

Title : Effects of *Caesalpinia sappan* Linn. heartwood extract on histology and oxidative stress of whiteleg shrimp (*Litopenaeus vannamei*)

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ABSTRACT

Caesalpinia sappan Linn. heartwood is a medicinal plant reported to possess therapeutic properties, especially in reducing oxidative stress. The aim of this study is to investigate the effects of *C. sappan* heartwood extract on histology and oxidative stress parameters in whiteleg shrimp. The shrimp were divided into two groups: a control group fed a normal diet and a treatment group fed a diet supplemented with *C. sappan* heartwood extract. The shrimp were fed once daily for two weeks. The hepatopancreas, gill, muscle, and intestine were processed using standard histological techniques and stained with hematoxylin and eosin (H&E). Furthermore, oxidative status in these four organs and hemolymph was measured using six parameters: malondialdehyde (MDA), reduced glutathione (GSH), and the activities of catalase (CAT), superoxide dismutase (SOD), glutathione reductase (GR), and glutathione peroxidase (GPx). The results demonstrated that *C. sappan* heartwood extract did not cause any histological changes, with no evidence of inflammation or cell necrosis. Additionally, *C. sappan* heartwood extract significantly stimulated the activities of glutathione system enzymes, specifically GR and GPx, in various organs ($P < 0.05$), which was associated with a significant reduction in MDA levels across all four organs. GR activity

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significantly increased in the hepatopancreas and muscle, a significant decrease was observed in the intestine. GPx activity was significantly increased in the gill. GSH levels decreased significantly in the gill and muscle. No significant changes were observed in the hemolymph. In conclusion, this study concludes that while *C. sappan* heartwood extract did not cause histological damage, it effectively inhibits oxidative stress, as evidenced by reduced MDA levels and enhanced antioxidant enzyme activities, particularly GR and GPx, in multiple organs.