

Basic Starch Technology

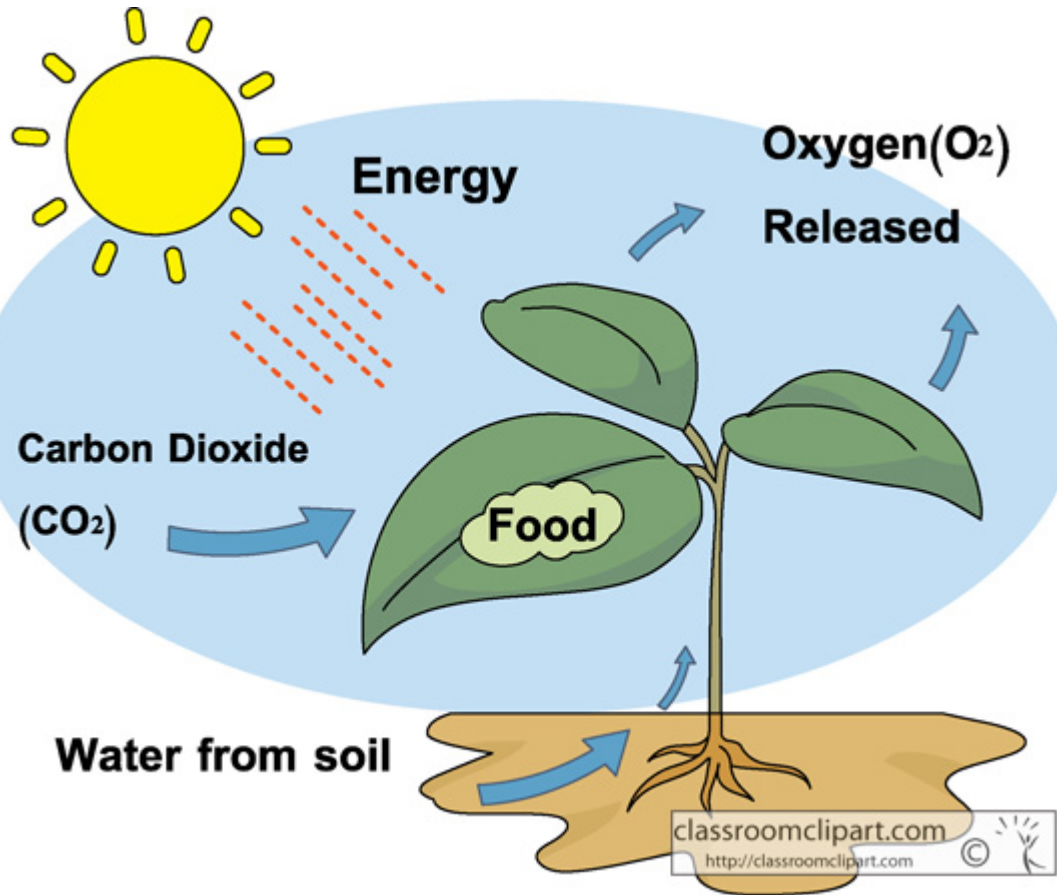


Topics

Basic Starch Technology

- Native Starch
- Structure of Amylose and Amylopectin
- Gelatinisation of starch
- Retrogradation

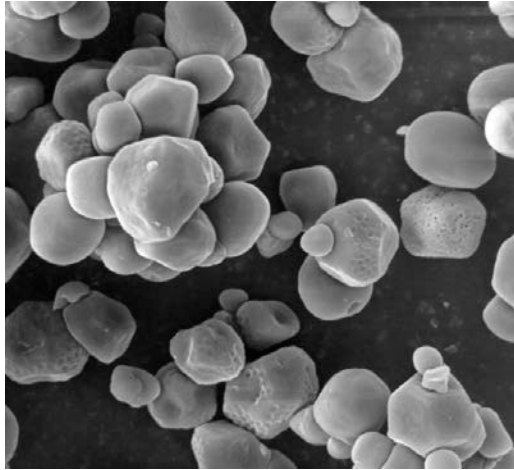
Native Starch



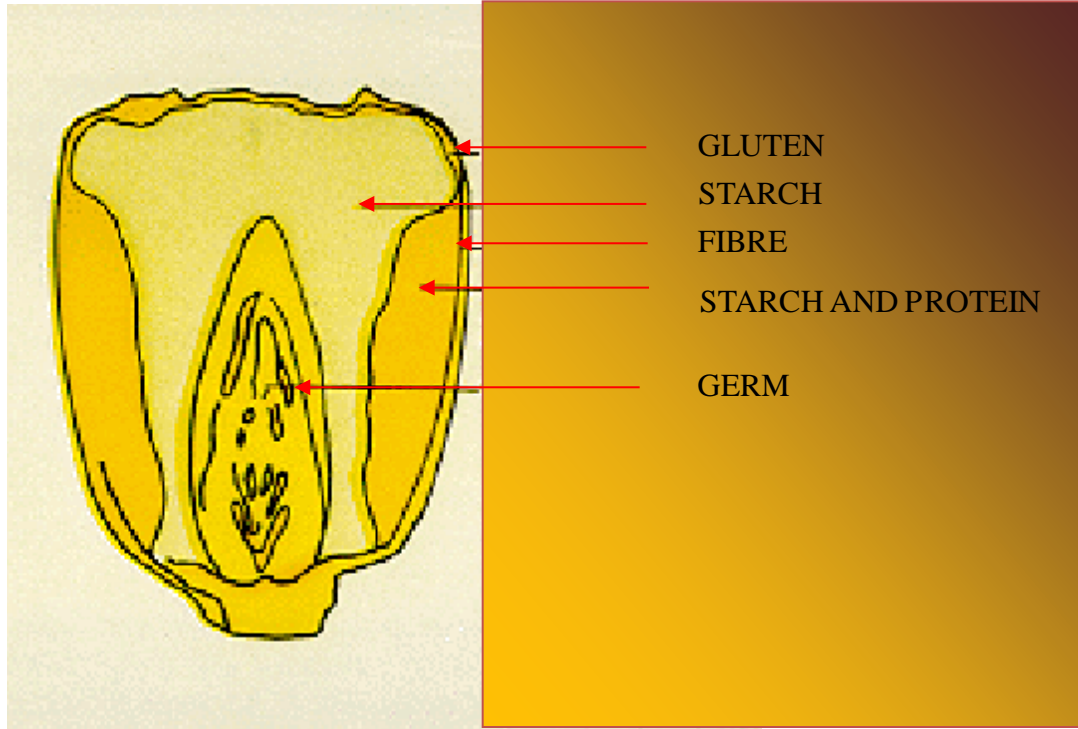
The sugars (dextrose) produced during photosynthesis are converted to starch and stored as a source of energy

Native Starch

- Naturally occurring carbohydrate
- Found in seeds, stems and tubers

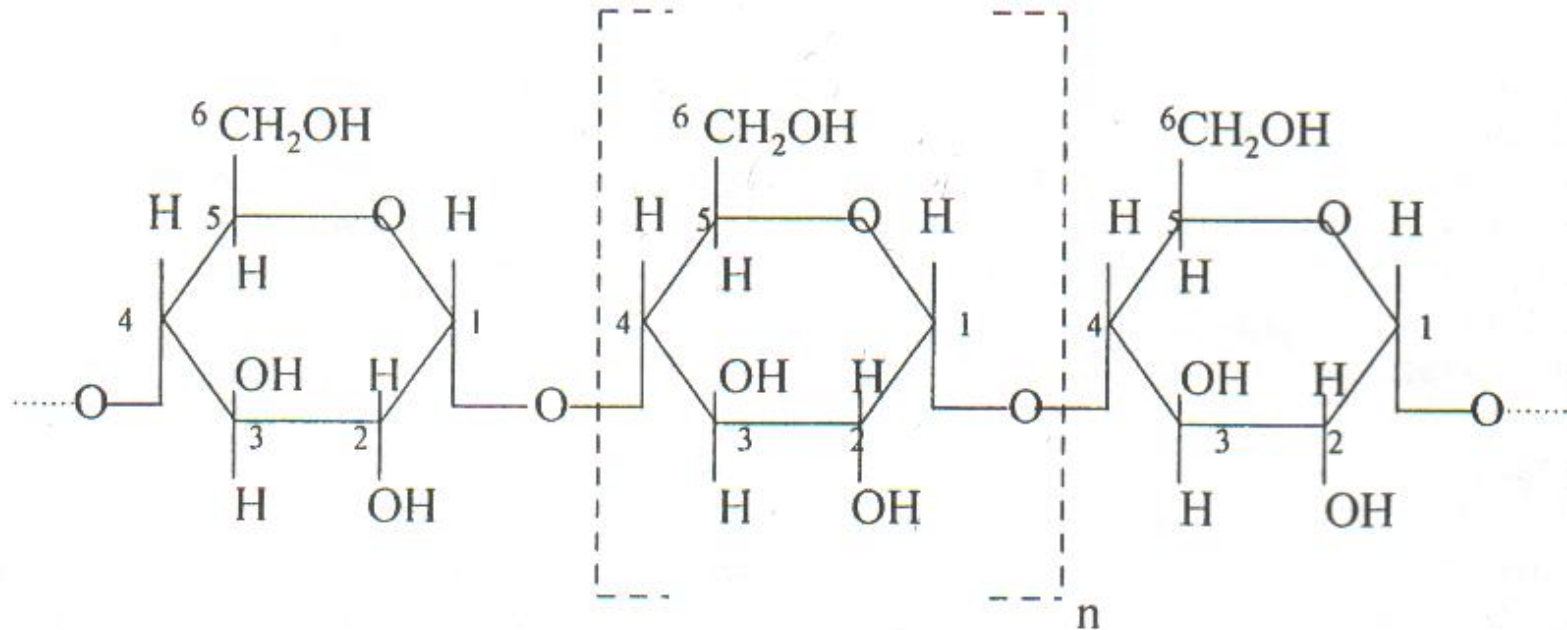


Native starch - Maize



- Starch 68%
- Protein 10.5%
- Oil 5%
- Fibre 4.5%
- Ash 2%
- Soluble Sugars 10%

Amylose



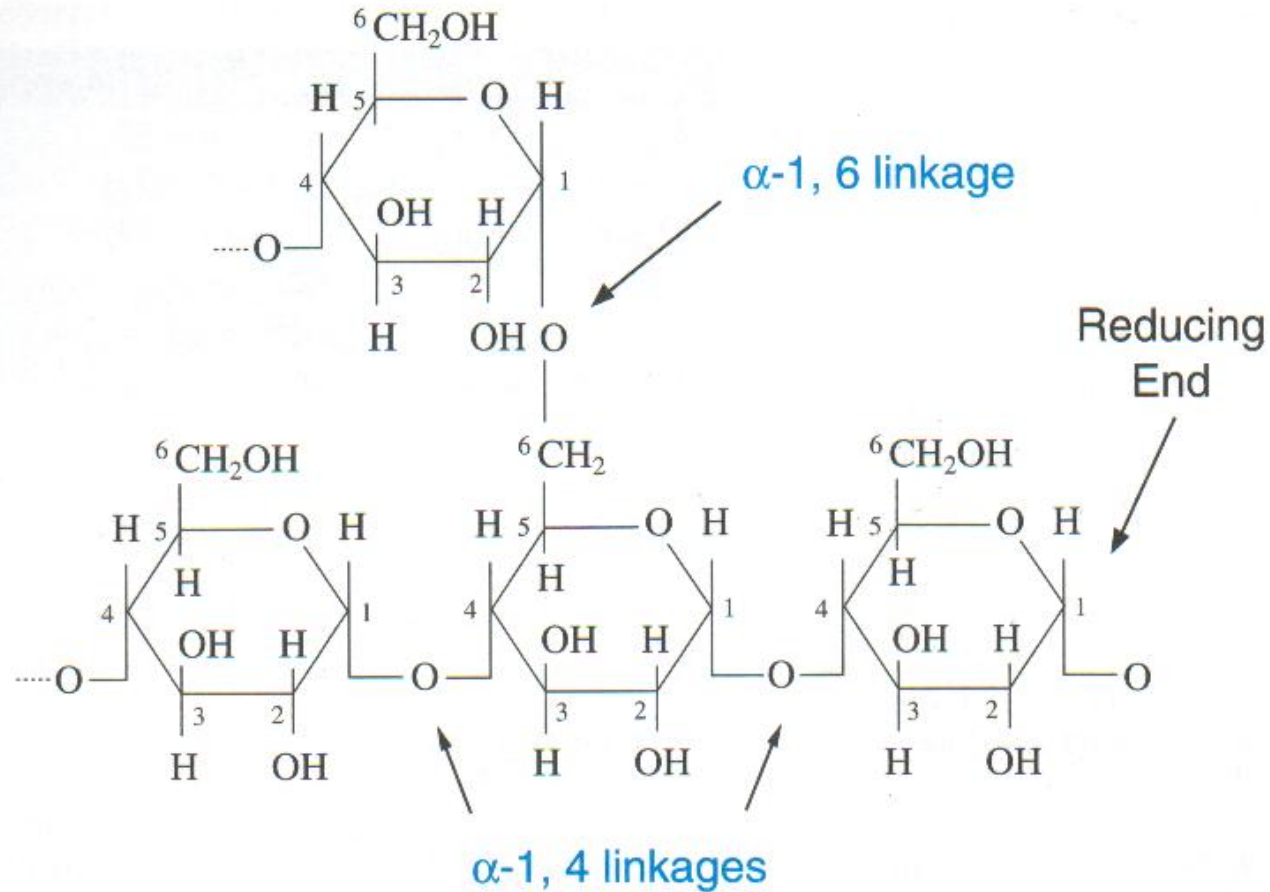
Essentially a linear polymer. Illustrated as a straight chain although it is often helical.

Amylose

- A well known attribute of amylose is the ability to form firm gel structures after cooking and subsequent cooling
- This is evident in starches such as maize, wheat, rice and high amylose starches from maize hybrids.
- This gel formation is due to retrogradation or “set back” of the linear polymer



Amylopectin



Amylopectin

- This is a branched polymer that is the dominant polymer in most starches
- Its “bush like” structure slows retrogradation and gel formation is either prevented or delayed
- High amylopectin starches like waxy maize are non gelling and form pastes exhibiting a long, cohesive texture

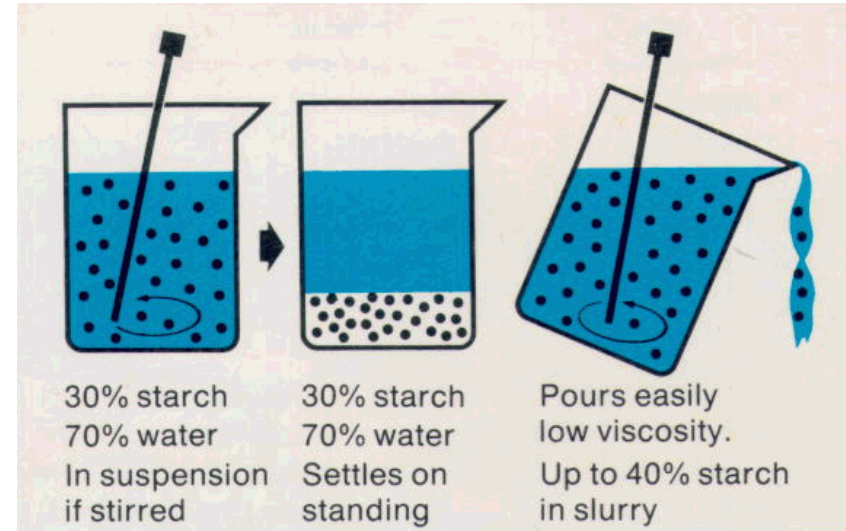
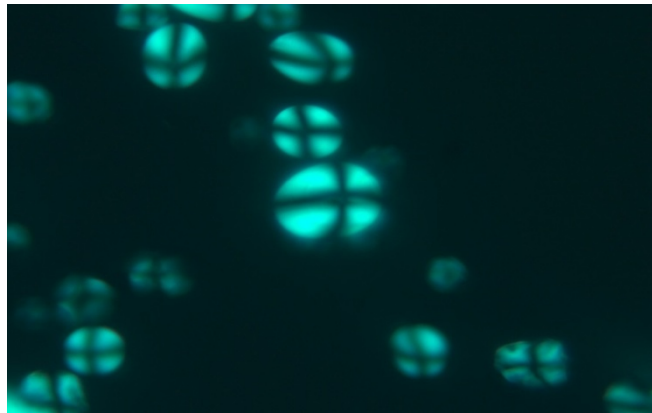


Amylose and Amylopectin Ratios

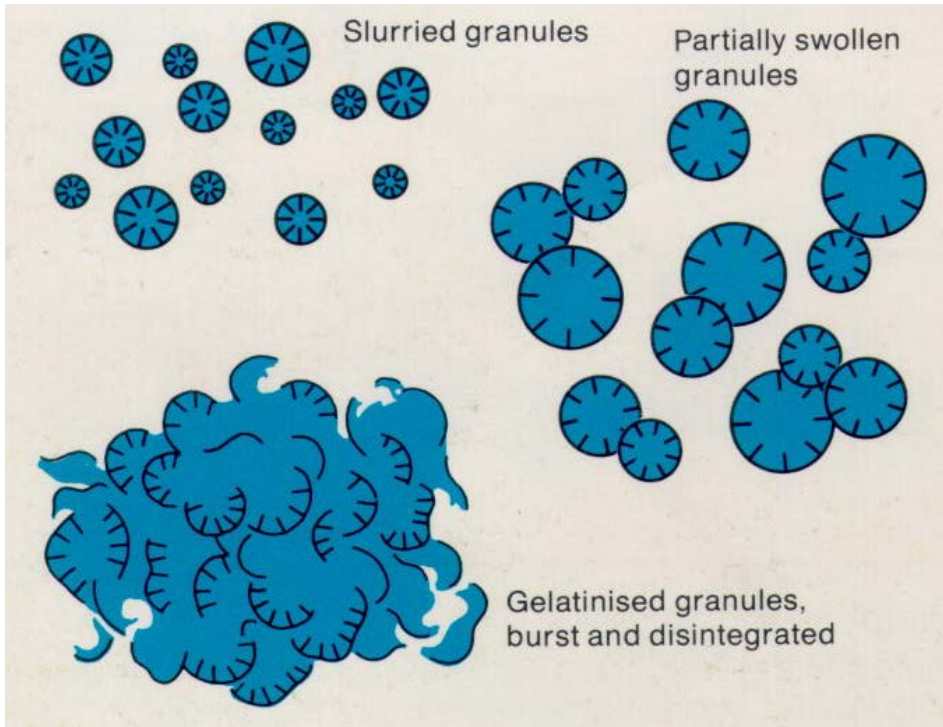
Type of starch	Amylose %	Amylopectin %	Granule size ave
Maize	26	74	14.3
Wheat	25	75	19.5
Rice	17	83	5.5
Potato	21	79	36
Cassava	17	83	14.0
Waxy Maize	1	99	14.3
High Amylose	70	30	9.8

Gelatinisation of starch

- Occurs as granules vary from 5 – 30 microns
- Inert – not soluble in water
- No adhesive power or binding capacity
- Birefringence under polarised light



Gelatinisation of starch



Water

- 4:1 Temperature
- for starch only
- 68 – 85°C

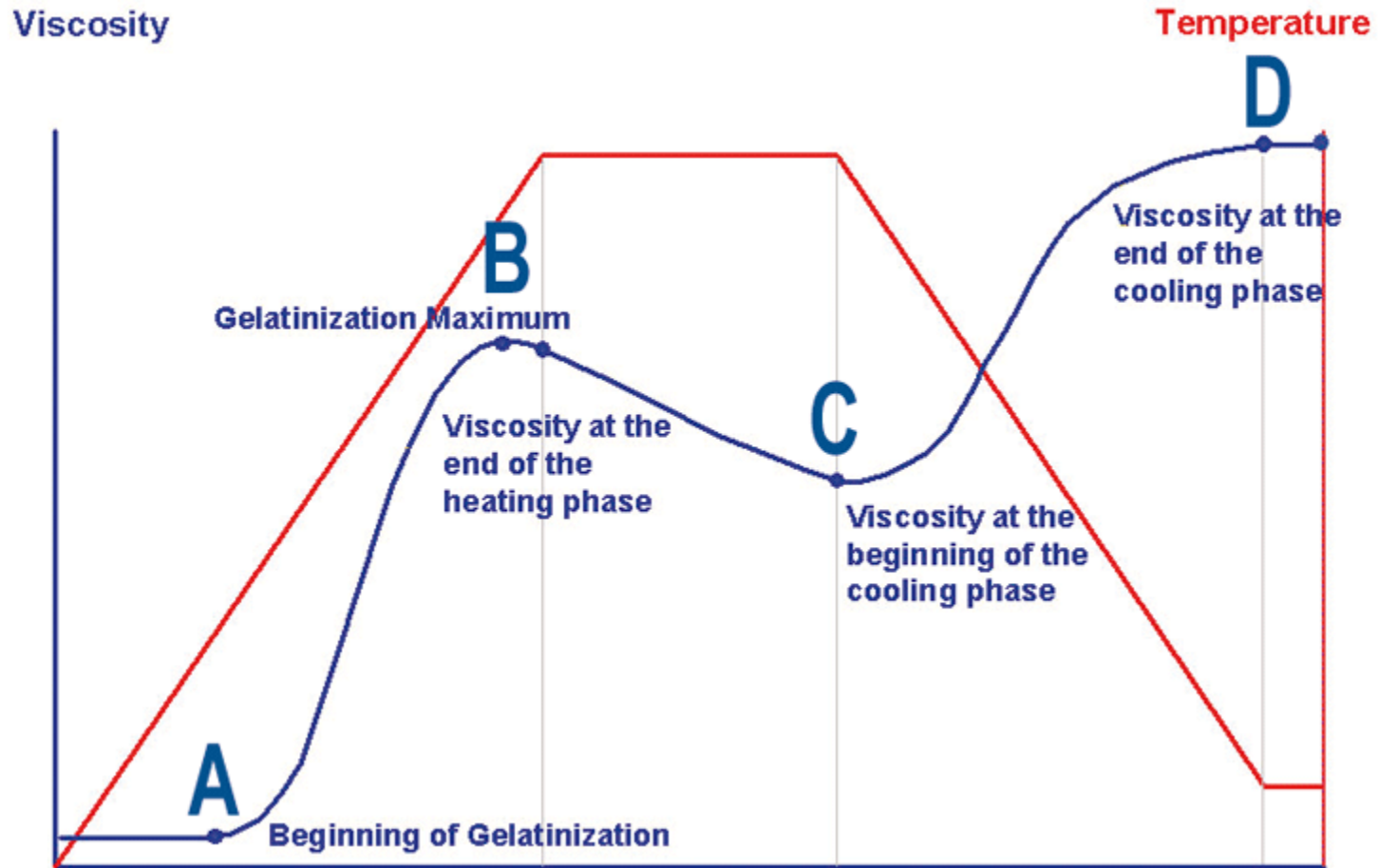
Time

- ± 15 minutes

Comparing different starches

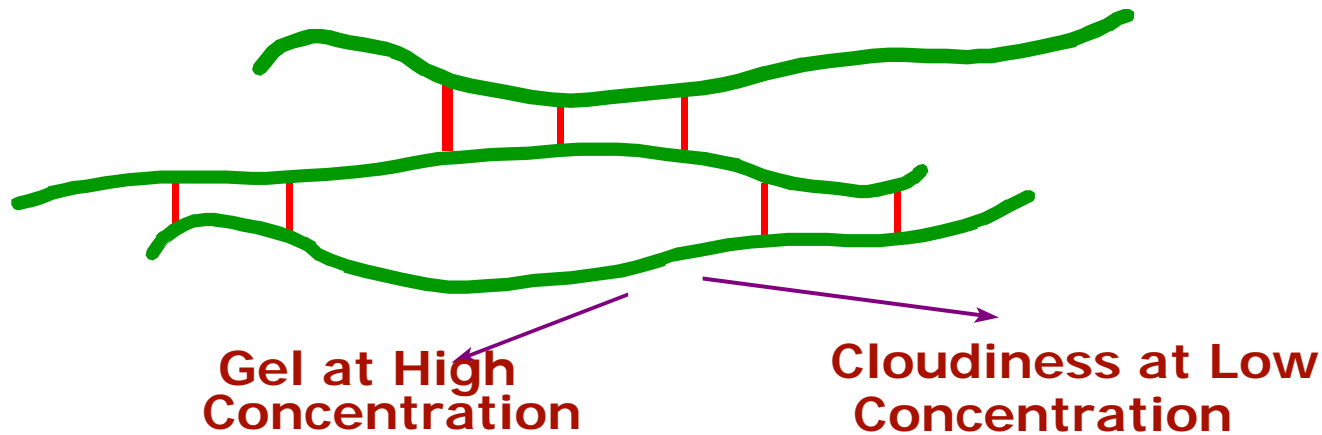
- **Granular size:** the larger granules swell faster and have a gelatinisation temperature 3°C lower than the smaller. **Amylose:** **Amylopectin ratio:** the higher the amylose, the higher the gelatinization temperature. Also determines the texture of cooked starch.
- **Amylose: Amylopectin molecular structure:** The potato and tapioca have a molecular weight so much higher than that of maize that it actually makes it more difficult for the molecules to associate - affects degree of retrogradation

Tracking Viscosity - Brabender



Retrogradation / Setback

- 26% solids cooked maize starch is opaque and short textured
- With time and decrease in temperature – viscosity increases
- Setback – reverse of gelatinisation - is a reaction that takes place when the amylose chains realign themselves, causing the liquid to gel and expel water from the polymer network - synerises



CONTACT DETAILS

FOR MORE INFORMATION PLEASE CONTACT

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