C-Cultivation and nutrition of mo.s :

Cultivation : is the process of propagating organisms by providing the proper environmental conditions.

Environmental condition for microbial growth (Requirements of growth):

1-Temperature
2-Nutrients
3-pH of the medium
4-Aeration
5-Salt concentration
6-Ionic strength of the medium

1-Nutrition :

Nutrients in growth media should contain all the elements necessary for synthesis of new organisms:

1.1) C-source :

Autotrophs : organisms that do not require organic-nutrient (carbon for growth).

Heterotrophs : organisms that require organic carbon for growth.

Chemolithotrophs: organisms that require inorganic substrate (e.g.H2) as reductant and CO2 as C-source.

1.2) N-source :

Nitrogen is the major component of proteins and nucleic acids (≈ 10% of microbial dry weight) e.g. (NO_3^-, NO_2^-, NH_4^+ , N_2 , R-NH_2).

1.3) P-source :

PO_4^{3-} is a component of ATP , Nucleic acids and Coenzymes (NAD and

NADP) , flavins , phospholipids , teichoic acid .

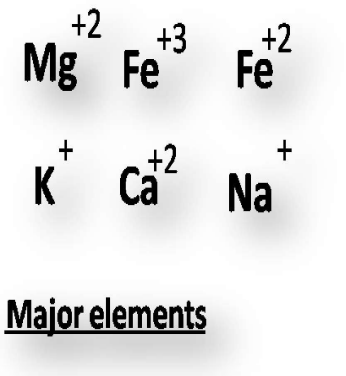
C : N : P ratio 1 : 0.1 : 0.01

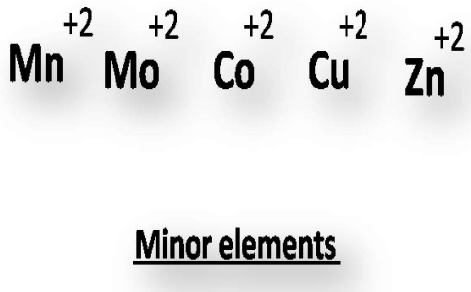
1.4) S-source :

S° is not utilizable , however some autotrophs can oxidize S°→ SO_4^{2-}.

In nutrient media the usual chemical form for sulfur is SO_4^{2-} , that can be utilized and reduced to H_2S.

1.5) Mineral sources :





1.6) Growth factors :

They are organic compounds necessary for cell growth , but can be able to synthesized:

Examples :

1-amino acids 2-purines 3-pyrimidines

4-vitamins 5-pentoses 6-some carbohydrates and fatty acids

2- Environmental factors affecting growth:

2.1) pH :

a.Neutralophiles : microorganisms that grow best at pH≈ 6,0 – 8,0.

b.Acidophiles : microorganisms that grow best at low pH (about 5,0).

c.Alkaliphiles : microorganisms that grow best at high pH (about 9,0).

2.2)Temp. :

a.Mesophiles : microorganisms that grow best at temp. 30-40˚c.

b.Psychrophiles : microorganisms that grow best at temp. 15-20˚c.

c.Thermophiles : mo.s that grow best at temp. 50 - 60˚c.

2.3) Aeration : (O_2 Supply)

a.Obligate aerobes : Organisms requiring O_2 as hydrogen acceptor .

b.Facultative aerobes : Organisms able to live aerobically and anaerobically .

c.Obligate anaerobes : Microorganisms are sensitive to oxygen and require another substance as a hydrogen acceptor .

d.Microaerophiles : Microorganisms that can tolerate a trace of oxygen .

2.4 : Ionic strength :

a.Halophiles : Microorganisms that require high salt concentration.

b.Osmophiles : Microorganisms require high concentration of osmotic pressure.

c.Saccharophiles : Require high sugar concentration (e.g. yeasts).

3.Cultivation methods :

These methods depend on:

a. The suitable method.

b. The microorganism.

3.1) The medium : the choice of nutrient medium depends on :

a. Just to isolate a microorganism (isolation only).

b.Need to determine number and type of the microorganism.

c.Need to isolate a particular type of microorganism.

3.2) Microorganism and the pure culture :

A pure culture is a progeny raised from one cell or a group of cells , cultivated in a certain nutrient medium .

Methods of purification :

3.2.1) Plating methods: - Pour plate method.

-Streaking.

3.2.2) Dilution to extinction method.

Antimicrobial agents and chemotherapy

A. Definitions

1. **Antibiotic :** a naturally occurring or synthetic organic compound , that inhibit or destroy selective microorganisms in low concentration.

2. **Biocide :** a broad-spectrum chemical agent , that inactivates microorganisms including:

Disinfectants	Antiseptics	Preservatives
Formaline	Chlorohexidine	Benzoic acid
Phenol	Hexachlorophene	Propionic acid
Hg-compounds	Chlorine and iodine compounds	Lactic acid
Alcohols	Alcohols	Alcohols

3. **Disinfectant:** a biocide used to kill microorganisms on inanimate (nonliving) objects or surfaces.

4. **Antiseptic :** a biocide used to kill or inhibit the growth of microorganisms in or on living tissues.

5. **preservative:** a biocide used to prevent the multiplication of microorganisms in formulated products including foods and pharmaceuticals.

6. **Sepsis:** is the presence of pathogenic microbes in living tissues.

7. **Asepsis :** is the absence of pathogens.

8. **Bacteriostatic :** a biocide is able to inhibit bacterial multiplication (with reversible effect) , fungistatic , sporostatic

9. **Bactericidal :** a biocide is able to kill bacterial cells (with irreversible effect) Fungicidal , sporicidal , virucidal.

10. **sterlization :** a physical or chemical process that completely destroys or remove all microbial life including spores.