MIND MAP : LEARNING MADE SIMPLE

CHAPTER - 10

Microbes in Human Welfare

Microbes as bio-fertilizers

- Bacteria
  - *Rhizobium* (Symbiotic bacteria)
  - *Azospirillum* and *Azotobacter* (free living bacteria).
- Fungi
  - Mycorrhiza- Association of *Glomus* with plants
- Cyanobacteria
  - Symbiosis: *Anabaena* in *Azolla*
  - Free living: *Nostoc, Oscillatoria* and blue green algae

Microbes in Industrial Products

- Fermented beverages
  - *Saccharomyces cerevisiae*
- Antibiotic Penicillin
  - *Penicillium notatum*
- Organic acids
  - *Aspergillus niger* (a fungus): Citric acid
  - *Acetobacter aceti* (a bacterium): Acetic acid
  - *Clostridium butylicum* (a bacterium): Butyric acid
  - *Lactobacillus* (a bacterium): Lactic acid
- Enzymes
  - Lipases
  - Pectinases and Proteases (To clarify bottles juices)
  - Streptikinase (*Streptococcus*- used as clot buster)
- Bioactive molecules
  - Statins- *Monascus purpureus*- used as blood-cholesterol lowering agents
  - Cyclosporine A- *Trichoderma polysporum*- used as an immunosuppressive drugs.

Microbes in household products

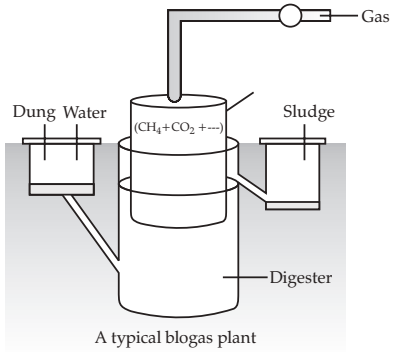
- Curd
  - *Lactobacillus* Or LAB
- Bread
  - *Saccharomyces cerevisiae*
- Toddy
- Swiss Cheese
  - *Propionibacterium sharmanii*

Microbes in Sewage Treatment

- Primary Sewage treatment
  - Involves removal of coarse solid materials
- Secondary Sewage treatment
  - Involves the action of microbes

Microbes in Production of Biogas

- Bacteria involved is *Methanobacterium*



A typical blogas plant

Microbes as biocontrol agents

- *Bacillus thuringiensis:* Control butterfly caterpillar
- *Tichoderma* sp.
- Baculoviruses (esp. genus *Nucleopolyhedrovirus*): Controls insect and arthropods