Plants store glucose as the polysaccharide starch; the cereal grains (wheat, rice, corn, oats, barley) as well as tubers such as potatoes are also rich in starch. Starch can be separated into two fractions—**amylose** and **amylopectin**. Natural starches are mixtures of amylose (10-20%) and amylopectin (80-90%).

**Introduction**

**Amylose** forms a colloidal dispersion in hot water whereas amylopectin is completely insoluble. The structure of amylose consists of long polymer chains of glucose units connected by an **alpha acetal** linkage. Starch - Amylose shows a very small portion of an amylose chain. All of the monomer units are alpha-D-glucose, and all the alpha acetal links connect C #1 of one glucose and to C #4 of the next glucose. As a result of the bond angles in the α acetal linkage, amylose actually forms a spiral much like a coiled spring. See the graphic below, which show four views in turning from a the side to an end view.

![Starch - Coil Structure - due to alpha acetal](image)

**Chemical Test for Starch or Iodine**

Amylose in starch is responsible for the formation of a deep blue color in the presence of iodine. The iodine molecule slips inside of the amylose coil. Iodine - KI Reagent: Iodine is not very soluble in water, therefore the iodine reagent is made by dissolving iodine in water in the presence of potassium iodide. This makes a linear triiodide ion complex with is soluble that slips into the coil of the starch causing an intense blue-black color.
**Starch Test:** Add Iodine-KI reagent to a solution or directly on a potato or other materials such as bread, crackers, or flour. A blue-black color results if starch is present. If starch amylose is not present, then the color will stay orange or yellow. Starch amylopectin does not give the color, nor does cellulose, nor do disaccharides such as sucrose in sugar.

**Iodine Test:** When following the changes in some inorganic oxidation reduction reactions, iodine may be used as an indicator to follow the changes of iodide ion and iodine element. Soluble starch solution is added. Only iodine element in the presence of iodide ion will give the characteristic blue black color. Neither iodine element alone nor iodide ions alone will give the color result. This phenomenon is used in the iodine clock demonstration.

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**Starch - Iodine Complex**

\[ \text{I}_2 + \text{I}^- \rightarrow \text{I}_3^- \]

Iodine slides into starch coil to give a blue-black color

C. Ophardt, c. 2003