



## Application perspective of tartary buckwheat as sports supplements

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### ABSTRACT

Tartary Buckwheat's health function has been one of the hot topics studies in the academic circles. at home and abroad. This paper aims firstly to elaborate the chemical composition of buckwheat and biological effects, especially its good oxidation resistance, and secondly to investigate the potential applications of Tartary Buckwheat as sports supplements.

**Key words:** Tartary Buckwheat; antioxidant; sports supplements

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### INTRODUCTION

Tartary Buckwheat (Buckwheat) belongs to Polygonaceae dicotyledons, commonly known as Buckwheat (also called *F.tataricum*). Tartary buckwheat is a kind of unique edible crops which is suitable to grow in a cool and moist environment, endurable to barren soil. We usually find them growing on the alpine mountains in Europe. And it's also planted in China, mainly in the Loess Plateau Mountainous Areas, Sichuan province, the Yunnan-Guizhou Plateau[1]. According to the "The Compendium of Materia Medica" records, Tartary Buckwheat could supplement the center and boost the energy. People pay more and more attention to the nutritional and medicinal value of Tartary Buckwheat.

#### The chemical composition and biological effects of Tartary Buckwheat

##### 1. The chemical composition of Tartary Buckwheat

The main contents of Tartary Buckwheat are flavonoids (rutin and quercetin, etc.) and amino acids (arginine, lysine, threonine, glutamate, ect), organic acids, proteins and trace elements (magnesium, potassium, sodium and selenium, ect) [2].

##### 2. The biological effects of Tartary Buckwheat

Glucose-decreasing effects[3-6]: Buckwheat contains flavonoids, fagopyrins, and D-chiroinositol. Such components have been reported to help control blood glucose levels. Researches show that the compound prescription of Tartary Buckwheat capsule can reduce the level of fasting blood glucose and increase the level of sugar tolerance by using various diabetic mice induced by Alloxan, which indicate that Tartary Buckwheat has glucose-decreasing effects or it may also help it.

Lipid-lowering effects: Tong Hongli, etc. found [7], buckwheat shell extract could decrease liver lipid, liver index, serum lipid in experimental hyperlipemia mouse, enhance the antioxidant capacity of blood, liver, reducing oxidative damage caused by high-fat diet, reduce the levels of liver lipid peroxidation, prevent the formation of fatty liver.

Antioxidation[8-10]: Some people have reported that Tartary Buckwheat leaf extract has stronger scavenging activity on hydroxide free radical and superoxide anion  $O_2^{\cdot-}$ . Flavonoids from Tartary Buckwheat seed can prevent the damage of antioxidase, then enhance the activity of antioxidant enzymes in aged rats, reduce the level of lipid peroxidation in vivo.

Anti-fatigue and enhance organisms immunity[11-12]: Research shows that Tartary Buckwheat inhibitor of trypsin can significantly inhibit the proliferation of HL<sub>60</sub> leukemia cells.

Anti-aging effect: Vitamin E is an indispensable element as a nutrient conservation in skeletal muscle, myocardium, smooth muscle and cardiovascular system. It can improve the utilization rate of nutrient, improve microcirculation of coronary artery and peripheral vascular, and enhance the immunity. As everyone knows, vitamin E can also improve skin elasticity, reduce cerebral cell lipofuscin. Tartary Buckwheat is rich in vitamins, including vitamin E of which the R tocopherol content is higher, so it can promote the regeneration of preventing senescence cell.

Anti-ischemia[13,14]: The flavonoid of Tartary Buckwheat shows that it can inhibit the decrease of MDA content in brain induced by cerebral ischemia, it have a protective effect by scavenging free radicals and reduce the damage of NO mediated neurotoxins. Tartary buckwheat flavones can decrease level of GSH in brain tissue of diabetic rats significantly, restore the activity of Na<sup>+</sup>\_K<sup>+</sup>\_ATP enzyme, then improve the nerve conduction velocity and increase the flow of blood of sciatic nerve.

## RESULTS AND DISCUSSION

### Application Perspective of Tartary Buckwheat as Sports Supplements

Free radical refers to the independent existence contains one or more unpaired atoms, groups of atoms, molecules or ions of electron. Free radical is very unstable, prone to loss or get electron by oxidation-reduction reaction. Numerous studies show that the reason of exercise fatigue is related to the metabolism of free radical. The organism's oxygen consumption increased after strenuous which is able to cause free radicals increased. In addition, Localized tissue hypoxia and the accumulation of metabolic products could affect the function of mitochondrial oxidative. Meanwhile a large number of oxygen consumption could provide opportunities for the one-electron reduction of oxygen, triggering a series of free radical reactions. Now we know that free radical can damage the body: lipid peroxidation, the crosslink of DNA and RNA, the damage caused by oxygenated and destroyed or crosslink of protein and amino acid a. All the damages mentioned above can cause the dysfunction of the body cell, the decreasing of the transport of oxygen red cell function, the slowdown of the mitochondrial oxidative phosphorylation, the loss of ATP synthesis, and finally make the body fatigued.

Tartary Buckwheat polyphenols is able to eliminate free radicals, reduce the level of brain lipid peroxides, protect cell membrane from damaging, inhibit the high level of glucose and total cholesterol, and increase the activity of SOD, protein kinase. There are Some researches showed that the SOD activity of erythrocytes in mice blood [was] increased by 15.1%, the catalase activity increased by 13.4% after feeding Tartary Buckwheat protein complex and the activity of whole blood GSH\_PX which prevent free radical formation increased by 23.2%. Furthermore, the activity of SOD, CAT and GSH\_PX in liver were increased by 19.2%, 15.1%, 18.4% respectively, and the content of MDA decreased, in which the decrease of MDA of heart is remarkable. All this tells us that Tartary Buckwheat protein complex can clear the body's lipid peroxides[14]. In animal experiments, Tartary Buckwheat can make the swimming time, the pole climbing time longer and increase the content of liver glycogen, decrease the content of blood lactic acid and blood urea, so it has anti-fatigue effect[15,16]. In addition, the selenium of Tartary Buckwheat is an essential element for insulin cells. Selenium is a part of glutathione peroxidase which plays a role of antioxidant by protecting cell membranes and hemoglobin from oxidative and destruction. Effects of selenium is promoting the immunoglobulin production and making phagocytes integrated. Magnesium Tartary Buckwheat contained could take part in the conversion of cell energy, regulation of cardiac activity and the maintenance of normal cardiac rhythm. These effects can increase the ATP energy supply, delay the exercise fatigue, then enhance exercise capacity.

## CONCLUSION

Different active components of Tartary Buckwheat plays an important role in hypoglycemic lipid-lowering, anti-aging, anti-ischemia, antioxidant, it can enhance immunity and clear free radical, delay the exercise fatigue, and promote the recovery of sports fatigue as well. So it has a broad application perspective as sports supplements.

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