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DRYING

- Oldest method of Preservation.
- Removal of water/moisture from a product to pre- determined level, the low water activity attained by food products extends the shelf life of dried foods without the need for refrigerated storage or transportation.
- For e.g. Liquid milk is highly perishable, whereas milk powders are more stable and easier for preservation and handling.
- Drying removes the moisture from the food so bacteria, yeast and mold cannot grow and spoil the food. Drying also slows down the action of enzymes (naturally occurring substances which cause foods to ripen), but does not inactivate them.
- Because drying removes moisture, the food becomes smaller and lighter in weight. When the food is ready for use, the water is added back, and the food returns to its original shape.
- Foods can be dried in the sun, in an oven or in a food dehydrator by using the right combination of warm temperatures, low humidity and air current.
- In drying, warm temperatures cause the moisture to evaporate. Low humidity allows moisture to move quickly from the food to the air. Air current speeds up drying by moving the surrounding moist air away from the food.

WATER ACTIVITY

Dehydration accomplishes preservation in two ways:

1. Removes the water necessary for growth of microbes and for enzymatic activity.
2. Removal of water, as it increases the osmotic pressure by concentrating salts, sugars, acids thus creating environment which is unfavourable for growth of microbes. The maximum water activity of dried food is below 0.70, which is below the minimum value for food pathogens.

MOISTURE CONTENT

- Expressed either in wet basis i.e. mass of water per unit mass of wet material or dry basis i.e. mass of water per unit mass of dry solids.
- Equilibrium Moisture content- moisture content after equilibration with specified conditions of temperature and humidity
- Water within food will be either bound or unbound to solids, this influences the drying process and stability

MECHANISM OF DRYING

1. INITIAL SETTLING DOWN- No loss of moisture, reaches to wet bulb temperature.
2. CONSTANT RATE PERIOD- CMC (Critical Moisture content) is reached, moisture from food product to atmosphere > moisture from atmosphere to outer surface of grain.
3. FALLING RATE PERIOD- Rate of drying falls in this period. Products can be packaged after this process, as this marks the end of the process of drying.

FACTORS THAT INFLUENCE DRYING OF FOOD

1. Drying Temperature- This varies with food and the method of drying, greater the temperature difference between heating medium and food, greater the rate of heat transfer
2. Relative Humidity of air- Sorption characteristic of food to be dried should be known, as EMC is the lowest moisture content that can be achieved under given set of temperature and humidity conditions.
3. Velocity of air- Higher the velocity of air, more efficient the process of drying
4. Drying Time- Drying time depends upon the type of food and its moisture content and temperature.

PURPOSE OF DRYING

1. Preservation of foods
2. Decreasing the weight and bulk of food to economize shipping and canning costs.
3. Production of convenience products such as instant coffee, milk powder, instant mash potatoes

DRYING PROCESSES

Drying processes falls in 3 categories:

1. Air and contact drying- Heat is transferred through food materials either from heated air or heated surface.
2. Vacuum drying- Heat transfer is generally by conduction sometimes by radiation.
3. Freeze drying- the water is sublimed off from frozen food, structure of the food product is maintained.

METHODS OF DRYING

1. SUN DRYING

2. USE OF MECHANICAL DRIERS

a) By Heat

b) Direct contact with Heated Surface

c) Application of Energy From Radiating Microwave Or Dielectric Source

3. FREEZE DRYING OR LYOPHILIZATION