Part One of the Food Science Infographic series...

PECTIN

A polysaccharide used commonly in food as a *gelling agent*, *thickener*, and *stabilizer*

Home cooks use it to make jams and jellies

Pectin is found in plant cell walls and is considered to be dietary fiber

note: this is a very simplified model

USES

Pectin is used in many different applications and fields. Namely, pectin is used in the **food**, **cosmetic**, and **pharmaceutical** industries.

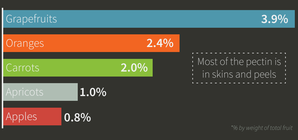
- Jams & jellies
- Gummy worms & bears
- Confectionaries
- Dairy & desserts
- Lotions & creams
- Lipstick
- Cough drops
- Capsule coatings

PRODUCTION

World production of pectin tops **80,000 tons** per year and accounts for **400 million dollars**

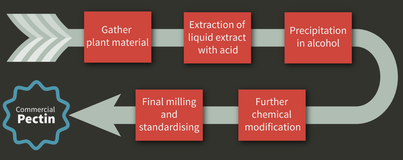
Pectin is naturally occuring and is found in many different fruits and vegetables:

% pectin* found in common fruits and vegetables



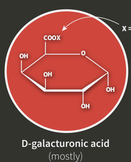
*% by weight of total fruit

Manufacturing Process

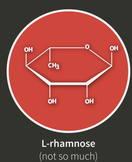


CHEMISTRY

Pectin is made of two main residues:



D-galacturonic acid (mostly)

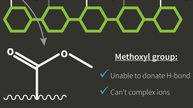


L-rhamnose (not so much)

These residues are linked (alpha-1,4) into long chains, with many different sugars branching off

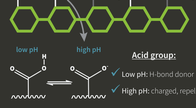
The type of pectin is determined by the type and amount of functional groups on the D-galacturonic acid residue. The simplest designation for pectins is:

High Methoxy (HM)
(>50% methoxyl groups)



Methoxyl group:
- ✓ Unable to donate H-bond
- ✓ Can't complex ions

Low Methoxy (LM)
(<50% methoxyl groups)

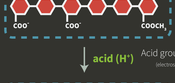


Acid group:
- ✓ Low pH: H-bond donor
- ✓ High pH: charged, repel

GELATION

HM and LM pectin gel under two unique **environments** and two different **mechanisms**

High Methoxy Gelation



Gel formation is mediated by acid groups. At neutral pH, the backbones are charged and repel each other.

acid (H^+)

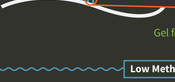
Acid groups are protonated
(electrostatic repulsion neutralized)

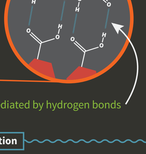
A "shell" of water exists around the strands. Hydrated, the strands can't effectively hydrogen bond with each other.

sucrose

Water shell is removed
(hydrophobic effects strengthen)

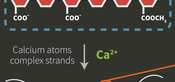
interaction between strands





Gel forms; mediated by hydrogen bonds

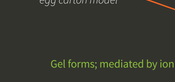
Low Methoxy Gelation



Charged acid groups out number the methoxyl groups, allowing for ionic interactions to occur

Calcium atoms complex strands

Ca^{2+}



"egg carton model"

Gel forms; mediated by ionic bonds

Sources:

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