Single Cell Protein

Single-Cell Protein (SCP) is a term coined at Massachusetts Institute of Technology by Prof C.L. Wilson (1966). It is the dry weight of microorganism growing in large industrial system for use as a source of protein for human and animals, also it referred to as a whole microbial biomass. Single cell protein applied to biomass not only single cell organism like yeasts or some unicellular algae but also some multi-cellular molds.

Several industrial giants investigated the possibility of converting cheap organic materials into protein using microorganism. Many scientists believe that single-cell protein production is possible solution to meet out the shortage of protein. Examples of microorganism used for single cell protein production are:

1. **Yeast:**
    - *i.* *Saccharomyces cervisiae.*
    - *ii.* *Candida utilis.*
    - *iii.* *Debaromyces.*
    - *iv.* *Kluyveromyces.*
2. **Bacteria:**
    - *i.* *Cellulomonas.*
    - *ii.* *Methelococcus.*
    - *iii.* *Methelomonas.*
    - *iv.* *Nocardia.*
3. **Molds:**
    - *i.* *Aspergillus.*
    - *ii.* *Pencillium.*
    - *iii.* *Fusarium.*
    - *iv.* *Endomycopsis.*
4. **Algae:**
    - *i.* *Chlorella.*
    - *ii.* *Spirulina.*

The percentage of protein produced is differ depending on the type of microorganism as follow:

Bacteria	50-84%.
Yeast	15-75%.
Algae	8-64%.
Mold	20-40%.

Advantages of microorganism in single-cell protein manufacture

1. Microorganisms have a rapid growth.
2. They have ability to change the materials to biomass rapidly.
3. They can be produced in large masses.
4. They use non-expensive material and some of them are waste product.
5. The production condition can be controlled very easy.

The basis of selection of microorganism

1. Microorganism should have a rapid growth.
2. Should grow on non-expensive materials.
3. Should not be a pathogenic one.
4. Should be resistant to high temperature.
5. The product must be separated in easy way.

In general yeast is the best m.o. used in production of proteins because of:

1. They contain high amount of nutritive value.
2. The ratio of RNA and cytoplasmic membrane is lower than bacteria and molds.

Procedure:

1. Prepare 4 flasks each contains 100ml of Molt Extract broth with 1%, 3%, 5% and 8% of glucose.
2. Inoculate the flasks with 5ml of activated *Saccharomyces cervisiae.*
3. Condition of growth:
   i. Source of carbon.
   ii. Aeration.
   iii. pH must be about 4.5-5.
   iv. Temperature 28^{o}C.
4. mix the media then incubate at 28^{o}C for 0, 30, 60, 90 minutes and calculate the following:
   i. Turbidity.
   ii. Direct Microscopic Count (DMC).
   iii. Plate Count.

The last step of SCP is harvesting in which the cellular growth is cooled and the cells are removed over by centrifugation. Then the yeast cells are washed in water and centrifuged again to remove residual media. Finally the cells are separated on filter press and extracted in block forms. This block is then cut into portions of commercial size. But before blocking the cells must be killed before using it as a source of protein and the most important type is shock heat treatment.