***Asparagus officinalis* polysaccharide fermented with *lactobacillus plantarum* NCU116: characterization, antioxidative, and bio-activities**

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Lactic acid fermentation represents a novel method to produce bioactive functional ingredients, including polysaccharides. In this work, a selected*lactobacillus plantarum* NCU116 was used to ferment *Asparagus officinalis* pulps. Polysaccharides were extracted with hot-water andsubsequently separated to obtain two polysaccharide fractions,named*Asparagus officinalis*polysaccharide (AOP) and fermented-AOP (F-AOP). The physicochemical and bioactive properties of AOP and F-AOP were characterized and investigated. HPAEC showed that fermentation increased the proportions of rhamnose, galacturonic acid, and glucuronic acid in polysaccharides by 46.70, 114.09, and 12.75‰, respectively. HPSEC revealed that fermentation decreased the average molecular weight from 181.3 kDa (AOP) to 152.8 kDa (F-AOP). In addition, fermentation process decreasedthe particle sizes and inversely increased the rheology property. *In vitro*, F-AOP displayed superior free radical scavenging properties compared to AOP,which raised up to 30.75% (DPPH), 13.56% (hydroxyl), 21.29% (superoxide anion radical scavenging assays) at a concentration of 1 mg/mL, respectively.*In vivo*, F-AOP administration revealed a dose-dependent shiftfrom Th17-dominant acute inflammatory response(IL-17 and RORγt) to Th1-dominant defensive immune response(IFN-γ and T-bet) of immune response within cyclophosphamide-treated mice.Additionally, hepatoprotective effect of F-AOP was associated with modulations on biochemical markers of liver injury, cellular oxidant/antioxidant imbalance, and pro-inflammatory factors via SCFAs and bile acid signaling, supported by serum metabolomeanalysis. The fermentation significantly prompted the synthesis of SCFA metabolites to improve intestinal mucosal barrier function.These results indicated that the *lactobacillus plantarum* NCU116 fermentation waspractical and useful to obtain promising bioactive polysaccharides.