Nutrient composition of the potato

Interesting varieties from human nutrition perspective

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HIDDEN TREASURE

Background

Potato is the world's number one non-grain food commodity.
The potato cultivated worldwide belongs to just one botanical species, *Solanum tuberosum*.

- The potato has four recognized species and 200 wild relatives.
- About 5000 potato varieties are grown in the Andes.
- The chemical composition of potatoes is influenced by many factors, such as the production area, cultivar, soil and climate, agricultural practice, preparation and cooking. Despite the potato's fundamental importance as a staple food, **little is known about the nutrient composition of many of the world's potato varieties**.

Objectives

The aim of this paper is to review the natural variation in the nutrient content of the potato in terms of genetic resource - for direct consumption or for breeding programmes, and in relation to nutritional properties and human diet and health.

Methods

A literature search was performed **to gather existing information on nutrient composition data of potato by species and variety**.
Nutritional data of about 1 015 different potatoes were gathered. The compilation focused on the variability within varieties for the characterization of potato varieties that represent the common market classes, breeding lines, Andean native potatoes, and wild Solanum species.
The **major macronutrients, vitamins and minerals as well as antioxidants and some anti-nutrients were reported**.

Table 1

Varietal variability in nutrient composition

Data from raw potatoes (flesh or whole potato) and expressed on a fresh weight basis.

Nutrient	Range	Average	Variety with highest content	Variety with lowest content
Protein	0.8-4.2 g/100g	2.1 (n=41)	Roja Riñon (Flesh, Tbr/T, Spain)	Revolución (Flesh, Agd, Argentina)
Total fibre Flesh	0.3-3.3 g/100g	1.7 (n=25)	Runa (Adg, Argentina)	Katahdin (Tbr, USA)
Starch	9.1-22.6	16.1	Imilla Negra (Flesh, Adg, Argentina)	Kufri Bahar (Flesh, Tbr, India)
Iron				
├ Flesh	0.1-3.8 mg/100g	0.7 (n=90)	Kufri Chandramukhi (Tbr, India)	Negrita (CIP703671, Adg, Peru)
└ Whole	0.7-10.4 mg/100g	1.4 (n=90)	Peluca (Tbr/T, Spain)	Cara (Tbr/T, Spain)
Potassium	239-694 mg/100g	443 (n=53)	Azucena (Whole, Adg, Spain)	Monalisa (Tbr, Spain)
Magnesium	10.8-37.6 mg/100g	20.2 (n=53)	Puca Huaryo (Cha, Peru)	Monalisa (Tbr, Spain)
Phosphorus	33.1-126 mg/100g	71.4 (n=26)	CIP 703315 (Gon/G, Peru)	Kufri Bahar (Flesh, Tbr, India)
Calcium	1.3-27.8 mg/100g	10.6 (n=127)	Jancko Anckanchi (Whole,CIP704229, Aja, Peru)	Kufri Bahar (Flesh, Tbr, India)
Vitamin C				
├ Flesh	2.8-42 mg/100g	16.6 (n=88)	Chaju (Tbr, Korea)	Liseta (Tbr, Spain)
└ Whole	4.6-40 mg/100g	17.1 (n=90)	Voran (Tbr, USA)	CIP705172 (Phu, Peru)
Hydrophilic antioxidant activity				
├ Flesh	43-892 mcg Trolox eq./g	386 (n=488)	*S. pinnatisectum* PNT (Wild, USA)	*S. brachistotrichum* 255528 TAX 42 (Wild, USA)
└ Whole	128-565	306 (n=26)	Purple Peruvian (Tbr, USA)	Atlantic (Tbr, USA)

Solanum tuberosum L. (Tbr); *S. tuberosum* subsp. *tuberosum* (Tbr/T); *S. tuberosum* subsp. *andigena* (Adg); *S. chaucha* (Cha); *S. stenotomum* subsp. *goniocalyx* (Gon/G); *S. ajanhuiri* (Aja). n = number of different varieties analyzed for each nutrient

Table 2

Iron and vitamin C in the flesh

Variety	Taxonomic	Origin	Iron mg/100g	Vitamin C mg/100g
Negra Ojosa CIP704143	Tbr Stn Adg	Peruvian Andes	0.4	12.8
Natin Suito CIP702464	Tbr Gon/G Stn/S	Peruvian Andes	0.5	18.2
Monalisa	Tbr	Spain	0.5	4.6
Puma Maqui CIP702 395	Tbr Adg	Peruvian Andes	0.6	11.0
Maria Cruz CIP704 393	Tbr Gon/G	Peruvian Andes	0.6	34.0
Cuchi Chucchan CIP706 191	Tbr Adg	Peruvian Andes	0.6	8.9
Runtu CIP703 985	Tbr Gon/G	Peruvian Andes	0.6	12.8
Superior	Tbr	Canada	0.5	26.9
Kufri Chandramukhi	Tbr	India	3.8	14.2

Results

High levels of variability were found in nutrient composition within varieties. For example, the difference for the highest and lowest value was as much as 10 mg/100g for iron when measured in the whole potato, and 37 mg/100g for magnesium (flesh) and 694 mg/100g for potassium (whole) **(Table 1)**.
A high variability was also found for vitamin C and dietary antioxidants, the highest antioxidant activity being measured in wild *Solanum* species.
Some common potato cultivars and breeding lines contain both high vitamin C and iron contents **(Table 2)**.

Discussion

Varietal differences in nutrient composition were found for all nutrients analyzed. Depending on the variety, potatoes can be a valuable source of minerals such as potassium, magnesium and phosphorus, and also of dietary antioxidants.
A high content of vitamin C enhances iron absorption, and high vitamin C / high iron potato varieties could significantly contribute to achieve the daily vitamin C and iron requirements. **Intake of one potato variety rather than another could be the source of difference between nutrient deficiency and adequacy**.

Conclusion

This study showed a wide variability in nutrient levels among the potato varieties. More data on varietal nutritional differences are needed to stimulate the identification of high nutrient content varieties, the production of more nutritious varieties, and the conservation of potato biodiversity. The use of varietal data in food composition databases or in food intake surveys may lead to more specific dietary guidelines and to the selection of potato varieties based, to some extent, on their nutritional value in breeding programs.

References
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