Technical Article

Introduction to Pectin

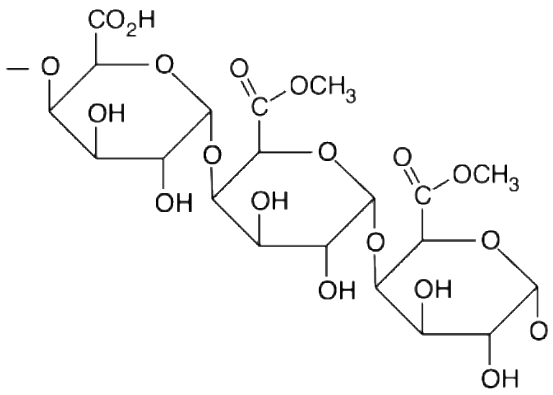
Introduction

Pectin has been recognised for at least 200 years and was originally identified in 1790 in apples by the French chemist Nicholas Vauquelin (who also discovered the elements chromium and beryllium). It was not until 1824 that further work on pectin was undertaken by Braconnot who named the acid, gelling substance pectic acid after the Greek word for gelling or congealing. In 1924 Smolenski identified the gelling substance as a polymer of galacturonic acid and later on in the 1937 Schneider and Bock established the basic formula of pectin.

Today pectin is recognised as a complex polymer that is present in many plants as a component of the middle lamella. Pectin is used extensively in the food industry as a gelling agent and is the key gelling agent in jam manufacture which is still one of the biggest markets for pectin.

Structure

Pectin is a complex polysaccharide consisting mainly of esterified D-galacturonic acid resides in an alpha-(1-4) chain. The acid groups along the chain are largely esterifed with methoxy groups in the natural product. There can also be acetyl groups present on the free hydroxy groups. The galacturonic acid main chain also has the occasional rhamnose group present which disrupts the chain helix formation.



Pectin is also known to contain other neutral sugars which are present in sidechains. The most common side chain sugars are xylose, galactose and arabinose. The sidechains tend to occur in groups and have led to the description of the pectin molecule as having hairy and smooth regions.

◀ Pectin backbone with 2 esterified molecules

Commercially pectins are categorised according to their methoxy content and whether they from gels quickly or slowly. Roughly speaking pectins can be split in to high

methoxy pectins (>50% esterified) and low methoxy pectins (<50%esterified). Low methoxy pectins can also be amidated or not.

Sources of Pectin

The traditional, commercial sources of pectin have been citrus peel and apple pomace. Often this is a waste material from another industry such as apple pomace from a cider producer.

Citrus peel has often been the preferred material for pectin manufacture due to its high pectin content and good colour properties. Generally lemon and lime peel are the preferred sources of citrus pectin. The peel must be unlimed and it cannot be enzyme treated. Lime treatment of the peel would hydrolyse all the pectin to pectic acid and peel that has been treated with enzyme to ease the peel removal will have the molecular weight of the pectin reduced.

More recently other sources of pectin are beginning to find markets such as sugar beet pectin and sunflower pectin. Sugar beet pectin in particular is finding a niche market due to its unusual emulsification properties. the amounts of pectin from these different sources varies considerably:

- Apple pomace: 10-15%
- Citrus peel: 25-35%
- Sugar beet: 10-20%
- Sunflower: 15-25%

Properties

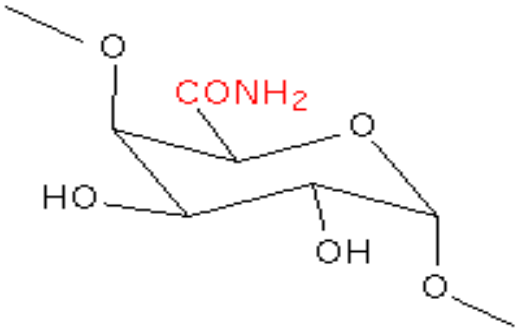
Pectin gelation characteristics can be divided into two main types: high methoxy gelation and low methoxy gelation.

Gelation of high methoxy pectin usually takes place at a pH of below 3.5 and a total solids content of above 55%. This is the typical gel formed during jam making. high methoxy pectins are characterised by their setting time and the gel strength. Setting time is usually categorised as rapid set, medium set and slow set. High methoxy pectins gel slower as more of the methoxy groups are removed during processing. The gel strength is measured SAG units and the pectin grade is often expressed as the number of units of sugar that a unit of pectin can gel.

Low methoxy pectin is gelled with calcium ions and hence is not dependant on the presence of acid or a high solids content. The less ester groups present the more sensitive the pectin becomes to pectin and hence a rapid set, low methoxy pectin has the lowest level of esterification.

Amidation can interfere with the gelation causing the gelation to be delayed. Another useful property of amidated pectins is the ability of the gel to reheal after shearing.

Amidated pectin ▶



Properties of different pectin grades

Type	Methylation level	Amidation level	Common Description
High Methoxy	74-77	0	Ultra Rapid set
High Methoxy	71-74	0	Rapid set
High Methoxy	66-69	0	Medium Rapid set
High Methoxy	58-65	0	Slow set
Low Methoxy	40	0	Slow set
Low Methoxy	30	0	Rapid set
Amidated	35	15	Slow set
Amidated	30	20	Rapid set