Production of α-amylase by *Bacillus licheniformis* in submerged fermentation

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Bacillus licheniformis M_{27} was grown in culture medium at 42°C and pH 7.0 while shaking at 100rpm. The culture medium contained (gl^{-1}) soluble starch, 2.0; diammonium hydrogen phosphate, 2.0; potassium chloride, 0.5; magnesium sulphate, 0.5; yeast extract 2.0 and peptone 2.0. Maximum α-amylase was produced (52.9μmol/ml/min) at 48h in the above medium. When Tween 80, Tween 20 or glycerol 1% (v/v) was added to the culture medium 172%, 139% and 15% of α-amylase activities respectively were obtained compared to the control. As Tween 80 gave the maximum activation, it was decided to incorporate Tween-80 into the culture medium and the medium was named as M1. The soluble starch present in the medium M1 was replaced with either potato or manioc starch ($2gl^{-1}$) and the α-amylase activities obtained were 83% and 78% of that of the medium M1. When different amounts of potato and manioc starch were added to the medium M1 instead of soluble starch, the media containing 1, 2 and $4gl^{-1}$ potato starch gave α-amylase activities of 96%, 82% and 53% of that of medium M1, whereas in the culture media containing 2 and $5gl^{-1}$manioc starch, 105% and 64% α-amylase activities respectively were obtained to that of the medium M_1. Maximum α-amylase was produced (135.9μmol/ml/min) at 52h in the medium containing $2gl^{-1}$ manioc starch. As potato is comparatively expensive to manioc it was decided to substitute manioc starch ($2gl^{-1}$) for soluble starch in the medium M1. When the soluble starch in the medium M1 was substituted with cellulose$1gl^{-1}$ or cellulose and glucose each of $1gl^{-1}$ the α-amylase activities obtained were 82 and 93% respectively compared to medium M1. Thus the *B. licheniformis* M_{27} prefers manioc starch to produce α-amylase. However the culture medium needs further investigation.