



A REVIEW OF STUDIES ASSESSING THE INFLUENCE OF BEETROOT JUICE ON HUMAN HEALTH AND PHYSICAL ACTIVITY

PRZEGLĄD BADAŃ OCENIAJĄCYCH WPŁYW SOKU Z BURAKA NA ZDROWIE I AKTYWNOŚĆ FIZYCZNĄ

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ABSTRACT

Nitrates are compounds whose highest levels are present in ham. So far, conducted surveys have shown that nitrate supplementation in the form of beetroot juice is associated with a lowering of blood pressure and a slight influence on the physical performance of athletes. The aim of the study is to evaluate the effect of beetroot juice consumption on blood pressure levels. The literature review shows that consumption of beetroot juice does not affect blood pressure levels.

KEYWORDS: nitrates, beetroot juice.

STRESZCZENIE

Związki azotowe są komponentem, który w największych ilościach występuje w szynce. Z dotychczas przeprowadzonych badań wynika, że suplementacja azotanami w postaci soku z buraka wiąże się z obniżeniem ciśnienia krwi i niewielkim wpływem na wydolność fizyczną sportowców. Celem pracy jest ocena wpływu spożycia soku z buraków na poziom ciśnienia tętniczego krwi. Z dokonanego przeglądu piśmiennictwa wynika, że spożycie soku z buraków nie wpływa na poziom ciśnienia tętniczego krwi.

SŁOWA KLUCZOWE: związki azotowe, sok z buraka.

Introduction

Nitrates are compounds which, according to the studies conducted so far, do not affect human health. The compiled research is based mainly on the supplementation of this compound in the form of beetroot juice. The level of nitrates in food are presented in **Table 1** [1].

Table 1. The level of nitrates

Source	The level of nitrates mg/100 g
Apple	0,008
Banana	0,009
Orange	0,02
Broccoli	0,07
Carrot	0,006
Chips	0,07
Ketchup	0,13

Źródło: opracowanie własne
Source: own study

Aim of the study: assessment of the impact of beetroot juice consumption on blood pressure, VO₂ max level and lactate concentration in the blood of athletes. The PubMed database was used to prepare the research review.

The effects of nitrates on blood pressure

The study by Jones T et al. (2019) involved 20 older adults with the average age of 63±6 years. The test group was randomized to consume either beetroot juice or a placebo for 28 days. The test group ingested 70 ml of a drink rich in nitrates or a placebo. The arterial blood pressure SBP (systolic blood pressure) and DBP (diastolic blood pressure) were both observed in the study. There was no difference in blood pressure. In the beet juice group, the baseline SBP pressure was 129 ± 12 mmHg. In the second week, it was 122 ± 14 mmHg, and in the fourth week, it was 124 ± 20 mmHg. The starting value in the placebo group was 124 ± 14 mmHg. In the second week, it was 123 ± 12 mmHg and in the fourth week, 119 ± 11 mmHg [2]. Eighteen people with arterial hypertension participated in the study by Zafeiridis A et al. (2018). The test group was given a placebo or a drink containing 8.1 mmol/500 mg of nitrate. In the performed study, blood pressure values were observed before and 2.5 hours after. It was noted that there was no reduction in blood pressure in the placebo group. In the group taking the drink with nitrates, it was observed that blood pressure from 141.7 ± 2.9mmHg was reduced to 134.9 ± 2.4 mmHg (p < 0.05) [3]. Eighteen

people participated in the study by Jones T et al. (2019). It was observed that beet juice supplementation did not affect the blood strain. The arterial pressure level was monitored for four weeks [4]. In the study by Coles LT et al. (2012) in a group of 30 people, the effect of beetroot juice supplementation and placebo on blood pressure was assessed. The effect of supplementation on blood pressure values was not investigated [5]. Similar conclusions were reached by Bondonno CP et al. (2015) [6]. A study by Velmurugan et al. (2016) involved 67 people who were supplemented with beetroot juice or a placebo for 6 weeks. No effect of supplementation on blood pressure was observed [7].

The influence of nitrates on physical performance

The study by Kramer S et al. (2016) involved 12 people with an average age of 23 ± 5 years. The study group took a supplement (8 mmol of nitrate) or a placebo for 6 weeks. In the study group, peak power and CrossFit efficiency were assessed (Grace protocol). In the study, it was observed that before the supplement was used, the CrossFit performance (Grace protocol) in the placebo group was 281.75 ± 41.84 s, after the supplementation, it was 270.92 ± 129.16 s. CrossFit (Grace protocol). In the group taking a nitrate, it was 295.92 ± 170.98 , and after supplementation, it was 263.67 ± 117.74 s. The peak power before using placebo supplementation was about 900 W, and after supplementation, it was also about 900 W. It was observed that the peak power before the use of placebo supplementation was about 890 W, and after supplementation, it was about 910 W. The difference was statistically significant [8]. The study by Dominguez et al. (2017) involved 15 people with an average age of 21.46 ± 1.72 years. The study group consumed either a drink containing 70 ml of nitrate or a placebo. The Wingate test was performed in the study group. It was observed that the lactate level in the placebo group before the test was $1.7 \text{ mmol} \cdot \text{L}^{-1}$, and after the test, it was $7.4 \text{ mmol} \cdot \text{L}^{-1}$. In the group consuming the nitrate drink before the test, the lactate level was $2.0 \pm 0.53 \text{ mmol} \cdot \text{L}^{-1}$. After the test, the lactate level in the group receiving nitrates was $13.6 \pm 4.12 \text{ mmol} \cdot \text{L}^{-1}$ [9]. In the study by Rasic L et al. (2018) in a group of 10 obese adolescents (8 girls, 2 boys) aged 16 ± 1 years the test group was supplemented with a placebo or beet juice (70 ml/day containing 5 mmol NO_3). VO_2 (also maximal consumption) was measured in the test group. It was observed that in the placebo group, VO_2 ($\text{L} \cdot \text{min}^{-1}$) with increasing exercise time was higher than that in the beet juice group ($p < 0.05$) [10]. The level of VO_2 was also assessed in a study conducted by Shannon OM et al. in a study group of eight people. The VO_2 level did not

differ significantly between the groups ($p > 0.05$) [11]. In the study by Murphy M et al. (2012), 5 men and 6 women aged 18 to 55 years were examined. In the study, a placebo or a roasted beetroot (200 g, 500 mg of nitrates) was administered. It was observed that from 0.0 km to 3.2 km, the running speed between the groups statistically did not differ significantly. The difference from 3.2 to 5.0 km was statistically significant [12]. In the study by Thompson C et al. (2018), in a group of people, beetroot juice, a placebo, or KNO_3 was administered for 4 weeks. The study group performed interval sprint training. The study assessed SBP and DBP pressure. Significantly higher reductions in blood pressure were observed in the beet juice group [13]. In the study by Oggioni C et al. (2018) in a group of 20 people, the test group was given a placebo or beet juice for 7 days. No effects on glucose and insulin levels were observed [14]. In a study conducted by Balsalobre-Fernandez C et al. (2018) in a group of 12 people, the impact of beetroot juice supplementation on VO_2 max was assessed. The test group took beetroot juice or a supplement. In the study group, a running test was performed on treadmills before and after 15 days of supplementation. VO_2 max in the group receiving beet juice before supplementation was $69.1 \pm 5.3 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ and after $70.1 \pm 7.0 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$. VO_2 max in the group receiving beetroot juice before supplementation was $72.3 \pm 6.8 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ and after $74.9 \pm 6.1 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ [15]. In the study conducted by Castro TF et al. (2019), among 13 men, the effect of supplementation with beetroot juice or placebo on VO_2 max was assessed. In the conducted study, the study group was supplemented with supplementation for a period of 3 days. VO_2 maximum in the placebo group was $45.1 \pm 5.8 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, and in the group receiving beet juice, $46.6 \pm 6.4 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ [16].

Summary

1. The results of the studies conducted so far indicate that supplementation with nitrates has no effect on blood pressure and physical performance.
2. Supplementation of beetroot juice has no effect on the level of VO_2 max.
3. Supplementation with beetroot juice has no effect on the blood lactate concentration of athletes.

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