

# **Course- B.Sc.Part-I Botany Subsidiary**

## **PAPER-I**

### **Topic -Economic importance of Bacteria (Microbiology)**

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#### **Bacteria in production of Beverages**

Yeasts are the widely used microorganism for the production of beverages like beer, brandy, rum, wine, whiskey, etc. Yeasts are single-celled, eukaryotic, microorganisms of the Kingdom Fungi. In this industrial process, the species of yeasts, *Saccharomyces cerevisiae*, generally called as the Brewer's Yeasts are used for fermenting fruit juices and malted cereals to produce ethanol. Once after the fermentation, these beverages are distilled to produce both Alcoholic and non-alcoholic beverages including whiskey, brandy, rum, etc.

#### **Food Production**

**Fermented Dairy Products:** Fermented milk is produced by inoculating pasteurised milk with specific culture of microorganisms. The different fermented dairy products include yoghurt and cheese.

**Bacteria is used in Yoghurt Making:**Yoghurt is a dairy product which is produced by the bacterial fermentation of milk. Most commonly, cow's milk is used, though it can be made from any kind of milk. It can be prepared from a variety of milk including whole, skimmed, dried, evaporated or semi-skimmed milk.

Bacteria and Fungi are used in Cheese Making:

Cheese is prepared by inoculating milk with a starter culture containing specific micro-organisms. Cheese is a solid food made from the milk of various animals, most commonly cows. Milk from goat, sheep, reindeer and water buffalo may also be used. There are several types of cheese.

#### **Bacteria in Organic acids production**

Microbes are also used for the industrial production of certain organic acids. Citric acid was the first discovered organic acids from microbial fermentation of lemon – a citrus fruits. Organic acids are also produced directly from glucose. *Aspergillus Niger*, *Acetobacter acute* and *Lactobacillus* are few examples of microbes used for the industrial production of organic acids.

#### **Bacteria in Enzymes production**

Enzymes are naturally occurring, biological catalysts that are mainly used to control certain biochemical reactions in the living system. Enzymes have a wide range of applications in the production of both medical and non-medical field. Apart from the plants and animals, enzymes are also obtained from certain microbes and are referred to as the microbial enzymes. Microorganisms are majorly used for the production of industrial enzymes through the safe gene transfer methods. The first industrially produced microbial enzymes were obtained from the fungal amylase in the year 1896 and were used to cure indigestion and several other digestive disorders.

#### **Bacteria in Antibiotic production**

Antibiotics are chemical substances produced by certain microbes which functions either by killing or retarding the growth of harmful microbes without affecting the host cells. Penicillin

was the first antibiotic to be discovered by Alexander Fleming in the year 1928 from the fungus *Penicillium notatum*. There are many other antibiotics produced by microorganisms, including Streptomycin, and other antibiotics used to treat a number of bacterial infections.

### Bacteria in Vitamins production

Vitamins are organic compounds which are capable of performing many life-sustaining functions inside our body. They are essential micronutrients which are required in small quantities for the body's metabolism. As our body cannot be synthesized these vitamins, they need to be supplied through the diet. Apart from plants and animals sources, microbes are also capable of synthesizing the vitamins. There are few groups of microbes living in the digestive tracts of both humans and other animals which are collectively called as the gut microbiota. These microbes are involved in synthesizing vitamin K. Other examples of microbial vitamins include ascorbic acid, beta-carotene, biotin, ergosterol, folic acid, vitamin b12, Thiamine, pantothenic acid, riboflavin, and pyridoxine.

### USEFUL ROLE

1 Lab- Used as test system in study of Microbial Genetics and Basic Genetics

2 Food Productions

a) Bacteria, molds and yeast are the most important microorganisms that cause food spoilage and also find the maximum exploitation in production of food and food products.

b) Different strains of bacteria and fungus are used for fermentation of dairy products for production of a wide variety of cultured milk products. Both bacteria and fungi are used in these cheese production processes.

c) Lactic acid bacteria are used for coagulation of milk that can be processed to yield a wide variety of cheeses, including soft unripened, soft ripened, semisoft, hard, and very hard types.

d) Microorganisms such as Lactobacillus and Bifidobacterium are used as in food and health industry.

e) Spirulina, a cyanobacterium, also is a popular food source sold in specialty stores.

f) Mushrooms (*Agaricus bisporus*) are one of the most important fungi used as a food source.

Alcoholic beverages as beer are produced by fermentation of cereals and grains using different strains of yeasts.

3) Industrial importance

- a) Retting of Fiber
- b) Processing of Tea and Tobacco
- c) Production of Various antibiotics
- d) Production of Industrial enzymes- Amylase, Lipase, Protease
- e) Production of Microbial Insecticides.
- f) Production of various Amino acids
- g) Production of various vitamins
- h) Ecological role

## HARMFUL ROLE

- a) Disease causing agent
- b) Agent for spoilage of Food
- c) Ecological role

## Economic Importance of Bacteria and Viruses

### 1. Economic Importance of Bacteria

Bacteria are ecologically very important. They are used in number of industries including food drugs and biotechnology. Similarly, they also cause spoilage of food. Some plant pathogens affect the agricultural industries. Some of their advantages and disadvantages are described below:

#### A. Beneficial Activities of Bacteria:

There are many kinds of bacteria without which we could not live. They are absolutely essential to the presence of life on earth. They make possible the continued existence of green plants and therefore of animals because the plants are the only source of food for animals.

Following is a brief account of the more important activities of the bacteria:

#### 1. Role in Agriculture:

##### (i) Decay and decomposition:

Soil bacteria play an important role in bringing about decomposition of organic matter. They serve a double purpose. In the first instance they act as scavengers removing harmful waste from the earth.

Secondly, they return it to the soil as plant food. The dead bodies and wastes of organisms (both plants and animals) are decomposed by the activities of the saprophytic bacteria.

##### (ii) Soil fertility:

Some bacteria play an important role in maintaining and others in increasing soil fertility. The fertility of soil is proportional to its nitrogen content. Nitrogen is an essential ingredient of all living protoplasm. All growing plants, therefore, require it in their metabolism.

##### (a) Ammonifying Bacteria:

The saprophytic bacteria break down the proteins and other nitrogen containing remains of the plant and animal origin in the soil to amino acids by secreting enzymes.

##### (b) Nitrifying Bacteria:

Ammonia is very soluble. It moves in the soil rapidly and is acted upon by microorganisms of the category of chemosynthetic autotrophs in the soil. They are the nitrifying bacteria such as Nitrosamines and Nitrobacter. They form nitrates from ammonium compounds.

##### (c) Nitrogen-fixing Bacteria:

A considerable amount of nitrogen is lost by denitrification and through drainage. The loss must be made good by equal gains if the soil fertility is to be maintained