

DETERMINATION OF WATER-SOLUBLE VITAMINS IN TOMATO SEED

Khujakulov A.P

Andijan State University. xujakulovaxtam@gmail.com

Askarov I.R

Andijan State University. xujakulovaxtam@gmail.com

Islamov A.Kh.

Institute of Bioorganic Chemistry named after Academician O.S. Sodikov of the Academy of Sciences of the Republic of Uzbekistan, e-mail: islomov-72@mail.ru, islomovakmal1972@gmail.com

ANNOTATION: *In this article, information about the Tomato (*Solanum lycopersicum*) plant, its chemical composition, medicinal value, and the amount of water-soluble vitamins in Tomato seeds determined by high-performance liquid chromatography, and its physicochemical properties and spectral characteristics are discussed.*

Key words: *Tomato (*Solanum lycopersicum*), glucose, fructose, proteins, organic acids, pectin, starch, lycopene substance, vitamins (B1, B2, B3, B5, vitamin C, provitamin A) choline substance, blood, cholesterol, immune, hemoglobin.*

INTRODUCTION.

Today, it is difficult to imagine the table of our people without vegetables and dairy products. For this reason, great attention is being paid to the cultivation of vegetables and fruit products in the republic in the following years. As a result, the population's interest in vegetable crops and their cultivation is increasing. This, in turn, is an important source of filling our markets with a variety of vegetable products, as well as improving the material well-being, lifestyle and healthy diet of families, ensuring that their free time is occupied with useful work. It is known that it depends on the agriculture of each country and the level of food supply. Due to the planned expansion of the area of vegetable crops in our country, more and more vegetable products are grown. Today, at a time when the shortage of food products in the markets of some countries is threatening, our President Sh. The instructions of M. Mirziyoyev and the government of the republic on the further development of the industry make the issue of increasing and exporting vegetable-polished products the main task. Decision PQ-3978 of the President of the Republic of Uzbekistan "On additional measures to increase the efficiency of the export of fruit and vegetable products to foreign markets" published on October 17, 2018 and the Cabinet of Ministers of the Republic of Uzbekistan in the republic Decision No. 935 dated

November 20, 2018, "On additional measures to increase the volume of fruit and vegetable processing in 2019-2020" is also dedicated to this area. It says, among other things: "On the basis of efficient use of household and homestead plots, great attention is being paid to the issues of increasing the production of fruit, grapes, vegetables, sugar, and leguminous products and increasing the volume of exports. At the same time, the analysis of the commissioning of new facilities for the processing (drying) of fruit and vegetable products grown in households and farm plots shows the need to further develop activities in this direction and implement new projects in some districts of the republic. is doing.

THEORETICAL PART

Tomato (Latin: *Solanum lycopersicum*) is an annual, perennial herb in tropical climates. It is widely cultivated as a vegetable crop. While the name tomato is used in scientific terminology, in Uzbekistan both the plant and the fruit are called tomato or "pamildori" (among the people). Tomato comes from the Italian word pomo d'oro, which means "golden apple". It is called tomato in English, Japanese, Korean, shu fan qie in Chinese, arbe a tomates, tomate arbustive in French, tomatobaum, zbaumtomate, baumtomatenstrauch in German, and tomate in Spanish. It first came from the American continent. It later spread throughout the world after the Spanish colonized the Americas. Nowadays, many varieties of tomatoes are grown in different countries of the world. Tomatoes are eaten both raw and as an ingredient in various dishes and salads or drinks. A tomato plant can usually grow up to 1-3 meters in height. The stem is loose, often spreading on the ground and growing on other plants. The root system of a tomato is extremely branched, penetrates deep (up to 150 centimeters) layers of soil and can grow up to 1.5-2.5 meters in diameter. When there is enough moisture, the roots easily appear from all parts of the stem, so tomatoes can be propagated not only by seeds, but also vegetatively. The stem of a tomato is herbaceous, grows upright or lying down, has strong or weak branching, and grows from 30 centimeters to 2-3 meters, depending on the type of stem. Depending on the structure of the stem and leaves, tomatoes are divided into 3 types: the stem with a stem is thick, less branching, even with the fruits standing upright; stem without a stem is thin, strongly branched, the fruit lies down under the influence of its weight; potato-like large-leaved. Also, the tomato stem is divided into determinant (the main stem and side branches grow moderately and end with the formation of flowers) and indeterminate (the main stem differs in strong growth, the side branches can grow up to 2-3 meters when removed). Determinant tomato varieties are grown in the open field, while indeterminate varieties are mainly grown in greenhouses. The flowers are bisexual, small, yellow, usually 5-7 petals. There are 5-6 pinnae, located in a conical shape. In most cultivars, the flower seed is located inside a cone of pollinators, which makes the tomato crop 95% self-pollinating. In some varieties or in

unfavorable weather conditions (warm temperatures), the seed beak is located above the pollinators, in which the tomato flowers can be pollinated by outside insects or wind. The fruit is two-, three- and multi-chambered, berry-like. Fruits weigh from 50 to 1000 grams; the color can be red, pink, yellow, purple, white and even black; the shape can be round, round-flat, pear-shaped, plum-shaped. The seeds are small, flat, pointed, hairy, yellow-gray in color, 1000 seeds weigh 2.5-4.0 grams, and remain viable for 4-6 years. Tomato is a heat-loving plant. For its normal growth and development, the temperature is 20-25°C, the relative humidity of the air is 40-65%. When the temperature drops below 15°C, growth slows down, at 0-1°C it stops growing, and at 1-2°C the plant dies. Extremely high temperature (<35 °C) has a negative effect on the growth and development of tomato plants. Such a tomato is a light-loving plant, and when it is grown in the shade, the stem grows long and slow, and does not produce fruit. Tomato seed and finished product Fig. 1. [1-7]



Figure 1. Tomato seeds and finished products

Today, tomato is one of the most widely cultivated vegetable crops in the world due to its valuable and dietary properties. To date, more than 1,000 different varieties of tomatoes have been created, and they are grown in open and protected areas (for example, in greenhouses). Currently, about 4.4 million hectares (2009) are planted in the world, and 153 million tons of gross crops are grown. The main tomato growing countries are China (45.4 million tons), USA (14.14 million tons), India (11.15 million tons), Turkey (10.7 million tons), Egypt (10.0 million tons). Tomato is considered one of the main vegetable crops in Uzbekistan, and 40-45% of the total area of vegetable crops is tomato. In 2010, tomatoes were grown on 75,000 hectares in Uzbekistan. 70% of the gross harvest is processed, 10-15% is sold in the local market, and 15-20% is exported. Tomatoes are popular vegetables that are grown and eaten all over the world because of their nutritional benefits. The purpose of this study was to determine the chemical composition (dry matter, soluble solids, titratable acidity, vitamin C, lycopene), taste. The results of the analysis showed that during ripening the amount of soluble solids increases

by an average of two times in all analyzed varieties; The highest content of vitamin C and lycopene was found in tomatoes at the red stage of the Sunstream variety and the highest total acidity expressed as citric acid g 100 g⁻¹ was observed at the pink stage (variety Sakura) or breaking stage (variety Sunstream and Mathew). significantly affects tomatoes.[3-4]

Vegetables are one of the main types of food due to their deliciousness, nutritional value and medicinal properties. The nutritional value of vegetables is determined by the amount of carbohydrates, proteins, fats and other substances in them. The biochemical composition of vegetables consists mainly of water (60-90%), and dry matter is cucumber, tomato -4-7%, root vegetables - 11-17%, green peas - 24%, garlic -35%. Therefore, the nutritional value of vegetables is not high. One kg of most consumed vegetables has 150-400 kcal or 600-1700 kj. Vegetables as food cannot meet the body's energy needs. But they serve as a source of biologically active substances, vitamins, enzymes, proteins, oils, carbohydrates, mineral salts, etc. necessary for the human body. Vitamins play a big role in people's life activities and healthy eating. [7-8]

Vitamins are called substances necessary for life (vita means life, vitamin means life amines). Vitamins are small molecular organic compounds, which are extremely important in the life - activity, growth and reproduction of organisms. Vitamins have the following properties: - they are not synthesized in the human body; - does not participate in the formation of structures; - when they are not enough in the body, the metabolism is disturbed and causes specific diseases; - vitamins consumed with food affect biochemical processes in the body as coenzymes. A change in the amount of vitamins in the body leads to the following conditions: 1. Avitaminosis - diseases caused by the lack of some vitamin in the body. 2. Hypovitaminosis - diseases caused by vitamin deficiency. 3. Hypervitaminosis - diseases caused by an excess of vitamins. So far, more than thirty vitamins have been identified, and they are divided into three groups: water-soluble, fat-soluble vitamins, and vitamin-like substances. Water-soluble vitamins include: Vitamin B1, Vitamin B2, Vitamin B6, Vitamin B12, Vitamin PP, Biotin, Vitamin N, Vitamin C, Vitamin P. Fat-soluble vitamins include: vitamin A, vitamin D, vitamin E, vitamin K. Water-soluble vitamins: Vitamin B1 - thiamine, is the first vitamin to be isolated in pure form. Lack of vitamin B1 - avitaminosis occurs in beriberi or polyneuritis. Vitamin B1 causes a violation of carbohydrate metabolism. Vitamin B1 is a coenzyme of pyruvate decarboxylase. This vitamin is found in large quantities in eggs, meat, and peas. The daily requirement of the body is 1-3 mg. Vitamin B2 is called riboflavin and it has a yellow color. Deficiency of this vitamin leads to avitaminosis, colds of the mucous membrane of the oral cavity, impaired vision, and anemia. Riboflavin is a coenzyme of flavin enzymes. A person receives 65-70% of this vitamin through dairy, meat and bread products, 30-35% through vegetables and fruit products. Daily requirement - 2 mg.

Vitamin B6 (pyridoxine). A lack of vitamin B6 causes a disturbance in the metabolism of amino acids and leads to a skin disease called dermatitis. It also causes anemia and growth retardation. This vitamin is a coenzyme of enzymes that catalyze the reamination reaction of amino acids. Vitamin compounds: pyridoxine, pyridoxal and pyridoxamine. Vitamin B6 is mainly found in meat, fish, and grain products. Adults need 2 mg of this vitamin. is Vitamin PP (nicotinic acid). Nicotinic acid is important in metabolic processes in living organisms. It is a coenzyme of dehydrogenase enzymes that catalyze oxidation-reduction reactions by becoming part of NAD and NADP. It is a derivative of pyridine: nicotinic acid and nicotinamide. Vitamin PP deficiency causes pellagra disease. The nervous system and digestive system are disturbed. Vitamin PP is found in cereals and vegetables. The daily requirement for an adult is 7 mg. Vitamin C (Ascorbic acid). Humans, monkeys and guinea pigs do not synthesize ascorbic acid, so they consume vitamin C with ready-made food. If there is a lack of products rich in vitamin C in the food, people and some animals develop ringworm. Milks cause bleeding and blood accumulation under the skin. If vitamin C is not taken into the body, it leads to death. Vitamin C increases the body's antioxidant capacity. Ascorbic acid serves as an intermediate that transfers hydrogen in oxidation-reduction reactions in living organisms. Vitamin C is abundant in plums, oranges, lemons, dill and other plants. The daily requirement of an adult is 0.2-1 g. is [4-11]

DISCUSSION OF RESULTS

Water-soluble vitamins in tomato seeds were determined using the high-performance liquid chromatography (HPLC) method. 5-10 g of tomato seeds are taken out on an analytical balance and placed in a 300 ml flat flask. 50 ml of 40% ethanol solution is added to it. The mixture was heated under vigorous stirring for 1 h, equipped with a magnetic stirrer, reflux condenser, and then stirred at room temperature for 2 h. The mixture is cooled and filtered. The remainder was re-extracted 2 times with 25 ml of 40 percent ethanol. The filtrates were combined and filled to the mark with 40% ethanol (5-10%) in a 100 ml volumetric flask. The resulting solution is spun in a centrifuge at a speed of 7000 rpm for 10 minutes. The resulting solution was taken from the upper part for analysis. Working solutions of water-soluble vitamins with a concentration of 1 mg/ml were prepared. For this purpose, 50.0 mg of each vitamin standard is taken on an analytical balance and dissolved in 40% ethanol in a 50 ml volumetric flask and filled to the mark.

Acetate buffer system and acetonitrile were used as an eluent for the determination of water-soluble vitamins in tomato seeds using YuSSX. Chromatographic conditions:- Chromatograph Agilent-1200 (equipped with an autosampler);-Column Exlipse XDB C 18 (obraschenno-faznyy), 5 μ m, 4.6 x150mm; -Diode matrix detector (DAD), 250 nm identified; -Flow rate 1ml/min; - Eluent acetate buffer: acetonitrile: 0-5 min 96:4, 6-8 min

90:10, 9-15 min 80:20, 15-17 min 96:4, thermostat temperature 25 0C, -5 µl injected amount. First, a working standard solution was prepared in the chromatograph, then a solution prepared from tomato seeds was introduced, and the amount of vitamins was determined by comparison. (Figure 2)

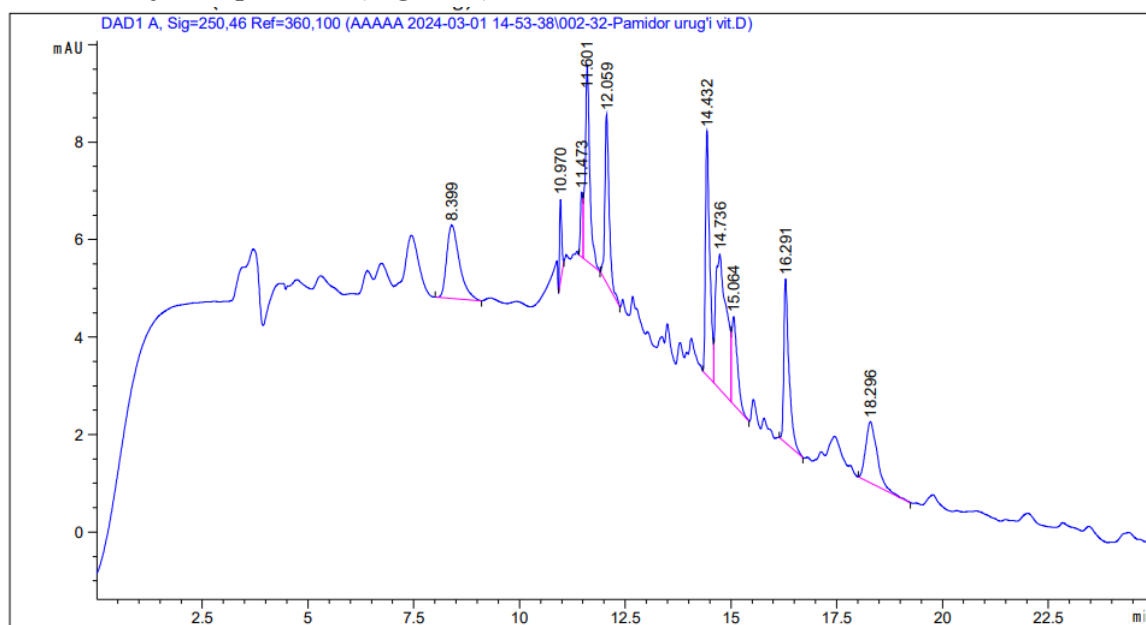


Figure 2. Chromatography of a solution prepared from tomato seeds to determine the amount of vitamins in tomato seeds

It can be seen from the chromatography that B1 = 0.038943 mg., B2 = 1.541992 mg., B6 = 4.263523 mg., B9 = 9.644809 mg., (PP) B3 = 0.074236 mg. Vitamin C (ascorbic acid) = 0.579656 mg was found.

CONCLUSION:

When the amount of water-soluble vitamins in tomato seeds was studied using the high-performance liquid chromatography (HPLC) method, in tomato seeds B1=0.038943 mg., B2= 1.541992 mg., B6=4.263523 mg., B9 = 9.644809 mg., (PP) B3 = 0.074236 mg. Vitamin C (ascorbic acid) = 0.579656 mg was found.

REFERENCES:

1. Encyclopedic dictionary of medicinal plants / Ed. G. P. Yakovlev and K. F. Blinova. - 2nd edition. - St. Petersburg: SPHFA publishing house, 2002. - P. 104.
2. Murdakhaev YU.M. Medical culture in Uzbekistan, Tashkent, 2001.
3. Murdakhaev YU. M. Medicinal plants native to Uzbekistan //Tashkent: Fan. - 1992. - T. 76.
4. Voprosy agrotechniki vzdelyvaniya lekarstvennyx kultur. Chast 1, Moscow, 1978.

5. Pharmacognosy (H. Kholmatov, O'. Ahmedov) Abu Ali ibn Sina Tashkent 1997.
6. Kh. Kh. Kholmatov, O. A. Ahmedov, Pharmacognosy: textbook, Tashkent, NMB named after Ibn Sina, 1995.
7. Balashev N.N., Zeman G.O.//Sabzavotchilik.T., Teacher, 1977, 406 p.
8. Abdullaev R., Yagudina S. "Berries grown in the garden". Tashkent, "Mehnat" 1989, pp. 37-70.
9. Oh. Ahmedov, A. Ergashev, A. Abzalov//Medicinal plants and their cultivation technology//Tashkent - 2008
10. Khujaev J.Kh. Physiology of plants. Tashkent Labor 2004. B 118-156.
11. <https://uz.wikipedia.org/wiki/Tomato>

