

Relevance of brown seaweed fucoidans as therapeutics for Type 2 diabetes mellitus(T2DM) and cancer progression

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Fucoidans are sulphated polysaccharides derived from brown seaweeds, consisting of considerable proportions of L-fucose and other monosaccharides. The search for novel natural compounds as potential drugs, due to the side effects associated with some currently available synthetic drugs, has led to an extensive study of fucoidan, since it is reported to display several bioactivities. Its anti-diabetic and anti-cancer properties have received the most research attention in the past decade. However, the relationship between the structure of fucoidan and its biological activity is still not well understood. Our studies sought to investigate the anti-diabetic (viz. inhibition of amylolytic enzymes) and anti-cancer activities of fucoidan. Firstly, fucoidan was hot water extracted from *Ecklonia maxima*, *Ecklonia radiata* and *Sargassum elegans*. These fucoidans were structurally and chemically profiled using FTIR, NMR, HPLC and colorimetric assays. Thereafter, the fucoidans were investigated for their anti-diabetic and anti-cancer activities. Our results show that fucoidans extracted from South African seaweeds inhibit α -glucosidase with the most potent fucoidan exhibiting an IC₅₀ of 19 μ g/ml compared to acarbose (a commercial anti-diabetic drug) with an IC₅₀ of 332 μ g/ml. In addition, the fucoidans acted as mixed-type enzyme inhibitors of α -glucosidase. Interestingly, fucoidans and acarbose also inhibited this enzyme synergistically, which enabled a remedy combination approach in a proposed new strategy in the control of Type 2 diabetes mellitus (T2DM). This combination strategy may reduce the amount of acarbose used and therefore the associated side effects. The fucoidans also exhibited anti-cancer activities, including inhibition of cancer cell adhesion to surfaces, anti-spheroid migration and anti-colony formation properties using a HCT116 human colorectal cancer cell line. In summary, fucoidans are seaweed polysaccharides that show potential application in the alleviation of T2DM and cancer progression.

Key words: amylolytic enzymes; anti-diabetic; anti-cancer properties; enzyme inhibitors; fucoidans