THE EFFECT OF THE COMPOSITION OF LEUZEA AND CRANBERRY MEAL EXTRACTS ON PHYSICAL PERFORMANCE

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Over the last decade, a huge number of herbal supplements have been introduced into the practice of sports medicine in order to increase physical performance. Medicinal plants are a valuable source of a large number of secondary metabolites such as polyphenols, triterpenes, phytohormones. This determines the ability of herbal medicines to compensate for the deficiency of nutrients in the human body.

The use of secondary products of processing provides an opportunity to obtain additional products of high biological value and purposeful spending of natural resources reserves.

Owing to the presence of phytoecdysteroids (ecdystene), *Rhaponticum carthamoides* (Willd.), commonly known as leuzea, has adaptogenic properties and is widely used in sports medicine. Nowadays, leuzea extract is included in numerous dietary supplements to promote muscle growth, increase the body's resistance to stress, eliminate physical weakness and mental weariness.

The peel of cranberry fruit contains a substantial amount of pentacyclic triterpenoid ursolic acid. Many beneficial effects such as antioxidative, anti-hyperlipidemic, hypoglycemic, hepatoprotective and immunomodulatory effects have been reported. In addition, ursolic acid can also stimulate muscle growth, increases brown fat and exercise capacity, so it can be introduced into dietary supplements for sports nutrition.

Based on the literature data on the properties of leuzea and ursolic acid, the researchers of the Laboratory of Pharmacological Research NIOCH SB RAS developed a composition of two plant components - extracts of leuzea and cranberry meal, containing 0.31% ecdysten and 40% ursolic acid, respectively.

The aim of this work is to study the effect of the composition of leuzea and cranberry meal extracts and its individual components on performance in the treadmill test in mice.

MATERIALS AND METHODS

The experiments were performed in male CD-1 mice weighing 20–25 g. Animals were obtained from the animal facility of the Institute of Cytology and Genetics SB RAS, and kept under standard conditions at a constant room temperature (21 °C ± 1.5) and maintained in a 12/12 h light/dark cycle, with free access to food and water. All manipulations with animals were conducted in strict accordance with the laws and regulations of the Russian Federation, the decree of the Ministry of Health of the Russian Federation No. 199n of January 04, 2016, and the provisions of Directive 2010/63/EU of the European Parliament and of the Council of the European Union of September 22, 2010 on the protection of animals used for scientific purposes. After quarantine the animals were randomized by weight and divided into four groups (n=12 per group). The investigated compounds:

1) control group;
2) extract of leuzea at a dose of 70 mg/kg;
3) extract of cranberry meal at a dose of 500 mg/kg;
4) composition of leuzea and cranberry meal extracts at a dose of 70:500 mg/kg.

All substances were dissolved in distilled water (pre-mixed with a few drops of Tween 80) and administered daily, intragastrically through a probe at the rate of 0.2 ml/10 g body weight for 14 days. The control group was received only the solvent.

Dynamics of body weight were assessed in mice daily for 21 days (3 weeks).

TRAINING PROTOCOL

The experiments was performed on an electrical treadmill designed for rodents (FT-200, ChengduTechnologyandMarketCo., Ltd, China).

All mice were subject to seven days of acclimatization (first week) to reduce the amount of stress and ensure familiarization with the treadmill. On day 1 animals were placed on a static treadmill. Starting from day 2, both speed (from 5 to 15 m/min) and duration (1 to 10 minutes) gradually increased over the following 6 days, with no incline.

After a seven-day acclimation, test compounds were administered daily for two weeks (second and third weeks), with all mice receiving a single exercise bout performed per day (10 minutes at a speed of 15-18 m/min on the same treadmill, with no incline). At least 24 hours passed between each run (recovery).

At the end of the experiment, all mice were sacrificed by cervical decapitation, blood was taken to determine the concentration of glucose and lactate in blood serum.

STATISTICAL ANALYSIS

Statistical analysis was conducted in Statistica 8.0 program using Mann-Whitney U test to assess the significance ($p < 0.05$) of differences. The data are presented in the format: mean ± standard error of the mean (SE).

RESULTS

Significant differences in the body weight of the animals in the experimental groups relative to control group were not detected.

Lactate dynamics in blood indicates the training load intensity and the degree of recovery after it. To confirm the increase in physical performance after 14 days of feeding with composition of leuzea and cranberry meal extracts in mice, the concentration of lactate and blood glucose was determined (***Fig. 1,2.***).

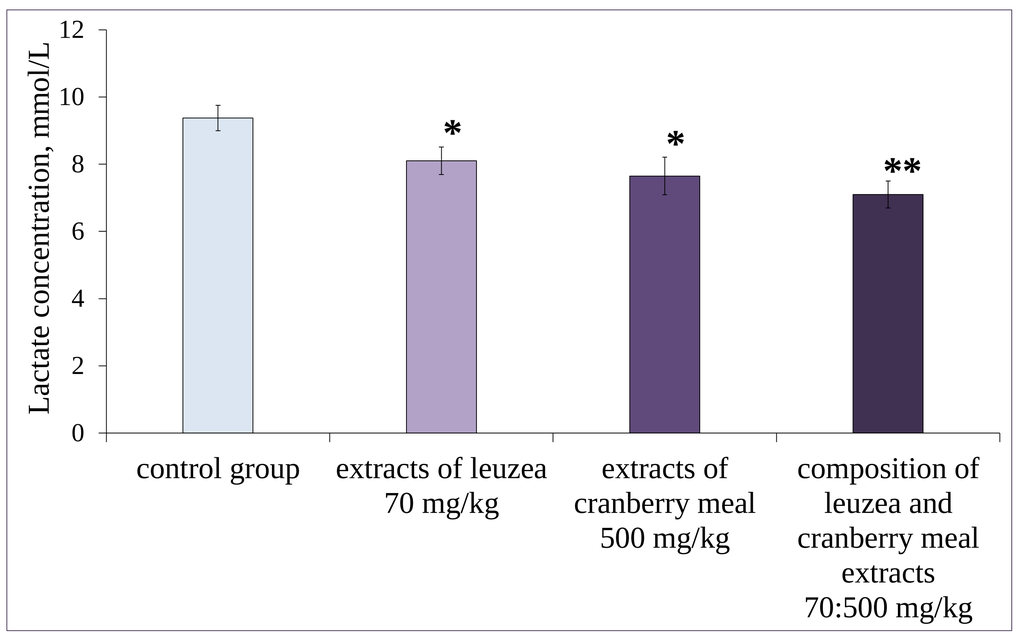

Fig. 1. Blood lactate concentration (mmol/L) in male CD-1 mice at the end of the experiment. * $p < 0.05$ — indicates significant difference compared to the control group.

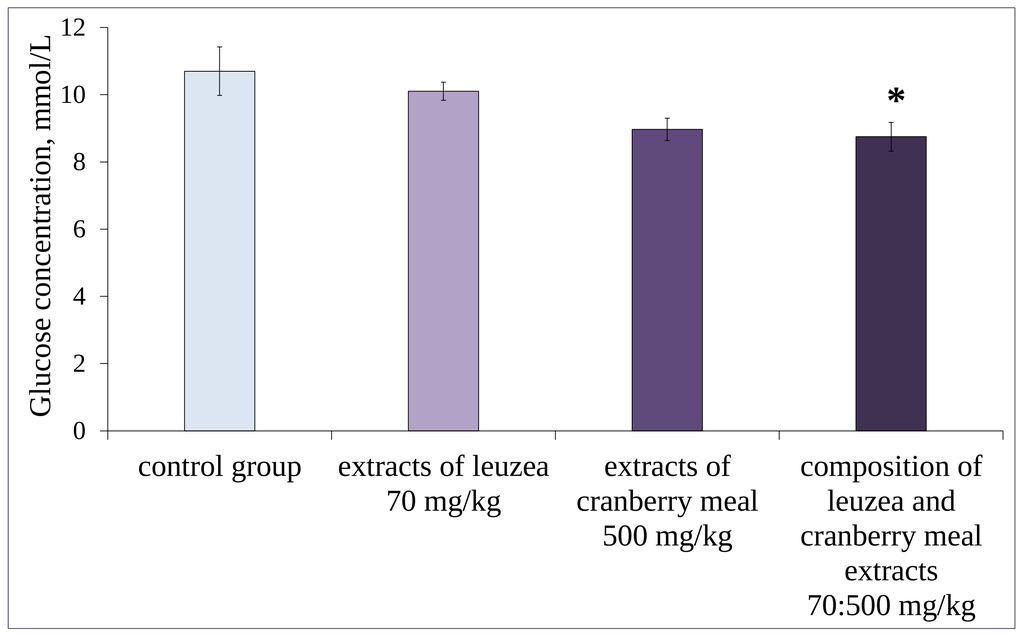

Fig. 2. Blood glucose concentration (mmol/L) in male CD-1 mice at the end of the experiment. * $p < 0.05$ — indicates significant difference compared to the control group.

CONCLUSION

The consumption of composition of leuzea and cranberry meal extracts significantly reduced the concentration of lactate and glucose in the blood of male CD-1 mice during forced treadmill running, which indicates its ability to increase physical performance.

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