

Oilseed rape and pollinators: the impact of variety on resource availability and pollination resilience

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Project background

Insect pollinators, across a range of taxa, have declined globally primarily as a consequence of loss of floral resources due to agricultural intensification (Vanbergen *et al.* 2013). With insect pollinators enhancing yields in almost 70% crops worldwide declines poses a genuine threat to global food security (Klein *et al.* 2007). Insect pollination enhances yield in oilseed rape by approximately 25% and selecting varieties with higher nectar secretion is likely to have positive implications for both pollinator populations and agricultural production. Furthermore, oilseed rape is economically important for commercial beekeepers as it is the main source of nectar in spring.

Within intensively managed agricultural landscapes, natural or semi-natural components provide important nesting and foraging sites for wild pollinators and proximity to such habitats increases pollinator species richness, crop visitation rates and thus pollination success (Garibaldi *et al.* 2011). Maintaining pollinator diversity can ensure resilience of pollination as an ecosystem service due to species' showing differential response to environmental change (i.e. response diversity).

Key research questions

- Does oilseed rape show varietal differences in the taxonomic and functional diversity of foraging pollinators?
- What are the relationships between pollinator diversity, nectar availability and fruit set?
- How do wider landscape characteristics influence pollinator diversity?
- What is the potential for phenotypic asynchrony to develop between oilseed rape peak flowering periods and pollinator emergence?

Aims and Methodology

Aims:

- Evaluate oilseed rape varieties with respect to their value as a forage resource for pollinators
- Investigate the relationship between foraging pollinator diversity (both taxonomic and functional), nectar availability, fruit set and yield
- Evaluate the diversity of foraging pollinators on different oilseed rape varieties to quantify varietal differences in resilience of pollination
- Determine the robustness with respect to changes in peak flowering periods of rape-pollinator interactions across geographical locations
- Determine the impact of surrounding landscape characteristics on pollinator diversity

This studentship would monitor insect pollinators (i.e. bumblebees, hoverflies, honeybees and solitary bees) actively foraging on a range of oilseed rape varieties using timed counts. These counts would determine how varietal differences in nectar/pollen secretion and flowering period impacts on the taxonomic and functional diversity of pollinator populations.

Sites will be selected across the UK to provide a north-south gradient. An application has been made to the Home Grown Cereals Authority requesting access to their recommend list trials for this research.

Information on pollinator taxonomic and functional diversity will be related to nectar availability and composition and pollen composition. Measurements will be made to determine pollination success (i.e. the proportion of blossoms with successful fruit set).

Wider pollinator diversity would be measured using pan traps prior to peak flowering and following peak flowering to determine how changes in flower period (e.g. as a result of varietal differences or climate change) may impact on pollination. At each study site data on surrounding landscape characteristics (e.g. proximity, proportion and diversity of semi-natural habitat) will be obtained using GIS and the impact of landscape characteristics on pollinator diversity assessed.

This research will assist in a means of evaluating oilseed rape varieties with respect to their value to insect pollinators. It will also increase our understanding of the relationship between resource availability, pollinator diversity and pollination success. The data gathered will assist in determining which varieties (and indeed geographical locations) support the most diverse pollinator assemblages and thus are most robust, with respect to the resilience of pollination, to future challenges.

Research training

A comprehensive training programme will be provided comprising both specialist scientific training and generic transferable and professional skills. The student will work alongside a team of agricultural ecologists and crop scientists. This studentship will provide an excellent opportunity for studentship training in pollinator ecology, invertebrate taxonomy, sampling design and analytical techniques for ecological research, including utilising GIS to manage and analyse spatial data. The student will learn how the data they generate can be utilised on the ground for decision-making and management purposes. The student will have the opportunity to gain valuable experience in presenting research findings to a wide range of audiences

Training Requirements

We are looking for a highly motivated individual with a first or 2:1 undergraduate degree in a biological discipline. The student should have good quantitative skills and a strong interest in ecology, entomology and agricultural production.