

Genetic analysis of flavour and texture in potato

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Introduction

Potato flavour and texture are traits of increasing importance as drivers of consumer choice. Previous efforts to identify genetic factors influencing such traits have suffered from a lack of variation among commercial varieties. We have expanded the phenotypic variability by use of our unique population of long-day adapted diploid *Solanum phureja* clones, known to possess strong flavours as well as unusual textural properties.

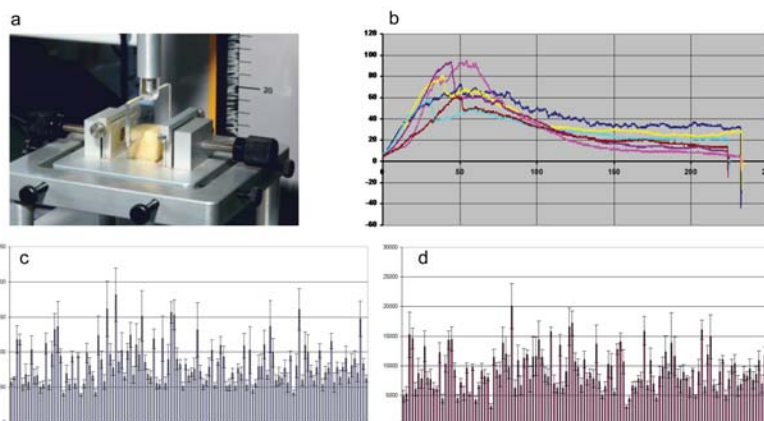
Population development

Hybrid clones resulting from an initial cross between diploid *S. tuberosum* clone 2DH40 and *S. phureja* clone DB337(33) (the variety Mayan Gold) were used in backcrosses to both parents. One of the four hybrid populations (FT.4) was taken forward for genetical studies of sensory and volatile characteristics of potato. A sample of tubers from different clones of the FT.4 population is shown in the figure below.



Texture analysis

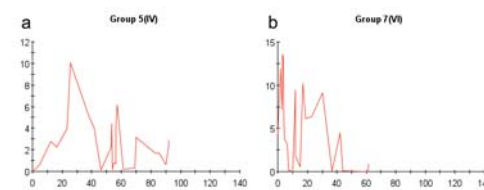
Texture in the FT4 population was examined using a QTS texture analyser. This measured the amount of force required to drive a wedge shaped acrylic probe through cooked tuber material at a given rate. This gave two distinct measures, 'peak load' and 'overall work done'. The FT4 population showed wide variation in both of these measures.



a. Acrylic probe used for texture analysis. b. Sample texture analysis traces. c. Texture peak load for FT4 population. d. Texture overall work done for FT4 population.

QTL analysis of texture data

The FT4 population had previously been subjected to linkage analysis, in which a genetic map was constructed using around 250 molecular markers (AFLPs and SSRs). Texture data were then subjected to Kruskal-Wallis QTL analysis, revealing putative QTLs for texture peak load and overall work done on chromosomes IV and VI.

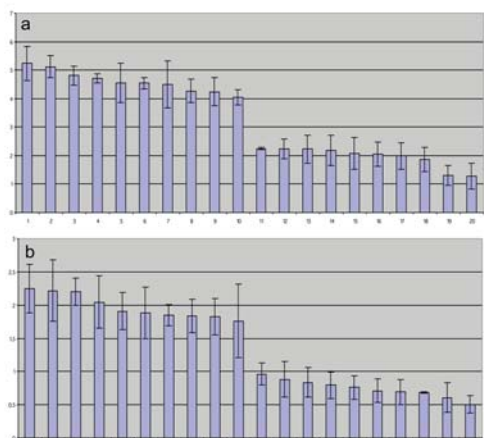


a. Putative QTL for texture peak load (chromosome IV). b. Putative QTL for texture overall work done (chromosome VI).

Analysis of umami compounds

Previous work has indicated that phureja cultivars contain greater amounts of umami compounds (5'-ribonucleotides and amino acids, particularly glutamate and aspartate) than tuberosum varieties as measured by equivalent umami calculation (EUC), and it is thought that this may be implicated in reported consumer preference for the phureja varieties. Cooked material from the whole FT4 population was freeze dried and analysed for amino acid content using HPLC. The population showed moderate variation in glutamate and aspartate and it is currently being analysed for 5'-ribonucleotide content in order to calculate EUC values.

a. Glutamate content in FT4 population. b. Aspartate content in FT4 population. Both show the top 10 and bottom 10 ranked clones.



Summary

QTLs have been identified for the first time for texture in potatoes. This will be further investigated by mapping candidate genes thought to be involved in texture. Once there is a full data set for EUC this will also be subjected to QTL analysis. This, in combination with previous work on volatiles and sensory analysis, will give a better picture of the genetic basis for flavour and texture in potatoes.