CHAPTER

12

MICROORGANISMS AND FOOD PRESERVATION

This chapter deals with microorganisms like be Bacteria, fungi, protozoa, algae, viruses and desires caused by these in plants and animals. The benefits are derive from microorganisms are also discussed which are important from examination points of view.

Microorganisms

- Organisms that cannot be seen with the unaided eyes are called microorganisms or microbes.
- These microorganisms are as small as 10^{-6} nm in size.
- Some of these such as fungus grown on moist bread can be seen with magnifying glass while others need a microscope for their presence.

Habitat of Microorganisms

- Microorganisms are spread over the entire biosphere. They are found in soil, water, air, inside the bodies of plants and animals.
- They show a high degree of adaptability and can be found in harsh conditions like hotsprings, deserts, marshy areas, etc.

Major Groups of Microorganisms

SN	Micro organisms	Characteristics
1.	Bacteria	• These are simplest unicellular organisms having rigid cell wall like plant cells. • Based on their shapes, bacteria are of four types, i.e. bacillus (rod-shaped), coccus (spherical-shaped), spirillum (spiral-shaped) and vibrio (comma-shaped), e.g. *Lactobacieeus, Rhizobium*.
2.	Fungi	• It is a large group of organisms which do not have chlorophyll and do not photosynthesise, thus are heterotrophs, e.g. yeast, *Penicillium, Aspergillus* and *Rhizopus* (bread mould). • Fungi may be unicellular (yeast) or multicellular. (*Aspergillus*)
3.	Protozoa	• It is a group of single-celled microorganisms that have animal-like characteristics. • They can move from place to place, e.g. *Amoeba* and *Paramecium*.
4.	Algae	• It is a large group of simple, plant-like organisms. But they have no roots, stems or leaves. • They can be unicellular or multicellular. They are photoautotrophs, e.g. *Chlamydomonas* and *Spirogyra*.
5.	Viruses	• These are also microscopic disease causing entities which reproduce only inside the cells of the host organisms (plants, animals, humans).

Beneficial Microorganisms

Use	Comment
1. **In household products**	
• Curd	The bacterium *Lactobacillus* converts milk into curd. It is added to idlis and bhaturas to make them soft and spongy.
• Dough	Yeast when added in dough produces carbon dioxide during cellular respiration. The bubbles of the gas fill the dough and increase its volume. This dough is used for making breads, pastries and cakes, etc.
• Cheese	It is produced by the curdling of milk. Cottage cheese is prepared by using *Streptococcus lactis*.
2. **In Industries**	
• Fermentation	The microbes are used for the large scale production of alcohols, wine and acetic acid. The process of conversion of sugar into alcohol is called **fermentation**. It was discovered by **Louis Pasteur** in 1857.

3. **In Medicines**	
• Antibiotics	These are chemicals produced by microbos and are used to kill or stop the growth of disease causing microorganisms in human beings and animals, e.g. penicillin (discovered by Alexander fleming).
• Vaccines	These provide immunity against a particular disease. It consists of a dead or weakend microbes which when introduced in a healthy body, produce suitable antibodies to fight and kill themselves.
4. Increasing soil fertility	Some bacteria and blue-green algae can fix atmospheric nitrogen and thus increase the soil fertility, e.g. *Rhizobium*, *Anabaen, Nostoc*.
5. Cleaning of environment	Some microbes decompose the harmful and smelly dead remains of plants and animals. They convert them into simple substances and thus clean the environment. These are called (decomposers), e.g. fungi, bacteria, etc.

Harmful Microorganisms

Some microorganisms are harmful for us. Some of diseases caused by microorganism are described below

Disease Causing Microorganisms in Humans

Some of the microorganisms cause diseases in human beings. Such disease causing microorganisms are called **pathogens**. The table given below depicts certain facts about some common human diseases.

Name of Disease	Causal Microorganism	Mode of Transmission	Preventive measure (General)
Tuberculosis	Bacteria	Air	Keep the patient in complete isolation.
Measles	Virus	Air	Keep the personal belongings of the patient away from those of the healthy persons.
Chickenpox	Virus	Air/contact	Vaccination to be given at suitable age.
Polio	Virus	Air/water	Vaccination
Cholera	Bacteria	Water/food	Consume properly cooked food and boiled drinking water.
Typhoid	Bacteria	Water	Maintain personal hygiene and good sanitary habits.

Disease Causing Microorganisms in Plants and Animals

Some of disease causing organisms are tabulated below

Disease Animals	Micro Organisms	Animal/Plant Affected
Anthrax	Bacteria (*Bacillus anthracis*) discovered by Robert Koch (1876)	Cattle
Foot and mouth disease	Virus	Cattle
Swine flu	Virus	Pigs
Bird flu	Virus	Birds

Disease Animals	Micro Organisms	Animal/Plant Affected
Plants Citrus canker	Bacteria	Lemon
Rust of wheat	Fungi	Wheat
Yellow vein mosaic of bhindi (okra)	Virus	Bhindi

Food Poisoning

- It occurs due to the consumption of food spoilt by some microorganisms.
- It's symptoms include vomiting, diarrhoea, headache, fever, etc. It is caused by bacteria (like *Salmonella*, *Clostridium*), fungus (like *Aspergillus*), etc.

Food Preservation

The process by which spoilage of food is prevented using suitable chemical or physical methods is called food preservation. Some of these methods are given below

(i) **Drying or dehydration** It means removal of water from food materials. In the absence of moisture, the food microorganisms stop growing. Vegetables (spinach, peas, etc), pulses, spices and dry-fruits are preserved by this method.

(ii) **Special preservatives** Sodium benzoate and sodium metabisulphite are common preservatives used to check the growth of microbes. They are added to pickles and also used in jams and squashes to check their spoilage.

(iii) **Preservation by common salt** Common salt has been used to preserve meat and fish for ages. Salting is also used to preserve amla, raw mangoes, tamarind, etc.

(iv) **Preservation by sugar** Jams, jellies and squashes are preserved by sugar. Sugar reduces the moisture content which inhibits the growth of bacteria which spoil food.

(v) **Preservation by oil and vinegar** Use of oil and vinegar prevents spoilage of pickles because bacteria cannot live in such an environment.

(vi) **Hot and cold treatments** Boiling kills many microorganisms. Similarly, we keep our food in the refrigerator, low temperature inhibits the growth of microbes.

(vii) **Pasteurisation** It is used for the preservation of milk. It involves the process of heating milk to about 70°C for 15-30 seconds (killing most of bacteria) and then cooling quickly to a very low temperature.

(viii) **Proper storage and packing** Dry-fruits and vegetables are sold in sealed and air tight packets to prevent the attack of microbes.

Nitrogen-Fixation

- It is the process of conversion of atmospheric nitrogen into nitrogenous compounds.
- It occurs by lightening, certain nitrogen fixing bacteria (e.g., *Azotobacter*), blue-green algae (e.g., *Anabaena*, *Nostoc*) and *Rhizobium* (symbiotic bacteria).

Nitrogen Cycle

- The atmospheric nitrogen remains constant, although it is continuously used by plants and animals. This happens through a cycle of processes grouped together called **nitrogen cycle**.
- Certain microbes fix atmospheric nitrogen. It is utilised by plants and animals feeding on plants.
- After their death certain bacteria and fungi change nitrogenous compounds into simple compounds and nitrogen gas is liberated into the atmosphere.

PRACTICE EXERCISE

1. The simplest unicellular organisms having rigid cell wall like plant cells are
   (a) virus (b) bacteria
   (c) protozoans (d) fungi
2. The spiral-shaped bacteria are called
   (a) bacillus (b) coccus
   (c) spirillum (d) vibrio
3. The vibrio bacteria are
   (a) rod - shaped
   (b) spiral - shaped
   (c) comma - shaped
   (d) spherical - shaped
4. The organisms which do not have chlorophyll and are mostly heterotrophs are
   (a) bacteria (b) algae
   (c) viruses (d) fungi
5. *Amoeba* and *Paramecium* are
   (a) protozoans (b) bacteria
   (c) virus (d) fungi
6. The simple plant-like organs that lack roots, stems or leaves are
   (a) protozoans (b) algae
   (c) virus (d) fungi
7. The organisms that can be stored as crystals are
   (a) virus (b) bacteria
   (c) algae (d) fungi
8. Microorganisms found in
   (a) deserts (b) marshy lands
   (c) hotsprings (d) All of these
9. Which of these do not have a regular cell strucutre?
   (a) Bacteria (b) Viruses
   (c) Protozoa (d) Algae
10. The bread of idli dough rises because of
    (a) heat
    (b) grinding
    (c) growth of yeast cells
    (d) kneading
11. The process of conversion of sugar into alcohol is called
    (a) nitrogen fixation (b) moulding
    (c) fermentation (d) infection
12. Curd is formed due to the presence of bacterium
    (a) *Lactobacillus* (b) *Streptococcus*
    (c) *Bacillus* (d) None of these
13. Cottage cheese is prepared by using
    (a) *Lactobacillus* (b) *Streptococcus lactis*
    (c) *Saccharomyces* (d) *Penicillium*
14. Fermentation was discovered by
    (a) Louis Pasteur (b) Robert Hooke
    (c) Robert Brown (d) Charles Darwin
15. The first antibiotic was
    (a) penicillin (b) streptomycin
    (c) tetracycline (d) erythromycin
16. The following is an antibiotic
    (a) sodium bicarbonate (b) streptomycin
    (c) alcohol (d) yeast
17. Vaccine contains
    (a) live microbes (b) dead microbes
    (c) weakend microbes (d) Both (b) and (c)
18. Vaccines provide immunity by producing
    (a) antigens (b) antibodies
    (c) pathogens (d) None of these
19. The microbe that increases soil fertility is
    (a) *Rhizobium* (b) *Lactobacillus*
    (c) yeast (d) *Streptococcus*
20. The bacterium, found in root nodules of leguminous plants is
    (a) *Anabaena* (b) *Nostoc*
    (c) *Azotobacter* (d) *Rhizobium*
21. The nitrogen-fixing blue-green algae is/are
    (a) *Azotobacter* (b) *Nostoc*
    (c) Anabaena (d) Both (b) and (c)
22. Typhoid is caused by
    (a) bacteria (b) virus
    (c) protozoa (d) fungus

23. Which of the following is a viral disease?
(a) Typhoid (b) Polio
(c) TB (d) Leprosy

24. Cholera is an infectious digestive disorder in which patients have loose motions and vomiting. It is caused by……
(a) virus (b) fungi
(c) Bacteria (d) None of these

25. Foot and mouth disease of cattle is caused by
(a) virus (b) bacteria
(c) protozoan (d) fungi

26. Citrus canker is caused by
(a) bacteria (b) fungi
(c) virus (d) protozoan

27. Food poisoning is caused by
(a) *Salmonella* (b) *Clostridium*
(c) *Aspergillus* (d) All of these

28. The spoiling of food is a
(a) physical change
(b) chemical change
(c) Both (a) and (b)
(d) None of these

29. Common food preservative is
(a) sodium benzoate
(b) sodium metabisulphate
(c) mercuric chloride
(d) Both (a) and (b)

30. Pasteurisation was discovered by
(a) Louis Pasteur (b) Darwin
(c) Khurana (d) Hooke

31. Jams are preserved by
(a) salts (b) sugars
(c) pasteurisation (d) irradiation

32. Dryfruits are prevented by spoiling through
(a) storage and packing (b) pasteurisation
(c) oil (d) salt

33. Common salt is used to preserve
(a) meat (b) fish
(c) tamarind (d) All of theseabove

34. Vinegar prevents spoilage of
(a) jams (b) jellies
(c) pickles (d) None of these

35. Pasteurisation is done at
(a) 100° C (b) 30° C (c) 70° C (d) 45° C

Answers

1	*(b)*	2	*(c)*	3	*(c)*	4	*(d)*	5	*(a)*	6	*(b)*	7	*(a)*	8	*(d)*	9	*(a)*	10	*(c)*
11	*(c)*	12	*(a)*	13	*(b)*	14	*(a)*	15	*(a)*	16	*(b)*	17	*(d)*	18	*(b)*	19	*(a)*	20	*(d)*
21	*(d)*	22	*(a)*	23	*(b)*	24	*(c)*	25	*(a)*	26	*(a)*	27	*(d)*	28	*(b)*	29	*(d)*	30	*(a)*
31	*(b)*	32	*(a)*	33	*(d)*	34	*(c)*	35	*(c)*										