



Potato Progress

Research and Extension for Washington's Potato Industry

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Potatoes as a Source of Dietary Nutrients

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A growing number of Americans appear increasingly interested in the medicinal benefits of foods and the relationship between diet and health. It has been estimated that 1/3 of Americans take a daily vitamin or dietary supplement and annual supplement sales in the U.S. top \$18 billion. Medical research in the years ahead will discover much more about which plant nutrients have positive effects on health and how readily they are absorbed when eaten. Consequently, the food-health link is likely to be a topic that receives substantial media coverage and ever-increasing public awareness.

Unlike during most of its long gastronomic history, the nutritional qualities of potatoes are perhaps currently underappreciated due to negative publicity from various sources, such as low-carb diet advocates. Nevertheless, most nutritionists agree that potato is a healthy food. Because Americans eat so many, about 140 pounds per year, potatoes have a unique potential to be a source of vitamins and desirable phytonutrients in the American diet. Developing and positioning potato as a "functional food," (ie a food that provides health benefits beyond that of meeting basic nutritional needs) could create new marketing opportunities amongst consumers who base their buying decisions upon the perceived nutritional value of a food.

Just what vitamins and nutrients are in potatoes? Which varieties have the most? Can new varieties be developed that have even more? Answering these types of questions has been made easier due to recent technological advances.

Potato total phenolics

Potato has potential as a source of dietary phenolics. These are a diverse group of thousands of different compounds, some of which are effective against diseases or have other health promoting qualities. The role of phenolics in health is a promising area of active ongoing medical research that is only beginning to be understood. Plant phenolics may contain a treasure chest of potential health-promoting compounds. For example, one often hears about positive health effects of green tea or wine, which is primarily due to phenolic content. Conducting a Google search using phenolics and health as keywords, returns over 700,000 links.

We screened numerous varieties and wild species, and found some potatoes that have over 100 mg/100 gram fresh weight of total phenolics, in samples that are mostly flesh. These amounts become substantially greater if all of the skin is included, and higher still if

anthocyanins are included in the calculation. If we compare high phenolic potatoes to some published reports of total phenolic amounts found in other plants, these potatoes have more phenolics than tomatoes, peas, onions, French beans, cucumbers, white cabbage, carrots, lettuce, or cucumbers. Furthermore, the amounts in these potatoes rival some published phenolic amounts for broccoli, brussel sprouts and spinach.

Potato flavonoids

Potatoes have a group of phenolics called flavonoids. We have identified 4 of these compounds all of which contain either quercetin or kaempferol. In addition, there are several more potato flavonoids that we haven't yet fully identified. Over 1,000 scientific studies involving quercetin have been published in the last 2 years. The U.S. Department of Defense recently funded a \$1.1 million grant to Appalachian State University to study whether quercetin can help maintain soldiers' immune systems. Numerous studies suggest quercetin and related flavonoids have multiple health-promoting effects, including reducing the risk of heart disease, lower risk of certain respiratory diseases, such as asthma, bronchitis, and emphysema and reduce the risk of some cancers including prostate and lung cancer. More medical research is needed in these areas, but the early results are encouraging. Potatoes appear to have significant amounts of flavonoids, and although they do not contain as much as some plants, such as onions, much greater quantities of potatoes are eaten. Thus, the contribution of potato flavonoids to the diet has perhaps not been fully appreciated so far and is an area well-worth further investigation.

Other phenolics in potatoes

Potato is a particularly rich source of numerous caffeic acid derivatives, including 4 different chlorogenic acids. There is evidence that chlorogenic acid has multiple health-promoting effects. It is known to protect against degenerative, age-related diseases in animals when added to their diet, and may reduce the risk of some cancers and heart disease. Over 200 scientific papers have been published about chlorogenic acid in the last 2 years. Potato has several other caffeic acid containing compounds. Caffeic acid is a strong antioxidant and recent medical studies have suggested a role for it in reducing the risk of cardiovascular disease and cancer. Potato also has ferulic acid containing compounds, another compound suspected to have various health-promoting effects.

Additional interesting compounds in potatoes

Last summer the European press, including the BBC, reported that potatoes contained compounds known to lower blood pressure. In June 2005, a British lab reported the discovery of compounds called kukoamines in potatoes. These compounds had previously only been found in a Chinese medicinal plant, in which they are being studied because they lower blood pressure. It should be noted that press coverage notwithstanding, it still needs to be established whether enough of these compounds survive cooking to have any effect on humans. Nevertheless, the presence of these compounds is indicative of the complex chemical makeup of potatoes. The method we developed to analyze phenolics in potato also detects at least 5 different kukoamines in some of the locally grown varieties and we do observe differences in the amounts between varieties.

In summary, the type of research described in this report should help in understanding the phytonutrient content of potato and in identifying existing or developing new varieties with even higher amounts of desirable phytonutrients and vitamins.

A Pipeline for the Future: The Potato Variety Development Program

Mark J. Pavek
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Your participation is requested at the upcoming Cultivar Performance Workshop on the Big Bend Community College campus. Evident from the results over the past couple of years, we have many new cultivars in our development pipeline with outstanding potential. Help us review this year's data from multiple WA and OR variety trials and provide input for next year's research. We will have many new potato clones on display during this workshop to allow you a glance of what's to come. During the workshop, we'll discuss positive change underway and open the floor for comments from the industry regarding the performance of newly released cultivars – the good and the bad, and future changes you would like to see in our evaluations. Additional items of discussion range from post harvest evaluations to the diseases resistance of new cultivars. The schedule is as follows:

Tuesday, Feb 7, 2006 – ATEC Conference Center, Big Bend Community College

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| 10:00 a.m. | 2005 In Field Results and Changes to Improve Variety Screening
MJ Pavek, EP Driskill, ZJ Holden, BC Clark, RG Garza Jr., RG Garza WSU - Pullman |
| 10:20 | 2005 Post Harvest Results
Rick Knowles, Lisa Knowles, and Nora Fuller, WSU - Pullman |
| 10:45 | Break |
| 11:00 | Advancing Varieties - A Report from Hermiston
Dan Hane, OSU - Hermiston |
| 11:20 | Phytonutrient Evaluation of Potatoes
Roy Navarre, USDA/ARS - Prosser |
| 11:40 | Discussion of Specialty Potato Characteristics and Performance
Chuck Brown, USDA/ARS - Prosser |
| 12:00 p.m. | Closing Observations and Comments |

A Reminder about Cull Pile and Waste Potato Management

Winter weather is here, and we need to be thinking about minimizing the success tuberworm moths can have in overwintering. Any potatoes exposed to moths can be food sources for larvae, and contribute to building tuberworm populations. One of the most likely places moths will overwinter is the grounds surrounding storage buildings and other places where potatoes might be piled intentionally or spilled accidentally. Cull piles and piles of dirt mixed with potatoes are likely a major means of overwintering of tuberworm, just as they can overwinter late blight. Another major source of tuber moth populations and a means of overwintering are tubers left in/on the ground after harvest.

Cull/Dirt Piles

Our tuberworm trapping network identified a population build-up this summer near a complex of storage buildings north of Othello. Tuberworm larvae are not afraid to share their food, and 25-50 (or more) larvae can develop in one tuber. Therefore, what seems like a small number of tubers, in comparison to the thousands of tons you handle each day, could be enough to build large numbers of moths. Such moths can then colonize neighboring fields or overwinter and start the race anew in the spring. **Cull potatoes should be destroyed, processed, or buried under at least 24 inches of soil as soon as possible.**

Franklin County Extension Position Interviews and Reception

The Franklin County Extension educator position formerly held by Erik Sorensen has been vacant for about a year now. There is currently a search being conducted to find the best candidate to fill this position. The search committee has elected to hold a reception during the interview process, during which all candidates will be present. The reception will be a great way for you to meet your future extension educator, and to help the selection committee decide which candidate best fits the needs of Franklin County agriculture.

All interested parties from industry are invited to this reception:

Date: December 15th, 2005

Time: 4:30 - 6:00 pm

Place: Pasco, TRAC, Agricultural Hall of Fame Room

On December 16th, there will be seminars presented by all candidates, in the same room, beginning at 8:00 am. The candidates have been asked to speak on "The Biggest Challenges Facing Agriculture in the Mid Columbia." Members of industry are welcome to attend these seminars as well.