

## Abstract

*Flammulina velutipes* has anti-inflammatory, immunomodulatory, antioxidant and many bioactive properties with high contents of carbohydrate, proteins and fibers. In this study, a novel proteoglycan with polysaccharide complexes and protein chain, named PGD1-1, was isolated from *F. velutipes*. The structural characteristics of PGD1-1 were then determined, and its anti-proliferation and pro-apoptotic activities against HepG-2 cells were demonstrated in vitro. Results proved that the average molecular weight of PGD1-1 was 32.71 kDa, and the carbohydrate and protein contents were 93.35 and 2.33%, respectively. The protein moiety was bonded to a polysaccharide chain via O-glycosidic linkage. The monosaccharides consisted of D-glucose, D-galactose and D-xylose in a molar ratio of 21.90:2.84:1.00. PGD1-1 significantly inhibited the proliferation of HepG-2 cells by affecting cell lipid peroxidation and nitric oxide production. In addition, PGD1-1 promoted the apoptosis of HepG-2 cells, especially the early apoptosis. These findings proved that PGD1-1 was a novel potent ingredient against the proliferation of HepG-2, which will provide a theoretical basis for the development and utilization of the functional ingredients of the *F. velutipes*.