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The Biological Activity of the Freshly Squeezed Lemon and Orange Juice.

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ABSTRACT

The alimentary health correction with natural food stuff of plant origin, metabolically close to the body as a means, having the immunoprotective properties, is essential for the maintenance of the human health. The freshly squeezed lemon and orange juice increases the biological activity of all body systems in 1 hour after ingestion. The biological activity of the hollow, yang-organs, ensuring the release of the body of the toxic substances and waste is increased especially. The cardiovascular system, the liver system – the gall bladder, the large intestine – the lungs and the stomach – the pancreas – the spleen are activated. In case of functional weakness of the said human systems and organs, it is advisable to drink lemon and orange juice.

Keywords: Alimentary health correction, lemon and orange juice, biological activity of the organs, biological activity of lemon and orange juice.

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INTRODUCTION

The longevity and the quality of life, according to the research performed by the World Health Organization, is 20% determined by heredity, 20% by the environment, 50% by the lifestyle, and is only 10% determined by the level of medical care [1]. A healthy lifestyle includes healthy (bringing health) food. The ingestion of the nutrients and minor food components is a factor, largely determining the health of the population. Therefore, the alimentary health correction with natural food stuff of plant origin, metabolically close to the body as a means, having the immunoprotective properties, is essential for the maintenance of the human health [2-4]. Lemon and orange juice is the most important food stuff of plant origin and is used not only for the improvement of the taste of products, but also to correct the state of the human health.

The chemical composition of the lemon juice depends on the place of growth and the species of the lemon tree. Up to 8% of the citric acid and 0.25% of the malic acid [5], from 2.06 to 6.0% of sugars (more than 0.80% of glucose, up to 0.75% of sucrose and more than 0.60% of fructose), not more than 0.9% of proteins, up to 0.1% of fat (lemon essential oil), up to 0.5% of pectin, and fiber, glycosides of various structures, etc. are concentrated in the fruit pulp [6].

The content of vitamins, macro- and microelements, as well as the daily rate of their consumption by human [6-8] are shown in the Table 1.

Table 1. The average content of vitamins, micro- and macro- elements per 100 g.

Vitamins										
Vitamin	Vitamin A	Vitamin B1	Vitamin B2	Vitamin B3	Vitamin B5	Vitamin B6	Vitamin B9	Vitamin C	Vitamin E	Vitamin H
Content in lemon	0.0010 mg	0.04 mg	0.02 mg	0.2 mg	-	0.06 mg	9.0 mg	40.0 mg	0.5 mg	-
Content in orange	18 mcg	0.04 mg	0.02 mg	0.2 mg	0.3 mg	0.06 mg	5 mcg	40.0 mg	0.2 mg	1 mcg
Daily demand of the body	5000 IU	1.5 mg	1.7 mg	20 mg	10 mg	2 mg	200 mcg	60 mg	20 IU	200 mcg

Microelements														
Microelement	Ferrum	Potassium	Calcium	Magnesium	Sodium	Sulfur	Phosphorus	Chlorine	Boron	Manganese	Copper	Iodine	Fluorine	Zinc
Content in lemon	0.6 mg	163.0 mg	40.0 mg	12.0 mg	11.0 mg	10.0 mg	22.0 mg	5.0 mg	175.0 mcg	40.0 mcg	240.0 mcg	-	10.0 mcg	125.0 mcg
Content in orange	0.3 mg	179 mg	18 mg	11 mg	10 mg	9 mg	13 mg	3 mg	180 mcg	0.03 mg	67 mcg	2 mcg	17 mcg	0.2 mg
Daily demand of the body	10-20 mg	1-2 g	1000 mg	400 mg	4-5 g	500-1000 mg	1000 mg	3400 mg	2-5 mg	2 mg	2 mg	150-200 mcg	2-4 mg	15 mg

The biologically active substances such as: flavonoids, coumarin derivatives, sesquiterpenes [5-6, 9] are also present in lemon fruits.

In ancient Oriental medicine of 10th-11th centuries it was believed that lemon "hardens" the stomach, strengthens the heart, helps to cure the infectious diseases, the diseases of the liver, stomach, as well as fever, sepsis, asthma, angina. It was used as an antidote for the bites of the insects. In complementary medicine, the juice and the fruit of lemon were widely used in treatment of the diseases of stomach, liver, gallbladder and biliary tract, the kidneys, the joint and muscle pain as a hemostatic, antipyretic and tonic, in case of various infectious diseases, as well as for treatment of diabetes, hypertension [5, 9]. Lemon juice mixed with water was used for liver diseases, inflammatory diseases. Freshly squeezed lemon juice was used to smear the diphtheritic raids in the throat, and as a means for nausea and vomiting distraction [10].

The modern studies show that the rich vitamin and mineral composition provides lemon juice with a wide range of useful properties: the citric acid, included in juice, is converted into alkali in the process of digestion, reducing the acidity of the stomach, eliminating the burning sensation; lemon juice dilutes the bile, promoting its outflow, enhances the effect of the liver enzymes, prevents the formation of gallstones; it is capable of destroying the uric acid salt deposits in case of gout and rheumatism; the significant content of lemon juice potassium improves the nutrition of the brain cells, the heart, the nerve endings; calcium helps to strengthen bones and tooth enamel. The combination of magnesium and calcium supports the body in the periods of increased nerve and physical stress, it helps to maintain good health and functional ability. Organic citric acid is capable of forming the soluble complexes with calcium, which is used in the treatment of diseases associated with the formation of gallstones, pancreas and kidney stones. Pectin, contained in lemons, along with other nutrients, improving the blood circulation and metabolism, can help to reduce the blood cholesterol level, promote the weight loss, the blood pressure normalization. The presence of vitamin C is very useful for the circulatory system: it strengthens the blood vessels, making them less permeable, it also beneficially affects the capillaries; it strengthens the immune system and is the excellent preventative measure during the seasonal epidemics of influenza and SARS, as the useful properties of lemon include the antimicrobial and anti-inflammatory effect [11-13].

Orange is also one of the food stuff of plant origin, providing the human health correction. A wide variety of vitamins and minerals, important for the functioning of the body, is contained in oranges. Due to the presence of the bioflavonoids in the composition of orange, the free radicals are neutralized and the harmful microorganisms are withdrawn. Vitamins B1, B2 and B3 ensure the normal development and function of the central nervous system, promote the growth of the organism, and the antibody synthesis (enhance the immunity). Vitamin B5 activates the nervous system, regulates the amount of adipose tissue, stimulates the production of adrenal hormones. Vitamin B6 is involved in the development of hormones, enzymes and amino acids, activates the metabolism. Vitamin H (B7) is required for the exchange of vitamin B3. Vitamin B9 (folic acid) stimulates the immune system, the metabolism of proteins and fats, it is involved in the formation of hemoglobin and red blood cells, it regulates the cell division. That is why the ingestion of oranges by women of reproductive age prevents fetal malformations of the child. The vitamins B1, B6 and C are required for the assimilation of folic acid (vitamin B9). Since orange has all these components, the folic acid is fully absorbed from orange by the body [14]. The ingestion of oranges is of particular significance for correction of the ascorbic acid (vitamin C) content, since a great need for it, and inability of the body to synthesize it have led to the need to use the ascorbic acid in the therapeutic and prophylactic purposes [12]. The main useful properties of orange are due to the high content of vitamin C. It is a highly effective antioxidant, it is required for the body to regulate many processes including the collagen production. The ascorbic acid has the anti-inflammatory and regenerating effect on many tissues, it increases the resistance to a number of infectious agents, facilitates the absorption of calcium and ferrum, withdraws copper, lead and mercury out of the body [12, 15]. The composition of orange includes a sufficient amount of phosphorus, calcium and magnesium (see Table 2). Calcium and phosphorus improve the condition of the bones, teeth, hair and skin. Magnesium is especially important for the normalization of the cardiovascular system. The lack of magnesium reduces the vascular tone and the cardiac muscle tone. In the course of orange and orange juice ingestion magnesium combined with vitamin C improve the physical and psychological stress resistance of the body. Since orange is rich in potassium, which contributes to the removal of the excess fluid from the tissue, the ingestion of a sufficient quantity of orange fruit and juice reduces the blood pressure, prevents the edema formation, especially in case of cardiovascular diseases accompanied by the potassium deficiency [16].

In complementary medicine the use of orange juice is widely known [5, 9]: it normalizes the bowel function, prevents the constipation, it is recommended for the treatment of anemia, liver and kidney diseases. There is the orange diet based on the juice of the red oranges, which helps to fight the obesity. Orange juice has long been used as an antipyretic means, in cases of hemoptysis, for the treatment of the infected wounds and ulcers, the kidney stones [17-18].

The purpose of this study is to identify the nature of the effect of freshly squeezed lemon and orange juice on the human body, the change of the biological and functional activity of the human organs produced by its ingestion.

MATERIALS AND METHODS

The software and hardware complex RUNO (thermoalgometry) was used to analyze the changes in the condition of the biological activity of the organs under the influence of the ingestion of lemon and orange juice. The diagnosis is based on the reflex correlation of the activity of the vegetative centers with the sensitivity of the areas of the skin – the smaller the threshold of sensitivity of the respective biologically active point of the meridian of the body, the higher the biological activity of the corresponding organ. The professional medical diagnostic system RUNO is entered in the Register of medical devices, certified by the RF Ministry of Health. Today it is the most accurate, complete, and at the same time, the simplest express-diagnostics technology, allowing to identify the changes in the activity of the organs during 3-5 minutes.

The apparently healthy men and women [19-20] of the most socially significant age from 20 to 69 years were taken as the material for this study.

To perform the "anchor measurement" – the annual average value of the biological activity of the organs within 3 years (November 2012 – October 2015), from 7.00 a.m. to 8.00 a.m., fasted, every 2 weeks the measurements of the biological activity state of the organs of the apparently healthy people were conducted. Totally, 557 measurements were conducted to detect the annual average of the biological activity of the organs within a given period of time. The number of the measurements and the average age of the studied by the age groups are presented in the Table 2.

Table 2. The number and the average age of the apparently healthy men and women participated in the "anchor measurement" by age groups.

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

During the same time period of the day (from 7 a.m.), to assess the changes in the biological activity of the organs under the influence of 50 ml ingested freshly squeezed lemon and orange juice, using the hardware and software complex RUNO, two measurements in each of 36 people were performed: *immediately after* the ingestion of juice and *in 1 hour* after the ingestion.

RESULTS AND DISCUSSION

The databases analyzed were completed in Microsoft Excel 2003 software. The variation series for each indicator were built for:

The age of the study subjects;

12 measurements of the biological activity of the meridians of the organs:

- by the "anchor measurement" of the state of the biological activity of the organs;
- by the values of the biological activity of each organ *immediately after* the ingestion of freshly
- squeezed lemon and orange juice;

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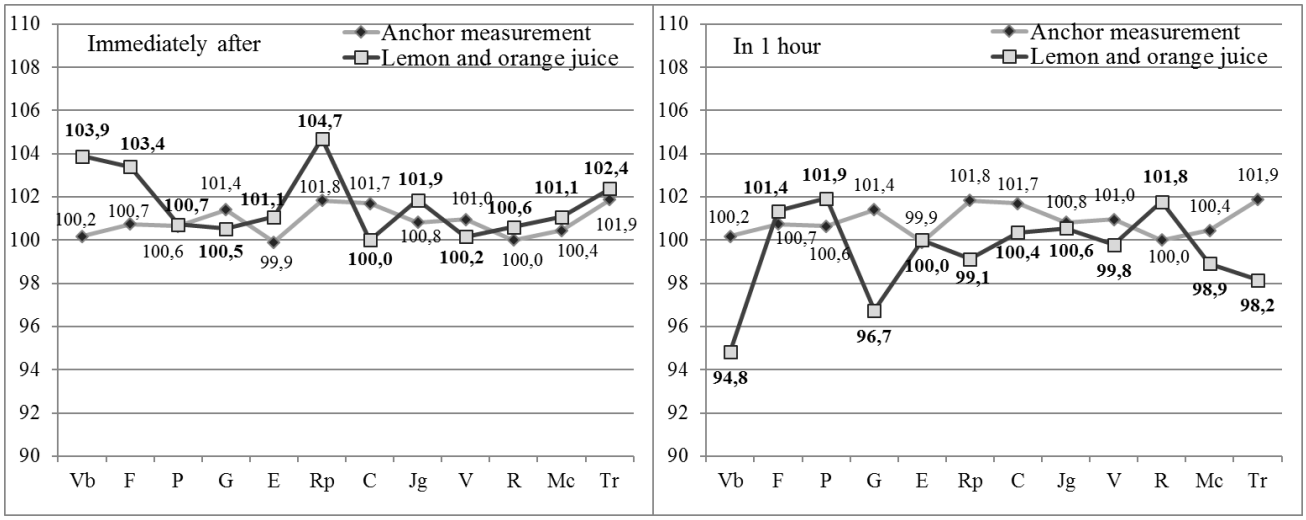
- by the values of the biological activity of each organ *in 1 hour* after the ingestion of freshly squeezed lemon and orange juice.

The average values by the mode, by the median, by the method of moments and the boundaries of their confidence intervals were established. The critical level of significance was taken to be p = 0.05. The indicators of the state of the activity of the organs are shown in the Table 3 and Figure 1.

Table 3. The average values of the indicators of the biological activity of the organs.

Meridian	Vb	F	P	G	E	Rp	C	Jg	V	R	Mc	Tr
	Gallbladder	Liver	Lungs	Large intestines	Stomach	Pancreas - Spleen	Heart	Small intestine	Bladder	Kidneys	Pericardium (Circulatory System)	Triple Heater (hormonal system)
Anchor 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 after	103.88 ±4.48	103.39 ±3.81	100.73 ±3.03	100.53 ±3.62	101.08 ±4.07	104.69 ±5.24	100.01 ±2.33	101.86 ±2.67	100.17 ±6.32	100.6 ±5.12	101.07 ±3.79	102.38 ±2.76
In 1 hour	94.82 ±6.43	101.35 ±3.81	101.94 ±3.96	96.74 ±5.29	100.00 ±5.11	99.13 ±5.13	100.36 ±3.16	100.56 ±2.64	99.78 ±5.52	101.8 ±6.49	98.91 ±4.36	98.16 ±2.86

Figure 1. The indicators of the state of the activity of the organs.



The change of the biological activity of the organs in case of ingestion of lemon and orange juice relative to the "anchor measurement" in absolute values and in percentage is shown in the Table 4 and Figure 2.

Table 4. The change of the biological activity of the organs in absolute values (Δ, points) and in percentage (Δ, %) relative to the indicators of the biological activity of the organs in "anchor measurement".

Meridian		Vb	F	P	G	E	Rp	C	Jg	V	R	Mc	Tr
Immediately after	Δ, points	-3.71	-2.64	-0.09	0.87	-1.18	-2.87	1.68	-1.04	0.80	-0.61	-0.62	-0.50
	Δ, %	-3.70	-2.63	-0.08	0.86	-1.18	-2.81	1.65	-1.03	0.79	-0.61	-0.62	-0.49
In 1 hour	Δ, points	5.35	-0.61	-1.29	4.66	-0.10	2.70	1.33	0.26	1.18	-1.78	1.54	3.72
	Δ, %	5.34	-0.60	-1.29	4.59	-0.10	2.65	1.31	0.26	1.17	-1.78	1.53	3.65

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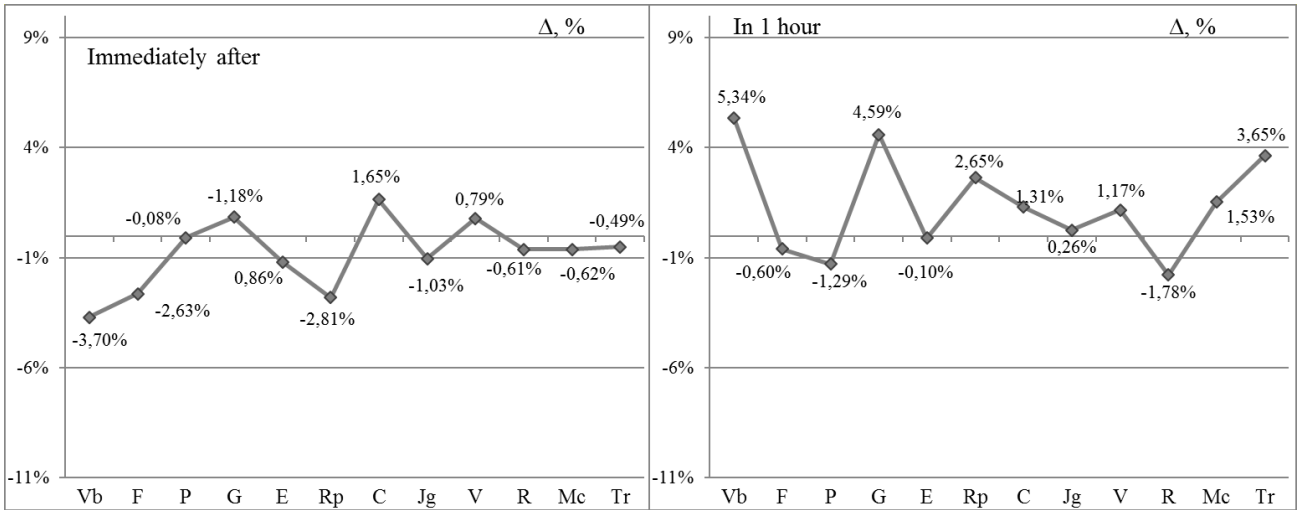
Figure 2. The change of the biological activity of the organs in percentage in case of ingestion of lemon and orange juice relative to the "anchor measurement".



The change of the biological activity of the organs relative to the "anchor measurement" values *immediately after* ingestion of the freshly squeezed lemon and orange juice is shown in the Table 5. The change of the biological activity of the organs relative to the "anchor measurement" values *in 1 hour* after ingestion of the freshly squeezed lemon and orange juice is shown in the Table 6.

Table 5. The change of the biological activity of the organs *immediately after* ingestion of lemon and orange juice, %.

Meridian of the organ	C	G	V	P	Tr	R	Mc	Jg	E	F	Rp	Vb
%	1.7	0.9	0.8	-0.1	-0.5	-0.6	-0.6	-1.0	-1.2	-2.6	-2.8	-3.7

Table 6. The change of the biological activity of the organs *in 1 hour after* ingestion of lemon and orange juice, %.

Meridian of the organ	Vb	G	Tr	Rp	Mc	C	V	Jg	E	F	P	R
%	5.3	4.6	3.7	2.6	1.5	1.3	1.2	0.3	-0.1	-0.6	-1.3	-1.8

The comparison of the results (Figure 2, Tables 5 and 6) show that the total change in the biological activity of all organs *immediately after* ingestion of freshly squeezed lemon and orange juice is equal to **"-9.9%"**, i.e. the total biological activity of the organism decreases a little. Speaking the language of the Oriental Medicine, after ingestion lemon and orange juice initially shows a weakly expressed Yin beginning [21], while slightly increasing the biological activity of C, G, V only. *In 1 hour* after ingestion of freshly squeezed lemon and orange juice, the total change in the biological activity of all organs is equal to **"+16.7%",** i.e. the total biological activity of the body increases. The biological activity of the hollow, Yang organs, ensuring the release of the body of the toxic substances and waste – Vb, G, Tr, V, Jg **(+15.1%**) increases especially. Thus, speaking the language of the Oriental Medicine, lemon and orange juice in case of its assimilation by the body shows the Yang beginning [21].

CONCLUSION

Summarizing the foresaid, the following conclusions can be drawn:

- The body reacts to freshly squeezed lemon and orange juice *immediately after* ingestion by some decrease in the total biological activity by 9.9%. At the same time the biological activity of the heart, colon and bladder increases.
- *In 1 hour after* ingestion of freshly squeezed lemon and orange juice the biological activity of almost all organs and body systems increases (by 16.7% total). The maximal biological activity is shown by: the cardiovascular system (Mc, Jg, C, Tr) – the activity rise by 6.8%; the liver – the gall

bladder (F, Vb) – by 4.7%; the large intestine – the lungs (G, P) – by 3.3%; the stomach – the pancreas – the spleen (Rp, E) – by 2.6%. The biological activity of the hollow, Yang organs, ensuring the release of the body of the toxic substances and waste - Vb, G, Tr, V, Jg **(+ 15.1%**) increases especially. The kidneys – the bladder system (R, V) slightly reduces its biological activity – by 0.6%.

- Thus, it is possible to recommend the ingestion of freshly squeezed lemon and orange juice for the purposes of alimentary health correction of the people suffering from the functional weakness of the cardiovascular system, the liver – the gall bladder, the large intestine – the lungs, the stomach – the pancreas – the spleen, as well as for the soft removal of the toxic substances and toxins from the body.

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