

Preserves

Preserves

Include gels, more commonly known as jellies

- Gel : a colloidal system possessing more or less the properties of solids
- Sol : a colloidal system which to the eye appears to be and behaves like a liquid
- Preservation of gels by soluble solids content >65 %
acid content high: pH 2.8 -3.5
- Jelling depends on
 - 1)Pectin
 - 2) Free acid available
 - 3)free water
 - 4)sugar

1. Triple helix of collagen

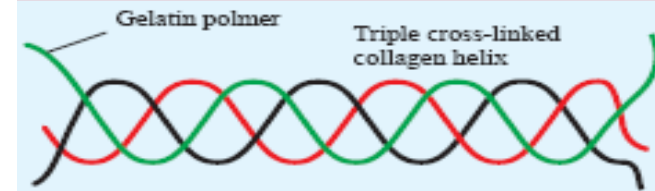


Figure 1. A collagen helix made of three intertwined gelatine molecules.

2. Structure of gel

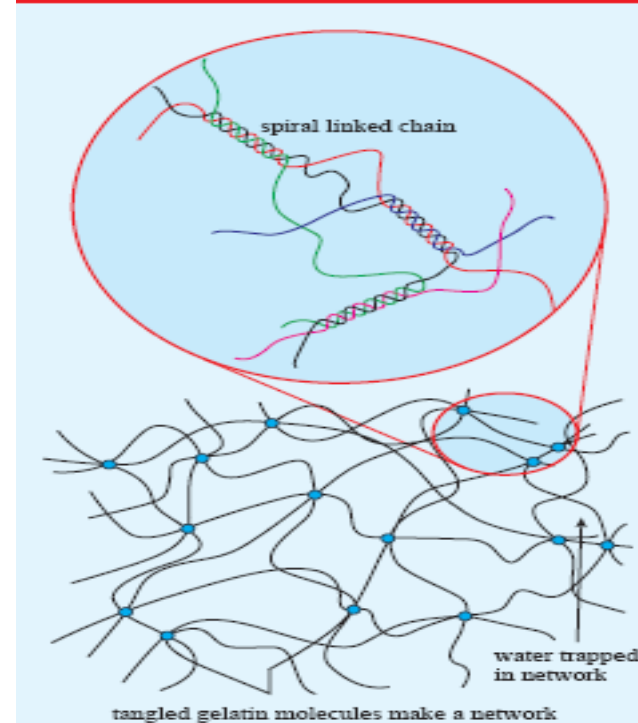


Figure 2. Structure of a gel.

3. Percolation model of gel formation

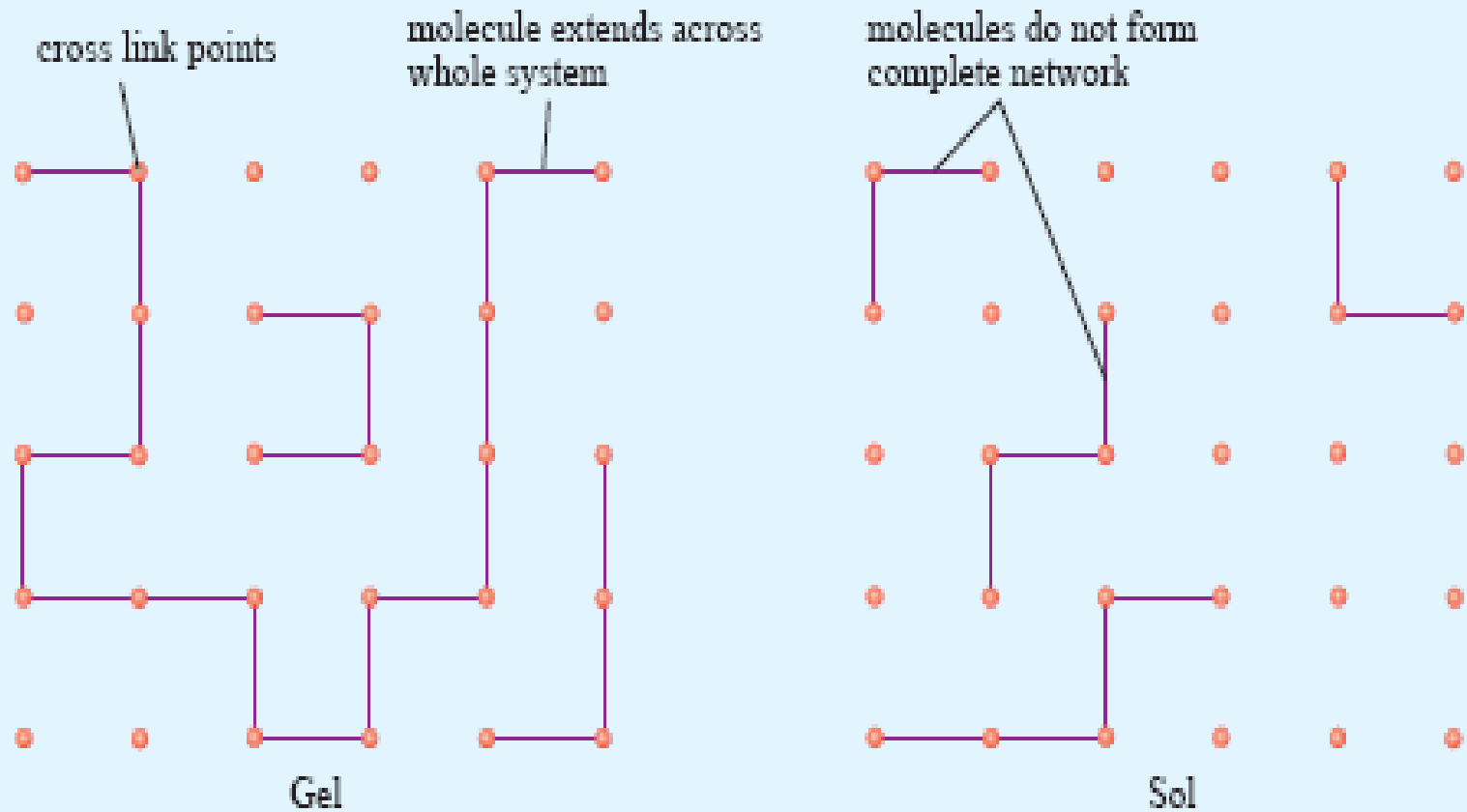


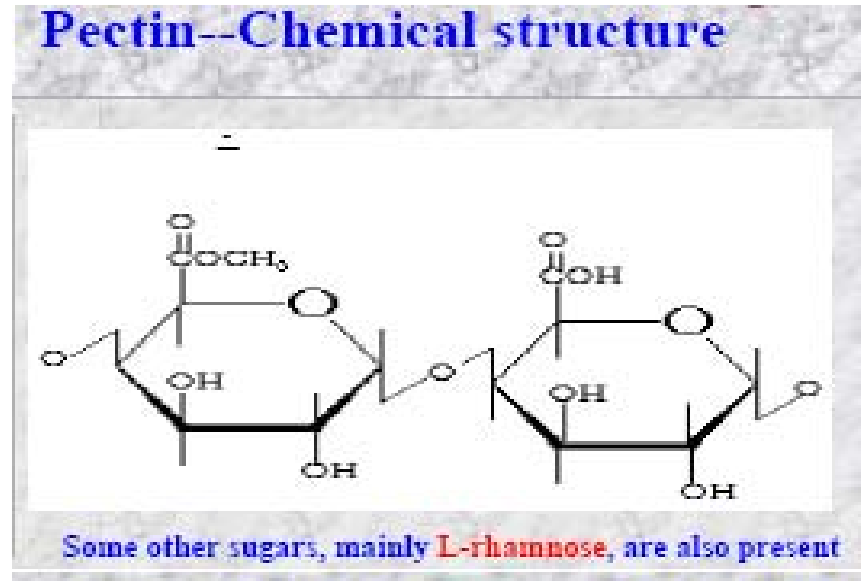
Figure 3. Percolation model of gel formation.

Pectin

- Occurs in plant middle lamella
- Gel former, e.g., fruit jelly
- From the Greek word meaning to congeal
- Pectin was discovered in 1790 by Vauquelin and later (1825) crudely characterized by Braconnot

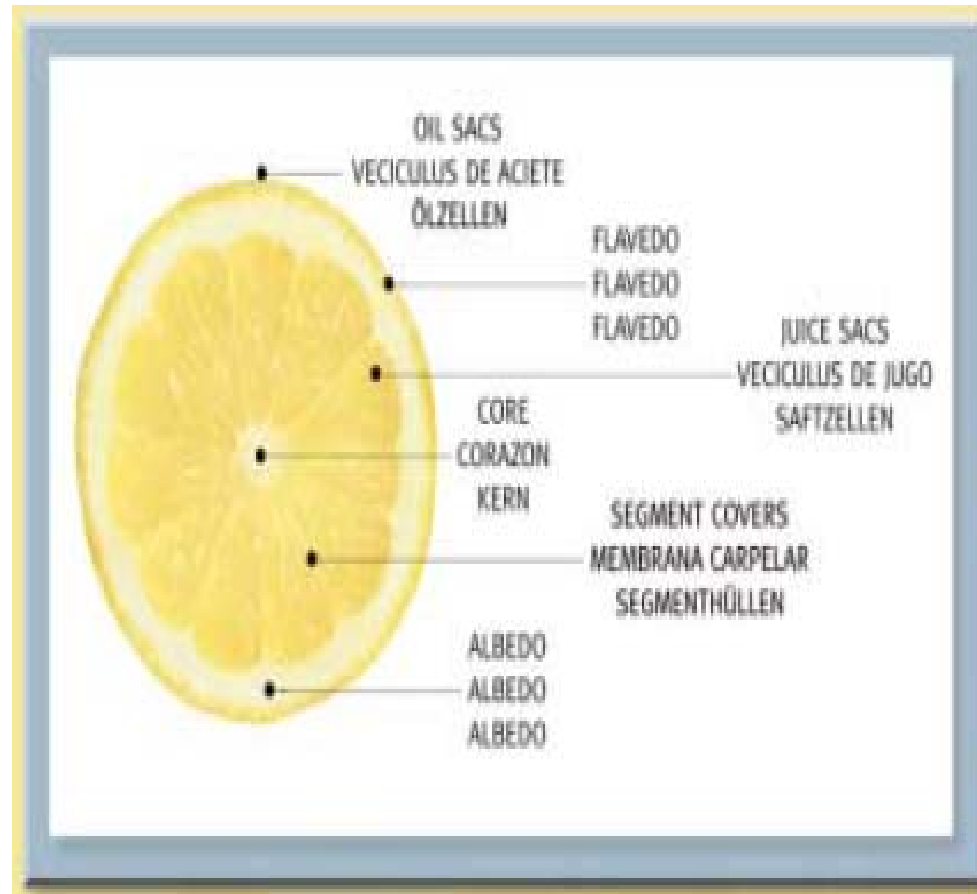
Pectin

- Hydrocolloids, or gums, are defined as water-loving materials which can influence processing conditions in several ways.
- Pectin is a common natural gum derived from land-plant extracts.
- Chemically, the pectins are linear polymers of galacturonic acid, with the carboxyl groups partially esterified with methanol.



Pectic Substance Nomenclature

- **Protopectin**-high methyl ester content
- **Pectinic acid**-intermediate methyl ester content, soluble
 - Salts are **pectinates**
- **Pectin**-intermediate methyl ester content, colloidal
- **Pectic Acid**-little methyl ester content
 - Salts are **pectates**



High and low methoxyl pectins

- If DE is greater than 50%, it is a high methoxyl pectin (HM pectin)
- If the DE is less than 50%, it is a low methoxyl pectin (LM pectin)

Types of pectins

HM	LM	Amidated LM
-COOCH ₃	-COOCH ₃	-COOCH ₃
(> 50%)	(< 50%)	(< 50%)
-COOH	-COOH	-COOH
-COO Na ⁺	-COO Na ⁺	-COO Na ⁺
		-CONH ₂
		(15-25%)

Pectic Substances and Gelation

Normal Pectin

- Gels in the presence of acid and sugar

Low Methoxyl Pectin

- Doesn't need sugar, but does need calcium ion

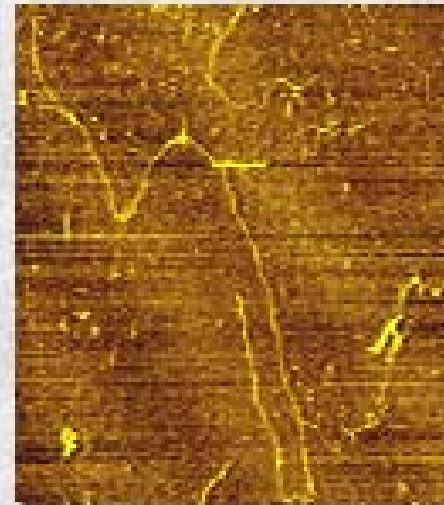
Pectic Acid

- Forms insoluble calcium pectate. This reaction is responsible for the firming effect seen in certain plant tissues, e.g., canned tomatoes

Pectin uses

- Principally used in jellies and jam
- However, some is used in
 - Confections
 - Beverages
 - Acidified drinks

Pectin gels



Jelly making

- Need -- pectin + acid + sugar
- Pectin
 - 0.5-1.0%
 - If juice is low in pectin, may concentrate by boiling or add more as commercial pectin
 - Peach – poor gel, pectin contains acetyl groups
 - Citrus – forms a good gel

Jelly making

- Sugar

- Preservative
- Micororganisms cannot grow due to the jelly's high osmotic pressure
- Optimum sugar concentration is about 65% soluble solids

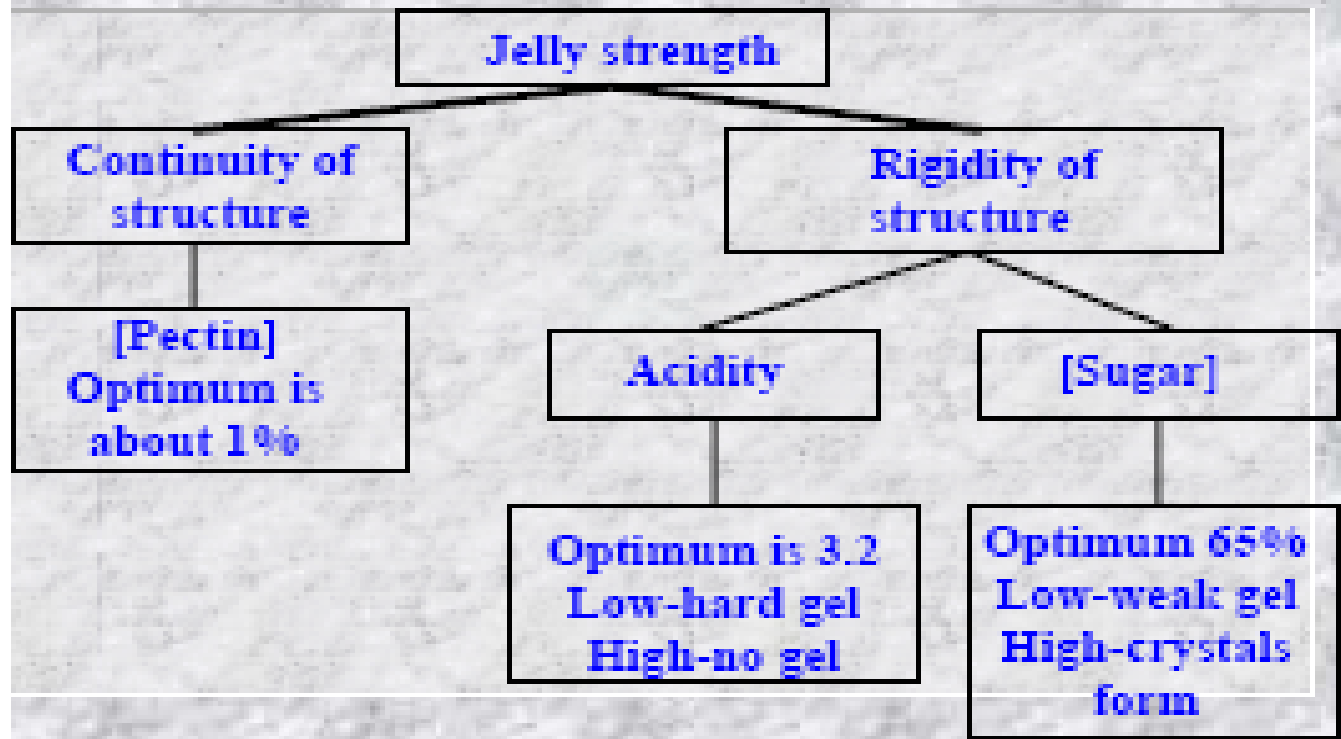
Jelly making

■ Acid

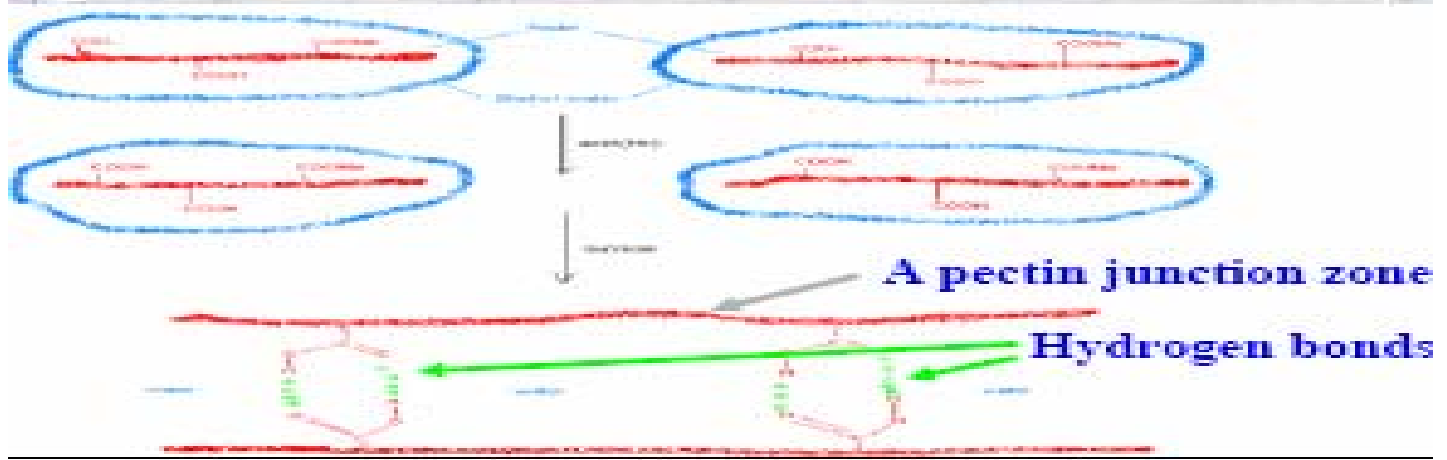
- Contributes flavor
- pH optimum is 3.2
- If juice is low in acid, add lemon juice



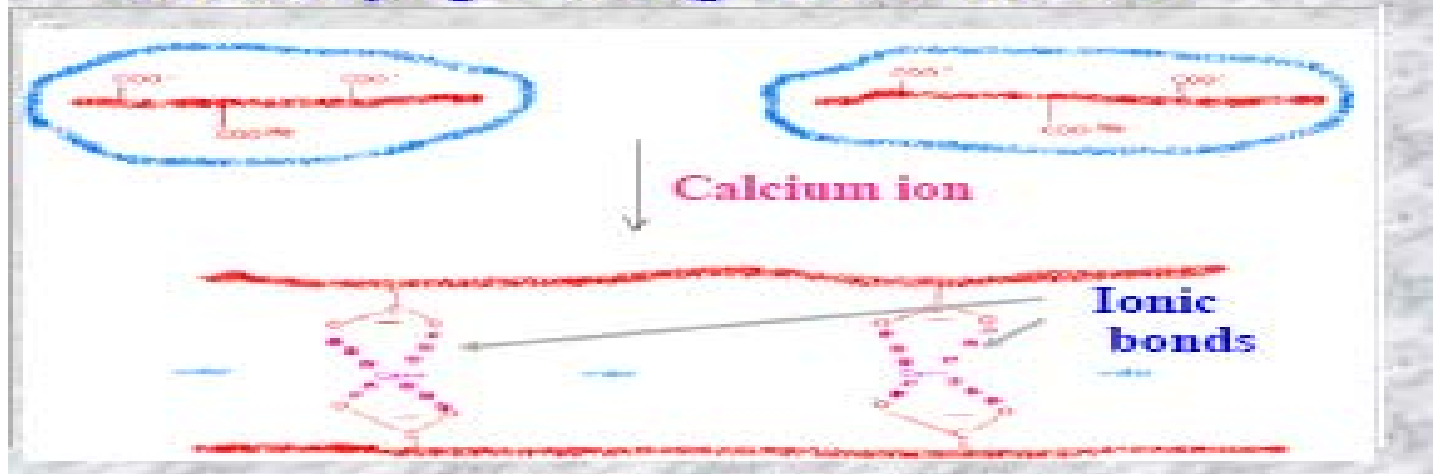
Gel strength in normal pectin jellies



Theory of normal pectin gel formation



Theory of low methoxyl pectin gel formation


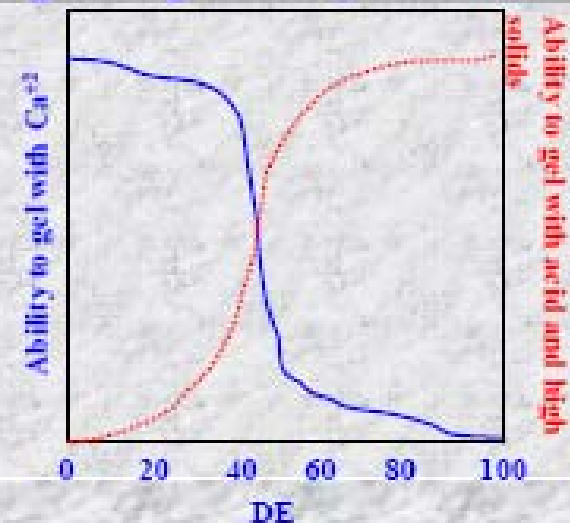


Theory of low methoxyl pectin gel formation

- pH needs to be higher (3.2-4.0) because only carboxylate (COO^-) groups can participate in these types of ionic bonds
- These gels can not usually be melted and reformed

 Carbohydrates

Methyl ester content and gelling ability

 Carbohydrates

Uses of low methoxyl pectin gels

- Fat mimetic
 - From Hercules, this is a LM pectin gelled with Ca^{+2} and microparticulated (particle size $< 1 \mu\text{m}$)
 - Trade name is Slendid

 Carbohydrates

Labeling

- Both HM and LM pectin may be labeled pectin