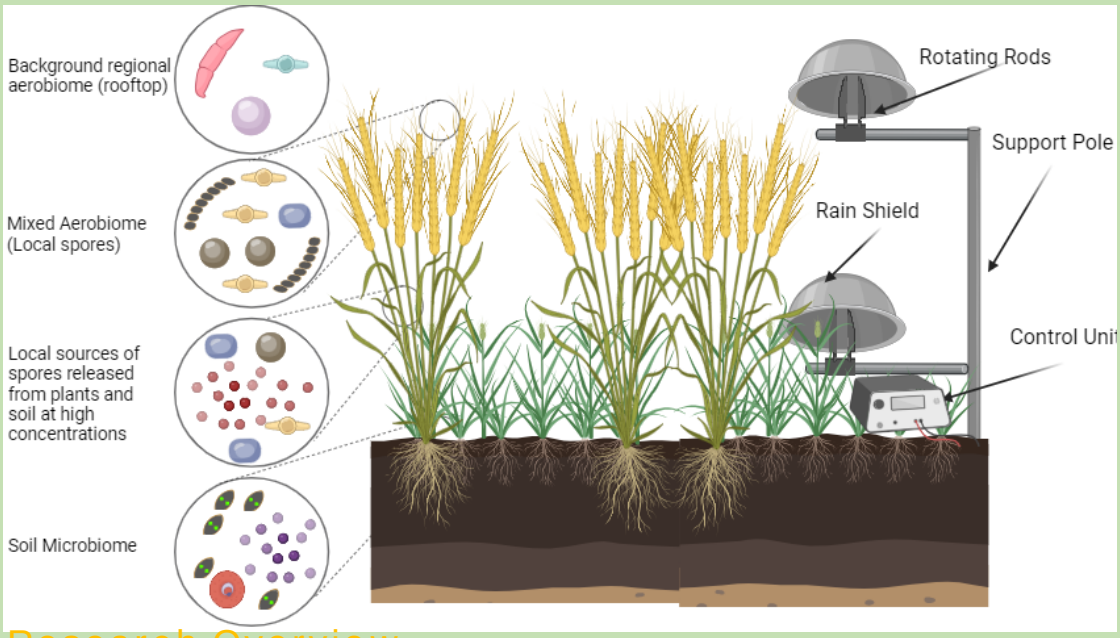

Figure 1 – Display of setup of field experiment. Rotarod spore samplers are placed at both 0.5 and 2.5 meters. Once activated the rotating arms coated in adhesive, sample the respective aerobiomes periodically according to a pre-programmed control unit. Spore samplers are set up across multiple locations in various growing environments.

Research Overview

1. Investigating spore dispersal through fungal metagenomics: Analysing seasonal air, soil, and plant samples via metagenomic sequencing to understand fungal communities. Comparing spore dispersal patterns across sample types and crop rotations.

2. Studying regional airborne spore dispersal in wheat diseases: Using a rooftop 7-day Burkard spore trap for daily air sampling. Employing DNA extraction and quantitative PCR to study timing and release of airborne spores from fungal pathogens over multiple growing seasons.

3. Examining extreme weather impact on fungal fruiting bodies: Outdoor incubation of soil containers with infected inoculum. Assessing fungal fruiting body development under natural conditions and simulating flood and drought scenarios to comprehend potential impacts on spore release.

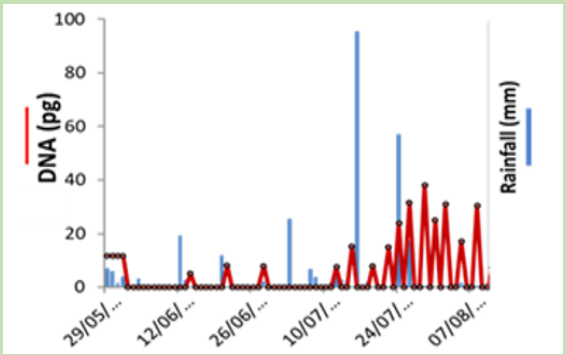

Figure 2 - Graph of pathogen quantification via qPCR. Air sample DNA is extracted, quantified & plotted alongside rainfall data.

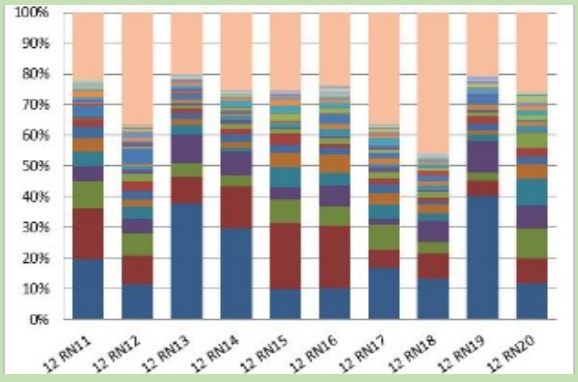

Figure 3 –Graph of abundance of daily aerobiome genera. Obtained via sequencing eDNA.

Conclusion

Understanding the intricacies of fungal spore dispersal amid a changing climate is imperative for effective disease management strategies in agriculture. The methodologies outlined in this poster will provide a comprehensive framework for studying the impact of climatic variables on airborne pathogen dynamics. Through the investigation of cover crops, extreme weather events, and regional spore dispersal, this project aims to shed light on the nuanced mechanisms influencing fungal disease spread and prevalence.

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