UDC: 547.979.8:635.6
Conference Paper

Determination of the quantity of Lycopene in Tomato Concentrate

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Abstract

Lycopene $C_{40}H_{56}$ is an isomer of carotene and as a colored substance is present in red oil, bar, beets and other similar products of ferments and vegetables. Unlike carotene, there is no vitamin, i.e. physiological action, is much stronger than the carotene of technological procedures in the processing of vegetables and fruits. Particularly sensitive to the action of heavy metals (Cu, Fe and others) under their action changes the color to brown.Tomato and tomato products are the main source of lycopene, therefore these products are classified as functional food, or food that can in any way have a positive impact on the metabolic and physiological functions of the human organism. Lycopene in tomato concentrate is responsible for the red color of the tomato.Tomato is especially interesting because of its biological, physico-chemical properties, especially antioxidant activity, reduction of damage to proteins, lipids and other cellular components. Together with other carotenoids, lycopene has a potential functional effect in food. Lycopene with its acyclic structure, the long chain of conjugated double bonds and expressed hydrophilicity, shows its unique biological properties as well as its antioxidant effect.Thanks to its stereochemical properties and the ability to effectively stabilize active oxygen and free radicals, lycopene is considered to be bioantioxidant with high biological activity in various tissues in the human body. Our examination refers to the determination of lycopene in tomato concentrate by spectrophotometric methods and the results show that 90.65 mg of tomato concentrate is present in the fresh tomatoes and 55.10 mg of tomato concentrate.

Keywords: tomato concentrate, lycopene, carotenoids, antioxidant action, spectrophotometric method.

Introduction

Tomato is a garden cultivation that grows over 4 million hectares around the world, with an annual production of over 100 million tones in 2010. Tomato Solanum lycopersicum L. (Sol. Lycopersiconesculentum Mill.) is a representative of the Solanaceae family, which includes 95 genera with about 2300 species, which are most numerous in the subtropical and tropical regions of America. This family includes a number of useful plants that are grown because of their nutritional value, as well as a number of healing plants used in pharmacy and medicine. Otany, tomato (Figure 1) is fruit because its fruit is a mature ovarian, but the culinary habits of people for his consumption are considered as vegetables. Tomato is a one-year-old plant whose fruit is used as fresh in salads, in supplements of various dishes as well as for raw material in the food industry for the production of juices and tomato paste, tomato concentrate, mittens, ketchup, sage and other products made from tomatoes are widely used in human nutrition and culinary. In the diet is used: fresh, preserved such as green tomato, juice, topping (ketchup - tomato sauce) or as a spice. Its fruits are rich in vitamin C, carotene, vitamin B1 and vitamin E. In addition to vitamins, significant quantities of manganese, iron and copper are also found in it.

Fig. 1. Appearance of tomato

Tomato has always taken a special place in people's diet because of its specific sensory properties and nutritional values. But the preciousness of the tomato is made up of lycopene, which is an active substance from the family of carotenoids, which plays an important role as micro-nutrition with beneficial effects on human health. Lycopene is a responsible pigment for obtaining the pleasant intense red color of the tomato. At least 85% of the intake of lycopene in the body comes from the fruit of tomatoes.[1]

Properties of lycopene

Physical properties - these properties are shown in Table 1. In mature fruits of the tomato, lycopene has the shape of an idyllic needle crystal. Lycopene (Figure 2) is pipophilic, dissolves in organic solvents, but not in water.[1,2]

Table 1. Physical properties of lycopene

Chemical formula	**$C_{40}H_{56}$**
Relative molecular mass	**536.873 g / mol**
Crystalline form	**Long red pins**
Powdered form	**Thermal red cup**
Solubility / Insolubility	**Soluble in chloroform, hexane, benzene, carbon disulfide, acetone and petroleum ether, insoluble in water, ethanol and methanol**
Sensitivity	**Sensitive to light, oxygen, high temperature, acid action.**

Fig. 2. Appearance of lycopene

Chemical properties of lycopene

The chemical structure of all carotenoids individually determines their color, the photochemical properties of molecules, and chemical reactivity. Lycopene is an acyclic hydrocarbon containing 11 conjugated and 2 unconjugated double bonds linearly represented (Figure 3).[4,5]

Fig. 3. Chemical formula of lycopene

Biochemical properties of lycopene

Lycopene with its acyclic structure, a long line of conjugated double bonds and the pronounced hydrophobicity, shows unique biological properties, as well as antioxidant action. Thanks to its stereo chemical properties and the ability of effective stabilization of active oxygen and free radicals, lycopene is considered to be bioantioksidant with high biological activity in various tissues in the human body. The long chromophore in the polyene chain, except for the red color of lycopene (λ_{max}=472 nm), is responsible for its strong antioxidant activity. [3]

Experimental part - Results and discussion

The extraction of lycopene from a fresh tomato concentrate is carried out with 95% ethanol.
After obtaining the lycopene extract present in the tomato, its detection is detected using UV / VIS spectrometry. After the calibration of spectrophotometer with blind rehearsal of hexane, the absorbance of the wavelength of 503 nm is measured for 5 working liquopent solutions in ethanol, with a concentration in the range of 0 to 03 mg / l. The UV spectrum of the standard of lycopene and ethanol tomato extract is shown in Figure 4, from which it can be noted that lycopene is adhered to an absorbent of 503 nm, this wavelength does not refer to the absorption of lycopene in ethanol.

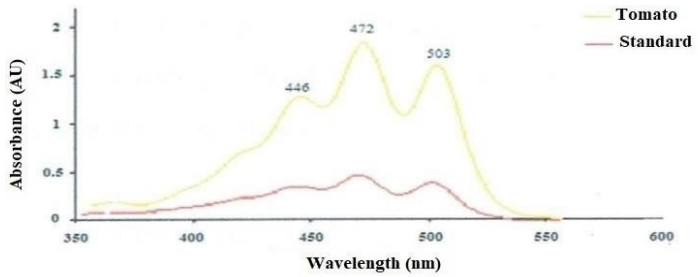

Fig. 4. UV spectrum of the standard of lycopene and ethanolic tomato extract

The content of lycopene present in the fresh tomato and tomato concentrate is shown in Table 2.

Table 2. Lycopene content in examined tomato samples

Samples	Lycopene (mg / l)
Fresh tomato	11.26
Tomato concentrate	57,18

From the obtained results we can conclude that the concentration of lycopene in the tomato itself is present in large quantities, we note that in the tomato concentrate concentration of lycopene is significantly higher due to its solubility in water, but also from the dissolved state of the components present in the tomato, as well as from the release of the juice present in the tomato itself in which vitamins and minerals are present, with the very process of mechanical processing of the tomato, it leads to the connection of the lycopene with the constituents of the tomato which leads to an increased amount of tomatoes in it.

Conclusion

Lycopene represents a component that makes tomato an extremely popular vegetable, cure and gives it its healing properties. It is the most powerful antioxidant, even 2 times more potent than vitamin A and 10 times more potent than vitamin E in neutralizing free radicals. Compared to other types of vegetables and fruits, lycopene occupies the first place. With the development of the food industry and the achievement of the pharmaceutical industry, the importance of lycopene in human nutrition increases, and its positive benifits on the human organism are increasingly determined,therefore, in countries that are not sufficiently developed and where the genetic modification of crops is increasingly applied, the amount of healthy and organic food has decreased, and the pharmaceutical industry has found a solution to consume lycopene in the form of medicines and various food supplements. The daily recommended amount of intake in the body is 5 - 10 mg. The nutritional composition of each tomato preparation plays an important role, adding food additives to tomato products reduces the effect of lycopene.

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