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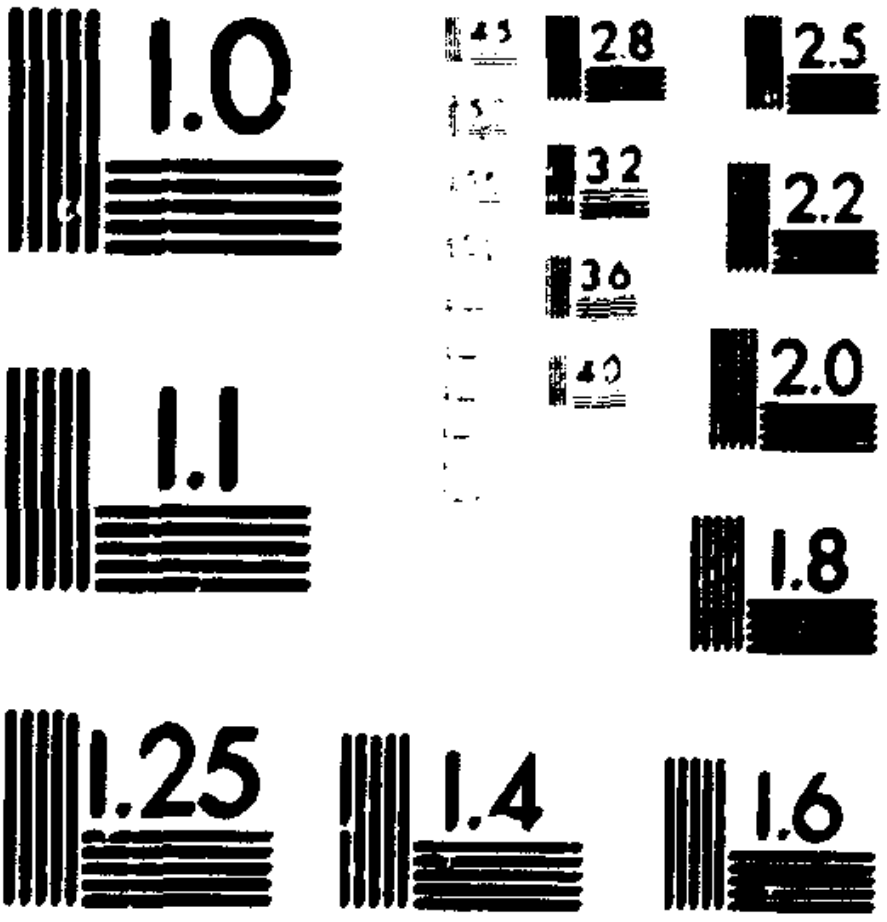

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ENZYME BIOTECHNOLOGY FOR DEVELOPMENT IN AFRICA*.

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Most of the 450 million people in the world who are hungry and malnourished live in Africa and Asia. In Africa there is little or no technological inputs which are necessarily required for increased food produced. There have been a number of recent advances in contemporary biochemistry and genetic engineering. These powerful techniques can surely be exploited by Africa. Such have recently been highlighted by the Chemical and Engineering News (January 2, 1984):

a) Recombinant DNA technology can provide the opportunity to prepare proteins in substantial quantities with controlled variations in amino sequence.

b) Monoclonal antibodies produced in large quantities using hybridoma techniques can provide specific receptors against virtually any high- or medium-molecular weight substance, and

c) Biochemistry and Biotechnology (including aspects of enzymic transformation and fermentation) make it now possible to synthesize complex naturally occurring substances and their analogues in sufficient quantities,

d) Biotechnology is an area of extremely active industrial research. The major immediate well-known markets are high value proteins (interferon, insulin, animal and human growth hormones), and

e) Longer term industrial projects concern the future treatments for cancer, diabetes, parasitic diseases and high-blood pressure. Other projects which are being planned are the following:

A. Enzymic catalysts for industrial use
B. Methods for organ transplantation
C. Improved plant strains
D. Biomass utilization for energy
E. Human genetic engineering

Doctors Vanbelle, Meurens and Crichton at Louvain in Belgium have outlined the uses of Enzymes for Industrial Enzyme projects with particular reference to foods and feeds.

1. Enzymes can be produced on an industrial scale from animal cells as well as plant sources. However, inadvertently most of these enzymes which are used on an industrial scale are of microbial origin.

2. Because of the exorbitant expenditure which is normally associated with animals and plants, it is often advantageous to isolate industrial enzymes from microbes because these extracellular enzymes are excreted into the culture medium by the microorganisms.

3. Well-known industrial applications of enzymes are:

(i) production of glucose from starch
(ii) in the pharmaceutical production of medicines (drugs) containing enzymes which facilitate digestion
(iii) the utilization of proteases in laundry powders
(iv) in the production of alcohol beverages, fermented food, the retting of flax and tenderizing meats.

The attached table shows the applications and possible utilization in Biotechnology.

ENZYMES	APPLICATIONS AND POSSIBLE UTILIZATION IN BIOTECHNOLOGY
α-amylase	- Fluidify starch - Treatment of Textiles - Production of glucose - Coating on paper
Glucoamylase	- Production of glucose - Saccharification in view of fermentation (breweries distilleries)
Pullulanase	- Brewery - Beer without malt
Invertase	- Production of inverted sugar, syrup - Fondant sweets
Pectinases	- Clarification of fruit juices and wines
Cellulases	- Production of glucose from cellulose residues for the production of ethanol by fermentation
Lactase	- Hydrolysis of the serum remaining after coagulation of milk - Treatment of intolerance to lactose
Microbial proteases	- Laundry powder, bakery products, chill-proof, meat, leather
Bromelain (pineapple)	- Digestive additive, meat
Papain (papaya)	- Meat, chill-proof
Pepsin (animal gastric)	- Digestive additive
Trypsin (animal)	- Digestive additive, leather
Rennin (animal and microbial)	- Production of cheese
Lipases	- Digestive additives, treatment of waste products
Pancreatin	- Digestive additives
Glucose oxidase	- Elimination of O_2 from food, elimination of sugar from egg powder, toothpaste, analysis of glucose
Catalase	- Elimination or peroxides in milk when sterilising. Acts together with glucose oxidase
Glucose-isomerase	- Production of fructose