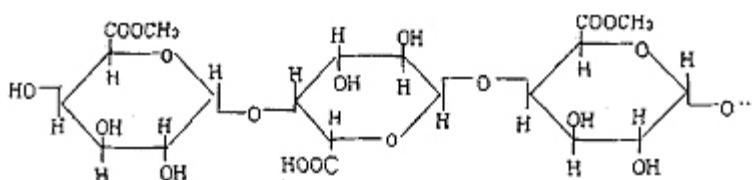


Pectin

Pectin is a polymeric carbohydrate, which is a natural component of the cell wall and the middle lamella in all green land plants. Hence, it has an important influence on the structural properties of fruits and vegetables.

Commercial pectins are white, light yellow or yellow powder without odour.

Generally, pectin is a linear polysaccharide chain which consists mainly of galacturonic acid units. The galacturonic acid molecules can be esterified with methanol. According to the degree of esterification (DE), pectin is classified into high methoxyl pectin (HM) with a degree of esterification higher than 50% and low methoxyl pectin with a degree of esterification less than 50% (LM).

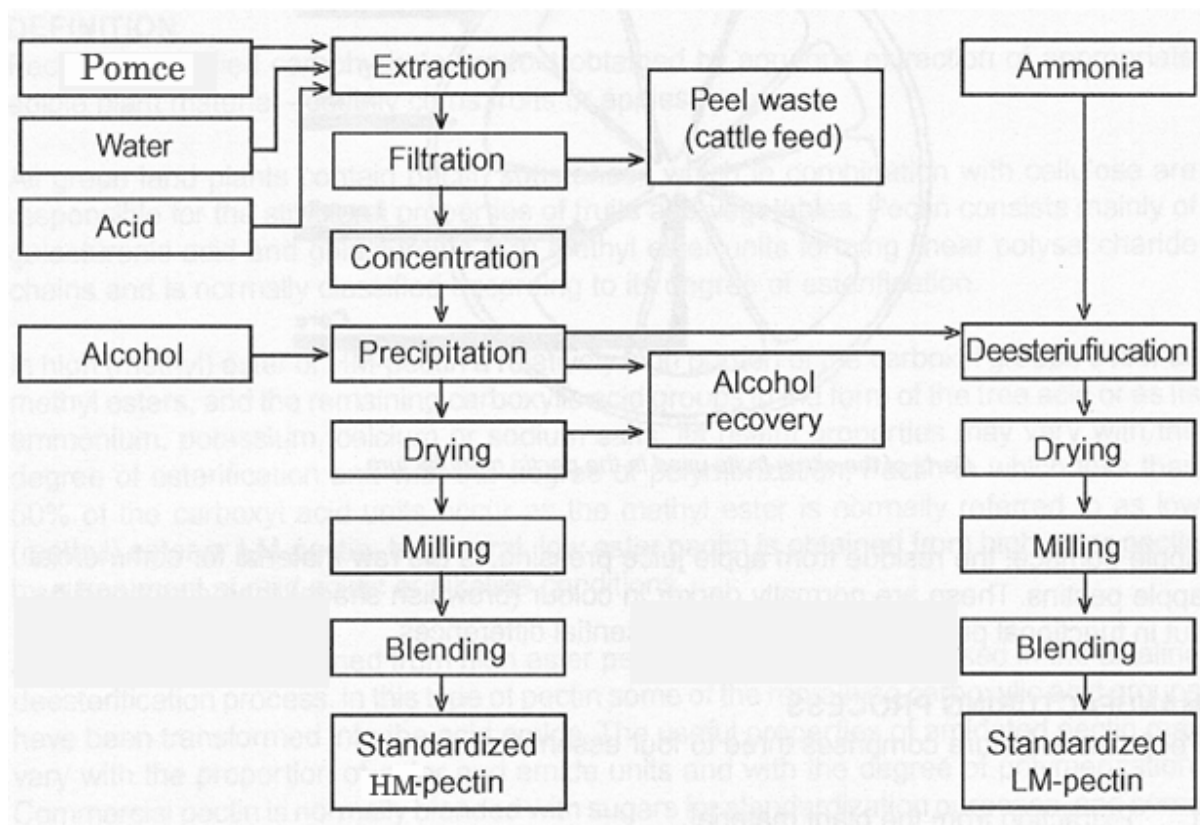


When ammonia is applied in the alkaline de-esterification process, some of ester groups have been replaced by amide group. Therefore, LM pectin is divided into low methoxyl conventional (LMC) and low methoxyl amidated (LMA)

Raw Merterials

China is one of the largest apple growing countries in the world, and Shandong enjoys a global reputation being an apple producing area. Thanks to the unique climate and land resources that favor apples, farmers here contribute high-quality apples to the world.

Production Process



Solubility

Pectin can dissolve in water but it is insoluble in most organic solvent. The solubility depends on the quantity and distribution of methoxyl groups, polymerization degree of molecules. At the same time, pH, temperature and ionic strength also have significant influence on it.

Rheological behavior

Pectin in aqueous solutions shows pseudoplastic behavior (shear thinning), when calcium is present, pectin system shows thixotropic tendency (structure rebuild). While diluted pectin solution is not influenced by salts and can be considered as Newtonian fluid.

Stability in solution

HM-pectin shows excellent stability at all temperatures in the pH-range 2.5~4.5. At pH higher than 4.5, pectin molecule is rapidly depolymerized due to β - elimination. At pH lower than 3.5, pectin is relatively heat stable. Adding sugar to the system can improve the stability of pectin.

Gelation

Pectin can gel under certain conditions. The key factor influencing the gelling properties of pectin is degree of esterification.

Calcium sensitivity

Calcium sensitivity (CS) is an important functional characteristic index of pectin. HM pectin is not Ca^{2+} sensitive during gelling, but certain amount of Ca^{2+} is necessary for LM pectin to gel. Generally, LMA pectin is more sensitive than LMC pectin.

Stability in solution

HM-pectin has remarkable stability on protein in acidified beverage.

Gelling mechanism

Gelling mechanism of HM pectin

The gelation of HM pectin needs sugar and acid. During gelling, different interaction between pectin molecules are

involved, e.g. hydrogen bonds and hydrophobic interaction, to form a three-dimensional network in which water, sugar and other solutes are held.

The most important factors which influence the solubility of pectin are:

1. Temperature
2. Pectin type
3. pH
4. Sugar and other solutes
5. Calcium ions
6. MW

Gelling mechanism of LM pectin

Calcium ions is important in the gelling mechanism of LM pectin. Besides, other factors which influence the solubility of pectin are:

1. Temperature
2. Pectin type
3. pH
4. Sugar and other solutes
5. Calcium ions
6. MW
7. DA

Stabilizing Acidified Milk Drinks

Milk proteins are negatively charged in pH 6.5-6.7 and will be positively charged below its isoelectric point (pH 4.6), while pectin has a negative charge at any pH > 3.5. In acidified milk system, the negative pectin molecules electrostatically stick to the positive protein surface, and lead to a uniformly distributed negative charge which keeps proteins being suspended by electrostatic repelling.

On the other hand, most part of pectin molecules will not interact with protein particles. Instead, the electrostatic repelling and hydrophobic interaction between these parts can disperse and stabilize protein system well.

HM pectin works the best on stabilization of protein system.

Products Types

High Methoxyl (HM)

HM pectins are pectins with a degree of esterification above 50%.

Low Methoxyl Conventional (LMC)

LMC are pectins with a degree of esterification below 50%. Commercial low methoxyl pectins are generally produced from plant material containing high methoxyl pectin. The transformation of high methoxyl pectin to low methoxyl pectin accordingly takes place under controlled conditions during the de-esterification process by treatment at either mild acidic or alkaline conditions.

Low Methoxyl Amidated (LMA)

If ammonia is used in an alkaline de-esterification process, a so-called amidated low methoxyl pectin will be produced. Besides galacturonic acids and galacturonic acid methoxyls, LMA pectin contains galacturonamide units in the molecular chain.

HM Medium Rapid Set Pectin E440

Description

MRS JF0102 is a medium rapid setting purified high methoxyl pectin, extracted from Citrus peel and standardized with dextrose

Specification

Grade (USA SAG):-	150 ± 5
Setting temperature:-	75 – 80°C
pH (1% solution):-	2.6 – 4.0
Degree of esterification:-	66–68%

Application

Jams, jellies	
pH range:-	2.5 – 3.5
Soluble solids:-	> 55 %

Usage Levels (Guidelines):

Jams, jellies:-	0.4 – 1.0 %
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We recommend dissolving Pectin in water before addition to the final system.

Sensory characteristics

Appearance:-	Free flowing powder.
Colour:-	Pale brown powder.
Odour:-	Slight, free from off-notes.
Taste:-	Slight, free from off-flavours.

Microbiological characteristics

Total plate count:-	< 1000cfu/g
Yeast and mould:-	< 100cfu/g
Coliforms:-	absent in 1 g
E. coli:-	absent in 1 g
Staphylococcus aureus:-	absent in 1 g
Salmonella:-	absent in 25 g

Chemical characteristics

Pectin content:-	>60 %
Galacturonic acid:-	>65 %
Loss on drying:-	<12 %
Ash ,total	<5%
Acid-insoluble ash:-	<1 %
Nitrogen content:-	<1 %
SO ₂ :-*	<50ppm
Free methyl, ethyl and isopropyl alcohol:-	<1 %
Heavy metals as lead	<15ppm
Lead	<5ppm
Arsenic	<3ppm
Particle size	1% retained on 300um

* Not used in the process.

Legal requirements

This product complies with all criteria laid down by ECC/EU, FAO/WHO (JECFA) and FDA/FCC .

Nutritional information depends on the standardisation

Energy (per100g)	typically 550 – 650kJ
Protein	typically <0.5%
Carbohydrates	15 – 25%
Of which sugars	15 – 25%
Fat	<0.5%
Fibre	typically 75 – 85%

Packaging & Storage

Packaging:-	Paper with polythene liner (25kg net).
Storage	Cool and dry
Shelf life:-	24 months.

Risks and Handling

A Material Safety Data Sheet is available on request.

The customer must take sole responsibility in the use and control of this product according to their countries current legislation.

Application:

Jam, Jelly & Preserve:

According to the content of soluble solids, Jam, Jelly & Preserves are distinguished by traditional standard resp. reduced calorie standard which is with a S.S. of higher than 60% resp. with a S.S. of 25% ~ 55%.

HM pectin is used for traditional jams, jellies, and preserves which have a S.S. 65% ~ 75%, a final pH 3.0-3.5, usually contain 0.25% to 0.5% HM pectin. Concerning the content of soluble solids and package size, rapid set, medium rapid set and slow set HM pectin can be chosen.

In low calorie jams, jellies and preserves production, LM pectin is used, especially LMA pectin, working with Calcium salts can form a rapidly homogeneous pectin-Ca²⁺ gel.

Acid Dairy Drinks:

Acid Dairy Drinks can be cultured, directly acidified or mixed with fruit juice. Without stabilizer, protein precipitation and serum

separation will occur, pectin molecules can protect protein molecules by hydrophobic interaction and electrostatic repelling to prevent the aggregation of casein particles to reach a long shelf-life.

HM pectin with a DE above 70% is used in Acid Milk Drinks.

Yoghurt Products:

Pectin can improve the texture of yogurt and reduce the tendency towards syneresis. Set yogurt adding with pectin can get improved firmness resp. stirred yogurt can get more creamy mouth-feel.

Both LMC and LMA can be used in yogurt products. Generally, the recommended addition is about 0.1%-0.2%.

Beverages:

Low calorie or low fruit juice content beverage tastes thinner due to the loss of viscosity from dissolved sugar. Pectin can help to gain back a desired mouth-feel without adding any calorie by building up a constant viscosity.

Pectin also has excellent cloud stability on fruit pulp beverage by increasing the serum viscosity in juice. Pectin gives uncomparable refreshing mouth-feel.

HM pectin has unique advantage in this application.

Confectionery:

As a texturizer, pectin is widely used in confectionery industry.

Pectin gives candy much better flavor release and typical visco-elastic texture. For a fruit flavored candy, extra slow set HM pectin is used, while for "neutral" flavor candy, a buffered LM pectin would be suitable to target on the final relatively high pH

Fruit Preparations:

Generally the soluble solids of fruit prep. is 20~65%. As regards good mouth-feel, soluble solids of 50~65% are required.

HM pectin are used in the fruit prep. which has S.S. of above 60% and a final pH below 3.5.

LM pectin has much wider gelling range in pH and S.S. besides, LM pectin is perfectly suited for yogurt fruit prep. due to the pumpable texture and ability to prevent fruit floatation.

Bakery Jelly:

Bakery jellies require very high baking stability and low water activity to avoid the water transformation from the filling into the dough.

For the reason of industrial use, pumpable (shear stable) and spreadable texture becomes more and more important.

Thus the extra slow set HM pectin and high calcium reactivity LM pectin can be chosen.

Dressing and Glazes:

Dressings are used in dessert after cooling or freezing to get refreshing mouth-feel and looking.

Glazes are normally reheated and diluted with water then applied on baked products to prevent them from drying out. A thermo-reversible gels is thus so necessary to guarantee a visco-elastic texture after application.

Apparently, LMA pectin has advantage to meet all these requirements. The recommend dosage normally is 1.0~1.5%.