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## Dietary supplements and exercise capacity in professional rugby players

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### Abstract

*Introduction:* We started from the idea that the association of dietary supplements recommended by specialists and approved by the World Anti-Doping Agency with natural honey-based products, is beneficial for improving body composition and effort capacity in elite rugby players. The main purpose of this study was to determine the type of carbohydrates with the most beneficial effects for recovery and performance.

*Materials and methods:* The study lasted 30 days and included 30 rugby players from SCM Timisoara Saracens Rugby team. They were randomly divided into 2 groups: the study group who consumed dietary supplements based on apiculture and herbal products, along with classical nutritional supplements and the control group that only used classical supplements. With the help of the InBody 720 Body Composition Analyzer, we evaluated the body composition parameters, and the player's ability to repeatedly perform high-intensity aerobic work was established with the intermittent Recovery Level 2 YO-YO test.

*Results:* The results show a significant increase in the average running distance in the fitness test for the study group ( $p = 0.021$ ) and also for the control group ( $p = 0.008$ ), with a considerable difference between the groups in terms of running distance (increase by 300 meters versus 208 meters in the control group) but without a significant difference between groups at the end of the study ( $p = 0.789$ ). Improvements in body composition parameters were found in both groups, but significant differences between groups occurred only in terms of extracellular fluids/total body fluids ratio ( $p = 0.047$ ) and extracellular water/ total water ratio ( $p = 0.042$ ). The study group showed a significant decrease in total body fat ( $p = 0.054$ ) and visceral fat area ( $p = 0.002$ ) and an increase in extracellular water ( $p = 0.013$ ). The control group experienced a significant decrease in body fat and body fat percentage ( $p = 0.013$  and  $p = 0.017$  respectively), and increase in terms of skeletal muscle mass ( $p = 0.03$ ), intracellular water ( $p = 0.03$ ) and total water = 0.032).

*Conclusion:* The results of this study highlight the importance of the type and quality of nutritional supplements in professional athletes training.

**Key words:** food supplements, rugby, exercise capacity, body composition.

### Rezumat

*Introducere:* Am pornit de la premisa că asocierea suplimentelor recomandate de specialiști și aprobate de World Anti-Doping Agency cu produse naturale pe bază de miere, este benefică în vederea ameliorării compoziției corporale și crește

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rezistenței la efort. *Scopul* principal al acestui studiu a fost acela de determinare a tipului (de carbohidrați) cu cele mai benefice efecte pentru recuperare și performanță.

*Material și metodă:* Studiul a durat 30 zile și a inclus 30 de jucători de rugby de la clubul SCM Timișoara Saracens. Aceștia au fost împărțiți în mod randomizat în 2 grupuri: grupul de studiu care a consumat suplimente alimentare pe bază de produse apicole și plante, alături de suplimentele nutritive considerate clasice și grupul de control care a folosit doar suplimentarea clasică. Cu ajutorul bioimpedanțometrului InBody 720, au fost evaluați parametrii compoziției corporale, iar cu ajutorul testului Intermittent Recovery Test Level 2 s-a stabilit rezistența maximă aerobă.

*Rezultate:* Rezultatele arată o creștere semnificativă a distanței medii parcurse în cadrul testului de fitness, atât în cazul grupului de studiu ( $p=0.021$ ) cât și în cazul grupului control ( $p=0.008$ ), cu o diferență considerabilă între grupuri din punct de vedere al distanței parcurse (creștere cu 300 metri față de 208 metri la grupul control), dar fără o diferență semnificativă între grupuri la finalul studiului ( $p=0.789$ ).

La ambele grupuri s-au constatat îmbunătățiri ale parametrilor compoziției corporale, însă diferențe semnificative între grupuri au apărut doar din punct de vedere al rapoartelor dintre fluidele extracelulare și fluidele corporale totale ( $p=0.047$ ) și apa extracelulară și apa totală ( $p=0.042$ ). Grupul de studiu a prezentat diminuări semnificative ale grăsimii corporale totale ( $p=0.054$ ) și a ariei grăsimii viscerale ( $p=0.002$ ) și o creștere a cantității de apă extracelulară ( $p=0.013$ ). Grupul control a cunoscut scăderi semnificative ale grăsimii corporale și a procentului de grăsime corporală ( $p=0.013$  respectiv  $p=0.017$ ), creșterea masei musculare scheletale ( $p=0.03$ ), a apei intracelulare ( $p=0.03$ ) și a apei totale ( $p=0.032$ ).

*Concluzii:* Rezultatele studiului subliniază importanța tipului și a calității suplimentelor nutriționale în pregătirea sportivilor de performanță.

**Cuvinte cheie:** *suplimente alimentare, rugby, capacitate de efort, compoziție corporală*

## Introduction

Rugby is a contact sport by specificity and is one of the most difficult sports games due to its playing style, aggressive physical contact, hard impact and physical demands [1]. It is one of the most demanding sport games. The physical effort is intense and depends on the playing position.

Strength, endurance and struggling are elements that stand out during a match, doubling teamwork spirit, courage and fortitude that manifest in the behavior of each player in the field [2].

A good health state, a balanced overall physical development, and last but not least a great effort capacity are required in order to be a good rugby player and to cope with a demanding physical training [2].

Performance implies situations with a high level of active involvement both in the emotionally-affective plan and especially in the physical plan.

Pushing the limits is a condition for elite sports [1]. In rugby, overloading is evident, and a recovery which brings together a range of natural or artificial means, aimed to restore performance after training or after a competition is a very important training stage.

There are 2 types of recovery: [3], [4]

1. Spontaneous recovery (natural)
2. Directed recovery

**Spontaneous recovery** refers to the rebalancing of the body which occurs without the influence of an external factor [3]. There is a certain order regarding the restoration of organs and system [3]. During the training, large amounts of energy are used and the energetic deposits must be restored before the next training takes place [3].

In the absence of nutritional supplements or in a low carbohydrate diet, energy recovery is achieved within a few hours. Recovery diet should suit the type of effort (hyperproteic, hyperglucidic) and should not miss dairy product, fruits and fruit juice [3].

**Directed recovery** is designed to stimulate the natural recovery of the organism, and is a necessity in contemporary sports. This kind of recovery can prevent the appearance of overburdening manifestations which are due to an intensive training program.

To optimize fitness, endurance and to improve the body composition, nutritional supplements must be properly understood, chosen, and used.

## Ingredients of natural nutritional supplements based on apiculture products and herbs and the importance of their ingestion for the recovery after effort

Honey was used by the sportsmen as an energetic source starting in the most ancient times, at the Olympic Games in Ancient Greece. The physiological actions of honey, as a source of carbohydrates, for the sportsmen performance have been highlighted in several studies [5],[6].

Honey significantly increases heart rate, blood glucose and muscle exercise capacity during the training [6], [7].

There have been studies evaluating the effect of carbohydrates with low glycemic index and high glycemic index of honey on sportsmen during the training and it was found that the fructose is absorbed more slowly than glucose and this is highly recommended for sportsmen [5],[6].

The most common dose of carbohydrates for any sportsmen is that of about 30-60 grams per hour [8],[9]. Honey contains both vitamins and minerals that sustain sport activities. Vitamin C has a role in immunity, defending the body and maintaining bone structure and muscles. Group B vitamins are responsible for metabolism regulation and also for digestion and energy. Among the numerous minerals contained by honey we can mention potassium responsible for enhancing cardiac movements and phosphorus with structural, functional and energetic role [10].

Many studies that targeted honey based supplements have demonstrated that ingesting honey before and during the training can improve performance and effort capacity, mainly due to the carbohydrates contained. Honey based supplements can significantly improve immune function and can promote optimal hormonal anabolic environment. Carbohydrate ingestion before, during and after physical effort helps optimize physical performance and body recovery [5]. During the last decade the scientist have evaluated the effects of ingesting different types of gels and honey before the effort and during the training [5], [8].

The main purpose of this study has been that of determining the optimal type (of carbohydrate) and dose in order to obtain some benefic effects for recovery and performance.

Honey and the response to its glycemic index have been almost identical to those of a carbohydrates gel [8], [11].

### Material and Methods

The study lasted 30 days and included 30 rugby players from SCM Timisoara Saracens Rugby team. They were randomly divided into 2 groups: the study group that consumed dietary supplements based on apiculture and herbal products Apifitotonic, along with classical nutritional supplements and the control group that only used classical supplements.

With the help of the InBody 720 Body Composition Analyzer, we evaluated the body composition parameters, and the player's ability to repeatedly perform high-intensity aerobic work was established with the intermittent Recovery Level 2 YO-YO test.

InBody makes a comprehensive varied evaluation: nutritional evaluation, weight management, obesity diagnosis, body balance, body strength, health diagnosis, lean balance (right arm, left arm, trunk, right leg, left leg). It also provides data about visceral fat area, body-fat mass, intra and extracellular water, edema, segmental edema, skeletal muscle mass.

Results sheet of 720 InBody summarizes all the results obtained by evaluation and helps the patient understand more easily some aspects of their health condition.

With the help of Yo Yo intermittent recovery test we tested the athlete's effort capacity.

The testing usually lasted between 5 and 15 minutes.

We used 3 cones for this procedure– A, B and C. Participants began to run the test at the audio signal from cone B to cone C; this must be reached before the following beep signal) and immediately return to cone B before the next signal. Once cone B is reached, players must walk from cone B towards cone A, and then back to cone B before they start the next shuttle. In this test the participants are only allowed two consecutive fail attempts before they are withdrawn from the test [12],[13] (Figure 1).

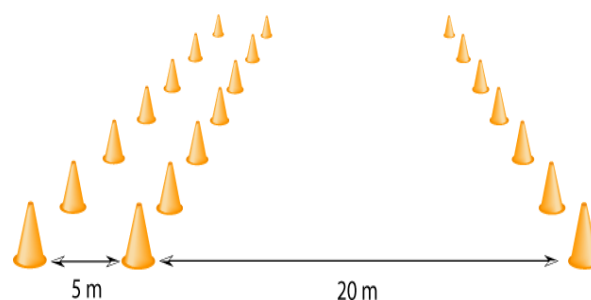


Figure 1. Yo Yo Test

The two groups consumed different products, those in the study group consumed 4 TA 6 teaspoons before the training and 2 TA 11 teaspoons after the training (Table I).

The two tonics are composed of bee products and herbs.

All the components of the classical supplements have been prepared of their purest state some of them being even raw (Table II).

The control group consumed “Optimum Nutrition” products (protein, BCAA, glutamine, creatine, artrosamin, minerals, vitamins, fish oil, l-carnitine, in order to have a better recovery, increased exercises capacity and improving body composition.

Table I. Herbal supplements dose adjustment according to weight

The sportsmen's weight	The quantity needed (teaspoonfuls)
A. under 100 kg	4 TA6 / 2TA12
B. over 100 kg	5TA6/ 3TA12

### Properties of the nutritional supplements based on honey and herbs

Royal jelly is extremely powerful having good nutritional properties but also strong antiviral and antibacterial effect. It also presents bio-stimulating action, improves physical performance and resistance to hypoxia, improves memory and has a neuro-vegetative activation action [10].

Raw pollen is often called “wonder nutriment”. The high biological value of the bee pollen is due to the presence of all essential amino acids and the balanced ratio of the others. To all these is added the extremely rich enzymatic equipment, made up out of about 100 enzymes (oxidoreductase, hydrolase, transferase, isomerase, lipase). The complex of vitamins and flavonoid and carotenoid

pigments contained also grant a high biological activity. The pollen consumption stimulates peristalsis, prevents tiredness and improves intellectual capacity [10].

Honey is a bee product exclusively from the nectar gathered from the flowers or from the sweet juice of other green herbs which the bees collect and improve with their own substances and then process in a specific manner, with the product thus finally stored in the cells of the honeycomb of the hive, to constitute their energetic food.

White buckthorn is a general tonifier having a strong antiscorbutic, astringent, anthelmintic, and bactericide action.

Armurarius- can be used prophylactically to protect liver cells.

**Table II.** Apifitotonic composition

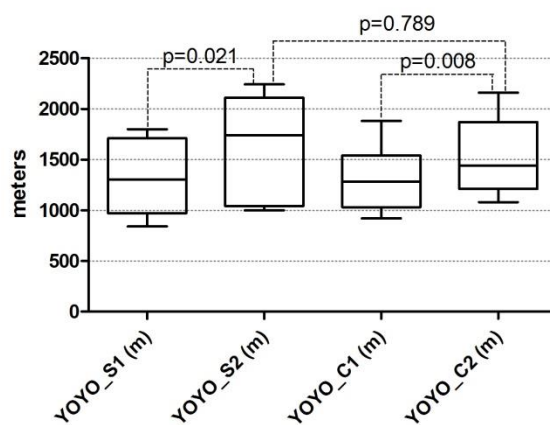
Ingredients
1. Mixed active substances
2. Honey
3. Raw bee pollen
4. White Sea buckthorn (Hippophaerhamnoides)
5. Raw propolis
6. Armurarius (Silybummarianum)
7. Royal jelly

## Results

The results showed a significant increase in the average running distance in the fitness test for the study group ( $p = 0.021$ ) and also for the control group ( $p = 0.008$ ), with a considerable difference between the groups in terms of running distance (increase by 300 meters versus 208 meters in the control group) but without a statistically significant difference between groups at the end of the study ( $p = 0.789$ ) (Figure 2).

Improvements in body composition parameters were found in both groups, but significant differences between groups occurred only in terms of extracellular fluids/total body fluids ratio ( $p = 0.047$ ) and extracellular water/ total water ratio ( $p = 0.042$ ) (Table III).

The study group showed significant decreases in total body fat ( $p = 0.054$ ) and visceral fat area ( $p = 0.002$ ) and an increase in extracellular water ( $p = 0.013$ ). The control group experienced significant decreases in body fat and body fat percentage ( $p = 0.013$  and  $p = 0.017$  respectively), and increase in terms of skeletal muscle mass ( $p = 0.03$ ), intracellular water ( $p = 0.03$ ) and total water ( $p = 0.032$ ). The athletes that consumed TA6 (Apifitotonic) and TA12 (Apifitotonic) supplements, showed at the end of the study a better performance in the "YO-YO" fitness test, better recovery, and sometimes also improved digestion.



**Figure 2.** Results of the intermittent Recovery test Yo-Yo

Table III. Body composition

	Study group			Control Group			p value*
	T1	T2	p value	T1	T2	p value	
<b>Weight (kg)</b>	108.2	108.2	0.944	102.2	101.5	0.269	0.378
<b>Fat (%)</b>	17.13	15.61	0.061	18.46	16.72	<b>0.017</b>	0.726
<b>BFM (kg)</b>	19.15	17.42	<b>0.054</b>	20.21	18.32	<b>0.013</b>	0.847
<b>VFA (cm<sup>2</sup>)</b>	103.8	94.76	<b>0.002</b>	104.3	98.93	0.122	0.823
<b>SMM (kg)</b>	51.83	52.73	0.079	47.62	48.5	<b>0.003</b>	0.131
<b>TBW (L)</b>	65.24	66.5	<b>0.036</b>	60.03	60.89	<b>0.032</b>	0.103
<b>ICW (L)</b>	41.27	41.98	0.069	38.03	38.71	<b>0.003</b>	0.128
<b>ECW (L)</b>	23.98	24.52	<b>0.013</b>	21.99	22.18	0.379	0.073
<b>ECF/TBF</b>	0.321	0.323	0.217	0.32	0.318	0.18	<b>0.047</b>
<b>ECW/TBW</b>	0.367	0.369	0.145	0.366	0.364	0.198	<b>0.042</b>

\* P value between groups, at the end of the study

T1: baseline evaluation

T2: evaluation after 1 month of training

BFM: Body Fat Mass;

Fat: Body Fat Percent;

VFA: visceral fat area;

ICW: Intracellular Water;

ECW: Extracellular Water;

SMM: Skeletal Muscle Mass;

ECF/ TBF: Extracellular Fluid/Total Body Fluid (edema score);

ECW/ TBW: Extracellular Water/Total Body Water (edema score).

### Discussions and conclusions

The difference between the trade mark nutritional supplements and the natural ones is in the list of ingredients as well in the way of being processed and promoted.

It is possible to choose vegetable sources with bioactive ingredients which have the same benefits as those in synthetic supplements, with the proviso that they do not have artificial additives [14], [15], [16].

Moreover, honey carbohydrates need a maximum of 10 minutes to enter the muscle, similarly to the sugar based gels and energy drinks.

Sometimes, the ingestion of carbohydrates and proteins in the first 2 hours after the training (the commune doses are 1,5 g/ kg of body weight of carbohydrates and 0.5 g of protein per kg of body weight) increases glycogen resistances and protein synthesis [7], [9].

There are many studies that demonstrate that natural ingredients are much easier assimilated and recognized by the normal body, while the artificial

ingredients are absorbed in a smaller proportion [17].

The results obtained by the sportsmen involved in the study showed that they had more energy, the recovery period after the training was reduced and they also had a better digestion. The improvement of the sports performances and the amelioration of body composition is a common desideration, both of the multidisciplinary team: trainer, physiotherapist, physician, physical preparatory and that of the player.

Intensive, complex and with an high- beveled working volume trainings, determine neuromuscular, neurophysical, metabolic and endocrine tiredness and need optimal recovery methods and high quality nutritional supplements which are adequate to the type of effort and are well tolerated by the sportsmen.

The combination of the two types of supplements (synthetic and natural) led to the increase of aerobic effort capacity, objectified by the "YOYO"

test and also by winning the National Rugby

Championship, 2016-2017 season.

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