

FOOD MICROBIOLOGY

- Food Microbiology is the study of microorganisms that inhabit, create, or contaminate food, including the study of microorganisms causing food spoilage.



MICROORGANISMS IN FOOD

- Microbes are single-cell organisms so tiny that millions can fit into the eye of a needle. They are the oldest form of life on earth.
- The first realization that microorganisms were involved in food production processes was in 1837, when scientists discovered the role of yeast in an alcoholic fermentation.



WHAT KINDS OF MICROBES ARE FOUND IN FOOD?

- Bacteria
- Fungi (Yeasts and Moulds)
- Viruses

- Protozoans, Algae, Helminths to a lesser extent
- (Helminths = worms)
- Protozoans and Helminths are considered "accidental".



FACTORS AFFECTING MICROBIAL GROWTH IN FOOD

- Composition
- pH
- Presence and availability of water
- Oxidation-reduction potential
 - altered by cooking
- Physical structure
- Presence of antimicrobial substances



FACTORS AFFECTING MICROBIAL GROWTH IN FOOD

- **Temperature**
 - Lower temperature retard microbial growth
- **Relative humidity**
 - Higher levels promote microbial growth
- **Atmosphere**
 - Oxygen promotes growth
- **Modified atmosphere packaging (MAP)**
 - Use of shrink wrap and vacuum technologies to package food in controlled atmospheres



COMPOSITION AND PH

- Putrefaction
 - Proteolysis and anaerobic breakdown of proteins, yielding foul-smelling amine compounds
- pH impacts make up of microbial community and therefore types of chemical reactions that occur when microbes grow in good



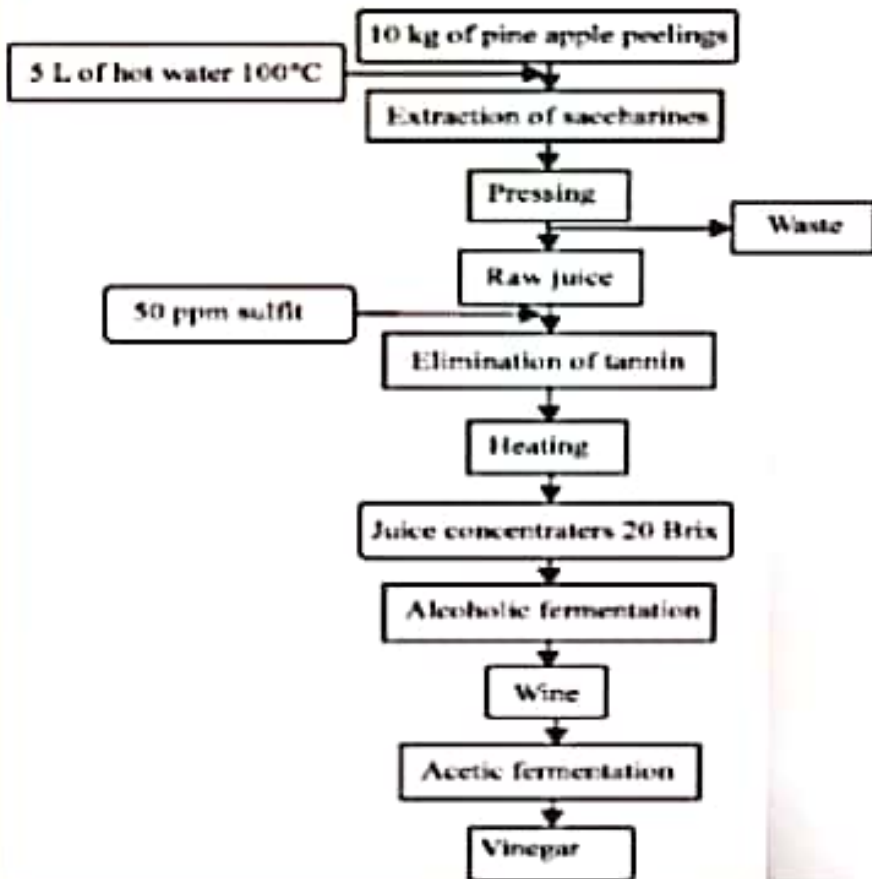
ROLE OF MICROORGANISMS IN PREPARATION OF CERTAIN FOODS

- Microorganisms are involved in producing many foods and beverages.
- Fermentation produces characteristic flavors, aromas, and consistencies of various foods.
- Microbial metabolism has other functions
 - I. Acts as a preservative
 - II. Destroys many pathogenic microbes and toxins
 - III. Can add nutritional value in form of vitamins or other nutrients
- Microbes are used in food production.



PRODUCT	COUNTRY NAME	MICROORGA NISMS	SUBSTRATE
Bread	International	Saccharomyces cerevisiae, yeast, lactic acid	Wheat, rye, other grain
Nan	Pakistan	Saccharomyces Cerevisiae	White wheat flour
Soy Sauce	International	Aspergillus oryzae or A. soyae Lactobacillus	Soybeans and wheat
Cheese	International	Lactic acid bacteria	Milk
Yogurt	International	S. thermophilus, Lb. bulgaricus	Milk, milk solids
Sauerkraut	International	Lactic acid bacteria	Cabbage

VINEGAR PRODUCTION



THE WINE MAKING PROCESS

- Produced from the fermentation of fruit juice, usually from grapes
- The grapes are crushed to form a “must”
- For white wines, white grapes are usually used, and the skins are removed from the must (“pressing”) before fermentation
- For red wines, red or black grapes are used, and the skin is allowed to remain during fermentation
- For rosé wines, red grapes are used and the juice is allowed to remain in contact with the skins just long enough for a rose or pink colour to develop



WINE

- It must undergoes primary fermentation
- Malolactic fermentation by bacteria in the must converts malic acid into lactic acid
- Secondary fermentation and aging
- Takes 3-6 months
- The vessel is kept airtight to prevent oxidation
- Proteins are broken down, and particles settle
- Blending and bottling



ROLE OF MICROORGANISMS IN FOOD SPOILAGE

- Food spoilage means the original nutritional value, texture, flavor of the food are damaged, the food become harmful to people and unsuitable to eat.
- Microbial spoilage:
- There are three types of microorganisms that mostly cause food spoilage .
 - yeasts
 - moulds
 - bacteria



- Storage rot in grapes caused by *Botrytis cinerea*.



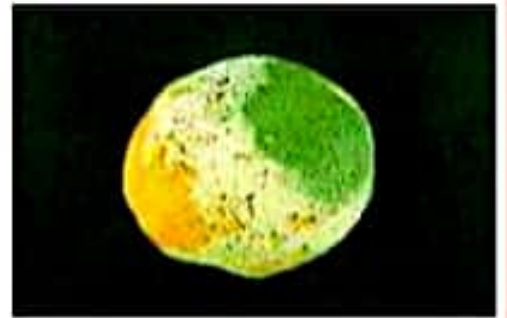
- Blue mould rot in tomato caused by *Penicillium* spp. (also by *Fusarium* spp.)



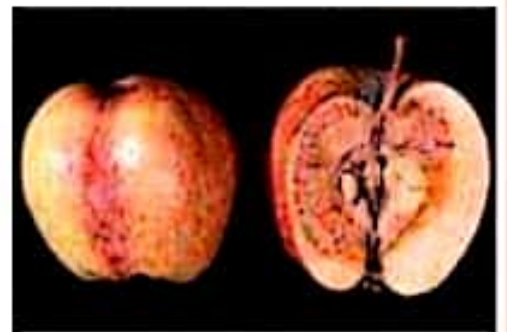
- Storage rot in strawberry caused by *Botrytis cinerea*.



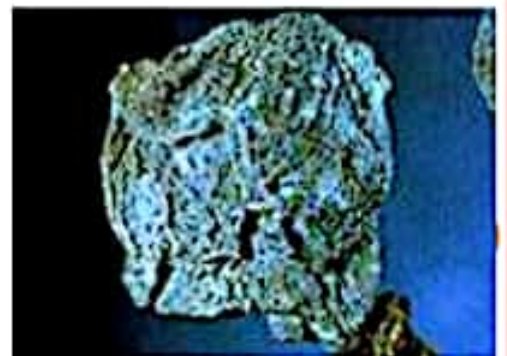
- Blue mould on oranges caused by *Penicillium digitatum*.



- Watery soft rot in apple caused by *Sclerotinia sclerotiorum*.



- Black mummy rot of grapes caused by *Guignardia bidwellii*.



FOOD BORNE DISEASE

Food-borne infection

BACTERIAL	PARASITIC
1. Typhoid	1. Ascariasis
2. Cholera	2. Amoebiasis
3. Bacillary Dysentery	3. Trichinosis
4. Salmonella infection	4. others
5. Others	