

Lactic acid bacteria
(LAB)

Gram-positive bacteria

Convert milk to curd

Increase vitamin B₁₂ content

E.g. *Lactobacillus*

Penicillin

An antibiotic produced from
Penicillium notatum (mould)

Discovered by Alexander
Fleming

Ernst Chain and Howard Florey
identified the full potential as an
antibiotic and awarded with
Nobel prize in 1945 with
Fleming

Organic compounds
produced by
microbes

Citric acid- *Aspergillus niger*

Acetic acid- *Acetobacter aceti*

Butyric acid- *Clostridium
butylicum*

Ethanol- *Saccharomyces
cerevisiae* (yeast)

Enzymes produced by microbes

Lipases- used to remove stains

Pectinases and proteases- for clearing bottled juices

Streptokinase- 'clot buster' for removing clots in blood vessels

Cyclosporin A

Produced by- *Trichoderma polysporum* (fungus)

Usage- as an immunosuppressant during organ-transplant

Statins

Produced by- *Monascus purpureus* (yeast)

Usage- blood-cholesterol lowering agent, inhibits cholesterol synthesis

Biological treatment in STPs

Secondary treatment

The primary effluent is treated first by aerobic microbes and then the activated sludge is treated by anaerobic bacteria

Biogas is produced and effluent is released into water bodies

Biogas

A mixture of methane and other gases used as a fuel

Produced by- Methanogens (anaerobic bacteria)

Present in rumen of cattle

Cattle dung is used to produce biogas

Biological control agents

Ladybird beetle to control aphids

Dragonflies to control mosquitoes

Bacillus thuringiensis (Bt) to control butterfly caterpillars

Trichoderma (fungus) to control plant pathogens

Nucleopolyhedrovirus (Baculoviruses) to control insects

Bacteria as biofertilisers

Symbiotic bacteria- *Rhizobium*

Free-living bacteria-
Azospirillum, Azotobacter

Increase nitrogen content of the soil

Mycorrhiza

A symbiotic association of fungi with plants

Fungi absorb phosphorus from soil

Glomus is a genus of mycorrhizal fungi present in plant roots

Cyanobacteria as biofertilisers

Fix atmospheric nitrogen

Extensively used in paddy fields

E.g. *Anabaena, Nostoc, Oscillatoria*, etc.