The story of Japanese Sake: its history, technology, and art

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Contents:

Sake (Seishu)

Sake is a traditional alcoholic beverage in Japan (its alcohol content is often about **15%**). It is made through fermentation, like beer and wine. Sake is **made from rice**, a staple food in Japan. In recent years, Japanese cuisine is becoming popular internationally. Accordingly, increasing number of **people enjoy sake world wide**.

Sake **making is more complicated** than wine and beer making. Nowadays sake production techniques have been **clarified by science**, and key elements of the traditional skills of "**Toji**" (The chief of sake makers) have been applied to produce **varieties of high quality sake**.

1 History

Ancient times:

The origins go back as far as **2,500 years ago** when rice growing became prevalent in Japan.

The oldest written records about Japanese sake are found **in third-century**. Japanese had the habit of gathering to drink sake when mourning the dead.

In the eighth century, there is **reference** to sake made using mold, providing insights into how sake was produced in those days.

The tenth century legal book records details of ancient sake-making methods. At that time, sake was **produced mainly at the imperial court**, either to be drunk by the emperor or for ceremonial use.

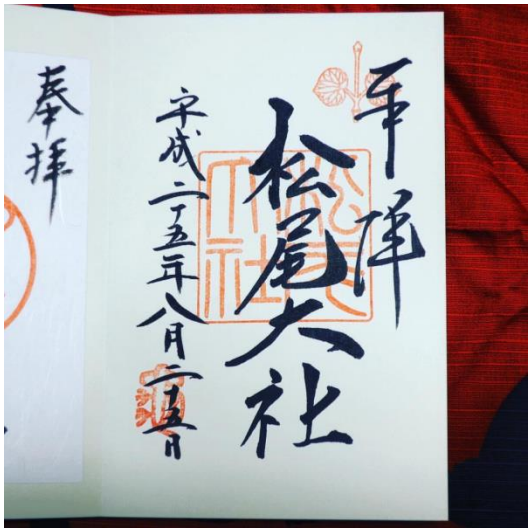
Middle ages:

Establishment of sake-brewing technology

In the 12-15th centuries, sake came to be brewed **at shrines and temples**.

The **techniques of sake brewing in use today** were largely developed during this period.

In the 16th century, the full-fledged production of sake was **established** by specialists not affiliated with temples or shrines.



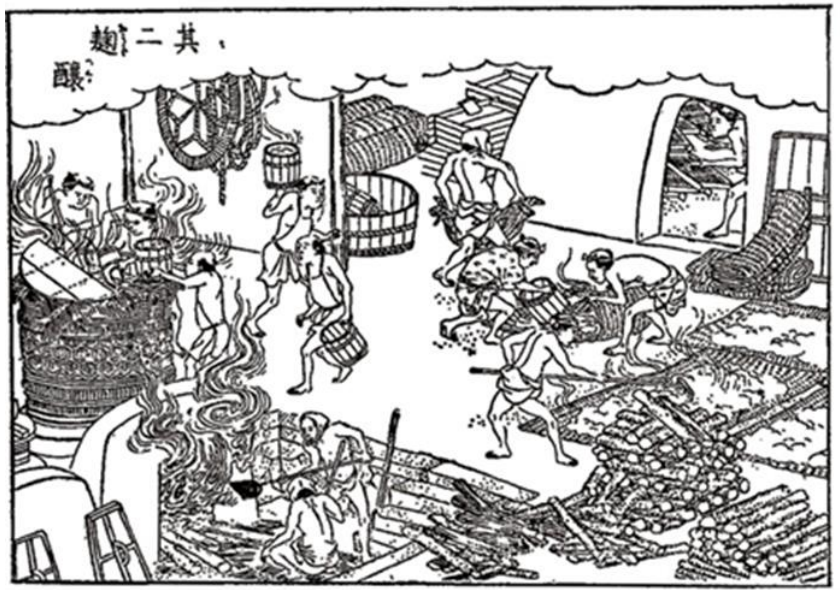
Early modern period:

In the 17th century, sake producers in Osaka found its way into the **three major cities of Kyoto, Osaka and Edo (now Tokyo).** Sake became especially popular in Edo. Production of sake reached 38,000 kiloliters at the beginning of the 18th century.

Large amounts of sake were packed in casks and **transported by sailboat**. At the beginning of the 19th century, vessels transporting sake **raced each other to see which could enter Edo** port the quickest, **from Kobe to Tokyo in just three to four days**, compared to the usual 10 to 30 days in those days.

The start of the 19th century saw the center of sake production shift from Itami, Ikeda and nearby areas to **Nadagogo. (the five areas covered by modern-day Nishinomiya and Kobe cities in Hyogo Prefecture**.)

Nadagogo has the **best water for sake, Miyamizu** , which contains large amounts of phosphates and potassium, which promote the proliferation of koji-fungi and yeast. The waterwheels for rice milling not only increased productivity, but boosted quality by increasing the level. At the same time, the concentration of sake production in the winter, when there is less risk of bacterial contamination, facilitated stable production of high-quality sake.



Sake brewing in the Edo Period (19th century)

Modern period:

From the middle of the **19th century**, it was reported the fact that **pasteurization** had been practiced by sake brewers in Japan much **earlier than Pasteur** in France.

In 1904, the National Research Institute of Brewing was established. Quality appraisal programs were initiated with the aim of raising the level of brewing technology **in 1911, the first national competition** was held, an institution that continues to this day. Subsequent developments affecting brewing technology.

During World War II and the immediate postwar period saw bold changes in production methods. A wave of modernization in production processes **in the 1960s** and the introduction of **machinery resulted in further streamlining**.

More **recent trends** affecting sake include the notion of "**Jizake: local production for local consumption**," leading to the development of new varieties of sake rice and unique types of sake.


BEREIDING

VAN DE

SACKI.

DOOR DEN HEER

Mr. ISAAC TITSING.

De gewoone drank der Japanners wordt *Sacki* genaamd, welk woord afkomstig is van Sasa een Bamboes, en Soesoemi een Mosch, of Vogel, doelende op de eerste oorzaak, die tot deszelfs ontdekking aanleiding zou gegeeven hebben, welke men aldus verhaald. Eerste Ontdekking.

Eenige boeren in de oudste tyden voorby een Bosch van Bamboesen gaande, ontwaarde een vreemde, doch aangenaame reuk; de oorzaak daar van naspoorende, ontdekten zy eenige afgekapte Bamboezen, in welker bovenste holte een vocht besloten-

2 Sake making

Toji (chief of sake makers)

2.1 Rice

The rice used for brewing sake has to be **special sake-brewing suitable one**.

Its **grain is larger, stronger**, and contains **less protein and lipid** than the ordinary rice. Sake rice is used only for making sake, because it is unpalatable for eating.

The rice has a **starch component in the center** of the grains. It is polished to remove the bran completely, and this the grains shall be larger and strong not to break during the polishing.

There are at least 80 types of sake rice in Japan. Among these, **Yamadanishiki**, Gohyakumangoku, Miyamanishiki and Omachi rice are very popular.

2.2 Water

Water is one of the important ingredients for making sake. The mineral content of the water is very important.

A. **Iron** will bond with an amino acid produced by the koji to produce off flavors and a yellowish color.

B. **Manganese**, when exposed to ultraviolet light, will also contribute to discoloration.

C. Conversely **potassium, magnesium, and phosphoric acid** serve as nutrients for yeast during fermentation and are considered desirable.

D. While **soft water will yield sweeter** sake, **hard water with a higher nutrient content** is known for producing **drier-style** sake.

The first region known for having **great water was the Nada-Gogo in Kobe**. A particular water source called "**Miyamizu**" was found to produce high quality.

2.3 Brewing (1)

Sake is produced by **the multiple parallel fermentation** of rice.

The **rice is first polished to remove the protein and oils** from the exterior of the rice grains, leaving behind starch. Thorough milling leads to fewer congeners and generally a more desirable product.

Newly polished rice is allowed to absorb enough moisture from the air and **washed clean**.

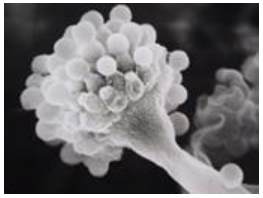
After soaking, the rice is **steamed**, and then cooled and divided into portions for different uses.

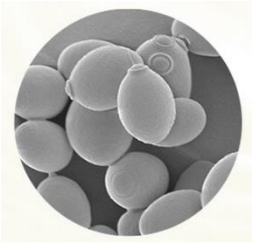
The microorganism ***Aspergillus oryzae*** (a mold) is sprinkled onto the steamed rice and allowed to ferment for 5–7 days to make the "**Koji**" (rice and mold mixture).

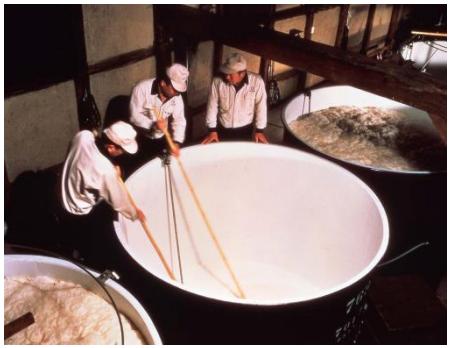
After this initial fermentation period, water and the yeast culture ***Saccharomyces cerevisiae*** are added to the Koji and allowed to incubate at 4℃ for about 7 days to make the starter culture "**Moto**".

Over the next four days, pre-incubated mixture of steamed rice (90 kg), fermented rice (90 kg) and water (440 L) are added to the **fermented mixture in three series.**

This staggered approach allows time for the yeast to keep up with the increased volume. The mixture is known as **the main mash "Moromi".**

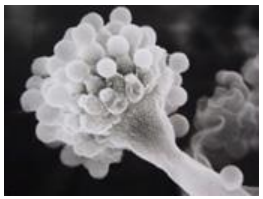


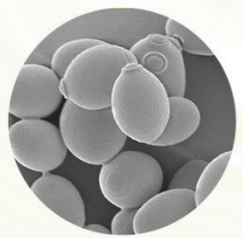




2.3 Brewing (2)

The main mash then ferments, at approximately 15–20℃ for 2–3 weeks. With high-grade sake, fermentation is deliberately slowed by lowering the temperature to 10℃ or less.



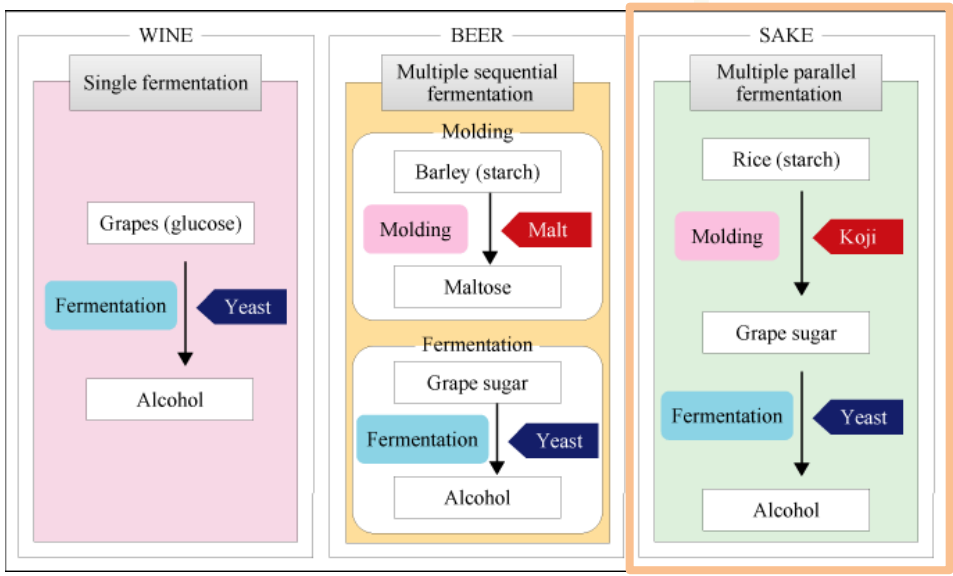


"**Multiple parallel fermentation**"

Unlike malt for beer, rice for sake does not contain the amylase necessary for converting starch to sugar; it must undergo a process of multiple fermentation.

The addition of ***A. oryzae*** **provides the necessary amylases, glucoamylases, and proteases to hydrolyze the nutrients** of the rice to support the growth of the yeast (*S. cerevisiae*).

In sake production these **two processes take place at the same time** rather than in separate steps, so sake is said to be made by multiple parallel fermentation.



After fermentation, sake is extracted from the solid mixtures through **a filtration process**. Next, the remaining lees (a fine sediment) are removed, and the sake is **carbon filtered and pasteurized.** The sake is usually diluted with water to lower the **alcohol content from around 20% to 15%** or so.

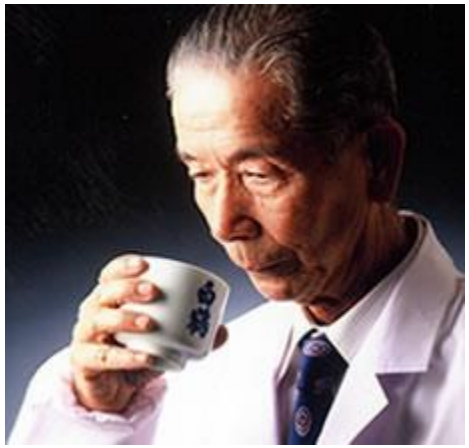
2.4 Maturation

Like other brewed beverages, sake tends to **benefit from a period of storage.**

Nine to twelve months are required for sake to mature.

Maturation is caused by physical and chemical factors such as oxygen supply, the broad application of external heat, nitrogen oxides, aldehydes and amino acids, among other unknown factors.

2.5 Toji



“**Toji**” is the job title of the chief of sake brewers.

It is a **highly respected job** in the Japanese society, being regarded as **artists like musicians or painters**.

The title has been historically passed on from father to son; today some are either veteran brewery workers or are trained at universities.

While modern breweries with refrigeration and cooling tanks operate year-round, **most old-fashioned sake breweries are seasonal, operating only in the cool winter** months.

During the summer and fall most Toji work elsewhere, and are commonly found on farms, only periodically returning to the brewery to supervise storage conditions or bottling operations.

3 Varieties

There are two basic types of sake:

Futsū-shu (ordinary sake) :

the equivalent of table wine and accounts for the majority of sake produced.

Tokutei meishō-shu (special-designation sake):

premium sakes distinguished by the degree to which the rice has been polished and the added percentage of brewer's alcohol or the absence of such additives.

3.1 Special-designation sake

There are eight varieties of special-designation sake. The listing here has the highest quality at the top.

Special Designation	Ingredients	Rice Polishing Ratio	Percentage of Koji rice
Junmai Daiginjō-shu (Pure rice, Very Special brew)	Rice, Kōji rice	Below 50%	At least 15%
Daiginjō-shu (Very Special brew)	Rice, Kōji rice, Distilled alcohol	Below 50%	At least 15%
Junmai Ginjō-shu (Pure rice, Special brew)	Rice, Kōji rice	Below 60%	At least 15%
Ginjō-shu (Special brew)	Rice, Kōji rice, Distilled alcohol	Below 60%	At least 15%
Tokubetsu Junmai-shu (Special Pure rice)	Rice, Kōji rice	Below 60% or produced by special brewing method	At least 15%
Tokubetsu Honjōzō-shu (Special Genuine brew)	Rice, Kōji rice, Distilled alcohol	Below 60% or produced by special brewing method	At least 15%
Junmai-shu (Pure rice)	Rice, Kōji rice	Below 70%	At least 15%
Honjōzō-shu (Genuine brew)	Rice, Kōji rice, Distilled alcohol	Below 70%	At least 15%

3.2 Ways to make the starter mash

"**Kimoto**":

The traditional orthodox method for preparing the starter mash, which includes the laborious process of grinding it into a paste. This method was the standard for 300 years, but it is rare today.

"**Yamahai**" (yama-oroshi haishi) :

A simplified version of the kimoto method, introduced in the early 1900s. The kimoto method includes a step making a paste out of the starter mash, known as "Yama-oroshi", which is omitted in "Yamahai" method. It is now used in specialty brews for the earthy flavors it produces.

"**Sokujo**" (quick fermentation):

The modern method of preparing the starter mash. Lactic acid, produced naturally in the two slower traditional methods, is added to the starter to inhibit unwanted bacteria. A lighter flavor than Kimoto or Yamahai.

3.3 Different handling after fermentation

Namazake: sake that has not been pasteurized. It requires refrigerated storage and has a shorter shelf-life than pasteurized sake

Genshu: undiluted sake. Most sake is diluted with water after brewing to lower the alcohol content from 18–20% down to 14–16%, but Genshu is not.

Muroka: sake that has not been carbon filtered, but which has been pressed and separated from the lees, and thus is clear, not cloudy. Carbon filtration can remove desirable flavors and odors as well as bad ones, thus Muroka sake has stronger flavors than filtered varieties.

Nigorizake: cloudy sake. The sake is passed through a loose mesh to separate it from the mash. It is not filtered thereafter and there is much rice sediment in the bottle. Before serving, the bottle is shaken to mix the sediment and turn the sake white or cloudy.

Koshu : "aged sake". Most sake does not age well, but this specially made type can age for decades, turning yellow and acquiring a honeyed flavor.

Taruzake: sake aged in wooden barrels or bottled in wooden casks. The wood used is Cryptomeria (sugi), which is also inaccurately known as Japanese cedar. Sake casks are often tapped ceremonially for the opening of buildings, businesses, parties, etc. Because the wood imparts a strong flavor, premium sake is rarely used for this type.

Shiboritate: "freshly pressed", refers to sake that has been shipped without the traditional six-month aging/maturation period. The result is usually a more acidic, "greener" sake.

Fukurozuri: a method of separating sake from the lees without external pressure by hanging the mash in bags and allowing the liquid to drip out under its own weight. Sake produced this way is sometimes called **Shizukuzake**, meaning "drip sake".

Tobingakoi: sake pressed into 18-liter bottles with the brewer selecting the best sake of the batch for shipping.

3.4 Others

Amazake: a traditional sweet, low-alcoholic Japanese drink made from fermented rice.

Doburoku: the classic home-brew style of sake (although home brewing is illegal in Japan). It is created by simply adding kōji mold to steamed rice and water and letting the mixture ferment. The resulting sake is somewhat like a chunkier version of nigorizake.

Jizake: locally brewed sake, the equivalent of microbrewing beer.

Kuroshu: sake made from unpolished rice (i.e., brown rice), and is more like Chinese rice wine.

Teiseihaku-shu: sake with a deliberately high rice-polishing ratio. It is generally held that the lower the rice polishing ratio (the percent weight after polishing), the better the potential of the sake. However, beginning around 2005, teiseihaku-shu has been produced as a specialty sake made with high rice-polishing ratios, usually around 80%, to produce sake with the characteristic flavor of rice itself.

Kasu: pressed sake lees, the solids left after pressing and filtering. These are used for making pickles, livestock feed, and as an ingredient in dishes like soup.

4 Taste and flavor

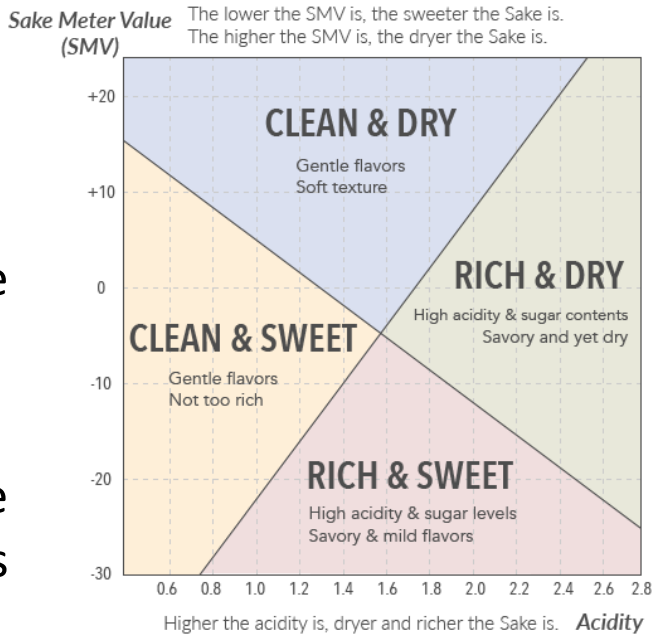
Nihonshu-do (“Sake Meter Value”, or SMV):

SMV = (|1/specific gravity|-1) X 1443

Specific gravity is measured on a scale weighing the same volume of water at 4℃ and sake at 15℃.

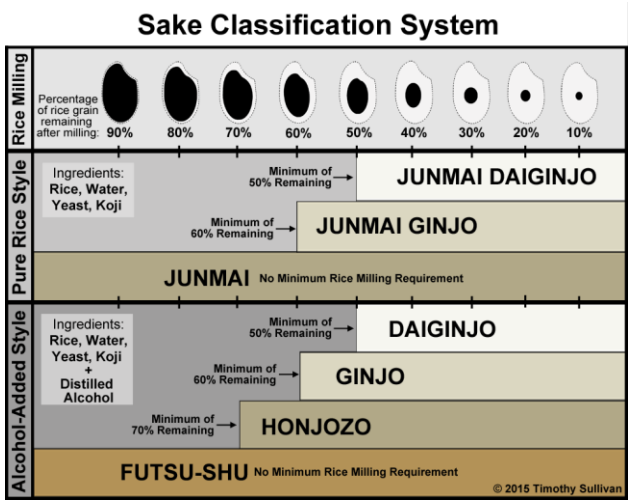
The sweeter the sake, the lower the number.

When the SMV was first used, 0 was designated the point between sweet sake and dry sake. Now +3 is considered neutral.



Seimai-buai (rice polishing ratio):

The rice polishing ratio, the percentage of weight remaining after polishing. Generally, the lower the number, the better the sake's potential. A lower percentage usually results in a fruitier sake, whereas a higher percentage will taste more like rice.



5 Serving sake

Sake is served at various temperatures depending on the preference of the drinker, the quality of the sake, and the season.

chilled ("**Reishu**"): Summer drink at 10℃

room temperature ("**Hiya**") : high-grade sake is not drunk hot, because the flavors and aromas will be lost.

heated ("**Atsukan**"), Typically, winter drink, and This masking of flavor is the reason that low-quality and old sake is often served hot (at 50℃).

Sake is traditionally drunk from small cups called **Choko**, and poured into the choko from ceramic flasks called **Tokkuri**, which is very common for hot sake drinking. Traditionally hot sake is heated immediately before serving. There are also a variety of devices for heating sake and keeping it warm.

TIPS: Traditionally one does not pour one's own drink, which is known as "**Tejaku** ", but instead members of a party pour for each other, which is known as "**Shaku**". generally observed on more formal occasions, such as business meals, and is still often observed for the first drink.

Another traditional cup is the "**Masu**", a box usually made of wood, which was originally used for measuring rice, which holds exactly 180 ml, so the chilled or room temperature sake is traditionally served in units of 180 ml.

In some Japanese restaurants, as a show of generosity, the server may put a glass inside the masu or put the masu on a saucer and pour until sake overflows and fills both containers.

Saucer-like cups called "**Sakazuki**" are also used, most commonly at weddings and other ceremonial occasions, such as the start of the year or at the beginning of a kaiseki meal.

6 Seasonality

Traditionally sake was brewed only in the winter.

While it can now be brewed year-round, there is still seasonality associated with sake, particularly artisanal ones.

The most visible symbol of this is the "**Sugitama**", a globe of cedar leaves traditionally hung outside a brewery when the new sake is brewed. The leaves start green, but turn brown over time, reflecting the maturation of the sake

The new year's sake is called "**Shinshu**" (new sake), and when initially released in late winter or early spring, many brewers have a celebration, known as "**Kurabiraki**" (warehouse opening). Traditionally sake was best transported in the cool spring, to avoid spoilage in the summer heat, with a secondary transport in autumn, once the weather had cooled, known as "**Hiyaoroshi**" (cold wholesale distribution) – this autumn sake has matured over the summer.

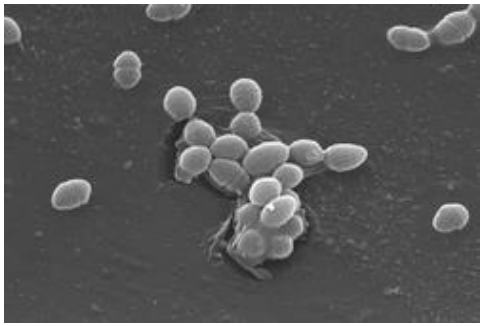
Traditionally there is no notion of vintage of sake – it is generally drunk within the year, and if aged, it does not vary significantly from year to year.

7 Storage

In general, it is best to **keep sake refrigerated in a cool or dark room**, as prolonged exposure to heat or direct light will lead to spoilage. Sake stored at room temperature is best consumed within a few months after purchase. In addition, sake stored at relatively high temperature can make it bitter as it ages.

Sake has high microbiological stability. However, incidences of **spoilage can occur because of lactic acid bacteria**, referred to as “hiochi”-bacteria.

After opening a bottle of sake, it is **best consumed within 2 or 3 hours**. It is possible to store sake **in the refrigerator for a couple of days**, because it begins to oxidize. If the sake is kept in the refrigerator for more than 3 days, it will lose its "best" flavor. However, sake can keep very well and still taste just fine after weeks in the refrigerator with oxygen-free sealed caps (similarly to wines).



How long a sake will remain drinkable depends on the product itself.

8 Ceremonial use

Sake is often consumed as part of “Shinto” religion. Sakes served to gods as offerings prior to drinking are called “**Omiki**”.

People drink Omiki with gods to communicate with them and to solicit rich harvests the following year.

In a ceremony called “**Kagami biraki**”, wooden casks of sake are opened with mallets during Shinto festivals, weddings, store openings, sports and election victories, and other celebrations. This sake, called “**Iwai-zake**” (celebration sake), is served freely to all to spread good fortune.

At the New Year many Japanese people drink a special sake called “**Toso**”.

Toso is a sort of Iwai-zake made by soaking “**Tososan**”, a Chinese powdered medicine, overnight in sake. Even children sip a portion. In some regions, the first sips of Toso are taken in order of age, from the youngest to the eldest.

9 New technology

Breeding of yeast mutants that produce elevated “Ginjo” incense

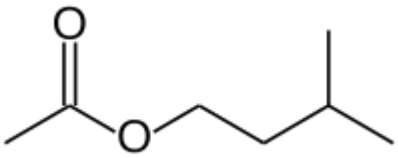
菊正宗 “TOP BRAND” Karakuchi in Japan

Kiku-Masamune Sake -Since 1659 -

https://youtu.be/OetChGu_GnA

菊正宗 "TOP BRAND" Karakuchi in Japan
Kiku-Masamune Sake -Since 1659 -

What is "Ginjo" incense?



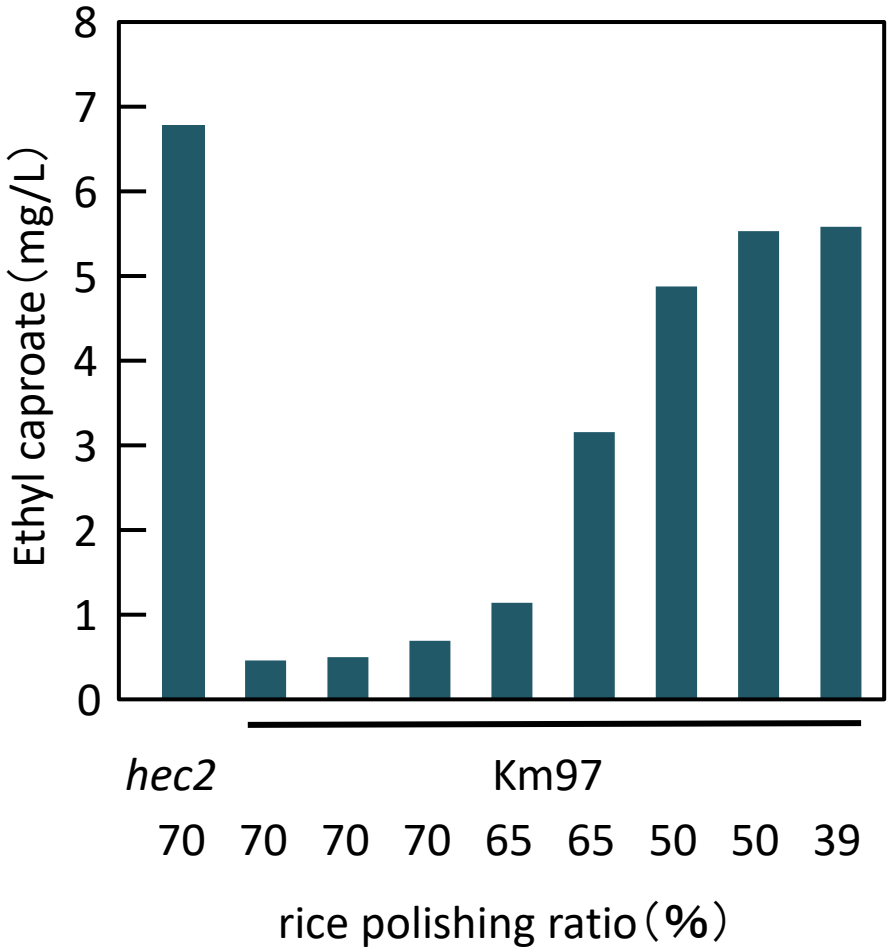
Isoamyl acetate:
banana and pear flavor

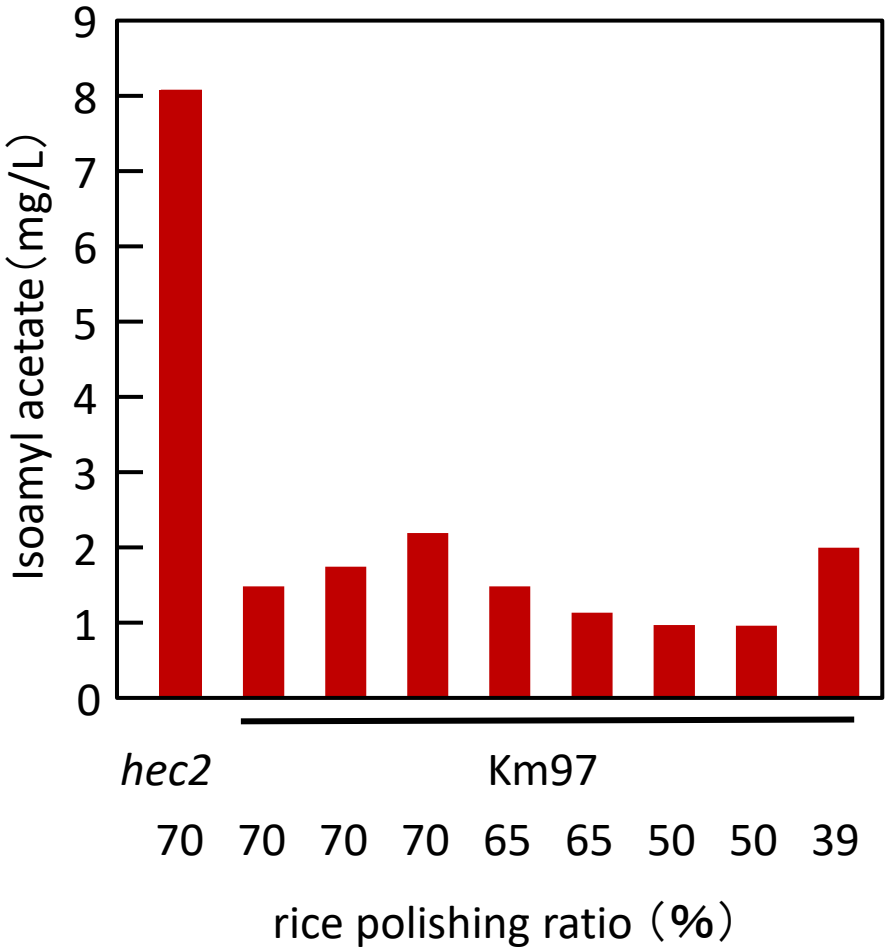
Ethyl caproate:
apple flavor

Ginjo incense is produced by enzymatic reactions in the yeast, and its **production is inhibited by unsaturated fatty acid, which are contained rich in surface part of rice grain.**

That's why sake rice must be polished to remove the bran completely, which was found from experiences without science.

Comparison of flavor components of net rice liquor and commercial sake





Without higher degrees of rice polishing, in *hec2* a very high content of ethyl caproate and isoamyl acetatesake was achieved.

Technology enabled a new generation of sake: Less expensive but more flagrant!

Today you discover it yourself?

"Kan pai!" (Cheers! in Japanese)

Merci beaucoup de votre attention.