







Hypoglycaemic Molecules for the Management of Diabetes Mellitus from Marine Sources

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Abstract: Diabetes mellitus (DM) is a chronic metabolic disorder recognized as a major health problem globally. A defective insulin activity contributes to the prevalence and expansion of DM. Treatment of DM is often hampered by limited options of conventional therapies and adverse effects associated with existing procedures. This has led to a spike in the exploration for potential therapeutic agents from various natural resources for clinical applications. The marine environment is a huge store of unexplored diversity of chemicals produced by a multitude of organisms. To date, marine microorganisms, microalgae, macroalgae, corals, sponges, and fishes have been evaluated for their anti-diabetic properties. The structural diversity of bioactive metabolites discovered has shown promising hypoglycaemic potential through in vitro and in vivo screenings via various mechanisms of action, such as PTP1B, α -glucosidase, α -amylase, β -glucosidase, and aldose reductase inhibition as well as PPAR alpha/gamma dual agonists activities. On the other hand, hypoglycaemic effect is also shown to be exerted through the balance of antioxidants and free radicals. This review highlights marine-derived chemicals with hypoglycaemic effects and their respective mechanisms of action in the management of DM in humans.

Keywords: diabetes mellitus, marine organisms, bioactive metabolites, α -amylase inhibition, α -glucosidase inhibition, PTP1B inhibition, antioxidants

Introduction

Diabetes mellitus (DM) is one of the chronic metabolic disorders, which often has been recognized as a major health problem globally due to unrelenting hyperglycaemia which contributes to morbidity and mortality.^{1,2} The International Diabetes Federation reported that approximately 425 million adults suffered from diabetes in 2017, and by 2045 it is expected to hit 629 million.³ According to the World Health Organization (WHO), the number of diabetics rose from 108 million in the year 1980 to 422 million in the year 2014. Prevalence of diabetes has been on the rise more rapidly in low- and middle-income countries as compared to high-income countries. Diabetes has been the principal cause of blindness, kidney disease, heart diseases, stroke, and lower limb amputations. There has been a 3% agewise increase in the diabetes-related mortality rates between the years 2000 and 2019. The severity of this disease is associated with microvascular complications causing destruction of neurons, retina, and nephrons affecting nerves, eyes, and kidneys.