

Protective effect of supplementation with *Lycium ruthenicum* Murray extract from exhaustive exercise-induced cardiac injury in rats

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To the Editor: Lycium ruthenicum (L. ruthenicum) Murray contains abundant anthocyanins. The purpose of the present research was to investigate the protective effect of *L. ruthenicum* extract supplementation on the damage from exhaustive exercise in rats which were treated for seven days before the exhaustive exercise. Exhaustive exercise induced an increase of Serum nitrate (NO) and reactive oxygen species (ROS) levels, but supplementation of *L. ruthenicum* extract reduced them significantly ($P < 0.05$). Interleukin (IL)-1 and IL-6 were also significantly reduced by *L. ruthenicum* as compared to the control ($P < 0.05$). Supplementation with *L. ruthenicum* extract also decreased the creatine kinase isoenzyme MB (CK-MB) generation significantly and ameliorated the myocardial histopathology.

L. ruthenicum belongs to the genus *Lycium* of the family Solanaceae and is a salinized desert plant distributed mainly in Qinghai and Xinjiang Provinces of China. Recently, studies have shown that *L. ruthenicum* exhibits a wide range of pharmacologic properties, such as anti-oxidation, anti-fatigue, and hypoglycemic activity.^[1,2] Anthocyanins and their aglycones from *L. ruthenicum* have strong antioxidant activity.^[3] Anthocyanins are flavonols, which occur ubiquitously in the plant kingdom and confer bright red or blue coloration on berries and other fruits and vegetables. Anthocyanin concentration in the *L. ruthenicum* extract was determined by using the Nakata method^[4] and the concentration in the *L. ruthenicum* extract was 24.1 ± 7.7 mg/g. However, we know anthocyanin has antioxidant properties and ROS induced by extreme temperatures can be protected by anthocyanins in several plants. Anthocyanin has an antioxidant role in plants against ROS and extreme temperatures.

Exercise-induced oxidative stress has been reported and antioxidant supplementation can prevent muscle damage, protective effects on the endocrine-metabolic and immune profile.^[5] Therefore, *L. ruthenicum* extract should have a

protective effect against oxidative stress and we investigated that the possible protective effect of *L. ruthenicum* extract and anthocyanin supplementation on the oxidative stress generated by exhaustive exercise in SD rats. In this study, 30 Sprague-Dawley (SD) rats, males and aged 6 weeks, were randomly assigned to the control, anthocyanin (5 mg/rat as the positive control), and other three groups were given *L. ruthenicum* extract in distilled water orally (as vehicle, 10 and 30 mg/rat), for 7 days before the exhaustive exercise stress. Rats of the exhaustive exercise group were subjected to graded treadmill running started at 10% grade, 15 m/min for 10 min followed by gradual increases of treadmill speed and time as 25 m/min for 20 min, 28 m/min for 20 min, 31 m/min for 20 min, 34 m/min for 20 min, 37 m/min for 20 min until exhaustion. The heart was dissected and washed with saline for fixation with formalin.

Exhaustive exercise causes oxidative stress and is defined as the inability of rats to run on the treadmill despite a mild electrical shocking.^[6] Add some information on dietary antioxidants for exercise-induced oxidative stress.^[7] Regular exercise is recommended for a healthy life, but exhaustive exercise generates the excessive oxidative stress that may exceed the beneficial effect from the regular exercise.^[8] In the present study, an increasing CK-MB activity from the cardiac muscle consisted of myocardial damage was seen in tissue vacuoles and cell death from heart tissue. Exhaustive exercise also induced an increase of serum NO, ROS, IL-1, IL-6, and CK-MB levels, but supplementation of *L. ruthenicum* extract reduced them significantly. Supplementation with *L. ruthenicum* extract also significantly ameliorated the myocardial histopathology. Under the microscope, the photographs showed the heart section with a 400 \times magnification. The severity of damage in the exhaustive exercise group was exhibited by vacuoles and dead cells. However, changes in histopathology were significantly reduced by the treatment with anthocyanin and *L. ruthenicum* extract [Figure 1].

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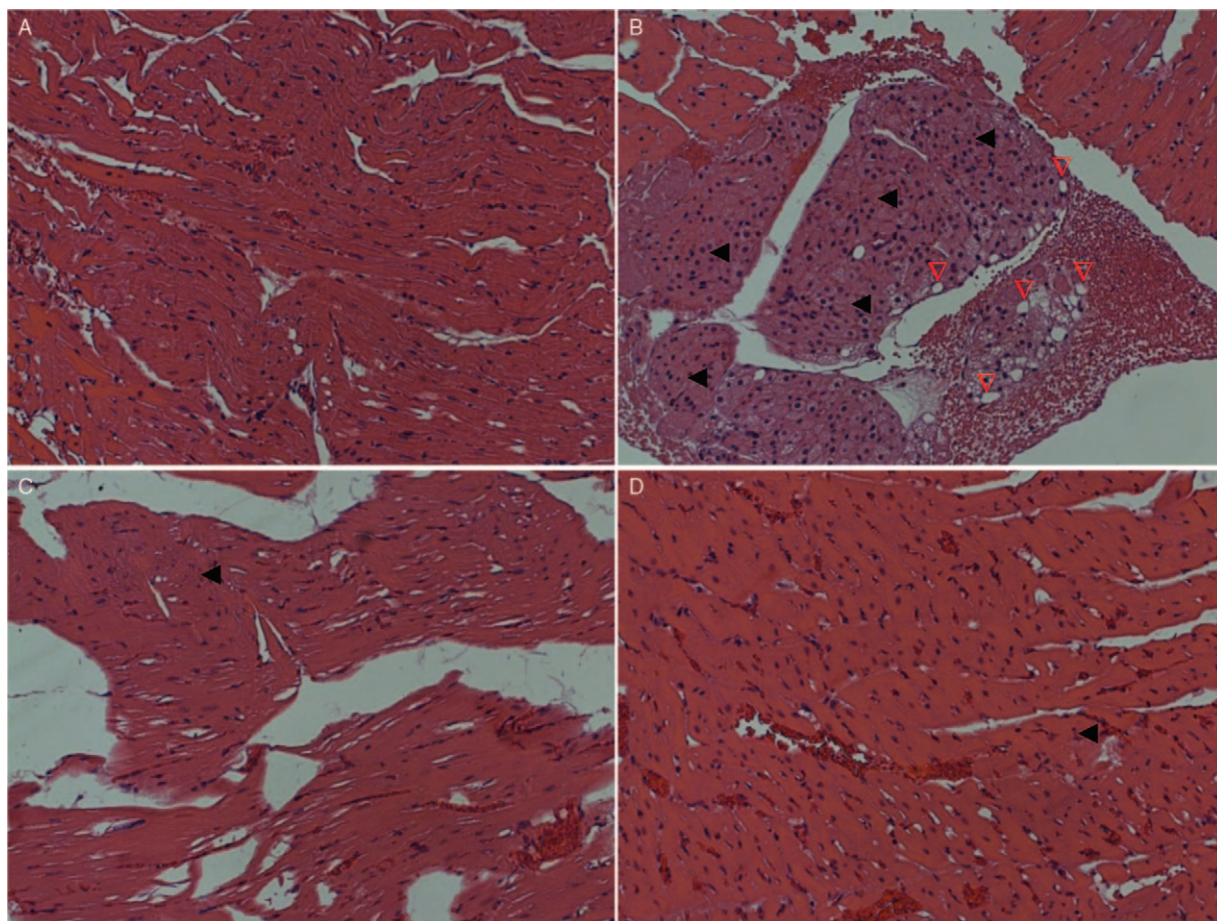


Figure 1: Protective effect of *Lycium ruthenicum* extract on the exhaustive exercise-induced myocardial injury. Histopathology (hematoxylin and eosin staining) of myocardial slices from rats from (A) no treatment control group; (B) the exhaustion group; (C) the Anthocyanin group, exhaustive exercise treatment supplemented with 5 mg Anthocyanin/rat; and (D) the *L. ruthenicum* extract group, exhaustive exercise treatment supplemented with 30 mg *L. ruthenicum*/rat. Photographs show the myocardial section with 400 \times magnification. Tissue vacuoles (hollow triangle arrow heads ∇) and cell death (nuclei stained, black arrow heads \blacktriangleleft) were more severe in exhaustion than those in control or *L. ruthenicum* groups.

In conclusion, 1-week oral supplementation of *L. ruthenicum* extracts present positive effects on the oxidative stress generated by exhaustive exercise in SD rats, possibly via promotion of antioxidant capacity. The mechanism of protection of *L. ruthenicum* extract supplementation was not investigated in this study and waits for further study in the future.

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Conflicts of interest

None.

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