

# Organic versus conventional potatoes – is there basis for consumers preference?

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**Abstract** - The aim of this study was to investigate the influence of growing conditions on the quality of potatoes from organic farming systems as compared to that from conventional farming. In our previous study conducted in the years 1996 – 1999 we recognised some differences between the potatoes (*Solanum tuberosum*) from organic and conventional farming. To demonstrate the general validity of observed trends, follow up study was established in Czech Republic in the years 2002-2005.

The ultimate goal of the project was to collate data for the assessment of a potential influence of foods from organic production system on consumers' health by studying differences between potatoes grown in both systems (for this purpose the levels of potentially toxic compounds as well as nutritionally valuable components with regard to variety, geographical location and inter-annual variation were determined).<sup>1</sup>

## INTRODUCTION

Growing consumers' interest in organically produced foods clearly reflects increasing public concern about environmental and personal health issues. In order to be able to make a free and informed choice between organic and conventional foods, an objective assessment of a product quality based on a sound scientific knowledge is needed. One of the main arguments, used in the promotion of organic foods, is their presumed beneficial influence on human health (Heaton, 2001). However, despite an internationally well established regulation and control systems exercised at a production level (EU Regulation, 1991), there still is a general lack of data on the quality of the organic food products related to their nutritional value and health risk associated properties (Williams, 2002; Worthington, 1998). For this reason it is necessary to get more data documenting quality of products from organic and conventional farming systems and their relevance to national requirements.

In our previous study conducted in the years 1996 – 1999 (Hajšlova et al., 2005) we recognised some differences between the potatoes (*Solanum tuberosum*) from organic and conventional farming. To demonstrate the general validity of observed trends, follow up study was established in other localities employing both new varieties (Bionta, Satina, Marabel) and some those previously tested (Rosara, Karin).

## EXPERIMENTAL

This study was conducted in cooperation with Agricultural faculty, University of South Bohemia in two separate geographic localities L1: Mloteč - Pacov and L2: Nišovice - Volyně in South Bohemia (altitude 500 m).

At each locality two farms situated close to each other were contracted, one with an organic (IFOAM principles) and the other one with a conventional production. Five common potato varieties Bionta, Karin, Marabel, Rosara and Satina were grown in each cultivation system in the years 2002-2005. Manually harvested potatoes were carefully inspected and any damaged or green tuber was discarded.

The parameters analyzed included potato glycoalkaloids, free amino acids, nitrates, vitamin C, starch, reducing sugars as well as chlorogenic acid. Selected agronomic parameters such as yields, tuber size distribution, germination of tubers as well as dry weight were also compared. Climatic conditions were monitored during all cultivation period.

## RESULTS AND DISCUSSION

Higher levels of chlorogenic acid were found in organically grown potatoes ( $185 \pm 97$  mg/kg) than in conventionally grown ones ( $156 \pm 81$  mg/kg). The differences were statistically significant (t-test,  $\alpha=0.05$ ) in some crop years. The highest levels were found in year 2004 (average 198 mg/kg), little lower in 2003 (187 mg/kg) and lowest in 2002 (144 mg/kg) and 2005 (160 mg/kg). The levels in potatoes ranged from 42 to 550 mg/kg. Chlorogenic acid content largely varied between the varieties studied. Low levels were seen in Bionta, Marabel and Satina while in Karin the chlorogenic acid concentrations were relatively high (Figure 1). Chlorogenic acid contributes typically up to 90% of the total phenolics content (Friedman, 1997). Chlorogenic acid content seems to be the parameter most consistently differentiating organically from conventionally produced potatoes.

Higher nitrate content was found in conventional potatoes.

The mean total glycoalkaloids (sum of major components represented by  $\alpha$ -solanine and  $\alpha$ -chaconine) content seemed to be slightly higher in the organic tubers ( $75 \pm 32$  mg/kg) as compared to conventional ones ( $72 \pm 41$  mg/kg), but these results were not significant. The total glycoalkaloid levels varied considerably from variety to variety,

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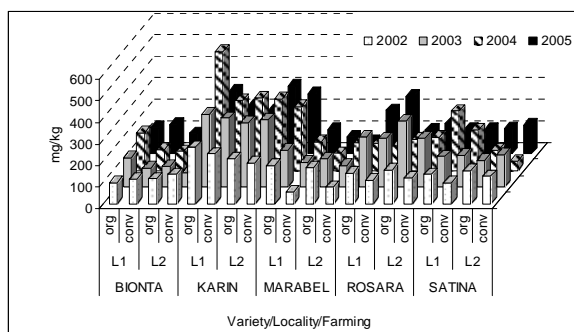


Figure 1. Chlorogenic acid content in tested potato varieties produced in organic (org) and conventional (conv) farming systems at localities L1 and L2.

typically high content was observed in variety Karin and Bionta, while low glycoalkaloid content was in varieties Satina and Marabel (Figure 2). Concentration of these toxins determined in potatoes ranged between 23 and 182 mg/kg. It should be noted that in none of samples the hygienic limit 200 mg/kg was exceeded. The highest mean glycoalkaloids levels were found in year 2004 (average 82 mg/kg) lower in other tested years (2002: 68 mg/kg, 2003: 77 mg/kg, 2005: 66 mg/kg). Higher, but not significantly, levels of total free amino acids were found in conventionally grown potatoes. Between the years' changes and also variety as well as geographical variations are equally or more important factors determining the quality of potatoes than the farming system.

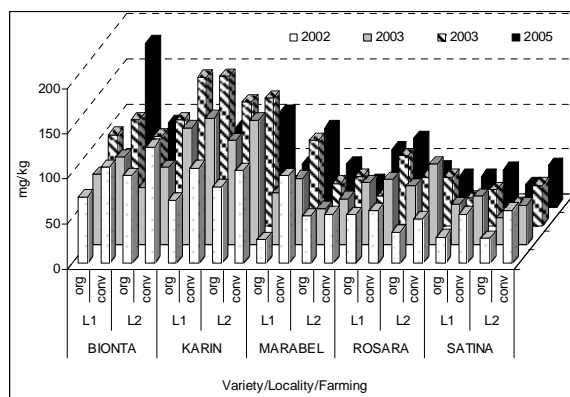


Figure 2. Glycoalkaloids content in tested potato varieties produced in organic (org) and conventional (conv) farming systems at localities L1 and L2.

### CONCLUSIONS

The way of farming (organic versus conventional) does not influence significantly levels of glycoalkaloids in potatoes, nevertheless the crops from organic farming tends to contain slightly higher levels by synthetic chemicals.

The results of this investigation indicate that the most consistent differences between organically and conventionally farmed potatoes are in chlorogenic acid content. Year to year variation, as well as genotype and locality variation appear to be equally or more important factors influencing the quality of this staple commodity than is the production system.

Obtained results are fully comparable with our previous results (Hajslova et al., 2005). Further extensive, long-term investigations are necessary to obtain reliable information on the influence of farming system on the quality of products.

### ACKNOWLEDGEMENT

This study was carried out with support from the Ministry of Education, Youth and Sports, Czech Republic - partly from the project MSM 6046137305, partly within the project COST OC 924.

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