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Inhibition of α-Glucosidase and Xanthine Oxidase by Curcumin and Its Analogs

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Abstract : Curcumin is the main active compound of turmeric that can inhibit the activities of α-glucosidase and xanthine oxidase (XO). α-Glucosidase and XO inhibitors are widely used to treat patients with diabetes mellitus and gout, respectively; therefore, the objective of this research was to evaluate the inhibitory activities of curcumin and its analogs against α-glucosidase and XO. Our results demonstrated that CM-F had the strongest antioxidant activity with a half-maximal effective concentration (EC50) of 9.39 ± 0.16 μM, which was superior to vitamin E (EC50=17.03 ± 0.09 μM). CM-F also exhibited potent inhibitory activity against XO with an IC50 value of 6.14 ± 0.38 μM and enzyme kinetic results revealed competitive inhibition of XO. We also found that CM-1 and CM-2 inhibited α-glucosidase with IC50 values of 21.06 ± 0.92 μM and 5.95 ± 0.09 μM, respectively, and kinetic studies indicated that both CM-1 and CM-2 are mixed competitive inhibitors of α-glucosidase. Furthermore, docking simulation identified five hydrogen bonds between XO and CM-F; however, only one and two hydrogen bonds are involved in CM-1 and CM-2 binding to α-glucosidase, respectively. Accordingly, curcumin and its analogs have the potential to be used in the treatment of patients with diabetes mellitus and gout.

Keywords : curcumin, α-glucosidase, inhibitor, xanthine oxidase
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