

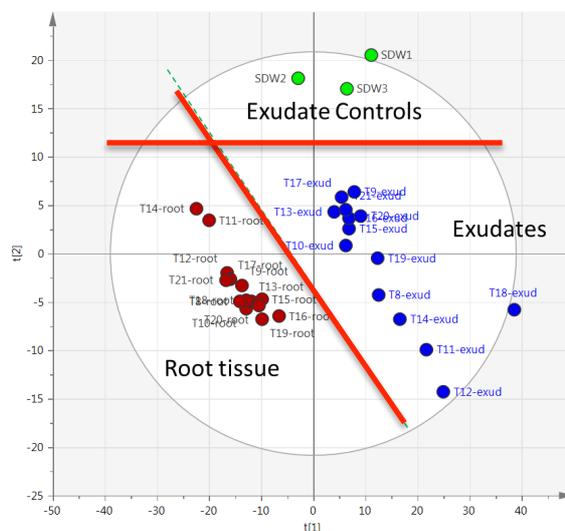
BBSRC CIRC Project : Yield Improvement of Oilseed Rape Through Genetic Manipulation of Rhizosphere Exudation

Newsletter N^o.2 – Jan 2013

Hello and welcome to the latest update of progress on the BBSRC CIRC funded project “Yield improvement of oilseed rape through genetic manipulation of rhizosphere exudation”. The initially intended timing of these newsletters (quarterly) seems to have slipped a little to six-monthly. Since this corresponds roughly with the CIRC dissemination events however, it allows us to summarize the progress presented at those events in a written form and to add a little flavor of the other things associated with the project that may not have been flagged up at the meetings. The main points of the progress review that we presented at the CIRC dissemination event in May 2013 in Cambridge, are reiterated here, however, for anyone who wishes to go into more detail or would like an explanation of any particular aspects, please get in touch; we’re more than happy to talk! This and previous newsletters are available electronically from the project web-page (see contact details below), and will be uploaded to the new CIRC extranet when it becomes available.

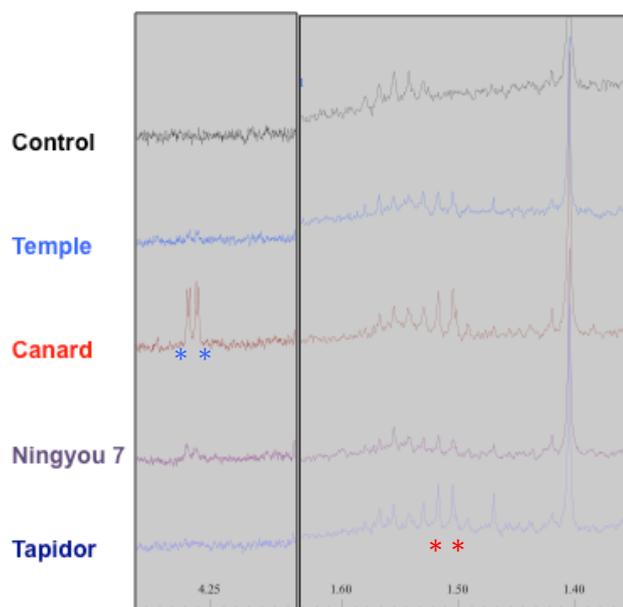
Project Progress. Initial profiling experiments have validated the approaches and been used to estimate the appropriate level of replication. We have demonstrated the ability of the profiling techniques to detect exudate compounds in the hydroponic solution and root tissue and to distinguish between samples based on these profiles using a statistical approach (principle co-ordinate analysis or PCA). Based on this data, data from a number of other measurements and practical considerations we arrived at an appropriate level of replication to ensure both coverage of the majority of variability within the samples and reproducible results.

9 oilseed rape lines have so far been screened, with the screening of another 12 *Brassica napus* lines (including some more diverse members of the species) currently underway. Preliminary results show significant differences in maximum root length (a characteristic associated with phosphorus uptake) in three lines and differences between exudate profiles for at least four lines.



Differences between root & shoot profiles by PCA

These latter lines are parents of two different mapping populations (genetically well characterized offspring from the crossing of the two parent lines) meaning that we have the potential to screen for these differences in well defined genetic backgrounds. This should enable us to begin to look for genetic factors influencing the levels of some of these exuded compounds.



Partial exudate profiles showing differences in concentrations of malate (*) and alanine (*) across four oilseed rape lines.

Compounds showing potential differences between lines include sucrose and glucosinolates, both of which are known to influence soil microbe community composition and malate (which is associated with phosphorus uptake) amongst others. Exudate profiling by our colleagues at the MeT-RO Centre, Rothamsted Research is continuing.

Public Engagement. Dr. Graham Teakle took part in a radio interview for BBC Coventry and Warwickshire on the plant science being conducted at the Warwick Crop Centre. The rhizodeposition project was highlighted as part of this. The interview can be found at <http://www.bbc.co.uk/programmes/p018syq0> 1hr and 22 minutes into the program.

Staffing News. Dr. Sally Hilton joined the project as a technician in February 2013 and has been primarily responsible for sterile plant growth and the production of exudate and root samples for profiling.

Interviews have now been held for the PhD post associated with this project and Mr. Christopher Hale has been appointed. He will begin work on the role of plants and rhizosphere microbes in the mobilization of organo-phosphorus in September. In the meantime we have had a brief (6 week) undergraduate project looking specifically at acid and alkaline phosphatase activity in roots and exudates which should hopefully provide a little useful background information and validation of assay methods for Christopher's project.

Looking Forward. Following a review of the relevant scientific literature, initial work to evaluate a number of non-destructive methods for collection of exudates from plants grown in sand or soil will be undertaken shortly.

Once the preliminary profiling of the *B. napus* lines has been completed, we will identify those lines which have the greatest differences and the best scope for further analysis of those differences. Larger quantities of seed from these lines will then be generated for further experiments. More in-depth investigations of the genetic control of the observed differences will also be undertaken

using crosses of plant lines showing the greatest differences.

We are currently undertaking a review of the relevant scientific literature on the subject of rhizodeposition specifically focusing on what is known concerning rhizodeposition in *Brassica* species. This will allow us to focus on specific exudate compounds that are known or believed to be important in Brassicas. We would also hope to publish this review in due course.

Warwick Crop Centre is holding a public open day in September and we will be publicizing the work and its potential importance at this event.

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Project web-page:

<http://www2.warwick.ac.uk/fac/sci/lifesci/research/rhizodeposition/>

CIRC portal:

<http://www.bbsrc.ac.uk/business/collaborative-research/industry-clubs/crop/crop-index.aspx>