

Brain Builders Coaching Center

ICSE Class 9 Biology

Economic Importance of Bacteria and Fungi

- Bacteria and fungi are micro-organisms with both beneficial and harmful roles.
- They influence agriculture, industry, medicine, food, and environment.
- Understanding their importance helps in using them beneficially and controlling their harmful effects.

Part A – Economic Importance of Bacteria

2. Useful Roles of Bacteria

(A) In Agriculture

1. Nitrogen Fixation

- *Rhizobium*: Symbiotic in legume root nodules; converts atmospheric N_2 → nitrates.
- *Azotobacter*, *Clostridium*: Free-living nitrogen fixers.

2. Nitrification

- *Nitrosomonas*: Converts ammonia → nitrites.
- *Nitrobacter*: Converts nitrites → nitrates.

3. Ammonification

- Decomposers convert organic nitrogen (proteins, urea) → ammonia.

4. Result: Increases soil fertility, essential for crop yield.

(B) In Industry

1. Dairy Industry

- *Lactobacillus* converts milk sugar (lactose) → lactic acid → curd, yoghurt, cheese.

2. Vinegar Production

- *Acetobacter aceti* converts alcohol → acetic acid (vinegar).

3. Antibiotics

- *Streptomyces* → streptomycin, tetracycline, erythromycin.
- *Bacillus subtilis* → bacitracin.

4. Enzymes

- *Bacillus subtilis* produces proteases, amylases → used in detergents, leather, textiles.

5. Leather Industry

- Bacteria remove hair & tissue from hides during tanning.

(C) In Medicine

- **Antibiotics:** Life-saving drugs (streptomycin, tetracycline).
- **Vaccines:** Certain bacteria used to prepare vaccines (e.g. BCG for TB).
- **Probiotics:** *Lactobacillus* improves digestion and gut health.

(D) In Environment

- **Decomposition:** Saprophytic bacteria recycle nutrients from dead matter.
- **Bioremediation:** Bacteria degrade pollutants, oil spills.
- **Sewage treatment:** Anaerobic bacteria digest organic waste.

3. Harmful Roles of Bacteria

(A) Human Diseases

- Tuberculosis – *Mycobacterium tuberculosis*.
- Cholera – *Vibrio cholerae*.
- Typhoid – *Salmonella typhi*.
- Tetanus – *Clostridium tetani*.
- Gonorrhoea – *Neisseria gonorrhoeae*.

(B) Plant Diseases

- Rice blight – *Xanthomonas oryzae*.
- Crown gall – *Agrobacterium tumefaciens*.
- Wilt in potato/tomato – *Pseudomonas solanacearum*.

(C) Food Spoilage

- Milk souring, meat rotting, vegetable decay.

4. Nitrogen Cycle

Bacteria play central role in cycling nitrogen:

1. **Nitrogen Fixation**
 - *Rhizobium*, *Azotobacter* fix atmospheric nitrogen → ammonia/nitrates.
2. **Nitrification**
 - *Nitrosomonas*: Ammonia → nitrite.
 - *Nitrobacter*: Nitrite → nitrate.
3. **Assimilation**
 - Plants absorb nitrates → form proteins.
 - Passed to animals through food chain.
4. **Ammonification**

- Decomposers break organic matter → ammonia.
- 5. **Denitrification**
 - *Pseudomonas*, *Thiobacillus* convert nitrates → free N₂ gas, returning it to atmosphere.

Importance: Maintains balance of nitrogen in biosphere.

Part B – Economic Importance of Fungi

5. Useful Roles of Fungi

(A) In Industry

1. **Fermentation**
 - *Saccharomyces cerevisiae* (yeast):
 - **Baker's yeast** → bread-making (CO₂ makes dough rise).
 - **Brewer's yeast** → beer, wine, alcohol fermentation.
2. **Antibiotics**
 - *Penicillium notatum* → Penicillin (first antibiotic discovered).
3. **Organic Acids**
 - *Aspergillus niger* → citric acid, oxalic acid.

(B) In Agriculture

- **Mycorrhizal fungi** (*Glomus*): Symbiotic with plant roots → increase nutrient absorption.
- **Decomposers**: Break down dead matter → recycle nutrients.

(C) In Food

- **Mushrooms** (*Agaricus bisporus*) → edible, rich in proteins, vitamins, minerals.
- **Cheese ripening**: *Penicillium roquefortii* in blue cheese, *Penicillium camemberti* in Camembert cheese.

(D) Mushroom Cultivation

- **Method:**
 - Compost prepared from straw & manure.
 - Spores/mycelium sown.
 - Kept moist at 20–25°C.
 - Ready for harvest in 3–4 weeks.
- **Economic value**: Nutritious food + profitable commercial crop.
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6. Harmful Roles of Fungi

- **Plant diseases:** Wheat rust (*Puccinia*), smut of corn (*Ustilago*).
- **Human diseases:** Ringworm (*Trichophyton*), Athlete's foot.
- **Food spoilage:** Bread mould (*Rhizopus*), fruit rot, food poisoning.
- **Poisonous fungi:** Toadstools (contain toxic alkaloids).

7. Moulds, Yeast, Mushrooms

- **Moulds (*Rhizopus*, *Aspergillus*, *Penicillium*)**
 - Spoil food.
 - Useful: antibiotics (penicillin), acids (citric acid).
- **Yeast (*Saccharomyces*)**
 - Single-celled fungus.
 - Baker's yeast → bread.
 - Brewer's yeast → alcohol.
 - Rich source of Vitamin B.
- **Mushrooms (*Agaricus*)**
 - Edible, rich in protein.
 - Cultivated commercially.
 - Some poisonous (toadstools).

Group	Useful Roles	Harmful Roles
Bacteria	Nitrogen fixation, dairy, vinegar, antibiotics, probiotics, decomposition	Human & plant diseases, food spoilage
Fungi	Bread, alcohol, penicillin, acids, cheese, mushroom cultivation	Plant diseases, fungal infections, food spoilage
Yeast	Baker's yeast, Brewer's yeast, Vitamin B	Rare infections
Moulds	Antibiotics, acids	Spoil bread, fruits
Mushrooms	Food, commercial cultivation	Poisonous toadstools