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## UP-LAND ENVIRONMENT INFLUENCES THE POTATO NUTRITIONAL PROFILE

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### Introduction

Securing sufficient and healthy food for all, while minimizing environmental impact is the great challenge we face already today. Local production limits and global trade challenge equal access to food. Specifically, effects of altitude on nutritional value of potato tubers was evaluated. Indeed, upper land potato satisfies consumer demand for high quality foods linked to traditional areas of origin and for new specialties and niche products endowed with added nutritional value since it is commonly thought that the crop x environment synergy improves potential beneficial properties of the tuber and gives it a special taste and a renowned quality. Additionally, potato is actually a precious source of bioactive compounds that have an enormous potential. Based on these considerations, we have deemed it interesting to evaluate the metabolic profile of potato in response to altitude, aware that consumer's choices might be influenced by food products' beneficial properties and "Mountain Potato" sounds good!

### Phytonutrient composition of potato genotypes

Phytonutrient composition of whole tubers extracts from six genotypes has been investigated in 2019 and in 2020. Three commercial potato varieties (Bleuet; purple skinned and fleshed tubers; Desiree, red-skinned and yellow-fleshed tubers and Kennebec, yellow-skinned and white-fleshed tubers), one advanced hybrid line (98-11-1, purple parti-coloured skinned and fleshed tubers) and two Italian traditional ecotypes (Bianca di Starleggia, yellow-skinned and white-fleshed tubers, and Rossa di Starleggia, red-skinned and yellow-fleshed tuber) were grown either at the experimental farm of CREA- Research Center for Cereals and Industrial Crops, located in Budrio (Bologna area, 25 m. a.s.l.). CGA was present at comparable levels in all the genotypes, except of Bleuet and 98-11-1, that resulted highly CGA-rich. ACNs are particularly concentrated in Bleuet.

### Effect of Up-Land environment on phytonutrients



Based on results, carotenoids content is low in all genotypes tested. The content of total GCA and ACNs were significantly affected from environment ( $p=0.0000$ ).

The average concentrations of CGA ranged from 60,1 to 94,5 mg/g 100g d.w. in flat-land and up-land, respectively. Up-land Bleuet showed the highest tot CGA, ACNs and CAR content, increasing in up-land area.

Genotype	CGA (mg/100 g d.w.)	ATH tot (mg/100 g d.w.)	CAR tot (mg/100 g d.w.)	GA tot (mg/kg d.w.)
Kennebec	27.5 ± 4,4	n.d.	2.5 ± 1.0	810.1 ± 181.7
Desiree	21.1 ± 5.0	n.d.	1.2 ± 0.4	651.9 ± 115.4
Bleuet	184.0 ± 36.2	103.5 ± 22.9	13.7 ± 5.4	938.2 ± 189.1
Starleggia Rossa	33.2 ± 3.0	2.6 ± 0.5	1.8 ± 0.8	792.9 ± 219.1
Starleggia Bianca	32.4 ± 4.1	n.d.	1.3 ± 0.3	630.2 ± 113.9
98-11-1	62.4 ± 12.2	4.3 ± 0.9	0.9 ± 0.1	532.8 ± 73.1

**Tab. 1** Data are averages ± standard error (n=6). GCA tot = total chlorogenic acids; ATH tot = total anthocyanins; CAR tot = total carotenoids; GA tot = total glycoalkaloids

### Conclusions

Our results show that the up-land environment has an influence on the nutritional profile of three varieties, two ecotypes and the pigmented clone tested, indicating that environment of potato may represent a possible terroir, biofortifying functional food since phenolics and ACNs are known to exert anti-oxidant and beneficial activities. To better understand if it is possible to extend these considerations also to anthocyanins pathway, we will investigate the effect of the environment on the expression of their key genes.

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