



The perfect potato?

Texture analysis has important implications for quality in potato products, says Lloyd Instruments

Potato products can be mashed, boiled, roasted, fried and baked, and be as diverse as potato salad through to chips. Each has its own texture characteristics and it is important to be able to make reproducible, scientific measurements of these parameters. Texture testing is a well-established technique for evaluating the mechanical and physical properties of raw ingredients.

Comparison of the results from texture analysis with trained human sensory panels has shown that the measurements have a high correlation with the sensory attributes associated with textural quality.

Texture analysis can highlight quality improvement opportunities throughout the supply chain and the production process. At the research and development (R&D) stage, new or alternative ingredients can be compared with existing ingredients for improvements. In production, texture analysis is used for the measurement and control of process variations such as temperature, humidity and cooking time.

Texture analysis also plays an important role in quality control; tolerances can be defined to ingredient suppliers and incoming batches can be checked. In this way, batch to batch variations or trends in quality from a particular supplier can easily be tracked. Testing manufactured products allows production quality to be checked against known standards for that product.

Mechanical texture analysis, using a properly calibrated texture analyser run by

software using fundamental algorithms removes all elements of subjectivity from the testing. Instrumental testing allows standards to be introduced and followed, so different production sites can achieve the same product quality, and the proper documentation of product quality simplifies negotiations between suppliers, processors and customers.

In many instances, a food testing instrument can be used to carry out the majority of tests simply by equipping it appropriately. With powerful application and analysis software available, a single instrument can be used in a multitude of applications.

Raw and cooked potato testing

There are many varieties of potato and so it is important to understand their different properties to ensure the selection of the most appropriate type for the particular product and test the effects of various processes such as cooking, temperature and storage life.

One such test is to measure the shear force required for slicing and dicing potatoes. This can be done using a texture analyser equipped with a Warner Bratzler Shear Blade accessory. The jig consists of a rigid frame supporting a shear bar. Interchangeable shear blades fit into the frame.

Force is applied to the blade to cut through the sample. The blade is cleaned between each test to eliminate any starch residue and maintain a clean cut.

Potato is diced, cooked and mixed with mayonnaise and chives to make potato salad. Overcooked potatoes would make a mushy salad while undercooking would make an equally unappetising product.

The texture of cooked diced potato can be checked on a sampling basis, which allows the cooking time to be adjusted accordingly.

The test is carried out using a texture analyser equipped with Ottawa forward extrusion cell. This consists of a square test cell with solid walls and an open base fitted with a plate containing a number of 6mm diameter holes. A square plunger compresses a known weight of cooked potato in the cell and the force required to extrude the sample is measured as a maximum and an average of the force plateau.

Ingredients can be cooked in a number of different ways and customers can evaluate the end product. The ingredients prepared under each set of conditions can be fully characterised on the tester and a substantial body of knowledge correlating texture with processing conditions established. Once the customer has identified his preferred texture, the texture can be reproduced in scale-up trials and on a production scale.

Crisp testing

'Crispiness' is a key characteristic of cooked potato crisps and other potato snacks and a departure from the expected texture is usually considered to be a quality defect. Measurement of the crispiness and fracturability of crisps can be made using a penetration test with a universal testing machine equipped with a crisp fracture support jig.

This jig consists of a ball probe and a round hollow support mounted to the base table. The ball probe is driven down to apply a bending force to the crisp. The measurement is generally made for the first significant break in the crisp during the first compression cycle and is usually taken as the first peak force prior to the force dropping by at least 5%.

In this way, the crispiness of the product can be evaluated to help develop the optimum cooking process. This test is also important in testing shelf-life, by comparing crispiness of the 'just-cooked' product to predict 'sell by' and 'use by' dates.

The above extracts show that the humble potato can be as diverse in its physical properties as in its uses. With the correct test methods and applications, a texture analyser is an incredibly useful tool, and can be used for all aspects of quality testing from R&D to routine production testing and quality control.

For more details, contact Lloyd Instruments at www.lloyd-instruments.co.uk