

Koji in Every Kitchen Class Outline

What is koji?

- a filamentous fungi used for powerful fermentation, tenderization and complexity of flavor
- “Koji creates multi-dimensional flavor by stimulating the sweet, sour, and bitter characteristics of the food—thereby making the ordinary more complex” – Nancy Singleton Hachisu
- first known solid state culture occurred in China initially, by fermenting cakes of indigenous plants and herbs (sometimes up to 20+ species at a time)
- Its production is usually used in two-phase fermentation processes.
- Best known products are soy sauce, sake, and miso. (talk about the two phase production)
- Soy sauce was invented in China 2500 years ago, and the recipe was brought to Japan in the 13th century by Buddhist monks. Koji has been used in Japan ever since and is the national microorganism of Japan.
- The character for expressing its name in Japanese is still a Chinese character, which means “grains fermented by fungi.”
- The scientific name for the fungus is *Aspergillus oryzae*.
- The western equivalent of koji fermentation is the malting process performed on grains in the distillation industry.
- Koji is far more enzymatically active than malt
- Koji was first patented as a by-product of the distilling industry and first marketed as a digestive aid
- It’s closest living relatives are aspergillus strains which can produce potent aflatoxins. It is believed that *A. oryzae* and *A. niger* and the *Aspergillus* species that are used in culinary production had the toxin selected out of them because of their co-evolution with humans. Humans using them in coordination with yeasts may have caused them to evolve differently than their toxic cousins.
- Koji has been studied as a health supplement, and shown to have anti-carcinogenic, anti-anxiety, anti-hypertension, and anti-allergy capabilities. It has also been studied as a treatment for fatigue-disorders, immune-disorders, and liver disorders.

How Does it Work?

- It’s a mold, which extends mycelia all over the surface of grains (traditionally rice or barley) and injects hypha into the grains to break complex molecules into simpler units. In this way, the fungus is both protective (it outcompetes other surface molds that may be toxic or impart bad flavor) and fermentative (it not only begins metabolizing substances but it also sets the stage for bacterial fermentation to occur.)

- Koji also has a slight electromagnetic charge, so it can be used to reduce water activity (the ultimate determiner of preservation/shelf stability). Throughout much of history, salt alone has been used for this purpose.
- It can be used for solid state fermentation, or enzymatic metabolization (via Koji's secondary ferments), or both, because its hyphae release powerful enzymes that continue to work outside of the incubation environment needed for initial cultivation.
- These enzymes are primarily amylases (starch metabolizing) and proteases (protein metabolizing). This is why koji is useful for pre-digesting complex starches (such as sorghum in Africa) and proteins (such as meat in tenderization or curing/charcuterie processes). Glutaminase is one enzyme produced, and is a huge component for umami.
- Secondary ferments are shio-koji and ama-koji/amazake. Amazake can be sour or sweet, so I think of it as three classes of secondary ferments, essentially, used for different purposes.
 - Shio-koji is salty
 - Sour amazake is savory
 - Sweet amazake is sweet

What do you want to do with koji???

- enhance flavor
- pickle and ferment
- substitute salt
- substitute sugar
- make charcuterie
- tenderize food

IF YOU WANT TO GROW KOJI

2# polished rice or barley

1 tsp koji spores

cheesecloth, or a tea towel

a controlled environment where you can maintain 80-85* F and 85% RH

(two examples from Meredith)

(online tutorial at <https://github.com/ariellejohnson/simple-fermentation-box>)

Don't rinse the rice or barley, you will want as much starch as possible for the koji to work on.

Cook the rice or barley until fluffy. Cool to 80-90°F and inoculate with the koji spores by mixing thoroughly. Incubate for 48 hours, stirring occasionally to evenly distribute heat.

After 48 hours you should have a well developed white mold, perhaps with some yellowing areas. Success!

You can remove the koji kin and dry it, freeze it for later use, or produce shio or amazake.

NOTE: If you're interested in growing koji on meat or directly on foods like vegetables, cheeses or other foods, you'll inoculate using koji spores as well as a small amount of sterilized flour. Per 5# of product, try 2 tsp. koji spores mixed with about 1/4c. of toasted flour. (Use all purpose flour, rice flour, whatever you want).

TO MAKE SHIO KOJI:

8 oz. koji rice
2 oz. sea salt
1-1/4 C. water

combine all ingredients in a jar and stir well. Cover with a towel and rubberband and keep at room temperature, stirring 1-2 times/day for 7-10 days. Then, refrigerate for up to 1 year.

TO MAKE SOUR AMAZAKE

1 C. rice
10 C. water
1 C. koji rice

Cook the rice in the water until you've produced a thin soup or porridge. Cool to 80°F and mix with koji rice. Incubate at 80°F for 6-10 hours. Refrigerate for up to 1 year

TO MAKE SWEET AMAZAKE

Same as sour amazake but mix koji rice in at 138°F and incubate 6-10 hours at 138°F.

HOW TO USE SHIO, SOUR AMA-KOJI AND SWEET AMAZAKE

Shio is used to brine, incubate (or cure), pickle, substitute salt, marinate, or provide a dash of umami to a regular savory recipe such as a dressing or sauce

Sour amazake is used in similar ways to shio, except is not a salt substitute as it is not salty

Sweet amazake is used in sweetbreads and cakes to substitute for some of the sugar, is used as an ice cream base, and is eaten like rice pudding. It can be mixed into smoothies for sweetness and as a probiotic boost. Yeast is added to amazake to further ferment and make sake.

If you don't want to grow your own koji, but you want its benefits in your cooking, you can purchase amazake and shio at any Asian food market. It is found in the refrigerator section.

Resources:

Buy koji spores at GEM Cultures online

Pure Charcuterie: The Craft & Poetry of Curing Meat at Home by Meredith Leigh contains a section on koji charcuterie and how to grow koji at home

Preserving the Japanese Way by Nancy Singleton Hachisu contains recipes using shio and sake lees, and a review of koji production in Japan.

Sandor Katz book, *Wild Fermentation* discusses koji but does not detail cultivating it. There are recipes for using it in miso and amazake. In his second book, *The Art of Fermentation* there is more detail on growing koji, and plenty of direction on making sake and miso.

Follow my koji mentor, Jeremy Umankysy of Larder Delicatessen in Cleveland, OH on Instagram: @tmgastronaut (he is working on a book!)

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