K-STATE Research and Extension

# Kombucha Fermentation

MU Extension University of Missouri

Food Safety Fact Sheet

Fermentation is the oldest food preservation method. It is a process in which raw ingredients transform via fermentation into a nutrient-rich product. Fermentation involves growth of microorganisms such as bacteria, yeast, and/or mold that break down carbohydrates and other organic compounds in the absence of oxygen and generates various compounds, such as acids, alcohol, and gases. Fermentation not only preserves the food but also provides unique texture and flavor. Lactic acid bacteria (LAB) are most commonly associated with fermented foods. Besides LAB, some other microorganisms involved are *Streptococcus, Leuconostoc, Pediococcus*, and yeasts like *Sacchromyces spp*. These are called "good microorganisms" since they are beneficial for human gut and overall health. Some examples of fermented foods include: yogurt, sauerkraut, kimchi, kombucha, and buttermilk. This fact sheet will focus on kombucha fermentation and guidelines for producing safe kombucha.

## Kombucha

Kombucha is a fermented effervescent beverage made by the addition of tea leaves into boiled water and adding sugar for a sweet tea mixture. Once the sweet tea is cooled, then a symbiotic culture of bacteria and yeasts (SCOBY) is added. The percentage of sugar is approximately 5 to 10%. A SCOBY or approximately 10% of the liquid from a previous batch of kombucha is used as a starter culture. Flavors like ginger, mint, lavender, chamomile, carrot, and beet can also be added. Adding flavors is optional and is usually added to enhance the taste, add nutritional benefits, and provide variety.

## Importance of Commercial SCOBY

Using a commercially purchased starter culture (SCOBY) for the initial batch of kombucha ensures consistency, safety, and reliable fermentation. These cultures are produced under controlled conditions, free from harmful contaminants, and contain a balanced mix of beneficial bacteria and yeast, leading to a high-quality and safe kombucha brew. SCOBY contains a diverse range of microbial populations, including common microbes from the genera *Gluconobacter, Acetobacter, Zygosaccharomyces, Saccharomyces*, and *Schizosaccharomyces*. Various other microorganisms also may be present in the starter culture.

*Kombucha with a layer of SCOBY.*

Duration for kombucha fermentation is typically 7 to 10 days. The fermentation process takes place at room temperature (60 to 70°F). Normally, the SCOBY allows for increased acidity in kombucha. However, excess fermentation may reduce the acidity, allowing harmful microorganisms to grow and cause potential health risks such as foodborne illnesses. Regular pH monitoring and controlled fermentation processes are essential to ensure consumer safety.

Fermentation of kombucha has the possibility of producing alcohol in the final product. A Kansas Department of Agriculture (KDA) Food Establishment License is required for the production facility in Kansas. To know more about regulations and food safety practices for foods sold directly to consumers in Kansas see this K-State Research and Extension publication: *https://bookstore.ksre.ksu.edu/pubs/foods-sold-directly-to-consumers-in-kansas-farmers-markets-regulations-and-food-safety-best-practices_MF3138.pdf*

## Alcohol Regulatory Limits

The legal limit for alcohol content in kombucha is 0.5% by volume. Under federal law, if kombucha has an alcohol content of 0.5% or more by volume at any point during production, bottling, or after bottling, it is considered an alcoholic beverage and must comply with Alcohol and Tobacco Tax and Trade Bureau (TTB) regulations. Producers of kombucha are required to test the alcohol content

according to AOAC (Association of Analytical Chemists) methods. For more information and resources on kombucha and alcohol testing methods see this link: *https://www.ttb.gov/regulated-commodities/beverage-alcohol/kombucha/kombucha-general*

## Guidelines for Producing Safe Kombucha

- Ensure proper sanitation, personal hygiene, and cleaning practices.
- Maintain the correct temperature and anaerobic conditions (no oxygen), monitor fermentation time to prevent over-fermentation and unwanted acidity changes.
- Records of specific gravity levels must be maintained for each batch produced to ensure the alcohol content does not exceed 0.5%.
- Understand and follow state regulations.
- Test the product's acidity (pH level).

### Steps for making kombucha:

1. **Brew tea** — Add tea (e.g., black tea, green tea) leaves to boiling water.
2. **Add sugar to tea** — Dissolve sugar (5 to 10%) into the brewed tea.
3. **Add SCOBY to kombucha** — After cooling sweet tea, then add a SCOBY and let it ferment for 7 to 10 days at room temperature.
4. **Remove SCOBY** — After the first fermentation, carefully remove the SCOBY and set it aside with some kombucha for the next batch.
5. **Add flavors to bottles** — Add flavors (e.g., chopped fruits, herbs, or spices) into clean bottles.
6. **Pour kombucha** — Fill the bottles with the fermented kombucha, leaving about one-inch of space at the top.
7. **Seal bottles** — Cap the bottles tightly to ensure they are airtight.
8. **Second fermentation** — Leave the sealed bottles at room temperature for 1 to 3 days to infuse the flavors and develop carbonation.
9. **Refrigerate** — Once the desired flavor and carbonation are achieved, refrigerate the bottles to stop further fermentation.

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