POTATOES AND ANTIOXIDANTS


Reported content and process stability of phenolics in potato products is inconsistent. Changes in phenolic content of select varieties through fresh and industrial preparation/reconstitution were assessed. Total chlorogenic acids (CQAs) ranged from 43 to 953mg/100g dw and were more concentrated in pigmented compared to white/yellow-fleshed potatoes. Anthocyanin (ANC) content ranged from 18.6 to 22.9mg/100g dw and were mainly present in the flesh of pigmented potatoes. Retention of phenolics through commercial processing ranged from 49 to 85% for pigmented varieties and 32-55% for white/yellow. CQA levels were reduced through processing but to a greater extent in white relative to pigmented potatoes. ANCs were well retained through industrial processing of pigmented potatoes (79-129%). Levels of CQA were significantly (p<0.05) lower in some industrially versus freshly processed products but not for all products. While some differences exist, overall, industrially processed potato products compare favorably to fresh preparation in levels and recovery of phenolics. Link: [https://www.ncbi.nlm.nih.gov/pubmed/27719937](https://www.ncbi.nlm.nih.gov/pubmed/27719937).


Potatoes (*Solanum tuberosum*) are an important global crop that can be transformed into many products impacting several health dimensions ranging from under-nutrition, food security and disease prevention to issues of over-nutrition including obesity, diabetes, heart disease. Processed potato products are typically categorized as high fat and sodium foods, as well as being classified as a significant source of carbohydrate, in the form of starch. Conversely, potato products are less known for their contribution of key micronutrients (vitamin C, potassium, magnesium), fiber, and phytochemicals (phenolics and carotenoids). More recent insight into the nutritional value of potatoes and the potential of potato phytochemicals to modulate oxidative and inflammatory stress as well as the potential to alter glycemic response has resulted in increased interest in strategies to improve and leverage the nutritional quality of processed potatoes. This review summarizes critical information on nutritional profiles of potatoes and their processed products and describes the state of the science relative to the influence of in-home and common commercial processing on nutritional quality and potential impacts on human health. Link: [https://www.ncbi.nlm.nih.gov/pubmed/26852789](https://www.ncbi.nlm.nih.gov/pubmed/26852789).


Potato (*Solanum tuberosum* L.) is common, affordable, readily stored, easily prepared for consumption, and nutritious. For these reasons, potato has become one of the top five crops consumed worldwide. Consequently, it is important to understand its contribution to both our daily and long-term health. Potato is one of the most important sources of antioxidants in the human diet. As such, it supports the antioxidant defense network in our bodies that reduces cellular and tissue toxicities that result from free radical-induced protein, lipid, carbohydrate, and DNA damage. In this way, potato antioxidants may reduce the risk for cancers, cardiovascular diseases, diabetes, and even radiation damage. A better understanding of these components of potato is needed by the food industry, health professionals, and
consumers. This review provides referenced summaries of all of the antioxidant groups present in potato tubers and updated schematics including genetic regulation for the major antioxidant biosynthesis pathways. This review complements current knowledge on the role of potato in human health. We hope it will provide impetus toward breeding efforts to develop cultivars with increased antioxidant capacity as ‘functional foods’ and encourage potato consumers and processors to work toward preservation of antioxidant capacity in cooked potato and potato products. 


Potato phytonutrients include phenolic acids, flavonols, anthocyanins, and carotenoids. Developmental effects on phytonutrient concentrations and gene expression were studied in white, yellow, and purple potatoes. Purple potatoes contained the most total phenolics, which decreased during development (from 14 to 10 mg g(-1)), as did the activity of phenylalanine ammonia-lyase. The major phenolic, 5-chlorogenic acid (SCGA), decreased during development in all cultivars. Products of later branches of the phenylpropanoid pathway also decreased, including quercetin 3-O rutinoside, kaempferol 3-O-rutinoside, and petunidin 3-O-(p-coumaroyl)rutinoside-3-glucoside (from 6.4 to 4.0 mg g(-1)). Violaxanthin and lutein were the two most abundant carotenoids and decreased 30-70% in the yellow and white potatoes. Sucrose, which can regulate phenylpropanoid metabolism, decreased with development in all cultivars and was highest in purple potatoes. Total protein decreased by 15-30% in two cultivars. Expression of most phenylpropanoid and carotenoid structural genes decreased during development. Immature potatoes like those used in this study are marketed as “baby potatoes”, and the greater amounts of these dietarily desirable compounds may appeal to health-conscious consumers. 


Potatoes have the highest daily per capita consumption of all vegetables in the U.S. diet. Pigmented potatoes contain high concentrations of antioxidants, including phenolic acids, anthocyanins, and carotenoids. In a single-dose study six to eight microwaved potatoes with skins or a comparable amount of refined starch as cooked biscuits was given to eight normal fasting subjects; repeated samples of blood were taken over an 8 h period. Plasma antioxidant capacity was measured by ferric reducing antioxidant power (FRAP). A 24 h urine was taken before and after each regimen. Urine antioxidant capacity due to polyphenol was measured by Folin reagent after correction for nonphenolic interferences with a solid phase (Polyclar) procedure. Potato caused an increase in plasma and urine antioxidant capacity, whereas refined potato starch caused a decrease in both; that is, it acted as a pro-oxidant. In a crossover study 18 hypertensive subjects with an average BMI of 29 were given either six to eight small, microwaved purple potatoes twice daily or no potatoes for 4 weeks and then given the other regimen for another 4 weeks. There was no significant effect of potato on fasting plasma glucose, lipids, or HbA1c. There was no significant body weight increase. Diastolic blood pressure significantly decreased 4.3%, a 4 mm reduction. Systolic blood pressure decreased 3.5%, a 5 mm reduction. This blood pressure drop occurred despite the fact that 14 of 18 subjects were taking antihypertensive drugs. This is the first study to investigate the effect of potatoes on blood pressure. Thus, purple potatoes are an effective hypotensive agent and lower the risk of heart disease and stroke in hypertensive subjects without weight gain. 


Pigmented potatoes contain high concentrations of antioxidants, including phenolic acids, anthocyanins, and carotenoids. These bioactive compounds have been implicated in the inhibition or prevention of cellular oxidative damage and chronic disease susceptibility. We assessed the effects of pigmented potato consumption on oxidative stress and inflammation biomarkers in adult males. Free-living healthy men (18-40 y; n = 12/group) consumed 150 g of cooked white- (WP), yellow- (YP), or purple-flesh potatoes (PP) once per day for 6 wk in a randomized study. Blood was collected at baseline and wk 6 to analyze total antioxidant capacity (TAC), DNA damage as assessed by plasma 8-hydroxydeoxyguanosine (8-OHdG), protein oxidation, lipid peroxidation, C-reactive protein (CRP), inflammatory cytokines, lymphoproliferation, NK cytotoxicity, and phenotypes. Potatoes were analyzed for TAC, phenolic acids, anthocyanins, and carotenoids. Compared with the WP group, the YP group had higher concentrations of phenolic acids (P < 0.002) and carotenoids (P < 0.001), whereas the PP group had higher concentrations of phenolic acids (P < 0.002) and anthocyanins (P < 0.001). Men who consumed YP and PP tended to have lower (P < 0.08) plasma IL-6 compared with those consuming WP. The PP group tended to have a lower plasma CRP concentration than the WP group (P = 0.07). The 8-OHdG concentration was lower in men who consumed either YP or PP compared with WP. Pigmented potato consumption reduced inflammation and DNA damage in healthy adult males. This offers consumers an improved nutritional choice in potato consumption. Link: http://www.ncbi.nlm.nih.gov/pubmed/21106930.