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HEALTH PROTECTING COMPONENTS OF TOMATOES AND TOMATO PRODUCTS

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Abstract

Tomatoes are one a main component of the traditional diet, which has been associated with health protection and longevity. Eating tomatoes has been associated with reduced risks of some types of cancer and other diseases. These beneficial properties appear to be related to the antioxidant content of the fruit, particularly carotenoids (lycopene and beta-carotene), ascorbic acid, and phenols, which may play a role in inhibiting reactions mediated by reactive oxygen species. Here we are presenting our results regarding health protecting components of tomatoes and some tomato products. Tomatoes and tomato juice had the highest content of antioxidant compounds –total polyphenols, ascorbic acid - followed by tomato pasta. Lycopen content increases after processing, so the higher content of lycopen was found in tomato pasta followed by tomato juice and than by tomatoes.

Key words: tomatoes, tomato juice, tomato pasta, polyphenols, lycopene, vitamin C

INTRODUCTION

Tomatoes *(Lycopersicum esculentum)* and tomato products are an important dietary source of micronutrients and antioxidants Sanjiv and Akkinappally, 2000.

The role of dietary antioxidants, including vitamin C, vitamin E, carotenoids , polyphenols and lycopene in disease prevention has received much attention in recent years (Hallivel et al., 1995; Sies et al., 1995; Feris, 1994). It is also an important source of minerals.

There are several factors affecting the nutritional value of this product, among the tomato variety, maturity, processing and storge conditions.

Vitamin C – a serving of about 243g of tomato juice provide 44.5mg of vitamin C. Vitamin C is susceptible to destruction by oxidation during processing and storage of tomato juice. Thermal treatement decreased vitamin C content of tomatoes (Gahler et al. 2003).

Polyphenols are products of the secondary metabolism of plants. These compounds are reported to exhibit anticarcinogenic, anti-inflammatory, anti-atherogenic, antithrombotic, immune modulating and analgesic activities, among others and exert these functions as antioxidants (Gomez-Caravaca, 2006).

Lycopen - is an important carotenoid pigment found in tomatoes and tomato products. In recent years, lycopene attracted a lot of attention from

various researchers because of its nutritional significance and ability to prevent disease, for example chronic and cancerous diseases (Giovannucci, E. 1999). Lycopen constitutes about 80-90% of the total carotenoid content found in tomato (Shi and Le Maguer, 2000). Cultivars vary in lycopene content depending on genotype and environmental conditions (Perkins-Veazie *et al*., 2001).

The aim of this study is to investigate health protecting components like: total polyphenols, lycopen and vitamin C, of tomatoes and some tomato products: tomato juice and tomato paste.

MATERIAL AND METHOD

The experiments were performed in 2013-2014, at the Laboratory of Secondary Metabolits in Food Industry, of Faculty for Environmental Protection, University of Oradea.

For this study, 3 tomatoes samples from 3 different region in Bihor County, 3 tomato juice and 3 ketchup samples were taken from market.

Samples preparation

For each sample it was made the alcoholic extraction: 10 g of each sample were mixed with 10 ml ethanol solution (50%), and after 30 minutes were filtered. Ethanol extracts were diluted than 1/10 with ethanol solution (50%) (Moigrădean et al., 2007).

Total Phenolic content

The total phenolic (TP) content was determined by using the Folin-Ciocâlteu (1927) colorimetric method developed by Singleton and Rossi (1965). A diluted extract (0.5 ml) or phenolic standard was mixed with 2.5 ml Folin- Ciocâlteau reagent and after 5 minutes 2.0 mL sodium carbonate (7.5%). The absorption was read after 2 h at 20°C, at 750 nm. For the preparation of calibration curve 0.5 ml aliquot of 0.2, 0.4, 0.8 and 1.2 μM/ml aqueous gallic acid solution were used as the standard and expressed as mg of gallic acid equivalent (GAE) (Gergen, 2004).

Lycopen content

Lycopene extraction from tomatoes and tomato products samples was realised with hexane:ethanol:acetone (2:1:1)(v/v) mixture following the method of Sharma and Le Maquer, 1996.

One gram of the homogenized samples and 25 ml of hexane: ethanol: acetone, were placed on the rotary mixer for 30 min., adding 10 ml distilled water and was continued agitation for another 2 min. The solution was left to separate into distinct polar and non-polar layers. The absorbance was measured at 503 nm, using hexane as a blank. The lycopene concentration was calculated using its specific extinction coefficient of 3150 at 503 nm. The lycopene concentration was expressed as mg/100g product.

For this determination Shimadzu–UV-mini–1240 spectrophotometer was used. All determinations were made in triplicates.

λ = 503 nm:

lycopene content (mg/100g) = E*20/3.15*m

m –weight of the product (g);

E – extinction coefficient**.**

Ascorbic acid (Vitamin C)- was extracted using metaphosphoric acid and the extract was titrate with iodine solution starch indicator (Bailey,1974; Kalluer,1986).

RESULTS AND DISSCUSIONS

Results obtained after performing analyses for health protecting component determination in tomatoes and tomato products were content in table 1.

Table 1.

Calculated values for health protecting components of tomatoes and tomato product

Type of Samples	**Health protecting components**			
	Nr. sample	**Lycopen mg% λ=503 nm**	**TP mg GAE/100g**	**Vitamin C mg%**
Tomatoes	**1.**	8.97	415.11	33.90
	2.	9.45	414.9	32.5
	3.	9.2	414.3	31.1
	mean±sd	**9.2±0.24**	**414.77±0.42**	**32.5±1.4**
Tomato juice	**1.**	19.87	376.19	18.3
	2.	20.3	358.2	19.3
	3.	19.6	369.1	21.2
	mean±sd	**19.92±0.35**	**367.83±9.06**	**19.6±1.47**
Tomato pasta	**1.**	20.37	224.51	16.9
	2.	19.55	226.8	17.3
	3.	18.7	225.3	17.8
	mean±sd	**19.54±0.83**	**225.53±1.16**	**17.33±0.45**

Results of the determination of total phenolic content are shown in Fig1, and prove that this compounds has very significantly higher value in case of tomatoes (414.77 mg GAE %) in comparison with tomato juice (367.83 mg GAE %) and tomato pasta (225.53 mgGAE%).

Evaluating our results we can say that the analysed tomatoes and tomato products sample are good source of polyphenols (between 224.5 minim, and 415.11, maxim value expressed in mg of GAE (gallic acid equivalents)/1kg oil). Similar results were obtained by Chérif et al. 2010. In their study for preserves of tomato concentrate, the polyphenols are the major antioxidants and represents 259.40 mg GAE/100g.

Analyzing the results obtained for lycopene content, it could be observed that in processed tomato products the content of lycopene was higher than in tomatoes. In tomatoes samples the mean value for lycopene content was 9.2 mg% at a 503 nm wavelength. In case of tomato juice, the mean value (19.92 mg %) was significantly higher in comparison with tomatoes lycopene content. For tomato pasta, 19.54 mg %, the results was similar (Fig.1). Alda et al, 2009, found a similar situation, when the lycopene content in tomato pasta (15.83 mg %), and other tomato products, were higher than in fresh tomato (12.34 mg %).

Among all the sources examined, Laleye et al, 2010, found that tomato paste has the highest concentration of lycopene. This finding is in line with expectation since tomato paste has more solid matter than the other sources.

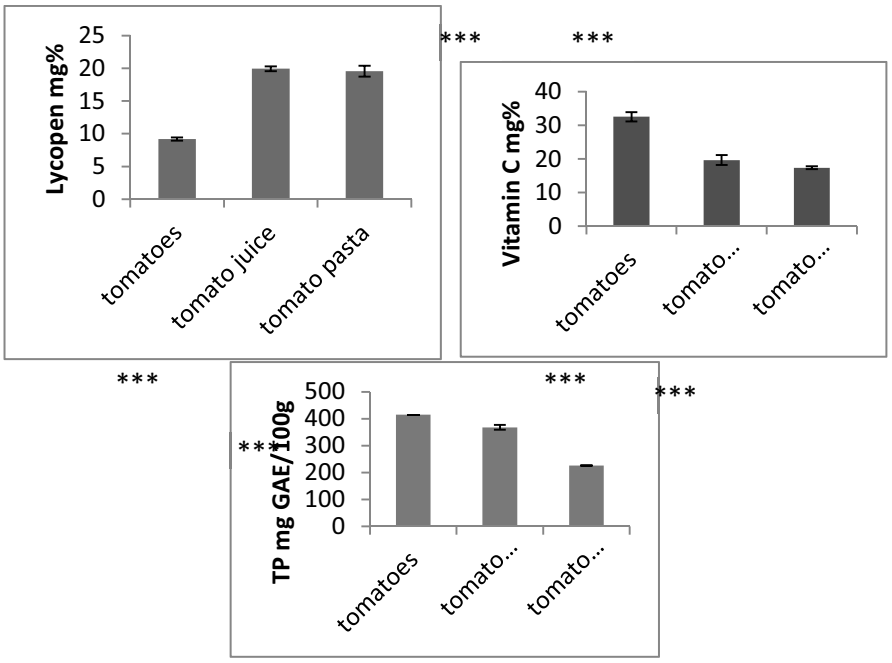

Fig. 1 Graphical representation of mean values and standard deviations of health protecting component content

The same decreasing trend was registered in case of Vitamin C, respectively a very higher value for tomatoes (32.5 mg %), in comparison with tomato juice (19.6mg%) and tomato pasta (17.33mg%). This decrease is due to vitamin C degradation under the influence of processing temperature.

Sanchez-Moreno, 2006, found a mean value for vitamin C of 17.9 and 20mg/100ml respectively in different commercial tomato juices analysed.

Podsedek et al 2003, showed variable content of ascorbic acid in tomato juices, from 0.69 to 26.87mg%.

CONCLUSIONS

Tomatoes and tomato product has highe content of antioxidants compounds – polyphenols and vitamin C, and it can be considered nutraceuticals.

Lycopene was not destroyed during technological process, but contrary, treatments led to higher content of this compounds. Lycopen is a lyposoluble substance and for this reason it is indicated the consumption of tomatoes togheter with olive oil, because it will facilitate a better absorbtion of Lycopen.

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