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REVIEW PAPER

Curcumin, a bioactive compound of Turmeric (*Curcuma longa*) and its derivatives as α-amylase and α-glucosidase inhibitors

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Abstract

Diabetes mellitus (DM) is a long-term metabolic disease characterised by a controlled metabolism of fat, carbohydrates, and proteins. In recent decades, it has grown into a significant global public health issue. According to the International Diabetes Federation, there were 425 million DM globally in 2017, and the number might be increased to 629 million by 2045 (a global 48% increase). Approximately 4.2 million deaths globally attributed to DM occur before the age of 60. The existing class of anti-diabetic medications is limited by side effects, which has led to the hunt for novel inhibitors that specifically target the α-amylase and α-glucosidase enzymes. Curcumin is a small-molecular-weight compound found in the roots of the *Curcuma longa* L (*C. longa*). plant, which has been used for culinary, medicinal, and other purposes throughout Asia for thousands of years. Curcumin has potent anti-inflammatory, anti-cancer, anti-angiogenic, antispasmodic, antibacterial, and anti-parasitic qualities. Even though the potential of curcumin to cure DM has been well investigated, its low solubility, rapid metabolism, and short plasma half-life have limited its application in DM. Therefore, the objectives of this review were to review the chemical composition of *C. longa*, the structure of curcumin, the degradation of curcumin, and the effects of curcumin derivatives on anti-diabetic properties against α-amylase and α-glucosidase enzymes. The results showed that *C. longa* contains carbohydrates, moisture, protein, fat, minerals, volatiles, fibre, and curcuminoids. Among the curcuminoids, curcumin is 60–70% present in *C. longa*. Moreover, curcumin and its derivatives have a lot of potential for treating DM, which was highlighted in this review. This review emphasises the several biological applications of curcumin, which collectively establish the foundation for its anti-diabetic characteristics. Considering these results, curcumin derivatives may be considered as potential agents in the pharmacotherapeutic management of patients with DM.

Keywords *Curcuma longa* · Curcumin · Anti-diabetic · Structure of curcumin · Degradation of curcumin.

Introduction

Humans have used plant-based therapeutic bioactive substances for over a century. Many bioactive molecules have powerful pharmacological properties that can be used in the development of new drugs [1]. Turmeric, or *Curcuma longa (C. longa)*, is widely used in Indian cuisine as a colouring, preservative, and spice. Turmeric is widely used in India for a number of uses, such as dietary spice, dietary pigment, and folk cures for treating various ailments [2]. It is used in textile and pharmaceutical industries, as well as Hindu religious ceremonies, in one form or another, and it is being used in traditional Indian medicine for sinusitis, rheumatoid arthritis, cough, diabetic wounds, hepatic problems, and biliary disorders [3].

Turmeric (*C. longa* L.) is the source of curcuminoids, especially diferuloylmethane or curcumin. This naturally

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