Stach: Composed of nemorous amount of Sugar molecules mainly (Glucose) that bind by (Glycosidic bond).

Experiment (1)
Microscopically Identification of Different Starch Types

major source of charbohydates in Plant.

Starch (polysaccharide) is the main form in which plants store carbon. It occurs as semi- crystalline granules composed of two polymers of glucose, called amylose and amylopectin. Depending on the plant organ, it can act as a store of carbon for lengths of time as short as a day (e.g., in leaves) or as long as many years (e.g., in dormant seeds). Starch granules are characterized by internal growth rings. There is enormous variation in granule size and shape between plant organs, and between species.

*Starch is energy source in Plant

Starch is the major carbohydrate of nutritional importance in the diet: it is degraded to glucose by amylases in the mouth and small intestine. When cooked in water, starch forms gels or pastes that have a wide range of industrial applicationsin both food and nonfood industries.

- ❖ **The starch granule consists mainly of two components:**

1. **Amylose:** long unbranched linear chain of glaucous residues, soluble in water.
2. **Amylopectin:** long branched chain of glaucous residues, insoluble in water. It is the major starch component and usually forming the outer layers of the granule. (major around 80% of the starch)

- ❖ **Use of starch in pharmaceutical industry:**

1. Dusting powder (in which adsorbent properties are important).
2. Antidote in treatment of iodine poisoning.
3. Skin emollient, basis for enemas.
4. Tablet disintegrant.
5. Lubricant for surgeon's gloves.

- ❖ **Macroscopical characters of starch:**

A) **Organoleptic:**

Starch occurs in irregular, angular masses or as a white powder, smoothtouch, odorless, and starchy taste.

B) Physical properties:

1. Solubility:

- Cold water insoluble (suspension) ← dispersion
- Hot water soluble (gelatinization: breaking down the intermolecular bonds of starch molecules, the semi-crystalline structure is lost and the smaller amylo and increasing the mixture's viscosity).
- Organic solvents (alcohol, ether, benzene) insoluble
- Chloral hydrate soluble

2. pH:

- Corn and wheat starches have neutral pH around 7
- Rice starch has slightly alkaline pH above 7
- Potato starch has slightly acidic pH. below 7

C) Chemical test: Distinctive test

- I_3^- (I_2/KI) + starch solution dark blue color (The strength of theresulting blue color depends on the amount of amylose present)

Chemically all types of starch are the same; they can be differentiated only under microscope.

Microscopical character of different starch types:

Starch can be identified by microscopical examination (they should be first mountedwith water) by the observation of the following granules characteristics:

I. Shape: the shape of the granules varies not only in the different plants butalso in the different organ in the same plant.

II. Size: the granules vary greatly in size even in the same plant. They may be very minute to such a large size.

Potato is largest size and Rice is smallest size

III. Hilum: (the starting point of the granules in the amyloplast) is another character that can be used to distinguish different types of starch. On microscopical examination, hilum takes the form of a rounded dot or simpleor multiple clefts.

IV. **Striation**: starch granules are built up of the deposition of successive layers around the hilum. Concentric rings or striation are often clearly visible in large granules as potato starch.

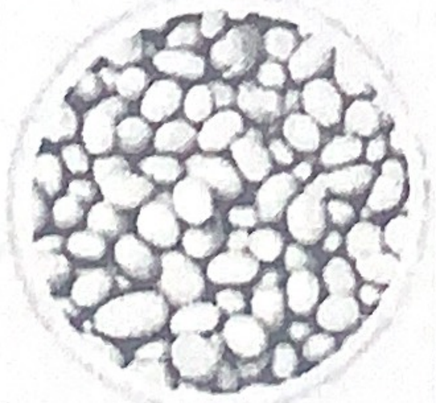
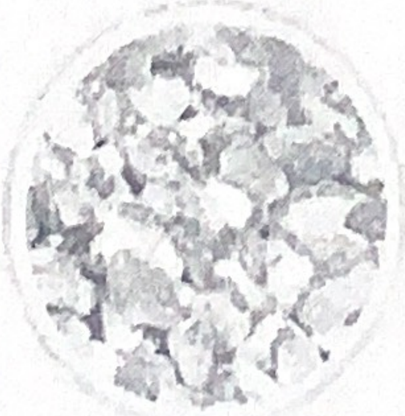
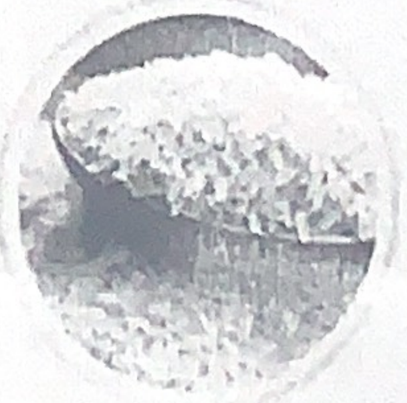
V. **Aggregation of the granule**: starch granules may be simple or compound. Compound granules produced by the continuous deposition of starch aroundtwo or more centers.

❖ Sources of starches:

a. Endosperm of the grain of:

1. Maize: *Zea mays* L. (Gramineae)
2. Wheat: *Triticum aestivum* L. (Gramineae)
3. Rice: *Oryza sativa* L. (Gramineae)

b. Tubers of potato: *Solanum tuberosum* L. (Solanaceae) shown in the tablebelow:

	Potato	Wheat	Maize	Rice
Origin	Tubers of *Solanum tuberosum* L.	Grain or fruit of *Triticum aestivum* L.	Grain or fruit of *Zea mays* L.	Grain or fruitof *Oryza sativa* L.
Family	Solanaceae	Gramineae	Gramineae	Gramineae
Shape	Oval and pyramidal	Rounded, oval. lenticular inside view	Poiyhedral withblunt angles	Polyhedralwith sharp angles
Hilum	Eccentric pointed	Faint centric point,Linear inside view	Cleft or fissured (triangular,centric)	Not present
Striation	Present, concentric	Faint	Not present	Not present
Aggregation	Simple, semi-compound	Simple	Mostly simple	Mostly compound
Size	Rounded 10-35 microns Or Ovoid 30-100 microns (Large)	Consist of large granules about 25-45microns and smaller granules about 6-7 microns (medium)	Consist of granules measuring 5-30 microns (medium)	Consist of granules measuring 2-10 microns (Small)
Image				

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