Bleached kenaf microfiber as a support matrix for cyclodextrin glucanotransferase immobilization via covalent binding by different coupling agents

ABSTRACT

Enzyme immobilization via covalent binding provides a strong interaction between enzyme and support material. In this study, the effect of different coupling agents (spacer arms and ligands) in cyclodextrin glucanotransferase (CGTase) immobilization on bleached kenaf microfiber as a support matrix was investigated. The immobilized CGTase properties such as storage stability, thermal stability and reusability were evaluated. Immobilized CGTases on microfiber resulted in 0.162–0.24 U/mg-fiber when 55.6 U/mL of CGTase activity was initially added during the immobilization. The highest storage stability (60 °C) was shown by CGTase that was immobilized with ethylenediamine and o-phthalaldehyde, whereby 60% of its activity remained after 15 days. Its high stability was also confirmed by the lowest deactivation constant, kd that was obtained at 25 °C (0.0161 day−1) and 60 °C (0.0361 day−1). The CGTase immobilized using ethylenediamine and glutaraldehyde has shown the best retention of enzyme activity up to 72.72% after 12 cycles of batch reaction. The results indicate that kenaf microfiber has potential to be applied as a support for enzyme immobilization and its enzymatic properties were affected by the coupling agents.

Keyword: Cyclodextrin glucanotransferase (CGTase); Bleached kenaf microfiber; Covalent immobilization; Spacer arm; Ligand