



2025

**WELCOME TO
UNIV. OF SHIZUOKA**

Tea Science center

Let's try Sencha and Matcha



Sencha

It's the most popular tea in Japan

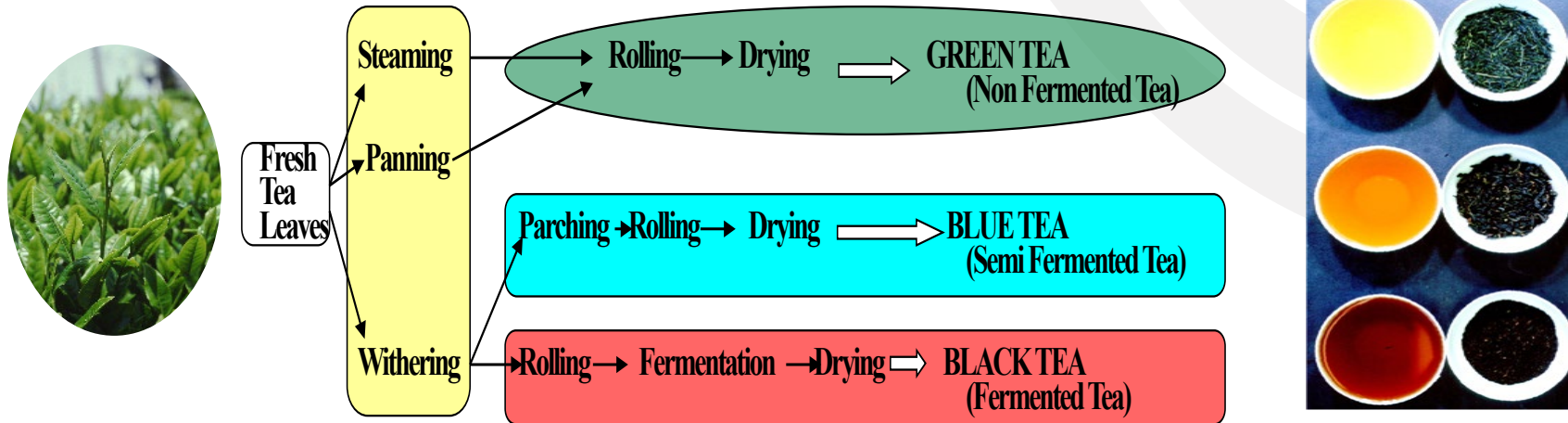
Matcha

It's a cultural tea in Japan



Various types of tea can be made from the same tea leaves

Different kinds of tea in the world



In the long history of tea production, many types of tea have been developed.

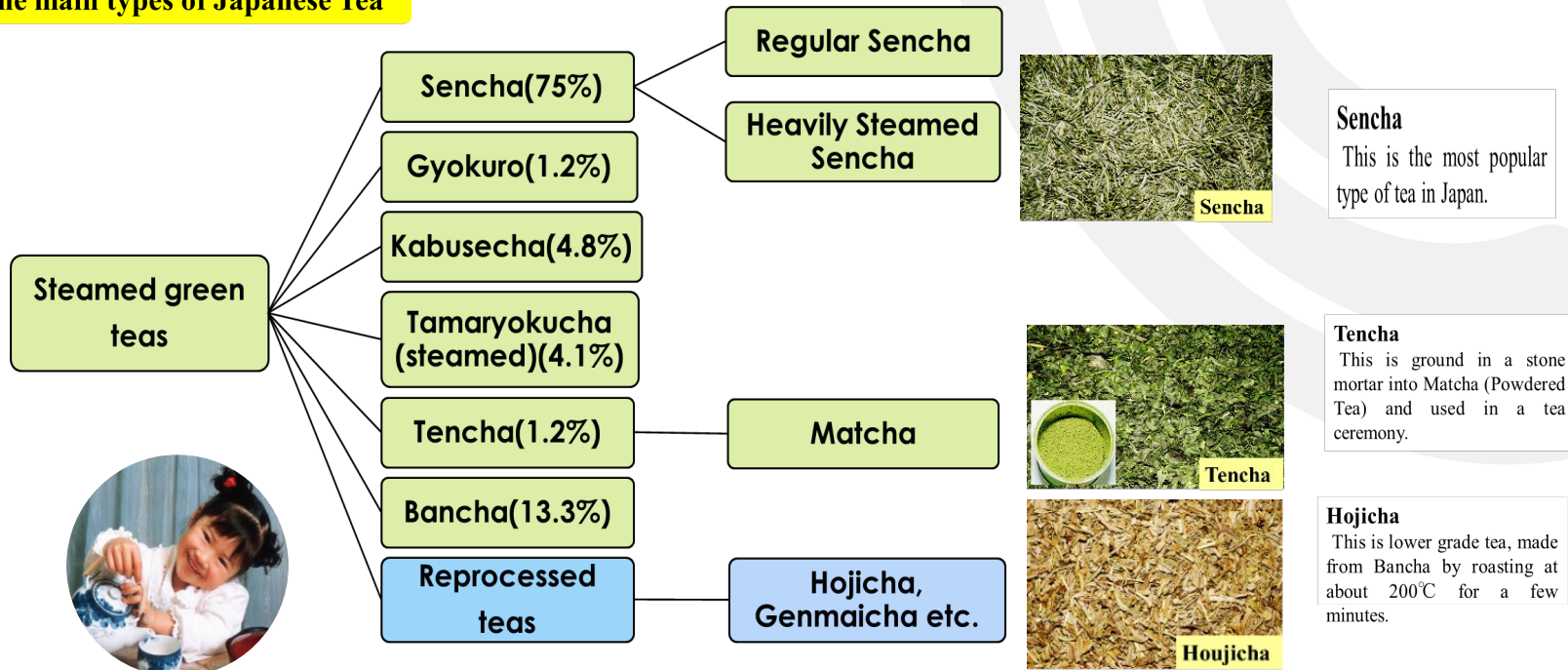
In general, tea is classified depending on the degree of fermentation (activation of oxidizing enzyme contained in the leaves).

- Green tea (non-fermented tea): After being plucked, fresh leaves of tea immediately **treated with high temperature** in order to **inactivation** of oxidizing enzyme of leaves.
- Black tea (fermented tea): The leaves are withered, rolled, and incubated for 5 to 20 hours **without applying high temperature** for fermentation.

During this step (fermentation process), oxidizing enzyme are especially active and change catechin to the oxidized form.

The main types of Japanese tea and production

The main types of Japanese Tea



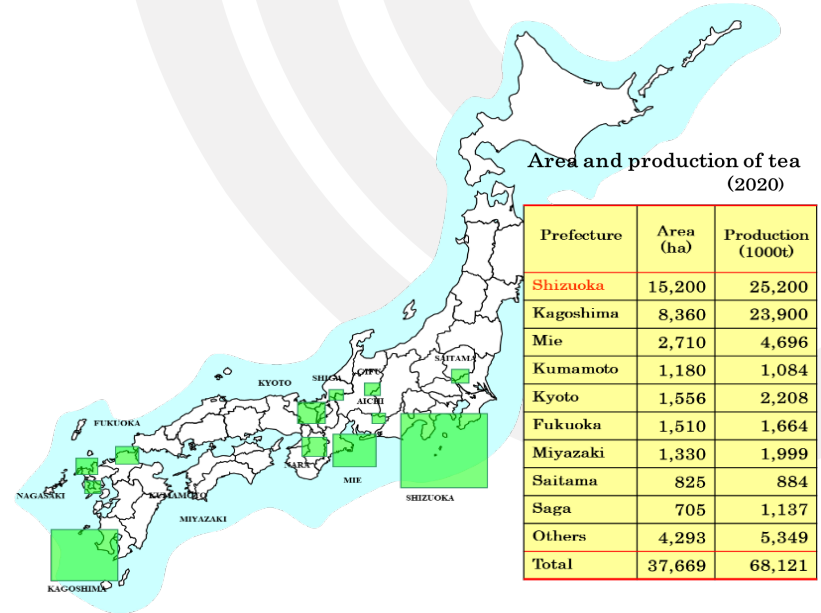
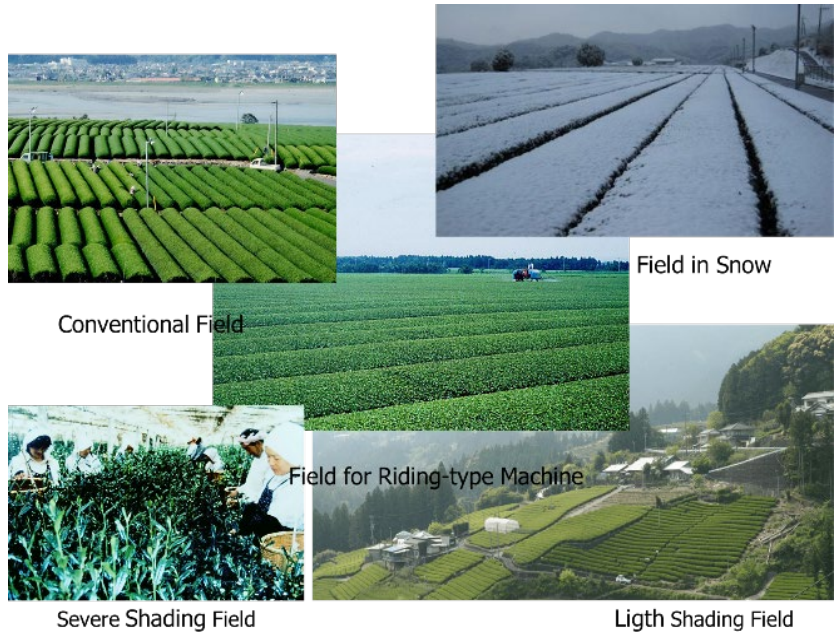
Japanese Green Tea Production

Japanese tea is processed by **steaming** to stop oxidation, then kneading and drying. Steaming is a characteristic of Japanese green tea, and it is a method of heating tea leaves that is rare in the world.

Japanese tea can be divided into gyokuro and tencha, which are grown under cover, and sencha and bancha, which are the other types.

In addition, there is also a classification of tea that is repelled in a process such as sorting, that is, stem tea, sprout tea, powdered tea, and raw material tea for tea bags.

Japan's tea producing areas and production volumes



In Japan, tea farming is prolific mostly in the southwestern half of the Japan for adaptability of the climatic conditions of the tea growing.

The total production of tea in Japan in 2021 was about 78 thousand tons and area was about 38 thousand hectors.

General, Japanese green tea, produced from the beautiful tea fields, achieves the highest quality and the highest yield in the world. This is due to the introduction of superior cultivars and newly mechanized cultivation systems.

In Japan, you can sometimes see snow-covered tea gardens, but this is a rare and beautiful sight.
Also, shading is covered from sunlight/ to produce high grade tea like Gyokuro and Matcha.

Matcha is one of the representative teas of Japan



Tencha, which are known as the finest tea in Japan, is made from the leaves grown under the ceiling-shelf covering.

Tencha, the raw material for matcha, is grown under cover. Cultivation under cover reduces the catechin content and increases the amino acid content. The tea leaves are steamed typically within 2-3 hours after plucking to inactivate the enzymes activities in the leaves and then dried without rolling. Tencha-ro consist of a furnace and an exhaust gas duct, and several steps perforated belt conveyers (3-5 steps) with brick walls. And, Tencha is grinded by the stone and becomes Matcha. Matcha for ceremony grade is ground by the special stone mill, designed for grinding tencha, rotated by a specially developed electric motor. The median particle diameter of matcha powder is less than 20 μm .

Production Process of Matcha

Processing stages

Tea leaf cooling spreader



Tencha dryer ('Tencha-ro')

Grinding stages



Tea grinder (special stone mill designed for matcha grinding)

In chanoyu, through exchanges of hospitality and appreciation, the host and guests can share a quite, heartwarming, peaceful time and reach a state of spiritual enlightenment so called Wa-Kei-Sei-Jyaku.



Wa-Kei-Sei-Jyaku (和敬清寂)

“Wa” : open each other’s heart.

“Kei” : respect each other.

“Sei” : purify your surrounding and your spirit.

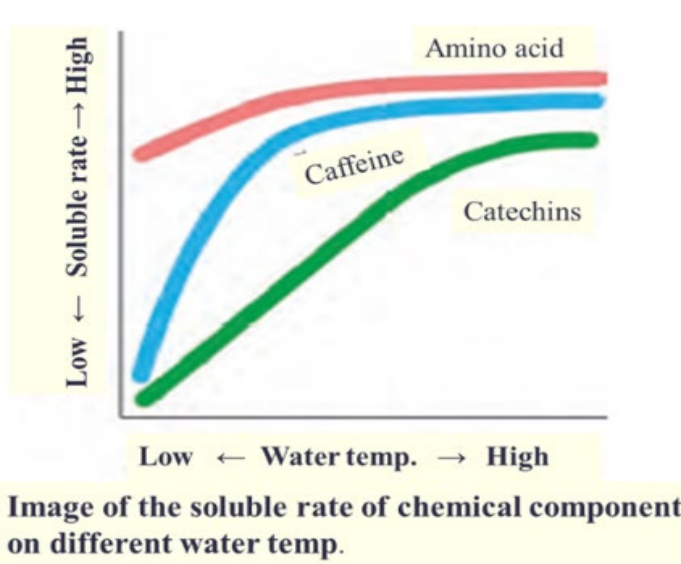
“Jyaku” : maintain a spirit of quietness



Matcha.

It is possible to consume vitamin A (beta carotene), vitamin E (tocopherol), dietary fiber etc which can not be ingested with tea brewed in teapot.

How to brew Japanese green tea



The soluble rate of chemical component is also different depending on water temperature.

Amino acid elutes at low temperatures, but Caffeine and Catechin are hardly eluted. Major chemical component is easy to elute when the is high.

Regarding the taste of major temperature component:

- amino acid is Umami
- catechins is astringent
- caffeine is bitter

So, of course, by the different component amount, the taste of tea and the functions are different.

Standard Brewing Method for Japanese Green Tea

		Number of persons served	Volume of teacup	Volume of tea	Temperaure of hot water	Volume of hot water	Infusion time
		persons	ml	g	°C	ml	seconds
Gyokuro	High grade	3	40	10	50	60	150
	Middle grad	3	40	10	60	60	120
Sencha	High grade	3	100	6	70	170	120
	Middle grad	5	150	10	90	430	60
Houjicha		5	240	15	100	650	30
Bancha		5	240	15	100	650	30

This table shows the general methods to brewing of Gyokuro, Sencha, Houjicha and Bancha.

The hot water is lower and the amount of hot water is lower as much as tea that enjoys umami like gyokuro and high grade Sencha.

On the other hand, houjicha and bancha that enjoy the aroma have high hot water temperature and hot water volume.

How to make Japanese tea

Sencha (Gyokuro)

1

Cool down by pouring the boiled water into tea cups.
(About 5 °C is cooled by this method)



2

Place the tea leaves into the tea pot.
6-10 g for 3-5 people



3

Pour the cooled down water into the tea pot
Water temp. 70-90 °C
Steeping time 60-120 sec.



4

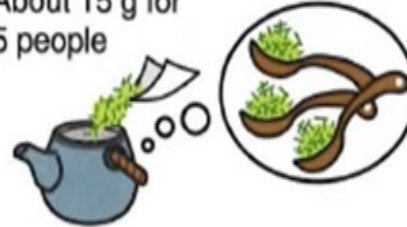
Serve equally into each tea cup until the final drop is poured.
Serving temp. 50-65 °C



Bancha, Houjicha

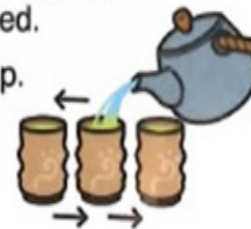
1

Place the tea leaves into the tea pot.
About 15 g for 5 people



3

Serve into each tea cup equally until the final drop is poured.
Serving temp. 75 °C



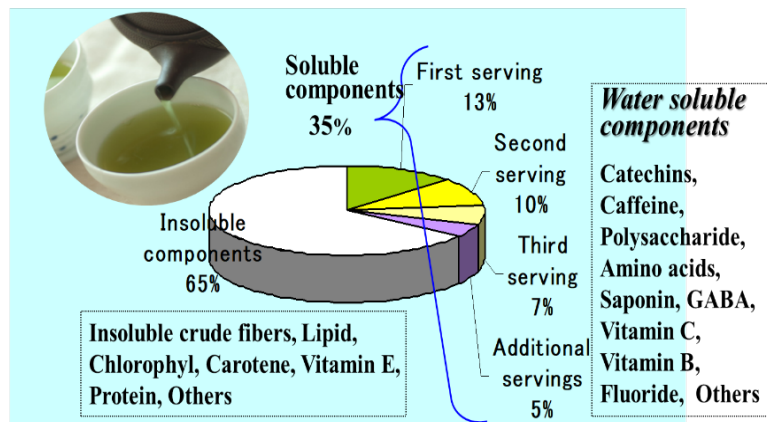
2

Pour the proper quantity of boiled water and leave it steeping for about 30 sec.
Be sure to use boiled water.



The point is to brew tea at a low temperature to enjoy the umami, and at a high temperature to enjoy the aroma.

Physiological functions of Japanese green tea components

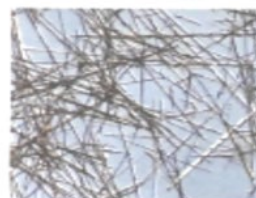


Green tea contains about 35% water soluble compounds, including catechins, caffeine and amino acids et al.

On the other hand, the remaining 65 % of the components of tea are water insoluble compounds, including fiber, vitamin E, carotene, protein and chlorophyll et al.

In the case of serving green tea, the 13% of soluble component in the green tea dissolves in hot water with first serving. And second serving is 10%, and third serving is 7%.

Crystals of tea catechins



EC



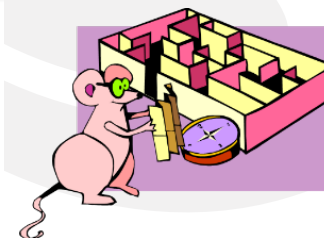
EGC



ECg



EGCg



Physiological functions of green tea components

Green Tea Components	Contents	Functions
Catechins	10~18%	Anti-oxidative, radioprotective, Anti-mutagenic, Anti-tumor, Enzyme inhibitory, Anti-hypercholesterolemic, Anti-hyperglycemic, Fat reducing, Anti-hypertensive, Anti-ulcer, Anti-bacterial etc.
Caffeine	3~4%	Removal of fatigue, Sleepy feeling, Diuretic etc.
Vitamin C	150~250mg%	Removal of stress, Cold prevention
Vitamin B	1.4mg%	Excitometabolic action of carbohydrates and amino acids
Vitamin E	25~70mg%	Anti oxidative, Aging prevention
γ amino butyric acid	0.1~0.2%	Anti hypertensive
Flavonoids	0.6~0.7%	Halitosis prevention
Theanine	0.6~2%	Anti hypertensive

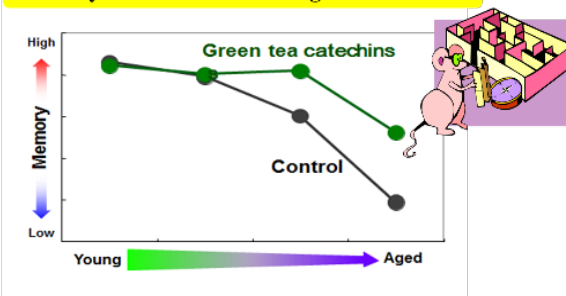
Catechins, caffeine and theanine are the most important chemicals and catechins shows various physiological functions, such as anti-oxidative, Anti-cancer, fat reduce et al. Caffeine show removal of fatigue, sleepy feeling. Theanine show anti-hypertensive effects. The benefits of tea drinking in both aspects of mental and physical health have been discussed for thousand years in China and many other countries where the tea is consumed. Recently, with the advance of modern chemistry, components of tea have been analyzed and health benefits argued in the past been attributed to the tea element. In particular, as for catechins in green tea a great many effects have been studied and a number of functionalities have been proved.

Various functions of Catechin and Theanine

Functionalities of catechin

- ◆ Antioxidant
- ◆ Antimutagen
- ◆ Cancer-fighting
- ◆ Oxidation resistant
- ◆ Anti-atherogenic
- ◆ Lowers blood cholesterol
- ◆ Lowers fat absorption
- ◆ Antibacterial, antiviral
- ◆ Prevents cavities
- ◆ Improves intestinal flora
- ◆ Eliminates odors
- ◆ Controls blood pressure
- ◆ Etc. Etc. Etc.

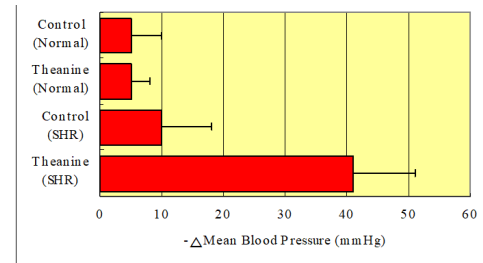
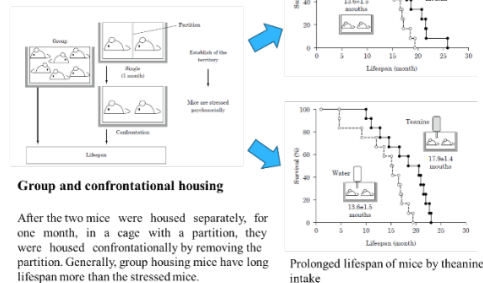
Memory retention in mice ingested catechin



Functionalities of theanine

- ◆ Reduces blood pressure
- ◆ Regulates cranial nerves performance
- ◆ Prevents vascular dementia
- ◆ Strengthens anti-tumor agents
- ◆ Improves cell infiltration resistance from lung cancer

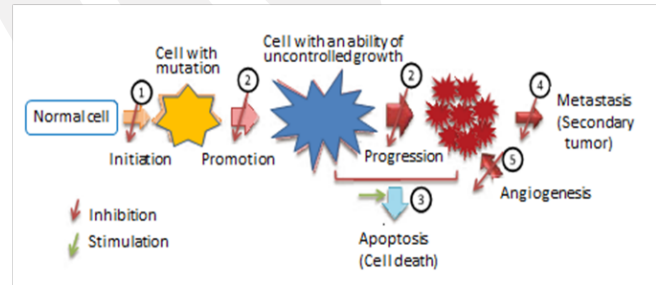
Effect of theanine on psychosocial stress



Effect of theanine on mean blood pressure in normal and spontaneous hypertensive rats (SHR)

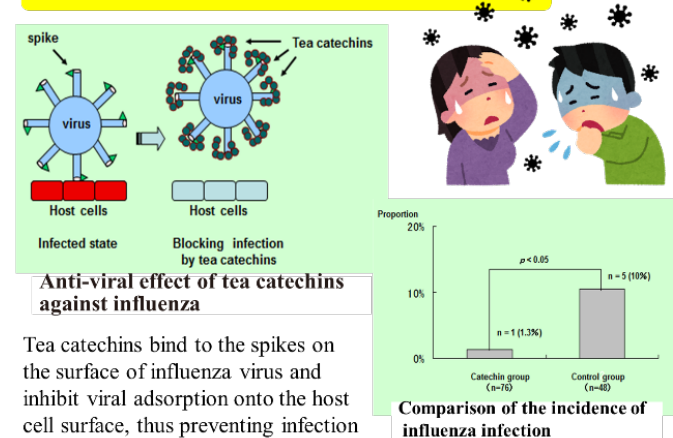
(H. Yokogoshi, et al. Biosci. Biotechnol. Biochem. 59, 615-618 (1995))

Cancer development and actions of tea catechins



Cancer progresses through several stages as it develops including initiation, promotion, progression, and metastasis. Green tea catechins have been shown to exert anti-cancer effects at each of these stages.

Effects of catechins on influenza virus *



Tea catechins bind to the spikes on the surface of influenza virus and inhibit viral adsorption onto the host cell surface, thus preventing infection

Modern life causes stress in many people. Long term stress is believed to trigger depression and cardiovascular diseases, and accelerate senescence. When psychosocial stress was applied to mice by confrontational housing, the survival time of mice was significantly shorter than of mice in group housing. However, by intaking theanine in these mice, their lifespan becomes longer. So, theanine suppresses senescence by reducing psychosocial stress

Matcha is a highly functional superfood



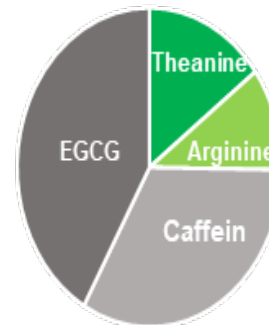
Modern life can cause stress in people, and the accumulation of stress is strongly linked to various diseases. Intervention of stress-induced alterations with dietary supplements is a potential therapeutic strategy for a healthy life. Reducing stress with matcha may become a new health-giving strategy for achieving good daily life.



The power of theanine in matcha

Theanine exhibits an excellent stress-reducing effect on mice and humans. However, the effect of theanine is antagonized by caffeine and epigallocatechin gallate (EGCG), which are two major components of green tea. In contrast, the stress-reducing effect of theanine is enhanced by arginine, which is the second most abundant amino acid in Japanese matcha. An effective stress-reducing outcome is only possible when the molar ratio of (caffeine (C) + EGCG (E)) / (theanine (T) + arginine (A)) is 2 or less. Matcha with a CE/TA ratio of 2 or less is high-grade matcha, and if the ratio is greater than 2, it is a low-grade matcha in terms of reducing stress.

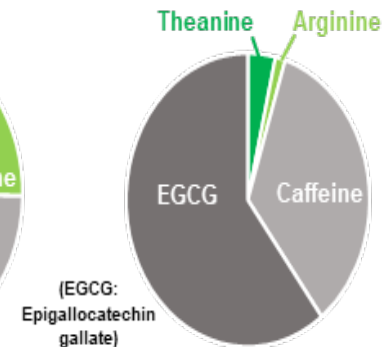
High-grade matcha



CE/TA = 1.79

Molar ratio of CE/TA =

Low-grade matcha



CE/TA = 10.64

$$\left[\frac{\text{Caffeine (C) + EGCG (E)}}{\text{Theanine (T) + Arginine (A)}} \right]$$



THANK YOU

THIS ONCE-IN-A-LIFETIME

ENCOUNTER IS A TREASURE