Do umani compounds put the “ooh” in potato flavour ?

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“After cost, the most important driver for consumer food purchase is flavour”

Connecting with Consumers, ICD, 2005

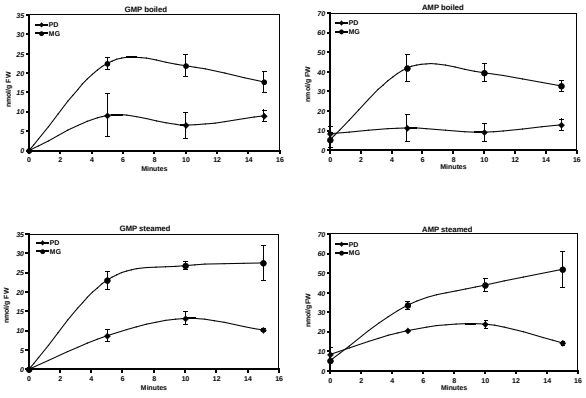
However, potato flavour is not generally given high priority in breeding programmes because flavour is difficult to assess and quantify. As consumer traits such as flavour are becoming much more important to consumers, research at SCRI has started to address what are the main determinants of potato flavour.

The basis of much of our work in this area is that tubers from *Solanum phureja* accessions consistently score better in sensory evaluations than those from *Solanum tuberosum*. Although there are considerable differences in the volatile compounds produced by cooked tubers from *S. phureja* and *S. tuberosum*, potential flavour compounds associated with the potato matrix have received less attention. These compounds define the basic taste parameters, sweet, sour, salty or bitter and also 'umami'. Umami compounds enhance flavour and mouth feel. The most potent umami compounds are glutamic acid and 5’ -ribonucleotides (particularly 5'-guanosine monophosphate, GMP). Glutamate and GMP interact synergistically so a small increase in GMP may lead to a large effect on flavour. In some vegetables (including potato tubers) GMP is produced during cooking, probably due to RNA breakdown. The purpose of this study was to assess the levels of the major umami compounds in boiled potato tubers, in cultivars previously assessed for sensory quality. The free levels of the major umami amino acids, glutamate and aspartate and the 5’-nucleotides, GMP, AMP, were measured in potato samples during the cooking process. Tubers were sampled at several time points during the growing season.

Results

Formation of 5´ nucleotides during different cooking processes.

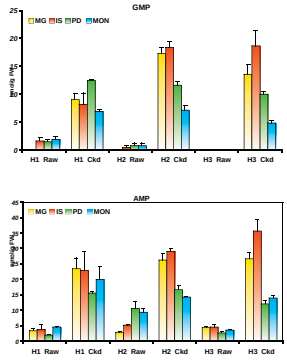
GMP and AMP are the major umami 5’ nucleotides found in potato tubers. In raw tubers there are very low levels of these compounds – they are formed during the cooking process. We measured the rate of 5’ nucleotide formation and compared this in tubers of ***S. phureja.*** Levels reached a maximum within 5 to 10 minutes for both boiling and steaming.



Developmental changes in cooked tuber 5’ nucleotide levels

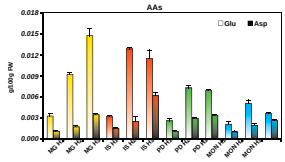
The levels of 5’-nucleotide levels were measured in raw and cooked (Ckd) potato tubers from cultivars Mayan Gold (MG), Inca Sun (IS), Pentland Dell (PD) and Montrose (MON). H1, harvest 1(early development, tuber size 20-40g); H2, harvest 2 (at maturity); H3, harvest 3 (maturity + 6 weeks storage at 4ºC). Error bars represent the SEM (n=3).

At H2 and H3, the levels of 5’ nucleotides were higher in the ***S. phureja*** tubers, but not at H1.



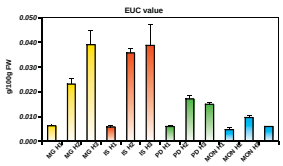
Developmental changes in cooked glutamate and aspartate levels

Effect of tuber developmental stage on flavour amino acid levels in cooked potato cultivars Mayan Gold (MG), Inca Sun (IS), Pentland Dell (PD) and Montrose (MON). Glu, glutamic acid; Asp, aspartic acid; H1, harvest 1; H2, harvest 2; H3, harvest 3 (see text for details). Error bars represent the SEM (n=3). Note the much higher levels of glutamate in *S. phureja* cultivars.



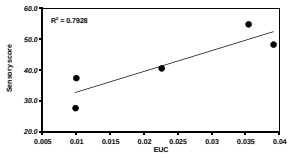
The equivalent umami concentration is significantly higher in *S. phureja* accessions

Effect of tuber developmental stage on equivalent umami concentrations (EUC) in cooked potato cultivars Mayan Gold (MG), Inca Sun (IS), Pentland Dell (PD) and Montrose (MON). H1, harvest 1; H2, harvest 2; H3, harvest 3 (see above for details). Error bars represent the SEM (n=3).



Correlation of sensory evaluation scores with equivalent umami concentration (EUC) of potato.

S. tuberosum cultivars Maris Piper (MP) and Record were compared with *S. phureja* clones DB333-16 and DB257-28, and cultivar Mayan Gold (MG). The sensory score was for “overall acceptability” and was carried out by a trained sensory evaluation panel.



Discussion

The *S. phureja* accessions studied in this project show a clearly higher level of umami level than *S. tuberosum* cultivars. In mature tubers this due to a combination of a higher glutamate content and a higher GMP level.

Comparison with sensory evaluation panel suggests that there is a correlation between overall acceptability and tuber umami content.

We are currently expanding this study to look at a wider range of breeding lines. Our ultimate aim is to understand the factors responsible for the higher umami level in *S. phureja* tubers.

Acknowledgement

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