



# PRESERVATION

## Making Pickles

**no. 9.304***by P. Kendall and C. Schultz<sup>1</sup>*

### Quick Facts...

Use only fresh, blemish-free fruits and vegetables and up-to-date, research-based recipes.

Use pure, granulated, noniodized canning or pickling salt, high-grade vinegar of 5 percent acidity, and fresh spices.

Process pickled products in a boiling water bath for the altitude-adjusted length of time stated in the recipe.

Store processed pickles in a dark, cool, dry place.

Pickles may spoil if untested recipes, poor quality ingredients, or poor canning methods and equipment are used.

The many varieties of pickled and fermented foods are classified by types of ingredients and method of preparation. Regular dill pickles and sauerkraut are fermented and cured for about three weeks, refrigerator dills for about one week. During curing, colors and flavors change and acidity increases. Fresh-pack or quick-process pickles are not fermented; they are brined several hours to overnight, then drained and covered with vinegar and seasonings. Fruit pickles usually are prepared by heating fruit in a seasoned syrup acidified with either lemon juice or vinegar. Relishes are made from chopped fruits and vegetables that are cooked with seasonings and vinegar.

### Ingredients

**Cucumbers.** Cucumbers grown for pickling will yield the best product. Seed catalogs are a good source of information about suitable varieties. Select firm cucumbers of the appropriate size: about 1 1/2 inches for gherkins and 4 inches for dills. Use odd-shaped and more mature cucumbers for relishes and bread-and-butter style pickles. Pick cucumbers early in the day to help prevent a bitter flavor. Do not purchase commercially waxed cucumbers for pickling — acid or salt will not penetrate them properly.

**Other fruits and vegetables.** Select fresh, tender vegetables and fresh, firm fruits that are free of blemishes. Use as soon as possible after picking. If the fruits or vegetables cannot be used within one or two hours after harvesting, refrigerate without washing or spread in a cool, well-ventilated place. Thoroughly wash all fruits and vegetables just before pickling. Remove and discard a 1/16-inch slice from the blossom end of fresh cucumbers. Blossoms may contain an enzyme that causes excessive softening.

**Salt.** Use noniodized canning or pickling salt. Noncaking materials added to other salts may make the brine cloudy. Because flake salt varies in density, it is not recommended for making pickled and fermented foods. For information on reduced-sodium pickles, see fact sheet 9.302, *Food Preservation Without Sugar or Salt*.

**Vinegar.** Use a high-grade cider or white distilled vinegar of 5 percent acidity (50 grain). Use white distilled vinegar with light-colored fruits and vegetables to retain their light color. Do not use homemade vinegars or vinegars of unknown acidity. **Caution:** The level of acidity in a pickled product is as important to its safety as it is to taste and texture. There must be a minimum, uniform level of acid throughout the mixed product to prevent the growth of botulinum bacteria. Use only recipes with tested proportions of ingredients. Do not alter vinegar, food or water proportions in the recipe or use a vinegar with unknown acidity.

**Spices.** Spices lose their flavor quickly. For best results, always use fresh spices in canning or pickling.

## Equipment

A 1-gallon container that does not react with acid is needed for each 5 pounds of fresh vegetables to be brined. A 5-gallon glazed stone crock is ideal for fermenting about 25 pounds of fresh cabbage or cucumbers. Food-grade plastic and glass containers are excellent substitutes for stone crocks.

**Caution: Do not use garbage bags or trash liners as brining containers.**

Fermenting sauerkraut in quart and half-gallon mason jars is an acceptable practice, but may result in more spoilage. Wash, rinse and scald containers prior to use.

The kettle used to heat the pickling solution or product may be made of aluminum, stainless steel or unchipped enamel. Do not use iron, copper, brass or galvanized utensils.

A long-handled, stainless-steel spoon, wide-mouth funnel, jar lifter and bubble freer are necessary tools. A plastic or rubber knife-like utensil may serve as the bubble freer.

To store pickles, use standard canning jars that are free from cracks and chips. Mayonnaise jars or other jars and lids from commercially canned foods are not recommended because a proper seal is difficult to achieve. Screw bands can be reused if in good shape, but lids must be new.

## Processing

Pickling means increasing the acidity of a product so that food poisoning organisms, such as *Clostridium botulinum*, do not grow and produce toxin. This may be done through a fermentation process and/or by the direct addition of an acid ingredient, such as vinegar or lemon juice. With either method, follow a reliable recipe to ensure proper acidification.

Once the produce has been properly acidified, take steps to prevent spoilage from microorganisms that thrive in an acid environment and to inactivate enzymes that may affect flavor, color and texture. Refrigeration is an acceptable short-term (up to six months) storage method for fully fermented products such as sauerkraut and long-brined dills. Canning is a better way to store fully fermented pickles and sauerkraut and is the **only** recommended procedure for fresh-pack pickle products. Processing times and procedures vary according to food acidity and the size of food pieces.

## Boiling Water Bath

To process in a boiling water bath, pack the fruit or vegetables into clean, hot glass canning jars according to recipe directions. Pickles processed less than 10 minutes at sea level need to be packed into hot, sterilized jars; see below. Release air bubbles by inserting a flat plastic (not metal) spatula between the food and jar. Slowly turn jar and move spatula up and down to release air bubbles. Adjust headspace, then clean jar rim with a dampened paper towel.

Place lid, gasket side down, on jar sealing surface and add screw band. Follow the lid manufacturer's directions for preparing and tightening the jar lids properly. Place jars on rack of canner or deep kettle half filled with hot (140 degrees F) water for raw-packed foods or very hot (180 degrees) for hot-packed foods. Add more boiling water, if needed, so the water level is at least 1 inch above jar tops. Turn heat to its highest position until water boils vigorously.

Cover canner, set timer for processing time required, and adjust heat setting to maintain a gentle boil throughout the process schedule, including the necessary adjustment for altitude (Table 1). The recipes in this fact sheet have been adjusted for use at altitudes of 1,001 to 10,000 feet. When only sea level processing time is given, use Table 1 to make the necessary increase in processing time.

To sterilize empty jars, place right side up on rack in boiling water bath canner. Fill canner and jars with hot water to 1 inch above jar tops. Boil 10 minutes plus 1 minute per 1,000 feet above sea level. Remove jars, drain and fill with product. Save hot water for processing filled jars.

**Table 1: Processing time adjustments for altitude.**

Altitude	Increase in sea level processing time	
	20 mins. or less	More than 20 mins.
(feet)	(minutes)	(minutes)
1,000	1	2
2,000	2	4
3,000	3	6
4,000	4	8
5,000	5	10
6,000	6	12
7,000	7	14
8,000	8	16
9,000	9	18
10,000	10	20

## Storage

When processing time is complete, remove jars and place upright about 2 inches apart on wire racks or towels. Let cool, undisturbed, for 12 to 24 hours.

Before storing, remove the screw bands of two-piece lids, recheck the seals and wipe the jars clean. Then label the jars with the name of the product, processing method used and date. Store pickled products in a cool, dark, dry place where there is no danger of freezing.

## Spoilage

Soft, slippery or slimy pickles are spoiled and should be destroyed so spoiled contents cannot be eaten by people or animals. Problems such as insufficient heat treatment and poor jar seals lead to spoilage. Processing pickles in a boiling water bath and using standard canning jars with new lids will help prevent these problems. Other factors that lead to spoilage include failure to remove blossom ends, failure to thoroughly wash products to be pickled, not

## Other Problems

**Shriveling** happens most often in very sweet or sour pickles and in large whole cucumber pickles. It is caused by using a salt, sugar or vinegar solution that is too strong at the beginning of the pickling process. Overcooking, overprocessing or not starting with fresh produce also may cause shriveling.

**Hollow pickles** are the result of faulty growth or curing. Because hollow cucumbers usually float, they can be picked out easily when the cucumbers are washed. Cucumbers that stand for more than 24 hours before processing may become hollow. For best results, use these for relishes rather than whole pickles.

**Discolored pickles** may be caused by iron from hard water or an iron cooking utensil. Iodized salt, ground spices, too much spice, or packing the spice bag in jars will darken pickles. Pickles prepared in a copper utensil will turn an abnormal green. Those made in a zinc pan will lose their color. Overmature dill may cause pickle liquid to turn pink shortly after canning. Sunburned or overmature cucumbers may produce dull or faded pickles. Pickles with small brown spots have been held too long before pickling.

**A white sediment** at the bottom of the jar may be caused by anticaking agents in the salt or by the fermenting bacteria. Neither cause is harmful.

**Blue, purple or blue-green garlic** may result from immature garlic or garlic that is not fully dry, from copper pans, or from a high amount of copper in the water. Garlic contains anthocyanin, a water-soluble pigment that under acid conditions may turn blue or purple. A blue-green color also may develop in pickles made with stored red-skinned garlic. Except for blue-green color resulting from an abnormally high copper-sulfate concentration, such color changes do not indicate the presence of harmful substances.

removing the scum that accumulates on curing brines, using a weak brine or vinegar solution, not keeping the pickles covered with brine throughout the curing process, using deteriorated ingredients such as moldy garlic or decayed spices, or storing the pickles at too warm a temperature.

## Quick Fresh-Pack Whole Dill Pickles

- 8 pounds of 3- to 5-inch pickling cucumbers
- 1 1/4 cups canning or pickling salt (divided)
- 2 gallons cold water
- 1 1/2 quarts vinegar (5% acidity)
- 1/4 cup sugar
- 2 quarts water
- 2 tablespoons whole mixed pickling spices
- 3 (about) tablespoons whole mustard seed (1 teaspoon per pint jar)
- 14 heads of fresh dill or 4 1/2 tablespoons dill seed

**Yield:** 7 to 9 pints or 4 quarts

**Procedure:** Wash cucumbers. Cut 1/16-inch slice from blossom end and discard. Leave 1/4 inch of stem attached. Dissolve 3/4 cup salt in 2 gallons water. Pour over cucumbers and let stand 12 hours. Drain. Combine vinegar, 1/2 cup salt, sugar and 2 quarts water. Add mixed pickling spices tied in a clean white cloth. Heat to boiling. Fill jars with cucumbers. Add 1 teaspoon mustard seed and 1 1/2 heads fresh dill (or 1 1/2 teaspoon dill seed) to each pint. Use twice the amount for quarts. Cover with boiling pickling solution, leaving 1/2-inch headspace. Remove air bubbles. Wipe jar rims. Adjust lids. Process in a boiling water bath: pints for 15 minutes at 6,000 feet or less, 20 minutes above 6,000 feet; quarts for 20 minutes at 6,000 feet or below, 25 minutes above 6,000 feet.

## Quick Sweet Pickles

- 8 pounds of 3- to 4-inch pickling cucumbers
- 1/3 cup canning or pickling salt
- Crushed or cubed ice
- 4 1/2 cups sugar
- 3 1/2 cups vinegar (5 % acidity)
- 2 teaspoons celery seed
- 1 tablespoon whole allspice
- 2 tablespoons mustard seed

**Yield:** 7 to 9 pints

**Procedure:** Wash cucumbers. Cut 1/16 inch off blossom end and discard. Cut cucumbers into slices or strips. Place in large bowl and sprinkle with 1/3 cup salt. Cover with 2 inches of crushed or cubed ice. Refrigerate 3 to 4 hours. Add more ice as needed. Combine sugar, vinegar, celery seed, allspice and mustard seed in 6-quart saucepot. Heat to boiling. Drain cucumbers and pack without heating into clean jars, leaving 1/2-inch head space. Fill jars to 1/2 inch from top with hot pickling liquid. Remove any air bubbles with a plastic spatula. Wipe jar rims. Adjust lids. Add two slices of raw onion to each jar before filling, if desired. Process in a boiling water bath: pints for 15 minutes at 6,000 feet or below, 20 minutes above 6,000 feet; quarts for 20 minutes at 6,000 feet or below, 25 minutes above 6,000 feet. After processing and cooling, store jars four to five weeks to allow flavor to develop.

## Pickled Bread-And-Butter Zucchini

- 16 cups fresh zucchini, sliced (3/16-inch thick)
- 4 cups onion, thinly sliced
- 1/2 cup canning or pickling salt

## References

The Complete Guide to Canning, *AIB-539*, U.S. Dept. of Agriculture, 1994.

Reynolds, S., Williams, P., and Harrison, J. So Easy to Preserve, *Cooperative Extension Service, The University of Georgia*, 3rd ed., 1993.

4 cups white vinegar (5% acidity)  
2 cups sugar  
4 tablespoons mustard seed  
2 tablespoons celery seed  
2 teaspoons ground turmeric

**Yield:** About 8 to 9 pints

**Procedure:** Cover zucchini and onion with 1 inch ice water and salt. Let stand 2 hours; drain thoroughly. Combine vinegar, sugar, mustard seed, celery seed and turmeric. Bring to a boil; add zucchini and onions. Simmer 5 minutes. Fill jars with mixture and pickling solution, leaving 1/2-inch headspace. Remove air bubbles. Wipe jar rims. Adjust lids. Process pints or quarts in a boiling water bath canner for 15 minutes at 6,000 feet or less; 20 minutes above 6,000 feet.

## Pickle Relish

3 quarts finely chopped cucumbers  
3 cups finely chopped green peppers  
3 cups finely chopped red peppers  
1 cup finely chopped onions  
3/4 cup canning or pickling salt  
4 cups ice  
8 cups water  
4 teaspoons each mustard seed, turmeric, whole allspice and whole cloves  
2 cups sugar  
6 cups white vinegar (5% acidity)

**Yield:** about 9 pints or 18 half-pints

**Procedure:** Add cucumbers, peppers, onions, salt and ice to water and let stand four hours. Drain and re-cover vegetables with fresh ice water for another hour. Drain again. Combine spices in a spice or cheesecloth bag. Add spices to sugar and vinegar. Heat to boiling and pour mixture over vegetables. Cover and refrigerate 24 hours. Heat pickle mixture to boiling and fill hot into clean jars, leaving 1/2-inch headspace. Remove air bubbles. Wipe jar rims. Adjust lids. Process pints or half-pints in a boiling water bath canner for 15 minutes at 6,000 feet or less; 20 minutes above 6,000 feet.

## Pickled Sweet Green Tomatoes

10 to 11 pounds of green tomatoes (16 cups sliced 1/4-inch thick)  
2 cups thinly sliced onions  
1/4 cup canning or pickling salt  
3 cups brown sugar  
4 cups vinegar (5% acidity)  
1 tablespoon each mustard seed, allspice, celery seed and whole cloves  
**Yield:** about 9 pints or 4 1/2 quarts

**Procedure:** Wash and slice tomatoes and onions. Place in bowl, sprinkle with 1/4 cup salt, and let stand 4 to 6 hours. Drain. Heat and stir sugar in vinegar until dissolved. Tie mustard seed, allspice, celery seed and cloves in a spice bag. Add to vinegar with tomatoes and onions. If needed, add minimum water to cover pieces. Bring to boil and simmer 30 minutes, stirring as needed to prevent burning. Tomatoes should be tender and transparent when properly cooked. Remove spice bag. Fill jars and cover with hot pickling solution, leaving 1/2-inch headspace. Remove air bubbles. Wipe jar rims. Adjust lids. Process in a boiling water bath: pints for 15 minutes at 6,000 feet or below, 20 minutes above 6,000 feet; quarts for 20 minutes at 6,000 feet or below, 25 minutes above 6,000 feet.

<sup>1</sup>P. Kendall, Colorado State University Cooperative Extension foods and nutrition specialist and professor, food science and human nutrition; and C. Schultz, Cooperative Extension family and consumer sciences agent, Larimer County.