

Application of Association Mapping to Starch and Glycaemic Index in Potato

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Introduction

The past 30 years has seen a *per capita* decline in the consumption of potatoes. Low carbohydrate and low glycaemic index (GI) diets could have contributed to a decline, leading consumers to perceive potatoes as being unhealthy. Diabetes is caused by uncontrolled blood glucose concentrations after eating a carbohydrate meal. The glycaemic index is a means to classify foods based upon their blood glucose response after carbohydrate consumption. Low GI diets are recommended to individuals that suffer from diabetes as a tool to modulate the disease. GI for potato is generally high but extends over a wide range (56-104). A key issue is whether we can use advances in potato genomics to identify genes and markers that impact on GI in potato products.

Objectives

- Develop a high throughput method for accessing starch digestibility as an indication of GI
- To use the technique of association mapping to discover the genetic architecture of the starch digestibility trait
- To discover gene markers linked to the trait

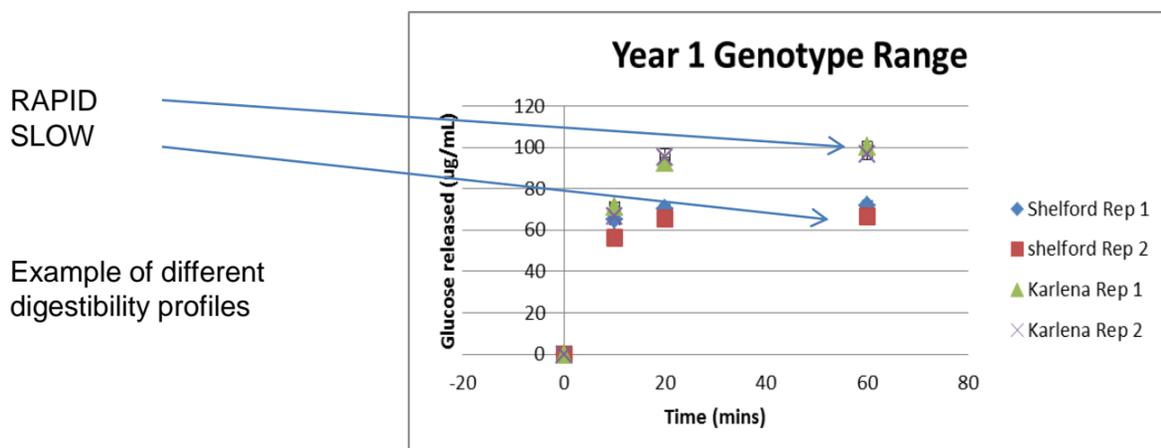


Methods

- Starch extraction from association panel (300 genotypes) replicated over 2 years
- Total Starch Measurement
- *In vitro* starch digestibility methods have become a popular tool and a proxy method for obtaining an indication of GI without the use of human volunteers. Three major types of starch were determined:
 - Rapidly Digestible Starch (RDS): glucose release after 20 minutes
 - Slowly Digestible Starch (SDS): glucose release between 20 and 120 minutes
 - Resistant Starch (RS): starch which has remained undigested after 120 minutes

Results

- Starch was successfully extracted from all 300 genotypes replicated over 2 years (1200 samples)
- Total starch measurements obtained from a subset of genotypes from year 1 and year 2 (n100).



- Starch digestibility method optimized. Year one starch digestions complete (n.600). Range between highest and lowest genotype about 30%. Greater than the sample errors, the values are reproducible

Implications for the Industry

- GI is becoming a major determinant of consumer preference and some new cultivars are being marketed primarily on the basis of their low GI.
- There is a need to identify the inherent factors that influence this trait, and to find potatoes of reduced GI to address consumer concerns.
- This could potentially help to avoid loss of market share to other starch sources competing with potatoes.



References

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