

## Supplementation of Amino Acids to Coconut Seed Cake to Enhance $\alpha$ -Amylase Production by *Bacillus licheniformis* ATCC 6346

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The aim of this study is to find the effect of different amino acids on the production of  $\alpha$ -amylase in the presence of fat removed coconut seed cake powder by *Bacillus licheniformis* ATCC 6346. The fermentation medium was inoculated with *B.licheniformis* ATCC 6346 12h old inoculum (20%, v/v), incubated at 42°C and 100rpm. The fermentation medium contained ( $\text{gL}^{-1}$ ) soluble starch, 4.0;  $(\text{NH}_4)_2\text{SO}_4$ , 5.0; peptone, 6.0;  $\text{FeCl}_3$ , 0.01;  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ , 0.01;  $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ , 0.01;  $\text{KH}_2\text{PO}_4$ , 4.0 and  $\text{K}_2\text{HPO}_4$ , 7.5. When the concentration of fat removed seed cake powders of mustard and coconut (instead of peptone,  $6\text{gL}^{-1}$ ) were varied in the range of 2-30  $\text{gL}^{-1}$  while all other contents of the fermentation medium were kept the same, the highest  $\alpha$ -amylase activity obtained in the media containing  $18\text{gL}^{-1}$  fat removed mustard seed cake powder and  $24\text{gL}^{-1}$  coconut seed cake powder at 48h were 58.1 and 29.6  $\text{UmL}^{-1}$  respectively. The  $\alpha$ -amylase activity obtained in fat removed coconut seed cake containing medium was less than that in fat removed mustard seed cake powder containing medium. 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 fat removed coconut seed cake powder ( $24\text{gL}^{-1}$ ), the additional amount of amino acids present in the mustard fat removed seed cake powder ( $18\text{gL}^{-1}$ ) was supplemented. The additional amount of amino acids such as Tryptophan ( $0.10801\text{g}^{-1}$ ), Histidine ( $0.1476\text{gL}^{-1}$ ), Valine ( $0.2246\text{gL}^{-1}$ ), Lysine ( $0.3060\text{gL}^{-1}$ ), Glutamic acid ( $0.8790\text{gL}^{-1}$ ), Proline ( $0.4073\text{gL}^{-1}$ ), Glycine ( $0.2386\text{gL}^{-1}$ ), Isoleucine ( $0.0588\text{gL}^{-1}$ ), Phenylalanine ( $0.1784\text{gL}^{-1}$ ), Serine ( $0.1774\text{gL}^{-1}$ ), Leucine ( $0.3128\text{gL}^{-1}$ ) and Alanine ( $0.2081\text{gL}^{-1}$ ) present in  $18\text{gL}^{-1}$  of fat removed mustard seed cake powder was added to  $24\text{gL}^{-1}$  of fat removed coconut seed cake powder individually and as a mixture. Tryptophan ( $58.26\text{UmL}^{-1}$ ) and Alanine ( $54.26\text{UmL}^{-1}$ ) supplementation improved  $\alpha$ -amylase production. This excess amount of tryptophan and Alanine present in fat removed mustard seed cake cannot be the only factor that has increased  $\alpha$ -amylase production in mustard powder containing medium. Some factors other than amino acids present in fat removed mustard powder could be increase enzyme production therefore amino acids were supplemented to peptone containing medium separately. When the peptone ( $6\text{gL}^{-1}$ ) containing fermentation medium

was supplemented with different amino acids such as  $0.2\text{gL}^{-1}$  of glycine, methionine, proline, lysine, leucine, threonine, serine, arginine, alanine, glutamic acid, tryptophan, glutamine, asparagine, histidine, valine, phenylalanine, isoleucine and their mixture separately,  $\alpha$ -amylase production was improved by lysine, threonine, serine, arginine, tryptophan, glutamine, histidine, and isoleucine and their mixture.