

Rothamsted Research, UK

Dr. Samantha Cook

Research Scientist
Plant and Invertebrate Ecology Division
Rothamsted Research

“GenStat is so versatile - I have not yet come across a test that I need that GenStat does not provide.”

Rothamsted Research is the largest agricultural research centre in the United Kingdom and perhaps the oldest agricultural research station in the world. Rothamsted has an unparalleled reputation as a centre of excellence for research in the agricultural sciences. Dr. Cook is based in the Plant and Invertebrate Ecology Division at Rothamsted and her main area of expertise is pest management of the pollen beetle (*Meligethes aeneus*) on oilseed rape.

The Problem

With growing worldwide concern regarding the extensive use of pesticides and the environmental damage caused by them, much attention is now being turned to finding possible alternative methods of pest control.

Dr. Cook's research and interests in this field relate specifically to the pollen beetle, *Meligethes aeneus*, (Figure 1) and its effect on oilseed rape (*Brassica napus*).



Figure 2: Lavender: essential oil used as a repellent 'push'.



Figure 1: Pollen beetle on an oilseed rape flower.

Dr. Cook's current activities include a range of experiments to develop 'Push-Pull' pest control strategies. Here, 'trap' crops are planted around the yield crop to attract (or 'pull') pests away from it whilst a natural repellent is applied to the yield crop to 'push' the pest away. In Dr. Cook's case, the 'push' is a lavender essential oil repellent (Figure 2) and the 'pull' crop of interest is turnip rape (*Brassica rapa*, Figure 5).

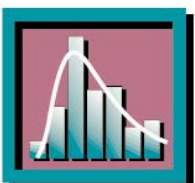
The Solution

Dr. Cook's research has 3 developmental stages.

1 - Laboratory Preference Tests

The first step is to test the odour preferences of the beetles. Odours from the trap and the yield crops are introduced into the chambers of a linear track olfactometer (Figure 3). The beetles are introduced into the apparatus and their odour preferences - which chamber they are attracted to - are recorded.

The odour preferences were analyzed using GenStat's generalized linear modelling facilities. By fitting logistic regression models to the data, Dr. Cook was able to account for any chamber bias. The results here indicated that turnip rape could indeed



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potentially act as an attractive trap crop for pollen beetles as they preferred this odour over that of the oilseed rape.

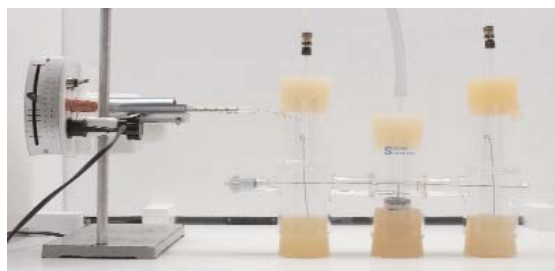


Figure 3: Linear track olfactometer.

2- Semi-Field Trials

With the odour preference established, Dr. Cook then moved to semi-field trials. Here the beetles were introduced into a poly-tunnel that housed small groups of the trap and yield crop plants (Figure 4). The infestation of each group of plants was monitored.



Figure 4: Poly-tunnel trial.

The poly-tunnel trials were designed using GenStat experimental design features while the results were analyzed using GenStat's unrivalled analysis of variance facilities. The ANOVA results indicated that turnip rape was preferred.

3 - Field Trials

With the potential of turnip rape as a trap crop proven, the research then progressed to full-scale field trials. The field experiments (Figure 5) have been running for 5 years, using a range of design layouts, most notably randomized block, factorial designs in randomized blocks and latin square designs. Here Dr. Cook finds the GenStat design facilities "extremely useful" as the field randomization and field layout is readily generated through the easy to use menu interface.

"In GenStat it is very easy to progress from designing and analyzing simple experiments to more difficult designs."

Results to date show a significant reduction in the damage to oilseed rape by pollen beetles when turnip rape is used as a trap crop. Future research will focus on 2 issues; the use of lavender essential oil as a 'push' repellent and the use of honey bees for dispersal of a *Metarhizium* fungus. This fungus has been shown to kill pollen beetles and is less environmentally damaging than chemical pesticides.



Figure 5: Field experiment showing the turnip rape trap crop (flowering) protecting plots of oilseed rape.

Technical Support & Maintenance

Aside from the power and versatility that GenStat offers her, an important factor in Dr. Cook choosing GenStat for her statistical analysis is the technical support she receives from the GenStat team.

"GenStat is much easier to use than other packages and is extremely well supported."

In addition to access to technical support from GenStat developers, supported GenStat users also benefit from automatic software upgrades and increased working flexibility through additional copies of GenStat for use on laptop or home desktop PCs.

Institution: Rothamsted Research
Address: Harpenden, Hertfordshire, UK, AL5 2JQ
Telephone: + 44 (0) 1582 763 133
Email: sam.cook@bbsrc.ac.uk
Web: <http://www.rothamsted.bbsrc.ac.uk>
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VSN International Ltd

5 The Waterhouse, Waterhouse Street, Hemel Hempstead, Herts, UP, HP1 1ES
TEL: +44-(0)1442-450230 FAX: +44 (0)870-1215653 WEB: <http://www.vsn-intl.com>

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