

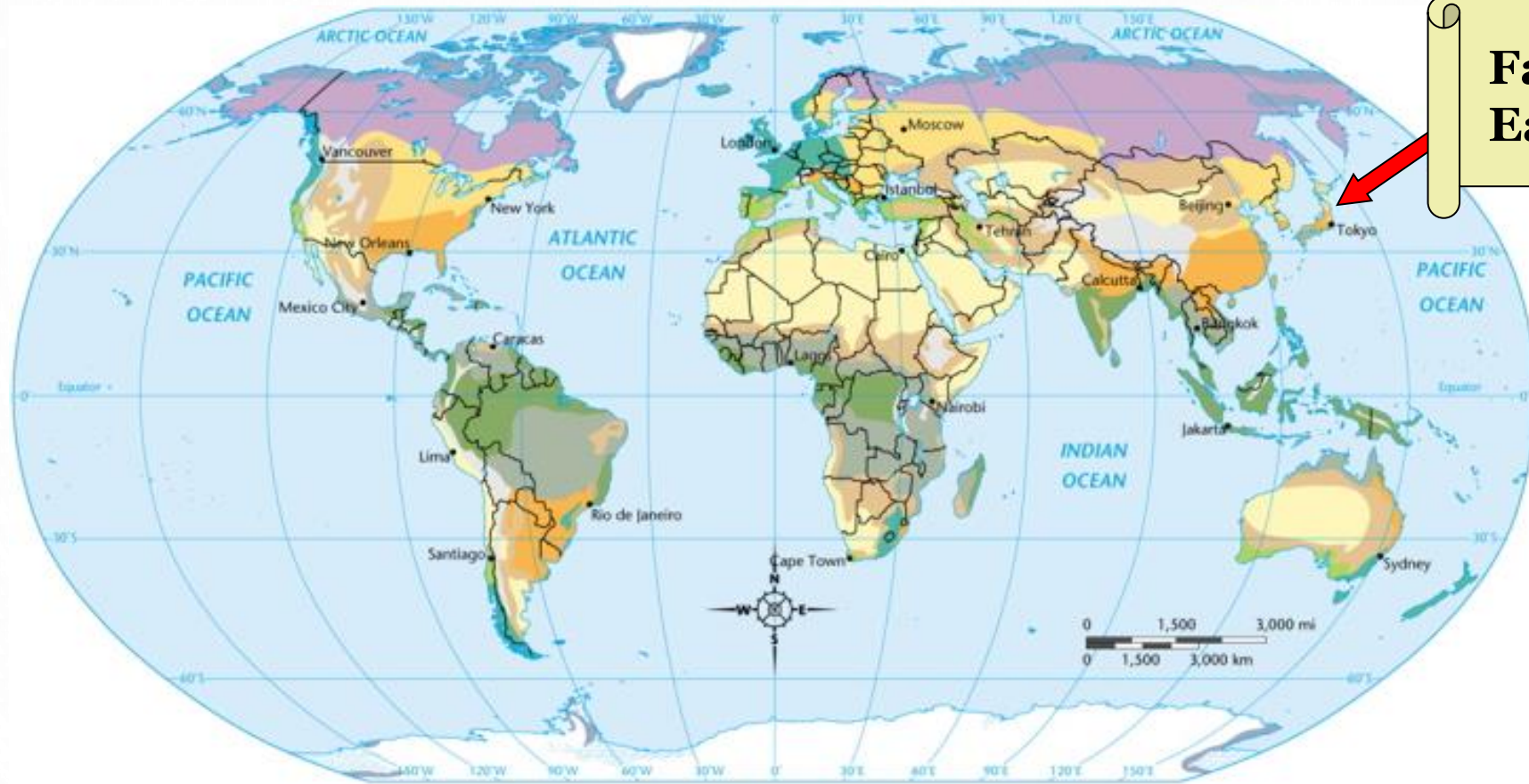
Premium Sparkling Sake for You!

AUGUST 10th, 2022



TOSHIO UENO MSS, CSW, CS, FWS, IWS

World Map & Climate



Far Far East...

Tropical

- Tropical wet
- Tropical wet and dry

Dry

- Semi-arid
- Arid

Moderate

- Mediterranean
- Humid subtropical
- Marine west coast

Continental

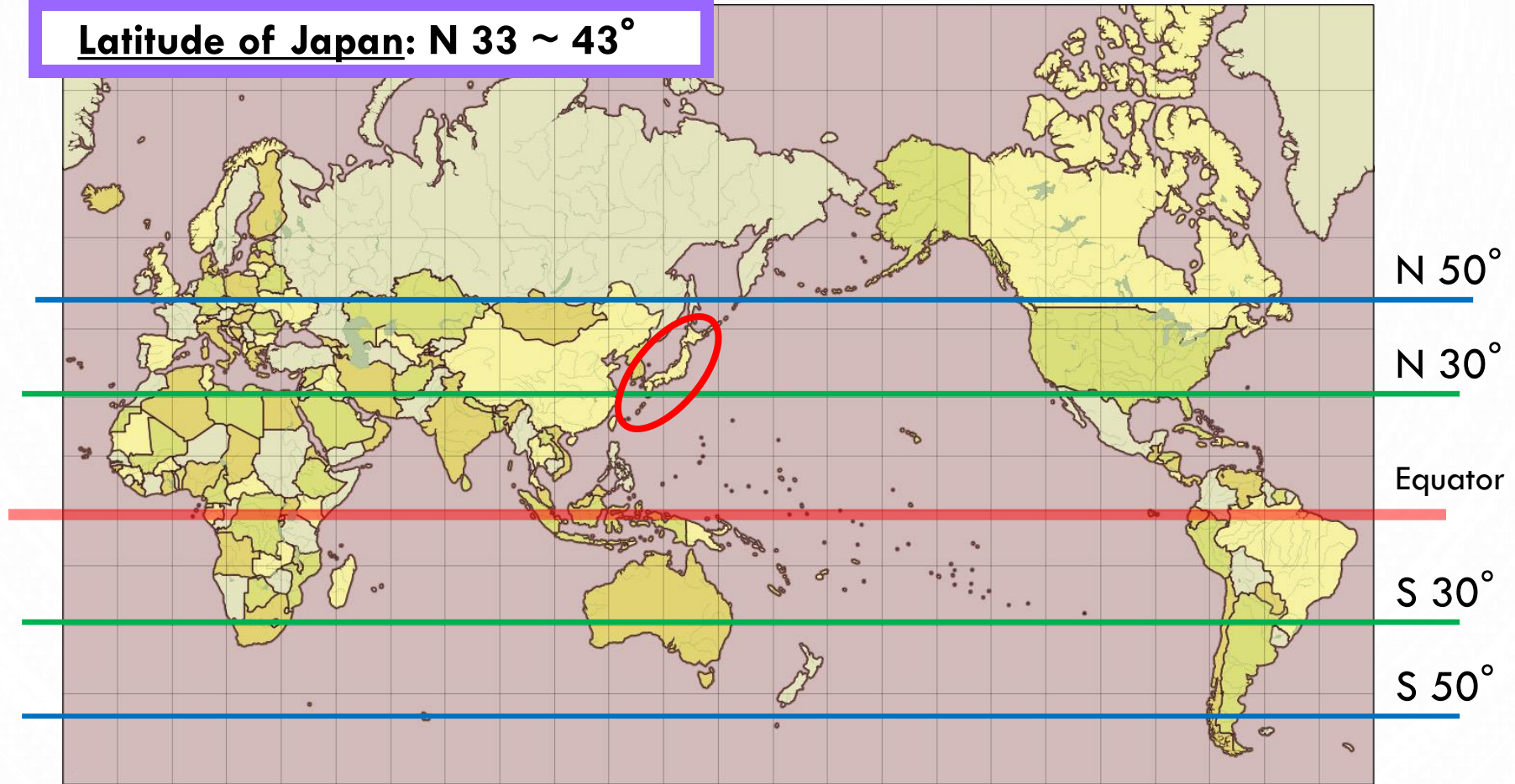
- Humid continental
- Subarctic

Polar

- Tundra
- Ice cap
- Highlands
- Non-permanent ice

Japan on World Map

Latitude of Japan: N 33 ~ 43°



Japan & Its Region

Latitude: 33~ 43° N

Ave. Temp:

Jan 43 F: Sep 74F

Land:145,883sq mi

Rains: 57.7 inch /yr



Prefecture: 46/47

Toji Guild: 25

Four Seasons – North to South



Winter, Niigata



Spring, Shizuoka



Fall, Nagano



Summer, Okinawa

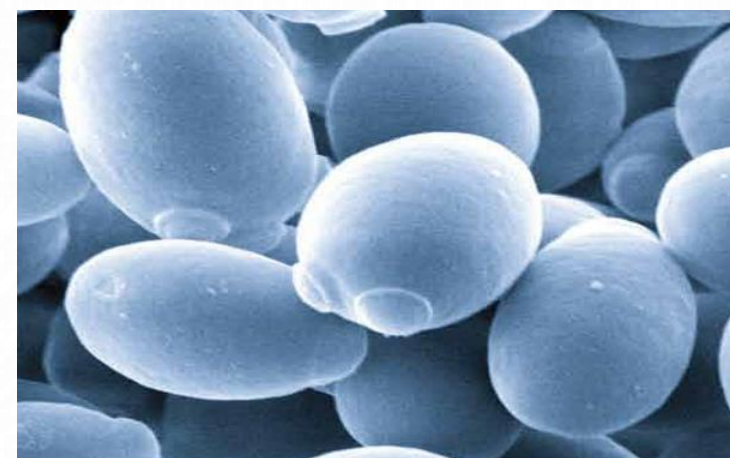
Japan is divided into 6 main climatic zones:

- | | |
|--------------------|--------------------------------------------------------------------------------------|
| Hokkaido: | Cool summers, long and cold winters. |
| Sea of Japan: | Relatively cool summers, cold winters with heavy snowfalls. |
| Central Highland: | Large temperature variance between summers and winters, and between days and nights. |
| Seto Inland Sea: | Mild climate throughout the year. |
| Pacific Ocean: | Hot and humid summers, cold winters with little snowfall. |
| Southwest Islands: | Subtropical climate with hot summers, warm winters with high precipitation. |

Sake Ingredients

Raw Ingredients of Sake (i.e. Junmai, Ginjō, Honjōzō): Rice, Water, Kōji, Yeast

- Brewers alcohol added before pressing stage for some categories –everything that is not **Junmai**
- Water can be filtered, (de) mineralised, acidified. But no other additives possible, including preservatives



Sake Rice = Japonica
Different from table rice, larger
and Shinpaku

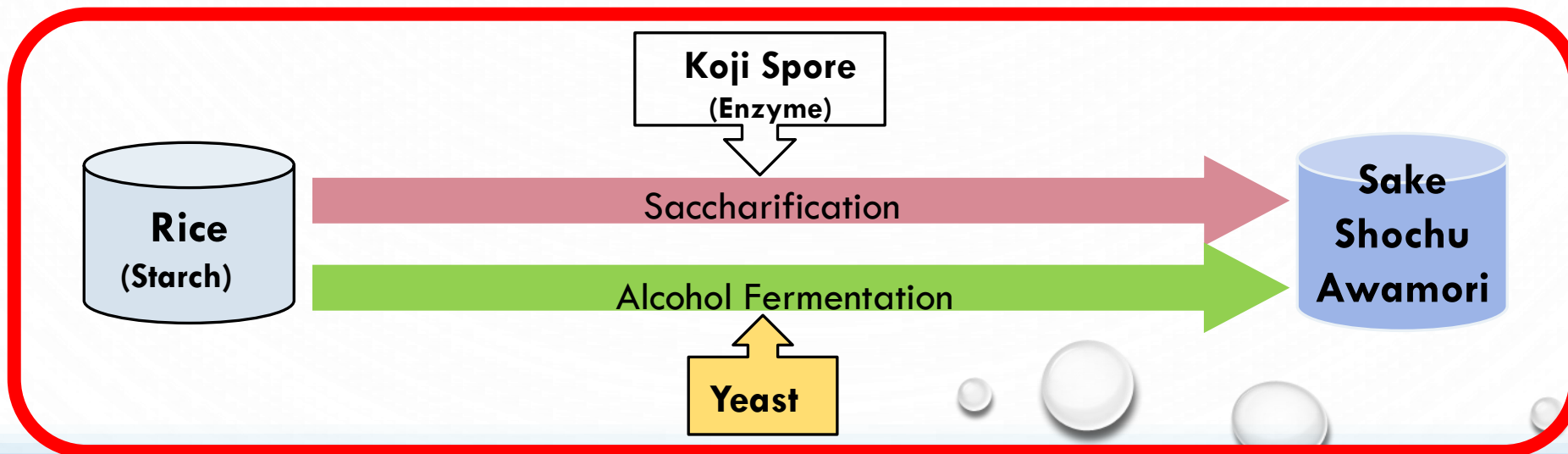
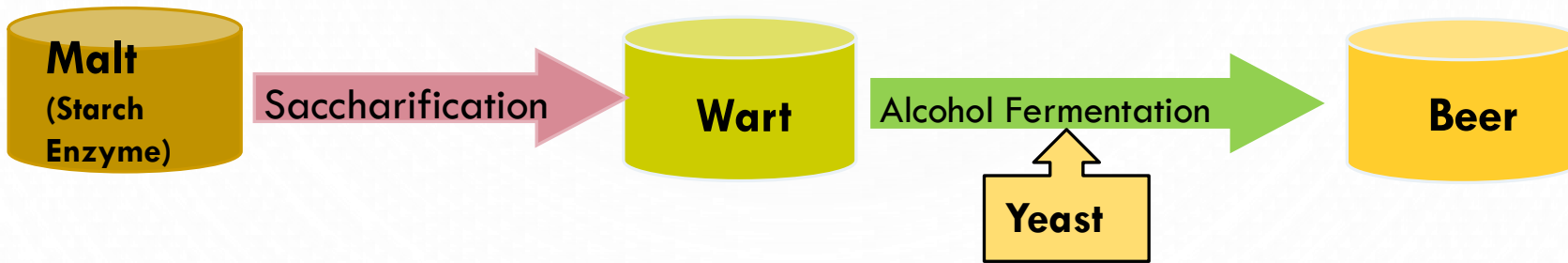
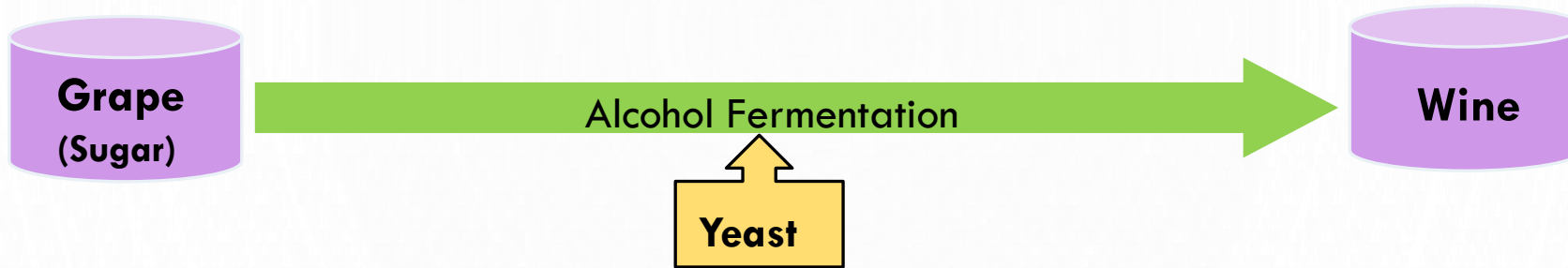
Water Accounts for 80%
Soft water = Feminine
Hard water = Masculine

Koji = Microbe
Convert

- starch to sugar
- protein to amino acids

Yeast produces **esters**
eg. **ethyl caporate**
(apple & pear)
Isoamyl acetate
(banana & melon)

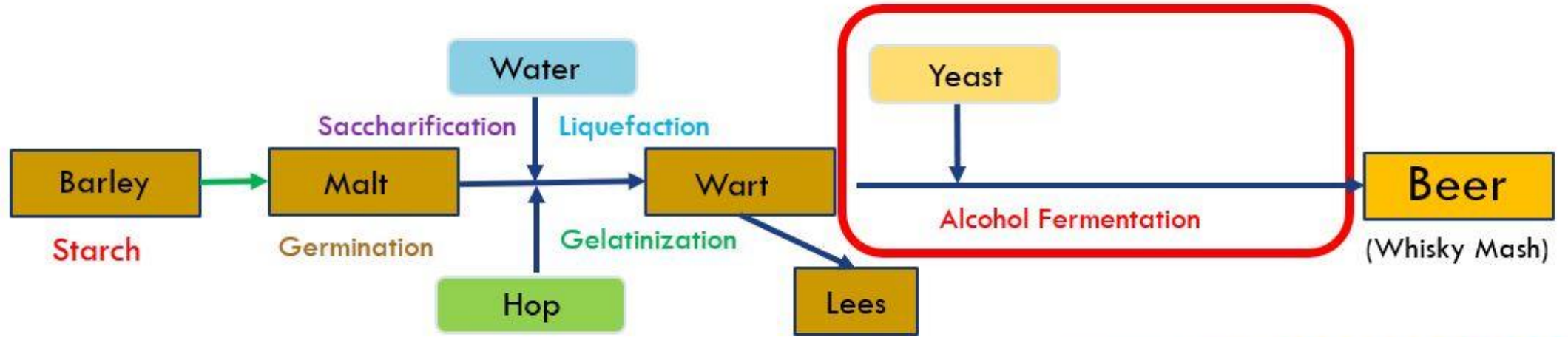
Japanese Unique Fermentation



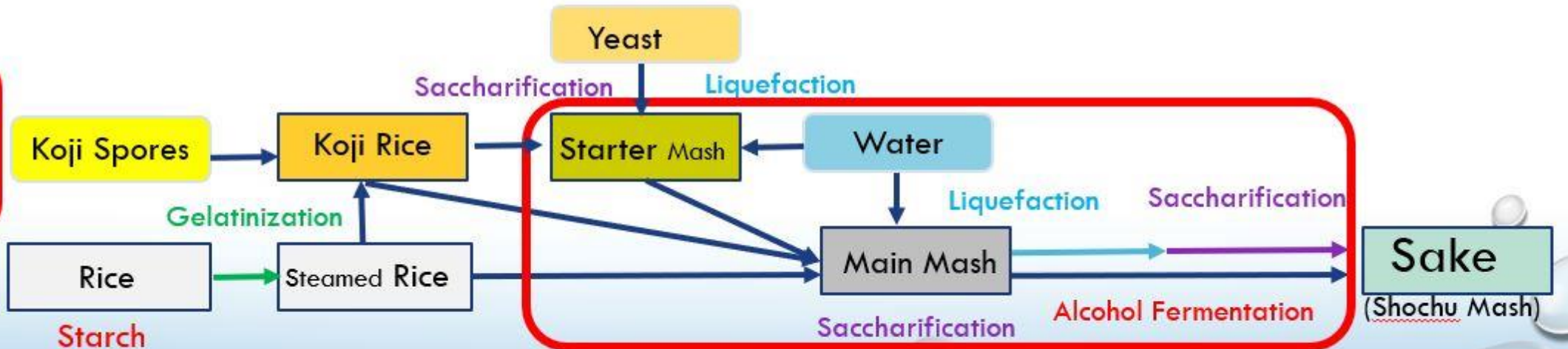


Starch (Carbohydrate) Alcohol Production

Beer



Sake & Shochu

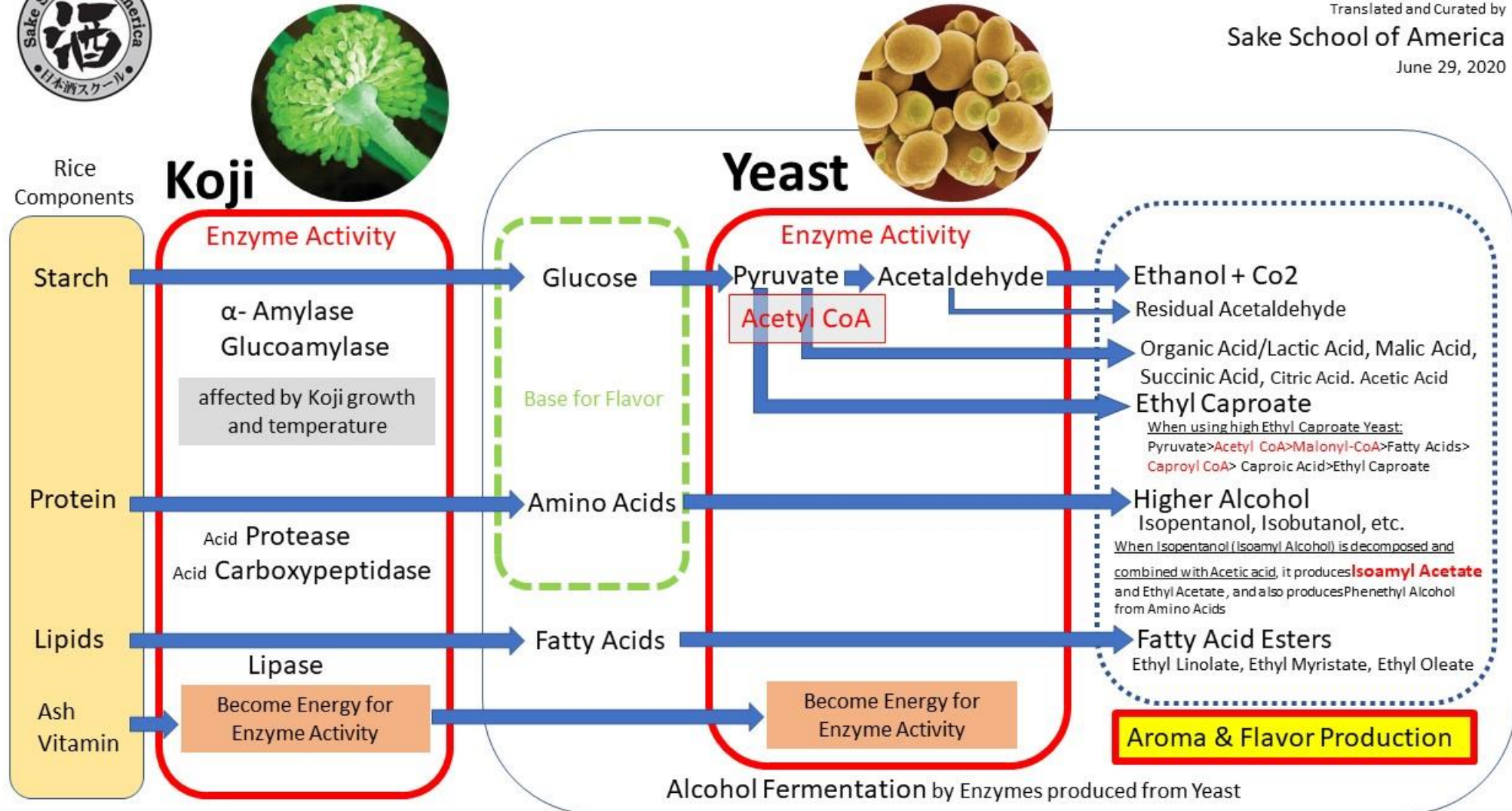


Factors Affecting Style and Quality

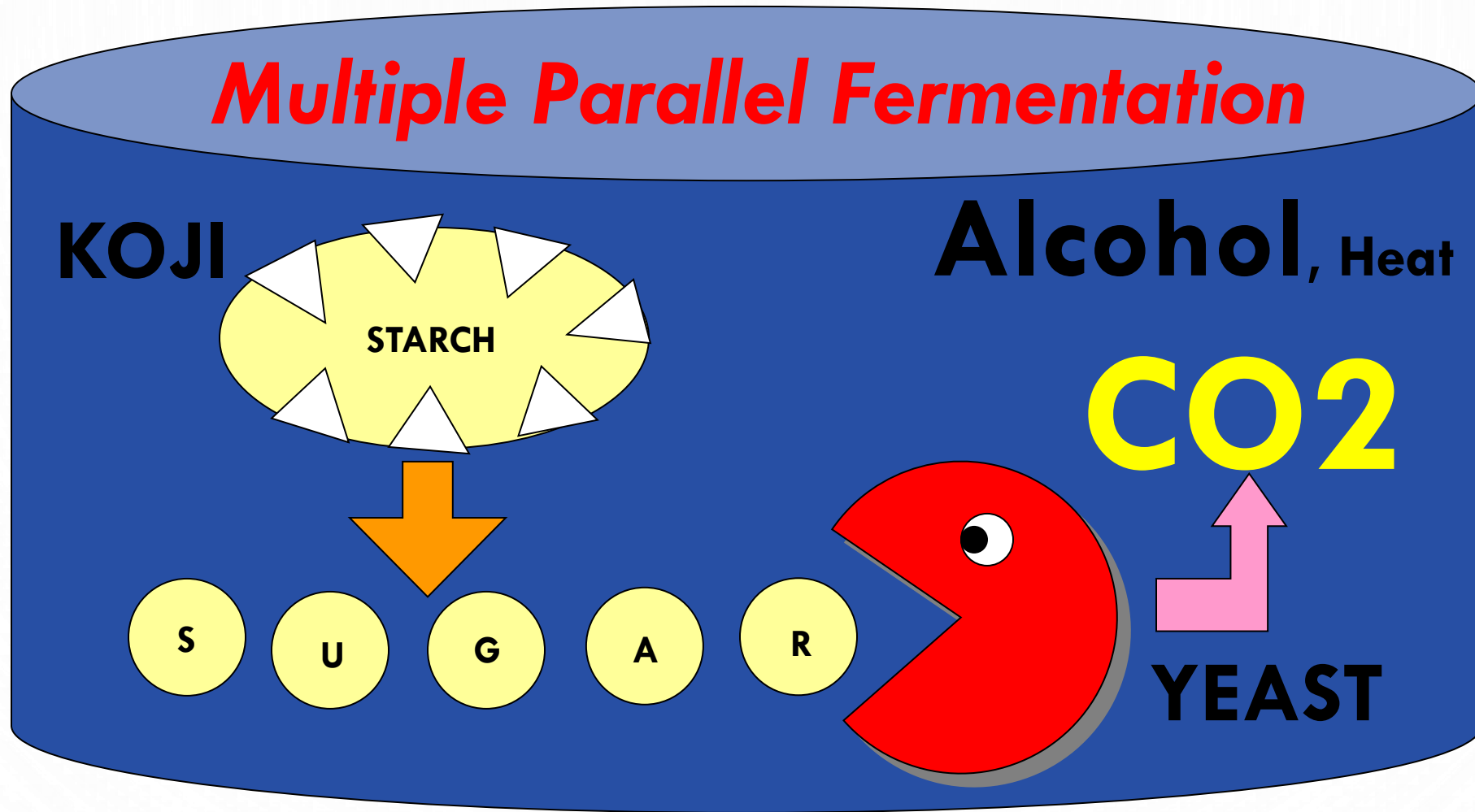
Japanese Sake Fermentation Pathway



Translated and Curated by
Sake School of America
June 29, 2020

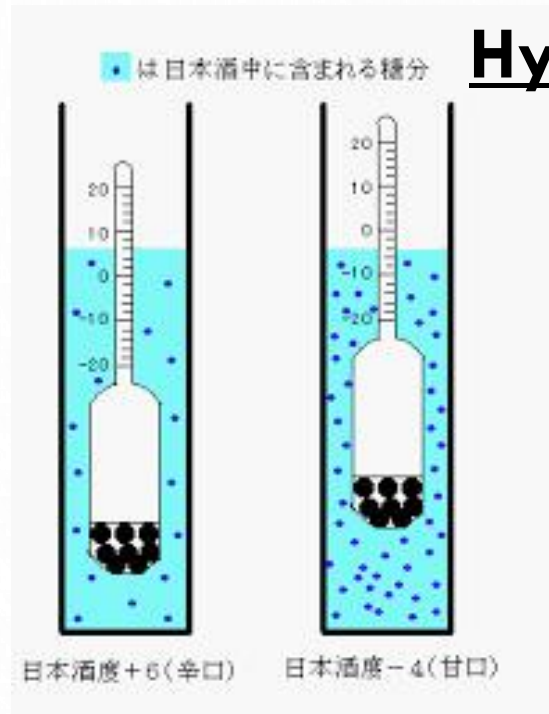


Unique Fermentation



Sake Parameters

- **SMV: SAKE METER VALUES** (NIHONSHU-DO)



Hydrometer measuring density of Sake vs density of water

INDICATES SWEETNESS/DRYNESS

plus 15 is **Very Dry**

Minus 15 is **Sweet** (Nigori/Sparkling)

Hydrometer Conversion

Baume 1 = 18g/L Sugar

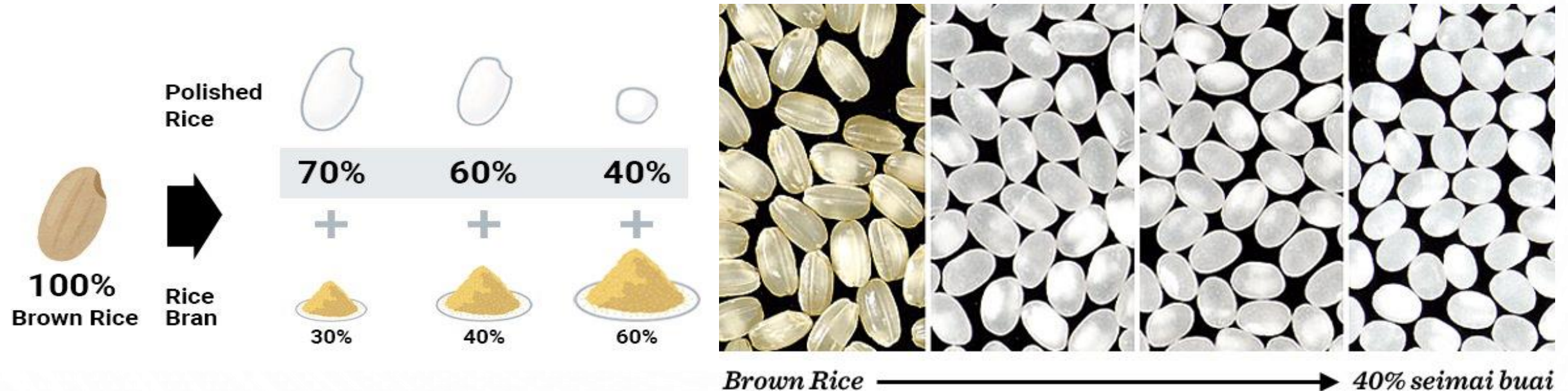
Baume 3 = SMV -30 = 48g/L Sugar

- **ACIDITY:** HIGHER ACIDITY SAKE TASTES DRIER (TITRATABLE ACID)
- **POLISHING RATIO** (SEIMAIBUAI): POLISHING RATIO, DETERMINES THE SAKE GRADES

Rice Polishing

Rice Polishing Ratio

This defines how much % of rice is polished.



Factors Affecting Style and Quality

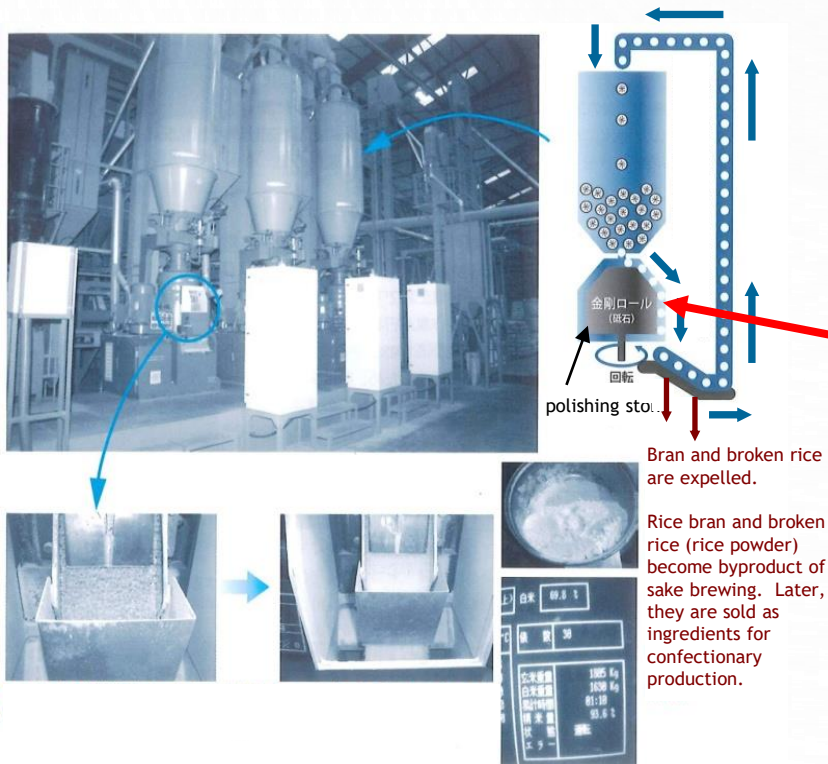
- Rice polishing ratio, fermentation temperature, and Yeast (especially for **Ginjō**)
- Ingredients (such as type of rice, mineral content of water) –subtle effect!
- Techniques and competence of brewer

Premium Sake Grade

JUNMAI (pure)	ARUTEN (alcohol fortified)
<u>Junmai Daiginjo</u> Sake Rice Remaining: 50% or less	<u>Daiginjo</u> Sake Rice Remaining: 50% or less
<u>Junmai Ginjo</u> Sake Rice Remaining: 60% or less	<u>Ginjo</u> Sake Rice Remaining: 60% or less
<u>Tokubetsu Junmai</u> Sake Rice Remaining: 60% or less	<u>Tokubetsu Honjozo</u> Sake Rice Remaining: 60% or less
<u>Junmai</u> Sake Rice Remaining: no specific rate	<u>Honjozo</u> Sake Rice Remaining: 70% or less

Rice Polishing

- Polished or milled to rid the exterior of grain unnecessary for brewing.
- **Vertical fed milling machine** was invented for polishing sake rice.
- Sake rice is trimmed down by use of a spinning stone.
- Milling is **a slow and arduous task**, carefully monitored to ***prevent breakage and from creating heat*** during the process.



Bran and broken rice are expelled.

Rice bran and broken rice (rice powder) become byproduct of sake brewing. Later, they are sold as ingredients for confectionary production.

On the average, it takes apprpx. **48hr to remove 60% off the exterior, reaching a 40% Daiginjo polish rate.**



Rice Variety

- RICE IS THE SEED OF RICE PLANT, A PLANT WHICH ORIGINATED IN ASIA AND AFRICA. ASIAN RICE PLANT IS DIVIDED INTO THREE STRAINS:

JAPONICA INDICA JAVANICA.

TYPE:	short grain	long grain	medium grain
CULTIVATION AREA:	Japan, Korea, northern part of China, USA	India, Thailand, Vietnam, China, USA	Southeast Asian Countries, Italy, Spain
MARKET SHARE:	less than 20%	about 80%	limited
PREPARATION:	boiled or steamed	boiled, cooked in broth	boiled, cooked in broth
CHARACTERISTICS:	sticky	dry and loose	slightly sticky, mild
POPULAR VARIETY:	Koshihikari	Jasmine	

Sake Rice Variety



LEFT: Table Rice
CENTER: *Gohyakumangoku*
RIGHT: *Yamadanishiki*

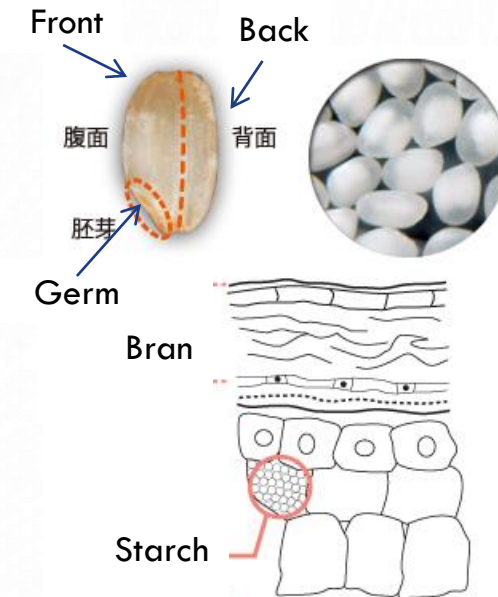
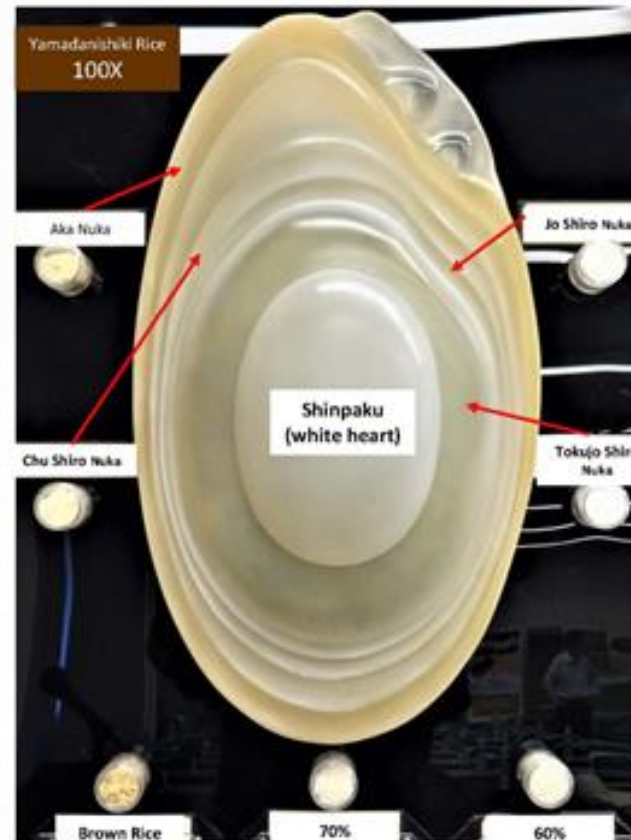


Yamadanishiki

Varieties of Rice for Sake Brewing

The diagram illustrates the differences between rice varieties used for sake brewing and those used for food. It shows two rice grains side-by-side. The grain on the left is larger and has a prominent white core, which is circled in red and labeled 'White Core'. Below it, a smaller grain is also circled in red and labeled 'For Sake Brewing (*Shuzo-kotekimai*) (*Yamada-nishiki*)'. The grain on the right is smaller and lacks a white core, circled in purple, and labeled 'For Food (*Nippon-bare*)'.

SAKE RICE - SHUZOKOUTEKIMAI



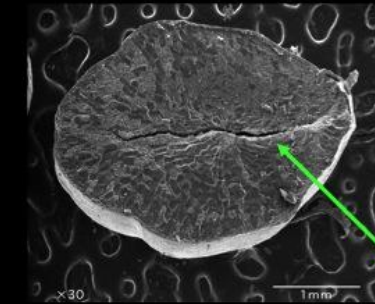
Shinpaku – White Heart



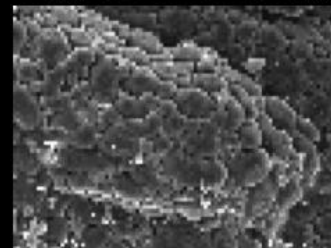
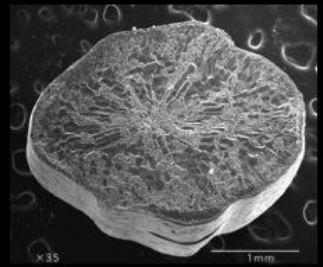
Polished rice (*Shuzo-kotekimai*)



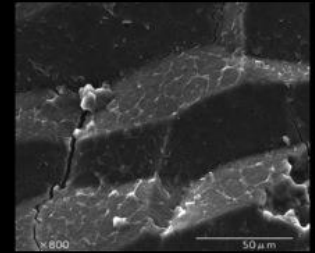
SEM of Endosperm



Crack



white-core region



Ymada-nishiki

Nippon-bare

Noble Rice Variety & Character

Sake Rice Variety	Farming Ratio (%)	Major Area (Prefecture)
Yamadanishiki	32.6%	Hyogo, Fukuoka, Mie
Gohyakumangoku	29.5%	Niigata, Toyama, Fukui
Miyamanishiki	9.5%	Nagano, Akita

- YAMADA NISHIKI : **ROUND, RICH FLAVOR**
- GOHYAKU MANGOKU : **LIGHT, CRISP**
- MIYAMANISHIKI : **SOFT, WELL-ROUNDED**
- OMACHI : **EARTHY, LAYERED**

WATER

THE QUALITY OF *SHUZO-YOSUI* , THE WATER USED FOR SAKE PRODUCTION, GREATLY AFFECTS THE FLAVOR OF SAKE.

- **WATER ACCOUNTS FOR 80%** OF RAW MATERIALS USED FOR SAKE PRODUCTION.
- MOST SAKE BREWERIES ARE LOCATED **NEAR HIGH QUALITY WATER SOURCE.**



WATER

Hard Water vs. Soft Water

- Hardness of water is measured through a scientific calculation where:

$$\underline{\text{Calcium}}_{\text{(mg)/L} \times 2.5} + \underline{\text{Magnesium}}_{\text{(mg)/L} \times 4.1} = \text{hardness of water (mg)/L}$$

One degree German (1dH) = 17.8 degrees American (17.8ppm)

- Hard water yields strong (masculine) sake.
- Soft water yields light and clean (feminine) sake.

Regional sake produce flavors unique in that area, stemming from the natural balance of the compounds found in the local water.

Water – Hard vs Soft



Fushimi, Kyoto
(4.0 dH)

Niigata
(3.0 dH)

Nijo, Hiroshima
(4.5 dH)

Shizuoka
(1.0 dH)

Miyamizu, Nada
(6.5 dH)

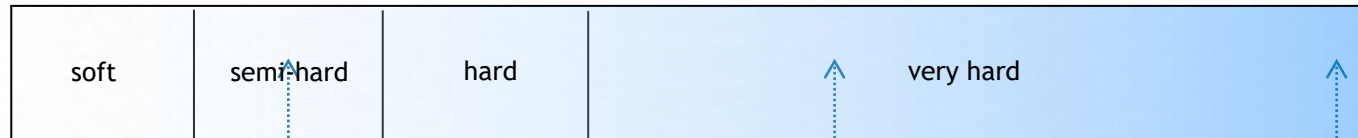
hardness of water (mg)/L =

$$\text{Calcium (mg)/L} \times 2.5 + \text{Magnesium (mg)/L} \times 4.1$$

water used for sake production



regular water



Tokyo (tap water)
(5.5 dH)

Evian, France
(16.8 dH)

Contrex, France
(81.4 dH)



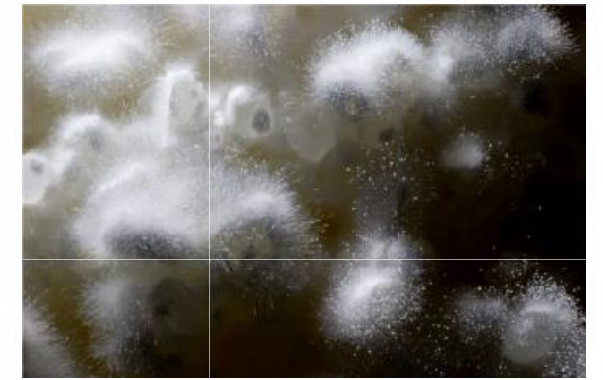
MICROBES #1: KOJI (麹菌)

Koji is a fungus used in producing a number of foods that are both fundamentally and distinctively Japanese: soy sauce, miso and sake.

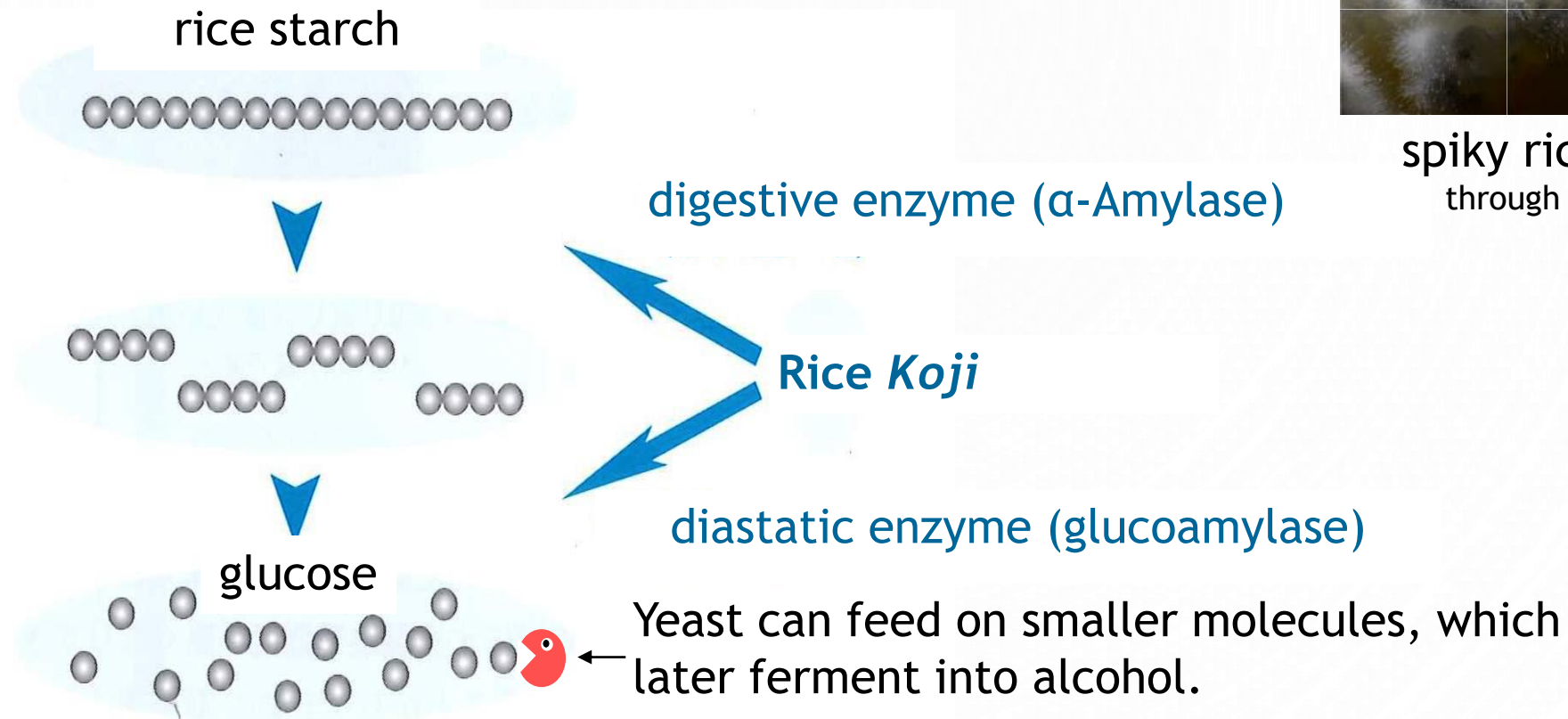
- Rice *koji* (米麹) is produced by inoculating koji onto steamed rice.
- Rice *koji* produces enzymes necessary for breaking down rice starch into fermentable glucose in sake production.
- Rice *koji* making is a carefully tended process that requires round-the-clock watch in order to assure successful outcome. It is at the heart of sake production where a minute misstep can lead to vastly different results.
- Rice *koji* provides vitamins and other nutrients for yeast.
- Rice *koji* directly and indirectly affects the aroma and flavor of sake.



KOJI (麴菌)



spiky rice *koji* seen through microscope

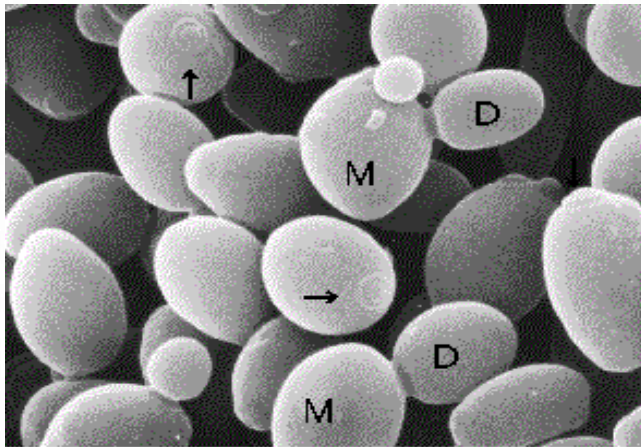


Rice *koji* produces enzymes (α -Amylase and glucoamylase) necessary for breaking down long starch molecules into smaller free molecules that are fermentable glucose.

Sake Yeast

Saccharomyces Cerevisiae

is the same yeast family as Wine, Beer and baking but different strains



Yeast produces **esters**

eg. **Ethyl Caporate**

(apple & pear)

Isoamyl Acetate

(banana & melon)

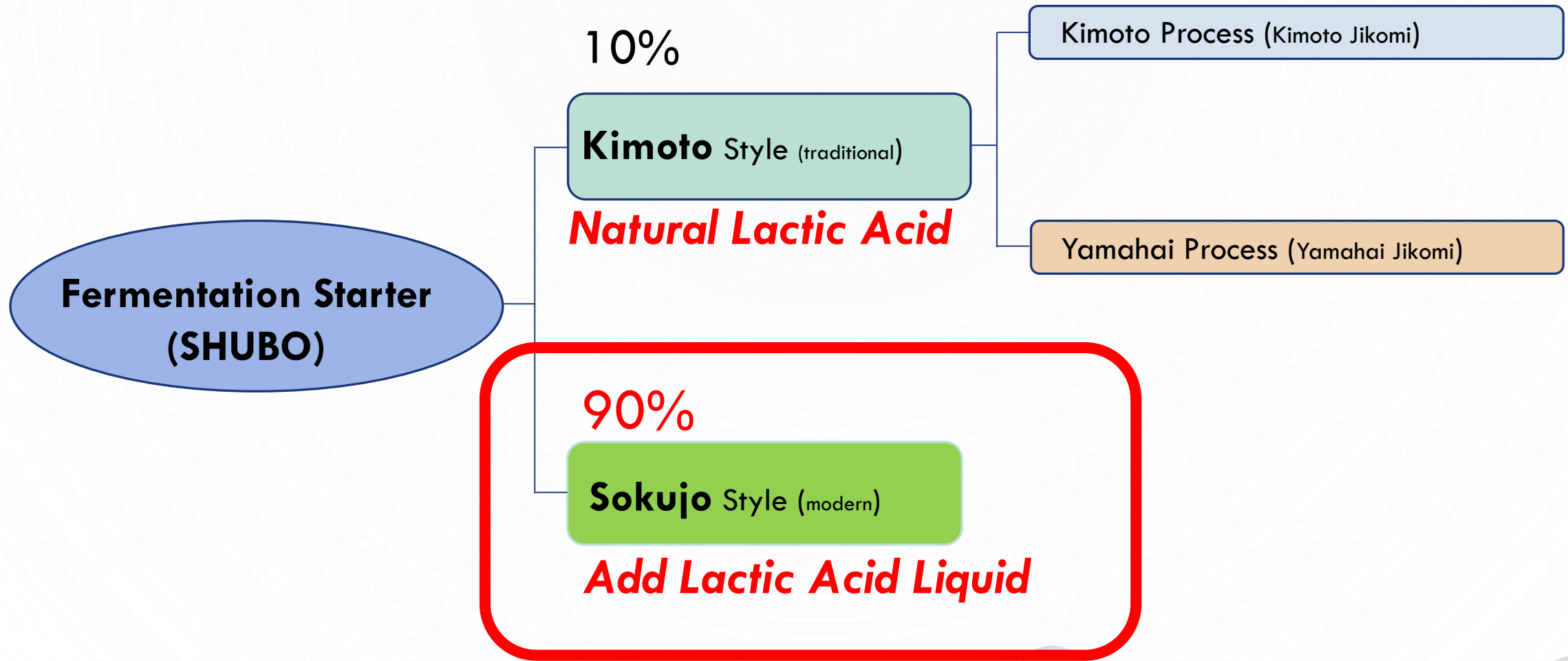


- **Yeast ferments sugar into alcohol**
- **Huge effect on the aroma of Sake**

MICROBES #3: LACTIC ACID

- LACTIC ACID IS INTRODUCED INTO THE FERMENTATION STARTER TO **INHIBIT THE GROWTH OF UNWANTED BACTERIA**, THUS CREATING AN OPTIMAL ENVIRONMENT FOR THE PROPAGATION OF YEAST.
- LACTIC ACID DEVELOPS NATURALLY DURING TRADITIONAL SAKE BREWING PROCESS, **KIMOTO** AND **YAMAHAI**.
- BUT IN MODERN BREWING, COMMERCIALY AVAILABLE LACTIC ACID IS ADDED TO THE FERMENTATION STARTER TO **SPEED UP THE PROCESS.**

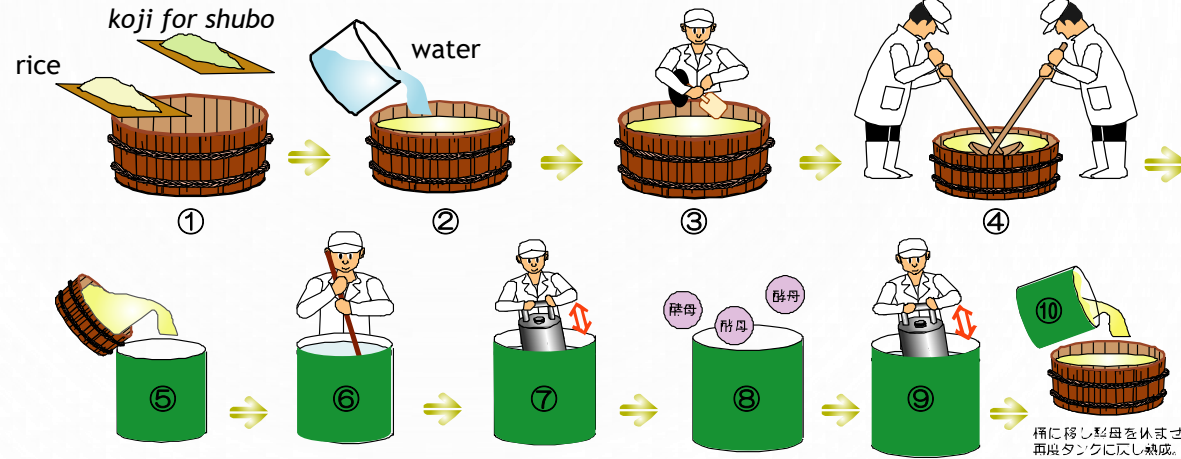
Fermentation Starter (SHUBO)



Kimoto vs Sokujo

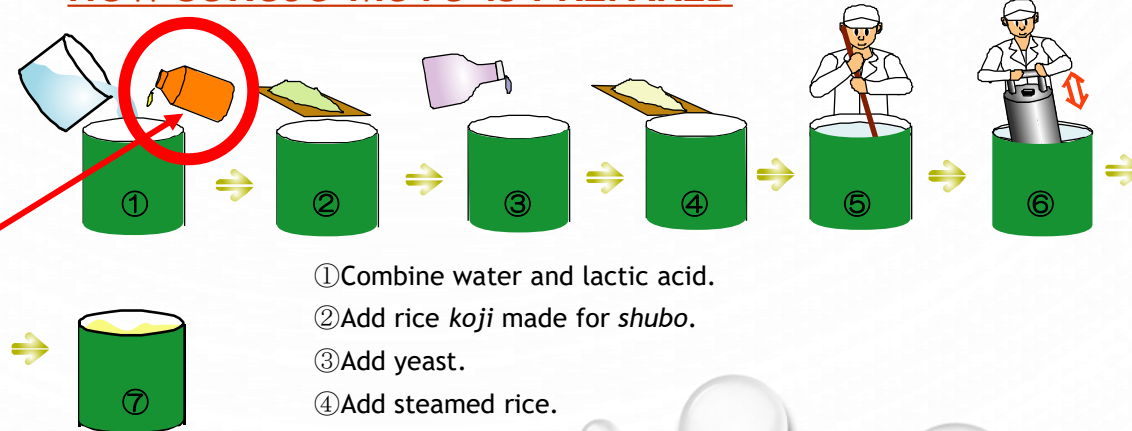
yamaoroshi process

HOW KIMOTO IS PREPARED



Kimoto Style (traditional)

HOW SOKUJO-MOTO IS PREPARED



Adding Lactic Acid liquid

- ①Combine water and lactic acid.
- ②Add rice *koji* made for *shubo*.
- ③Add yeast.
- ④Add steamed rice.
- ⑤Mix well.

Sokujo Style (modern)

Kimoto vs Yamahai

Kimoto Process

“Pigeage”



Mixing Koji, Steamed Rice, water very well by hands and paddles.



Mashing down the mixture, three times after the 1st mixing (9hrs, 5hrs, 3hrs later).

Yamahai Process

“Remontage”



Try not to break rice grains, rather pour the koji water (enzyme rich water) over rice grains to melt them down by Koji Enzyme.

AWA Sparkling Sake

AWA SAKE is a Japanese sparkling sake with natural carbonation obtained after secondary fermentation.

Japan Awa Sake Association: founded in **2016**

28 Breweries currently belongs, **32** products are certified.

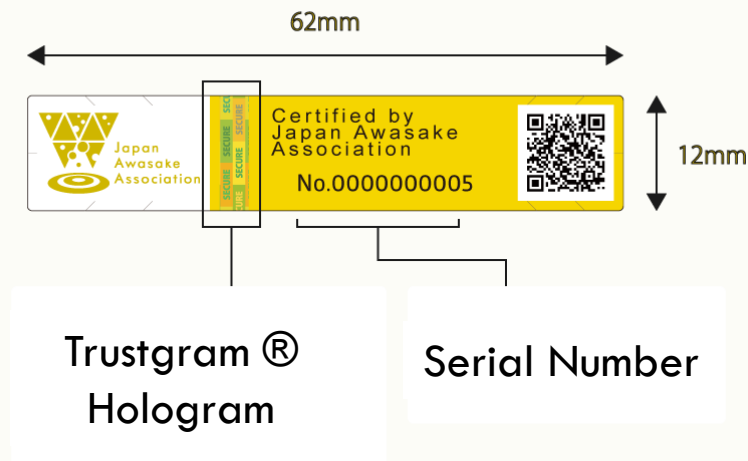
Certification Requirements:

- **Inspection of equipment, brewing processes, & raw materials meet the certification standards.**
- **Inspection by external institutions: Quality auditing to ensure that the ingredients meet the standards.**
(Gas pressure, Sake spoilage lactic acid bacteria test, Alcohol content, CO2 composition measurement)



Requirements:

- 1) Ingredients: Rice, Rice Koji, Water
- 2) Rice: 100% Japan grown, Top 3 Grades
- 3) Natural Fermentation
- 4) Clear, Transparent
- 5) ABV = above 10%
- 6) Gas 3.5 Bar at 20 C degree



Sparkling Sake

Bottle-Fermented Sparkling Sakes

Bottle-fermented sparkling sake is initially made the same way as regular sake, but fermentation is halted earlier than is usual when the alcohol is only around 5–10%, as opposed to the 18–20% of normal sake. The sake is then filtered and bottled. Within the bottle, fermentation continues and produces carbonation. In order to continue fermentation, a significant amount of sugar and yeast is needed, hence these sparkling sakes tends to be cloudy.

Carbonated Sparkling Sakes

The simplest method of making sparkling sake is simply to inject carbon dioxide under pressure once the sake is made and filtered. Sparkling sake made in this method tends to be clear coloured without any remaining sediment. Most are sold pasteurised.

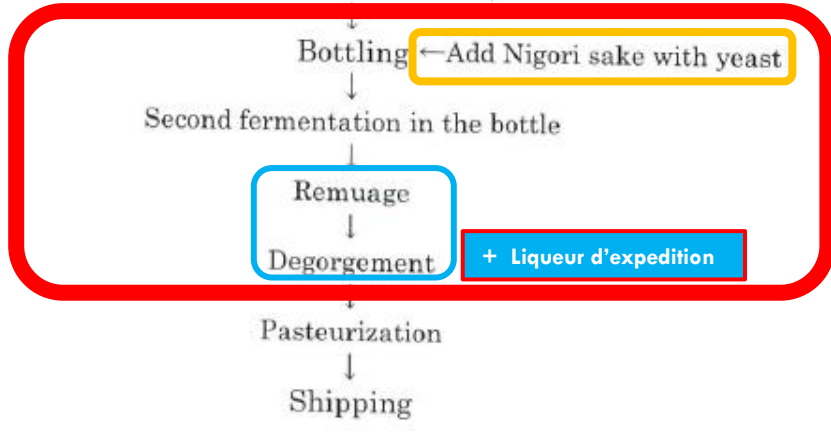
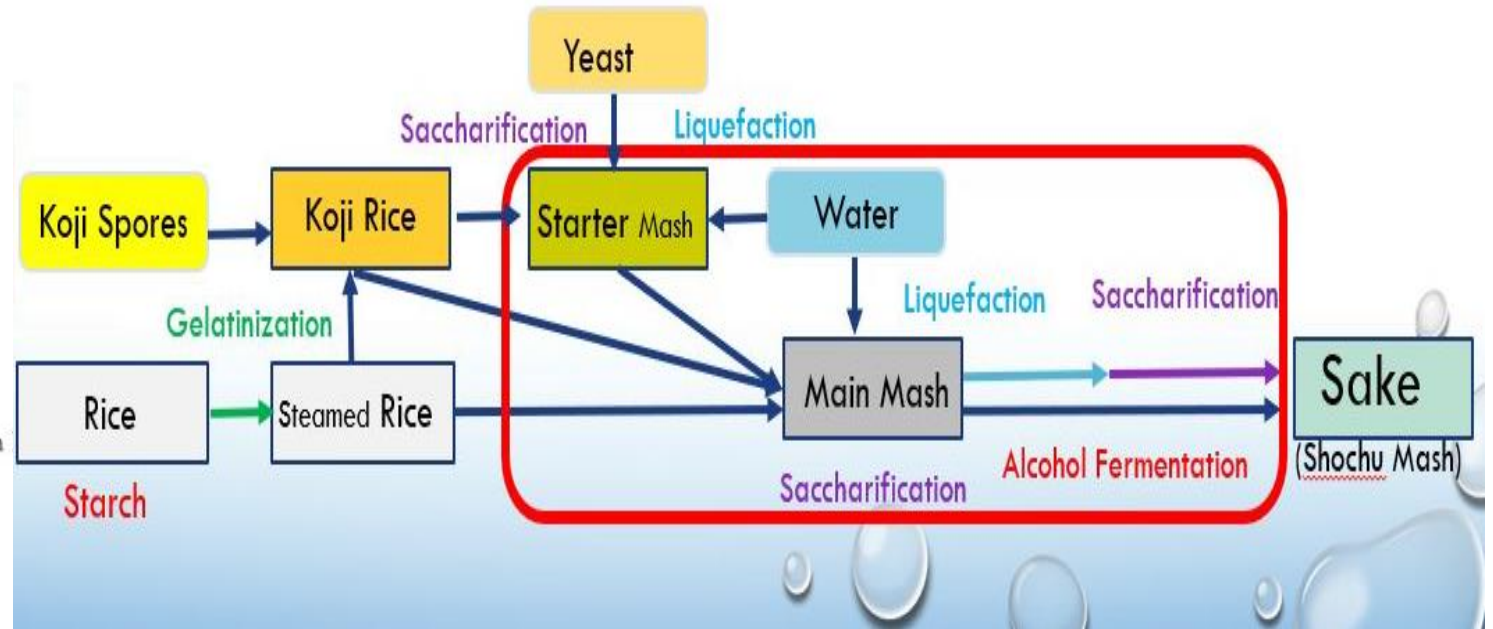
‘Live Nigori’

The ‘live *nigori*’ method is the most traditional style of sparkling sake. It is a seasonal style, released in the winter, around Christmas-time, when *shinshu* (‘new sake’) comes onto the market. The production method is similar to the bottle-fermented sparkling sakes, except that these are bottled with only a very coarse filtration.

PRODUCTION FLOW



↑ Fermentation ↓



Remuage (Riddling)



Degorgement (Disgorgement)



Hakkaisan Brewery Co., Ltd. – Niigata Pref.



Hakkaisan AWA Clear Sparkling – Niigata Pref.

Brewer: Hakkaisan Brewery Co., Ltd.

Sake Rice: Yamadanishiki,
Gohyakumangoku, Miyamanishiki

Polish Ratio: 50%

SMV: -5.0 **Acidity** 1.4 **Alcohol:** 13%

Flavor Profile:

Hakkaisan Clear Sparkling “AWA” has a lovely fruity aroma and refreshing taste that is rounded out a gentle sweetness and crisp finish. Hakkaisan Clear Sparkling “AWA” is the perfect sake to toast any occasion.

Price: \$60.00



Founded: 1922

Profile: Hakkaisan Brewery is situated at the foot of Mount Hakkai in Niigata. The spring water that flows from the mountain is used to produce its sake.

Apply the highest standards of production to all its sakes, and in order to achieve the smooth wonderfully pure, and mellow flavors, the Brewery insists on producing in small batches, using hand-made koji and slow fermentation at low temperatures.

Akita Seishu Co., Ltd. – Akita Pref.



Dewatsuru AWA Sake Ashitae – Akita Pref.

Brewer: Akita Seishu Co., Ltd.

Sake Rice: Akita Sakekomachi

Polish Ratio: 55%

SMV: -1 **Acidity** 1.7 **Alcohol:** 13%

Flavor Profile: This sparkling sake was produced to be paired with a wide variety of foods. It is bright with a gentle aroma and full, lush flavor.

Price: \$75.00



Founded: 1865

Profile: “Yamato-shuzouten” was founded in the area of Minaminaraoka (Currently Daisen-city) by Ito Juushiro who was the 12th head of the Ito Family.

150 years on, they still work with the same spirit as the brewery founders in the past. Their philosophy is to brew original and strictly local sake by only using particular local rice and water from within a 10km radius.

Hachinohe Shuzo Co., Ltd. – Aomori Pref.



8000 Dry Sparkling – Aomori Pref.

Brewer: Hachinohe Shuzo Co., Ltd.

Sake Rice: 100% Local Rice

Polish Ratio: n/a

SMV: n/a **Acidity** n/a **Alcohol:** 12%

Flavor Profile: Dry sparkling sake produced using the Champagne brewing method (in-bottle secondary fermentation). With delicate bubbles and hints of refreshing acidity and savory rice, this sake can be enjoyed as an aperitif as well as during the meal.

Price: \$115.00



Founded: 1775

Profile: A microbrewery in Aomori prefecture that selects local rice and yeast and brews with the famous water of Kanizawa, Hachinohe.

Aiming to produce a modern sake that is delicious yet safe for the environment and personal health. The brewery use 100% white koji in their moromi base giving their sake a fresh, straight-from-the-brewery character.

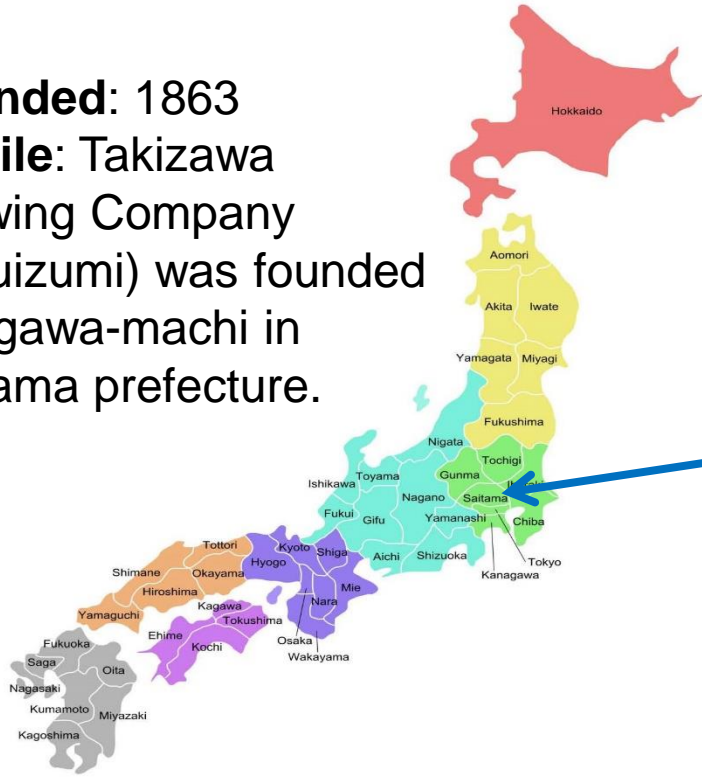
Takizawa Brewing Co., Ltd. – Saitama Pref.



Takizawa Hitosuji Sparkling Sake – Saitama Pref.

Founded: 1863

Profile: Takizawa Brewing Company (Kikuizumi) was founded in Ogawa-machi in Saitama prefecture.



In 2007, Hideyuki Takizawa, the sixth generation head of the brewery, studied the brewing techniques of the previous Toji (master brewer) of the Nanbu Toji school, and became a Toji himself.



Brewer: Takizawa Brewing Co., Ltd.

Sake Rice: Sake Musashi

Polish Ratio: 60%

SMV: -30 **Acidity** 4.8 **Alcohol:** 12%

Flavor Profile: A moderate bouquet of yellow peach, cooked apple, and earthy shiitake. Fine and refreshing bubbles greet you at entrance, expanding into a cushiony texture and juicy acidity. Blood orange, floral honey, and pine nut flavors lead into a lingering finish. Hitosuji Sparkling enhances the savoriness of Japanese cuisine, while the fresh acidity enhances Mediterranean cuisine.

Price: \$65.00

Takizawa Hitosuji Rose – Saitama Pref.



Brewer: Takizawa Brewing Co., Ltd.

Sake Rice: Gohyakumangoku

Polish Ratio: 60%

SMV: -45 **Acidity** 3.8 **Alcohol:** 11%

Flavor Profile: A soft daydream of juicy raspberry jam, orange marmalade, and dried figs waft from this beautiful rosé sparkling sake. Sweet, pressed apple and candied hibiscus delight the palate with a creamy acidity and velvety mouthfeel for balance. An aperitif to pair well with creamy sauces and desserts, or charcuterie. This sparkler is the perfect drink for all types of celebrations.

Price: \$170.00

Nambu Bijin Co., Ltd. – Iwate Pref.



Nanbu Bijin AWA Sparkling Junmai Ginjo – Iwate Pref.

Founded: 1902

Profile: The brewery was established in 1902, and the Nanbu Bijin brand name came to be in 1951.



The Iwate area used to be called Nanbu (South), and is a place rich with nature, abundant water and fertile soil. In Japan, most breweries of the time made quite rough, inelegant, sweet sake, but this brewery wanted to make clean & beautiful sake like a fair southern maiden. Hence, the name Nanbu Bijin, or Southern Beauty.



Brewer: Nanbu Bijin Co., Ltd.

Sake Rice: Ginotome

Polish Ratio: 55%

SMV: -20 **Acidity** 1.6 **Alcohol:** 12%

Flavor Profile: This elegant and perfectly balanced sparkling sake is made with local Ginotome rice and delicious subterranean water. It has a calming floral aroma and a crisp carbonation which offsets the soft mouthfeel of the sake. Finally, the delicate umami undertone leads the palate to a creamy and satisfying finish.

Price: \$85.00

Food Pairing

SAKE VS. WINE: Acid Component Comparison

SAKE	
WARM temp preferred	COLD temp preferred
65%	35%
succinic acid (39%)	malic acid (27%)
lactic acid (20%)	citric acid (5%)
others (6%)	acetic acid (3%)

WINE	
WARM temp preferred	COLD temp preferred
14%	86%
succinic acid (7%)	tartaric acid (42%)
lactic acid (7%)	malic acid (27%)
	acetic acid (9%)
	citric acid (8%)

Acid Listing by Food Types

Acid Types	Representative Food Listing
succinic acid	shellfish (lobster, shrimp, crab, clam)
lactic acid	milk and fermented foods (yogurt, cheese, miso, soy sauce)
tartaric acid	grape
malic acid	apple
citric acid	lemon
acetic acid	vinegar

Why Sakes Taste Different

BIOCHEMICAL CHANGES IN SAKE PRODUCTION BY KOJI & YEAST

Biochemical Changes	Affected Substance	Microbes	Enzyme	Output
Saccharification	Starch	Koji	<i>Amylase, Glucoamylase</i>	Dextrin, Glucose
Fermentation	Glucose & Amino Acid	Yeast		Ethanol, Isoamyl Alcohol
Acid Formation	Glucose & Amino Acid	Yeast & Koji		Lactic Acid, Succinic Acid, Malic Acid
Protein Decomposition	Protein	Koji	<i>Protease, Peptidase</i>	Peptides, Amino Acids (umami)
Lipid Decomposition	Rice Lipid	Koji	<i>Lipase</i>	Fatty Acid, Glycerol
Ester Formation	Glucose	Yeast		Isoamyl Acetate, Ethyl Caproate

Where you can purchase these Sake:

Online:

MM Sake (LA): <https://mmsake.com/>

True Sake (SF): <https://www.truesake.com/>

Or you can request to:

Many Japanese Super Markets.

All the products today are imported
& distributed by Mutual Trading Co., Inc.



**Thank You for Your Attention, and Hope
You Will Be Able To Tell Your Friends
What You Have Learned Today !!!**



Sake Acidity Measurement

‘Sake Acidity level’ conversion to Titratable Acidity:

$$\text{Titrateable Acidity} = \text{Sake Acidity} \times 0.075$$

eg. If Sake Total Acidity measurement is 1.4,

$$\text{Titrateable Acidity} = \text{Sake Acidity } 1.4 \times 0.075 = \underline{0.105}$$

Table 1.1 Composition of sake, beer and wine compared

	Sake	Beer	White wine
Alcohol (%)	13 – 17	4 – 6	10 – 13
Extract (g/100ml)	3 – 6	3 – 4	2 – 8
Glucose (g/100ml)	0.5 – 4.2	0.03 – 0.1	0.1 – 3
Nitrogen (mg/l)	700 – 1900	250 – 1000	100 – 900
Glutamic acid (mg/l)	100 – 250	10 – 15	10 – 90
Titrateable acidity (g/100ml)	0.1 – 0.2	0.15 – 0.2	0.5 – 0.9
pH	4.2 – 4.7	4.1 – 4.4	3.0 – 4.1
Succinic acid (mg/l)	200 – 500	40 – 100	500 – 1500
Malic acid (mg/l)	100 – 400	50 – 120	250 – 5000
Tartaric acid (mg/l)	0	0	1500 – 4000
SO ₂ (total) (mg/l)	0	– 20	– 250