# Genetic Variation of Mineral Content in Potato and Nutritional Considerations

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#### Introduction

Potato is often underestimated as a source of minerals in the human diet. If one examines information available to consumers, it is immediately apparent that potato is a good source of potassium. In table one a summary of Recommended Daily Allowance (RDA) for potato constituents is shown (U.S. National Potato Board, 2005, http://www.healthypotato.com).

Table 1. Percent of the Recommended Daily Allowance of several minerals found in potato\*Serving size 148 g/ 5.3 oz.

Component *	Percent RDA
Iron	6
Potassium	21
Calcium	2
Zinc	2
Phosphorus	6
Magnesium	6

Clearly potato offers a good source of potassium. The supply of other minerals is certainly much lower.

However, the information databases from which these kinds of statistics are derived are from a limited genetic base. We have found quite a range of values upon examining potato breeding lines from the Tri-State and Western Regional Trials.

### Iron Content and Vitamin C

Of great interest are the iron contents. Iron deficiency is experienced by about half of the world's citizens. Iron deficiency in children is difficult to reverse and leaves a lifetime of stunted growth, diminished cognitive capacity and other conditions. It is important to remedy iron deficiency during the rapid growth periods of childhood. Fortunately, only about 9% of the U.S. population is iron deficient. However, even abundant iron supplies in the diet may be largely unavailable from certain foods. The rule of thumb is that iron availability is directly a function of total iron and the concentration of vitamin C, and is inversely correlated with the concentration of constituents that tie up iron, such as polyphenols and phytic acid (Reddy et al., 2000). Small grains have abundant phytic acid and beans have large amounts of polyphenols. Our analysis of iron content reveals that there is a broad range of values, from 30 to 260 micrograms per gram dry weight (See figure 1).



Iron content could conceivably be raised to a high enough level in new varieties that a substantial meal including potato and an additional high source of iron, such as a piece of meat, might provide half of the RDA for iron. The great advantage provided by the vitamin C content of potato would be increased by simultaneously increasing vitamin C and iron. Currently, the cultivar Ranger Russet has one of the higher vitamin C contents in economically important potato varieties, about 30 milligrams per 100 grams fresh weight, and as can be seen in figure 1, has approximately 100 micrograms of iron per gram dry weight. Manganese is a mineral that aids in uptake of iron. There appears to be a strong correlation of iron and manganese contents in the materials analyzed (Figures 2 and 3).



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## **Other Minerals**

Among the other minerals analyzed in our materials was zinc. Zinc is now known to be a crucial micronutrient for the proper development of the brain in children. Children with zinc deficiency show cognitive deficits in school. Learning disabilities have been increasingly attribut-



Figure 4. Zinc content in advanced breeding lines and varieties.

Potassium was mentioned as a mineral for which potato is an abundant source. The range in potassium contents is shown in Figure 5.



Figure 5. Potassium contents of advanced breeding lines and varieties.

The varieties Russet Burbank and Ranger Russet have 1.7 and 1.8 percent (weight by weight) potassium respectively. There is an indication in the range of breeding lines that new varieties could be selected that would have approximately 50% greater potassium, if such a goal were set as a high priority.

The potato is an underground stem that is modified during development as a storage organ. It is interesting to surmise from Figure 6 below that minerals are located primarily in the outer cortex of the tuber (Rastovski and van Es, 1987; Loon and Müller, 1984). This has intriguing implications for the nutritional value of the skin. Potato is often eaten in a peeled condition. However, the retention of the skin appears to be a nutrition-enhancing option, when it concerns minerals and vitamin C. This might argue for a shift to skin-on processed products in the future. Based on these data a full discussion of the significance of potato in iron nutrition in the



Figure 6. The anatomical locations of concentrations of various classes of tuber chemical constituents in the potato.

### References

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