

**The effect of Carbohydrate and Amino acids on production of  $\alpha$ -amylase  
from *Bacillus licheniformis* ATCC 6346**

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The present study is concerned with the effect of carbohydrate and amino acids on the production of  $\alpha$ -amylase by *Bacillus licheniformis* ATCC 6346. The fermentation medium was inoculated with *B.licheniformis* ATCC 6346 inoculum (20%, v/v) grown on nutrient agar medium and incubated at 42°C and 100rpm. The fermentation medium contained (g/l) soluble starch, 4.0; (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 5.0; peptone, 6.0; FeCl<sub>3</sub>, 0.01; MgCl<sub>2</sub>.6H<sub>2</sub>O, 0.01; CaCl<sub>2</sub>.2H<sub>2</sub>O, 0.01; KH<sub>2</sub>PO<sub>4</sub>, 4.0 and K<sub>2</sub>HPO<sub>4</sub>, 7.5. When the peptone of the medium was replaced by different concentration (2-30g/l<sup>-1</sup>) of completely oil removed seed cakes of either sesamum or mustard, highest  $\alpha$ -amylase activities of 58.14 and 56.64 Uml<sup>-1</sup> were observed at 48 hours, at 42°C and 100rpm in 18g/l of mustard and sesamum containing media respectively. With increase in mustard and sesamum oil free cakes concentration the  $\alpha$ -amylase production also increased. The increase in  $\alpha$ -amylase production could be due to the difference in carbohydrate or protein contents, when increasing amounts of either oil cakes were added. The protein and carbohydrate content of sesamum oil free cake was 35.72 and 4.01% and that of mustard was 32.95 and 4.41% respectively. To evaluate whether the effect is due to difference in carbohydrate content to the media containing different concentration (2-18 g/l) of oil seed cakes of sesamum and mustard total carbohydrate content was kept constant by the addition of soluble starch. The highest  $\alpha$ -amylase activity obtained in the medium containing 18g/l<sup>-1</sup> mustard and sesamum were 59.27 and 50 Uml<sup>-1</sup> respectively at 48 hours, at 42°C and 100rpm. The results indicated that under these conditions the carbohydrate content had no effect on the production of  $\alpha$ -amylase. However the enzyme production in the mustard containing medium was better than that in a sesamum containing medium. As the protein contents of both sources were very clear to each other, the difference in this enzyme production could be due to the difference in the amino acid content of the proteins. Therefore the effect of amino acids on the production of  $\alpha$ -amylase was investigated. To the sesamum oil free cake (18g/l<sup>-1</sup>) the amino acids present in the mustard was supplied. When the amount of amino acids such as Tryptophan (0.11g/l<sup>-1</sup>), Histidine (0.15g/l<sup>-1</sup>), Valine (0.29g/l<sup>-1</sup>), Lysine (0.16g/l<sup>-1</sup>), Glutamicacid (1.15g/l<sup>-1</sup>), Proline (0.23g/l<sup>-1</sup>), Threonine (0.21g/l<sup>-1</sup>), Leucine (0.39g/l<sup>-1</sup>) and Alanine (0.27g/l<sup>-1</sup>) in 18g/l<sup>-1</sup> of mustard was supplemented to 18g/l<sup>-1</sup> of sesamum and mixture of these amino acids also added separately, production of  $\alpha$ -amylase in sesamum containing medium was increased by Alanine (57.42 Uml<sup>-1</sup>), Lysine (54.19Uml<sup>-1</sup>) & mixture of these amino acids (55.58 Uml<sup>-1</sup>) and decreased by Threonine (39.34 Uml<sup>-1</sup>), Leucine (34.51 Uml<sup>-1</sup>), Valine (42.48 Uml<sup>-1</sup>), Histidine (44.77 Uml<sup>-1</sup>) and Proline (36.40 Uml<sup>-1</sup>). Hence we can conclude that, Alanine and Lysine showed considerable increase on the  $\alpha$ -amylase production. Further investigation is in progress to study the effect of amino acids.