

The Science of Jam and Jelly Making

Home canning jams and jellies is fun and satisfying. Generally referred to as soft spreads, they differ only in their consistency. They all are made of four main ingredients: fruit, sugar, pectin, and acid. The formation of a gel depends on the right amount of each of these ingredients. If you understand the science of jelling, all your soft spreads will be a success.

Soft Spreads

Butters are made by cooking fruit pulp and sugar to a thick consistency that will spread easily. Spices may be added, depending on personal taste.

Conserves are jam-like and made by cooking two or more fruits with sugar until the mixture will either round up on a spoon like jam or flake from it like jelly. A true conserve contains nuts and raisins.

Jams are made by cooking crushed or chopped fruits with sugar until the mixture will round up on a spoon. Jams do not hold their shape but are spreadable.

Jellies are made from the strained juice of fruit. Jelly should be crystal clear and shimmering. It should hold its shape but be soft enough to spread.

Marmalades are soft-fruit jellies containing small pieces of fruit or peel evenly suspended in the transparent jelly.

Preserves are fruits preserved with sugar so that the fruit retains its shape. Preserves are clear, shiny, tender, and plump.

Pectin and Fruit

- ❖ Pectin is a carbohydrate found in fruits. When sugar is added, the pectin in fruit or commercial pectin precipitates out and forms insoluble fibers. An acid, such as lemon juice or citric acid, aids in the process. The insoluble fibers produce a mesh-like structure that traps the fruit juice or other liquid, much like a sponge absorbs water. This enables a gel to form.
- ❖ Recipes without added pectin use the natural pectin in the fruit to form the gel. Tart apples, sour blackberries, cranberries, currants, gooseberries, concord grapes, soft plums, and quinces work well in recipes without added pectin.
- ❖ Slightly under-ripe fruit contains more pectin than ripe fruit. Overripe fruit may not contain enough pectin to form a gel. A general guideline is to use one part under-ripe

fruit to two parts fully ripe fruit for the best gel and flavor. The USDA canning guide recommends at least one fourth of the fruit to be under-ripe.

- ❖ Other fruits, such as apricots, blueberries, cherries, peaches, pineapple, rhubarb, and strawberries are low in pectin. To form a gel, they must be combined with one of the higher pectin fruits or used with a commercial pectin product. Use of the commercial pectin decreases cooking time.
- ❖ The pectin in fruit becomes water soluble when it is heated. So for jelling to occur, the fruit must be heated. Too high of a temperature or cooking for too long can destroy the pectin, resulting in a poor gel. Doubling the recipe changes the length of time needed for boiling and can result in a soft gel.
- ❖ Commercial pectin can be used with any fruit, even those high in pectin. Too much pectin will give the jelly a tough, rubbery consistency, making it difficult to spread. Following the recipe guide that comes with the pectin will help eliminate this problem.
- ❖ There are two types of pectin, liquid (usually made from apples) and dry (from citrus fruits or apples). Powdered pectin can be stored in the freezer from one season to the next. Freezing will destroy the gel-producing qualities of liquid pectin, but liquid pectin will keep for two years in a cool, dry place. Powdered and liquid pectin are not interchangeable. The production code on the back will indicate the date of packaging.
- ❖ There are several products on the market that allow you to make jams and jellies that are lower in calories. These low methoxyl pectin products allow you to make jams and jellies with less sugar but they will not be quite as thick or glossy.

Acid

The acidity level is also important to jelling. The gel will not set if there is too little acid. Too much acid will cause the gel to lose liquid or weep. For fruits low in acid, add lemon juice or other acid source as instructed.

Sugar

Sugar is necessary for the gel to form. It also acts as a preserving agent and contributes flavor. Do not attempt to reduce the amount of sugar in regular jam and jelly recipes as a syrupy gel will form. When using low methoxyl pectin products, you must use the recipes provided in the package.

Fruit Jam or Jelly Common Problems

Jam or Jelly did not Set:

- 1) You may have used overripe fruit.
- 2) You may have used old pectin.
- 3) There was not enough pectin available during the cooking process.
- 4) You may have overcooked the fruit while extracting the juice or used too much water in this part of the process.
- 5) You may not have measured the ingredients accurately.
- 6) You may not have cooked the jam quite long enough.
- 7) You may have moved the jam before it had a chance to set up in the jar.

Sugar Crystals in Jelly:

- 1) You may have used more sugar than the recipe listed.
- 2) There might have been undissolved grains of sugar on the sides of the pan that washed into the jelly while ladling into the jars.
- 3) Overcooking the jam or jelly by cooking too long.
- 4) Doubling or tripling the batch.
- 5) Crystals could be tartrate crystals—these are found in grape juice that has not been allowed to settle and strained.

Bubbles in Jelly:

- 1) Trapped air in the jelly—remember to skim foam before filling jars.
- 2) Fill jars quickly to prevent partial gelling before jars are filled.
- 3) Bubbles may be an indication of spoiling. If the bubbles are moving discard.

Jam or Jelly Seems to be Weeping:

- 1) There may be extra acid in the juice that made the pectin unstable.
- 2) You may be storing the jam or jelly in a place that is too warm.

Jam or Jelly Seems to be Darker than Expected:

- 1) You may have boiled the jam or jelly too long or cooked it too slowly.
- 2) The jam or jelly may have been stored in a place that is too hot

Jelly is Cloudy:

- 1) You may have used fruit that is under ripe.

- 2) You may have squeezed the juice bag while straining the juice from the fruit. Just let the juice drip out next time.
- 3) You may have waited too long to place the jam or jelly in the jar. Ladle it into jars before it begins to set up.

Jam or Jelly is too Stiff:

- 1) You may have overcooked the jam or jelly.
- 2) The fruit you used may have too much pectin in it—remember to use ripe fruit.

Step-By-Step Canning

- 1) Assemble all equipment utensils.
- 2) Visually examine jars, lids, and bands for defects. Wash jars and two-piece caps in hot, soapy water. Sterilize jars by placing in boiling water for 10 minutes. Place lids, bands, and jars in simmering water. Remove pan from heat and allow the lids and jars to remain in the hot water until needed. Do not boil the lids. Dry the bands and set aside.
- 3) Use top-quality fruits after washing.
- 4) Prepare only one recipe at a time and follow the directions.
- 5) Remove from heat and skim foam.
- 6) Immediately fill hot spread into hot jars, leaving a ½-inch headspace.
- 7) Wipe top of jars and adjust caps.
- 8) When all the jars are full, place on a rack. Lower in a canner half full of boiling water. Add boiling water to cover two piece caps by 1 to 2 inches.
- 9) When processing time is complete, remove jars from canner. Most recipes call for at least five minutes. Stand jars upright on a towel a few inches apart. 10. After 12 to 24 hours, test seals and remove bands.
- 10) Wash outside of jar and lid surface. Label and store sealed jars in a cool, dark, dry place.
- 11) Enjoy your very own spreads.

References

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- McGee, H. On Food & Cooking, Scribner, 1997.
- USDA Guide to Home Canning & Preserving, Second Edition, 1999.
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