Amylose and Amylopectin

Amylose
- A linear molecule comprising of 1,4 linked alpha-D-glucopyranosyl units. There is a small degree of branching by 1,6 alpha linkages.
- The smaller of the two polysaccharides making up starch.

Amylopectin
- A highly branched molecule comprising both 1,4 linked and 1,6 linked alpha-D-glucopyranosyl units.
- Branches are non-randomly distributed in clusters.
- The larger of the two polysaccharides making up starch.
Amylose and Amylopectin

Diagrams of amylopectin branches & clusters

Amylose and Amylopectin

Reducing end

Open ring

Aldehyde oxidized to carboxylic acid
Amylose and Amylopectin

Different type of chains for amylopectin

- Three chain types A, B and C
- A chains are not branched
- B chains are branched
- C chain has the reducing end R
- One reducing end per amylopectin molecule

Wang et. al., J. Exp. Botany (1998) 49, 481
Structural parameters of amylopectin clusters

Amylose and Amylopectin

Amylose and Amylopectin

Starch-lipid complex

Polar (hydrophilic) head outside
Non-polar (hydrophobic) tail inside

Starch Crystallinity

Crystalline forms

- **A**: Cereal starch
- **B**: Tuber starch, high amylose starch
- **V**: amylose crystallized with lipids, iodine, etc
- **Vh**: hydrated V form

Crystalline A structure for starch. An (a,b) plane projection of the unit showing helix packing, water molecules, and hydrogen bonding.

Crystalline B structure for starch. An (a,b) plane projection of the unit showing nearby helices and the center channel of organized water molecules.

Imberty et al. Biopolymers (1988) 27,1205
Estimation of Crystallinity $\alpha$

Crystalline area = 435

Total area = 1460

$\alpha = \frac{435}{1460} = 30\%$

Diagram from Dr. Rengaswami Chandrasekaran