

**PENGARUH PENAMBAHAN ION LOGAM DIVALEN TERHADAP
PROSES SAKARIFIKASI LIMBAH KULIT SINGKONG
MENGUNAKAN GALUR MUTAN *Streptomyces bungoensis* InaCC A489
ST 3-12**

INTISARI

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Penambahan ion logam divalen dengan konsentrasi tertentu dalam proses sakarifikasi limbah pertanian diketahui dapat meningkatkan aktivitas enzim selulase dan mengurangi adsorpsi non-produktif enzim ke lignin dengan biaya yang murah. Penelitian ini bertujuan untuk mengetahui ion logam divalen yang paling berpengaruh optimal terhadap proses sakarifikasi enzim selulase. Pada penelitian ini digunakan galur mutan *Streptomyces bungoensis* InaCC A489 ST 3-12 yang resistan terhadap streptomisin untuk memproduksi selulase dengan sumber karbon kulit singkong dan penambahan ion logam divalen (Mg^{2+} dan Mn^{2+}) di bawah fermentasi kultur terendam.

Aktivitas *Streptomyces bungoensis* InaCC A489 ST 3-12 diobservasi dengan pengukuran konsentrasi gula reduksi yang dihasilkan dan pengamatan aktivitas selulase (endoglukanase/CMCase) setiap 24 jam selama lima hari berturut-turut. Sebelum ditambahkan ke dalam media fermentasi, limbah kulit singkong digiling hingga lolos ayakan 20 mesh kemudian dikenakan perlakuan pendahuluan kimiawi dengan larutan natrium hidroksida konsentrasi rendah (NaOH 2%) selama 40 menit dalam autoklaf (121°C/15 psi) untuk meningkatkan aksesibilitas selulosa. Hasil menunjukkan penambahan ion logam $MgSO_4$ 20 mM dapat meningkatkan produksi gula reduksi tertinggi pada hari ke dua fermentasi sebesar 16,26 mg/ml dan aktivitas endoglukanase sebesar 1,86 IU/ml.

Kata kunci: limbah kulit singkong, sakarifikasi, selulase, *Streptomyces*, ion logam, divalen

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EFFECT OF DIVALENT METAL ION ON CASSAVA PEEL WASTE SACCHARIFICATION WITH MUTANT *Streptomyces bungoensis* InaCC A489 ST 3-12 STRAIN

ABSTRACT

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The addition of divalent metal ions with certain concentrations in the saccharification process of agricultural waste is known to increase cellulase enzyme activity and reduce non-productive adsorption of enzymes to lignin at a low cost. This study aims to determine the divalent metal ion that has the most optimal effect on the saccharification process of the cellulase enzyme. In this study, a mutant of *Streptomyces bungoensis* InaCC A489 ST 3-12 strain which is resistant to streptomycin was used to produce cellulase with cassava peel as carbon source and the addition of divalent metal ions (Mg^{2+} and Mn^{2+}) under submerged culture fermentation.

The activity of *Streptomyces bungoensis* InaCC A489 ST 3-12 was observed by measuring the concentration of reducing sugar produced and observing the activity of cellulase (endoglucanase/CMCase) every 24 hours for five consecutive days. Before being added to the fermentation medium, the cassava peel waste was ground to pass a 20 mesh sieve and then subjected to chemical pretreatment with a low concentration of sodium hydroxide solution (2% NaOH) for 40 minutes in an autoclave (121°C/15 psi) to increase the accessibility of cellulose. The results showed that the addition of 20 mM $MgSO_4$ metal ion was able to increase the production of reducing sugar on the second day of fermentation by 16,26 mg/ml and endoglucanase activity by 1.86 IU/ml.

Keyword: cassava peel waste, saccharification, cellulase, *Streptomyces*, metal ion, divalent

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