Abstract

An initial investigation was carried out to extract the *Sargassum polycystum* sodium alginate. The physicochemical and phytochemical characters of sodium alginate were studied. The result of UV spectral, FT-IR, \(^{13}\)C and \(^{1}\)H NMR analysis indicated the presence of carbon and anomeric proton of gluronic acid and mannuronic acid in sodium alginate. The antidiabetic efficacy of different concentrations (250 to 1250mg/kg) of *S. polycystum* sodium alginate on alloxan induced diabetic rats was studied. In this study, the initial blood glucose level after alloxan injection was 396.75 mg/dl in diabetic control group, but it was not reduced much and recorded with 252.25 mg/dl on 45\(^{th}\) day. Whereas, the blood glucose level was gradually decreased from 145.75 to 86.25 mg/dl in experimental groups treated with 250 - 1250 mg/dl sodium alginate, respectively. During the experiment, the hematological parameters such as RBC, WBC and Hb were significantly (P< 0.05) increased with increasing concentrations of sodium alginate treated experimental groups. Apart from these, the glycosylated hemoglobin level was found to be higher in alloxan induced diabetic rats than normal control rats, but it was significantly (P< 0.05) decreased with respect to the different concentrations of sodium alginate treated experimental groups. The blood serum lipid profiles parameters such as total cholesterol, triglycerides, HDL, LDL and VLDL levels in the blood serum samples were significantly (P< 0.05) decreased with respect to the increase in concentrations (250-1250mg/kg) of sodium alginate treated rats. The kidney function test such as urea, creatinine and uric acid were significantly (P< 0.05) decreased in sodium alginate treated experimental groups than the diabetic control rats. The diabetic rats treated with sodium alginate showed significant (P< 0.05) decrease in the activities of glycogen phosphorylase, glucose-6- phosphatase and fructose-1, 6-bisphosphatase in the liver samples than the diabetic control rats. However, the hexokinase activity of sodium alginate treated diabetic rats was significantly (P< 0.05) increased than the diabetic control rats. In the fecal samples of experimental groups, the reducing sugar and cholesterol levels were significantly (P< 0.05) increased with increasing concentrations of sodium alginate treatment. The histopathological observation of pancreatic \(\beta\) cells of experimental groups, in particular at the highest concentrations of sodium alginate treated groups were regenerated and observed a normal architecture of cells. The \textit{in vitro} antioxidant activities such as nitric acid scavenging activity and hydroxyl radical scavenging activity of sodium alginate were determined. The enzymatic antioxidant parameters such as catalase, peroxidase, superoxide dismutase, glutathione peroxidase and glutathione- S transferase activities were analysed and the results indicated that the catalase, peroxidase, superoxide dismutase and glutathione- S transferase activities were significantly (P< 0.05) increased than diabetic control rats with increasing concentrations (250 – 1250mg/kg) of sodium alginate. Invariably, the glutathione peroxidase activity was significantly decreased with increasing concentrations (250 – 1250mg/kg) of sodium alginate. The non-enzymatic antioxidant parameters such as reduced glutathione, lipid peroxidation, ascorbic acid and nitrite levels were significantly increased than the diabetic control rats with increasing concentrations (250 – 1250 mg/kg) of sodium alginate. Invariably, the lipid peroxidation activity was significantly (P< 0.05) decreased with increasing concentrations (250 – 1250mg/kg) of sodium alginate. The \textit{in vitro} anticancer activities of *S. polycystum* sodium alginate against mouth carcinoma cell line (HEP-2), liver carcinoma cell line (HepG2), breast carcinoma cell line (MCF7) and cervix carcinoma cell line (HeLa) was determined by cytotoxic assay (MTT) method. The antibacterial effect of sodium alginate extracted from *S. polycystum* against human pus forming bacterial pathogens was screened by agar well diffusion method. The wound healing activity of sodium alginate was determined on buring wound created rats for 21 days. The wound healing rate in experimental rats was increased with increasing concentrations of sodium alginate. The epithelialization rate and blood vessel content of closed wound skin were significantly increased in experimental groups than control.