



The Story of Whisky

Whisky made in Japan

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Whisky production in Japan began in 1924. Although domestic shipments decreased after the whisky boom during Japan's period of rapid economic growth, they have shown an increasing trend in recent years. Additionally, whisky made in Japan has gained high popularity overseas, leading to robust export growth.

Whisky is made by blending 10 to 30 different types of matured spirits. Therefore, creating various matured spirits with distinctive flavours and colours is crucial, and Japan has honed this skill.

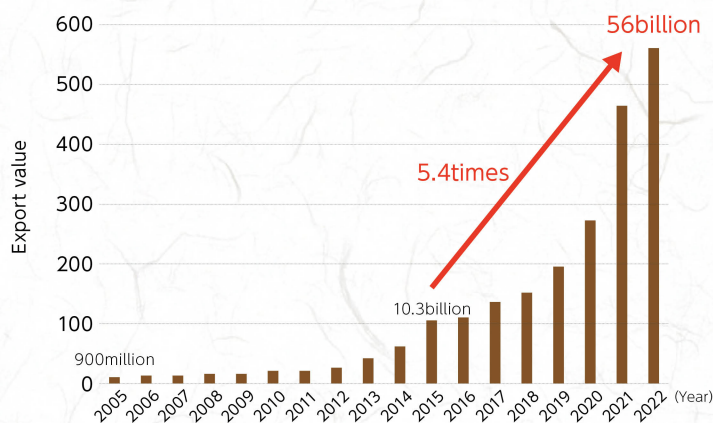
As the opportunity to enjoy whisky has increased recently, this time we introduce whisky made in Japan (Japanese whisky), which has attracted attention from around the world. First, we will look at the matured spirits that are the key to whisky making, the origins of their diversity, then trace the 100-year history of whisky made in Japan, and finally, explain the scientific topics related to whisky.



Japanese distilleries with pot stills of different sizes and shapes

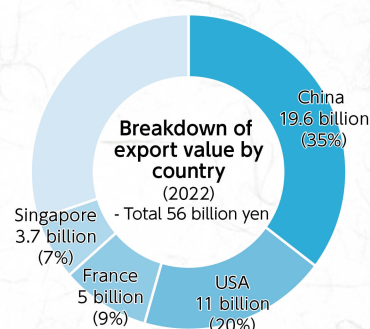
Whisky made in Japan spreading worldwide

In recent years, whisky made in Japan has received high recognition at international competitions. Consequently, its global popularity and demand have risen, and the export value of whisky made in Japan continues to increase. Especially remarkable has been the growth since the late 2010s, and in 2020, whisky surpassed sake to become the leading export among Japanese alcoholic beverages. Whisky made in Japan is gaining attention as a driving force in expanding overseas markets for Japanese alcoholic beverages.



Export value trends of whisky made in Japan

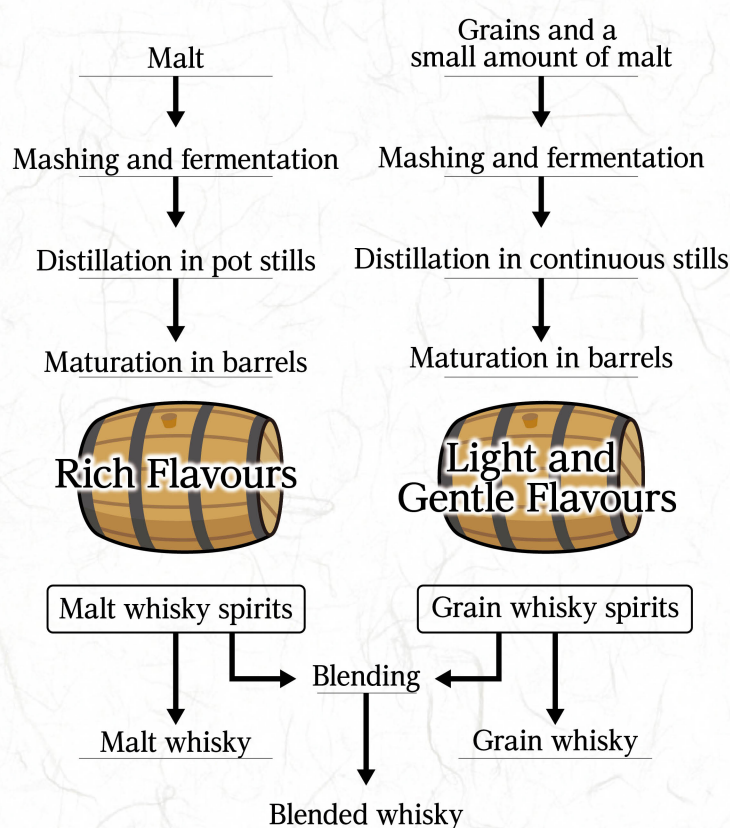
Whisky made in Japan is exported to more than 50 countries worldwide, including China, the United States, and France. In recent years, China and the United States have accounted for more than 50% of the export value, establishing themselves as significant markets for whisky made in Japan.



Source: Ministry of Finance Trade Statistics

The diversity of matured spirits

Blended whisky, which is the mainstream of Japanese whisky products, is made by blending malt whisky with rich flavours and grain whisky with light and gentle flavours. Recently, single malt whisky, which is a product made by blending multiple malt whiskies produced at a single distillery, and single cask whisky, which is bottled from a single cask, have also attracted attention for their rich and unique flavours.



The whisky production process

In Scotland, a whisky powerhouse producing about 60% of the world's whisky, it is said there are more than 100 distilleries. Each distillery has its distinctive spirits, which are exchanged or purchased and then blended to create products.

In contrast, in Japan, due to the smaller number of distilleries, it is common to produce a variety of spirits within the same distillery and blend them into products. Hence, the craft to create matured spirits with different flavours and colours has been perfected. Where does the diversity of spirits come from? Let's follow the production process.

Malt

Peat - derived aroma

Have you ever sensed a smoky or smoked flavour in the aroma of whisky? This comes from the smoke of peat.



Dried peat

In Scotland, peat has traditionally been burned as a heat source to dry germinated barley. As a result, the malt acquires a peaty smoke flavour, which gives Scotch whisky its characteristic aroma. Even today, peat is used for flavouring, despite the heat source being switched to heavy oil. The intensity of the peaty flavour in the malt significantly changes the impression of the whisky's flavour.

In Japanese whisky making, malt that is not flavoured with peat or has a mild aroma to suit the Japanese palate is mainly used, thus suppressing the peaty flavour.



Malt

What is peat?

Peat is an accumulation of organic matter, such as plant remains, that has not decomposed sufficiently. In cool, humid climates, dead wild grass, moss, and other plants turn into peat over thousands of years. Peat is dug out from the ground, stacked, and dried for use as fuel. It is said that one-fourth of the land in Scotland is covered with peat layers. In Japan, peat can be found in some areas such as Hokkaido.

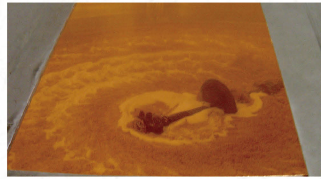


Mashing

Clarity of wort

Mashing involves adding hot water to the ground malt and maintaining the temperature at about 63° C, where the enzymes in the malt break down the starches. After that, it is filtered to obtain clear wort. The clearer the wort, the lighter the taste, and the more likely it is to produce spirits with a high fruity aroma, such as apples or bananas. This is because clear wort has fewer unsaturated fatty acids that inhibit the production of fruity aroma components. Conversely, cloudy wort tends to produce spirits with a grainy flavour.

To increase the clarity of wort, the malt is finely ground. However, if it is ground too finely, the filtration process becomes difficult due to clogging. On the other hand, if it is ground too coarsely, the wort becomes cloudy. In the production site, malt is milled while maintaining the best balance.



The mashing process

Fermentation

Role of yeast and lactic acid bacteria

After mashing, yeast is added to the wort for alcoholic fermentation.

Various types of yeast exist, each specialising in different types of alcohol. Whisky yeast is mainly used in whisky production, but sometimes beer yeast is also added. Beer yeast contributes to the complexity and depth of flavour, as well as the fruity aroma. Additionally, there are various types of whisky and beer yeasts, each producing different flavours. By combining them, the characteristics of whisky can be altered.

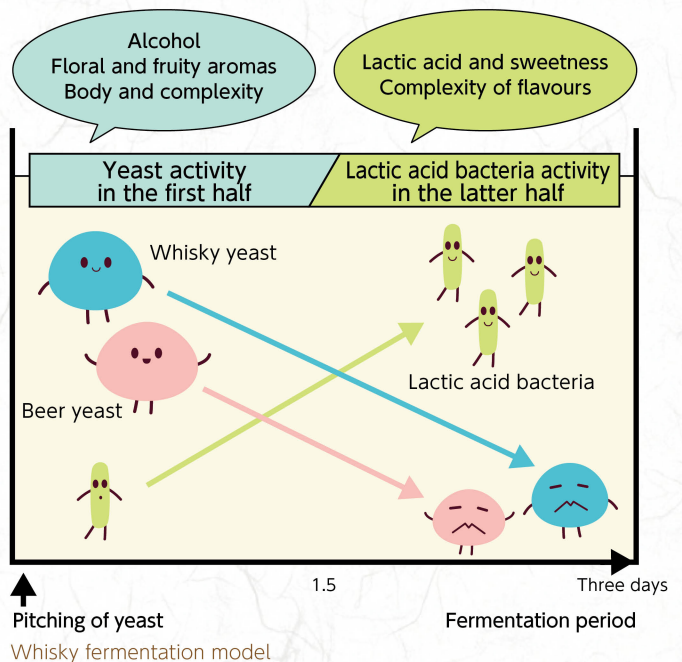
Since wort is not boiled and sterilised in whisky production, lactic acid bacteria from malt and fermentation tanks are present in the wort.



Fermenting whisky mash
Fermentation creates about 7% alcohol in about three days.

These bacteria contribute to the complexity of the new make spirit's flavour.

As fermentation nears its end and the sugar content decreases, yeast begins to die off. Lactic acid bacteria use the nutrients from the dead yeast cells to proliferate, producing lactic acid and increasing acidity. This acidity helps create floral and fruity aroma components during distillation and also forms a component called "lactone," which adds sweetness and creaminess to the raw spirit.



Fermentation vessel

Fermentation uses not only stainless steel tanks for easy temperature control but also wooden vessels made from fir trees and other woods. Wooden vessels have high heat retention and contribute to creating whisky with a luxurious and creamy impression due to the activity of lactic acid bacteria living in the wood grain.



Fermentation room with wooden vessels

The diversity of matured spirits

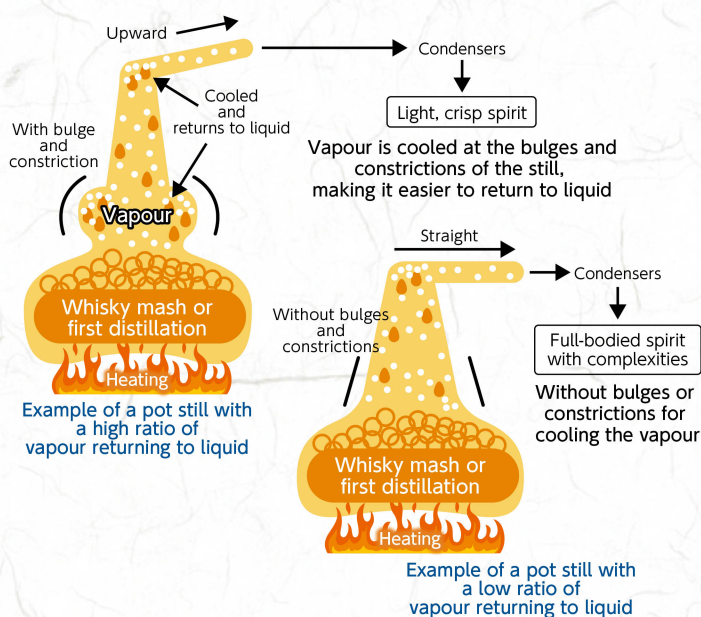
Distillation

Shape of pot stills

Traditionally, copper pot stills are used for distillation. Copper has the advantage of being a good heat conductor and easy to shape into various forms.

When mash is heated in the pot still, the components with low boiling points evaporate first and rise to the top of the still as vapour. This vapour is collected, cooled, and condensed into new make spirit.

The shape of the pot still changes the movement of the vapour inside. For example, if the still has bulges or constrictions, the vapour accumulates and cools at those points. Additionally, tall stills or those with an upward lyne arms to the condensers also cause the vapour to cool and condense more easily. Among the cooled vapours, components with higher boiling points are more likely to return to liquid form and go back into the mash. In this way, in stills where vapour is easily cooled and returns to liquid, low-boiling-point alcohol is easily collected, while high-boiling-point components are less likely to be collected. High-boiling point compounds often carry heavier flavour characteristics, while new make spirits with fewer of these tend to exhibit a lighter, crisper profile. Conversely, in stills where vapour is less likely to return to liquid, the resulting new make spirits are rich and full-bodied with a variety of components.



Shape of the pot still and spirit quality

Heating methods

There are two ways to heat the pot stills : direct fire using coal and indirect heating by passing steam through pipes inside the kettle of the stills.

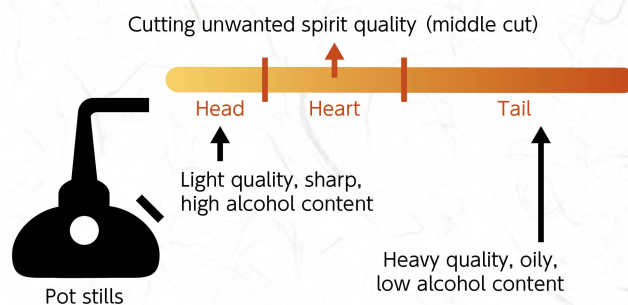
In direct fire, the surface of the still exposed to the fire reaches very high temperatures, causing various heat reactions that produce complex and rich flavours with a roasted aroma.

In indirect heating, the temperature is lower compared to direct fire, resulting in milder heat reactions and a lighter, crisp flavour.

Timing of the middle cut

Malt whisky is usually distilled twice. In the first distillation, the alcohol content increases from about 7% to about 25%, and in the second distillation, it is concentrated to about 70%.

In the second distillation, the first fraction is called the Head, the next is the Heart, and the last is the Tail. Only the Heart is collected as the new make spirit. The process of excluding the head with strong, sharp aromas and the tail with low alcohol content, and selecting the heart suitable for malt whisky, is called the middle cut. The middle cut significantly affects the flavour of malt spirit, and its timing is determined by the flavour and alcohol content of the distillate.



Selection image of distillate

Cask aging

Material of the casks

The clear new make spirit is stored in casks, where it becomes malt whisky. During storage, the new make undergoes chemical reactions such as oxidation and slowly matures. During this time, components of the new make are absorbed by the cask, and conversely, polyphenols and other substances dissolve out of the cask, changing the aroma, colour and taste of the maturing spirit.



The type and origin of the wood affect the quality and quantity of polyphenols and other components it contains. Therefore, even the same new make spirit can develop different flavours and colours during maturation, depending on the wood used for storage, resulting in base spirits with different qualities.

Whisky casks are made from materials such as American white oak, which has fine grain and is less prone to leakage, and European Spanish oaks. White oak is said to produce spirits with aromas reminiscent of apples and sometimes citrus fruits, and with golden or amber hues, while Spanish oak is known to produce aromas of dried fruits or ripe fruits, and with tawny or reddish-brown hues.

In Japan, the use of Mizunara oak from Hokkaido is notable. Mizunara, also known as Japanese oak, tends to leak liquid and thus requires thick staves to make casks, but long-term storage in Mizunara casks has been found to develop unique aromas reminiscent of fragrant woods and reddish-golden hues in the base spirit.



Mizunara cask

Effects of charring the inside of casks

The inside of the casks is charred. Charring transforms wood components like lignin into various compounds that impart aromas reminiscent of vanilla, caramel, coffee, and almonds. Additionally, tannins and other polyphenols that provide amber colour, maturation character, and astringency dissolve more easily into the spirit, while the charred surface of the staves absorbs unpleasant aromas from the base spirit.



Charring the inside of a cask



The charred inside of a cask

History of the cask

In whisky storage, the history of the cask is just as important as the type of cask material. The history of the cask refers to the types of alcohol previously stored in the cask and the duration of their storage. It is generally said that the influence of the cask material becomes milder the longer the cask is used.

The cask retains components from the previously stored alcohol, which dissolve into the maturing spirits, imparting unique flavours and colours. For example, using a cask that previously stored sherry, a traditional Spanish wine, imparts sweet, rich flavours and a reddish hue.

Maturation environment and storage period

The climate, temperature, humidity, and other environmental factors surrounding the storage warehouse also affect the maturation of whisky. During storage, the alcohol and water in the spirit evaporate out of the cask, while air and moisture from outside the cask penetrate inside. The incoming air slowly oxidizes some components of the spirit, increasing the complexity of its flavour. Additionally, 2-4% of the spirit is lost each year during storage, concentrating its flavour.

In general, the longer the maturation, the more flavour is imparted by cask ageing. If the cask is smaller, the ratio of contact between the cask and the spirit is higher, leading to faster maturation.



Whisky maturation warehouse

Blending

After cask ageing, whisky is blended to complete the product. The blender, who performs this crucial task, selects various types of casks based on the product image and adjusts the combination and blending ratio to complete the product. Typically, a single product contains a blend of 10 to 30 different types of base spirits. After blending, the whisky is often placed in more neutral casks to let the flavours meld for about six months, then it is bottled and becomes the final product.

In recent years, whisky made in Japan has won numerous awards at international competitions, receiving high acclaim for its assured quality and technical prowess. Through innovative production methods and excellent blending, the style of whisky made in Japan has been established.

100 years of whisky made in Japan

It has been 100 years since the start of the first whisky production in Japan in 1924. Today, whisky made in Japan is considered one of the “World’s Five Great Whiskies” and is highly regarded among the world’s whisky-producing regions, but its journey was not always smooth.

From adversity to the top of the world. Introducing the 100-year journey of whisky made in Japan.



Whisky distillery

Birth of domestic whisky

Japan’s first whisky distillery was completed in 1924 on the outskirts of Kyoto. Taketsuru Masataka, who learned whisky making in Scotland, was invited to the distillery, and whisky production began. With two pot stills and the use of peat imported from the UK, domestic barley was malted within the distillery, following the same style as Scotch whisky. Initially, whisky production was extremely challenging, but in 1929, the first domestic whisky product was released.

However, at that time, the product’s smoky aroma from peat, characteristic of Scotch whisky, did not suit Japanese tastes and was poorly received. Subsequently, aiming to create whisky that could compete with Scotch whisky, various improvements and blending trials were conducted on the new make spirit. As a result, they successfully developed a product that catered to the refined palate of the Japanese people, which is believed to have played a key role in the early success of whisky made in Japan.

From prosperity to the “winter era”

During the high economic growth period, with the westernisation of lifestyles, domestic whisky consumption increased steadily. Ways of drinking whisky, such as *mizuwari* (whisky with water) and *highball* (whisky with soda), evolved uniquely in Japan, and whisky became a part of daily life. In the early 1980s, domestic whisky consumption peaked. This shipment volume remains the largest to date.

However, from the early 1980s peak, whisky entered a “tough winter” period lasting about 25 years. The popularity of shochu and the diversification of Japanese tastes led to a significant decline in whisky consumption.

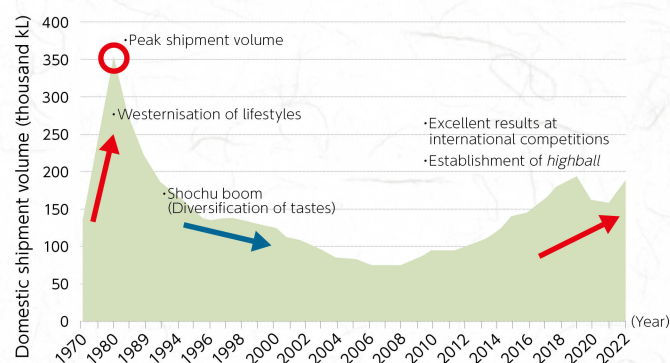
Gaining global fame and revival

During this period of decline, distilleries were closed, and production volumes were reduced, but producers did not stop striving for quality improvement. Then, whisky made in Japan took a significant step onto the world stage.

In 2001, whisky made in Japan won the top prize at a prestigious international competition held annually in the UK. After that, whisky made in Japan continued to achieve excellent results, gaining high international acclaim and attention.

In Japan, *highball* became a boom around 2009. *Highball* had been known as a way to drink whisky, but as this method became known to younger people, it spread across generations, contributing to the resurgence of the whisky market.

The rising international acclaim and the establishment of *highball* in Japan have continued to increase the popularity of whisky made in Japan.



Trends in domestic whisky shipments

Source: National Tax Agency
“Liquor Guide”



Japanese whisky

As the reputation about whisky made in Japan has risen at international competitions, its export value has also been steadily increasing (see page 1). In the early 2000s, there were years when the export value was less than 1 billion yen, but by 2015, it surpassed 10 billion yen. Even during the COVID-19 pandemic in the early 2020s, this momentum did not wane, and whisky accounted for about 40% of the export value of Japanese alcoholic beverages, gaining popularity as “Japanese whisky.”

In 2020, the Japanese government set a goal of increasing the export value of agricultural, forestry, and fishery products and foods to 5 trillion yen by 2030, selecting whisky as one of 29 priority items. Whisky ranks high as an item in the total export value of agricultural, forestry, and fishery products and foods, and its popularity overseas is a strong driver of exports.

When Japanese whisky first entered the global market, there was no formal definition outlining what qualifies as Japanese whisky. In other countries, strict definitions exist to protect their whiskies from imitations. However, in Japan, there was only a tax law definition for proper alcohol production, which

was for domestic purposes, allowing products that did not qualify as whisky domestically to be sold as Japanese whisky abroad. To address this situation, industry groups led a four-year review, resulting in the establishment of the “Standards for Labelling Japanese Whisky” in 2021. This creates an environment where people worldwide can purchase Japanese whisky with confidence, protecting and enhancing the brand value.

Toward the next 100 years

Over 100 years, whisky made in Japan has established a position comparable to Scotland, the home of whisky. Riding the wave of its popularity, small-scale distilleries (craft distilleries) are increasing across Japan. In anticipation of new revenue streams, producers of sake, shochu, and beer are entering whisky production, and even those from entirely different industries are challenging the whisky business, broadening its base. There are also cases where foreign companies are building distilleries in Japan and starting whisky production.

As we look toward the next 100 years, whisky made in Japan is on the cusp of further leaps forward.

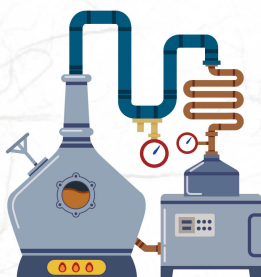
Definition of Japanese whisky



Malt, grains, and water from Japan
Malt is essential



Mashing, fermentation, and distillation
must be carried out in a domestic distillery



Distilled to less than 95% alcohol



Aged in wooden casks of 700L or less for
more than three years domestically



Bottled domestically with an alcohol content of at least 40%

The use of caramel for colour adjustment is permitted

Source: Japan Spirits & Liqueurs Makers Association

The science of whisky

Oak lactone

What is oak lactone ?

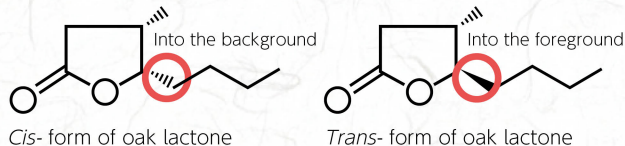
Whisky is stored in casks for a certain period after distillation to mature. During maturation, various components from the cask dissolve into the spirit, altering the aroma of the whisky.

Among these, “Quercus lactone” is particularly known for dissolving into whisky and contributing to its aroma. Quercus lactone, specific to oak wood used in casks, is also known as “oak lactone.”

Oak lactone exists in two stereoisomers: *cis*- and *trans*-. Stereoisomers are compounds with the same types of atoms but different three-dimensional structures. Stereoisomers have similar shapes but different properties. For example, in the case of oak lactone, the *cis*- and *trans*- forms have different effects on the sense of smell.



Representative *cis*- form (left) and *trans*- form (right)



Stereoisomers of oak lactone

In the *cis*- form (left) and *trans*- form (right), the bonding arrangement of atoms is different (red circles). Dashed lines represent bonds into the background, and wedge shapes represent bonds into the foreground, indicating different three-dimensional structures.

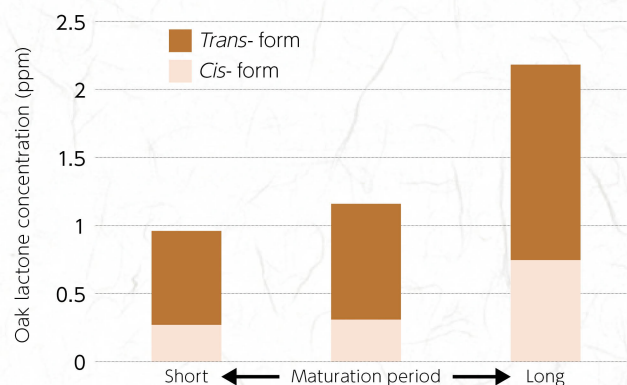
Effects on whisky aroma

When investigating aroma components in alcohol, it is important to know “how the component is perceived” and “the threshold of the component”. The threshold is the minimum concentration at which an aroma or taste can be perceived; the lower the value, the more noticeable the aroma or taste at lower concentrations. Oak lactone in both *cis*- and *trans*- forms has a coconut-like aroma, but the *trans*- form has a threshold about one-tenth that of the *cis*- form, making it emit a strong aroma even in small amounts.

It has also been reported that whisky contains more of the *trans*- form, which has a lower threshold, than the *cis*- form. Therefore, the *trans*- form is believed to have a greater impact on the aroma of cask-aged whisky.

Impact of maturation period

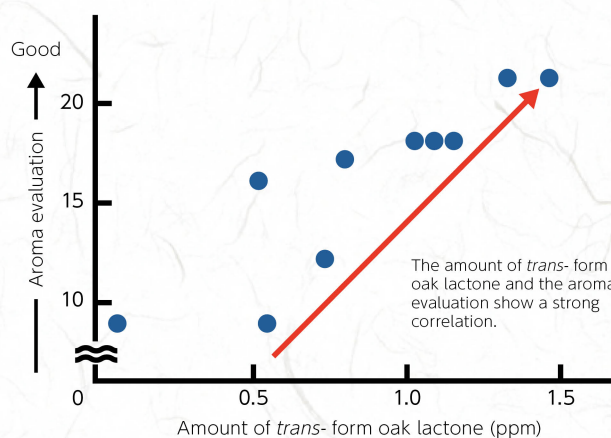
It is known that the longer the maturation period, the more both *cis*- and *trans*- forms of oak lactone increase.



Maturation period and amount of oak lactone

Sensory significance

In the relationship between the sensory evaluation of whisky and the amount of *trans*- form oak lactone, the higher the amount of *trans*- form oak lactone, the higher the aroma evaluation of the whisky.



Sensory evaluation of whisky and amount of *trans*- form oak lactone

While many aspects of cask aging remain unknown, recent scientific advancements have gradually provided more insight into the process. Future developments are eagerly anticipated.



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