

New integrative data portal for brilliant brassicas

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Credit: The Genome Analysis Centre

Scientists at The Genome Analysis Centre (TGAC) have released the first web repository for Brassica (mustard plants) trait data to tackle reproducibility, user controlled data sharing and analysis worldwide. Scoring the versatile crop's beneficial traits will assist Brassica breeders in improving their crop yields, increased nutritional benefits and reduce our carbon footprint through biofuel production.

The *Brassica* Information Portal (BIP) is being developed with a

uniquely collaborative *Brassica* research community. Increasing the visibility of existing research, the open-access Portal will store all data from previous and future pre-breeding trait scoring experiments performed on *Brassica* species

The BIP presents a standardised, curated data resource for scientists. By matching the characteristics of plants with their genetic background, we can better inform breeding programmes for crop improvement.

The *Brassica* genus contains versatile vegetable, forage and crop plants that exuberates many valuable attributes for public consumption and the environment. The innovative new data portal hosts information about how, for example, rapeseed responds to different experimental conditions to identify beneficial genetic traits.

Significant to the consumer, these findings will increase the production and quality of the *Brassica* vegetables, and decrease costs in biofuels through using rapeseed for biodiesel production.

Annemarie Eckes, Research Assistant in the Integrative Genomics Group at TGAC, said: "Thanks to this database, traits from pre-breeding trials are made more accessible and can be used for improving existing varieties. Breeding of improved varieties means that we can have very nutritious cabbage / broccoli / swede (all from the *Brassica* genus) , varieties are resistant to pests, or varieties that need minimum resources."

Facilitating research projects for population genomics and breeding information, the database will enable scientists to store and analyse large quantities of *Brassica* trait data. The portal will serve as a gateway for an integrated analysis of phenotypic and genotypic information using methods such as associative transcriptomics and QTL analysis.

Brassica oleracea Using new traits for marker assisted selection, *Brassica* breeders will be able to decrease the input of fertiliser and water, increase crop yield, quality and resilience of the plants. High concentrations of industrially important compounds can be selected for in otherwise discarded parts of the plant, adding value to the crop (e.g. lubricants in waste straw).

Additional data that will be collected in the Portal includes information to make rapeseed contain much more oil used for biofuel production. This will reduce our carbon footprint by decreasing the UK's fossil fuel emissions, and raise energy supplies.

This can all be done with conventional breeding methods, drawing from the list of genetic traits associated with plants in the new *Brassica* genus database.

With climate change impacting the UK with both droughts and floods, new pests arriving and thriving, old varieties may not be as resilient to these changes in the environment as newly bred ones. It is important to understand and create the diversity of the vegetables we eat to select the best individuals for creating new varieties to ensure these vegetables will also be on our plates in the future.

Annemarie Eckes, added: "The database will be a powerful tool for the breeders to select for new traits important for the future changes. At the same time, they need to produce a reliable amount at appropriate prices for society; to guarantee food and energy security and a healthy diet."

Dr Wiktor Jurkowski, Project lead and Group Leader at TGAC, said: "Data sharing today must be extensive, comprehensive, global and long-term. With the BIP, we help the *Brassica* Community to achieve these objectives.

"With all trait information in one place, and linked with genomics data, many new connections between the plant's traits and responses in different experiments can be drawn, that was previously not possible. This database can, therefore, encourage integrative, big data analysis, which has become a crucial part of today's Science.

"At the same time, it is a perfect example of collaborative work across UK and beyond. The *Brassica* Information Portal is derived from 'Cropstore', a database hosting *Brassicas* and other crops led by Prof Graham King (University of Southern Cross, Australia) and currently supported by the Renewable Industrial Products from Rapeseed (RIPR) project, led by Prof Ian Bancroft at the University of York and by BBSRC."

The further database design and content curation involved Sarah Ayling, co-lead on BIP project (TGAC), Martin Trick, Judith Irwin and Rachel Wells (John Innes Centre), RIPR, OREGIN 3 consortia and the UK *Brassica* community, whose feedback is reflected in the user interface and BIP features.

Web-based analytics for the BIP is developed in collaboration with the Clark Group (TGAC), and Ian Bancroft (University of York). Anil Thanki (Davey Group, TGAC) and Dan Bolser (EBI) are helping to cross-link BIP with [TGAC Browser and Ensembl Plants](#). The Davey Group will also help with integrating BIP with iPlant and COPO - projects supporting collaborative and open plant science. Finally, Manuel Corpas (TGAC) and his team will contribute to further development of phenotyping API and oversee implementation of bioinformatics standards developed within the frame of ELIXIR.

Provided by The Genome Analysis Centre

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