



# Potato Progress

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## Effect of Different Cooking Methods on "New Potato" Phytonutrients

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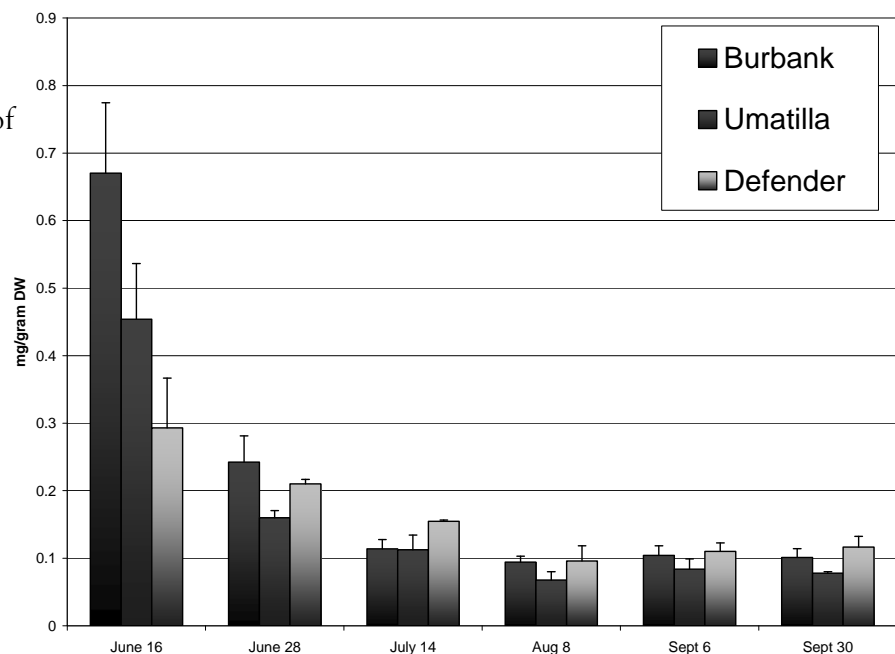
Potatoes are a nutritious vegetable, but over the last decade negative publicity from various quarters has raised concerns among some consumers about the healthfulness of potatoes. In the United States and in much of the developed world, potato consumption is greater than that of any other vegetable. Moreover, consumption is increasing rapidly in the developing world. As a staple food, potatoes have a dietary role distinct from fruits and vegetables eaten in sparser quantities. If a public goal is to promote health by increasing the amounts of vitamins, minerals or phytonutrients consumed in the diet, then a sensible approach is to focus on further enhancing the nutritional content of the most consumed crops.

Potatoes have much untapped nutritional potential, and efforts to further enhance potato phytonutrients have really only begun in the last few years. Today, several groups around the world are working on potato phytonutrients, whereas a decade ago it would have been difficult to find any concerted effort towards enhancement. Attempting to develop a nutritionally maximized potato is an example of working on a consumer-desired trait. Such potatoes should be good for the industry by offering marketing opportunities and good for the public's health by increasing consumption of health-promoting phytochemicals.

If one was trying to pick a product that would showcase the nutritional value of potatoes, "new potatoes" would be a good choice. New potatoes (also known as "baby" or "early" potatoes) are harvested at a young development age. We have found new potatoes have higher concentrations of many phytonutrients than mature tubers. For example, chlorogenic acid (Fig. 1), a phenolic phytonutrient with many health-promoting properties, is found at the highest concentrations early in the growing season. Similar tendencies were found for other phytonutrients.

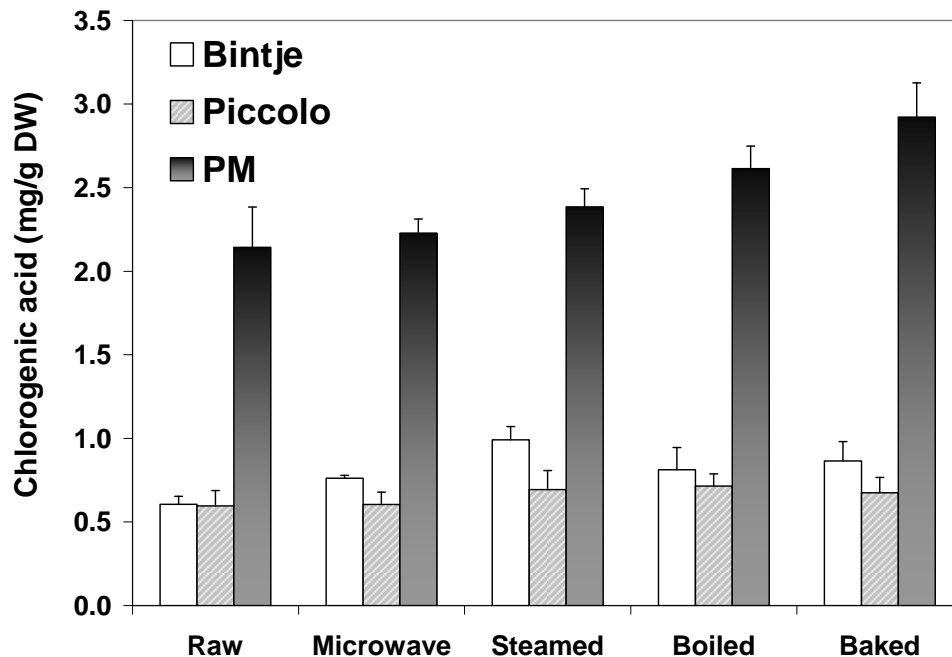
Moreover, new potatoes are typically cooked and eaten with their skin on thereby retaining all of the phytonutrients, minerals and vitamins present in the whole potato.

**Figure 1.** Chlorogenic acid concentrations measured throughout the growing season. Tubers were harvested at the dates indicated.



Furthermore, cooking with the skin on should reduce the leaching of phytonutrients that can occur during some types of cooking. Because of their small size, new potatoes cook faster and faster cooking times have the dual benefit of reducing thermal degradation of phytonutrients and providing consumers with quicker preparation times. Consumers typically pay extra for new potatoes, in part because they are perceived to have a superior taste. New potatoes are a good example of a product with consumer-oriented traits, namely, superior taste, faster preparation and more phytonutrients.

We measured the effect of multiple cooking methods on new potatoes to see how well select phytonutrients survive cooking. Additionally, we also wanted to know if those phytonutrients we think are promising targets to further increase in potatoes, actually survive cooking in reasonable amounts. Obviously research directed towards increasing phytonutrients should focus on those that survive cooking.



**Figure 2.** Effect of four different cooking methods on chlorogenic acid in new potatoes from Bintje, Piccolo and Purple Majesty (PM).

New potatoes from the cultivars ‘Piccolo,’ ‘Bintje’ and ‘Purple Majesty’ were baked, boiled, microwaved, steamed or stir-fried. **Fig 2** shows the effect of cooking on chlorogenic acid in ‘Bintje,’ ‘Piccolo’ and ‘Purple Majesty.’ None of these four cooking methods significantly decreased the amount of chlorogenic acid. Similar results were seen for rutin, a flavonol with numerous health-promoting properties (**Fig 3**) and vitamin C (**Fig 4**). For some phytonutrients, including vitamin C, rutin and chlorogenic acid, there was a trend to more being extractable after cooking, especially after baking, than in uncooked potatoes. This was probably due to the phytonutrients becoming easier to extract due to cooking. In published cooking studies for potatoes and other vegetables, results tend to be highly variable. Some studies show substantial degradation of a given compound in a given food after cooking, whereas other studies may show a slight increase in the same compound after cooking. One source of variability in potato cooking studies might be a failure to account for increased weight of potatoes after boiling due to water absorption. In our study, all samples were freeze-dried after cooking, so changes in water content would not have been a factor. We also carefully optimized cooking time to avoid overcooking. Potatoes were judged fully cooked when microwaved for 2 min 30 sec, baked for 30 min at 375 °C, steamed for 15 min or boiled for 18 min.

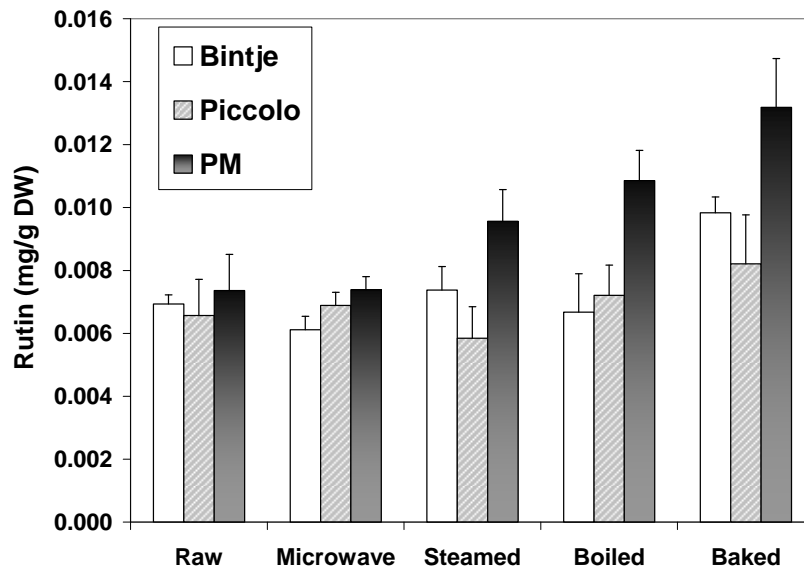


Figure 3. Effect of four cooking methods on rutin.

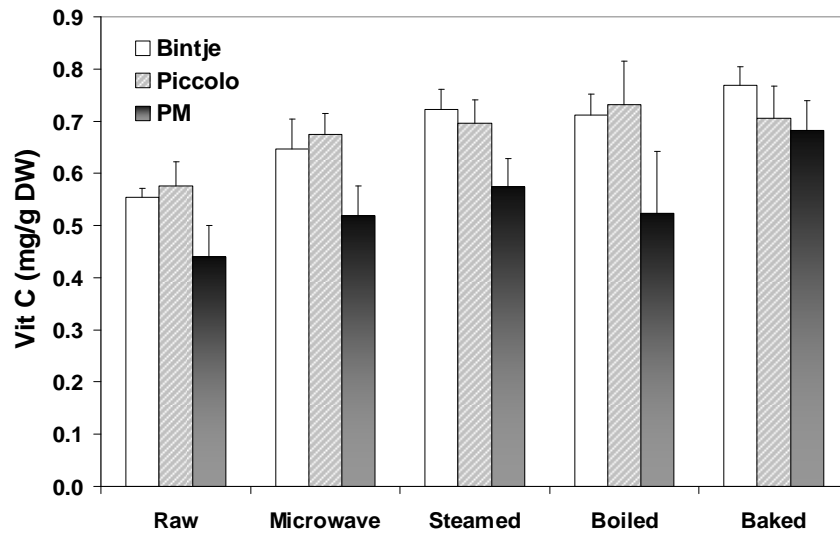
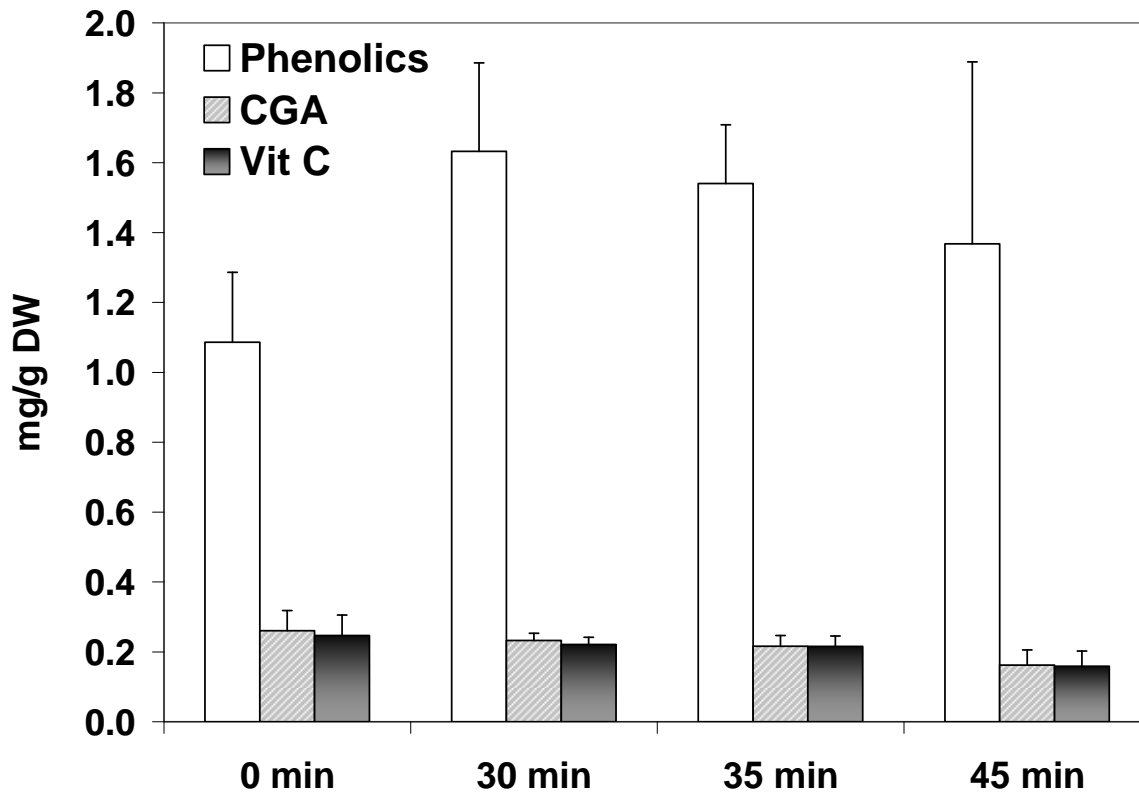


Figure 4. Effect of four cooking methods on vitamin C content.

After verifying that cooking oil did not interfere with our assays, we stir-fried whole new potatoes in canola oil for 18 minutes. No decrease in total phenolics, chlorogenic acid or vitamin C was observed (data not shown). Potatoes cooked at home would likely be subjected to a range of cooking conditions with some being overcooked. To examine whether overcooking substantially reduces phytonutrients in new potatoes, we microwaved 'Bintje' tubers for an additional 1 or two minutes, or baked them for an additional 5 or 15 minutes. No decrease in total phenolics, chlorogenic acid, flavonols or vitamin C was seen after microwaving for an extra 1-2 min (data not shown), but a slight decrease was seen in chlorogenic acid and vitamin C after baking an extra 15 min (Fig 5).



**Figure 5.** Effect of baking on total phenolics, chlorogenic acid or vitamin C in new potatoes from 'Bintje' baked an additional 5 min (35 min total) or 15 min (45 min total) compared to uncooked (0 min) or fully cooked (30 min) potatoes.

This suggests that potatoes modestly overcooked at home, may not suffer a substantial loss in phytonutrients. Furthermore, processors preparing pre-cooked potato products should be able to standardize methods and avoid overcooking.

In summary, new potatoes may be a particularly apt vehicle to more fully utilize the nutritional offerings of potatoes and have several traits that should appeal to consumers. Furthermore, this study shows that many of the phytonutrients of interest to the Northwest research community survive cooking thus confirming that they are sensible targets for enhancement.

## New Book: Potato Health Management, Second Edition

This highly-anticipated manual tackles the hundreds of problems that affect the potato crop including weeds, insects, nematodes, fungi, bacteria, phytoplasmas, and viruses. The new edition is 30% larger than the first and contains more color photographs, which are now interspersed throughout the text. It includes timely new chapters on economics, home gardening, and organic production.

More than 40 experts from the fields of soil science, weed science, nematology, plant pathology, and entomology explain how to manage potato health from seed to storage by a holistic approach. The book provides the most current information on potato production practices, with an emphasis on pest and disease management. The knowledge base provided in this text can be integrated into a comprehensive management scheme in the context of today's agriculture.

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