Changes in Potassium Content of Different Potato Varieties After Cooking

Jerrilynn D. Burrowes, PhD, RD, CDN, and Nicholas J. Ramer, PhD†*

Objective: We sought to determine analytically the potassium content of different varieties of raw potatoes, and to estimate the amount of potassium that can be extracted or leached from raw potatoes by cooking.

Design and Methods: Six different varieties of fresh potatoes were obtained from the Whole Foods Market in Manhasset, New York. Two different cooking methods (normal cooking [NC] and double cooking [DC]) were applied to each potato. Potassium was extracted from the ash of dried samples. The potassium content of aqueous extractions was ascertained by atomic absorption spectrophotometry.

Results: Mean potassium content was highest in the purple Viking potato (448.1 ± 60.5 mg [11.5 ± 1.6 mEq]/100 g [values are mean ± SD unless otherwise noted]), and lowest in the Idaho potato (295 ± 15.7 mg [7.6 ± 0.4 mEq]/100 g). All raw potatoes had a mean potassium content of about 300 mg (7.7 mEq)/100 g or greater. The DC method resulted in a greater reduction in potassium from raw potatoes than the NC method. All potatoes retained a mean potassium content greater than 200 mg (5.1 mEq)/100 g, using the NC versus the DC method.

Conclusion: The potassium content of the raw potatoes studied varied considerably, with most tubers retaining a moderate amount of potassium after leaching. This study showed that the DC method appears to be more effective than the NC method in leaching potassium from the potatoes studied. Our findings provide useful information for dietitians involved in menu planning for people on potassium-restricted diets.

POTATOES ARE THE most widely grown tuber crop, and the fourth largest food crop in terms of fresh produce after rice, wheat, and corn.[1] They contain a number of important vitamins and minerals. A potato with its skin is a good source of vitamin C, potassium, and vitamin B6, and it contains trace amounts of thiamin, riboflavin, folate, niacin, magnesium, phosphorus, iron, and zinc. In addition to vitamins and minerals, potatoes with skin also contain fiber and phytochemicals such as carotenoids and polyphenols. Because potatoes have a high potassium content, they are frequently limited in the diets of people with chronic kidney disease (CKD). If patients want to include potatoes in their diet, dietitians can teach them how to leach potassium from the potato before consumption.

Potatoes have been bred into many standard or well-known varieties, each of which has particular agricultural or culinary attributes. There are currently over 500 potato varieties, which are generally categorized based on common characteristics into a few main groups, such as russets, reds, whites, yellows (i.e., Yukons), and purples.[1]

Previous studies examined the potassium content of raw potatoes after leaching.[2,3] However, the potato variety in these studies was limited to Idaho. Therefore, this study sought to determine analytically the potassium content of different varieties of raw potatoes, and to estimate the amount of potassium that can be extracted or leached from raw potatoes by cooking.

Methods

Material Selection

Six different varieties of fresh potatoes (i.e., Idaho, also known as (AKA) russet, red bliss

**Department of Nutrition, School of Health Professions and Nursing, Long Island University, Brookville, New York.*

†*Department of Chemistry, College of Liberal Arts and Sciences, Long Island University, Brookville, New York.*

This study was supported by a research grant from the National Kidney Foundation Council on Renal Nutrition.

Address reprint requests to Jerrilynn D. Burrowes, PhD, RD, Department of Nutrition, School of Health Professions and Nursing, Long Island University, C.W. Post Campus, 720 Northern Blvd., Brookville, NY 11548. E-mail: jerrilynn.burrowes@liu.edu

1051-2276/08/1806-0009$34.00/0
doi:10.1053/j.jrn.2008.08.005

AKA red Dakota, Yukon gold, purple Viking, white rose, and Russian banana fingerling) for this study were obtained from the Whole Foods Market in Manhasset, New York. These potatoes are briefly described in Table 1.

Procedures for Preparing and Cooking the Potatoes

Raw potatoes were washed, peeled, washed again, surface-dried, and prepared for processing. Based on the results of Bower,[4] and to maximize potassium leaching, sliced samples (≈3 mm) were prepared using a mandoline. For a given set of conditions, 3 slices were taken from different sections of each potato, to sample variations in potassium content. In total, 9 slices were taken from each potato, except in the case of purple Viking, white rose, and Russian banana fingerling potatoes, where a second tuber was obtained from the same lot because of the small size of the potato. Each slice was weighed and recorded. Raw samples were neither soaked in water nor cooked. Based on results of a previous study, the potatoes were not soaked, because soaking was found to be ineffective in leaching potassium from tuberous root vegetables.[5] For samples that were cooked, two methods were applied: normal cooking (NC) and double cooking (DC). Normal cooked samples were placed in deionized water at a 2:1 water-to-sample ratio. Cooking time varied from 5 to 10 minutes, depending on the density of the potato. Cooking ceased when the sample was soft yet retained its integrity. Double-cooked samples were placed in deionized water at room temperature at a 2:1 water-to-sample ratio. The water was brought to a boil and then drained off. Fresh room-temperature deionized water was added. The water was brought to a boil again, and the sample was cooked until it was soft yet retained its integrity. The DC method was previously used by Bower in a study of the potato.[4]

All cooked samples were rinsed with deionized water and placed on tared watch glasses, to be dried in a drying oven. The drying-oven temperature was maintained between 90°C and 110°C. Raw and cooked samples were left to dry in the drying oven for at least 24 hours and dried to constant weight. Dried samples were transferred from the watch glasses, and each was separately ground into a powder. Powdered samples were stored in glass bottles in desiccators.

All equipment and glassware used for the preparation, cooking, and storage of samples were washed with 5% nitric acid, triple-rinsed with deionized water, and air-dried before use.

Chemical Analysis

Powdered samples were ashed in a muffle furnace to burn off the organic matrix, and to liberate potassium. One gram of each dried sample was placed into a clean, dry, and weighed nickel crucible. To prevent splattering and loss, nickel lids were placed half-covering the crucibles. Ashing times and temperature programs were based on the study of Rowan et al.[6] The initial furnace temperature was set to 300°C. After 10 to 15 minutes, the furnace temperature was raised to 400°C at a rate of 2° to 3° per minute. The furnace door was left ajar to allow smoke to escape. For all samples, smoking occurred between 350°C and 400°C. Once smoking ceased, the furnace temperature was raised to 500°C, and samples were heated for 3 hours. After heating was complete,

Table 1. Description of Potato Varieties Selected for This Study*

Potato Variety	Description
Idaho, AKA russet	Large, brown-skinned, white fleshy potato
Red bliss, AKA red Dakota	Smooth, red skin; white flesh
Yukon gold	Oval-shaped; buff skin color; waxy smooth skin texture; yellow-fleshed potato
Purple Viking	Large, round-shaped tubers with purple skin splashed with pink and moist, firm, white flesh
White rose	Oval-shaped; tan-colored, thin outer skin
Russian banana fingerling	Long, fingerling tuber shape; golden-skinned, yellow-fleshed potato; waxy; firm texture

AKA, also known as.

*From "A Root Vegetable Primer," Whole Foods Market, available at: www.wholefoodsmarket.com/products/produce/rootvegprimer.html; "The Cook's Thesaurus," available at: http://www.foodsubs.com/Potatoes.html; and the Potato Association of America, University of Maine, available at http://www.umaine.edu/PAA/Varieties/whiterose.htm.