

Amazake

Subjects: Food Science & Technology

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The sweet drink *amazake* is a fermented food made from *Aspergillus oryzae* and related *koji* molds in Japan. There are two types of drinks called *amazake*, one made from *koji* (*koji amazake*) and the other made from sake lees, a by-product of sake (*sakekasu amazake*).

Keywords: lee ; glucose ; anti-fatigue ; bowel movement ; skin barrier

1. Introduction

There are a wide variety of traditional fermented foods made from *Aspergillus oryzae* and related *koji* molds in Japan, such as *sake*, *shochu* (Japanese traditional hard liquor), *mirin* (sweet sake), rice vinegar, soy sauce, *miso*, salt *koji*, and some Japanese pickles. *Koji* is a grain, such as rice, wheat, and soybeans, fermented with *A. oryzae* and with related *koji* molds grown on it. Both *amazakes* are closely related to sake brewing (**Figure 1**). Sake brewing begins by polishing brown rice into white rice. Rice-*koji* is produced based on the growth of *A. oryzae* from the surface layer to the rice (rice-*koji* making process). Sake yeast is cultivated using steamed rice and rice-*koji* (*Shubo* making process).

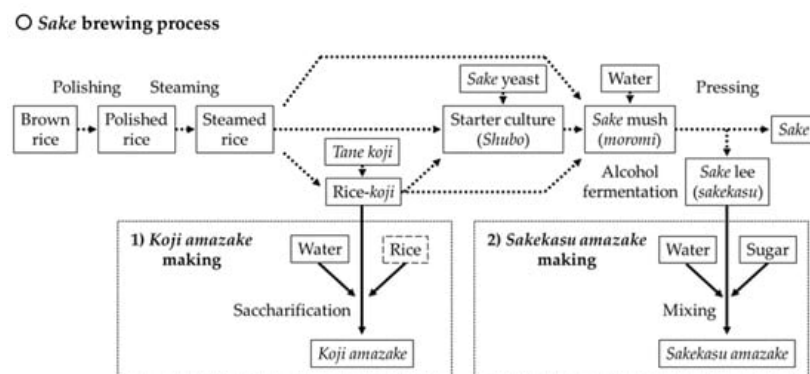


Figure 1. Relationship between sake brewing and the *amazake* production process.

One type is made only from rice-*koji* and water, whereas the other type is made with additional rice. The *koji amazake* production process is as follows: the rice-*koji* is mixed with water and placed in a tank set at 50–60 °C, where the amylase secreted by *A. oryzae* breaks down rice starch into glucose. It is a unique beverage for which the main component is glucose, as compared to other sweet beverages such as fruit juice, for which the main sugars are sucrose and fructose.

In particular, *koji amazake* has been consumed for a long time, as it appeared in the Chronicles of Japan (*Nihon shoki*) compiled in 720, the second oldest book of classical Japanese history; however, in the middle of the Edo period (around 1700–1750), it was made by the same method as it is today and sold by peddlers ^[1]. Another drink, in which sake lees is dissolved in hot water (*kasuyuzake*), has also been consumed for a long time as a substitute for sake ^[2]. *Koji amazake* and *sakekasu amazake*, including *kasuyuzake*, have been consumed for a long time. Nevertheless, there are few research reports on both *amazake* and other fermented foods using *koji*. An *amazake* boom occurred in Japan in 2015, and its market size grew from JPY 11.9 billion in 2009 to JPY 16.7 billion in 2015 and JPY 24.6 billion in 2017. In addition, research reports, including those on safety, have increased.

2. Ingredients

Carbohydrates are the most abundant nutritional component of both *amazakes*, but their contents are different. Most of the carbohydrates in *koji amazake* are glucose derived from rice starch, which is broken down by α -amylase and glucoamylase secreted by *A. oryzae*, as described previously herein. Furthermore, various oligosaccharides, mainly glucooligosaccharides, are produced by the transglycosylation activity of α -glucosidase.

Twenty amino acids are produced by the degradation of rice proteins by the protease of *A. oryzae*^{[3][4]}. The number of amino acids depends on the amount of rice-*koji* and steamed rice, but the rice polishing rate also has an effect on amino acid content because proteins are unevenly distributed on the surface layer of rice. The vitamin B complex includes thiamine (B1), riboflavin (B2), nicotinic acid (B3), pantothenic acid (B5), pyridoxine (B6), and biotin (B7) in *koji amazake*^{[3][4][5][7][8][9]}. Lipids in *koji amazake* include palmitic acid, oleic acid, and linoleic acid^[3]. In addition to these compounds, *koji amazake* contains more than 300 compounds including such as g-aminobutyric acid and ergothioneine, glycosylceramides.

3. Functionality

Koji amazake has a history of being consumed as a nutritional supplement to prevent heat fatigue, and its effects on improving bowel movements and the skin barrier are empirically known. While scientific verification is underway, other functional properties have also become clear in the verification process.

4. Safety

To address this concern, Kurahashi et al. confirmed its safety in an excessive intake test^[11] and a long-term intake test of *koji amazake*^[12]. No adverse events were observed, blood chemistry was within the reference range, and body weight remained unchanged during the test period.

Ui reported bacterial food poisoning caused by *koji amazake*, mainly through staphylococci^{[13][14]}. *Koji amazake* is saccharified at 50–60 °C, as mentioned in the introduction. However, as food poisoning bacteria can grow at approximately 40 °C, the saccharification temperature of *koji amazake* should be kept at 50–60 °C. Furthermore, after production, low-temperature (>10 °C) storage is required to suppress the growth of food-poisoning bacteria. Although most manufacturers sterilize *amazake* before distribution, it is important to note that after opening it, it should be maintained at low-temperature storage.

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