

Teacher: Dr. Raju Kulkarnee

Class: Part-III

College: R.M. College, Saharsa Title: **(Microbiology-Industrial application of Microorganisms in Organic acids)**

Subject: Botany

email ID: rajukulkarnee17@gmail.com

Course: UG

Mob: 8678878139

- ❖ Organic acids are chemical compounds widely distributed in nature as normal constituents of plants or animal tissues.
- Organic acids constitute a key group among the building block chemicals that can be produced by microbial processes. The chemical industries use organic acids as basic compounds for wide variety of polymer as solvent production.
- ✚ Major types of organic acid produced by microbial activity are citric acid, succinic acid, lactic acid, gluconic acid, fumaric acid, propionic acid and acetic acid.
- ❖ **Citric acid**:- Citric acid was first discovered as a constituent of lemon. Many microorganisms can produce citric acid. The fungus *Aspergillus niger* is most commonly used for industrial production of citric acid. The other organisms (less important) include *Aspergillus clavatum*, *A. usentil*, *Penicillium luteum*, *Candida catenula* etc. For improved industrial production of citric acid, mutant strains of *A. niger* have been developed. Citric acid, due to its pleasant taste and platability is used as flavoring agent in foods and beverages.eg. jams, jellies, candies, frozen fruits, soft drinks, wine. Citric acid acts as antioxidant and preserves the flavors of foods.
- In pharmaceutical industry, as trisodium citrate, it is used as blood preservative. Citric acid is also used for preservation of ointments and cosmetic preparations. Citric acid can be utilized as agent for stabilization of fats, oils or ascorbic acid.
- ❖ **Gluconic acid**:- Gluconic acid can be produced by several bacteria and fungi. Bacterial species of genera *Gluconobacter*, *Acetobacter*, *Pseudomonas*, *Vibrio*. Fungal species of the genera *Aspergillus*, *Penicillium*, *Gliocladium*.
- It is used in the manufacture of metals, stainless steel and leather, as it can remove the calcareous and rust deposits. It is used as an additive to foods and

beverages. It is used in manufacture of highly resistant (to frost and cracking) concrete.

- ❖ **Lactic acid**:- Lactic acid producing bacteria are broadly categorized into two types- Heterofermentative bacteria- produce other byproducts, besides lactic acid and therefore are not useful for industrial production of lactic acid. Homofermentative bacteria- specialized for exclusive production of lactic acid and therefore are suitable for industrial purpose. *Lactobacillus* sp. are used for lactic acid production. It is used in food additive (sour flour and dough), intestinal treatment (metal ion lactates).
- ❖ **Acetic acid**:- The production of acetic acid in the form of vinegar (used as refreshing drink) from alcoholic liquids has been known to centuries. The commercial production of acetic acid is carried out by a special group of acetic bacteria, which are divided into two genera- *Gluconobacter* that oxidizes ethanol exclusively to acetic acid. *Acetobacter* that oxidizes ethanol first to acetic acid, and then to CO₂ and H₂O. These over oxidizers are Gram negative and acid tolerant. eg. *A. aceti*, *A. peroxidans*, *A. pasteurianus*.
- ❖ **L-Ascorbic Acid**:- It is commonly used chemical name for the water soluble vitamin C. Microorganisms used in industrial production of ascorbic acid are *Acetobacter* or *Gluconobacter* sp. Vitamin C protects the body against carcinogenic nitrosamines and free radicals. The deficiency of ascorbic acid causes scurvy. Vitamin C is mainly used in food and pharmaceutical industries.
- ❖ **Itaconic acid**:- It is used in plastic industry, paper industry and in the manufacture of adhesives. Itaconic acid can be commonly commercially produced by *Aspergillus itaconicus* and *A. terreus*.