Pectin

Pectin is amazing stuff: in nature, it acts as glue, holding cells together in plant tissue. The pectin used in cooking acts as a thickener and comes from a family of polysaccharides that, depending on processing, are divided into two broad types: high- and low-ester pectins, sometimes called high-methoxyl (HM) and low-methoxyl (LM). The difference between the high and low types has to do with the esterification of the molecular structure—this is just a detail of the pectin molecules that can vary. The number of esters present in the pectin molecules is naturally high, but with processing it can be reduced, which changes the way pectin forms a gel. High-ester pectin requires sugar and acid in order to link together; low-ester pectin can also create a gel using cations like potassium or calcium.

To complicate matters, the labels of high- and low-ester are based on an arbitrary cutoff point for the degree of esterification. All the requirements for gelling can be satisfied, but the time for the gel to actually set can vary from 20 seconds to 250 seconds. If you're making jam and pull a sample to test gel level, you may have to wait 4 minutes or so to actually determine if you've created the right conditions, depending on the specifics of the high-ester pectin you're using.

> Making jam? Throw some spoons in the freezer before you start. When making the jam, drip the hot jam onto the cold spoon to let it cool for a few minutes to check if it forms a good gel.

Commercially, pectin is extracted from cooked citrus rinds or apple pomace (what's left after the juice is pressed out of the fruit) and cores. You can use the same method to make your own pectin; you'll end up with high-ester pectin in liquid. (The process to convert it to low-ester pectin isn't a home project.) The natural presence of pectin in some fruits is also why a jam recipe may not even call for pectin—it's already in the ingredients!

High-ester pectin won't form gels when there's too much water around. Adding sugar reduces the amount of available water, plus sugar is needed for high-ester pectin to set. High-ester pectin also forms gels only in a pH range of around 2.5 to ~3.5, which is why some recipes add an acid like lemon juice to drop the pH range. Fruits that have more natural sugars will require less added sugar, and likewise more acidic fruits won't require the addition of something like lemon juice.

Low-ester pectin is made by processing high-ester pectin with an acidified alcohol. This creates a pectin that sets in the much wider pH range of 2.5–6.0 and tolerates more water, although low-ester pectin does still gel better at the lower pH range (below 3.6). Low-ester pectin is more forgiving than high-ester pectin: it can handle more free water and less acidic environments but still does better when treated like high-ester pectin. Low-ester pectin has the benefit of being able to create low-sugar or low-acid foods, allowing for less sugary jams.

In general, if you can get low-ester pectin, use it—it's just easier to work with, as you can see from the chemistry. Otherwise, be patient with high-ester pectin: use about 1% (by weight), plenty of sugar (60–75%), and enough acid (like lemon juice) to drop the pH.