



CHANGES IN THE CONTENT OF VITAMIN C IN POTATO TUBERS DEPENDING ON VARIETY

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ABSTRACT

At work we watched on the basis of cultivar dependence to changes in the content of vitamin C in potato tubers harvested in field conditions in the locality – Matejovce. The concentration of ascorbic acid we set in 6 varieties of potato tubers (Arlet, Spinelá, Malvína, Megan, Svella, Timea) with different maturing period. We showed a significant correlation between early and medium early potato varieties. In a sampling of potatoes is determined by the average content of vitamin C ranged from 2.60 to 8.21 mg. 100 g⁻¹ fresh matter, while the maximum level reported medium early variety Arlet. The content of vitamin C decreased in the following order: Spinelá (8.10 mg.100 g⁻¹ fresh matter) > Megan (4.47 mg.100 g⁻¹ fresh matter) > Timea (4.15 mg.100 g⁻¹ fresh matter) > Malvína (2.82 mg.100 g⁻¹ fresh matter) Svella > (2.60 mg.100 g⁻¹ fresh matter).

Keywords: potato, ascorbic acid, cultivar dependence

INTRODUCTION

Potato tubers – *Solanum tuberosum* are generally considered herbal product that has a meaning in human nutrition as a source of vitamin C (**Bárta, Čurn, 2004**). Vitamin C is found in varieties of fruits and juices, no other commonly consumed foods, however, supplied such as starch a significant amount of this vitamin than potatoes (**FAO, 2008**). Its nutritional benefit from potatoes is about 40% of the recommended daily intake (**Vreugdenhil et al., 2007**). Our varieties contain 9 – 25 mg.kg⁻¹ of vitamin C in the original mass (**Kováč et al., 2001**). One portion of potatoes provides 25 mg of vitamin C, for comparison **Mosure (2004)** states hereinafter referred to as red pepper (95 mg), orange and broccoli (60 mg), or strawberry (50 mg).

Potatoes are a reliable source of vitamin C – a great medium boiled potato (180 g) contains about 10 mg, which represents around one eighth of an adult man. In the new potatoes is about double the amount, so that their normal portion will give to an adult man for about a quarter of the daily need of vitamin C. Although vitamin C is sensitive to the warming and to a certain extent, it still retains enough stretches to cooked potatoes were their useful resource. Among other things, vitamin C acts as an antioxidant in the body (**FAO, 2008**), which has an important role in the protection against oxidative stress (**Bates, 1997**). Due to its participation in the transitional metal ions oxidation also plays an important role in increasing the bioavailability of iron (**Teucher et al., 2004**). Potatoes are one of the most important sources of vitamin C, but its value in human nutrition is often underestimated (**Dale et al., 2003**). Aim of the work was monitor and evaluate the content of vitamin C in potato tubers in the dependence of the variety.

MATERIAL AND METHODS

The aim of the work was based on the experiments carried out in field conditions on soils relatively clean in terms of content accessible forms of hazardous metals, to track and evaluate changes in the content of vitamin C in potato tubers. For the experiment, we chose the early potato varieties (Malvína, Svella) and medium early potato varieties (Arlet, Megan, Spinela, Timea). Samples of the plant material, we collected at the stage of full maturity from Matejovce, region of Poprad. Soil from this area have been weakly alkaline, with central supply humus, very low content of phosphorus, high content of magnesium and good potassium content (**Bielek, 1996**).

Table 1 Characteristics of the soil and nutrient content (mg.kg⁻¹)

point of delivery	agrochemical characteristics				nutrient content		
	pH/KCl	C _{ox} . (%)	mold (%)	P	K	Ca	Mg
Matejovce	5.75	1.56	2.69	36.27	191.03	2689.50	193.50

Analytical methods

In soil samples we set the agrochemical characteristics of the soil (the soil exchange reaction pH/KCl, Cox (%) – oxidimetry % of the translation method as Ľurina and % mold – of Cox) and nutrient contents. Nutrient contents (P, K, Ca, Mg) we set by Mehlich method (Mehlich II), analytical method for the determination of output was AAS (AAS Varian AA Spectr DUO 240FS/240Z/UltrAA).

Content of vitamin C we set by titration modified method by **Mukherjee, Choudhuri (1983)**, where we titrated sample by solution of 2,6-dichlorophenolindophenol.

In the work the statistical program Statgraphics (LSD-test contrasts, P<0.05) was used.

RESULTS AND DISCUSSION

Content of vitamin C in potato tubers

The mainly vitamin in potatoes is vitamin C. In potato tubers occurs as L-ascorbic acid and dehydroascorbic acid in the oxidation position of acid (**Vreugdenhil et al., 2007**).

In freshly harvested potato tubers is the vitamin C content in the range of 10 – 25 mg.100 g⁻¹ fresh material (FM), according to **Brown (2005)** the average content of 20 mg.100 g⁻¹ FM can be up to 13% of the total antioxidant capacity of tuber. Significantly below the figures reported **Tudela et al. (2002)**, who established the content of vitamin C 6.2 mg.100 g⁻¹ FM potatoes and **André et al. (2007)** 217.7 µg g⁻¹ dry matter.

With lower values, set out the content of vitamin C our results obtained by analysis of the correspondence between potatoes taken from Matejovce. The average content of vitamin C was moving in the range of 2.60 to 8.21 mg.kg⁻¹ FM, while the lowest content was in an early variety Svella and the highest content was in medium early variety Arlet. Content of vitamin C decreased in the following order: Arlet (8.21 mg.100 g⁻¹ FM) > Spinela (8.10 mg.100 g⁻¹ FM) > Megan (4.17 mg.100 g⁻¹ FM) > Timea (4.15 mg.100 g⁻¹ FM) > Malvína (2.82 mg.100 g⁻¹ FM) > Svella (2.60 mg.100 g⁻¹ FM).

Higher contents of vitamin C in raw potatoes appear **Jímenez et al. (2009)** 7.54 – 28.58 mg.100 g⁻¹ FM and **Han et al. (2004)** 16 – 42 mg.100 g⁻¹ FM.

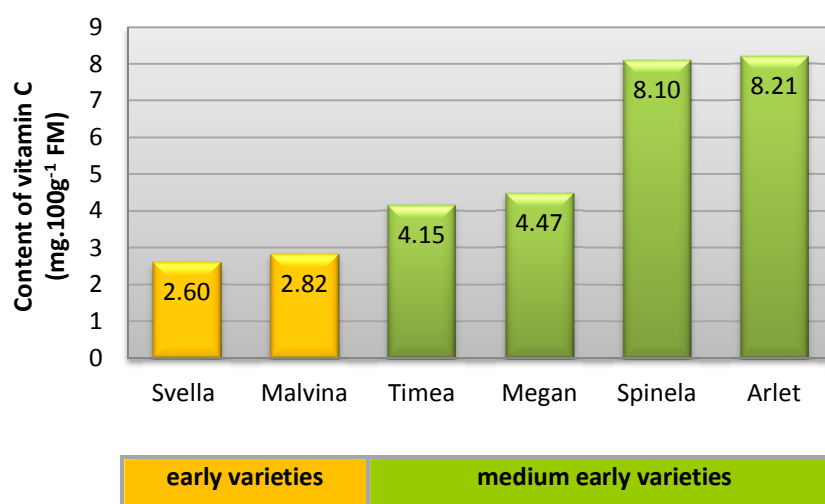


Figure 1 Changes in the content of vitamin C (mg.100g⁻¹ FM) in potato tubers depending of variety

Obtained results that were statistically processed ($\alpha = 0.05$ significance level test of contrasts of LSD in) confirms variety as one of the major factors affecting the dependence of vitamin C content in potato tubers. Statistically conclusive differences are between early and medium early varieties of potatoes. The differences between the varieties are also confirmed by the conclusive medium early varieties Timea, Megan and Spinela, Arlet (table 2). Using this methodology has been processed and the analysis of the changes of vitamin C content in potato tubers (**Musilová et al., 2009**).

Table 2 ANOVA of total vitamin C (mg.100g⁻¹ FM) between varieties of potatoes

SUMMARY STATISTICS

variety	Count	Average	Standard deviation	Coeff. of variation	Minimum	Maximum	Range	Std. skewness
Arlet	16	8.210	0.858	10.447%	6.955	9.419	2.464	0.109
Malvína	16	2.824	0.074	2.630%	2.724	3.033	0.309	2.255
Megan	16	4.470	0.568	12.700%	3.645	5.176	1.531	-0.022
Spinela	16	8.096	0.517	6.382%	7.39	9.201	1.811	0.916
Svella	16	2.597	0.262	10.086%	2.114	3.135	1.021	1.082
Timea	16	4.153	0.213	5.126%	3.563	4.438	0.875	-1.982
Total	96	5.058	2.348	46.415%	2.114	9.419	7.305	2.130

ANOVA Table for vitamin C by varieties

<i>Source</i>	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F-Ratio</i>	<i>P-Value</i>
Between groups	502.001	5	100.400	417.11	0.0000
Within groups	21.664	90	0.241		
Total (Corr.)	523.664	95			

Multiple range tests for vitamin C by varieties

Method: 95,0 percent LSD

<i>variety</i>	<i>Count</i>	<i>Mean</i>	<i>Homogeneous Groups</i>
Svella	16	2.597	X
Malvína	16	2.824	X
Timea	16	4.153	X
Megan	16	4.470	X
Spinela	16	8.096	X
Arlet	16	8.210	X

According to **Lachman et al. (2000)**, the content of ascorbic acid is influenced by many factors, such as harvest, vintage, method and growing conditions, stage of maturity of the tubers and so on. Similar conclusions stating **Prugar (2000)**; in most cases, the contents of L-ascorbic acid were higher in organically grown potatoes and an important factor that affects the content of vitamin C, is variety.

Also other authors (**Dale et al, 2003; Finotti et al, 2006; Leo et al., 2008**) showed the influence of several factors (the way of cultivation, the geographical location, the stage of ripeness, soil and weather conditions) on the chemical composition of the potatoes and, therefore, their nutritional value, but among the most important factors include the variety (**Toledo, Burlingame, 2006**).

CONCLUSION

The nutritional composition of potato tubers, therefore the content of vitamin C, is significantly influenced by a number of factors, but the most important is the variety. Varietal addition we confirmed results of the analyses of potatoes collected from Matejovce. Confirmed statistically significant dependency was between early varieties (Svella, Malvína) and medium early variety (Arlet, Spinela, Megan, Timea) potatoes. In the early varieties of potatoes are vitamin C ranged between 4.15 – 8.21 mg.100 g⁻¹ FM, the maximum content of vitamin C was determined in the variety Arlet (8.21 mg.100 g⁻¹ FM). Significantly lower

contents of vitamin C (2.60 – 2.82 mg.100 g⁻¹ FM) were fixed in a medium early potatoes variety, while the lowest content was fixed in a variety of Timea.

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