A NON-DESTRUCTIVE METHOD FOR RAPID EVALUATION OF BOILING QUALITY OF POTATO TUBERS

B.B. Chubey and G. Mazza

Abstract

A non-destructive method for rapid evaluation of boiling quality of potatoes has been developed. The method is based on the degree of sloughing, after-cooking darkening and colour of tuber fractions (cores of 1.3 cm in diameter) cooked in test tubes at 118°C for 25 min. Using sixteen potato cultivars, with 20-30% dry matter content, boiling quality results obtained by the new method were compared to sloughing and after-cooking darkening values obtained by boiling quartered tubers in aluminum sauce pans on a standard electric stove. The correlation coefficient between sloughing data obtained by the two methods was 0.912 (P < 0.001). The new method has proven to be simple, reproducible and highly suitable for evaluating a large number of potato samples. This should make it attractive for routine use by potato breeders.

Resumen

Un método que no destruye los tubérculos ha sido desarrollado con el objeto de evaluar la calidad de éstos al ser hervidos. El método se basa en el grado de desintegración y el oscurecimiento, luego del cocido, de fracciones de tubérculos (muestras medulares de 1.3 cms de diámetro, obtenidas con sacabocado), cocinadas en probeta a 118°C durante 25 minutos.

Utilizando dieciséis cultivares de papa con un contenido de materia seca entre 20 y 30%, la calidad ante el hervido evaluada con el nuevo método, fue comparada a los valores de desintegración y oscurecimiento, luego del cocido de tubérculos fraccionados en cuartos y hervidos en cazos normales sobre una hornilla eléctrica normal. El coeficiente de correlación entre los valores de desintegración obtenidos por los dos métodos fue de 0.912 (P < 0.001). El nuevo método ha demostrado ser simple, fácil de efectuar y muy apropiado para la evaluación de un gran número de muestras de papa; lo que deberá hacerlo atractivo para el uso rutinario por parte de los mejoradores.

1Research Scientists, Agriculture Canada, Research Station, Morden, Manitoba, Canada R0G 1J0.
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Introduction

Although the primary objective of potato breeding is to produce new cultivars which are higher yielding and have fewer defects than existing cultivars, quality of the cooked tubers is used as a selection criterion by breeders throughout the world. The quality of the cooked tubers determines the degree of acceptance by consumers, and thus the success or failure of new cultivars.

Requirements for acceptable potatoes are: (a) aesthetics - appearance and presentation of the raw tubers, colour, texture and flavour of the cooked tubers; (b) economics - price and freedom from wastage of the raw tubers; (c) safety - freedom from undesirable quantities of natural or added substances which represent an actual or potential hazard to the consumer; and (d) nutritional value (2).

For the assessment of color, texture and after-cooking darkening of boiled potatoes, available procedures require considerable time for sample preparation and evaluation. The time required is particularly prohibitive with a large number of samples. It would therefore be of value if a simple and rapid method were available to distinguish good boiling from poor boiling potatoes.

Numerous attempts have been made to correlate various properties of raw tubers with the texture of cooked samples, and certain physical measurements on cooked tuber tissue with texture. These studies have included measurements of firmness, penetration, tensile strength, shear strength and even electrical resistance of potato tissue (4, 10). In general, these methods give poor correlation with subjective measurements of such characteristics as mealiness, closeness and waxiness of the cooked tubers, which may relate in part to the form in which boiled potatoes are served. If they are mashed before serving, then a mealy texture, which breaks down readily by cell separation to give a non-sticky mash, is desirable. The tuber must not, however, disintegrate during the cooking process.

The bluish-gray discoloration, which occurs in certain cultivars of potatoes when they are exposed to the air after being boiled, is called after-cooking darkening. The pigment responsible for the discoloration is a complex of chlorogenic acids and iron, which is formed on cooking and oxidized on cooling, to give a coloured complex of ferri-dichlorogenic acid (2).

The present communication describes a rapid, non-destructive method for evaluating a large number of potato samples for after-cooking discoloration, sloughing and colour of cooked tubers.

Materials and Methods

Sixteen cultivars of potatoes were used in this study. All were grown at the Agriculture Canada Research Station, Morden and were selected from a