



Understanding and Making Kimchi

What is kimchi?

Kimchi is a flavorful, sour, salty mix of fermented vegetables and seasonings that plays an important role in Korean culture. There are more than 200 variations of kimchi; the types of ingredients and the preparation method have a profound impact on the taste. Napa cabbage, radishes, green onions, garlic, and ginger, along with a specific red pepper, are used in classical baechu style, but region, seasonality, and cultural traditions influence the unique types of kimchi.

The nutritional value of kimchi varies with ingredients but it is generally low in calories and contains vitamins A, C, and B complex, as well as various phytochemicals and live cultures of microorganisms which confer a health benefit to the host. Eating kimchi can be a healthful way to include more vegetables and probiotic microorganisms in the diet.

How is kimchi made?

Making kimchi requires maintaining a clean environment and good hygiene practices, carefully following all steps, and monitoring temperatures to foster the growth of Weisella species, Lactobacillus species, and other bacteria contributing to the fermentation process.

- The process of making kimchi involves brining (salting) the vegetables to draw out the water, which helps in preservation and allows the seasonings to penetrate the food over time; the final salt concentration ranges from 2-5%.
- Kimchi is typically fermented by 'wild cultures' naturally present on the vegetables. The formation of organic acids (primarily lactic and acetic acid) results in an optimum kimchi pH of 4.2.
- The kimchi fermentation process is very short in comparison to making sauerkraut. Kimchi ferments at room temperature in only 1-2 days or more slowly in the refrigerator. For safety, kimchi should be stored refrigerated and is best eaten within 1 week, as the quality of kimchi deteriorates with longer fermentation.

Making Baechu (Bet-schu) Kimchi: Mack (Chopped Cabbage) Style

Kimchi is a fermented vegetable condiment, traditional to Korean cuisine. Season will impact vegetable size and quality, as well as time needed for fermentation. Look for light-green Napa cabbage with compact, elongated heads that feel heavy for size.

Did you know...

- *The history of kimchi dates back thousands of years and the original name, chimchae, translates to 'salted vegetables.'*
- *The bacterial cultures needed for kimchi fermentation are present on the raw ingredients, so a 'starter' culture is unnecessary.*
- *Store fermented kimchi covered tightly in the refrigerator. Keep it pressed down to minimize air exposure. Kimchi may become more sour over time. Discard if you observe indications of surface mold.*



In summer, Napa cabbage may be softer and ferment faster; while in winter, Napa cabbage may be firmer and need more time to ferment. Some ingredients, such as Korean red pepper powder and Korean radish, may need to be purchased through specialty Asian stores or ordered online.

During preparation, proper sanitation practices must be followed to prevent contamination by spoilage or harmful microorganisms. This includes proper hand washing as well as using clean equipment, utensils, and surfaces throughout all preparation steps.

Equipment:

- Large sharp knife and cutting board
- Blender or food processor (optional for blending ginger and garlic)
- Measuring cup, measuring spoons, and mixing utensils
- 1-quart saucepan for making sweet rice paste
- Food-safe, glass or plastic storage container with tight fitting lid. For example: plastic rectangle kimchi container, glass mason jars with bands and lids, or gallon-size re-sealable zipper plastic bags. Do not use metal containers nor earthenware with cracks or chips. Container(s) must fit in your refrigerator, but big enough to hold 2 cabbages.
- Large glass, plastic, or stainless steel mixing bowl
- Disposable food handler gloves (highly recommended) for protection from red pepper powder while handling kimchi

Ingredients:

- 2 medium heads Napa cabbage (about 6-8 pounds total)
- 1 1/2 cups coarse salt, non-iodized, divided (baked or sea salt recommended)

- 1 gallon + 1/2 cup cold water, divided
- 2 Tbsp. sweet rice flour
- 1-10 cloves garlic, depending on taste preference
- About 3 slices fresh ginger root (about 0.2-0.4 oz.)
- 1 cup Korean red pepper powder –specific “for kimchi”
- 1/2 Korean radish (about 1-1.5 pounds), or daikon radish
- 1 Asian pear (optional)
- 10 green onions
- 1 tsp. fish sauce (optional)
- 2 tsp. finely ground salt (optional, as needed)

Procedure:

Prepare Napa cabbage:

1. Rinse heads under cold water and drain.
2. Cut away and discard any spoiled or damaged spots.
3. Cut Napa cabbage into four quarters and remove core from each. Chop quarters into 2-inch pieces.

Salt cabbage:

1. Prepare saltwater solution of 1/2 cup coarse, non-iodized salt and 1 gallon cold water in large mixing bowl.
2. Dip cabbage pieces briefly in the saltwater solution, to facilitate penetration of salt into the cabbage pieces. Discard saltwater solution.
3. Drain and place cabbage pieces in a bowl. Sprinkle 1 cup of coarse, non-iodized salt over the cut cabbage and massage it into the cabbage well. Allow cabbage to sit covered at room temperature for 3 to 6 hours (a longer time will make it more salty).
4. Rinse cabbage pieces 3 to 4 times with cold water to rinse away the salt, then place in a colander to drain out excess water from the cabbage for at least 30 minutes.



Prepare seasonings:

1. Add sweet rice flour to 1/2 cup water in small saucepan. Bring to a boil and set aside to cool.
2. Clean, peel, and finely mince (or use blender with small amount of water) garlic and ginger. Mix with cooled sweet rice flour paste and add Korean red pepper powder.
3. Clean and peel radish, clean and trim green onions, and if desired, clean and peel Asian pear. Slice all Julienne style, or into matchsticks about 1 inch in length.
4. Using clean hands and disposable food handler gloves, mix above seasoning paste and Julienned vegetables together in large mixing bowl. Then mix in fish sauce to create a spicy veggie paste. Add salt only as needed.
5. Combine cabbage with the spicy veggie paste, rub together and mix thoroughly.

4. Pack container:

1. Pack kimchi tightly into container, minimizing air exposure and encouraging brine formation. Fill container about 2/3 of the way full, as fermenting microorganisms will release carbon dioxide (CO₂) and create bubbling and fizzing.
2. Cover tightly. If using jars, seal to finger-tip tight. If using bags, squeeze out excess air. Place on plate or in bowl to catch potential overflow.

5. Ferment!

1. Option 1: Kimchi may be placed in refrigerator so it ferments slowly over 3 to 4 days. This may be preferred, especially during hot weather.
2. Option 2: Place sealed container in a well-ventilated location (may become pungent), with a relatively constant room temperature, around 68°F is ideal. Ferment only 1 to 2 days at room temperature, tasting it daily until it reaches preferred tangy taste and desired texture.

6. Store and enjoy!

1. Store fermented kimchi covered tightly in the refrigerator. Keep it pressed down to minimize air exposure. Kimchi may become more sour over time. Discard if you observe indications of surface mold.
2. Kimchi can be enjoyed in countless recipes! Try it with eggs, rice, noodles, potatoes, in stir fry, fried rice, soup, pancakes, or on a sandwich or hot dog. Happy kimchi making!

Recipe provided by HyoJung Kang, local kimchi expert, with edits by Laura Bauer, PhD, RD, in collaboration with CSU Food Science & Human Nutrition Extension. For additional information, contact: Marisa Bunning, PhD; Associate Professor and Extension Specialist-food safety: marisa.bunning@colostate.edu

Kimchi Resource

Health Benefits of Kimchi as a Probiotic Food. Park et al. (2014). *Journal of Medicinal Food*. 17(1): 6-20.

Acknowledgments

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