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PICKLES

There are two classifications of pickles, fermented and fresh pack. Fermented pickles (also called brined pickles) are prepared by soaking cucumbers in brine for several weeks. During this period, lactic acid bacteria that are salt tolerant, produce lactic acid from natural sugars in cucumbers. Lactic acid not only preserves the pickles but also imparts a characteristic flavor. Most spoilage microorganisms cannot tolerate the saltiness of the brine and die. Yeast that requires air, grow as a scum on the surface of brine. This scum should be removed daily because it destroys the lactic acid produced by bacterial fermentation and produces enzymes that break down pectic substances in the pickles, making them soft and mushy.

Fresh-pack pickles are prepared by soaking cucumbers in brine for a few hours or overnight. They are then drained and covered with a boiling hot pickling solution containing vinegar and spices. They are not fermented. The vinegar, that should be 5% acetic acid, acts as the preservative. The short brining procedure serves two purposes. First, it removes bitter juices present in some cucumbers and enhances the uptake of pickling solution, resulting in a firmer product. Too strong of a brine shrivels the cucumbers. Too weak of a brine removes too little water, which results in spoilage. Processing in a boiling water canner is necessary for both fermented and fresh-pack pickles.

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WATER FOR PICKLING

Hard water might interfere with the formation of acid and prevent curing during pickle making. If soft water is unavailable, boil hard water for 15 minutes. Cover and set aside for 24 hours, removing any scum. Carefully pour water from container so the sediment is not disturbed. Discard sediment. Water is now ready to use. Distilled water can be used also but this would be more expensive. If water in the home is softened by means of a water softener, it might be too soft for successful pickling. Unless there are some minerals (especially calcium and magnesium) in the water, pickles will be mushy. (Calcium combines with naturally occurring pectic substances in the cucumbers to form calcium pectate that makes pickles firm). It is best to use a blend of hard water and softened water for pickling.

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GREEN COLOR OF PICKLES

Because both acid and heat are destructive to chlorophyll, a bright green color is not to be expected in pickles. During pickling, the magnesium atom in the center of the chlorophyll molecule is replaced by two hydrogen atoms to form pheophytin, an olive green pigment. While the olive green color of pickles is not as attractive as the natural green color, it is accepted as characteristic of pickles. If copper replaces magnesium in the chlorophyll molecule, the pigment takes on a vivid green color. Formerly copper kettles were used for cooking pickles in order to impart a bright green color, but this practice is not recommended. Some old-fashioned pickle recipes call for using a "blue stone"--namely copper sulfate-- to give the pickles a bright green color. We do not recommend this practice because copper can be toxic if present in large enough quantities.

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PREVENTING SPOILAGE OF PICKLES

Pickle products are subject to spoilage from microorganisms, particularly yeasts and molds, as well as enzymes that might affect flavor, color and texture. Processing pickle products in a boiling water canner will prevent both of these problems. Standard canning jars and self-sealing lids are recommended. Processing times and procedures will vary according to the food acidity and the size of food pieces.

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PREPARING PICKLED AND FERMENTED FOODS

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 3 weeks before processed. Refrigerator dills are fermented for about one week. During curing, colors and flavors change acidity increases. Fresh-pack (or quick process) pickles are not fermented; some are brined several hours or 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.

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PICKLES WITH REDUCED SALT CONTENT

Recipes for fresh-pack pickles with reduced sodium content are provided in the database. When making fresh-pack pickles, cucumbers are acidified quickly with vinegar. Use only tested recipes formulated to produce the proper acidity. While these pickles can be prepared safely with reduced or no salt, their quality may be noticeably poorer. Both texture and flavor might be slightly, but noticeably, different than expected. You may wish to make small quantities first to determine if you like them. The salt used to make fermented sauerkraut and brined pickles not only provides characteristic flavor but also is essential for the safety and texture of the pickle. In fermented foods, salt favors the growth of desirable bacteria while inhibiting the growth of others. **CAUTION:** Never make sauerkraut or fermented pickles by reducing the amount of salt required.

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PICKLING, GENERAL INFORMATION

Pickled vegetables or fruits are preserved by acid. Because pickles are high in acid, they can be safely processed in a water bath canner. Pickle flavors reach their peak after 6 or more weeks in the jar. In fresh-pack pickles, acetic acid is added to vegetables or fruits in the form of vinegar. Examples of fresh-pack pickle products are fresh-pack dill pickles, pickled zucchini, watermelon pickles and corn relish.

Fermented pickles, also known as brine pickles, contain lactic acid produced by bacterial fermentation. They are submerged in a brine solution to ferment for about three weeks. Brine dill pickles, deli-style dill pickles and sauerkraut are all fermented pickle products. Fruit pickles are usually prepared from whole fruits and simmered in a spicy, sweet-sour syrup. They are bright in color, of uniform size, and tender and firm without being watery. Pears and watermelon rind are prepared this way.

Relishes are prepared from fruits and vegetables that are chopped, seasoned and then cooked to desired consistency. Bright color and uniformity in size of pieces make an attractive product. Relishes accent the flavors of other foods. They might be quite hot and spicy. Relishes include piccalilli, pepper onion, tomato-apple chutney, tomato-pear chutney, horseradish, corn relish and chili sauce.

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PICKLE INGREDIENTS

Select fresh, firm fruits or vegetables free of spoilage. Measure or weigh amounts carefully, because the proportion of fresh food to other ingredients will affect flavor and safety. Only use canning or pickling salt. Non-caking material is added to other salts, such as table salt. If used, the brine might be cloudy. Because flake salt varies in density, do not use to make pickled and fermented foods. White granulated and brown sugars are most often used. Corn syrup and honey, unless called for in a reliable recipe, might produce undesirable flavors. White distilled and cider vinegars of 5 percent acidity (50 grain) are recommended. White vinegar is usually preferred when light color is desirable, as is the case with fruits and cauliflower.

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PICKLING EQUIPMENT

When brining or fermenting pickles, use a crock or stone jar, an unchipped enamel-lined pan, a large glass bowl or jar, or a food-grade plastic container. Plastic containers that are obviously intended for food use, such as mixing bowls, food keepers, or cake savers, are food-grade. Large food-grade plastic containers are available at wine making supply stores. Do not use plastic pails or trashcans for brining pickles. Toxic compounds could migrate from these containers into the brine. When heating pickling liquids, use utensils of unchipped enamelware, stainless steel, aluminum or glass. Do not use copper, brass, galvanized or iron utensils. A brine-filled plastic bag is an effective cover for sealing the brine surface and keeping out air, thus preventing the growth of yeast or mold. The bag should be of heavyweight, watertight plastic and intended for use with food. Fill the bag with enough brine (6 tablespoons salt to 1 gallon of water) to form a tight-fitting cover over the cabbage or cucumbers. Tie it tightly so the water will not leak out. For added protection, place the brine-filled bag inside another heavyweight, watertight plastic bag intended for food use. Check the bags daily for leaks. Replace leaking bags.

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PICKLE PROCESSING

All shelf stable pickle products need to be processed in a boiling water canner or by low temperature. Pasteurization when indicated, to kill organisms that cause spoilage and to inactivate enzymes that make pickles soft and mushy. Processing also insures a good seal on the jar. Over processing can soften pickles. Time the processing carefully.

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FRESH-PACK PICKLES

Fresh-pack pickles--such as fresh-pack dill pickles, crosscut pickles slices (bread-and-butter pickles), sweet gherkins, or cauliflower pickles--are quick and easy to prepare. Some recipes call for soaking vegetables for a few hours or overnight in brine (salt water). After soaking, they are drained, packed into clean, hot jars, and covered with boiling-hot pickling solution. The jars are then closed with two-piece canning lids and processed in a boiling water bath. The pickling solution must contain plenty of vinegar. Some old recipes call for too little vinegar to insure safety. Never decrease the vinegar in a pickling recipe. Avoid packing vegetables too tightly into jars. Plenty of room must be left for the boiling-hot pickling solution to circulate around pickles during processing. Spoilage is a problem when pickles are wedged tightly into jars.

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FERMENTED PICKLES

Fermented pickles require more time and effort to make than fresh-pack pickles. Brined dill pickles are an example of fermented pickles that are prepared by soaking cucumbers in brine (salt water) for about 3 weeks. During this time, lactic acid bacteria--that are naturally present on cucumbers--convert sugars in the cucumbers into lactic acid. Lactic acid not only preserves the pickles but also gives them good flavor. (Vinegar, that contains acetic acid, gives fresh-pack pickles a "sharper" flavor.) When making the brine, measure the salt and water carefully. It is important to get just the right concentration of salt so the lactic acid bacteria-that can tolerate salt--will be able to grow. Most spoilage organisms cannot tolerate salt and will die in the brine. If the brine is too salty, even the lactic acid bacteria will die. If the brine is not salty enough, undesirable organisms will grow and spoil the pickles. Make the brine with cold or room temperature water. Do not use boiling water--it will kill the lactic acid bacteria. During fermentation, keep the pickles at room temperature between 68 and 78°F. Fermenting pickles must be kept submerged. Uncovered pickles will spoil. Use a plate to cover the pickles and weight it down with a glass jar or plastic bags filled with brine (6 tablespoons salt to 1 gallon of water). Remove any scum that forms on the surface of the brine daily. The scum consists of yeasts that destroy lactic acid and produce enzymes that make pickles soft. If the scum is not removed daily, pickles will spoil. After three or more weeks, fermentation should be complete. Pickles will have an olive-green color and a desirable flavor. The brine will be cloudy as a result of yeast growth during the fermentation period. Strain the brine; then heat it to boiling. Pack the pickles into clean, hot jars. Do not wedge tightly. Cover with boiling hot brine. Put lids on the jars and process in a boiling water bath.

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CONTAINERS FOR PICKLES

Many of the directions for making pickles call for processing for 5 or 10 minutes in a boiling water bath. Whenever the processing time for pickles is less than 10 minutes, sterilized jars should be used. If the processing time is 10 minutes or longer, the jars do not need to be sterilized. Make sure all jars are clean and hot.

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FIRMING AGENTS

Lime and alum are not needed to make crisp pickles if good quality ingredients and up-to-date methods are used. A better and safer alternative to these products is to simply soak cucumbers in ice water for 4 to 5 hours prior to pickling. If alum is used, it can be used to firm fermented cucumbers. It cannot be used with fresh-pack (or quick-process) pickles.

Lime can also be used but is not necessary. The calcium in lime does improve pickle firmness. Only use food-grade pickling lime. Never use agricultural or burnt lime. Food-grade lime can be used as a lime-water solution for soaking fresh cucumbers 12 to 24 hours before pickling the cucumbers. Always, remove excess lime absorbed by the cucumbers before pickling. If it is not properly removed, the pickles could be unsafe to eat. To remove excess lime, drain the lime-water solution, rinse, and then re-soak the cucumbers in fresh water for one hour. Repeat the rinsing and soaking steps two more times.

Source:

E.L. Andress and J.A. Harrison. 1999. *So Easy to Preserve*. Cooperative Extension Service/The University of Georgia. 344 pp.

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DESALTING CURED CUCUMBERS

To "desalt" pickles, cover cucumbers with hot water (at least three times as much water as cucumbers). Let stand about four hours, ideally in the refrigerator. Stir occasionally. Lift cucumbers out of the water; pour out the water; rinse the container. Repeat two more times. Prick cucumbers a number of times in several places to prevent shriveling. Use a silver or stainless steel fork. Let stand in a weak vinegar solution (1 part water to 3 parts commercial vinegar for 12 hours. If not enough salt has been removed (taste test), let stand for 12 hours longer. Place the desalted cucumbers in fresh pickling solution (without salt) and store in the refrigerator. Note, while a fair amount of salt will be removed during desalting, all the salt will not be removed.

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SALTS USED IN PICKLING

Only use canning or pickling salt for pickling. Fermented and non-fermented pickles may be safely made using either iodized or non-iodized table salt. However, non-caking materials added to table salts may make the brine cloudy. Flake salt varies in density and is not recommended for use.

Reduced-sodium salts, for example "Lite Salt," can be used in quick pickle recipes. The pickles may, however, have a slightly different taste than expected. *Do not use reduced-sodium salt in fermented pickle and sauerkraut recipes as it will make them unsafe.*

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SUITABLE CONTAINERS, COVERS, AND WEIGHTS FOR FERMENTING FOOD

A 1-gallon container is needed for each 5 pounds of fresh vegetables. Therefore, a 5-gallon 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. Other 1- to 3-gallon non-food-grade plastic containers can be used *if* lined inside with a clean food-grade plastic bag. *Be certain that foods contact only food-grade plastics. Never use garbage bags or trash liners.* Fermenting sauerkraut in quart and half-gallon Mason jars is an acceptable practice, but may result in more spoilage.

Cabbage and cucumbers must be kept 1 to 2-inches under brine while fermenting. After adding prepared vegetables and brine, insert a suitably sized dinner plate or glass pie plate inside the fermentation container. The plate must be slightly smaller than the container opening, yet large enough to cover most of the shredded cabbage or cucumbers. To keep the plate under the brine, place on it 2 to 3 sealed quart jars filled with water. Covering the container opening with a clean, heavy bath towel helps to prevent contamination from insects and molds while the vegetables are fermenting. Another option is to place on food-grade plastic bag inside another and fill the inside bag with pickling brine. Freezer bags sold for packaging turkeys are acceptable. Close the end tightly then place the filled bag on top of the brining vegetables. Filling the bag with brine is a precaution, in the event the bag becomes punctured.

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BITTER PICKLES

Pickles can develop a strong, bitter taste because:

- Spices were cooked too long in the vinegar or too many spices were used. Therefore, follow the directions for the amount of spices to use and the boiling time.
- The vinegar was too strong. Use vinegar that is of the proper strength (5% acidity)
- The growing conditions were dry. There is no prevention for this. The bitter taste is usually contained to the peel.
- Salt substitutes were used. Potassium chloride, the ingredient in these, is naturally bitter.

BLUESTONE IN PICKLING

Some old pickle recipes call for a bluestone to be added to the pickling brine to give the pickles a blue-green color. Bluestone is copper sulfate and is also known as blue vitro. In earlier days, pickles were usually made in metal pans containing copper. They turned a bright blue-green as the copper ions interacted with the chlorophyll molecules in the pickle. A similar color was sought for pickles brined in enameled pan or crocks, and it wasn't long before copper sulfate, or bluestone, was found to do the job. Because high levels of copper can produce toxicity symptoms in humans, particularly gastrointestinal problems, the use of copper sulfate in pickling should be avoided. Because its only function is to color the pickles, the bluestone can be simply eliminated from the recipe without affecting the overall quality of the final product.

PICKLING PROBLEMS, DISCOLORATION

1. Dark (gray or brown) Pickles

- Minerals in hard water so use soft water.
- Ground spices used so use whole spices.
- Spices left in pickles so place spices loosely in cheesecloth bag so they can be removed before canning.
- Brass, iron, copper, or zinc utensils used so use unchipped enamelware, glass, stainless steel, or stoneware utensils.
- Iodized salt used so use canning or pickling salt.

1. Blue or Green Garlic

Garlic contains sulfur compounds that might react with copper to form copper sulfate, a blue or blue-green compound. The amount of copper needed for this reaction is very small and is frequently found in normal water supplies. Use the pickles but discard the garlic. Garlic bulbs that have not been properly cured before marketing or bulbs that have been refrigerated will turn green or blue-green. Storing garlic bulbs in dry air for 32 days at or above 70 to 80°F before use will prevent formation of green or blue-green pigments.

2. Pink Sauerkraut

Pink color in sauerkraut is caused by the growth of certain types of yeast on the surface of the sauerkraut. These pigments might grow if there is too much salt, an uneven distribution of salt, or if the sauerkraut is improperly covered or weighted during fermentation. They are safe.

3. Pink Cauliflower

Color pigments in some varieties of cauliflower turn pink in the acid vinegar solution. Commercially pickled cauliflower is treated with sulfur dioxide to prevent this color change. Pink cauliflower is safe to eat.

4. Black pickles

The probable cause for pickles turning black is the formation of a ferrous sulfide complex. The iron and sulfur necessary to form this complex could be present in the water. Water used in pickling should be low in iron and gypsum. Iron cookware could also be a source of iron so should not be used for pickling. This defect is also favored by the low acidity of the brine. Another cause of black pickles is growth of a black-pigmented bacteria, *Bacillus nigrificans*. Do not eat black pickles because they might be unsafe.

5. Dark sauerkraut

Darkness in sauerkraut might be caused by: unwashed and improperly trimmed cabbage; insufficient juice covering fermenting cabbage; uneven distribution of salt; exposure to air; high temperatures during fermentation, processing, or storage; or long storage periods. Discard darkened sauerkraut.

PICKLING PROBLEMS, CLOUDINESS

Cloudy liquid might be a sign of spoilage. To confirm spoilage, examine the pickles for other signs of spoilage, such as spurting liquid, mold, off-odor, mushiness, or slipperiness. If any of the above signs are present, do not eat the pickles. Two other reasons that cloudiness might occur is because: (1) hard water was used to make the pickling solution so use soft water or (2) salt containing anti-caking agents was used to make pickling brine so use canning or pickling salt instead.