



# SAGIT Research Snapshot

S1205: Cost-effective selection of high beta-glucan using molecular markers

## **FAST FACTS**

### **The details**

**Start:** July 1, 2012

**Finish:** June 30, 2015

**Project participants:** SARDI - Dr Tim Sutton, John Harris, Klaus Oldach and Judy Cheong.

### **The problem**

Beta-glucan content is an important trait in oats, however, the challenges including cost and technology of screening for this trait have been high. Breeders have been unable to screen all germplasm early in the breeding cycle because there are too many lines, which has potentially resulted in the loss of lines with high beta-glucan content.

### **The research**

This research was designed to find molecular markers for beta-glucans to assist in the detection of beta-glucans in oats. The research has provided some basic and essential information to guide the future direction of research, however, this work will be ongoing.

## **BACKGROUND**

Beta-glucan is a soluble fibre which can lower cholesterol reabsorption in the gut leading to healthier blood cholesterol levels and lowering the risk of heart disease.

The high cost, low throughput and technical challenges of phenotyping for beta-glucan content in grain make it prohibitive for a breeding program to screen all germplasm early in the breeding cycle. This is potentially resulting in the loss of lines with high beta-glucan content from the breeding program. The

## **In a nutshell**

The project discovered that the genes known to indicate high beta-glucan content in barley are different to those in oat, complicating the ability to develop molecular markers. It has, however, provided important foundation work for future research in this area.

availability of molecular markers would give the breeding program an advantage in selecting lines with high beta-glucan content, and would benefit growers who in-turn would have access to high beta-glucan varieties which are attractive to marketers internationally.

## **RESEARCH AIMS**

The aim of this project was to develop molecular tools to screen for high beta-glucan content in the National Oat Breeding Program. This would enable cost effective screening for the trait.

## **IN THE FIELD**

Genes contributing to high beta-glucan content in barley grain are known and this project aimed to isolate the same sequences from oat varieties Yallara and Mitika, which are known to differ in their beta-glucan content.

This research has shown that the control of beta-glucan content in oats is genetically more complex relative to barley than was expected. In oats, there have been more than 15 versions of the main beta-glucan gene CsIF6 identified.

The 15 versions of the gene may represent duplicated copies of genes similar to those which control beta-glucan in barley, or additional genes in oats that are not present in barley.



## RESULTS

Despite the identification of many copies of beta-glucan-like genes in oat, gene sequence differences were not detected between high and low beta-glucan lines. This means that the development of markers to associate those beta-glucan gene copies with beta-glucan content is not possible.

The results suggest that an approach based on transferring knowledge from one species (barley) to another (oat) will only partially assist in identifying markers to be used for selection in breeding.

Despite being unable to identify molecular markers because of the difference in genes from oat to barley, the project has provided important knowledge which guides the next steps in this area of research.

The next steps should include the screening of mapping populations to determine the genetic location of genes which control grain beta-glucan in oat, and further investigation into underlying biological differences between high and low beta-glucan lines, such as cell wall structure and composition. Screening of oat germplasm to identify alternative sources of high beta-glucan would also complement these approaches.



Researcher Dr Tim Sutton



## VALUE FOR GROWERS

This project has been important in providing the foundation for future direction of research. Work will be ongoing to enable the cost efficient selection of high beta-glucan oats to provide South Australian growers with a competitive advantage.

### More information:

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