

Abstract

Papain and bromelain were immobilized on CM-cellulose, DEAE-cellulose and natural cellulose supports using glutaraldehyde as crosslinking agent. CM-cellulose was more effective support for enzyme immobilization than others. The optimum immobilization conditions for Papain(or bromelain)were mixing 5 mL 1.00%(or 0.25 %)glutaraldehyde and 20 mL 1.00 mg/mL(or 0.50 mg/mL) enzyme solution at 4 °C and pH 5.2(or 4.2)and stirring for one hour. The immobilization percentage for papain and bromelain were 22.93% and 14.49%, respectively.

The optimal pH's for reaction of bromelain immobilized on CM-cellulose and natural cellulose were higher than that of soluble enzyme, and others were about the same. The optimal temperatures for reaction of immobilized enzymes were higher than those of soluble enzymes, except bromelain immobilized on DEAE-cellulose, Thermostabilities of immobilized enzymes were all higher than those of respective soluble enzymes. The pH stabilities of immobilized enzymes on CM-cellulose and DEAE-cellulose were very poor. The immobilized enzymes lost about 20% of activity after storage at 4°C for three months. The Km Values of the immobilized enzymes were higher than the respective soluble enzymes, but the Vmax values were all lower .

Beer chillproofing can be operated by passing beer through the packed bed column at a flow rate of 30 mL/h. When the mixture of 5 g immobilized papain and 5 g immobilized bromelain both on CM-cellulose were used for beer chillproofing, the best result was obtained. The turbidity of beer was decreased from 913 F. T. U. to 349 F. T. U. and the content of protein with molecular weight higher than 8,000 daltons was decreased from 42.76% to 13.10%. After the mixture of immobilized papain and immobilized bromelain were operated continuously for ten days, the total residual activity of the enzymes immobilized on CM-cellulose, DEAE-cellulose and natural cellulose were 46.1, 45.0 and 41.7%, respectively. They were still effective for the prevention of haze formation in beer .

KEY WORDS: beer chillproofing, bromelain, papain, immobilization, turbidity, haze formation