



Genetic diversity in potato breeding for nutritional quality in Colombia

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Introduction

Southern Colombia is a diversity center for diploid potato. We are starting a potato breeding program focused on nutritional traits. We are evaluating nutritional quality of potato genotypes and the biochemical analysis includes sugars, proteins, minerals, starch, moisture, fat, dietary fiber and others as antioxidants that includes carotenoids and vitamin C. Chemical analysis also includes antinutritional compounds such as glycoalkaloids that are common in potatoes. These results contribute to the selection of optimal genotypes for breeding and consumption.

Plant material

- 145 Native potato varieties
- 110 *Solanum phureja* accessions from Colombia (CCC)
- 12 Advanced clones from potato breeding program (Fig. 1)



Figure 1. Plant material and samples preparation for nutritional analysis a) Colombian Core Collection of *S. phureja*. b) Protocol to prepare potato tuber samples: tubers were washed and immersed in 0.25 M of HCl for ten minutes, after it they were cooked, cut and freeze dried for the analysis.

Table 1. Proximal analysis of potato Colombian Core Collection (g/100g)

No. Individuals	Moisture	Protein	Fat	Ashes
	n = 120*	n = 60 **	n = 65**	n = 65**
Average	77,202 ± 4,986	1,462 ± 0,654	0,056 ± 0,032	1,530 ± 1,935
Range	70,040 - 84,970	0,487 - 2,621	0,011 - 0,126	0,569 - 1,129

* Sample in triplicate for each clone, Location 1 harvest.

** Duplicate samples of a replica of clones in location 2.

Mineral analysis

Peeled ccc tubers were washed, immersed in 0.25 M HCl for 10min, cooked, cut, frozen, freeze dried and processed,

Table 2. Fe and Zink contents of selected clones

Clon	Fe (mg/Kg)			Zn (mg/Kg)		
	With skin	HCl	Without skin	With skin	HCl	Without skin
CA04	20.65	32.83	29.00	13.94	30.90	31.77
CA09	24.11	30.65	26.80	14.01	23.64	23.49
CA50	23.18	21.57	22.19	16.10	24.67	25.45
CA51	27.14	20.05	20.27	18.08	22.28	20.79
CA52	28.78	22.48	23.74	15.23	20.79	22.14
CA59	31.27	26.82	20.28	16.50	30.75	30.32
CA63	19.56	24.36	26.73	13.74	20.94	23.33
CA64	22.40	30.05	52.71	15.73	24.84	29.07
Average	24.64a	26.10a	28.69a	15.42a	24.85a	25.80

a: significant differences with p < 0.05

Phenolic acids and flavonoids analysis

Functional compounds such as phenolic acids and flavonoids have a positive contribution to human health risks reducing coronary disease, age-related diseases and they have proven hypotensive effects. We identified and quantified contents of functional compounds in advanced breeding lines and CCC using lyophilized material of boiled potato under UHPLC technique. Regarding phenolic compounds, the most abundant hydroxycinnamic acids were chlorogenic acid (0.2149 to 0.09847 mg g⁻¹ DW), caffeic acid (0.004265 to 0.000117 mg g⁻¹ DW) and *p*-coumaric acid (from 0.00276 to 0.0004 mg g⁻¹ DW). Similarly as kaempferol flavonols found (0.00077 to 0.0 mg g⁻¹ DW) and flavanols such as catechin (0.0172 to 0.0 mg g⁻¹ DW). Figure 2 shows the diversity of phenols compounds present in *Solanum phureja* collection.

Intra/Intervarietal differences in total and individual amounts of phenolic compounds

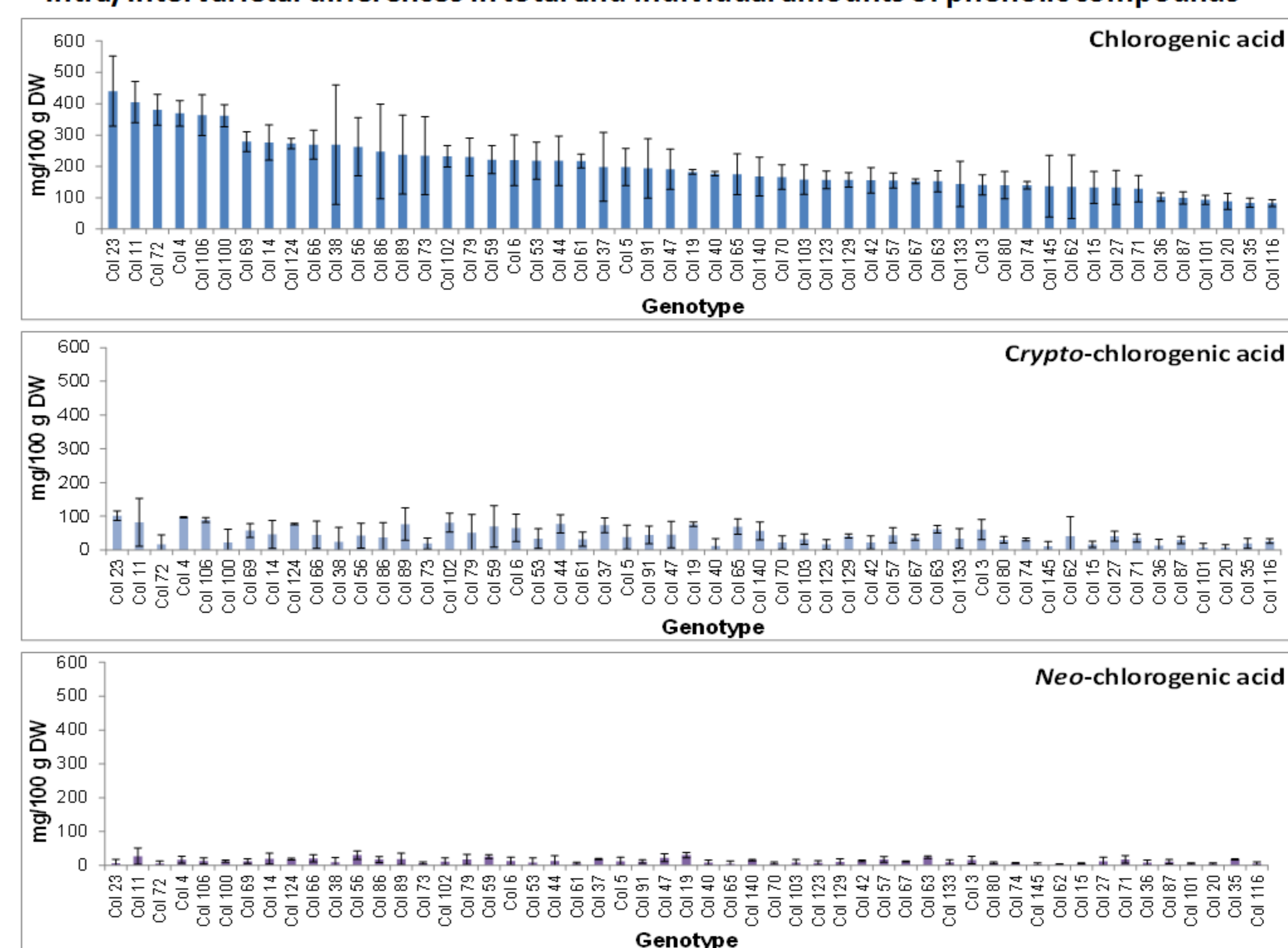


Figure 2. Diversity present in *S. phureja* (CCC) accessions. Amount of chlorogenic acid, *Crypto*-chlorogenic and *Neo*-chlorogenic acid is shown.

Conclusions

- There are significant differences in nutrition contents
- Chlorogenic acid is the most abundant phenolic
- Content and phenolic ratios are strongly affected by crop location and boiling
- There is partial correlation between color and chlorogenic acid
- There are significant differences between with and without skin