

# The influence of dietary supplements based on fermented wheat bran on the body composition of wrestlers

Natalia I. Kadochnikova  
*PhD in Biology, Associate Professor,  
 Department of biomedical disciplines,  
 Pedagogical Institute,  
 Vyatka State University  
 Kirov, Russia  
 usr11568@vyatsu.ru  
 0000-0003-3777-4192*

Viktor A. Oborin  
*Doctor of Biology, Associate Professor,  
 Department of biomedical disciplines,  
 Pedagogical Institute,  
 Vyatka State University  
 Kirov, Russia  
 usr07351@vyatsu.ru  
 0000-0002-6941-2201*

Marina A. Morozova  
*PhD in Biology, Head of the Department  
 of biomedical disciplines,  
 Pedagogical Institute,  
 Vyatka State University  
 Kirov, Russia  
 usr11390@vyatsyu.ru  
 0000-0003-3303-3426*

**Abstract.** *The purpose of the research is to study the influence of dietary supplements based on fermented wheat bran (Rekitsen-RD) on the body composition of wrestlers. Materials and methods. 21 male athletes (Greco-Roman wrestling) took part in the research during the training camp. The average age of the athletes was  $14.52 \pm 0.29$  years. All wrestlers were divided into 2 groups: control and experimental. In addition to the basic diet, the experimental group had dietary supplements Rekitsen-RD based on fermented wheat bran ("Yagodnoye Plus", Kirov, Russia; state registration certificate RU.77.99.11.003.E.010901.11.14 of 17.11. 2014), 1 tablespoon 3 times a day before meals during one month. The survey was conducted on the premises of the Vyatka State University (Kirov, Russia) using standard anthropometric techniques and bio-impedance analysis methods of the Scientific and Technical Center "Medass", program ABC01-0362. Results. The use of dietary supplements "Rekitsen-RD" based on fermented wheat bran reduces the fat component of the body, increases the content of intracellular water and bone mineral mass, increases specific metabolism and reduces the risk of metabolic syndrome. Moreover, it promotes an increase of metabolically active in the tissues of the body, improves the physical status and performance of athletes.*

**Keywords** – *dietary supplements, fermented dietary fiber, body composition, athletes*

## I. INTRODUCTION

Nowadays sports achievements are often made due to extreme physical and psycho-emotional stress. To maintain good physical shape, coaches and athletes use different means. One of them is specialized nutrition using targeted dietary supplements (DS). Supplements are products of natural plant, animal and mineral origin that improve athletic form, increase physical strength, endurance, concentration and working capacity. They act gently and produce far fewer negative side effects compared to drugs. A mandatory requirement for dietary supplements is strict control over the content and ratio of the components necessary for the human body [1, 2]. Athlete nutrition is one of the determining factors in the body composition, which in turn affects sports results [3]. The most common method for assessing the component composition of the body at present is bioimpedance analysis [3, 4, 5, 6]. It should be noted that athletes with sports grades, especially masters of sports,

have significant differences in the percentage of active cell mass and the magnitude of the phase angle compared with other athletes. In addition, young masters of sports have a significant decrease in the percentage of adipose tissue. In contrast, girls do not have a difference in the percentage of adipose tissue [3, 5, 7].

*The purpose of the research* was to study the influence of dietary supplements based on fermented wheat bran on the body composition of wrestlers.

## II. MATERIALS AND METHODS

21 male athletes (Greco-Roman wrestling) were examined during the training camp. The average age of the examined was  $14.52 \pm 0.29$  years. All wrestlers were divided into 2 groups: control and experimental. In addition to the basic diet, the experimental group had dietary supplements Rekitsen-RD based on fermented wheat bran ("Yagodnoye Plus", Kirov, Russia; state registration certificate RU.77.99.11.003.E.010901.11.14 of 17.11. 2014), 1 tablespoon 3 times a day before meals during one month.

The survey was conducted on the premises of Vyatka State University (Kirov, Russia) in accordance with Articles 5, 6 and 7 of the "Universal Declaration on Bioethics and Human Rights" with the consent of the students and their parents (or legal representatives). To determine the anthropometric characteristics of the body, we measured body length while standing, body weight, waist circumference, and hip circumference according to generally accepted methods. Based on the data obtained, body mass index (BMI) and the ratio of the waist circumference to hip circumference were calculated. To determine the body composition, we used the bio-impedance analysis technique of the Scientific and Technical Center "Medass", program ABC01-0362. Measuring and current electrodes were superimposed according to the standard tetrapolar scheme. We determined the following parameters: fat mass, lean mass, active cell mass, skeletal muscle mass, total body water, extracellular and intracellular water, mineral body mass, soft tissue mineral mass, bone mineral mass, phase angle, basal metabolic rate. Based on the data obtained, we calculated the following indicators: body fat

mass (%), active cell mass (%), skeletal muscle mass (%), mineral mass in lean body mass (%), soft tissue mineral mass in lean body mass (%), and bone mineral mass in lean body mass (%), body fat mass index, lean body mass index, active cell mass index, musculoskeletal body mass index, specific metabolism. Processing of the research results was carried out using "STATISTICA 10.0", Microsoft Excel for Windows.

**III. RESULTS AND DISCUSSION**

At the beginning of the research, the control and experimental groups did not differ in anthropometric and bio-impedance characteristics of the body composition. At the end of the study, we obtained the following results.

*Anthropometric characteristics* of wrestlers from the control and experimental groups are presented in Table 1. The data obtained show active growth processes and the adequacy of physical activity. The use of Rekitsen-RD dietary supplement leads to a significant decrease in the ratio of the waist circumference to hip circumference, which indicates a decrease in the risk of developing metabolic syndrome in young wrestlers. According to [8, 9, 10] it is due to the introduction of fermented dietary fiber into the diet that normalizes the level of glucose, cholesterol and low- and high-density lipoproteins in blood. Therefore, it prevents various disorders of carbohydrate and fat metabolism, the development of atherosclerosis and obesity.

TABLE 1. ANTHROPOMETRIC CHARACTERISTICS OF WRESTLERS

Parameter	Units	Control group (n=10)	Experimental group (n=11)	Significance
Body length	cm	169.43±2.21	171.43±2.36	p≥0.05
Body weight	kg	61.52±2.64	61.50±3.02	p≥0.05
Waist circumference	cm	73.43±1.56	71.79±1.56	p≥0.05
Hip circumference	cm	90.71±1.44	91.71±1.69	p≥0.05
Waist circumference to hip circumference		0.81±0.01	0.78±0.01	p≤0.05
Body mass index	kg/m <sup>2</sup>	21.54±0.41	21.22±0.49	p≥0.05

*Bioimpedance characteristics* of the body composition are presented in Tables 2 and 3. The data obtained (Table 2) show that the use of Rekitsen-RD dietary supplement significantly reduces the fat component of the body, and there is a tendency to increase the muscle component, specific metabolism, basal metabolic rate and phase angle. All this indicates an increase in metabolic processes, metabolically active body tissues, physical condition and working capacity of an athlete.

TABLE 2. BIOIMPEDANCE CHARACTERISTICS OF BODY COMPOSITION OF WRESTLERS

Parameter	Units	Control group (n=10)	Experimental group (n=11)	Certainty
Phase angle at 50 kHz	degree	6.88±0.14	7.25±0.24	p≥0.05
Fat mass	kg	11.70±0.91	8.09±0.68	p≤0.05
Fat mass	%	17.38±0.91	13.16±0.95	p≤0.05
Body fat index	kg/m <sup>2</sup>	3.83±0.25	2.74±0.22	p≤0.05
Fat free weight	kg	53.50±1.37	53.41±2.73	p≥0.05
Index of lean mass	kg/m <sup>2</sup>	17.75±0.25	17.99±0.50	p≥0.05
Active cell mass	kg	31.31±0.98	31.61±1.79	p≥0.05
Active cell mass	%	58.25±0.44	58.95±0.83	p≥0.05

Active cell mass index	kg/m <sup>2</sup>	10.37±0.20	10.63±0.37	p≥0.05
Skeletal muscle mass	kg	30.88±0.61	31.41±1.43	p≥0.05
Skeletal-muscle mass	%	57.99±0.42	59.06±0.43	p≥0.05
Skeletal muscle mass index	kg/m <sup>2</sup>	10.26±0.12	10.61±0.25	p≥0.05
Basal metabolic rate	kcal	1604.80±31.03	1614.07±56.46	p≥0.05
The specific exchange	kcal/m <sup>2</sup>	899.93±6.74	932.43±11.78	p≤0.05

The data in table 3 indicate that the use of “Rekitsen-RD” dietary supplement significantly increases the content of intracellular water and bone mineral mass in the body of athletes.

TABLE 3. WATER AND MINERAL BALANCE OF WRESTLERS

Parameter	Units	Control group (n=10)	Experimental group (n=11)	Certainty
Total water	kg	39.14±1.00	41.27±1.60	p≥0.05
Extracellular water	kg	16.23±0.34	17.07±0.59	p≥0.05
Intracellular water	kg	22.91±0.67	24.34±1.05	p≤0.05
Mineral weight	kg	2.99±0.06	3.13±0.11	p≥0.05
Mineral mass to fat-free body mass	%	5.61±0.04	5.58±0.04	p≥0.05
Mineral mass of soft tissues	kg	0.53±0.01	0.55±0.02	p≥0.05
Mineral mass of soft tissues to fat-free body mass	%	0.98±0.001	0.98±0.001	p≥0.05
Bone mineral mass	kg	2.46±0.05	2.58±0.08	p≤0.05
Bone mineral mass to fat-free body mass	%	4.63±0.04	4.59±0.04	p≥0.05

We believe that one of the factors of such effects is the activity of the Rekitsen-RD components. It contains insoluble and soluble dietary fiber, the products of their fermentation - short chain fatty acids, 18 different amino acids, 11 vitamins, macrocells and microelements. This is consistent with literature data that the components of the studied dietary supplement normalize the function of the gastrointestinal tract and its microflora, the detoxifying function of the liver, and also have immunotropic, anti-inflammatory, anti-allergic effects. V.F. Kuznetsova et al. prove that fermented dietary fiber has a more pronounced prophylactic and therapeutic effect than basic dietary fiber, since it does not contain phytic acid. Enzymatic dietary fiber does not remove useful substances from the intestine and is characterized by a pronounced adsorption ability with respect to toxic agents of microbial and non-microbial origin. Moreover, “Rekitsen-RD” saturates the body with vitamins, macroelements and microelements, normalizes the production of its own B vitamins and folic acid, also enhances the body's antioxidant potential, barrier function, restores the activity of the humoral link of the immune system, and normalizes blood formation and metabolism [8, 9, 10, 11, 12].

**IV. CONCLUSION**

In general, the use of Rekitsen-RD fermented wheat bran dietary supplements, by wrestlers reduces the fat component of the body, increases the content of intracellular water and bone mineral mass, enhances specific metabolism and reduces the risk of metabolic syndrome. Moreover, it promotes an increase in the number of metabolically active tissues of the body, increase the physical condition and performance of the athlete.

**REFERENCES**

- [1] S.N. Portugalov [et al.] «Dietary supplements and specialized nutrition in sports». Moscow: All-Russ. scientific research Institute of Physics culture, 2002.
- [2] G.A. Makarova «Pharmacological support in the system of training athletes». Moscow: Soviet Sport, 2003.
- [3] T.F. Abramova, T.M. Nikitina, N.I. Kochetkova «The labile components of body weight are the criteria for general physical fitness and control of current and long-term adaptation to training loads». Methodical recommendations Moscow: LLC Skyprint, 2013.
- [4] E.G. Martirosov, D.V. Nikolaev, S.G. Rudnev «Technologies and methods for determining the composition of the human body» Moscow: Nauka, 2006.
- [5] D.V. Nikolaev, A.V. Smirnov, I.G. Bobrinskaya, S.G. Rudnev «Bioimpedance analysis of the composition of the human body» Moscow: Nauka, 2009.
- [6] L.V. Kapilevich, K.V. Davletyarova, E.V. Koshelskaya, Yu.P. Bredikhina, V.I. Andreev «Physiological methods of control in sport» Tomsk: Tomsk Polytechnic University, 2009.
- [7] S.G. Rudnev, N.P. Soboleva, S.A. Sterlikov D.V. Nikolaev, O.A. Starunova, S.P. Chernykh, T.A. Eryukova, V.A. Kolesnikov, O.A. Melnichenko, E.G. Ponomareva «Bioimpedance study of the body composition of the population of Russia» Moscow: RIO TSNIIOIZ, 2014.
- [8] V.F. Kuznetsov, L.M. Kulemin, T.S. Ulanova, M.A. Zemlyanova, S.V. Kuznetsov «Clinical and laboratory examination of the use of fermented dietary fiber for intoxication caused by metals and aromatic carbohydrates» Omsk Scientific Herald, 2010, vol. 1 (94), pp. 67-69.
- [9] V.F. Kuznetsov, P.V. Kosareva, S.V. Kuznetsov, Yu.N. Maslov, N.L. Rogue, T.P. Obernebesova «Functional nutrition, including fermented dietary fiber (dietary supplement "Rekitsen-RD"), and innate immunity» Materials of the 2011 scientific session dedicated to the 95th anniversary of higher medical education in the Urals and the 80th anniversary of Perm State Medical Academy named after Academician E.A. Wagner. Perm, 2011, pp. 106-108
- [10] V.F. Kuznetsov, P.V. Kosareva, S.V. Kuznetsov, L.M. Kulemin «Functional nutrition and adaptive capabilities of the body» Allergology and Immunology, 2011, vol.12 (1) , pp.113-114
- [11] T. V. Kopytova «Study of the sorption capacity of red blood cells to assess the nature of endogenous intoxication with dermatoses» Clinical Laboratory Diagnostics, 2006, vol. 1, pp. 18-19.  
S.V. Kuznetsov, V.F. Kuznetsov, L.M. Kulemin «Functional nutrition and modulation of the parameters of innate immunity» Allergology and Immunology, 2011, vol. 12 (1). pp. 114.