

## **KIMCHI: FERMENTED VEGETABLES**

Kimchi, also spelled *gimchi*, *kimchee*, or *kim chee*, is a traditional fermented Korean dish made with a variety of vegetables and seasonings. Kimchi is used as a side dish, stew, soup, or with fried rice. Depending on the region of the country, the Kimchi may contain other ingredients, depending on the season and tradition. There are hundreds of varieties.

### **Kimchi Recipe**

#### **Ingredients**

- 1 Napa Cabbage, 4 pounds
- 3/4 cup (3.2 to 4.8 ounces) combination of the following ingredients: Onion, Carrot, fresh Garlic, fresh Ginger
- 1/4 cup (2.5 to 2.8 ounces) Salt (very important, this is a safety factor)
- 1 Tablespoon (1/2 ounce) Fish Sauce / Fermented Seafood (optional)
- 3 Tablespoons (1/2 ounce) dry ground Chili Pepper (optional)
- 1 Tablespoon (1/2 ounce) Soy Sauce (optional)

#### **Procedure:**

1. Clean and prepare fresh ingredients (cabbage, radish, onions, carrot, garlic, ginger)
2. Combine fresh ingredients and salt and mix thoroughly. Pack into glass, ceramic (lead-free) or food grade plastic container.
3. Weigh down with food grade weight, cover, and let stand at room temperature (70 – 75 degrees):
  - a. 4 days for milder Kimchi
  - b. 7 days for “riper” Kimchi – will be more sour

During curing, colors and flavors change and acidity increases. The level of acidity is as important to its safety as it is to taste and texture. In fermented foods, salt favors the growth of desirable acid producing bacteria while inhibiting the growth of others. There must be a minimum uniform level of acid throughout the mixed product to prevent the growth of *Clostridium botulinum* bacteria and other food borne pathogens.

4. After the desired ripeness (taste the mixture daily, if desired) is reached, drain excess liquid (discard liquid or use as condiment).
5. Combine with remaining ingredients (fish sauce and spices) and mix thoroughly. Ready to consume or store under refrigeration at this point.
6. May repack into smaller food containers, cover tightly, and keep refrigerated at ≤41°F. Fermentation will be very slow to non-existent at these temperatures.
7. Keep refrigerated when not in use. Consume within 30 days of preparation for best quality.

- **Note:** Processing directions for canning are not available. Variability of ingredients and length of fermentation does not produce a product with a consistent pH, and therefore it is impossible to provide safe canning directions. Freezing is not recommended because of flavor changes to garlic and onions which tend to get strong and bitter. Properly made Kimchi has vegetables that are crunchy and not soft.

**Additional preparation details:**

- Use fresh Napa cabbage, preferably between 24 and 48 hours of picking time. Discard outer leaves and tough core. Cut in half lengthwise. Cut in half from core to middle. Cut crosswise into 1 to 2-inch bite-size pieces. Wash thoroughly. Drain.
- Peel outer skin off the radish. Slice into ½ inch rounds and dice into ½ inch cubes, or cut into match size sticks. Wash. Drain.
- Peel onion. Cut in half and chop. If using leaks or green onions, cut in half lengthwise and wash thoroughly under cold running water to remove all traces of sand or dirt. Chop coarsely.
- Peel carrot and chop thinly into match sticks.
- Peel garlic. Mince.
- Peel ginger with edge of a spoon or a vegetable peeler. Chop fine.
- In a large container, mix fresh ingredients thoroughly with salt, being careful not to crush the cabbage. Mixing the fresh ingredients evenly with the salt is an important step in obtaining good fermentation. The other important step is to eliminate as much air as possible. Then cover the container. Be sure the container is deep enough so that its rim is at least 4 or 5 inches above the vegetables.

Caution: Do not attempt to make Kimchi by cutting back on the salt required. Fermented products are subject to spoilage from microorganisms, particularly yeast and molds, as well as enzymes that may affect flavor, color, and texture.

**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 of ideal size for fermenting about 25 pounds of fresh ingredients. Food-grade plastic and glass containers are excellent substitutes for stone crocks. Other 1- to 3-gallon non-food-grade plastic containers may be used if lined inside with a clean food-grade plastic bag. **Caution: Be certain that foods contact only food-grade plastics. Do not use garbage bags or trash liners, which are lined with mold retardants and therefore not suitable for food, and can leak toxic compounds into Kimchi.**

The fermentation container, plate, and jars must be washed in hot sudsy water, and rinsed well with very hot water before use.

After placing the salted vegetables in the container, 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 vegetables. Brine will form as salt draws water from the fresh vegetables. It is best if the vegetables are held under 1 to 2 inches of brine. To keep the plate under the brine, weight it down with 2 to 3 sealed quart jars filled with water or a very large clean, plastic bag filled with 3 quarts of water containing 4-1/2 tablespoons of salt. Be sure to seal the plastic bag. Freezer bags sold for packaging turkeys are suitable for use with 5-gallon containers.

Covering the container opening with a clean, heavy bath towel helps to prevent contamination from insects and molds while the vegetables are fermenting.

**Resources:**

Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University/NYSAES Food Research Lab, 630 West North Street, Geneva, NY 14456  
<http://www.nysaes.cornell.edu/hecfe/index.html>

National Center for Home Food Preservation, <http://www.uga.edu/nchfp/>