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Basics of Nutrition

Health:- Health is defined by world health organization as a state of complete physical, social and mental well being, not merely the absence of any disease and infirmity. The essential requirements of health are optimum growth and development, maintenance of structural integrity and functional capacity of the body, ability to withstand the process of ageing with minimal loss of ability, ability to fight diseases, ability to fight diseases by resisting infections, resisting the effect of environmental pollutants and toxins.

Nutrition:- It is derived from the Latin word *nutrire* which means feed, nourish and is a science of foods, nutrients and other substances they contain and their actions within the body.

Malnutrition:- It results from a lack, excess or imbalance of nutrients in the diet, it includes under nutrition and over nutrition.

Under nutrition:- It is insufficient supply of essential nutrients and **Over nutrition** refers to an excessive intake of one or more nutrients.

Nutrients:- They are substances required by body to perform its basic functions. Most nutrients are obtained from our diet since the human body does not synthesize or produce them. They have three basic functions

- i) they provide energy and contribute to body structure and regulate chemical process in the body.

* methionine in legumes.
* cysteine in wheat.

* legumes & protein in pulses.
* vitamins in seeds.
* cereals have carbohydrates.

There are six classes of nutrients which are required for the body to function and maintain overall health.
Carbohydrates lipids protein water
vitamin minerals.

Food may also contain a variety of non-nutrients. Some non nutrient such as anti oxidant, natural toxins and additives, phytochemicals.

Nutrients that are needed in large amount are called macronutrients. Classes:- Carbohydrates, lipids and protein. Nutrients that are needed in small amount are called micronutrients. classes:- Vitamins and minerals. These are essential for carrying out bodily function but in lesser amount.

Classification of food by origin:-

- (i) Plants (ii) Animals
- direct (meat, fish)
 - indirect (milk products).

Classification of food by function:-

- (i) Energy yielding foods :- This group includes food rich in Carbohydrate, fats and proteins. They are divided into ^{two} ~~three~~ groups (a) cereal, pulses, roots and tubers (b) fat, oils and pure carbohydrates like sugar.
- (ii) Body building foods :- Foods rich in protein are called body building foods. Eg. (a) Milk, Egg, meat and fish are rich in protein and have all essential amino groups. (b) Pulses, nuts and oil seeds are rich in protein but might not contain all essential amino acids.

→ how efficiently body can absorb is biological value.



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(iii) Protective foods:- Foods rich in protein, vitamins and minerals have regulatory function in the body like maintaining heartbeat, water balance, temperature etc. They are classified into two groups:- (a) Food rich in vitamin, mineral & protein of high biological value. Eg. milk and ^{fish} fruit. (b) food rich in certain vitamin and mineral only. Eg. green leafy vegetable and fruits.

Classification on the basis of nutritive value:-

- (i) Cereal grains and products:- include foods like rice, wheat, ragi, bajra, maize, wheat flour, oats, barley etc. Main nutrients present are energy, protein, fat, vitamin B1, B2, folic acid, iron and fibre and provide 10-15% of calories.
- (ii) Pulses and legumes:- It includes foods like green dal, red dal, mung, bengal dal. They are rich in energy, protein, fat, vitamin B1, B2, folic acid, calcium, iron and fibre. & 19-24%.
- (iii) Milk and Meat product:- It includes protein, fat, calcium, ~~and~~ vitamin, phyto chemicals.
- (iv) Fruits and vegetables
- (v) Fats and sugars:- They are helpful

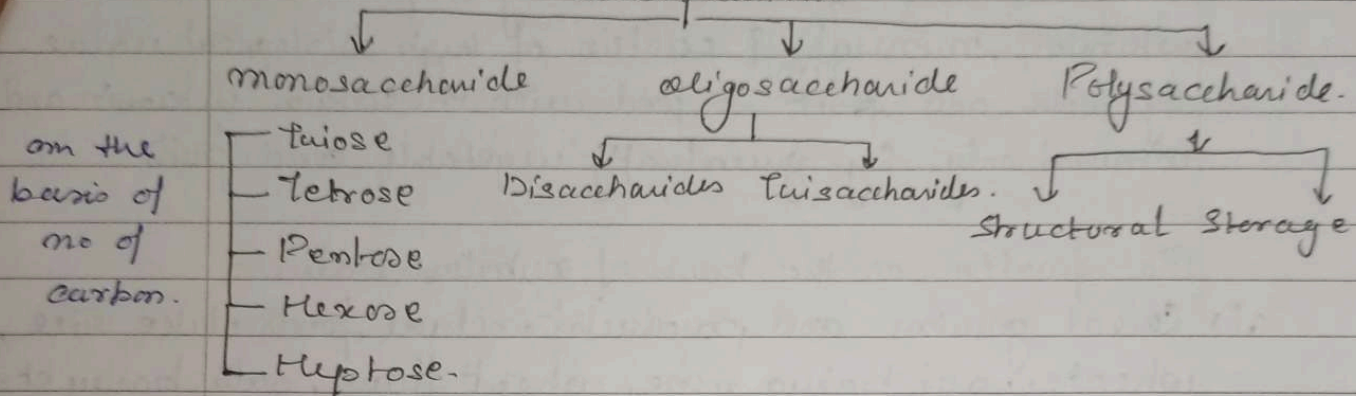


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polyhydroxy \rightarrow multiple hydroxyl group (OH)
hydrolyse \rightarrow breaking down in presence of water.

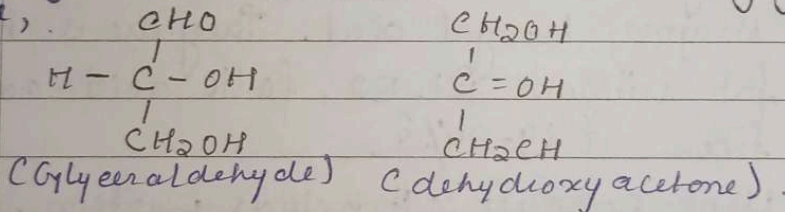
Carbohydrates (hydrates of Carbon) $C_x(H_2O)_y$ [C₆H₁₂O₆] sugar.
Carbohydrates are polyhydroxy aldehyde or ketone or their compounds that can be hydrolyse to them.

classification.



Monosaccharides:- They are simplest carbohydrates that cannot be hydrolysed further. On the basis of groups \rightarrow aldose \rightarrow ketose. Triose - glyceraldehyde.

Example,



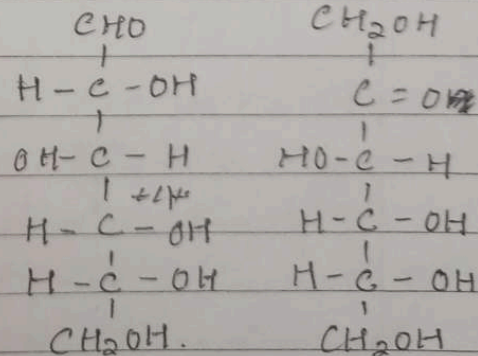
| | aldose | ketose |
|------------|-----------|-------------|
| Tetrose 4C | Erythrose | Erythrulose |
| Pentose 5C | Ribose | Ribulose |
| Hexose 6C | Glucose | Fructose |

Tetrose \rightarrow (Erythrose, Erythrulose).

Oligosaccharides:- They are hydrolysable chain of two to ten monosaccharides unit.

Disaccharide

- ① Maltose (2 units of glucose) α -1,4 glycosidic linkage.
- ② Lactose (Glucose + Galactose) β -1,4 glycosidic linkage.
- ③ Sucrose (Glucose + Fructose) α -1,2 glycosidic linkage.



Reducing Sugar (monosaccharide, Maltose, lactose).

Non Reducing Sugar (Sucrose).

Polysaccharides :- They are polymers with hundred or thousand saccharide units.

Storage polysaccharides

1. Starch :- It is a storage form of glucose in plants. It contains mixture of amylose and amylopectin.

Amylose is linear unbranched polymer of α -D-glucose units in repeating sequence of α -1,4 glycosidic linkage. Amylopectin is a branched polymer of α -D-glucose with α -1,4 glycosidic linkage and α -1,6 glycosidic linkage that occurs at interval of 25 to 30 glucose residues.

2. Glycogen :- It is a storage form of glucose in case of animals. It is highly branched form of amylopectin. α -1,6 branching occurs every 8-10 glucose residues and latter are in α -1,4 linkage.

Structural Polysaccharide

Homopoly
saccharide

The most abundant polysaccharide is cellulose. It is present in wall of plants it is linear unbranched homopolysaccharide.

Chitin. It is a linear homopolysaccharide and is present in exoskeleton of insects.

Heteropolysaccharides. These are composed of repeating disaccharide units that consists of acidic sugar linked with amino sugar. Eg Hyaluronic acid, it is present in vitreous eye, and as synovial fluid. Eg, Heparin, it is an anticoagulant.



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Function of Carbohydrates

- (i) Provide constant energy to body.
- (ii) Act as reserved food for body emergency.
- (iii) They form other biomolecules like fat.
- (iv) It helps in detoxification of body.
- (v) It acts as constituent of genetic material.
- (vi) Gives mechanical strength to body.

Assignment

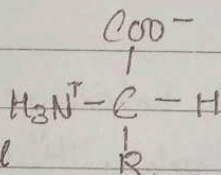
Unit-02. Cereals and Millets.

Concept of milling, Processed products of wheat and rice. Types of Millets and food uses.

~~Get~~ →

Protein

Amino Acid



On the basis of side chain or presence of R group.

| ↓ Basic Amino acid | ↓ aromatic amino acid | ↓ non-polar, amino acid | ↓ polar amino acid | ↓ acidic amino acid |
|-----------------------------|-----------------------------|-------------------------------|--------------------------|------------------------------|
| - Lysine | - Phenylalanine | - Glycine | - Proline | - Serine |
| - Arginine | - Threonine | - Alanine | - Threonine | - Glutamate |
| - Histidine | - Tryptophan | - Valine | - Cysteine | - Aspartate |
| | | - Leucine | - Asparagine | |
| | | - Isoleucine | - Glutamine | |
| | | - Methionine | | |

Protein: - They are polymers of amino acid, these are compounds containing carbon, hydrogen, oxygen and Nitrogen. They serve as monomers of proteins and are composed of an amino group, carboxyl group, hydrogen atom and a distinctive side chain.

Based upon nutritional requirements amino acids are divided into three groups.

(i) Essential amino acids:- These amino acids that are not

Synthesized in the body and are required to be supplied in the diet. There are eight essential amino acids which include methionine, ~~tryptophan~~ Threonine, Tryptophan, Valine, leucine, Isoleucine, ~~lysine~~ lysine and phenylalanine.

(ii) Semi-Essential amino acid:- These aren't essential for normal body functions but requirement increases during growth, pregnancy, lactation. for example arginine and histidine.

(iii) Non-Essential amino acids:- These are generally synthesized by body and are not required in diet. Eg. glycine, Alanine, Asparagine, Glutamine, proline.

Classification on the basis of shape and solubility.

(i) Fibrous protein:- These are long rod shaped molecules that are insoluble in water and physically tough. for eg, Keratine protein present in hair, skin and nail.

(ii) Globular protein:- These are compact spherical molecules that are usually water soluble. Eg. Hemoglobin, Myoglobin.

(i) Simple protein:- These are those protein that contains only amino acid.

(ii) Conjugated protein:- These consist of simple protein combined with non-protein component. This non protein



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component can be a carbohydrate or metalline
Functions of Protein:-

- (i) Growth and development of body.
- (ii) Replace worn out cells
- (iii) Muscle building
- (iv) Transport of various gases, waste product and bio-molecules.
- (v) Regulation of body functions
- (vi) Protein act as storage of iron and calcium in the form of Casein and keratine
- (vii) Provides defense to the body in the form of anti-bodies.
- (viii) Helps in muscle contraction. (Actine and Myosine).

Biological Value of Protein:- It is a measure of proportion of ~~pro~~ absorbed protein from a body food which becomes incorporated into organism's body. It is number from 100 to 0 like protein in Eggs have highest biological value i.e., 94.

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Lipids $\begin{cases} \rightarrow \text{Simple (fat \& waxes)} \\ \rightarrow \text{Complex} \\ \rightarrow \text{Derived} \end{cases}$

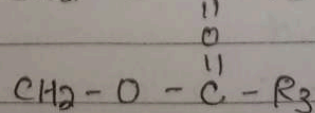
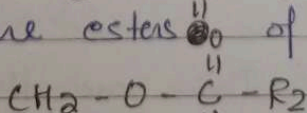
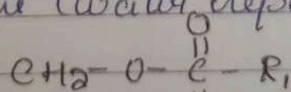
They are chemically diversified groups of organic compounds insoluble or poorly soluble in water and readily soluble in non-polar solvents, such as chloroform, ether or benzene. They are hydrophobic in nature (water repelling).

Simple lipids

- O - Ester bond

Eg. fats:- fats are esters of fatty acid with glycerol

$\begin{cases} \text{CH}_2 - \text{O} \\ \text{CH}_2 - \text{O} \\ \text{CH}_2 - \text{O} \end{cases} \begin{cases} \text{Ester of fatty} \\ \text{acid with} \\ \text{Glycerol.} \end{cases}$



Fats are also called triacylglycerol.

Fatty acid:- They are simplest form of lipids, ^{they have long} and ~~are~~ as hydrocarbon chain with a carboxyl group. They are $\text{CH}_3 - \overset{\text{H}}{\underset{|}{\text{C}}} - \overset{\text{H}}{\underset{|}{\text{C}}} - \text{COOH}$. divided into two group:-

Saturated fatty acid and unsaturated fatty acid

Saturated fatty acid have no double bond in their chains. If they have 12 carbon chain they're called lauric acids, for 14 carbon chain Myristic acid, ¹⁶ 16-carbon chain ~~poly~~ palmitic acid, ¹⁸ 18-carbon chain stearic acid. These are solid at room temperature.

Unsaturated fatty acid have one or more double bond and are called as mono unsaturated and poly-unsaturated fatty acids. for Eg, oil (liquid at room temperature).

Example, oleic acid ($\text{C}_{18:1}$)⁹, linoleic acid ($\text{C}_{18:2}$)^{9,12}, linolenic acid ($\text{C}_{18:3}$)^{9,12,15}, Arachidonic acid ($\text{C}_{20:4}$)^{5,8,11,14}.

Waxes:- They are esters of long chain of saturated and unsaturated fatty acids with long chain alcohol.

Complex lipids:-

They are esters of fatty acid containing groups like phosphoric acid carbohydrate group in addition to alcohol and fatty acid. Eg:- Glycolipid and Phospholipid.

Derived lipids:-

They consist of fatty acid, glycerol and sterols. Example cholesterol and vitamin D.

Essential fatty acids:- These fatty acids cannot be synthesized by body and need to be taken in diet, they promote growth and maintain integrity.

Eg:- linoleic, arachidonic

These are also known as polyunsaturated fatty acid.



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It's sources are fish, walnut, flaxseed
 Non Essential fatty acid :- These fatty acids can be synthesized by body, for eg, palmitic and steric.

Functions of lipids

- (i) ~~They~~ They serve as storage form of metabolic fuel
- (ii) They serve as transport form of metabolic fuel.
- (iii) They provide structural component of membrane.
- (iv) They have protective action in bacteria and insects.
- (v) Biological lipid serve as pigments, hormones, signalling molecules and as cofactor.

09/10/24

Processing of fruits and vegetables.

washing >> sorting and grading >> Size reduction.
 Soaking. Lust, density, shape > quality > small pieces, peeling, freezing.
 cleaning > > >
 LWB not reduced.

Potassium permanganate / Sodium hypochloride :- dilute soln for washing.
 0.1%

Peeling / coring / sizing.
 Central inedible p

Methods of peeling.

- | | |
|----------------------------------|-----------------------------|
| 1. Flash peeling (root crops) | 3. Hand peeling (potatoes). |
| 2. Knife peeling (citrus fruit) | 4. Caustic peeling (Guava). |
| 5. Flame peeling (onion/garlic). | or dye peeling. |

Blanching :- to inactivate enzyme (polyphenol oxidase) that cause browning by supplying mild heat ($\leq 100^\circ\text{C}$).

- ① Pectin Methyl Esterase :- present in fruit juices, causes
- ② Polygalacturonase } a texture.

products of fruit & veg. ^{scarcity} Nutrients: - ^{carb. fats} deficiency
 night blindness ^{carb. fats} deficiency
 what is canning? ^{acc. - O₂} classification
 processing of food and vegetable.

Date

Ripening: - Some fruits that ripens after plugging: -

Apple, banana, mango

Products - Jam, jelly, chips, candies, Ketchup, Olives

Ethylene treatment, Calcium Carbide.

Types of products: -

(A) Frozen: - peas, corns ISF: - Individual Quick Freezing.

Types of freezing.

(1) Quick freezing (0 to -40°C for 30 min)

(2) Slow freezing (-15 to -29°C for 3 to 72 hours)

(3) Cryogenic freezing (-196°C)

(4) Dehydro freezing (50% moisture is removed)

(B) Dehydrated Products: - Removal of moisture.

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Dryers: - (i) fluidized bed dryer, spray dryer, freeze dryer.
 ↳ motion. ↳ atomization. ↳ Sublimation.

Canning: - Thermally sealing a product vacuum tight after heating.

Product: - blueberries, pineapple.

Headspace: - upto where the product is filled in can to smoothly conduct rxn.

washing > grading > peeling > size reduction >

blanching (to stop enzym act, or enhance colour).

Types: - (i) hot water blanching (80-85°C) (3-5 min)

(ii) Steam blanching. (Syruping).

> Cooling (to avoid cooking) > Sugar syrup (fruit) >

brine solution (vegetable) (2-3%) > headspace (3-5 cm)

> exhausting (removing air)

Packaging & filling > exhausting > sealing > sterilization (autoclaving) > cooling.



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Pectin \rightarrow helps setting,
(Guava) texture.
(Jam \rightarrow Sugar + acid).

* Processed products of fruits and vegetables.

Total soluble solid \rightarrow Refractometer

(to check consistency) (Equipment used)

- ① Jam - pulp ② Jelly - fruit juice ③ Marmalade - peels of fruits
(65°C brix) (65°C brix / 0.6-0.7% acidity)

- ④ Candies - heavy sugar syrup ⑤ Squash - ^{Sulphur dioxide} Sodium benzoate.
(45°C brix) (1% acidity)
concentrated fruit juice or pulp

- ⑥ Cordial :- Sparky clear fruit juice without pulp or
(30°C brix) suspended particle. (1.5% acidity).

Products :- Tomato Ketchup.

\rightarrow thick in consistency
(25°C brix).

Sauces

\rightarrow thin in consistency
(25°C brix).