



**Centurion**  
**UNIVERSITY**

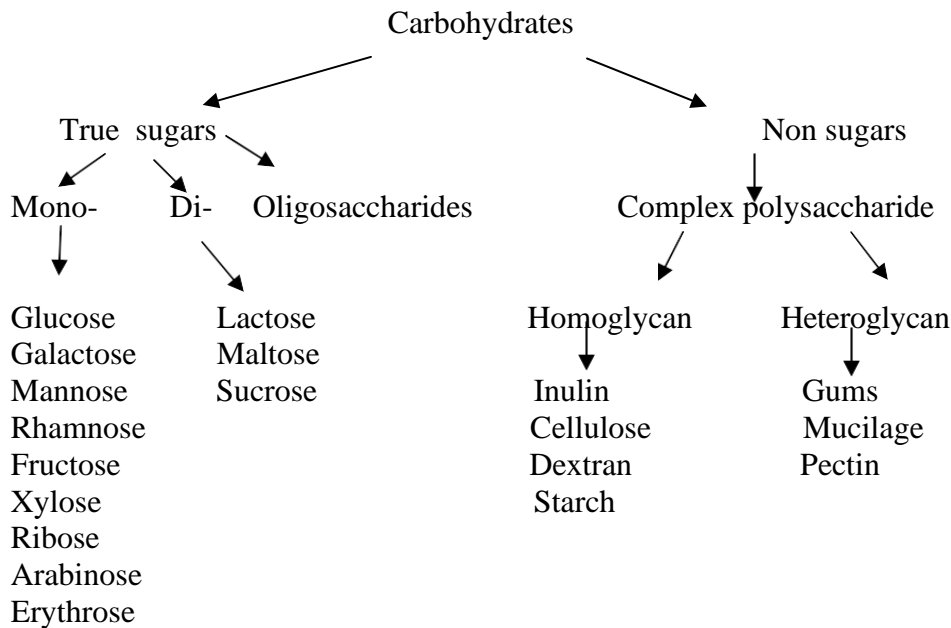
Shaping Lives...  
Empowering Communities...

## EXPERIMENT NO: 1

### Carbohydrates Starch

#### Definition:

Carbohydrates: natural plant products – organic compounds consist of C,H and O .



**Complex polysaccharides:** substances with very high molecular weight and consist of a large number of monosaccharide units linked together through glycosidic linkage.

#### **Starch ( *Amylum* ):**

Natural plant product which is a mixture of amylose (25%) and amylopectin (75%).

#### **Amylose:**

- Linear molecule consists of 250 – 300 glucose units of  $\alpha$  – D – glucose units linked together through  $\alpha$  – 1,4 glycosidic linkage.
- More water soluble than amylopectin
- Amylose + I<sub>2</sub> → blue color

#### **Amylopectin:**

- Branched molecule consists of more than 1000 units of  $\alpha$ - D – glucose linked together through  $\alpha$  – 1,4 and  $\alpha$ - 1,6 glycosidic linkage.
- Amylopectin is less water soluble than amylose.
- Amylopectin + I<sub>2</sub> → violet color

#### **Plants containing starch:**

- ✓ Cereal seeds contain 50- 65 % starch
- ✓ Ginger rhizomes 50% starch.
- ✓ Potato tubers 80- 90% starch.

#### **Commercial sources of starch:**

1. Corn starch: isolated from the caryopses of *Zea mays L.* – (*Graminae*)
2. Wheat starch: isolated from the caryopses of *Triticum aestivum L.* – (*Graminae*)
3. Rice starch: isolated from the caryopses of *Oryza sativa L.* – (*Graminae*)
4. Potato starch: isolated from the tubers of *Solanum tuberosum L.* – (*Solanaceae*)

### **Properties of Starch:**

1. White mass powder, odorless with starchy taste
2. Insoluble in water and form colloidal solution with water.
3. Starch + I<sub>2</sub> → Deep blue color.
4. Starch + NaOH or chloral hydrate → gelatinization
5. Starch + H<sub>2</sub>O → gel ( with heat)
6. Corn starch and wheat starch have neutral pH  
Rice starch has slightly alkaline pH  
Potato starch has slightly acidic pH

### **Identification tests for starch:**

- 1) Give positive reaction with Fehling's solution test:  
Starch + HCl (hydrolysis) + NaOH (neutralization) + Fehling's solution → Red colour
- 2) Give positive reaction with Molisch's test  
Starch + H<sub>2</sub>SO<sub>4</sub> + α- naphthol → Purple ring
- 3) Starch + H<sub>2</sub>O → gel (jelly form) with heat
- 4) Starch + I<sub>2</sub> → deep blue → colour disappears (with heating) → the colour reappears with cooling.

### **The general uses:**

1. Nutritive.
2. Demulcent.
3. Pharmaceutical uses as tablets filler and binder.
4. Antipruritic: Baby paste®- (Vitamed company) used in case of diaper rash, skin irritation (ZnO, Starch).
5. Industrial uses: papers, clothes.
6. Antidote in case of poisoning from Iodine.

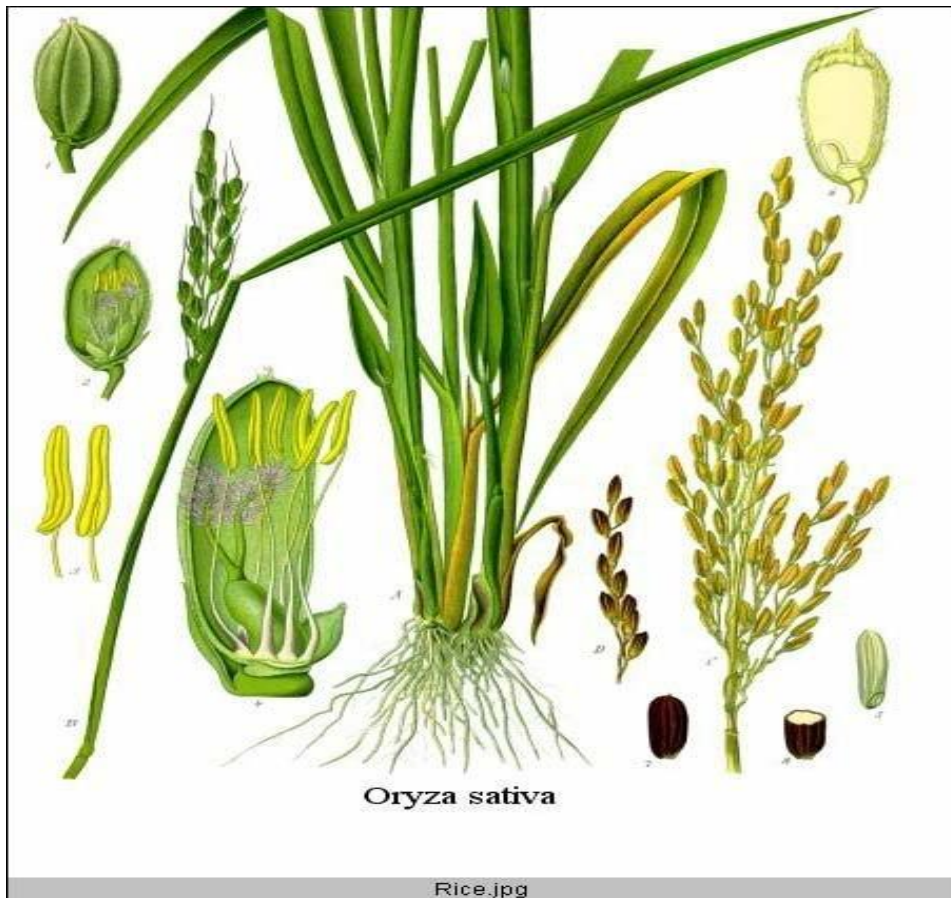
### **Microscopical characters:**

#### **I. Potato starch**

- Central and eccentric hilum ( dot shape )
- The horse shoe-shaped hila are eccentrically situated, small and unapparent
- Clear striations(rings are clearly evident)
- Mussel- shaped

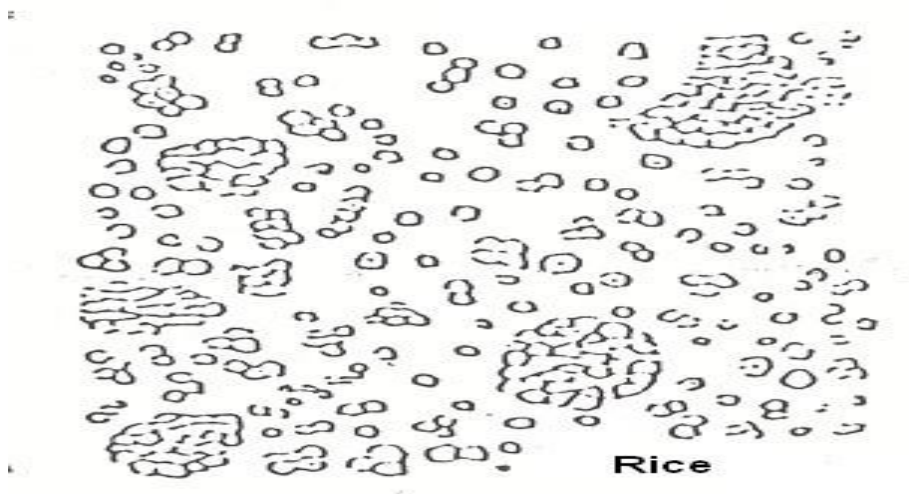


## Rice plant



## II. Rice starch

- They are very small, polyhedral and polygonal grains
- Aggregated from 2 – 150 component
- Sharp angles
- Rings and hila cannot be detected (Striations are absent)
- Very rare we can detect the presence of centric hila.

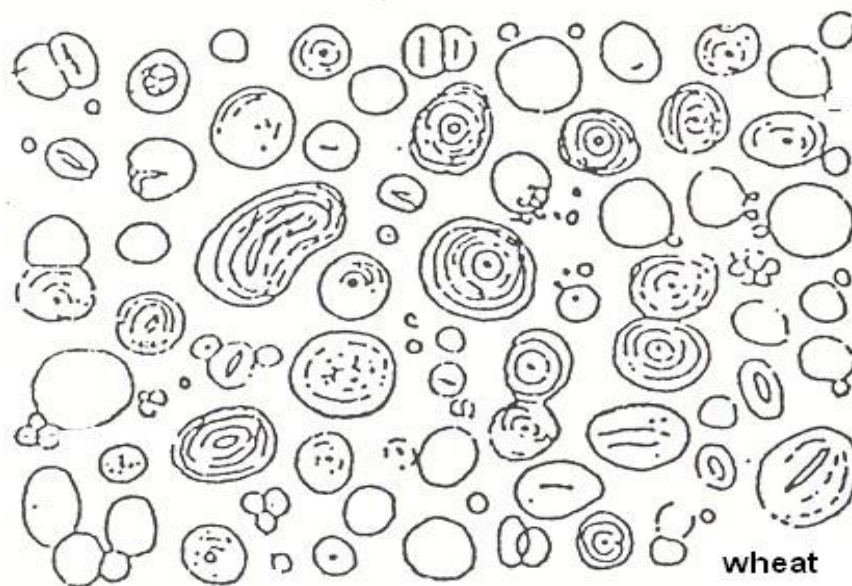


## Wheat plant

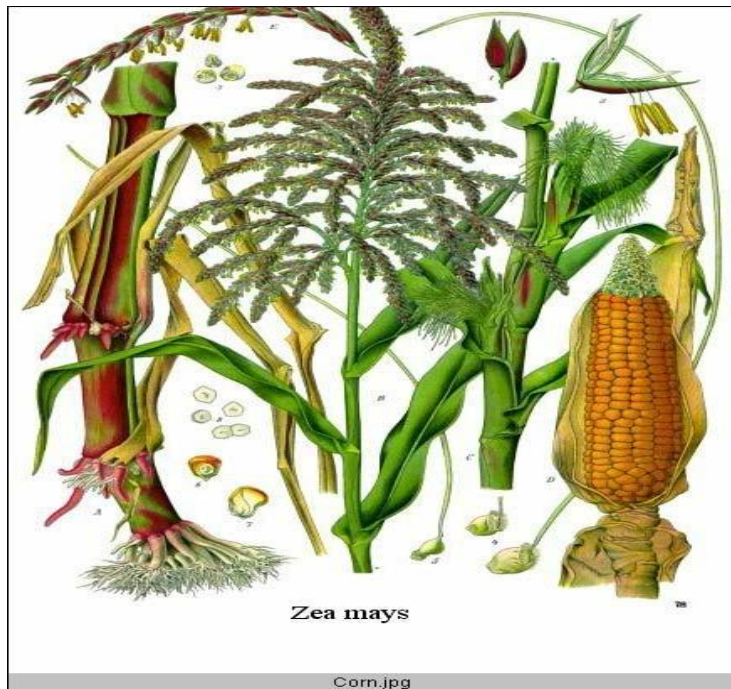


### III. Wheat starch

- Contain large granules.
- Lenticular.
- Smaller ones globular.
- Hilum is centric.
- Faint striations.
- Transition sizes are rare.



## Corn plant



### IV. Corn starch

- ❑ Rings (striations) are usually absent.
- ❑ Spheroidal and polygonal.
- ❑ Polyhydral
- ❑ The usually stellate hila can often be found
- ❑ X-Y hilum

