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LYCOPENE CONTENT OF SELECTED FOODS AVAILABLE ON THE POLISH MARKET AND ESTIMATION OF ITS INTAKE

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In the present study, lycopene content of tomatoes as well as tomato products and other products available on the Polish market was estimated. Lycopene content of fresh tomatoes ranged from 1.21 to 6.43 mg/100 g, the average content of tomato pastes was 38.88 mg/100g, of ketchups – 11.12 mg/100 g, and of tomato juices – 7.05 mg/100 g. Lycopene intake was estimated at 1.93 mg/person/day. The main sources of lycopene were fresh tomatoes which contributed 52.2% of the total amount of this carotenoid in the diet.

INTRODUCTION

Appropriate nutrition has an impact on our health, welfare and wellbeing. Western diet is characterized by a higher intake of products with high energy density, which in combination with low physical activity as well as unhealthy lifestyle and stress leads to the development of cardiovascular diseases and cancer. One of the ways to combat this problem is to promote higher intake of fruit and vegetables as well as research on carotenoids, especially lycopene.

Thorough investigations over the role and significance of lycopene (main pigment present, among others in tomatoes, red grapefruit and watermelon) in human nutrition and prevention of diet-related diseases demonstrated that it is the most effective oxygen quencher among dietary carotenoids [DiMascio *et al.*, 1989].

Lycopene inhibits the generation as well as the detrimental action of reactive oxygen species. Therefore, this compound protects against the development of many cancers, including skin, gastrointestinal, bladder, pancreas, breast, endometrium, prostate and lung cancer as well as cardiovascular diseases. The protective action of lycopene is due to the presence of 11 conjugated double bonds in its structure [Clinton, 1998; DiMascio *et al.*, 1989; Gerster, 1997; Health …, 1999; Rao & Agarwal, 1999].

Despite large interest in the role of lycopene in the prevention of many chronic diseases, there are no data on lycopene in foods commonly available and consumed in Poland. The purpose of this study was to determine lycopene content of foods and to estimate daily lycopene intake based on balance sheet data.

MATERIALS AND METHODS

The determination of lycopene content in foods was carried out in the years 2002–2003. Materials used during this investigation were different varieties of tomatoes sold on the Polish market as well as selected tomato products manufactured in Poland, including juices, concentrates, pastes, ketchups, canned tomatoes, powdered tomato soups, powdered tomato sauces as well as sauces and pastes in cartons from 21 producers. Tomato products from an Italian company operating on the Polish market as well as canned tomatoes produced in Italy for a Polish company were also subjected to chemical analysis for their lycopene content. Furthermore, lycopene was estimated in red grapefruit, watermelons, papaya, dried apricots, all available on the Polish market. The examined tomato samples were bought in 18 local shops, the other fruits were obtained from 6 other shops. Tomato products were purchased from the market, 4 packages of each product at different places. Lycopene content was determined for each of the packages by high-performance liquid chromatography (HPLC) method with the use of an apparatus from the Gilson Company.

In order to obtain representative samples before weighing, each product was mixed properly or homogenized, as in the case of vegetables, fresh fruit and canned tomatoes (homogenizer from IKA-WERTKE, type T 25 BASIC, 13500 r/min). Tomatoes were homogenized as a whole, together with the skin. Lycopene content of the other fruits was determined only in the edible parts. Following this, products were weighed in the amount of 1.0 g (estimation of lycopene content of sauces, powdered soups was performed

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immediately after their purchase) and 20 mL methanol as well as 0.2 mL of 2% hydroquinone alcohol solution were added. So prepared samples were re-homogenized to obtain an unvarying consistency.

Lycopene was extracted from samples with petroleum ether. Ether was added 4–5 times (in 20 mL portions), depending on the degree of food discoloration. The ether extract was decanted and filtered with a filter paper to a cylinder. The collected ether extract was properly mixed and its 20 mL portion was collected for evaporation with the aid of nitrogen gas in a boiling water bath. The evaporated residue was dissolved in 2 mL of hexane. The solution was filtered with the use of microfilters with a porous diameter of 0.45 μm and injected to the chromatograph column C18 RP (Vydac Company). The determination of lycopene content was carried out spectrophometrically at a wave length of 466 nm, using the mixture of hexane:dichloromethane at the ratio of 90:10 as well as the flow rate of 1.5 mL/min. Results obtained were compared with the standard curve performed with lycopene standard obtained from Sigma. Sample analysis was carried out in triplicate for each of the purchased samples. Recovery trial using this method was 95%.

Data from lycopene assessment was used for the estimation of its daily intake based on balance sheet data (household budget) from the year 2002, obtained at the National Office of Statistics.

RESULTS AND DISCUSSION

Lycopene is a carotenoid pigment characterized by a symmetric and acyclic structure containing 11 conjugated double bonds. This structure is responsible for the red-orange colour of foods, such as tomatoes, watermelon and red grapefruit. The lycopene content of fresh tomatoes depends on their varieties and increases with the degree of ripening. Studies carried out in Great Britain revealed that the lycopene content of tomatoes with intensive red colour was 50 mg/kg; yellow variety of tomatoes was characterized by a 10-fold lower content of lycoopene, *i.e.* 5 mg/kg [Hart & Scott, 1995].

In the present study, lycopene content of tomatoes bred in Poland ranged from 1.21 to 6.43 mg/100 g of fresh product; with the mean amount accounting for 3.58 mg/100 g (Table 1). These data are in agreement with the results of studies performed by other scientists [Clinton, 1998; Hart & Scott, 1995; Health …., 1999; Lugasi *et al.*, 2003; Mangels *et al.*, 1993; Nguyen & Schwartz, 1998; O'Neill *et al.*, 2001; Ong & Tee, 1992; Pelz *et al.*, 1998; Rao & Agarwal, 1999], who found that lycopene content of fresh tomatoes ranged from 0.88 to 7.74 mg/100 g. It is worth emphasizing that lycopene content of tomatoes depends on the seasons of the year, the mean content being 2.6–3.1 mg/100 g for winter tomatoes, and 3.8–6.6 mg/100 g for summer tomatoes [Health …, 1999]. Studies conducted in Hungary demonstrated that the average lycopene content of tomatoes accounted for 0.85 mg/100 g in winter, for 1.10 mg in spring and for 13.6 mg in summer [Lugasi *et al.*, 2003]. In the present study lycopene content of tomatoes was a function of seasonality. The mean content of lycopene in tomatoes with intensive red colour, purchased in summer was 2 times higher as that in tomatoes with lighter colour bought in autumn, winter and spring. The average content of lycopene in tomatoes with intensive colour reached 5.6 mg/100 g, compared to 2.6 mg/100 g for tomatoes with less intensive colour. The amounts of lycopene in tomatoes with intensive colour were quite similar to each other, which was due to a lack of differences in the colour intensity of the tomatoes investigated.

The lycopene content of watermelon, red grapefruit as well as papaya was similar to that of tomatoes, the mean content ranging from 2.99 to 3.78 mg/100 g (Table 1). The lycopene content of the fruits and vegetables under examination was in agreement with the amount of this carotenoid demonstrated by many other authors [Clinton, 1998; Hart & Scott, 1995; Health …., 1999; Mangels *et al.*, 1993; Nguyen & Schwartz, 1998; O'Neill *et al.*, 2001; Ong & Tee, 1992; Rao & Agarwal, 1999]. It is worth mentioning, however, that the maximum amount of lycopene in watermelon and papaya was by 25–35% lower in Polish products.

Apart from fresh tomatoes, the main sources of lycopene in the Polish diet were tomato products. Fresh tomatoes are a good raw material for the food industry; therefore they can be consumed in different forms all year round. Among foods available on the Polish market, the highest concentration of lycopene was found in tomato pastes, the mean content being 38.88 mg/100 g (Table 2). The amounts of lycopene in 30% tomato pastes from different companies were similar and ranged from 38.0 to 49.3 mg/100 g. The lycopene content of these products was the function of many factors, such as the degree of processing, ripeness as well as variety and period of tomato harvest. Methods of packaging did not have any impact on the content of lycopene. Only tomato pastes from one company sold under 2 distinct trade marks differed in the content of

TABLE 1. Lycopene content (mg/100 g) of fresh tomatoes and other exotic fruit available on the Polish market.

Product	Lycopene content
Tomato	3.58±1.70 (1.21–6.43)*
Watermelon	3.78±1.26 (2.28–5.37)
Grapefruit, red	3.35±0.57 (2.81–4.22)
Papaya	2.99±0.51 (2.27–3.54)
Apricot, dried	0.79±0.22 (0.55–1.22)

*range; ± standard deviation

TABLE 2. Lycopene content (mg/100 g) of concentrated tomato pastes available on the Polish market.

Concentrated tomato pastes	Lycopene content
Carton, 20% I	33.58±2.91 (30.22–37.23)*
Can, 30% II	45.81±2.64 (42.98–49.33)
Can, 30% III	44.50±2.49 (41.27–46.43)
Can, 30% IV	42.07±3.29 (38.00–45.87)
Can, 30% Va	24.63±2.22 (22.15–27.97)
Can, 30% Vb	22.22±0.79 (20.94–22.93)
Jar, 30% I	46.86±2.30 (43.54–49.16)
Jar, 30% IV	44.47±1.12 (43.34–46.25)
Jar, 30% III	42.60±2.52 (39.72–44.92)
Jar, 30% II	42.01±2.20 (39.56–45.17)
x	38.88±8.79 (20.94–49.33)

*range; ± standard deviation; I–V – company codes for concentrated tomato pastes

lycopene – the amount of this carotenoid was almost 50% lower. Data from the present studies cannot be compared with the published values since tomato pastes were typically Polish without appropriate equivalents.

Ketchups are another category of tomato products present on the Polish market (Table 3). The mean lycopene content of ketchups accounted for 11.12 mg/100 g and just as in the case of tomato pastes, the degree of raw material processing, its quality and ripeness, and to a lesser extent the type of company exerted an influence on the amount of this carotenoid. These data are consistent with the results of studies carried out by many other authors. The lycopene content of ketchups in other countries was reported to range from 9.9 to 16.6 mg/100 g [Clinton, 1998; Hart & Scott, 1995; Health...., 1999; Lugasi *et al.*, 2003; Mangels *et al.*, 1993; Nguyen & Schwartz, 1998, 1999; O'Neill *et al.*, 2001; Ong & Tee, 1992; Rao & Agarwal, 1999; Schierle *et al.*, 1996; Shi & Maguer, 2000; Tonucci *et al.*, 1995].

TABLE 3. Lycopene content (mg/100 g) of ketchups available on the Polish market.

Ketchup	Lycopene content
Plastic bottle I	12.24 ±0.62 (11.33–12.99)*
Plastic bottle II	12.08±0.41 (11.47–12.56)
Plastic bottle, hot ketchup I	11.56±0.38 (10.94–11.88)
Plastic bottle, mild III	11.48±0.54 (10.63–11.99)
Plastic bottle, mild IV	10.92±0.77 (9.76–11.74)
Plastic bottle, pizza ketchup IV	10.38±0.88 (9.12–11.47)
Plastic bottle, mild V	8.89±1.07 (7.21–9.66)
Jar, mild IV	12.93±1.06 (11.53–14.03)
Jar, piquant IV	12.81±0.91 (11.68–14.02)
Jar, piquant VI	9.56±0.69 (8.45–10.20)
Jar, piquant V	9.45±0.44 (8.88–10.03)
x	11.12±1.51 (7.21–14.03)

*range; ± standard deviation; I–VI – company codes for ketchups

Besides tomato pastes and ketchups, tomato juices are ranked third in terms of the popularity of tomato products. The estimated lycopene content of this class of tomato products ranged from 5.18 to 9.74 mg/100 g (Table 4), which is in agreement with the results of studies performed by many authors [Clinton, 1998; Hart & Scott, 1995; Health..., 1999; Lugasi *et al.*, 2003; Mangels *et al.*, 1993; Nguyen & Schwartz, 1998, 1999; O`Neill *et al.*, 2001; Ong & Tee, 1992; Rao & Agarwal, 1999; Schierle *et al.*, 1996; Shi & Maguer, 2000; Tonucci *et al.*, 1995]. The higher upper limit of the content of lycopene in ketchups and tomato juices observed in experiments conducted in other countries is likely to be due to more favourable climatic conditions for breeding tomatoes.

TABLE 4. Lycopene content (mg/100 g) of tomato juices available on the Polish market.

Tomato juice	Lycopene content
Box I	8.86±0.82 (7.91–9.74)*
Box II	7.19±0.57 (6.56–8.03)
Box III	6.90±0.57 (6.05–7.54)
Box IV	6.05±0.62 (5.22–6.63)
Box V	5.93±0.64 (5.18–6.64)
Glass bottle I	8.14±0.60 (7.72–8.86)
Glass bottle II	7.07±0.58 (6.23–7.79)
Glass bottle III	6.91±0.56 (6.00–7.56)
Glass bottle IV	6.38±0.58 (5.56–6.98)
x	7.05±1.08 (5.18–9.74)

*range; ± standard deviation; I–V – company codes for tomato juices

Tomato soups, powdered form (mean lycopene content of 20.86) and in cartons (4.48 mg lycopene/100 g) as well as rice and spaghetti sauces (2.22 to 14.15 mg lycopene/100 g) and tomatoes in bottles and cans (Tables 5 and 6) were other tomato products found on the Polish market. It seems impossible to compare the lycopene content of these products with other published data, which is due to different

TABLE 5. Lycopene content (mg/100 g) of commercially available processed tomato.

Tomato	Lycopene content
Glass bottle, peeled, cut, in tomato juice I (Italy)	12.26±0.61 (11.34–12.98)*
Canned, peeled, whole,in tomato juice II	8.11±0.60 (7.34–8.97)
Canned, peeled, cut, in tomato juice III (Italy)	7.87±0.43 (7.25–8.43)
Canned, peeled, whole, in tomato juice III (Italy)	7.43±0.68 (6.54–8.15)
Peeled, whole, in tomato juice IV	3.61±0.41 (3.13–4.22)
x	7.86±2.82 (3.13–12.98)

*range; ± standard deviation; I–IV – company codes for commercially available processed tomato

TABLE 6. Lycopene content (mg/100g) of other tomato products available on the Polish market.

Tomato products	Lycopene content
Powdered tomato soup	
Tomato cream I	23.12±1.92 (20.82–25.93)*
Tomato soup with noodles, ready–to–eat in 5 minute II	22.79±2.17 (19.56–25.33)
Tomato soup III	16.69±1.88 (13.75–18.24)
x	20.86±3.57 (13.75–25.93)
Liquid tomato soup	
Soup	4.48±0.34 (4.11–4.99)
Powdered tomato sauce	
Sauce I	25.59±1.48 (23.23–26.93)
Sauce II	23.29±1.29 (21.14–24.10)
Sauce III	22.76±0.95 (21.38–23.94)
x	23.88±1.75 (21.14–26.93)
Liquid tomato sauce	
Sauce I (Italy)	14.51±0.83 (13.51–15.55)
Sauce II	14.38±1.38 (12.34–15.63)
x	14.44±1.11 (12.34–15.63)
Tomato sauce	
Bolognese I	12.78±1.11 (11.16–14.15)
Bolognese II	7.56±0.73 (6.58–8.45)
Sweet–sour I	3.30±0.35 (2.97–3.83)
Sweet–sour II	2.53±0.20 (2.22–2.71)
With mushrooms III	9.43±0.93 (8.11–10.55)

*range, ±standard deviation, I–III – company codes

contribution of tomatoes or possibly different composition of the products (since tomatoes are one of the components) as well as technological processes applied.

The estimation of the daily intake of lycopene was based on balance sheet data (made available by the Central Office of Statistics) as well as data presented in the present study. The average intake of this carotenoid reached 1.93 mg/person/day (Table 7).

TABLE 7. Lycopene intake with selected Polish food items available on the market.

Product	Lycopene intake	
	mg/person/day	%
Tomato	1.01	52.2
Tomato products	0.83	43.1
Others	0.09	4.7
Σ	1.93	100

Studies performed in the USA among 16 000 health adult individuals in the years 1987 and 1992 revealed that the average intake of lycopene was 2.07 mg/day [Nebeling *et al.*, 1997]. In other studies with 96 healthy participants in the USA, Young *et al.* [1994] found that lycopene intake based on 24-h food record and food frequency questionnaire was 3.06 and 3.35 mg/day, respectively. In a nutritional survey of 1102 American respondents, Chug-Ahuja *et al.* [1993] estimated that lycopene intake reached 2.6 mg/day. The highest average lycopene intake, *i.e.* 3.7 mg/person/day, was observed in investigations carried out in the USA by Forman *et al.* [1993].

Data from different European countries are characterized by a lower intake compared to that of the USA. Studies by Jarvinen [1995] conducted in Finland in the years 1966–1972 among 10 000 respondents showed that the intake of lycopene by men was 0.70 and 0.87 mg/day by women. Studies carried out in Germany amount 23 000 participants demonstrated lycopene intake to reach 1.28 mg/person/day, whereas the total carotenoid consumption stood at 5.33 mg [Pelz *et al.*, 1998]. Goldbohm *et al.* [1998] reported that the Dutch consume lycopene in the amount of 1.0 (men) and 1.3 mg/day (women).

Data from 4 European countries, that is, Great Britain (Coleraine), Ireland (Cork), France (Grenoble) and Holland (Zeist), showed a higher intake of lycopene, ranging from 4.43 to 5.01 mg/person/day. Studies carried out in Madrid revealed lower lycopene intake, the average being 1.64 mg/person/day. It is worth emphasizing that studies in the above-mentioned countries were carried out in single cities in populations of not more than 76 persons from each country [O'Neill *et al.*, 2001]. Lugasi *et al.* [2003] demonstrated a higher average intake of lycopene (4.26 mg/day) in a study carried out on 204 healthy adult Hungarians. The higher consumption of intake in this population might have resulted from a higher lycopene content of tomatoes.

In the present study, tomatoes contributed 52.2% (1.01 mg) of lycopene consumed with the diet, tomato products – 43.1% (0.83 mg); and other products – as little as 4.7% (0.09 mg). It can be concluded that tomatoes and tomato products supplied 95.3% of the dietary lycopene (Table 7). These data are in agreement with the results of investigations published by many authors, who demonstrated that tomatoes and tomato products contributed 85–90% of the dietary lycopene, with processed tomato products, such as tomato juice, ketchups, sauces and soups being the main sources of lycopene [Chug-Ahuja *et al.*, 1993; Clinton, 1998; Gerster, 1997; Hart & Scott, 1995; Mangels *et al.*, 1993; O'Neill *et al.*, 2003; Rao & Agarwal, 1999]. In a study carried out by Chug-Ahuja *et al.* [1993], it was shown that tomato sauces supplied 29% of dietary lycopene, ketchups – 12%, tomato juice as well as tomatoes in pizzas – 8%, and fresh tomatoes – 12%. The results of the present studies demonstrated that tomatoes were the main source of lycopene, contributing from 48 to 55% of the dietary lycopene; which is comparable with data obtained in Canada, Spain, and Germany [O'Neill *et al.*, 2001; Pelz *et al.*, 1998; Rao *et al.*, 1998]. In contrast, tomatoes in France, Great Britain and Holland contributed only 16–25% of the dietary lycopene, while pizzas supplied 16% of the total amount of this carotenoid [O'Neill *et al.*, 2001]. The higher intake of lycopene from tomatoes and tomato products and the lower intake from exotic fruits in Poland could have been due to the popularity of the later products in other countries [Pelz *et al.*, 2001].

CONCLUSIONS

1. The mean lycopene content of fresh tomatoes, papaya, watermelon and red grapefruit ranged from 2.99 to 3.78 mg/100 g.

2. The highest concentration of lycopene in concentrates reached 38.88 mg/100 g; the content of lycopene in ketchups stood at 11.12 mg/100 g and in tomato juice at 7.05 mg/100 g.

3. The estimated average intake of lycopene was 1.93 mg/person/day; the main source of lycopene were tomatoes, which supplied 52.2% of the dietary lycopene; tomato products contributed 43.1% of the total lycopene.

REFERENCES

1. Chug-Ahuja J.K., Holden J.M., Forman M.R., Mangels A.R., Beecher G.R., Lanza E., The development and application of carotenoid database for fruit, vegetables, and selected multicomponent foods. J. Am. Diet. Assoc., 1993, 93, 318–323.
2. Clinton S.K., Lycopene: Chemistry, biology, and implications for human health and disease. Nutr. Rev., 1998, 56, 35–51.
3. DiMascio P., Kaiser S., Sies H., Lycopene as the most effective biological carotenoid singlet oxygen quencher. Arch. Biochem. Biophys., 1989, 274, 532–538.
4. Forman M.R., Lanza E., Yong L.C, Holden J.M., Graubard B.I, Beecher G.R., Meltiz M., Brown E.D, Smith J.C., The correlation between two dietary assessments of carotenoid intake and plasma carotenoid concentrations: Application of a carotenoid food-composition database. Am. J. Clin. Nutr., 1993, 58, 519–524.
5. Gerster H., The potential role of lycopene for human health. J. Am. Col. Nutr., 1997, 16, 109–126.
6. Goldbohm R.A., Brants H.A., Hulshof K.F., van den Brandt P.A., The contribution of various foods intake of vitamin A and carotenoids in The Netherlands. Int. J. Vitam. Nutr. Res., 1998, 68, 378–383.
7. Hart D.J., Scott K.J., Development and evaluation of an

HPLC method for the analysis of carotenoids in foods and the measurement of carotenoid content of vegetables and fruits commonly consumed in the UK. Food Chem., 1995, 54, 101–111.
8. Health promotion: safety assessment and potential health benefits of food components based on selected scientific criteria. Report ILSI N.A. Technical Committee on Food Components for Health Promotion. Crit. Rev. Food Sci. Nutr., 1999, 39, 285–289.
9. Jarvinen R., Carotenoids, retinoids, tocopherols and tocotrienols in the diet; the Finnish Mobile Clinic Health Examination Survey. Int. J. Vit. Nutr. Res., 1995, 65, 24–30.
10. Lugasi A., Biro L., Hovarie J., Sagi K. V., Brandt S., Barna E., Lycopene content of foods and lycopene intake in two groups of the Hungarian population. Nutr. Res., 2003, 23, 1035–1044.
11. Mangels A.R., Holden J.M., Beecher G.R., Forman M.R., Lanza E., Carotenoid contents of fruits and vegetables: an evaluation of analytical data. J. Am. Diet. Assoc., 1993, 93, 284–96.
12. Nebeling L.C., Forman M.R., Graubard B.I., Snyder R.A., Changes in carotenoid intake in the United States: The 1987 and 1992 National Health Interview Surveys. J. Am. Dietet. Assoc., 1997, 97, 991–996.
13. Nguyen M.L., Schwartz S.J., Lycopene stability during food processing. Proc. Soc. Exp. Biol. Med., 1998, 218, 101–105.
14. Nguyen M.L., Schwartz S.J., Lycopene: chemical and biological properties. Food Techol., 1999, 53, 2, 38–45.
15. O'Neill M.E., Carroll Y., Corridan B., Olmedilla B., Granado F., Blanco I., Van den Berg H., Hininger I., Rousell A.M., Chopra M., Southon S., Thurnham D.I., A European carotenoid database to assess carotenoid intakes and its use in a five-country comparative study. Br. J. Nutr., 2001, 85, 499–507.
16. Ong A.S.H., Tee E.S., Natural sources of carotenoids from plants and oils. Methods Enzymology, 1992, 213, 142–67.
17. Pelz R., Schmidt-Faber B., Heseker H., Carotenoid intake in the German National Food Consumption Survey. Z. Ernährungswiss, 1998, 37, 319–327.
18. Rao A.V., Agarwal S., Role of lycopene as antioxidant carotenoid in the prevention of chronic diseases: a review. Nutr. Res., 1999, 19, 305–323.
19. Rao A.V., Waseem Z., Agarwal S., Lycopene content of tomatoes and tomato products and their contribution to dietary lycopene. Food Res. Int., 1998, 31, 737–741.
20. Schierle J., Bretzel W., Buhler I., Faccin N., Hess D., Steiner K., Schuep W., Contents and isomeric ratio of lycopene in food and human plasma. Food Chem., 1996, 59, 459–465.
21. Shi J., Le Maguer M., Lycopene in tomatoes: chemical and physical properties affected by food processing. Crit. Rev. Biotechnol., 2000, 20, 293–334.
22. Tonucci L.H., Holden J.M., Beecher G.R., Khachik F., Davis C.S., Mulokozi G., Carotenoid contents of thermally processed tomato-based food products. J. Agric. Food Chem., 1995, 43, 579–586.
23. Young L.C., Forman M.R., Beecher G.R., Graubard B.I., Campbell W.S., Reichman M.E., Relationship between dietary intake and plasma concentration of carotenoids in premenopausal women: application of the USDA-NCI carotenoid food composition database. Am. J. Clin. Nutr., 1994, 60, 223–230.

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BADANIA NAD ZAWARTOŚCIĄ LIKOPENU W WYBRANYCH PRODUKTACH DOSTĘPNYCH NA POLSKIM RYNKU ORAZ OSZACOWANIE JEGO SPOŻYCIA

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W pracy oznaczono, przy użyciu wysokosprawnej chromatografii cieczowej (HPLC), zawartości likopenu w pomidorach oraz w przetworach pomidorowych dostępnych na polskim rynku, jak też w owocach egzotycznych dostępnych w sprzedaży detalicznej, a mogących być źródłem likopenu w diecie oraz oszacowano z wykorzystaniem danych GUS spożycie likopenu z dietą. Świeże pomidory zawierały od 1,21–6,43 mg likopenu (średnio 3,58 mg), papaja – 2,99 mg, arbuz – 3,78 mg, czerwony grejpfrut – 3,35 mg, suszone morele 0,79 mg likopenu/100 g (tab. 1). Najwyższe zawartości likopenu oznaczono w koncentratach pomidorowych – średnio 38,88 mg/100 g, ketchupy dostarczały likopen średnio w ilości 11,12 mg/100g, a soki pomidorowe 7,05 mg/100 g (tab. 2–4). Średnie spożycie likopenu oceniono na 1,93 mg/osobę/dzień/. Głównym źródłem likopenu były pomidory dostarczające 52,2% tego składnika do diety, przetwory pomidorowe dostarczały 43,1% (tab. 7).