Microorganism Fermentation

Bioprocess or fermentation technology is an important component in biotechnology process and involve complete living cells(microbe, mammalian or plant), organelles or enzymes as the biocatalyst and will aim to bring about specific chemical and/or physical changes in organic materials. The reasons for using microorganisms in fermentation:

1-The ratio of surface area to volume is high, so that the nutrients in the medium consumed quickly forced the metabolic reactions.

2- Adaptation for different ecological conditions that facilitates its transfer from natural habitat to the lab and growth on cheap carbon and nitrogen sources then production compounds that higher economical value.

3-The ability to achieve huge chemical reactions.

4- By easydealing with microorganisms in field genetic mutation and genetic engineering easing fordesigning genetically modified organisms produced higher amounts of product in comparison with wild type.

Stages of fermentation

1-Screening and isolation of microorganisms

Microorganisms holds the key to the success or failure of a fermentation process. It is therefore important to select the most suitable microorganisms to carry out the desired industrial process.The most important factor for the success of any fermentation industry is a production strain. It is highly desirable to use a production strain possessing the following four characteristics:

1-It should be high-yielding strain.

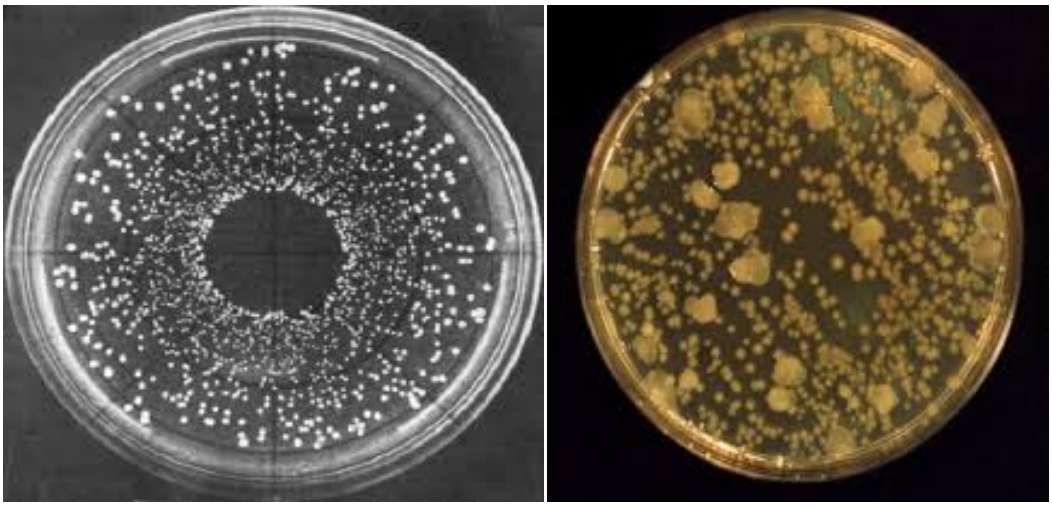
2-It should have stable biochemical/genetical characteristics.

3-It should not produce undesirable substances.

4-It should be easily cultivated on large-scale.

Screening may be defined as the use of highly selective procedures to allow the detection and isolation of only those microorganisms of interest from among a large microbial population. The techniques that used for screening:

1-Crowded plate technique: The crowded plate technique is the simplest screening technique employed in detecting and isolating antibiotic producers.It consists of preparing a series of dilution of the source material for the antibiotic producing microorganisms, followed by spreading the dilution on the agar plates.The agar plates having 300- 400 or more colonies per plate after incubation for 2-4 days are observed since they are helpful in locating the colonies producing antibiotic activity. Colonies showing antibiotic activity is indicated by the presence of a zone of inhibition surrounding the colony. Such a colony is sub- cultured to a similar medium and purified.



2-Auxanography technique: This technique is largely employed for detecting microorganisms able to produce growth factors (eg. Amino acid and Vitamins) extracellularly.

3-Enrichment culture technique: This technique was used to isolate the desired microorganisms form a heterogeneous microbial population present in the sample. Either medium or incubation conditions are adjusted so as to favor the growth of the desired

microorganism. On the other hand, unwanted microbes are eliminated or develop poorly since they do not find suitable growth conditions in the newly created environment.

The wild strains isolated from the nature have low production efficiency, therefore; many ways were used for enhance the productivity such as:

1- Ecological ways:

Provision of the optimal growth conditions for microorganism such as temperature, pH, aeration, humidity, media.....etc.

2-Genetic ways:

Any alteration in the inherited nucleic acid sequence of the genotype of an organism by using:

1-Genetic mutation

The mutation is defined as a permanent change in the sequence of DNA that alter the sequence of amino acids in the protein. There are two types of mutations:

a- Spontaneous mutation

Spontaneous mutations occur without exposure to any obvious mutagenic agent. Sometimes DNA nucleotides shift without warning to a different chemical form (know as an **isomer**) which in turn will form a different series of hydrogen bonds with its partner. This leads to mistakes at the time of DNA replication. The frequency and productivity were low so that don't dependent on it.

b-Induced mutation

Induced mutation occur by treatment the cells with mutagens such as physical mutagens which includingultraviolet andX-rays and chemical mutagens such as mitomycin C, nitrosoguanidine..etc. The cells that result from mutation called mutantswhich divided to:

1-Majer mutants: The mutant strains have appeared a big and clear change in biochemical characteristics. The mutation had easily lost. These mutants were important in genetic studies.

2-Minor mutants: The mutant strains have appeared a little change in some features and don't recognize in the external shape.This mutation is genetically constant and important in development the productivity of strains.