Chapter 9. Economic Importance Of Bacteria And Fungi

Exercise 1

Solution A.

1. (d) they have no chlorophyll
2. (b) Streptomyces
3. (c) Bacillus
4. (c) Rhizobium

Solution B.1.

The three common types of bacteria are:

1. Cocci (spherical bacteria)
2. Bacilli (rod-shaped bacteria)
3. Spirilla (spiral bacteria)

Solution B.2.

Column A	Column B
(i) *Penicillium*	(b) Antibiotic
(ii) Diplococci	(c) Bacteria occurring in pairs
(iii) Streptococci	(a) Bacteria occuring in chains

Solution C.1.

No, bacteria and yeast are not considered as plants because they do not have chlorophyll and their mode of nutrition is not autotrophic, which are characteristic features of plants.

Solution C.2.

Bacteria may be present in the form of spores in the air.

Solution C.3.

Spore formation in bacteria is not considered as a form of reproduction because bacteria reproduce only asexually by means of fission or cell division. Spore formation is just a method of escaping unfavourable conditions.

Solution C.4.

Bacteria are unicellular organisms that lack membrane bound cell organelles like chloroplast, mitochondria, etc. and even a well-defined nucleus is absent which states that they have a simpler cellular organization.

Solution C.5.

(a) Decay and Putrefaction

Decay	Putrefaction
1. It is the complete breakdown of organic matter by bacteria.	1. It is the incomplete breakdown of organic matter by bacteria.
2. Does not emit a foul smell	2. Emits a foul smell

(b) Pasteurization and Sterilization

Pasteurization	Sterilization
1. Temperature- 60°C	1. Temperature- 110°C
2. Does not kill spores	2. Kills even spores
3. Partial sterilization	3. Complete sterilization
E.g. Pasteurization of milk	E.g. Sterilization of canned food

Solution C.6.

Direct sunlight contains ultraviolet radiations of the sun, which help in killing of mould spores present in air.

Solution D.1.

Bacteria reproduce asexually by means of fission (binary fission), while yeast reproduces asexually by budding producing chains.

Solution D.2.

Role of micro-organisms in industrial production:

1. Bacteria are used in the production of vinegar and in the processing of coffee, tobacco, etc.
2. Different flavours of tea, coffee, etc. are produced by certain bacteria.
3. Tanning of leather is basically brought about by sunlight, but there are a few micro-organisms which are involved in this process.
4. Fibres used for making rope, linen, etc. are obtained by loosening the fibres of hemp and flax by retting, which involves the use of bacteria.
5. Bacteria are used for the large-scale production of antibiotics, enzymes, hormones, serum, vaccines and toxoids.

Solution D.3.

Modes of nutrition in bacteria:

1. **Autotrophic bacteria:** Able to synthesize their own food
   a. Photoautotrophs: Contain chlorophyll and use light energy for the synthesis of food
   b. Chemoautotrophs: Obtain energy by oxidizing inorganic compounds
2. **Heterotrophic bacteria:** Require organic compounds as their main source
   a. Saprophytes: Grow on dead and decaying organic matter
   b. Parasites: Obtain their food from living host on which they grow

Solution D.4.

Uses of bacteria in industry:

1. **Tea curing:** Certain bacteria are used to produce different flavours of tea.
2. **Tanning of leather:** Tanning of leather is basically brought about by sunlight, but there are a few bacteria which are involved in this process.

Solution D.5.

Antibiotics are chemical substances produced by a living organism that kill or stop the growth of disease-causing micro-organisms such as fungi and bacteria.

Examples of antibiotics:

1. Penicillin
2. Streptomycin

Solution D.6.

No, tinned and sealed food are not always safe to eat as they may contain harmful bacteria like Clostridium botulinum, which may cause serious food poisoning resulting in Botulism. In extreme cases, this condition may even prove to be fatal for life.

Solution E.1.

(a) Soil bacteria such as Rhizobium are present in the root nodules of leguminous plants. These bacteria convert free nitrogen of the soil atmosphere to soluble nitrates.

(b) (i) Nitrosomonas converts ammonium compounds to nitrites.
(ii) Nitrobacter converts nitrites to nitrates.

(c) Denitrifying bacteria in the soil break down nitrates present in the soil to release nitrogen gas which enters the atmosphere.

(d) Nitrifying bacteria present in the soil convert nitrogenous wastes of animals and dead remains of plants and animals to ammonia. Ammonia is then converted to ammonium compounds. In this way, plants and animals help in the formation of ammonium compounds.

Exercise 2

Solution A.1.

1. (b) Yeast
2. (c) Spore formation
3. (d) They do not have a true nucleus.
4. (a) Ethyl alcohol

Solution B.1.

(a) All mushrooms are poisonous.

(b) All toadstools are poisonous.(✓)

(c) Some toadstools are poisonous.

(d) Some mushrooms are edible.(✓)

Solution C.1.

Rhizopus is the common bread mould. It grows not only on bread, but also on a variety of organic matter such as paper, wood, cloth, animal dung, leather goods and food materials such as fruit, bread, pickles, chapati, etc. particularly in warm and humid climate.

Solution C.2.

Direct sunlight contains ultraviolet radiations of the sun which help in killing of mould spores present in air.

Solution C.3.

Role of certain fungi in industrial production:

1. Preparation of fermented foods and bakery products
2. Preparation of alcoholic beverages
3. Preparation of organic acids
4. Production of enzymes
5. Production of antibiotics
6. Production of alcohol
7. Production of wine
8. Bread-making
9. Cheese making
10. Mushroom cultivation

Solution C.4.

Useful effects of wine:

- In mild quantities, wine acts as a stimulant.
- It can be used to stimulate hunger, reduce anxiety and improve digestion.

Harmful effects of wine:

- In large quantities, wine can trigger asthma attack and increase blood pressure.
- It can cause body ailments, particularly liver cirrhosis.

Solution C.5.

(a) Saprophyte and parasite

Saprophyte	Parasite
Obtains nourishment from dead and decaying organic matter	Obtains nourishment from the body of the living host

(b) Aerobic and anaerobic respiration with regard to products

Aerobic respiration	Anaerobic respiration
Products – Carbon dioxide (CO_2), water (H_2O) and energy (ATP)	Products – Ethanol ($2C_2H_5OH$), carbon dioxide (CO_2) and energy (ATP)

(c) Decay and putrefaction

Decay	Putrefaction
Complete breakdown of organic matter by bacteria without the emission of foul smell	Incomplete breakdown of organic matter by bacteria along with the emission of foul smell

Solution D.1.

Antibiotics are chemical substances produced by a living organism that kill or stop the growth of disease-causing micro-organisms such as fungi and bacteria.

Examples of antibiotics:

1. Penicillin
2. Streptomycin

Solution D.2.

No, tinned and sealed food are not always safe to eat as they may contain harmful bacteria like Clostridium botulinum, which may cause serious food poisoning resulting in Botulism. In extreme cases, this condition may even prove to be fatal for life.

Solution D.3.

- Bacteria can be present in an aquarium.
- Bacteria are present everywhere; in air, soil, water and foodstuffs. They are found in boiling water and also below 0°C. They are present on the bodies of all living and

non-living organisms. They live on readymade food. In short, they are omnipresent.
- Bacteria are heterotrophic and may be decomposers or micro-aerobic in nature. Their mode of reproduction is very fast.

Solution E.1.

(a) Moulds are commonly present in air, water, etc. Hence, they were already present when moist bread was kept covered with the bell-jar.

(b) If bread was not covered with the bell-jar, moulds would have still appeared, but after some time. The warm and humid conditions inside the bell-jar promote rapid production of mould.

(c) Moulds do not grow below freezing point inside a refrigerator.

(d) Mycelia appear first on the bread.

(e) Bread mould obtains its nourishment through extracellular digestion from the substratum on which it grows. This mode of nourishment is called saprophytic nutrition.

Solution E.2.

Major steps in the cultivation of common edible mushrooms:

1. **Composting:** Composting involves mixing of various components such as wheat or paddy straw, chicken manure and organic and inorganic fertilizers in a fixed proportion. The temperature of compost is maintained at around 50°C. The compost is kept undisturbed for about one week.
2. **Spawning:** 'Mushroom seed' in the form of mycelium of mushroom to be grown is introduced into the heap of compost and left for spreading for around two days.
3. **Casing:** Casing is the most important step of mushroom cultivation. It involves spreading of a thin layer of soil over the compost. This provides humidity and support to the mushroom. It also serves to prevent the desiccation of the compost heap and helps in temperature regulation at around 20°C-25°C to forbid the growth of pests and diseases. The provision for circulating air around the compost bed should also be made.
4. **Cropping and harvesting:**Three major growth stages are observed, before mushrooms attain a fully grown form. Firstly, the mycelium, i.e. a network of fibrous mass, spreads out in 2 to 6 weeks, followed by the tiny pin head stage and finally the button stage, which is marked by an increase in the mushroom size, until it acquires marketable size.
5. **Preservation:** Mushrooms have a very short shelf-life. Processes such as vacuum cooling, bombardment by gamma radiation, followed by storage at 15°C, freeze drying in a solution of citric acid, ascorbic acid and brine, etc. are used for the preservation of mushrooms.

Solution E.3.

a. Denitrifying bacteria are a boon to farmers because they curb the excess supply of nitrates to plants. Excessive nitrates can even harm the ecosystem as a whole because

some wild plants like cultivated crops can thrive on nitrogen. Growth of these plants is favoured in nitrogen-saturated environments which can upset the ecosystem. Denitrifying bacteria are a curse to farmers because they breakdown soil nitrates to release free nitrogen gas into the atmosphere, thereby reducing the levels of nitrogenous compounds in the soil.
Yeast respires anaerobically in the absence of oxygen. It breaks down carbohydrates into simpler products such as ethanol by fermentation. The quality of alcohol produced varies with the kind of yeast employed.

b. During the baking process, yeast added to the dough ferments sugar and produces carbon dioxide. This causes the dough to rise, and when baked, the gas bubbles expand, giving the bread a light and spongy texture. Therefore, yeast is used in bakeries and breweries.