

CARBOHYDRATES

- Polyhydroxy aldehydes / ketones $\xrightarrow{\text{OH}}$, either A/K

Monosaccharides

- C_3 to C_9 carbon atoms.

- Bioses

Trioses eg:- Glyceraldehydes.

Tetroses eg:- Erythrose

Pentoses

$\xrightarrow{\text{OH}}$ of Polysaccharides like
mucilage, gums, gemides
eg:- Hemicellulose, Ribose,
Xylose.

Hexoses \xrightarrow{OH} ~~of~~

Polysaccharides like starch, Inulin.

Aldoses - Glucose, Mannose, Galactose

Ketoses - Fructose, Sorbose

→ Heptose: Rarely found in plants
eg:- Glucoheptose
Mannoheptose

Disaccharides:

④ Sucrose \xrightarrow{OH} Glucose + Fructose
(sugarcane)

Maltose \xrightarrow{OH} Glucose + Glucose

Lactose \xrightarrow{OH} Glucose + Galactose
(cows milk)

Trisaccharides:

Raffinose \xrightarrow{OH} Glucose + Fructose + Galactose

Gentianose \xrightarrow{OH} Glucose + Glucose + Fructose

Tetrasaccharides:

stachyose \xrightarrow{OH} 3 Galactose + Fructose

Polysaccharides:

produced from monosaccharides by condensation with the elimination of water.

① Pentosans - Xylan

② Hexosans - Starch, inulin, cellulose

Oligosaccharides: condensation products of 2 or 10 monosaccharides
eg:- Maltotriose.

Gums:

- Polyuronides.

Ca, K & Mg salts of polyuronides.

Gums + Dil Acid $\xrightarrow{\Delta}$ Sugars + uronic acid

Mucilages:- sulphuric acid esters.

→ Polyuronides & consists of protopectin, pectin, pectinic acid, Ca-pectate.

Pectin * 7% of methoxy groups

Neutral methoxy ester of aldobionic acid - pectin acid. 78% of galactouronic acid

Glycogen - Storage form of energy

ID tests

① Molish's Test:

Carbohydrates + α -naphthol + H_2SO_4
↓
purple colour

② Redⁿ of Fehling's Soln:

sample + Fehling's A & B → Brick red ppt.

③ Osazone formⁿ

sample + phenylhydrazine HCl + Na-acetate + acetic acid → Osazone crystal (sugar)

—/—/—

④ Pentose test:

Sample + Equal vol of HCl + $\frac{1}{2}$ phloroglucinol \downarrow
Red colour

II. b.

⑤ Keller Killani test for Deoxysugars:

Deoxysugar dissolved in acetic acid with $\text{FeCl}_2 \rightarrow$ Transfer to surface of H_2SO_4
 \downarrow

At the junction of liq \rightarrow Reddish brown colour turns blue.

⑥ Resorcinol test for Ketones:

Sample + Resorcinol crystals $\xrightarrow{\Delta}$ Water bath
+ eq. vol of conc. HCl

\downarrow
Rose color shows trace of ketose
eg:- Honey, Fructose, hydrolysed insulin

Honey: By *Apis melifa*, doosaba
Apidae

Nectar of flower \rightarrow 25% sucrose
75% water

Nectar $\xrightarrow{\text{Invertase}}$ Invert sugar

\hookrightarrow sucked by proboscis (hollow mouth tube)

Δ to 80°C

Honey density 1.35

S.R \rightarrow +3 to -10

† Natural Honey 1.47.

Extracted by centrifugation.

Ash: 0.1 to 0.8 %

Enzymes +nt in honey - Invertase
Diastase (S.D.T.)
Inulase

Aq sol of Glucose - 35 %
Fructose - 45 %
sucrose - 2 %

Fiehe's Test:

- Does not give red colour with resorcinol in HCl.

Starch: (Amylum)

- NaOH (5%) soln is used in rice for prep of starch.
- Drained water from maize starch is used in culture medium of penicillin
- SO_2 is used to prevent fermentation. ^{in corn starch}
- Corn oil contains oleic & linoleic acids & Vit E.

Asst $\approx 0.3\%$ P, W, M
 $\approx 0.6\%$ Rice

Rice starch - Simple (Polyhedral) ^{2-12 μ}
Compound (ovoid egg shape) ^{2-150 μ} components

Wheat starch - simple lenticular (Biconvex lens) ^{5-50 μ}
2-4 components

Hilum \rightarrow point in starch granule around which layers of starch are deposited



Maize starch

Polyhedral/Round 5-31 μ dia
① distinct cavity in center

Potato starch (Sub spherical, ovoid)
30-100 μ

hilum near narrow end. \bar{c} conc striation
② (no. of tiny parallel grooves, scratches)

Chemical constituents

Amylose (β -Amylose) — water sol

Amylopectin (α -D-Amylose) \rightarrow 1:2
 \hookrightarrow water insoluble, swell \bar{c} gelatinising property.

Amylose + $I_2 \rightarrow$ Blue colour

Amylopectine + $I_2 \rightarrow$ Bluish black

Uses:- In preph of Talcum powder.

Antidote in I_2 poisoning

Disintegrating agent in pills & tabs

Diluents

Glycerine of starch \rightarrow Emollient
& suppository
base.

— / — / —

- Starch is the starting material for mfg of lig. glucose, dextrose, dextrin.
(DPLG)

Adulterant: Tapioca/Cassava/Brazilian arrow root
(RBC) 4m *Manihot esculenta*
(Euphorbiaceae)

Gelatinising property of ~~starch~~ Potato & Maize starch by HCl.

AGAR (Agar-Agar, Veg. Gelatin, Japan or China Gelatin, Japan Isinglass)

Bleached, dried gelatinous subs 4m
Gelidium amansii (Japanese agar)
Gelidaceae.

Red algae \rightarrow Gracilaria \rightarrow Gracilariaceae.
Pterocladia \rightarrow Gelidaceae.

In America, Deep freezing method is used.

-ve result with I_2 solution.

(c) Heterogenous polysaccharides.

Agarose \rightarrow ~~Rep~~ the gel strength. — | — | —

Agaropectine — Resp for viscosity of agar solutions

~~Agar~~

Agarose \rightarrow D-galactose & 3,6 anhydro L-galactose units.

Agaropectin \rightarrow Sulphonated polysaccharides where Galactose and uronic acids units are partly esterified \bar{H}_2SO_4

ID Test:

\rightarrow With Ruthenium red, pink color is produced.

\rightarrow $\bar{0.02 M I_2}$ soln \rightarrow Deep crimson (Deep Red color)

* Differentiates it from acacia & Tragacanth.

\downarrow
to Brown colour

\rightarrow No N_2 , so -ve test with Millon's reagent (No ppt)

$\bar{0.2\%}$ soln in Tannins \rightarrow No ppt

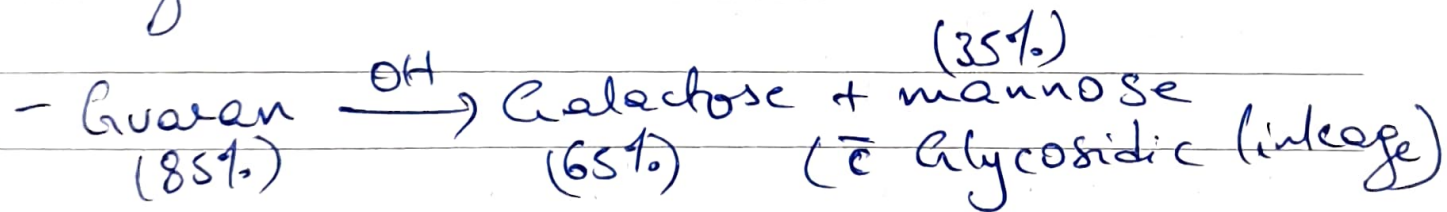
$\bar{\text{soda line}}$ — No ammonia

Uses:-

- Gels of pure agarose in electrophoresis of proteins.
- Lubricant
- Wound dressing
- Affinity Chromatography.
- In Dentistry

Guar Gum (Jaguar Gum, Guar flour)

- Lm Endosperm of *Cyamopsis tetragonolobus* leguminosae.



IO Test

- ① Guar gum + I_2 soln \rightarrow No olive green colour.
- ② Guar gum + Ruthenium Red \rightarrow No pink colour
(distinction Lm agar & Sterculia gum)
- ③ Guar gum + 2% Pb. acetate \rightarrow ppt
- ④ \bar{c} H_2O_2 & Benzidine (alc) \rightarrow No Blue colour
(distinction Lm acacia gum)

Uses:- Appetite suppressant
Pepic ulcer.

Anti diabetic
Anti hypolipidemic

Binder & Disintegrating agent.

TRAGACANTH

(Coat) (Horn) - Greek

- Dried gummy exudation from stem & branches
of *Astragalus gummifer*
(Leguminosae)

Ribbon like incisions collected from
April to November

Horny & transverse & longitudinal ridges.

Tragacanthin (water soluble) - 8-10%
Bassorin (water insoluble) 60-70%

- 15% Methoxy group that swells in water.

OH → Galacturonic acid
D-Galactopyranose
L-arabinorhamnose
D-xylopyranose

Uses:- Binding agent
Thickening agent.

(Phaeophyceae)

SODIUM ALGINATE (Na. polymannuronate)
(cont in cell wall)

Alginic acid - polyuronic acid composed of reduced mannuronic & glucuronic acid

- It is purified carbohydrate extracted from Brown seaweed by dil. alkali.

In India - near Saurashtra
largely in USA, UK

- Disc by Stanford in 1880

→ Sea weeds are extracted in Na_2CO_3 soln

ID Test:

① Ag. soln of Na. Alginate } ~~+~~ \rightarrow Copious ppt
+ CaCl_2 soln

② 1% soln in water + dil. $\text{H}_2\text{SO}_4 \rightarrow$ Heavy
Gelatinous
ppt