

# PHILADELPHIA SOFT PRETZELS

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## Materials Needed

- 1 package active dry yeast
- 1-1/4 cup warm water
- 1 tsp. sugar
- 2 tsp. salt
- 4 to 5 cups all-purpose flour
- 4 tsp. baking soda
- shortening (as needed)
- coarse salt (pretzel salt, if available, substitute Kosher salt)
- bowls for mixing and rising the dough
- wooden spoon or utensil for mixing dough
- slotted spatula
- large pot
- cookie sheet

## Safety

Safety glasses or goggles must be worn in the laboratory at all times.

If this experiment is performed in a chemistry laboratory, all work surfaces must be cleaned and free from laboratory chemicals. After cleaning worksurfaces, it is advised to cover all work areas with aluminum foil or a food-grade paper covering.

All glassware and apparatus must be clean and free from laboratory chemicals. Use only special glassware and equipment, stored away from all sources of laboratory chemical contamination, and reserved only for food experiments is recommended.

There are no safety hazards associated with the materials used in this experiment.

Exercise proper precautions in handling hot materials. Use pot holders or oven mitts when necessary.

## Disposal

Generally, all waste materials in this experiment can be disposed in the trash or poured down the drain with running water. All disposal must conform to local regulations.

## Procedure

Dissolve the yeast in 1/4 cup of warm water.

Place one cup warm water in a mixing bowl. Add the sugar. Stir to dissolve. Add the yeast solution and the salt. Stir well.

Add 4 cups flour and mix to form a stiff dough. (If dough is too soft, add additional flour. If dough is too stiff, add additional water one tsp. at a time.)

Knead the dough until elastic (may take up to 10 minutes).

Grease a bowl with shortening. Place the dough in the bowl and turn it until coated with the shortening. Cover the bowl with a damp towel and let the dough rise in a warm place until double in size. (Approximately 45 minutes.)

Break the dough into 8 to 10 pieces. Roll each piece into a long stick about 50 cm (20 inches) long. Twist into a pretzel shape. If necessary, dampen the ends with water so they will stick together.

Measure 4 cups water with 4 tsp. of baking soda into a large pot. Bring to a boil. Drop in the pretzels two or three at a time (don't crowd them) and wait until they float. Boil for 1 minute, turning once. Remove them with a slotted spatula, drain momentarily, and place them on a greased cookie sheet. (As an alternative, the pretzels can be placed on parchment paper on a cookie sheet, but care should be exercised as the oven temperature will be near the ignition temperature of the paper.) Sprinkle the pretzels with coarse salt.

Bake the pretzels at 245°C (475°F) for 12 minutes or until they are golden brown.

## **Explanation**

Philadelphia soft pretzels are made from a basic bread dough. When making bread dough, some of the added water is absorbed by starch granules in the flour, but the rest gets tightly bound to the proteins by hydrogen bonding forming massive branched aggregates of 100 or more molecules which are called gluten. As the dough is kneaded, the gluten chains line up forming new links, similar to the process of spinning cotton or wool into thread, making the dough stiff and elastic. The stiff, elastic dough will expand slowly to incorporate pressurized pockets, or bubbles, of carbon dioxide produced by the yeast. A stiff dough results in gas bubbles of a more even size and produces a bread with a finer texture.

Only one rising of the dough is used in this recipe, as compared to many bread recipes. The second rising redistributes the yeast, its food supply, carbon dioxide, and the temperature (fermentation produces heat) forming smaller, more even gas bubbles which results in a finer, sometimes cake-like, texture.

Boiling the pretzel dough before baking causes the surface starch to gelatinize into a thin transparent coating that produces a glossy brown crust when baked. If boiled too long, excess moisture will prevent browning.

The baking soda (sodium bicarbonate) is added to the water to help the salt adhere to the surface. Some pretzel recipes call for the use of a dilute lye (sodium hydroxide) wash, instead of boiling, to make the salt adhere. The sodium hydroxide is neutralized by carbon dioxide, produced in gas and wood-fired ovens, during the baking process to form sodium carbonate.

## References

Committee of Amish Women, *Amish Cooking*, Herald Press, Scottsdale, PA, 1980.

McGee, Harold, *On Food and Cooking*, Charles Scribner's Sons, New York, NY, 1984.

Coulter, Tom, and Jill Davies, *Food, The Definitive Guide*, The Royal Society of Chemistry, Cambridge, UK, 1994.