

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Biological Activity of Tomato Juice.

Olga I. Ustinova\*, and Yuri V. Ustinov.

Medical University "REAVIZ" 227, Chapaevskaya str., Samara, 443001, Russian Federation.

### ABSTRACT

The subject of alimentary correction of health by natural foods of plant origin, which are metabolically connatural to the body and exhibit immunoprotective properties, is essential for maintaining human health. Tomato juice an hour after intake increases the biological activity of all body systems, especially the system of kidneys – bladder and cardiovascular system. Thus, in case of the functional weakness of these human systems, it is advisable to drink tomato juice.

**Key words:** Alimentary correction of health, tomato juice, biological activity of organs, biological activity of tomato juice.

*\*Corresponding author*

### INTRODUCTION

In the era of rapidly rising wave of multiple morbidity detectable even in young people, trust in the omnipotence of synthetic drugs is extremely dangerous for the population [1]. According to research conducted by the World Health Organization, longevity and quality of human life is conditioned by 50% on life pattern and just by 10% on the level of medical care [2]. A healthy lifestyle involves healthy (health bearing) nutrition, ensuring the intake of nutrients and minor components of food. As a consequence, the subject of alimentary correction of health by natural foods of plant origin is most important for maintaining human health [3, 4, 5]. Tomatoes and tomato juice are the most important vegetable food stuffs.

The tomato juice has an exceptionally rich composition [6]. It contains natural sugars (fructose and glucose), organic acids (tartaric, oxalic, malic, citric, and succinic acid detected in overripe tomatoes); vitamins A, E, H, PP as well as B-group vitamins, carotene, and vitamin C. Tomatoes are also rich in mineral content that includes calcium, magnesium, chlorine, phosphorus, potassium, sulfur, zinc, iron, copper, iodine, selenium, manganese, fluorine, chromium, and molybdenum. Not many products have such a variety of useful components; therefore tomatoes are often included in the schemes of fasting days and included into the dietary intake [7].

The content of vitamins, mineral nutrients and macronutrient elements in tomatoes, as well as the daily intake are presented in Table 1 [7, 8].

**Table 1: The average content of vitamins, mineral nutrients and macronutrient elements per 100 g of tomato juice**

Vitamins														
Vitamin	Vitamin A	Vitamin B1	Vitamin B2	Vitamin B3	Vitamin B5	Vitamin B6	Vitamin B9	Vitamin C	Vitamin E	Vitamin H				
Content in tomato juice, µg	50	30	30	400	300	100	11	10000	400	1.2				
Daily intake, mg	1.5	1.5	1.7	20	10	2	0.2	60	1.33	0.2				
Mineral nutrients and macronutrient elements														
Mineral nutrients	Potassium	Chlorine	Phosphorus	Sulfur	Magnesium	Calcium	Iron	Zink	Manganese	Boron	Copper	Fluorine	Iodine	Selene
Content in tomato juice, mg	240	57	32	12	12	7	0.700	0.200	0.140	0.115	0.110	0.20	0.002	0.0003
Daily intake, mg	1000-2000	3400	1000	500-1000	400	1000	10-20	15	2	2-5	2	2-4	0.15-0.2	0.05-0.07

In folk medicine [9, 10] tomato juice was used as a diuretic in diseases of kidneys and bladder; as a means to reduce the risk of cerebral accident and heart attack, as well as to improve the state of cardiovascular system. The tomatoes are used at metabolic disorders, cough, atherosclerosis, obesity, anemia, and constipation [11].

Contemporary research presents enough arguments in favor of the fact that the nutrition with the natural plant products, including products containing tomatoes, can be effective means against oncological diseases [12]. Thanks to the rich vitamin and mineral composition and the high content of lycopene, tomato juice, provided its regular consumption, normalizes the process of metabolism as well as improves activity of cardiovascular and nervous systems [7]. This product has anti-inflammatory, bactericidal, cholagogic, diuretic,

anti-sclerotic and blood capillary strengthening action; it prevents the emergence and development of thrombosis and is a preventive remedy against constipation [6]. Tomatoes are recommended in dietetic nutrition: because of their low calorie content they are included in the fasting diet. As a source of minerals and vitamins, the consumption of tomatoes is advisable to patients with metabolic syndrome (especially those having disturbed exchange of potassium). Deficiency of vitamins A, C, iron and potassium salts in organism can be compensated by eating 150-200 grams of fresh tomatoes a day or drinking two glasses of tomato juice. Tomatoes are useful at anemia, as they contain large amounts of biogenic iron; excite the appetite, and enhance the digestive process. Though, tomatoes are not recommended at cholelithiasis [13].

The aim of the present study was to determine the natural effect of tomato juice on the human body, as well as to reveal a change in the biological activity of human organs.

### MATERIALS AND RESEARCH METHODS

To analyze change in the state of biological activity of organs under the effect of the tomato juice we have used the software and hardware system RUNO (thermoalgometry). The diagnostics is based on the reflectory connection between the activity of autonomic centers and the sensitivity of skin zones - the **less** the sensitivity threshold of the corresponding acupuncture point of the organ's meridian the **higher** the biological activity of the respective organ. Professional-grade medical diagnostic system RUNO is included in the State register of medicines and medical products, and certified by the Ministry of Health of the Russian Federation. Today it is the most accurate, complete, and at the same time, the simple technology for express-diagnostics, which allows identifying the change in the organs biological activity within 3-5 minutes.

The study was conducted on apparently healthy men and women [14, 15] under the most socially significant age from 20 through 69 years.

To obtain "control measurements" of the average annual biological activity of the organs, tests were performed on apparently healthy people every 2 weeks during 3 years (since November 2012 through October 2015) in the fasted state from 7.00 a.m. to 8.00 a.m. To identify the average biological activity of the organs, 557 measurements were carried out during this period. The number of measurements and the average age of the studied groups are presented in Table 2.

**Table 2: The number and the average age of apparently healthy men and women tested in control measurements conducted in various age groups**

Age group	20-29 years	30-39 years	40-49 years	50-59 years	60-69 years
Number of testees	40	165	65	169	118
Average age of the group , years	27.7±0.02	37.0±0.08	43.1±0.03	51.7±0.02	64.0±0.01

To assess change in the biological activity of the organs under the effect of 50 ml of used tomato juice, 38 people were tested twice immediately after drinking the juice and one hour after ingesting it in the same time period of the day (from 7 a.m.) employing the software and hardware system RUNO.

### RESULTS AND DISCUSSION

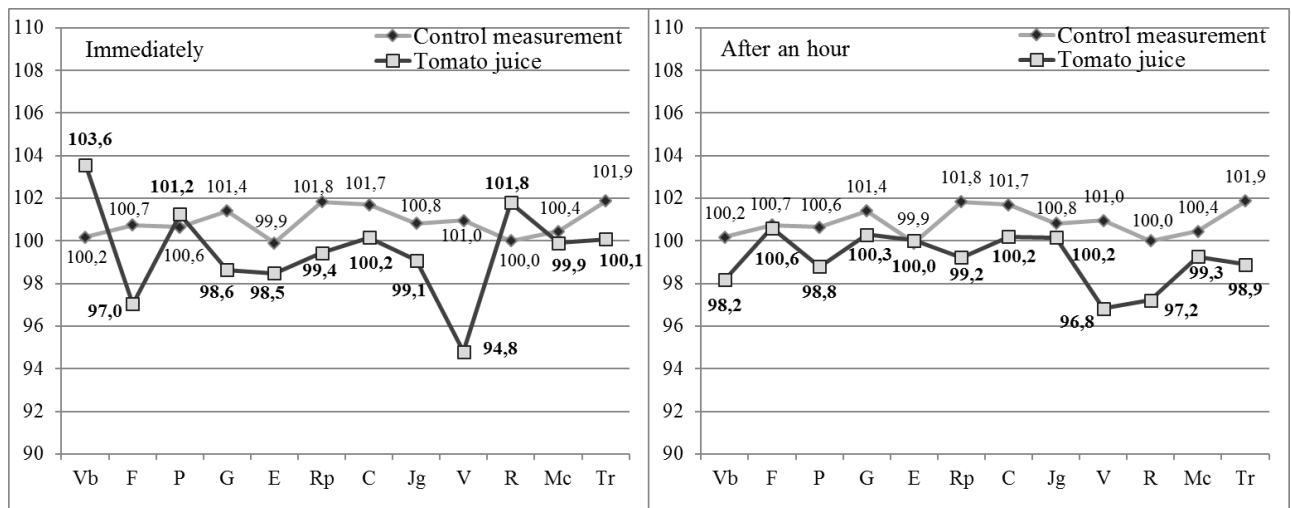
The analyzed databases were created in Microsoft Excel 2003. The variational series were constructed with regard to each of the following indicators:

1. The age of the testees;
2. Measurements of the biological activity of twelve body meridians:
  - 2.1 "control measurement" of the biological activity of the organs;
  - 2.2 the biological activity of each organ immediately after ingestion of fresh squeezed tomato juice;
  - 2.3 the biological activity of each organ one hour after ingestion of fresh squeezed tomato juice.

The average value of indicators based on the mode, meridian, moments techniques, and the boundaries of their confidence intervals, were revealed. The critical level of significance was taken as  $p = 0.05$ . Indicators of the biological activity status of the organs are presented in Table 3 and shown in Fig. 1.

**Table 3: The average values of indicators of biological activity status of body organs**

Meridian	Vb	F	P	G	E	Rp	C	Jg	V	R	Mc	Tr
	Gall bladder	Liver	Lungs	Large intestine	Stomach	Pancreas - Spleen	Heart	Small intestine	Urinary bladder	Kidney	Pericardium (vascular system)	Triple heater (hormonal system)
Control measurement	100.17 ±1.49	100.74 ±1.19	100.65 ±1.17	101.40 ±1.22	99.90 ±1.20	101.83 ±1.41	101.69 ±0.95	100.82 ±2.31	100.96 ±2.31	99.99 ±1.39	100.45 ±1.14	101.88 ±0.99
Immediately	103.57 ±5.88	97.03 ±4.14	101.25 ±4.19	98.64 ±4.15	98.47 ±3.67	99.44 ±4.60	100.17 ±3.36	99.08 ±2.99	94.79 ±7.65	101.79 ±5.73	99.90 ±3.88	100.08 ±2.93
After an hour	98.18 ±5.13	100.60 ±3.88	98.78 ±3.65	100.29 ±3.44	100.02 ±4.06	99.22 ±4.58	100.21 ±2.54	100.16 ±2.88	96.82 ±6.91	97.22 ±5.12	99.26 ±4.01	98.90 ±2.70



**Figure 1: The indicators of the biological activity status of the organs.**

The change of the biological activity of the organs when drinking tomato juice with regard to “control measurement” is presented in absolute values and percentage ratio in Table 4 and shown in Fig. 2.

**Table 4: The change of the biological activity of the organs in absolute values ( $\Delta$ , points) and percentage ratio ( $\Delta$ , %) against the indicators of biological activity obtained for “control measurements”**

Meridian	Vb	F	P	G	E	Rp	C	Jg	V	R	Mc	Tr	
Immediately	$\Delta$ , points	-3.40	3.71	-0.60	2.76	1.43	2.38	1.52	1.73	6.17	-1.80	0.55	1.80
	$\Delta$ , %	-3.39	3.69	-0.60	2.72	1.43	2.34	1.50	1.72	6.11	-1.80	0.54	1.77
After an hour	$\Delta$ , points	1.99	0.14	1.86	1.10	-0.12	2.61	1.48	0.66	4.15	2.77	1.19	2.98
	$\Delta$ , %	1.99	0.14	1.85	1.09	-0.12	2.56	1.46	0.65	4.11	2.77	1.18	2.93

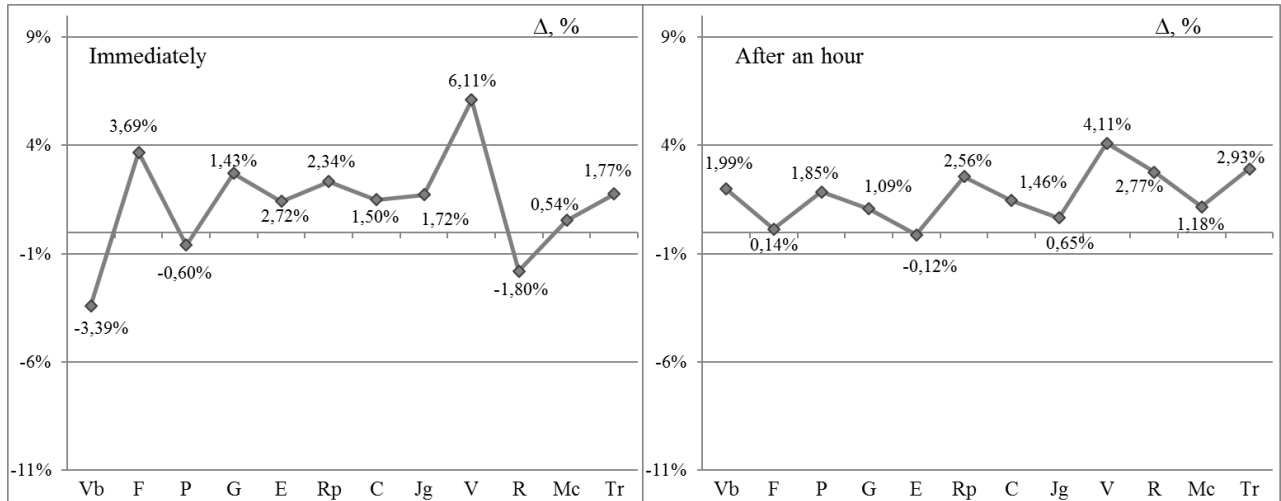


Figure 2: The change of the biological activity of the organs under the effect of tomato juice in percentage ratio against the indicators of biological activity obtained for “control measurements”.

The change in the biological activity of the body organs with regard to “control” values *immediately after* intake of tomato juice is presented in Table 5, while similar values obtained *one hour after* the ingestion of tomato juice are presented in Table 6.

Table 5: The change in the biological activity of the body organs *immediately after* intake of tomato juice, %

Body meridian	V	F	G	Rp	Tr	Jg	C	E	Mc	P	R	Vb
%	6.1	3.7	2.7	2.3	1.8	1.7	1.5	1.4	0.5	-0.6	-1.8	-3.4

Table 6: The change in the biological activity of the body organs *one hour after* intake of tomato juice, %

Body meridian	V	Tr	R	Rp	Vb	P	C	Mc	G	Jg	F	E
%	4.1	2.9	2.8	2.6	2.0	1.8	1.5	1.2	1.1	0.7	0.1	-0.1

The comparison of the results (Fig. 2, Tables 5 and 6) show that the total change of the biological activity of all organs *immediately after* ingestion of tomato juice is “+16.0%”, i.e. the total biological activity of the whole organism increases dramatically. Speaking the language of Oriental medicine, tomato juice, when ingested, initially displays male principle of Yang [16]. Thus, the biological activity of almost all body systems increases. *An hour after* ingestion of the tomato juice, the total change in the biological activity of all organs amounts to “+20.6%”, i.e. the total biological activity of the whole organism still increases. Speaking the language of Oriental medicine, tomato juice, while ingested and absorbed by the organism, displays a pronounced male principle of Yang [16].

### CONCLUSIONS

In summary, we can draw the following conclusions.

1. The response of the body to tomato juice *immediately after ingestion* consists in the increase of the total biological activity by 16.0%. At that, noticeable enhancement of the biological activity was noted in cardiovascular system (Jg, Tr, C, Mc) (6.3%), kidneys – bladder (R, V) (4.3%), and stomach – pancreas – spleen (Rp, E) (3.7%). At the same time, we indicated decrease in the biological activity of gall-bladder (Vb) (3.4%), kidneys (R), (1.8%), and lungs (P) (0.6%).
2. *An hour after* ingestion of the tomato juice, the biological activity of almost all body organs and systems further increases (on total by 20.6%). Maximum biological activity was displayed in kidneys – bladder system (R, V) (6.9%), and cardiovascular system (Mc, Jg, C, Tr), (6.2%). The systems of lungs – large

intestine (P, G) and liver – gall bladder (F, Vb) activate to a lesser extent (2.9 and 2.1%, respectively). At that, the stomach (E) activity somewhat reduces (0.1%).

3. Thus, we can recommend the use of tomato juice for alimentary correction of health to the people suffering from functional weakness of kidneys – bladder and cardio-vascular systems.

#### ACKNOWLEDGEMENT

The authors express their gratitude to N.B. Kalugina for the highly intelligent technical support.

#### REFERENCES

- [1] Karpeev, A.A., 2012, "Essays on the History of Herbal Medicine," *Traditional Medicine*, 2(29), pp. 51-58.
- [2] "Active Aging with High Quality Living of the Population in Russia," 2013, Materials for the State Program of Russia for the Period of 2014-2025, Moscow, 82 p.
- [3] Ustinova, O.I., 2015, "Use of Natural Herbal Remedies as Immunity Protectors, Metabolically Connatural to the Body," *BBRA-OSPC, Biosciences, Biotechnology Research Asia*, 12 (2), pp. 59-64.
- [4] Ustinova, O.I., Pimenov, Y.S., and Ustinov, Y.V., 2014, "Health of Healthy Humans: Historical Heritage of Academician N.M. Amosov on Achieving Good Health," *World Journal of Medical Sciences*, 10(1), pp. 17-21.
- [5] Ustinova, O.I., 2014, "Health of Healthy People. Historical Heritage of Academician N.M. Amosov concerning the Issues of Nutritional and Physical Training and Detraining of an Organism," *World Applied Sciences Journal*, 31(2), pp. 227-231.
- [6] "Benefit of Tomato Juice," *bezvreda.com*. Retrieved February 2, 2016, from <http://bezvreda.com/polza-tomatnogo-soka/>
- [7] "Tomato Juice: the Benefits and Harms of Tomato Juice," *findfood.ru*. Retrieved February 2, 2016, from <http://findfood.ru/product/tomatnyj-sok> (accessed 02.02.2016).
- [8] "Vitamins and Minerals: What you should Know," *medafarm.ru*. Retrieved February 1, 2016, from <http://medafarm.ru/page/vitaminy-i-mineraly-%E2%80%93-o-chem-sleduet-znat>.
- [9] Nuraliev, Yu., 1988, "Medicinal Plants: the Healing Properties of Fruits and Vegetables (From the experience of Traditional, Oriental and Modern Medicine)," 2nd ed., Dushanbe, Maorif, 287 p.
- [10] Makhrajuk, V.P., 1967, "Medicinal Plants in Folk Medicine," 2nd ed., Saratov: Volga Book Publishing House, 560 p.
- [11] "Tomato: What is the benefit?" Website of folk medicine, *samsebelekar.ru*. Retrieved March, 3, 2016, from [http://samsebelekar.ru/index/pomidor\\_polza/0-787](http://samsebelekar.ru/index/pomidor_polza/0-787)
- [12] Campbell, K., and Campbell, T., 2014, "The Chinese Study," *Trans*, from English. 3rd ed., rev., Moscow: Mann, Ivanov and Ferber, 416 p.
- [13] Maznev, N.I., 2003, "Encyclopedia of Medicinal Plants," Moscow, Martin, 496 p.
- [14] Ustinova, O.I., 2014. "Apparently Healthy Human Being: the Necessity to Refine the Notion," *Life Science Journal*, 11(10), pp. 524-526.
- [15] Ustinova, O.I., 2014, "Analysis of the State of Practical Interest to Health Demonstrated by People from Different Age Groups and Identification of its Connection with Mortality," *Biosciences Biotechnology Research Asia*, 11, pp. 323-327.
- [16] Ustinova, O.I., Pimenov, Y.S., and Ustinov, Y.V., 2014, "Health Achievement and Integration of Medical Ontological East-West Paradigms," *World Journal of Medical Sciences*, 30(9), pp. 1139-1144.