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Optimization of Ultrasonic Extraction of Maca Polysaccharides and Evaluation of its Anti-fatigue Ability

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Objective The aim of this study was to establish the optimal extraction conditions of polysaccharides of Maca (Lepidium meyenii Walp) and explore its anti-fatigue ability of exhaustive exercise rats.
Methods Response surface methodology, based on Box-Behnken design, was used to optimize of ultrasonic extraction conditions of maca polysaccharides.Three independent variables (ratio of water to raw material, ultrasonic time, ultrasonic temperature) were taken into consideration. Subsequently, 80 male SD rats were randomly divided into 4 groups, negative control group, low dose group (ML, 130mg/Kg.bw/d), middle dose group (MM, 270mg/Kg.bw/d), high dose group (MH, 800mg/Kg.bw/d). After continuous oral gavage for 30 days, 10 rats were randomly selected from each group to measure the liver glycogen, and the remaining 40 were used to determine the exhaustion swimming time, biochemical indicators of exercise capacity in rats.
Results 1. The best extracting method the ratio of material to liquid 1:22g/ml, ultrasonic time was 28min, ultrasonic temperature was 59 degrees centigrade, the extraction rate was 17.6754%. 2. Both middle and high doses of maca polysaccharides could significantly improve the swimming time of exhausted rats. 3. The maca polysaccharides group (ML, MM, MH) could effectively inhibit the growth of lactic acid in rats and accelerated the elimination of lactic acid. The effect of high dose MH group was the most obvious($P<0.05$). 4. The content of BUN in swimming rats was reduced by different doses of maca polysaccharides. High dose of maca polysaccharides on reducing the content of MDA was the most significant($P<0.05$). 6. Different doses of maca polysaccharides increased liver glycogen storage in rats, the high dose of maca polysaccharides to improve the effect of liver glycogen content of rats was the most significantly($P<0.05$).
Conclusions 1. The optimum extraction conditions of maca polysaccharides was as follows: the ratio of material to liquid was 1:22g/ml, the ultrasonic time was 30min, the ultrasonic temperature was 60, and the extraction rate was 17.6754%. 2. Maca polysaccharides could improve the antioxidant capacity of the body, improve energy reserves; prolonged exhaustive swimming time.