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COIMBATORE-641 035, TAMIL NADU



DEPARTMENT OF FOOD TECHNOLOGY

UNIT I: Microorganisms in Food

Topic: INTRINSIC AND EXTRINSIC FACTORS INFLUENCING MICROBIAL GROWTH

Microbial growth in food is influenced by **intrinsic** and **extrinsic** parameters. These factors determine whether microorganisms will thrive, survive, or be inhibited in food products.

Intrinsic Parameters (Properties of the Food Itself)

1. pH

- Most bacteria prefer neutral pH (6.5–7.5), while fungi can tolerate acidic conditions.
- Example: Lactic acid bacteria thrive in acidic foods like yogurt.

2. Water Activity (a_w)

- Microorganisms need water to grow. Lower water activity inhibits growth.
- Example: Dried fruits (low a_w) prevent bacterial growth.

3. Nutrient Content

- The availability of carbohydrates, proteins, fats, vitamins, and minerals affects microbial survival.
- Example: High-protein foods (e.g., meat) support bacterial growth more than low-nutrient foods.

4. Oxidation-Reduction Potential (Eh)

- Aerobic bacteria require high oxygen potential, while anaerobic bacteria grow in low or negative Eh environments.
- Example: Clostridium botulinum thrives in canned food with low Eh.

5. Antimicrobial Compounds

- Some foods naturally contain compounds that inhibit microbial growth.
- Example: Garlic contains allicin, which has antimicrobial properties.

6. Biological Structures

- Natural barriers like eggshells, fruit skins, and nut shells protect against microbial invasion.

Extrinsic Parameters (Environmental Factors)

1. Temperature

- Microbial growth varies with temperature:
 - Psychrophiles: Grow in cold ($\leq 15^{\circ}\text{C}$).
 - Mesophiles: Prefer moderate temperatures ($20\text{--}45^{\circ}\text{C}$).
 - Thermophiles: Thrive in high heat ($>45^{\circ}\text{C}$).
- Example: Refrigeration slows bacterial growth.

2. Relative Humidity

- High humidity can promote microbial growth by increasing food moisture.
- Example: Mold growth in humid storage conditions.

3. Gaseous Atmosphere

- Oxygen availability affects aerobic and anaerobic microorganisms.
- Example: Vacuum packaging reduces oxygen, limiting aerobic bacterial growth.

4. Presence of Other Microorganisms

- Some microbes produce inhibitory substances (e.g., bacteriocins) that suppress competitors.
- Example: Lactic acid bacteria inhibit spoilage microbes in fermented foods.

By controlling these intrinsic and extrinsic factors, food spoilage and contamination can be minimized, improving food safety and shelf life.

