

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

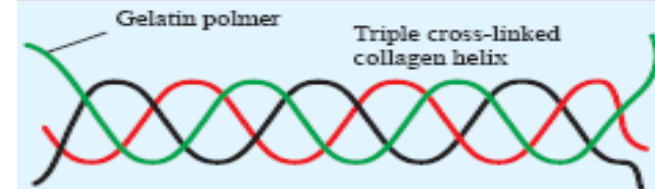


Figure 1. A collagen helix made of three intertwined gelatine molecules.

### 2. Structure of gel

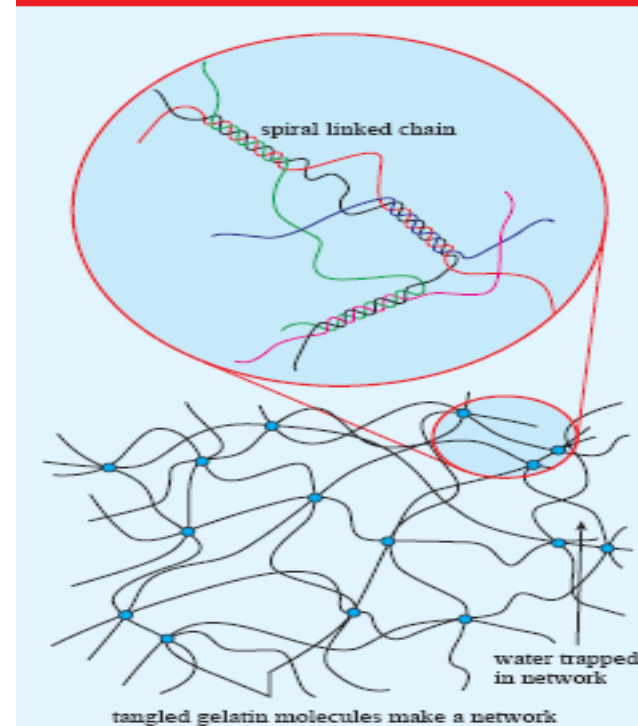


Figure 2. Structure of a gel.

### 3. Percolation model of gel formation

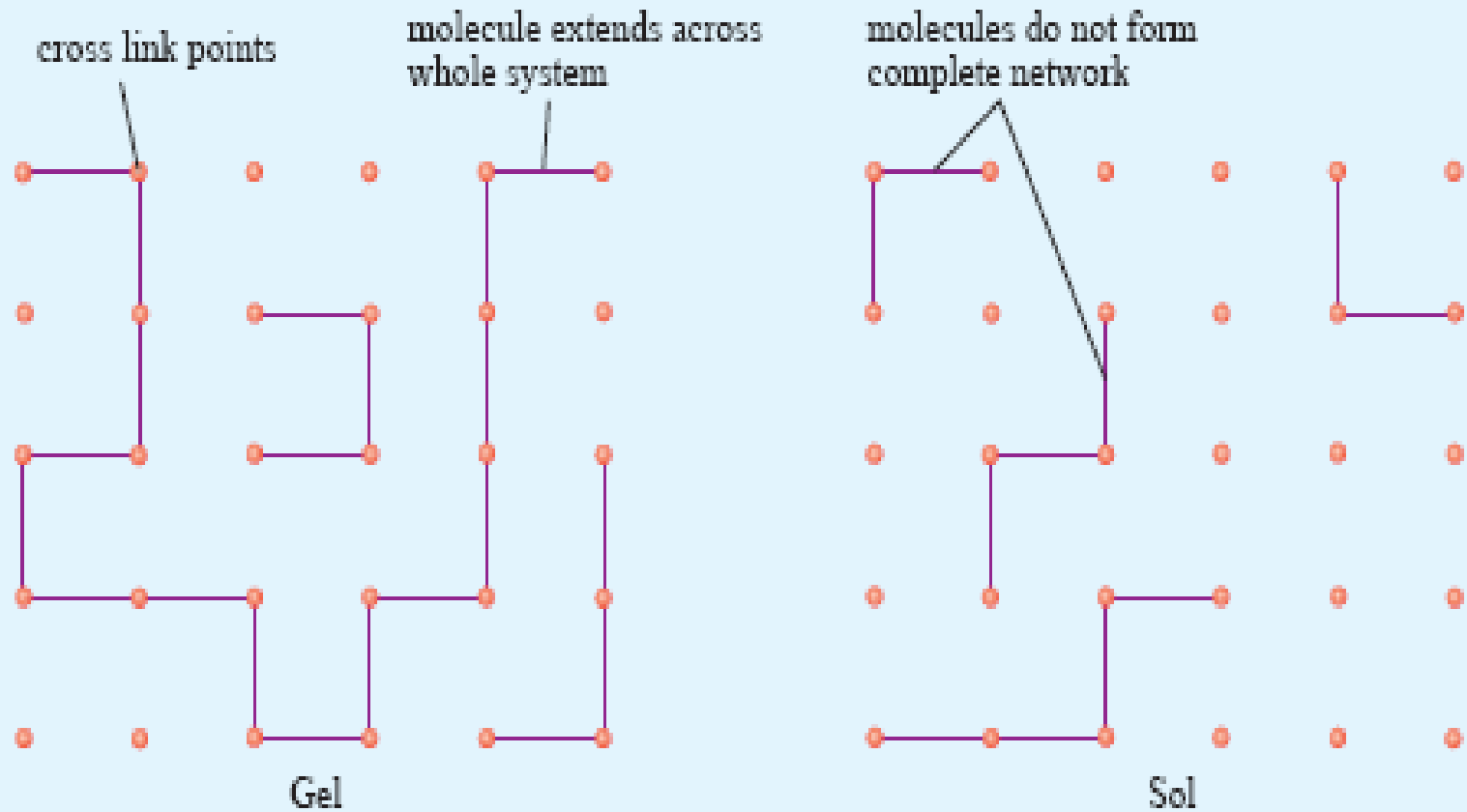


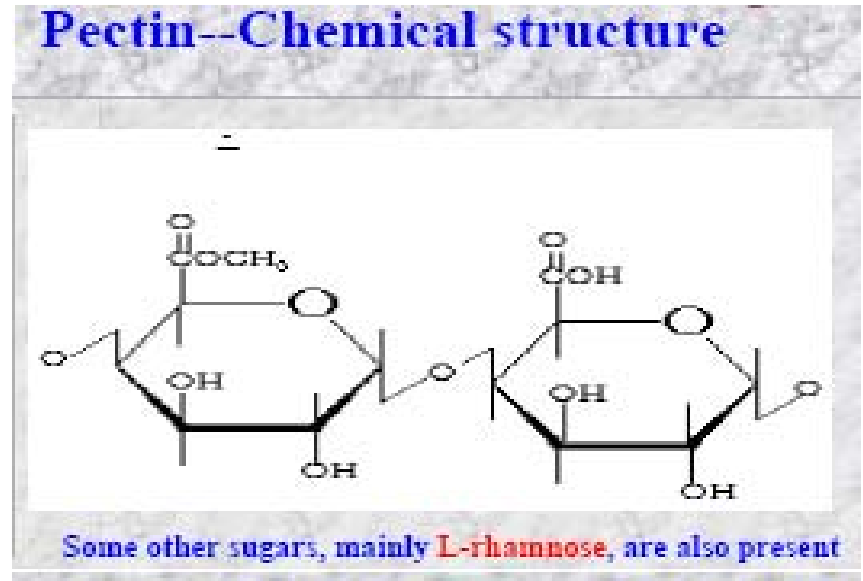
Figure 3. Percolation model of gel formation.

# 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

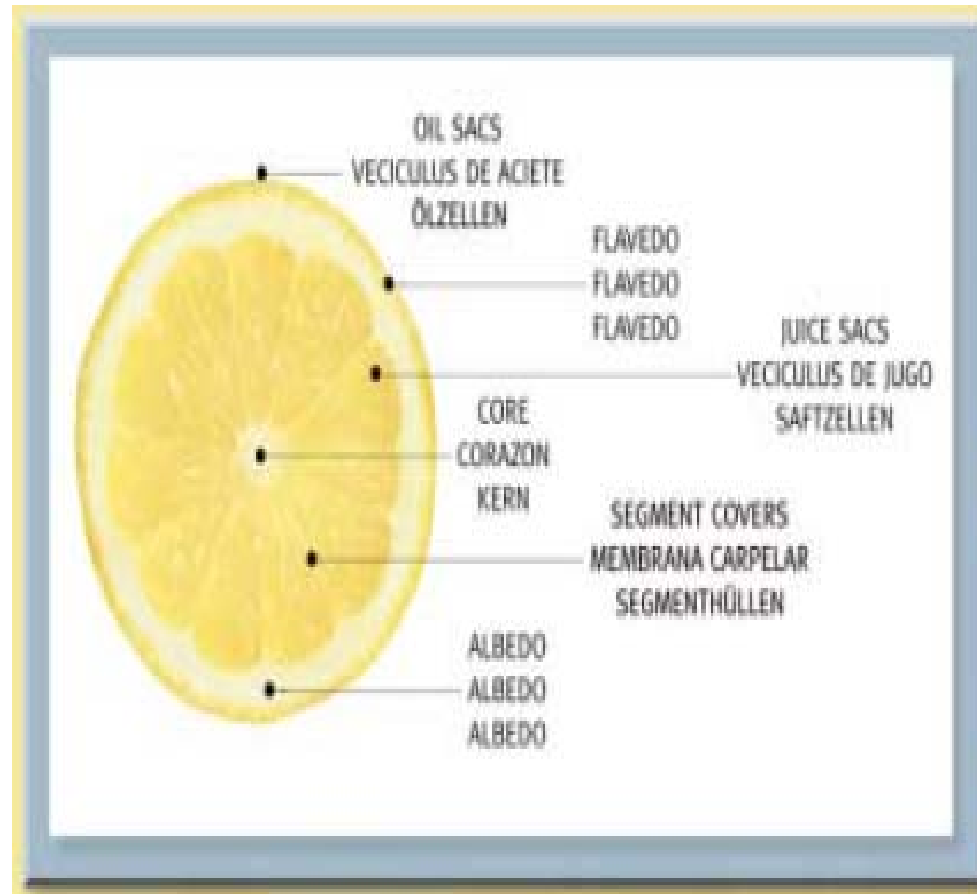
# Pectin

- 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 <sub>3</sub>	-COOCH <sub>3</sub>	-COOCH <sub>3</sub>
(> 50%)	(< 50%)	(< 50%)
-COOH	-COOH	-COOH
-COO Na <sup>+</sup>	-COO Na <sup>+</sup>	-COO Na <sup>+</sup>
		-CONH <sub>2</sub>
		(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

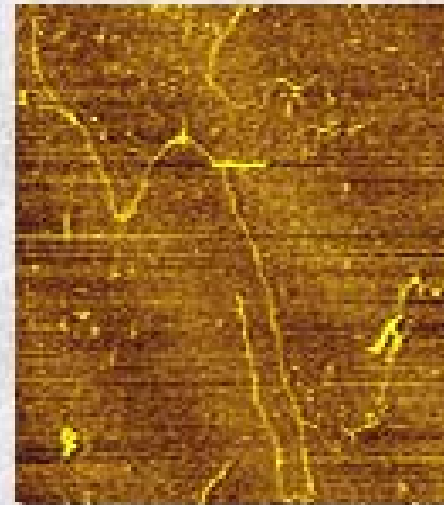
### Pectic Acid

- 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

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- Sugar

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

# Jelly making

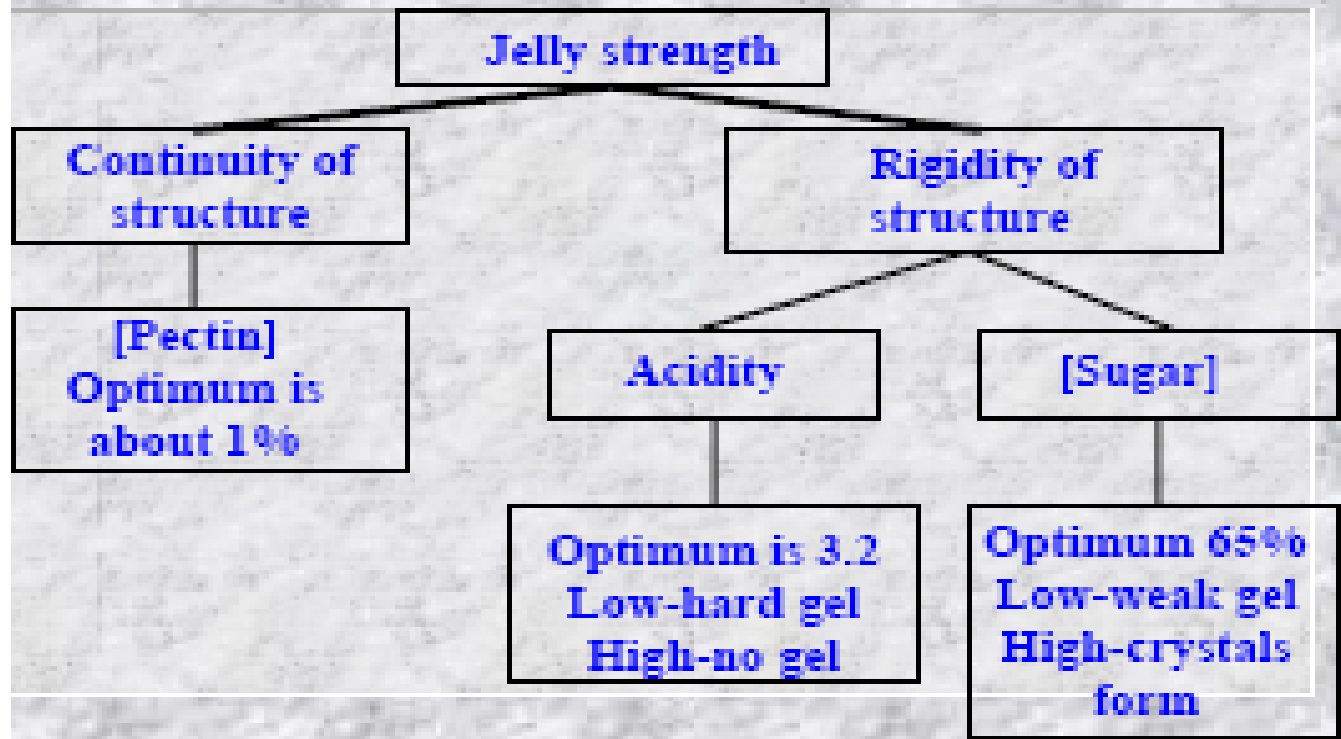
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## ■ Acid

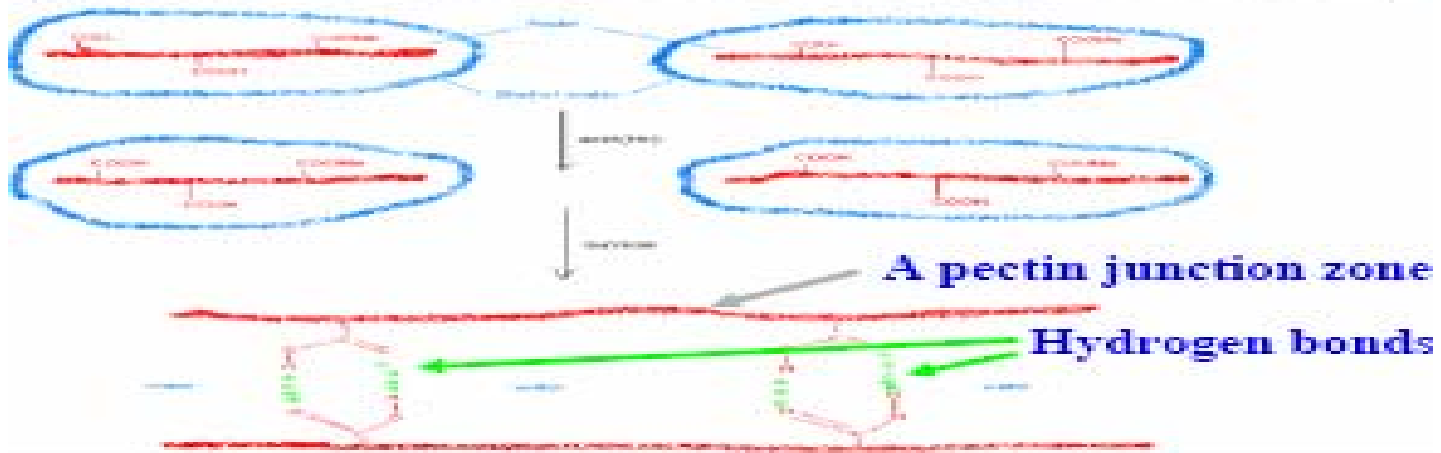
- Contributes flavor
- pH optimum is 3.2
- If juice is low in acid, add lemon juice



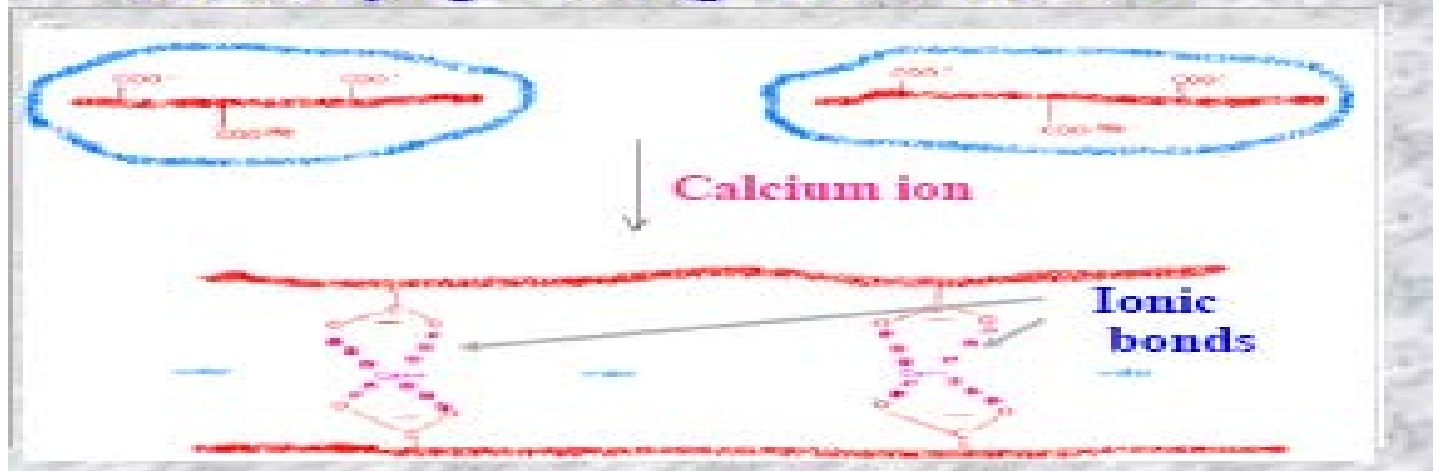
## Gel strength in normal pectin jellies



# Theory of normal pectin gel formation



# Theory of low methoxyl pectin gel formation

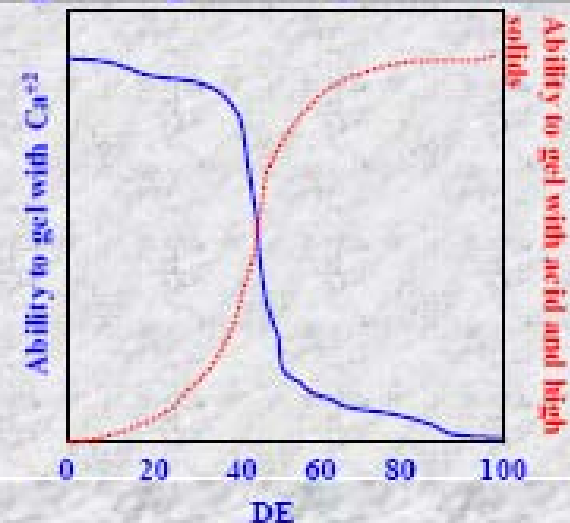


## Theory of low methoxyl pectin gel formation

- pH needs to be higher (3.2-4.0) because only carboxylate ( $\text{COO}^-$ ) 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  $\text{Ca}^{+2}$  and microparticulated (particle size  $< 1 \mu\text{m}$ )
  - Trade name is Slendid

 Carbohydrates  

## Labeling

- Both HM and LM pectin may be labeled pectin