unipektin INGREDIENTS AG

Know-How & Experience

SWISS QUALITY

VIDOPECTINE®

Natural Ingredient

Gelling Agent, Viscosifier, Stabilizer

Part of an extensive Portfolio

Know-How, Experience, Support

VIDOPECTINE®

Know-How and Experience

Pectin has determined and influenced UNIPEKTIN throughout its more than 80 years of company history. For example, soon after its foundation in 1936 by the Schauwecker family in Eschenz, Northern Switzerland as a trading company for pectin and fruit concentrates the establishment of pectin factories in Switzerland, Italy and France were initiated and realized.
The degree of involvement of UNIPEKTIN in these pectin ventures changed during the following decades and eventually stood back behind other hydrocolloid activities like galactomannans. However, early in the new Millenium, it was decided to resurrect the pectin business by using UNIPEKTIN's broad experience base with countless years of experience in pectin production, standardization and application among its management, the laboratory personnel and technical sales-people as well as the international distributors, making UNIPEKTIN Ingredients AG once again a trusted source for pectin globally.

VIDOPECTINE® Texture & Stability

Our VIDOPECTINE pectin product line complements perfectly our VIDOGUM Galactomannan product range of Locust Bean Gum, Guar Gum and Tara Gum, the VIDOFIBRES range of sugar beet, apple and pear fibres, the VIDOGUM PRO carob protein as well as the VIDOGLACE ice cream stabilizer product line. With these, we offer our customers a wide range of solutions for gelling, texture, stability and protein protection for countless applications in the food industry.

Our quality ingredients combined with our know-how in applications and global market experience deliver unique and cost-effective solutions helping our customers to remain competitive in their fields.

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VIDOPECTINE®

The Basics

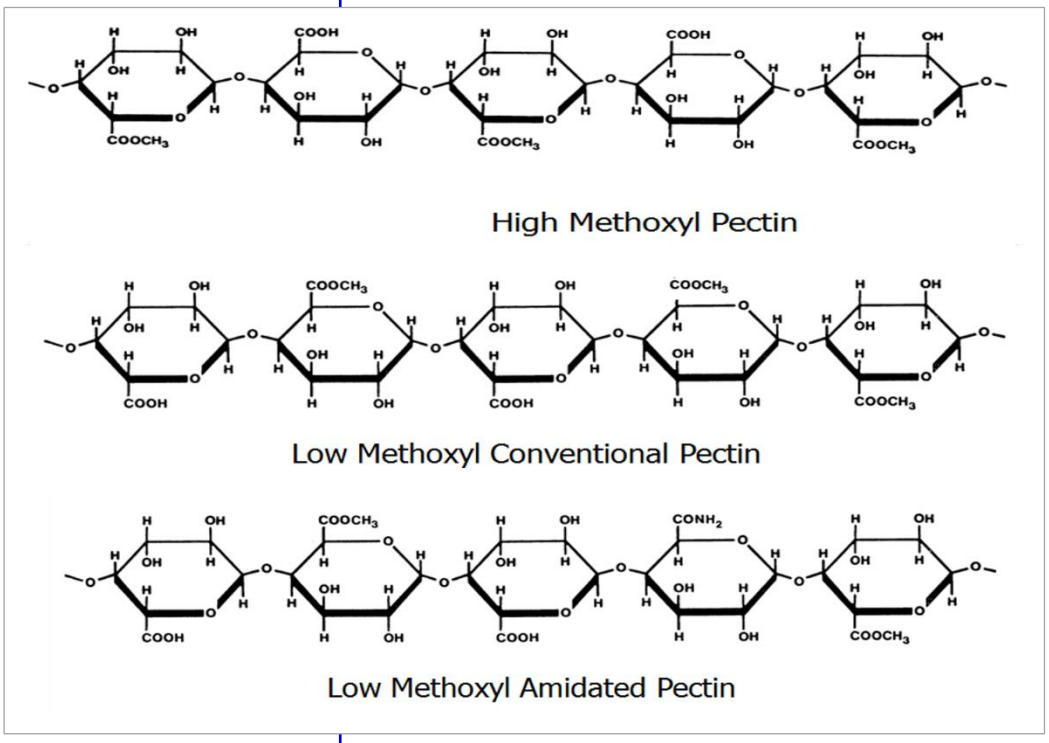
Pectin is a structural acidic heteropolysaccharide contained in the primary cell walls of terrestrial plants. Its main component is galacturonic acid, a sugar acid derived from galactose.
It was first isolated and described in 1825 by Henri Braconnot and is commercially produced since the early 1900s.
It is produced commercially as a white to light brown powder, mainly extracted from citrus peel and apple pomace but also frm sugar beet pulp, and is used in food as a gelling agent, particularly in jams and jellies. It is also used in dessert fillings, sweets, as a stabilizer in fruit juices and milk drinks, as a source of dietary fibre and in supplements and medicines.

To the pectin user, many different grades of pectin are commercially available, all of them optimized for specific functions like e.g. gelling, viscosifying and stabilization.
UNIPEKTIN can supply a wide portfolio of application-specific standardized pectin grades and blends.
Pectin products are classified into 3 main pectin types according to their degree of methylation. Each of these types of pectin has different characteristics yielding a wide range of beneficial functions and uses within the food and pharmaceutical industries

High Methoxyl (HM) Pectin:
This type of pectin has a degree of methylation (DM) greater than 50%. The DM refers to the number of carboxyl groups that are esterified with methanol on the pectin galacturonic acid backbone. HM pectins need a system containing over 55% solids and a low pH to gel.

Low Methoxyl (LM) Pectin:
These pectins have a DM lower than 50% (less than 50% of the carboxyl groups are esterified). LM pectins gel in the presence of calcium but also with sugars and acids, however, their distinctive feature is the ability to gel in systems with low soluble solids.

Low Methoxyl Amidated (LMA) Pectin:
This type of pectin is similar to the LM pectins, though some of the free carboxyl groups are 'amidated', meaning they have -CONH2 groups on them. LMA pectins also require calcium ions to gel, though usually far less than LM pectins. LMA pectins are ideal for certain types of jams and fruit preparations, as well as yoghurts.



VIDOPECTINE®

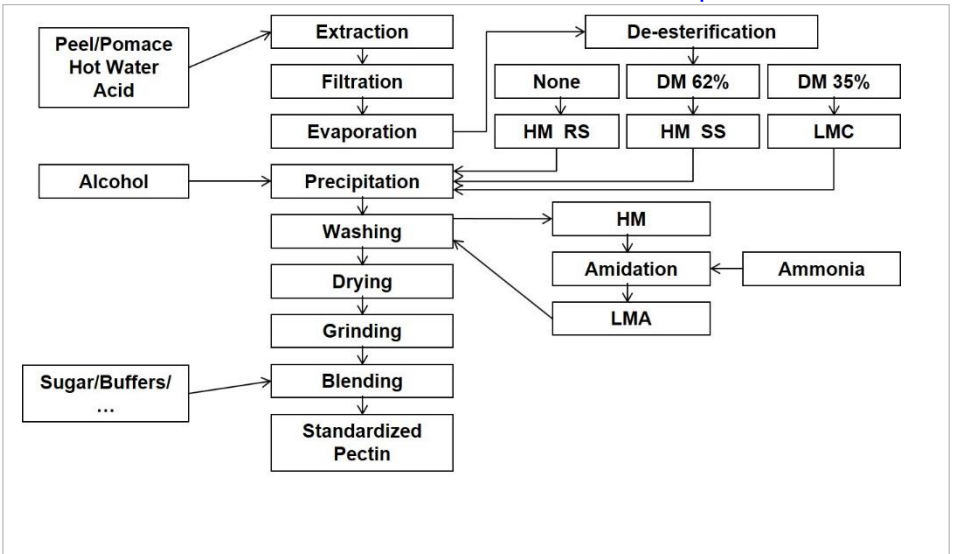
Production & Chemistry

The pectin used to manufacture our VIDOPECTINE pectin grades is extracted from the citrus peel or apple pomace. The quality of pectin is greatly depending on the quality of the source, therefore it is produced under contract by two dedicated pectin producers with which Unipektin Ingredients AG enjoys a trusted and close relationship, which we supported technologically in the establishment of their pectin factories, and with which we continue to work together closely in the constant optimization of the production process This is the guarantee for us to receive the raw premium quality pectin extracts needed by us to produce our premium quality commercial pectin grades by standardization to several important parameters like e.g. setting time, calcium reactivity, texture, viscosity etc.

The extraction process starts using either fresh or dried raw material like citrus peel, apple pomace or sugar beet pulp and adding water and nitric acid. In a carefully controlled process, the requested pectin (first and foremost defined by the degree of methoxylation) is produced by varying parameters like time, pH and temperature. Once the intended DM has been reached, the peels or pomace is separated from the extract by pressing, the extract then is concentrated and filtered to remove impurities. Finally, liquid (HM) pectin is precipitated in alcohol. At this stage as an option, the liquid pectin can be 'amidated' using ammonia, where during the so-called de-esterification process some of the ester groups on the molecule are replaced by amide groups, resulting in pectins (LMA) with different and unique gelling characteristics and textures, making them suitable for a wider range of solids levels and pH values.

The de-esterification to a DM of below 50% can also be done using acids instead of ammonia and then will produce the LM pectins, sometimes also referred to as non-amidated or conventional (LMC) pectins, whose calcium reactivity will increase with a lower DM.
The final production steps to obtain pure powdered and concentrated HM, LM or LMA citrus or apple pectin extracts involve washing, drying, milling, sieving. After receiving these 'raw pectins' in our factory they are carefully quality checked, analyzed and specified to decide which of our Swiss-made commercial pectin grade they are suitable for and how they will have to be standardized to fulfil the requirements of these grades. A recipe is set, and production can start by blending different batches of raw pectins, adding neutral ingredients like sugar or processing aids like buffer salts.

Pectin Chemistry
The characteristic and primary backbone of pectin and the chain-building unit is galacturonic acid (GA, minimum 65%), 1,4-linked into the polysaccharide chain, with some of the GA groups being free, or simple salts of sodium or potassium, or naturally esterified with methanol (methyl ester groups).
The methyl ester groups are randomly distributed along the pectin chain, and they play the most significant role in the function and properties of pectin.
Pectin is the most acid stable natural hydrocolloid. It is stable in a pH range of 2.5 – 5.0, but unstable at pH 7 or higher as at this level the ester groups split off, resulting in sodium pectate.



Gelling

All pectins, HM, LM and LMA, can gel, but they do produce their own specific and distinct types of gels.
HM pectins need over 55% solids and a low pH (below 3.3) to gel. The family of VIDOPECTINE HM pectin grades can provide a wide range of gel textures depending on the source (citrus or apple) and the DM (50 – 80) for a range of typical applications like jams and preserves, marmalades, jelly candy, gummies, fruit-based fillings for bakery products. Excellent flavour release and syneresis control are other key functions of the HM pectins.

LM pectins gel in the presence of calcium but also with sugars and acids, however, their distinctive feature is the ability to gel in systems with low soluble solids. As a rule, the amount of calcium needed by the pectin to gel increases with lower solids content and pH.

LMA pectins also need calcium ions to gel, though usually far less than LM pectins. LMA pectins are ideal for certain types of jams and fruit preparations, and yoghurts as well.

Viscosity

HM pectins are an ideal viscosity delivering hydrocolloid for fruit-based beverages, fruit syrups and cordials, but also in ice lollies, water ice and sorbets, particularly also in low calorie, low sugar or diet beverages, to compensate for the low mouth-feel caused by the lack of sugar.

Stabilization and protection of protein against heat denaturation

HM pectin is uniquely suitable and able to stabilize low pH and protein-based beverages such as yoghurt drinks, acid milk drinks, milk juice drinks, whey drinks and acidified soy drinks. In such systems and at a pH below the isoelectric point of the casein or protein, the negatively charged pectin molecule interacts with the positively charged casein establishing a sort of protective cover and preventing heat denaturation during pasteurization or sterilization. As a side effect, the pectin molecules also create steric hindrance between themselves assisting in the prevention of sedimentation of protein during shelf life.

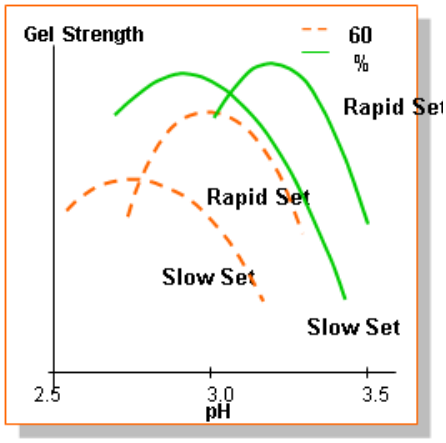
UNIPEKTIN's VIDOPECTINE range of pectins for these applications are standardized and tested in consideration of the finished products and provide the stability, viscosity and organoleptic qualities expected by the consumers.

HM pectin needs a minimum sugar or solids content and acid to gel, usually a minimum of 55% solids, and a pH of 3.5 – 2.8. A high solids content in the system allows for a higher pH too, as the sugars support the pectin's ability to gel.
HM pectins are usually classified according to the setting speed in Extra Rapid Set, Rapid Set, Medium Rapid Set, Slow Set and extra Slow Set pectins. The time it takes the gel to build increases with a lower DM (or in other words: the temperature at which the gelling starts, decreases with a lower DM). Rapid Set pectin will set faster and set at a higher temperature than Slow Set. The following table explains schematically the different HM commercial pectin types for high solids applications.

HM Pectin type	Typical DM (%)	Setting Time (min	Setting Temp. (°C)*	Typical Application
Extra Rapid Set	> 72	< 2	> 75	Jams, Preserves with whole fruit
Rapid Set	68 - 72	2 - 3	70 - 75	Regular Jams and Preserves, Marmalades
Medium Rapid Set	64 - 68	3 - 4	65 - 70	Acidic jams and Preserves
Slow Set	58 - 64	4 - 5	60 - 65	Jams in large containers, jellies, fruit preps, confectionery.
Extra Slow Set	< 58 - 54	> 5	< 60	Confectionery, gummy candy.

* Standard jam conditions: 65% SS, pH = 3.1 - 3.2.

The gelation mechanism of HM pectin is based on the formation of junction zones as a result of hydrogen bonding between non-dissociated carboxyl groups (–COOH) and hydrophobic interactions between methyl ester groups (-COOCH3). The presence of high solids creates low water activity which promotes pectin to pectin interactions. Lowering the pH increases the –COOH number; lowering the DM increases the –COOH number, but also lowers the methyl ester group number. The combination, therefore, of pH, soluble solids, and pectin DM provides a functionality grid for a wide range of high solids applications. High methoxyl VIDOPECTINE pectins will provide smooth and spreadable textures in jams and jellies, as well as a wide range of textures, from hard or firm to soft and chewy, in confectionery products. Some VIDOPECTINE pectins are standardized with buffer salts, facilitating their use during processing and providing distinct textural differences.
The higher the SS the stronger is the gel strength till the pre-gelation point.
The lower the pH (higher the acidity), the stronger is the gel strength till the pre-gelation point.

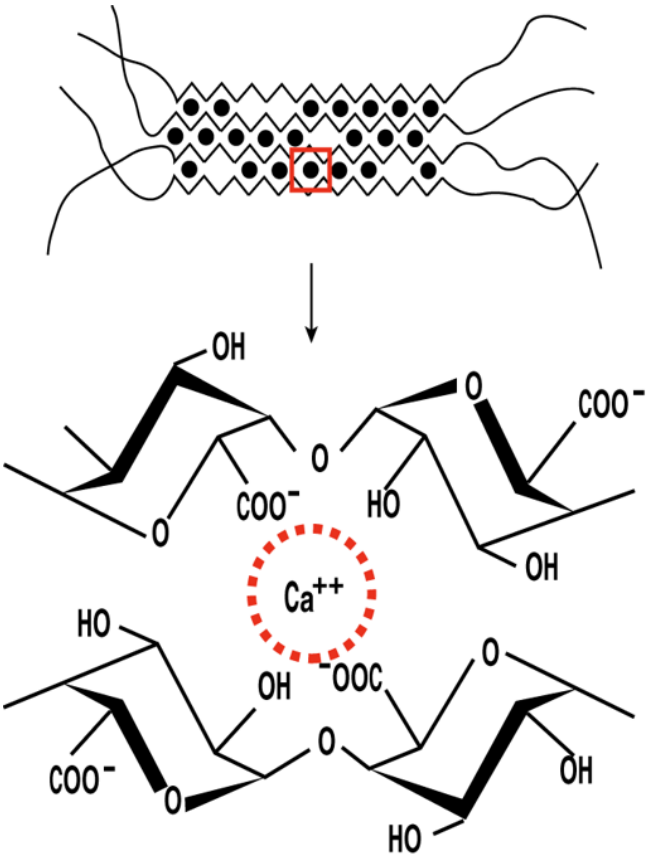


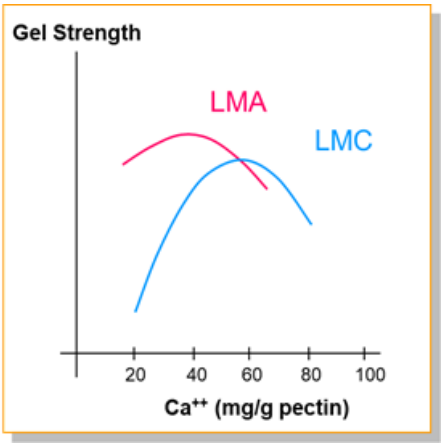
VIDOPECTINE®

Gelling Mechanisms LM and LMA Pectins

LM (Low methoxyl pectin)

LM pectin forms gels through in a similar way to HM pectins in high sugar-acid systems, but they can also form gels in low soluble solids systems by bonding with bivalent cations, primarily calcium ions, but also potassium ions. Pectin chains cluster over calcium bonds like the “Egg Box” model. LM pectin gels are less elastic than HM gels and are thermo-reversible and thixotropic.





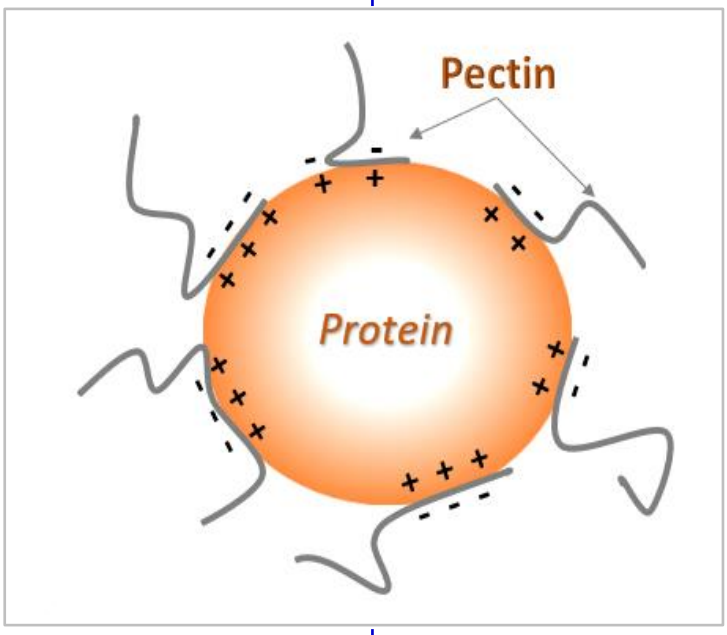
LMA (Low methoxyl amidated pectin)

LMA pectin gels in a similar way to LM pectin, however, LMA pectin is more sensitive to the presence of calcium ions and hence will gel at lower calcium concentrations. Furthermore, LMA is more tolerant of calcium content and thus will gel over a wider range of calcium concentrations.

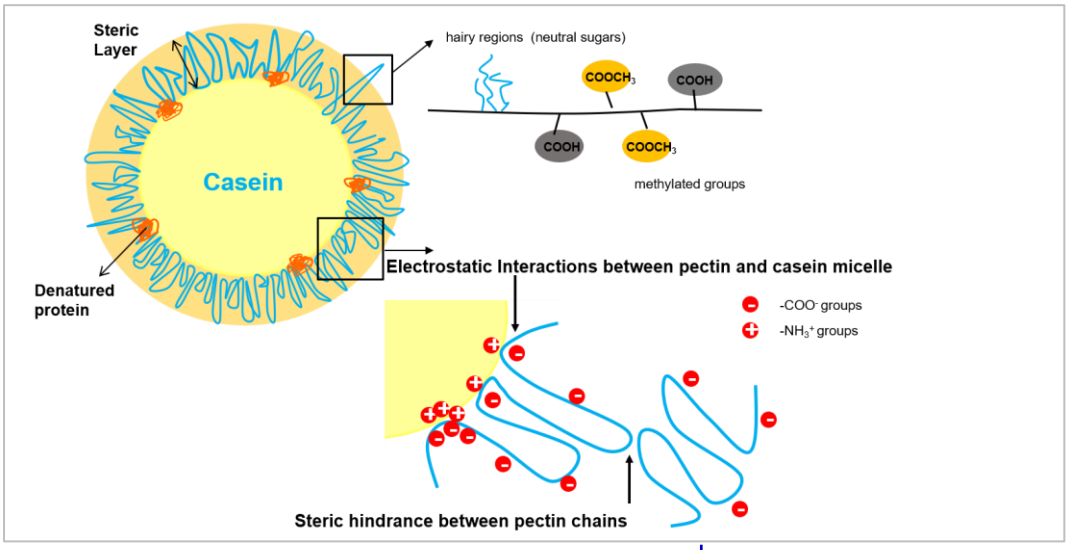
VIDOPECTINE®

HM Pectin - Protein Protective Colloid

The VIDOPECTINE product line contains a range of pectins suitable to stabilize acid milk drinks and acidified protein beverages.
The graphic below shows how the negative charges of the pectin cross-link to the positive zones on a protein molecule.



Also, steric hindrance is created between pectin chains to further stabilize the system. That is demonstrated in the graphic below:



Without pectin, significant sediment would form at the bottom of acidified protein drinks. Our high methoxyl pectin solutions, however, offer the ability to not only stabilize beverages such as drinkable yoghurts and acid milk-juice drinks but also provide excellent mouth-feel, viscosity and flavour release.

Storage

Under normal conditions of storage, all powder pectins will undergo a certain amount of deterioration. The length of the pectin molecule will shorten, reducing the molecular weight and grade of the pectin. Also, the degree of methylation will be reduced, altering the properties of the pectin.

For powder pectin, the storage life of at least 18 months can be expected, provided the powder is kept under cool, dry conditions and the container is sealed when not in use. The powder should be stored clear of strongly flavoured material.

Hydrating Pectin properly

Pectin is a hydrophilic colloid and therefore has a high affinity for water. When making a pectin solution the pectin particles must be separated before they are fully wetted if the formation of lumps is to be avoided.

There are various methods which may be used to separate the pectin particles. These are detailed below.

High shear mixer

Place the high shear mixer off-centre in the container to obtain maximum turbulence. The agitator blades should be submerged to prevent excessive aeration. The powder should be added slowly onto the upper part of the vortex so that the individual granules are wetted out. The addition should be completed before thickening reduces the vortex. Using this method it is possible to prepare a 5% solution at room temperature. More concentrated solutions (5 – 7%) can be prepared when using hot (80°C) water.

Dry-mix or liquid-mix dispersion:

Physical separation of the gum can be obtained by mixing pectin with 3-5 times its weight of a dry ingredient such as sugar, or with 4-6 times its weight of sugar syrup. The blend can then gradually be added to water at 80°C while stirring. The solution must then ideally be heated to boiling point to ensure the pectin is completely dissolved. This method is known as the open pan method, and can also be used to reduce lumping when using a high shear mixer.

When pectin is blended with sugar syrups, the pectin will slowly hydrate, therefore the blend should be used within a few hours of makeup, to avoid high viscosity build-up

stability of pectin solutions

pH	Type of Pectin	Stability
< 3.0	HM	Generally fairly stable at room temperature for several hours.
	LM	May begin to precipitate because of pH.
3-5	HM/LM	Both types stable at room temperature for up to a maximum of 8 hours. At 80°C a solution should be held for no longer than 1 hour. Storage at high temperatures is not generally recommended.
> 5.0	HM/LM	Not recommended due to risk of severe depolymerization and de-esterification.
	LM	Less sensitive to degradation. However solutions should not be held at high temperatures for long periods.

Factors affecting hydration

Once the pectin particles have been fully separated using either of the methods above, the conditions present in the dissolving medium affect the ability of the pectin to dissolve fully. The various factors that influence this are detailed below.

Lump formation

Using the methods detailed above, lump-free solutions should be obtained. If lumps are formed, this pectin becomes unavailable, resulting in a product of reduced gel strength, and the dissolving method should be reviewed.

Soluble solids

As with most hydrocolloids, pectin will not fully dissolve in a high solids medium. It is recommended that the soluble solids level when making a pectin solution be no more than 30%, and if prepared at these levels, the solution must be heated to 80°C to ensure the pectin is fully dissolved.

Water hardness

Pectin, particularly LM types, will have reduced solubility in hard water. To achieve full hydration the solution may need to be heated sufficiently or may require some sequestration.

Other dissolving media

Pectins, particularly HM types, can be dissolved in other liquids such as milk or fruit juice, provided that the medium is heated adequately to fully dissolve the pectin. When dissolving LM pectin, account must be taken of the soluble solids and calcium content of the medium

Pectin concentration

If a very concentrated solution (7% - 10%) is to be prepared, it may be necessary to heat the medium to reduce the viscosity to ensure that the pectin dissolves.

VIDOPECTINE®

Main Applications and Functions

Application	*Product*	*Functions*
Fruit spreads	Jams, Jellies, Preserves, Marmalades, Fruit spreads, low-calorie jams etc.	Gelling and providing a range of different textures from firm and elastic to soft and spreadable and reversible. Syneresis control. Prevention of flotation of fruit pieces.
Confectionery	Jelly candy, gummy candy, pâtes de fruits, fruit leathers, pastilles, Zefir etc.	Gelling and creation of a range of different textures from firm and elastic to soft and pasty. Quick setting, starchless depositing possible. Improvement of melting point in gelatine based gummy candy through the addition of pectin.
Bakery	Bake stable fruit fillings, post bake Injection and other fillings, toppings, glazes, other preparations	Used on its own or in combination with starches, alginates, fibres etc. Provides pumpability, reversibility, syneresis control, bake stability, a range of textures and fruit suspension.
Fruit yoghurts, layered or mixed	Yoghurt fruit preparations	Gelling, texture, pumpability, stability, fruit suspension during filling and storage. Often used in combination with starches, guar gum, LBG etc. Calcium reaction of LM pectin can have a positive viscosity and mouth-feel effect in fruit yoghurt.
Acid milk drinks / low pH protein beverages	Drinking yoghurt Acid Milk Drinks Fruit-milk smoothies Whey – fruit drinks Soy – fruit drinks	Stabilization through protein protection during acidification/fermentation, and pasteurization. Reduction of sedimentation of protein. Mouth-feel, flavour release.
Dairy desserts	Cup yoghurts, stirred or set, short shelf life.	Provides clean, non-sticky texture and structure.
Beverages	Juice drinks Diet drinks	Helps with the suspension of fruit sacks and fruit particles. Adds viscosity and mouth-feel.
Ice cream	Water ice, ice lollies, popsicles	Reduces crystal size during freezing. Improves mouth-feel, melting behaviour, and 'suckability'.
Nutritionals, Supplements, Health-care	Fibre supplements, anti-diarrhoea pills and emulsions, colostomy bag – seals, wound treatment….	Pectin is 100% soluble fibre, with proven effects on cholesterol control, weight loss, diarrhoea treatment, wound healing, anti-inflammatory effect on skin and many more.

Product Suitability

The information and advice contained in this document is provided by UNIPEKTIN Ingredients AG as a courtesy only and is intended to be general. Any uses suggested in this brochure are presented only to assist our customers in exploring possible applications.
UNIPEKTIN Ingredients AG makes no warranty as to its accuracy or completeness, or the results obtained from such information.
It is in the interest of the customer and user to determine whether our products are suitable for the intended use and if they do comply with all applicable laws and regulations valid for the food industry in their country and also observe all third-party rights.

Know-How and Experience

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