



# Wakayama Prefecture Food Functionality Guide



Wakayama Prefectural Mascot, Kiichan

Agriculture, Forestry and Fisheries Department, Wakayama Prefecture

# Tasty, Healthy Wakayama

## Good food heals mind and body [Tasty, Healthy Wakayama]

Deep into the Kii Mountains, the Japan Current flows, the sun shines bright, and the rainwater turns into limpid streams clearing its way to the sea

Fresh seafood, bountiful fruits, soy sauce, umeboshi, and dried bonito...

For ages, the food culture fostered in Wakayama Prefecture has bestowed a vital energy on us all over Japan. The foods of Wakayama have the power to rejuvenate your mind and body.

This pamphlet will take you through the food items manufactured in Wakayama prefecture with the idea of delivering "tasty" and "safe food" that is "healthy" for your body.

What does "food" or "health" mean for you? Why don't you choose the fresh and functional food from Wakayama for a rich and healthy lifestyle?



This pamphlet summarizes the highly reliable information of the representative agricultural and fishery products from Wakayama Prefecture on the basis of prefectural statistics, analysis data by the prefectural research centers, the STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Version) published by the Japanese government, research papers and publications on ume and its effectiveness of the various nutrients, etc.



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Kishu Ume Chicken and Kishu Ume Eggs, Wakayama Gibier



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# Ume



## Production and properties

Main production areas	Minabe town, Tanabe city, etc.
Yield	53,500 t (2017)
Harvest time	Mid-May to early July
Main varieties	Nanko, Gojiro, etc.

## Features

Wakayama is the top producer of ume in Japan, accounting for 66% in total. Ume is grown mainly in Minabe town, Hidaka-gun and Tanabe city. The harvested fruits are processed into umeboshi, umeshu, ume juice, ume vinegar, ume extracts, etc. Ume is valued for over 1300 years for their culinary and medicinal properties. The processed ume products contain organic acids such as Potassium,  $\beta$ -Carotene, Citric acid, Oleanolic acid and polyphenols such as Syringaresinol and Vanillin.

## Nutritional value <per 100 g>

Energy	28 kcal	Sodium	2 mg
Protein	0.7 g	Potassium	240 mg
Fats	0.5 g	$\beta$ -Carotene	220 $\mu$ g
Carbohydrates	7.9 g		

Fruits/Ume/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Prevents hypertension!

#### Potassium

Potassium is a type of minerals. It regulates the osmotic pressure of body fluids and maintains it at a constant level. By releasing out sodium ions from the body, it can control excessive salt intake.

### Have antioxidant effects!

#### $\beta$ -Carotene

$\beta$ -Carotene is found in yellow and orange color in fruits and vegetables, and gets converted into Vitamin A in our bodies. It has antioxidant effects.

### Prevents influenza infections!

#### Ume polyphenols

Ume fruits contain ume polyphenols. According to papers and conference presentations by Takahiko Mitani, Wakayama Industry Promotion Foundation (Presently a Professor at Wakayama University) and Hajime Koyama, President, Wakayama Shin-ai Women's Junior College (Presently a Professor at Wakayama Medical University), the ume polyphenols have anti-viral and anti-bacterial effects.

**Prevents hypertension!/Purifies blood!/Prevents food poisoning!  
Prevents osteoporosis!/Helps recovery from fatigue!**

### Citric acid

Citric acid is an organic acid. The citric acid contained in umeboshi neutralizes the acidity, makes the blood flow smoothly.

Citric acid has strong antibacterial properties. Hence, it controls the multiplication of Staphylococcus aureus and pathogenic E. coli bacteria, thereby preventing food poisoning. It also controls the multiplication of Helicobacter pylori that cause stomach and duodenal ulcer.

Citric acid also facilitates burning of sugar and lowers or disintegrates the lactic acid, thus helping recovery from fatigue.

Moreover, by facilitating the absorption of calcium and iron in the body, citric acid prevents osteoporosis and anemia.

**Prevents diabetes!**

### Oleanolic acid

Oleanolic acid is an organic acid. Oleanolic acid reduces the activity of alpha-glucosidase 1) and slows down the digestion and absorption of dietary sugar in the body. Minabe town has acquired a patent for the Oleanolic acid that acts as an "alpha-glucosidase inhibitor" preventing sudden rise in blood sugar level after meals. (Patent No. 4403457)

**Prevents stomach cancer!**

### Syringaresinol

Syringaresinol is a polyphenol. Syringaresinol is known to lower the activity of Helicobacter pylori that are harmful to stomach. Minabe town has acquired a patent for Syringaresinol that acts as a "Helicobacter pylori motility inhibitor". (Patent No. 4081678)

**Burns fat! / Acts as an anti-allergen!**

### Vanillin

"Vanillin" contained in umeboshi produced in Wakayama helps in weight loss.

The research conducted on cultured fat cells has proven that umeboshi produced in Wakayama stimulate the fat cells. Consumption of umeboshi in its roasted form is an effective way of losing weight. (Patent No. 4081678)

Vanillin and the other constituents such as Syringic acid, Protocatechuic aldehyde, Lyoniresinol, p-Coumaric acid present in ume suppress degranulation of mast cells that trigger allergic reactions. Hence, it has been pointed out that Japanese Apricots probably has allergy fighting effects.

#### Citations

Potassium: "Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

β-Carotene, Citric acid (prevention of Osteoporosis and recover from fatigue)

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

Ume polyphenol

"Antimicrobial Activity of the Phenolic Compounds of Prunus mume against Enterobacteria" vol. 41 No. 2 of Biological and Pharmaceutical Bulletin 2018

Citric acid (prevention of arteriosclerosis and food poisoning, and blood purification)

Hirotooshi Utsunomiya, Associate Professor, Kishu Ume kounoukenkyukai, Wakayama Medical University "Treatment vol.83 No. 10 (2001) Medical Assessment of Processed Ume Products"

Oleanolic acid, Syringaresinol, and Vanillin

Hirotooshi Utsunomiya, Associate Professor, Kishu Ume kounoukenyukai, Wakayama Medical University

#### 1) Alpha-glucosidase

It is an enzyme that acts as a catalyst in the hydrolysis of 1,4 alpha glycosidic bonds between carbohydrate molecules.

Alpha-glucosidase is also called Maltase as it breaks down maltose

# Mikan (Citrus unshiu)



## Production and properties

Main production areas	Aridagawa town, Kainan city, Arida city, Kinokawa city, Tanabe city, etc.
Yield	144,200 t (2017)
Harvest time	Late September to mid-February
Main varieties	Yura Wase, Nichinan Ichigo, Miyagawa Wase, Taguchi Wase, etc.

## Features

Wakayama boasts the highest production of mikan (mandarin oranges) in Japan. The fruits are cultivated under the best conditions, including a warm climate and sloping land with good water drainage. The cultivation is thoroughly managed to produce mikan with high sugar content. Mikan is rich in Vitamin C, beta-cryptoxanthin, pectin and hesperidin among other nutrients.

The thin skin (carpel wall) and the white inner layer (mesocarp: albedo) of mikan contain ample of pectin and hesperidin, allowing a rich intake of nutrients simply by eating the peeled fruit.

## Nutritional value <per 100 g>

Energy	45 kcal	Sodium	1 mg
Protein	0.5 g	Dietary fiber equivalent	0.7 g
Fats	0.1 g	Vitamin C	35 mg
Carbohydrates	11.9 g	Beta-cryptoxanthin	1,900 µg

Fruits/(Citrus)/Citrus Unshiu/Segment/Early Ripening Variety, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Improves your intestinal environment!

#### Pectin

Pectin is a type of water soluble dietary fiber. It helps control the rise in blood sugar and blood cholesterol, thus combating the lifestyle diseases. By improving your intestinal environment, pectin promotes regular bowel movements, thus acting as a laxative.

### Prevents lifestyle diseases!

#### Hesperidin

Hesperidin is a type of polyphenol. It is also called Vitamin P. It improves Vitamin C absorption and strengthens capillary blood vessels by promoting collagen synthesis. Furthermore, the antioxidant effects suppress aging of blood vessels and prevents arteriosclerosis. It is also effective in improving blood flow and sensitivity to the cold. It prevents hypertension by suppressing rise in blood pressure, prevents hyperlipidemia by suppressing rise in neutral fats and buildup of LDL-cholesterol in the blood, prevents osteoporosis by maintaining a healthy bone density.

**Has antioxidant effects! / Prevents osteoporosis!  
Has skin beautifying effects! / Relieves stress!**

### Vitamin C

Vitamin C is a water soluble vitamin. It is a nutrient that helps maintain the health of skin and mucous membrane, and has antioxidant effects.

Vitamin C also contributes to collagen synthesis. Insufficiency of collagen leads to poor coupling between cells, making our blood vessels, skin and bones brittle. It also synthesizes adrenocortical and adrenomedullary hormones secreted to relieve stress, has antioxidant effects, activates the enzymes that aid in the metabolism and detoxification actions of the liver, and promotes iron absorption.

3 mikan fruits (approx. 300 g) per day are enough to provide the recommended daily amount of Vitamin C1).

**Creates strong bones! / Suppresses carcinogenesis!**

### Beta-cryptoxanthin

Beta-cryptoxanthin is a type of carotenoid (natural pigment). It has been reported to promote bone health by helping bone metabolism.

In addition, its strong antioxidant effects make it effective in suppressing carcinogenesis.



### Citations

Vitamin C (antioxidant effects)

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

Vitamin C (skin beautifying effects, osteoporosis prevention), beta-cryptoxanthin

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

#### 1) Recommended dietary allowance (RDA)

In the 2015 version of Dietary Reference Intakes for Japanese, the recommended number of calories and amount of daily nutrient intake for maintaining and promoting good health, preventing the onset and severe symptoms of lifestyle diseases have been listed by gender and age. The RDA indicates the amount that would meet the requirement of the population

# Kaki (Persimmon)



## Production and properties

Main production areas	Katsuragi town, Kinokawa city, Hashimoto city, Kudoyama town, etc.
Yield	47,500 t (2017)
Harvest time	Mid-September to early December
Main varieties	Tone Wase, Hiratanenashi, Fuyu, etc.

## Features

Thanks to the temperature difference between day and night in the Northern areas, Wakayama is the top producer of persimmons in Japan. This climate allows high-quality, sweet and nicely colored persimmons to be cultivated.

There is an old saying that, "When persimmons get red (ripen) the doctor turns blue (is unhappy because he will have no income)," as the fruits contain Vitamin C,  $\beta$ -carotene,  $\beta$ -cryptoxanthin, insoluble dietary fiber, tannins and other nutrients.

Tannins are known to moderate alcohol absorption in the body. Hence, they are reported to be effective in alleviating hangovers.

## Nutritional value <per 100 g>

Energy	63 kcal	Sodium	1 mg
Protein	0.5 g	Vitamin C	55 mg
Fats	0.1 g	Beta-Carotene	100 $\mu$ g
Carbohydrates	16.9 g	Beta-cryptoxanthin	380 $\mu$ g
		Dietary fiber	2.8 g



Persimmon/Astringency-removed, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

## Main nutrients and their benefits

**Creates strong bones! /Suppresses carcinogenesis!**

### Beta-cryptoxanthin

Beta-cryptoxanthin is a type of carotenoid (natural pigment). It has been reported to promote bone health by helping bone metabolism.

In addition, its strong antioxidant effects make it effective in suppressing carcinogenesis.



**Has antioxidant effects! /Prevents osteoporosis!  
Has skin beautifying effects! /Relieves stress!**

### Vitamin C

Vitamin C is a water soluble vitamin. It is a nutrient that helps maintain the health of skin and mucous membrane, and has antioxidant effects.

Vitamin C also contributes to collagen synthesis. Insufficiency of collagen leads to poor coupling between cells, making our blood vessels, skin and bones brittle. It also synthesizes adrenocortical and adrenomedullary hormones secreted to relieve stress, has antioxidant effects, activates the enzymes that aid in the metabolism and detoxification actions of the liver, and promotes iron absorption.

1 persimmon (approx. 200 g) per day provides the recommended daily amount of Vitamin C.

**Has antioxidant effects! / Regulates the function of the intestine!**

### Tannin

Tannin is a type of phenolic compounds and the origin of astringency. The antioxidant effects of tannins inhibit oxidation of LDL-cholesterol and prevent arteriosclerosis. It also has bactericidal and deodorizing properties. Owing to their astringency, they have skin tightening and beautifying effects. They also subdue enterospasms and alleviate the symptoms of diarrhea.

### Persimmon vinegar is rich in nutrients!

There are two types of persimmon vinegar; one is made by directly soaking persimmons in vinegar and the other is by fermenting the fruit and converting it into vinegar.

They are both extremely high in nutritional value and contain a variety of polyphenols. In particular, the most common persimmon vinegar made in Wakayama is of the second type, which contains about 3 times the amount of potassium as that in the black vinegar and is effective in preventing high blood pressure.

Based on the analysis results at the Industrial Technology Center of Wakayama Prefecture



### Citations

Vitamin C (antioxidant effects)

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

Vitamin C (skin beautifying effects, osteoporosis prevention, stress relief), ( $\beta$ -cryptoxanthin, tannins):

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# Peach

## Production and properties

Main production areas	Kinokawa city, Katsuragi town, etc.
Yield	10,200 t (2017)
Harvest time	Mid-June to mid-August
Main varieties	Hikawa Hakuho, Hakuho, Shimizu Hakuto, Kawanakajima Hakuto, etc.



## Features

Wakayama is the fourth biggest peach cultivar in Japan. Main production area is in the Kinokawa river basin featuring a gravelly soil having good drainage and a warm climate, both of which are ideal for peach cultivation. The "Arakawa Peaches" produced in the Momoyama town of Kinokawa city is a highly popular brand all over the country.

Peaches contain pectin, potassium and Vitamin E, as well as catechin in the area near the skins and anthocyanin in the area near the seeds.

## Nutritional value <per 100 g>

Energy	40 kcal	Sodium	1 mg
Protein	0.6 g	Dietary fiber equivalent	1.3 g
Fats	0.1 g	Potassium	180 mg
Carbohydrates	10.2 g	Vitamin E	0.7 mg

Fruits/Peaches/Peach/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Improves your intestinal environment!

#### Pectin

Pectin is a type of water soluble dietary fiber. It helps control the rise in blood sugar and blood cholesterol, thus combating the lifestyle diseases. By improving your intestinal environment, pectin promotes regular bowel movements, thus acting as a laxative.

### Have antioxidant effects!

#### Vitamin E

It is a type of fat - soluble vitamin. It has antioxidant effects, inhibiting oxidation of LDL-Cholesterol and preventing arteriosclerosis, suppresses generation of peroxidized fat and prevents symptoms of aging and cancer. It also prevents oxidation of both proteins and fatty acids that constitute the cell surface membranes, thus stabilizing the fatty acids and preventing damage to the cells.

### Prevents lifestyle diseases!

#### Catechin

Catechin is a type of polyphenol. It has antioxidant effects and suppresses rise in blood pressure, blood cholesterol and blood sugar levels thereby preventing the lifestyle diseases. In addition to its antibacterial properties, Catechin fights tooth decay.

#### Citations

Pectin, Vitamin E, Catechin:

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# YUZU



## Production and properties

Main production areas	Kozagawa town, Kimino town, etc.
Yield	397 t (2016)
Harvest time	Late October to early December

## Features

Yuzu is cultivated in the mountainous areas of Kozagawa and Kimino towns. As well as vitamin C, yuzu contains citric acid, which is effective in recovery from fatigue, limonene, an aroma component with a relaxing effect and polyphenols such as hesperidin, which has antioxidant effects.

## Main nutrients and their benefits

### Have antioxidant effects!

#### Limonene

Limonene is an organic acid and a citrus odorant. It has strong antioxidant effects.

# Jabara



## Production and properties

Main production areas	Kitayama village, etc.
Yield	153 t (2016)
Harvest time	Late October to late November

## Features

Kitayama village is the only "enclave" village in Japan, located between Nara and Mie prefectures. Jabara is a kind of citrus species that was grown wild in Kitayama village in Wakayama prefecture. The tree got its name from the Japanese phrase, "Jaki wo Harau", which means to ward off evil spirits. The fruit juice is known for its unique flavor, used in many beverage products.

## Main nutrients and their benefits

### Alleviates hay fever!

#### Narirutin

Jabara is high in narirutin, which is a type of polyphenols. Narirutin is suggested to be possessing anti-allergic properties. Its exact effects are currently being studied in the Universities and other research organizations.

#### Citations

##### Limonene

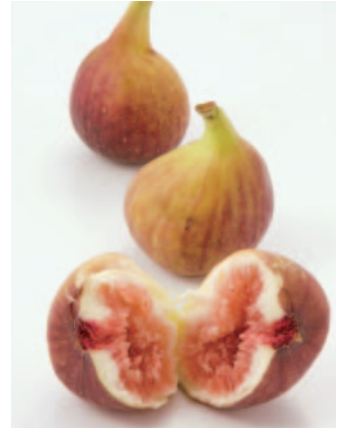
"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

##### Narirutin

Shinya Minatoguchi, Cardiovascular Research, Gifu University

(Vol. 50 No. 3 (September 2008 issue) Effect of "Jabara" Juice on Symptoms and QOL in Patients with Japanese Cedar Pollinosis. Clinical Immunology & Allergy)

# Fig



## Production and properties

Main production areas	Kinokawa city, Wakayama city, etc.
Yield	2,298 t (2016)
Harvest time	Early June to late November
Main varieties	Masui Dofin, etc.

## Features

Wakayama is the second fig producer in Japan. Figs are cultivated in the northern part of Wakayama prefecture, mainly Kinokawa city. Figs cultivated in greenhouses and in open fields are harvested from June and from August to November, respectively.

Figs contain water soluble dietary fiber, potassium and anthocyanin.

When dried, the dietary fiber content per weight increases by at least five times as compared to when they are eaten raw. This allows for even better effective dietary fiber intake.

## Nutritional value <per 100 g>

Energy	54 kcal	Sodium	2 mg
Protein	0.6 g	Considerable amount of dietary fiber	1.9 g
Fats	0.1 g	Potassium	170 mg
Carbohydrates	14.3 g		



Fruits/Fig/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

## Main nutrients and their benefits

### Improves your intestinal environment!

#### Pectin

Pectin is a type of water soluble dietary fiber. It helps control the rise in blood sugar and blood cholesterol, thus combating the lifestyle diseases. By improving your intestinal environment, pectin promotes regular bowel movements, thus having a laxative property.

### Prevents hypertension!

#### Potassium

Potassium is a type of minerals. It regulates the osmotic pressure of body fluids and maintains it at a constant level. By releasing out sodium ions from the body, it can control excessive salt intake.

### Relives eye strain! / Has antioxidant effects!

#### Anthocyanin

Anthocyanin is a type of polyphenols. It has strong antioxidant effects and the synergistic effects with vitamin C, vitamin E and catechin prevent arteriosclerosis, symptoms of aging and cancer. Moreover, by strengthening the capillary blood vessels of the eyes and improving the blood flow, it ensures a steady supply of oxygen and nutrients to the eyes and treats eye strain by improving the function of the ciliary body which adjusts eye focus.

#### Citations

Pectin, anthocyanin:

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

Potassium

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

# Kiwi fruit



## Production and properties

Main production areas	Kinokawa city, Kainan city, etc.
Yield	4,060 t (2017)
Harvest time	Early December to late March
Main varieties	Hayward, etc.

## Features

Wakayama prefecture is the third biggest producer of kiwifruits in Japan, which are known for their emerald green color, a unique sweet-and-sour taste, and superior nutritional value. They contain insoluble dietary fiber, vitamin C, vitamin E,  $\beta$ -carotene, potassium, actinidine, etc.

## Nutritional value <per 100 g>

Energy	53 kcal	Sodium	2 mg
Protein	1.0 g	Considerable amount of dietary fiber	2.5 g
Fats	0.1 g	Vitamin C	69 mg
Carbohydrates	13.5 g	Potassium	290 mg

Fruits/Kiwifruit/Green Flesh

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Prevents constipation!

#### Insoluble dietary fiber

It slows down the digestion and absorption of dietary sugar, suppressing the sudden rise in blood sugar level after meals. The dietary fiber swelling in digestive juices prevents constipation by promoting peristalsis of the digestive tract. It also helps prevent colon cancer.

### Promotes protein digestion!

#### Actinidine

Actinidine is an enzyme that breaks down proteins. Having kiwi fruit for dessert helps you digest meat and fish, making them lighter on your gut. Sprinkling kiwi juice on uncooked meat helps to soften the meat by breaking down its protein cells.

### Have antioxidant effects!

#### Vitamin C, Vitamin E, $\beta$ - carotene

These nutrients have antioxidant effects.

### Prevent hypertension!

#### Potassium

By releasing sodium ions from the body, it can control the excessive salt intake.

## Citations

Insoluble dietary fiber, actinidine, Vitamin C,  $\beta$ -carotene, Vitamin E

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

Potassium

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

# Japanese "Sansho" pepper

## Production and properties

Main production areas	Aridagawa town, Kimino town, etc.
Yield	441t (2016)
Harvest time	Mid-May to mid-August



## Features

Wakayama's Budo Sansho pepper is the most produced sansho pepper in Japan, and has the highest quality in both taste and flavor.

Clusters of Budo Sansho resemble grapes and each grain in the cluster is bigger than those of other types of sansho. The unripe and green fruit of Japanese peppercorn is harvested in May, and then used for boiling down foods, etc. Dried sansho is harvested in July and August and ground into powder to be used mainly as a spice.

It is used as a material for traditional Chinese medicine "Daikenchuto," which stimulates digestive tract function. In addition to being known to maintaining the stomach health, it is also thought to improve basic metabolism and warm the body.

It contains sanshool which is a spicy component, and citronellal and geraniol which are fragrant components of Sansho pepper.

## Nutritional value <per 100 g>

Energy	375 kcal	Sodium	10 mg
Protein	10.3 g		
Fats	6.2 g		
Carbohydrates	69.6 g		

Spices and Flavorings/Sansho/Powder

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Sansho better allows you to sense saltiness

**By reducing the salt intake, it prevents hypertension!**

### Sanshool

The "Sanshool" in sansho pepper has always been known to have numbing effects on the tongue, but the fact that it has the effect of enhancing saltiness was verified in a joint study conducted by Wakayama University and Yamamoto Katsunosuke Shoten, a powdered sansho pepper producer in Kainan city. They have also obtained a patent on Sansho tablets.

(Patent No. 5625089)

By being more sensitive to salt, you can enjoy even the low-sodium dishes, keeping hypertension at bay.

# Strawberry

## Production and properties

Main production areas	Kinokawa city, Gobo city, Yuasa town, etc.
Yield	1,130 t (2016)
Harvest time	Mid-December to mid-April
Main varieties	Marihime, Sachinoka, Benihoppe



## Features

Integrated managements such as water control have enabled the cultivation of high quality strawberries all over Wakayama, especially in its northern parts.

According to an analysis report published by Wakayama Prefectural Experiment Station of Agriculture, the prefecture's original strawberry brand "Marihime" is even more rich in vitamin C than other common varieties. Strawberries contain vitamin C, folic acid, potassium, and polyphenols.

## Nutritional value <per 100 g>

Energy	34 kcal	Sodium	Tr
Protein	1.0 g	Vitamin C	62 mg
Fats	0.1 g	Folic acid	90 µg
Carbohydrates	8.5 g	Potassium	170 mg



Strawberry/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

Tr: "Tr" (Trace) indicates that the food item contains at least 1/10th to less than 5/10th of the minimum listed volume of the constituent.

## Main nutrients and their benefits

### Relieves stress!

#### Vitamin C

Vitamin C is a water soluble vitamin. It is required for collagen synthesis as well as for the synthesis of adrenocortical and adrenomedullary hormones secreted to resist some stresses. Vitamin C, a kind of antioxidants, activates the enzymes that involved in metabolism and detoxification by the liver, and promotes iron absorption. One hundred mg strawberries can provide 60% of the daily recommended vitamin C intake.

### Induces hematopoiesis! / Prevents arteriosclerosis!

#### Folic acid

Folic acid is a water-soluble vitamin. It is instrumental in nucleic acid synthesis, and the synthesis of methionin, one of the amino acids, from homocysteine. Difficulties in synthesis of red blood corpuscles and consequent megaloblastic anemia can be occurred in the individuals deficient in folic acid. Folic acid deficiency in pregnant women might cause infant neural tube defects and heart failure of infants.

### Relives eye strain! / Have antioxidant effects!

#### Anthocyanin

Anthocyanins are water-soluble pigments. They act as antioxidants and expected to be good for eyesight.

#### Citations

Vitamin C

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

Folic acid, anthocyanin

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# Cherry tomatoes

## Production and properties

Main production areas	Inami town, Hidaka town, Kinokawa city, etc.
Yield	3,020 t (2017)
Harvest time	Throughout the year



## Features

Tomatoes are cultivated throughout Wakayama, especially in the central parts of the prefecture. Most of the tomato varieties containing high sugar content are cultivated with thorough water management. Cherry tomatoes contain  $\beta$ -carotene, vitamin C, citric acid, potassium, lycopene, rutin,  $\gamma$ -aminobutyric acid, etc.

## Nutritional value <per 100 g>

Energy	29 kcal	Sodium	4 mg
Protein	1.1 g	Vitamin C	32 mg
Fats	0.1 g	$\beta$ -Carotene	960 $\mu$ g
Carbohydrates	7.2 g	Potassium	290 mg

Cherry Tomatoes/Fruit, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Have antioxidant effects!

#### $\beta$ -Carotene

Beta-Carotene is a type of carotenoids and a yellow-orange pigment found in plants. In animal bodies it is converted to and then used as vitamin A. It also has antioxidant effects.

### Has skin beautifying effects!

#### Lycopene

Lycopene is a type of carotenoids and a red pigment found in plant foods. It does not function as Vitamin A, but has strong antioxidant effects.

### Improves blood flow! / Prevent hypertension!

#### Rutin

Rutin is a type of polyphenols. It supports in Vitamin C function by promoting Vitamin C absorption and inhibiting oxidation. It helps to strengthen capillary blood vessels and is effective in preventing high blood pressure.

### Has relaxing effects! / Prevent hypertension!

#### $\gamma$ -Aminobutyric acid

Gamma - Aminobutyric acid is a type of amino acid. It is also known as GABA. The relaxing effect, blood sugar level control and hypotensive action of this compound is expected to prevent lifestyle diseases.

#### Citations

Vitamin C, lycopene, rutin,  $\gamma$ -aminobutyric acid:

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition



# Usui peas (Garen peas)

## Production and properties

Main production areas	Inami town, Hidakagawa town, Minabe town, etc.
Yield	2,740 t (2017)
Harvest time	Mid-November to late May



## Features

Wakayama is the top producer of usui-endo (green peas) in Japan, and they are cultivated in the warm climate and fertile fields along the coast. The peas including original varieties developed by Wakayama Prefecture such as the Kishu-usui and Kino-kagayaki are produced and shipped out between mid-November to late May. They are a popular spring vegetable in the Kansai region of Japan.

This variety of garden peas contain protein, vitamin B<sub>1</sub>, iron, phosphorus and insoluble dietary fiber.

## Nutritional value <per 100 g>

Energy	93 kcal	Sodium	1 mg
Protein	6.9 g	Total dietary fiber	1.7 mg
Fats	0.4 g	Phosphorus	120 mg
Carbohydrates	15.3 g	Total amount of dietary fiber	7.7 g



(Garden peas) Green peas Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

## Main nutrients and their benefits

### Helps recovery from fatigue!

#### Vitamin B<sub>1</sub>

Vitamin B<sub>1</sub> is a water-soluble vitamin. Stimulates carbohydrate metabolism to generate energy.

### Prevents anemia!

#### Iron

Usui peas contain non-heme iron. The absorption efficiency is low compared to heme iron in meat and fish, but it can be improved when consumed with vitamin C, citric acid or animal proteins.

### Prevents constipation!

#### Insoluble dietary fiber

Insoluble dietary fiber slows down the digestion and absorption of dietary sugar, suppressing the sudden rise in blood sugar level after meals. The dietary fiber swelling in digestive juices prevents constipation by promoting peristalsis of the digestive tract.

It also helps prevent colon cancer.

#### Citations

Vitamin B<sub>1</sub>, iron, insoluble dietary fiber

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# Young ginger

## Production and properties

Main production areas	Wakayama city
Yield	2,890 t (2016)
Harvest time	Mid-June to early October



## Features

Young ginger, mostly cultivated in the sandy soil along the Wakayama city coast, has a refreshing white and pink contrast, a fresh fragrance, and is known for its firmness.

Young ginger contains both shogaol and zingerone.

## Nutritional value <per 100 g>

Energy	30 kcal	Sodium	6 mg
Protein	0.9 g	Manganese	5.01 mg
Fats	0.3 g	Potassium	270 mg
Carbohydrates	6.6 g		

Ginger

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

**Prevents food poisoning! / Increases appetite!  
Promotes blood flow! / Has anti-inflammatory effects!**

### Shogaol

Shogaol is a type of polyphenol. This is the spicy and fragrant component of ginger. When drying or heating ginger, the gingerol contained in ginger changes, and shogaol is produced.

It has antioxidant and bactericidal effects.

Furthermore, by controlling coagulation of blood and promoting blood circulation, it spreads blood through the entire body, increasing thermogenesis in and warming the deep parts of the body. By stimulating the secretion of gastric juices, it aids digestion and increases appetite. It has anti-inflammatory effects and can also relieve headaches, etc. Shogaol is also considered to be effective in relieving menstrual cramps.

**Promotes blood flow! / Prevent food poisoning!**

### Zingerone

Zingerone is a type of polyphenol. This is the spicy and fragrant component of ginger. When drying or heating ginger, the gingerol contained in ginger changes and zingerone is produced.

It improves blood flow and warms the body. By warming the body, it activates the peristalsis of the large intestine and alleviates constipation.

It is effective on initial symptoms of cold, cold sensitivity, and cystitis caused by cold sensitivity. Zingerone also has strong bactericidal properties and prevents food poisoning.

## Citations

Shogaol, zingerone

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# Whitebait

## Fish catch and properties

Main fishing sites	IKii Channel, etc.
Landing	2,277 t (2017)
Fishing season	Spring and Autumn(March to May and September to October)



## Features

The young sardines reared the mineral-rich sea of Wakayama are caught and processed into whitebait boiled near the beach.

Whitebait contains vitamin D, calcium and high quality proteins. "Chirimen-jako," dried whitebait, is high in calcium as compared to whitebait and allows for efficient intake of calcium.

A whitebaitrice bowl served with Wakayama's specialties of umeboshi and soy sauce served with a whitebait rice bowl is delicious as well as nutritionally well-balanced.

## Nutritional value <per 100 g>

Energy	76 kcal	Sodium	380 mg
Protein	15.0 g	Vitamin D	6.7 µg
Fats	1.3 g	Calcium	210 mg
Carbohydrates	0.1 g		

Seafood/(Sardines)/Whitebait/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Builds strong bones!

#### Vitamin D

Vitamin D is a type of fat - soluble vitamin. This vitamin is abundantly found in fish and mushrooms. It gets converted into active Vitamin D in the kidney, promoting absorption of calcium and phosphorus from your food in the small intestine and aiding in bone formation.

### Builds strong bones!

#### Calcium

Calcium is a type of mineral. Calcium in your body exists in your bones, cells and blood. Bones serve as a reservoir of calcium. The calcium in your blood is necessary for sustaining life, as it sends signals to your muscles to contract and blood to coagulate. It also stimulates nerves. As the calcium content in your blood decreases, the calcium from your bones is released into the blood to make up for the shortage.

Bones are constantly being regenerated to maintain their firmness and flexibility. They are made of deposits of calcium on a protein named collagen. Sufficient calcium intake is necessary for strong bones.

#### Citations

Vitamin D, calcium:

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

## Tuna

### Fish catch and properties

Main fishing sites	Kuroshio current region, etc.
Landing	9,279 t (2017)
The volume is based on landings from the Katsuura fishing port.	
Fishing season	Throughout the year



### Features

The Katsuura fishing port in Nachikatsuura town of Wakayama is one of the few Japanese ports with the large catch of fresh tuna, and has obtained a regional collective trademark "Kishu Katsuura Tuna." The types of tuna caught here include Albacore, Bluefin, Bigeye, and Yellowfin, etc.

Albacore tuna fished between December and February is characterized by its chewy meat with a tasty layer of fat. It contains Taurine and Selenium in addition to an umami component, inosinic acid. The fish fat contains IPA and DHA.

### Nutritional value <per 100 g>

Energy	117 kcal	Sodium	38 mg
Protein	26.0 g	Selenium	71 µg
Fats	0.7 g	Icosapentaenoic acid	43 mg
Carbohydrates	0.2 g	Docosahexaenoic acid	140 mg

Seafood/(Tuna)/Albacore/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



### Main nutrients and their benefits

#### Has antioxidant effects!

#### Selenium

Selenium is a component of antioxidant enzymes and breaks up active oxygen.

The effects are thought to enhance when consumed with Vitamin E, which has the same antioxidant effects.

#### Digests fats!

#### Taurine

Taurine is a type of amino acid. Taurine binds with bile acid, a component of bile, and contributes to digestion of fats as taurocholic acid. It also functions as a neurotransmitter.

#### Citations

Selenium, taurine:

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

**Eyesight recovery! / Prevents thrombosis and arteriosclerosis!  
Activates the brain! / Prevents lifestyle diseases!**

**Icosapentaenoic acid**

Abbreviated as IPA, it is one of the n-3 series polyunsaturated fatty acids. It is also known as Eicosapentaenoic acid (EPA). IPA controls rise in the amount of neutral fat present in the blood. The biologically active substances made from IPA have been proven to inhibit platelet aggregation, thus preventing thrombogenesis and arteriosclerosis. These substances also have anti-inflammatory and anti-allergic properties. IPA also prevents age-related macular degeneration<sup>1)</sup>.

**Docosahexaenoic acid**

Abbreviated as DHA, it is one of the n-3 polyunsaturated fatty acids. By controlling the rise in blood cholesterol level and LDL cholesterol level, it increases the amount of HDL cholesterol in the blood and helps prevent arteriosclerosis. Also, the hippocampus region of the brain which controls our memory contains high volumes of DHA, which improves our memory and learning ability. It also prevents age-related macular degeneration<sup>1)</sup>.

Citations

Icosapentaenoic acid, Docosahexaenoic acid  
"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition  
1) Age-related macular degeneration: A disease that affects the function of the macular part of the retina, thereby deteriorating the eyesight. The prevalence of this disease is inversely related to the intake of the n-3 series polyunsaturated fatty acids.

**Many sea foods other than tuna also contain IPA and DHA.**



**Bonito**



**Horse mackerel**



**Mackerel**



**Hairtail**



**Chicken grunt**



**Cetacean**

## Bonito

### Fish catch and properties

Main fishing sites	Kinan open sea
Landing	462 t (2017)
Fishing season	Nobori-Gatsuo (Bonito): February to May Modori-Gatsuo (Bonito): September to November



### Features

Bonitoes migrating along the Kuroshio Current to the Kinan open sea in spring are called nobori-gatsuo, and bonitoes migrating to the south in autumn are called modori-gatsuo.

They are caught by a fish trolling method, locally known as Kenken fishing. Right after they are caught, their blood is drained while they are still alive. Later they are stored in ice at the appropriate temperatures and then sold under the brands "Susami Kenken Bonito" and "Shorasan Bonito".

Bonitos contain inosinic acid, Vitamin D and Vitamin B6. The dark red parts of the meat also contains Vitamin B12 and iron. The fat of modori-gatsuo is high in IPA and DHA.

### Nutritional value <per 100 g>

Energy	114 kcal	Sodium	43 mg
Protein	25.8 g	Vitamin B6	0.76 mg
Fats	0.5 g	Vitamin B12	8.4 µg
Carbohydrates	0.1 g	Iron	1.9 mg

Seafood/(Bonito)/Bonito/Spring Catch, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



### Main nutrients and their benefits

#### Aids protein metabolism!

#### Vitamin B<sub>6</sub>

It is a water soluble vitamin. Vitamin B<sub>6</sub> is related to protein metabolism, hemoglobin synthesis, neurotransmitter (γ-aminobutyric acid) synthesis, and immunity, etc.

#### Induces Hematopoiesis! / Prevents arteriosclerosis!

#### Vitamin B<sub>12</sub>

Vitamin B<sub>12</sub> is a water soluble vitamin. Together with folic acid, it takes part in nucleic acid and methionine syntheses. It also aids in the formation of red blood cells and stimulates the synthesis of intraneuronal nucleic acids and proteins, helping to maintain the functions of the nervous system.

#### Prevents anemia!

#### Iron

Iron is a nutrient required for making red blood corpuscles. It is especially rich in the dark red parts of the meat near the backbone.

#### Citations

Vitamin B<sub>6</sub>, Vitamin B<sub>12</sub>

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

Iron

"Information System on Safety and Effectiveness of Health Food", National Institute of Health and Nutrition

# Horse mackerel, Mackerel



## Fish catch and properties

Main fishing sites	From the Kii Channel to the Kinan open sea
Landing	Total horse mackerel (jack mackerel, amberfish, etc.): 4,123 t (2017) Total mackerel (chub mackerel, blue mackerel, etc.): 3,768 t (2017)
Fishing season	Jack mackerel: February to September, Amberfish: October to May, Chub mackerel and Blue mackerel: September to November

## Features

Summer is the best season to catch jack mackerel in the Kii Channel, while autumn to winter is the best for amberfish. Fresh mackerels (chub mackerel and blue mackerel) have the highest fat content from autumn to winter. In addition to mackerel sashimi (raw), minced or grilled mackerel, "Narezushi" is a rare and famous local method of preparation.

Horse mackerel and mackerel contain high quality proteins, IPA, and DHA.

## Nutritional value <per 100 g>

### Horse mackerel

Energy	126 kcal	Sodium	130 mg
Protein	19.7 g	Vitamin D	8.9 µg
Fats	4.5 g	Icosapentaenoic acid	300 mg
Carbohydrates	0.1 g	Docosahexaenoic acid	570 mg

Seafood/(Horse Mackerel)/Jack Mackerel/With Skin/Raw  
Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 -  
(Seventh Revised Edition)

### Mackerel

Energy	247 kcal	Sodium	110 mg
Protein	20.6 g	Selenium	70 µg
Fats	16.8 g	Icosapentaenoic acid	690 mg
Carbohydrates	0.3 g	Docosahexaenoic acid	970 mg

Seafood/(Mackerel)/Mackerel/Raw  
Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 -  
(Seventh Revised Edition)



## Main nutrients and their benefits

### Actively involved in protein synthesis!

#### High-quality proteins

Proteins are built from approximately 20 types of amino acids. Of those, nine are considered to be essential amino acids that cannot be synthesized in the body or are synthesized too slowly to meet the biological demand. Hence, they need to be obtained from food.

High quality proteins refers to the proteins that synthesize the body proteins and contain a balanced and sufficient amount of the nine essential amino acids. If the diet lacks a single essential amino acid, there will be no protein synthesis in the body, and all other amino acids will be used only as energy.

#### Citations

High-quality proteins

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

## Hairtail

### Fish catch and properties

Main fishing sites	Kii Channel
Landing	685 t (2017)
Fishing season	Throughout the year



### Features

Hairtails grow well in the Kii Channel. Their flesh are white and firm, and have a light taste despite the fat content.

In addition to being made into sashimi, they are used in a mirin-dried form or as an ingredient for kamaboko. A study conducted by the Wakayama Prefecture's Fisheries Experimental Station in 2014 showed that hairtails caught in winter have a high fat content and are rich in IPA as well as DHA, whereas those caught in summer have high amounts of glutamic acid.

### Nutritional value <per 100 g>

Energy	266 kcal	Sodium	88 mg
Protein	16.5 g	Glutamic acid	2,500 µg
Fats	20.9 g	Icosapentaenoic acid	970 mg
Carbohydrates	Tr	Docosahexaenoic acid	1,440 mg
		Vitamin D	14 mg



Seafood/Hairtail/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

### Main nutrients and their benefits

#### Has relaxing effects!

#### Glutamic acid

It is a type of amino acid. This component of amino acid imparts umami to the food. Inside our body, it contributes to memory and learning as a neurotransmitter, and is also related to the production of  $\gamma$ -aminobutyric acid (GABA), which has calming and relaxing effects on the brain. Glutamic acid also has ammonia detoxification and diuretic effects, and is also reported to be lowering the blood pressure.

#### Builds strong bones

#### Vitamin D

Vitamin D is a type of fat - soluble vitamin. This vitamin is abundantly found in fish and mushrooms. It gets converted into active Vitamin D in the kidney, promoting absorption of calcium and phosphorus from your food in the small intestine and aiding in bone formation.

#### Citations

Glutamic acid, Vitamin D

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition



# Chicken grunt

## Fish catch and properties

Main fishing sites	Kii Channel, Pacific Ocean
Landing	165 t (2017)
Fishing season	Throughout the year



## Features

The chicken grunt, which lives between the Kichu and Kinan shores, is said to be comparable in flavor to red sea bream when served as "Mugiwara Chicken Grunt" sashimi in early summer. This white fish is known for its rich fat and high Vitamin A content.

A study conducted by the Wakayama Prefecture's Fisheries Experimental Station in 2014 showed that the chicken grunts contain ample of fat, IPA, and DHA in the winter and high amounts of glutamic acid in the summer.

## Nutritional value <per 100 g>

Energy	127 kcal	Sodium	160 mg
Protein	17.2 g	Vitamin A	41 µg
Fats	5.7 g	Glutamic acid	2,500 mg
Carbohydrates	0.1 g	Icosapentaenoic acid	350 mg
		Docosahexaenoic acid	810 mg

Seafood/Chicken Grunt/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their nutritional benefits

### Improves the vision! / Improves skin health!

#### Vitamin A

Vitamin A (retinol) is a fat-soluble vitamin. It maintains the functions of the skin and membrana mucosa and prevents drying. By blocking the pathogenic bacteria and viruses, it prevents the body from contracting infectious diseases. It also improves eye function and has cancer-suppressing effects.

### Has relaxing effects!

#### Glutamic acid

Glutamic acid is a type of amino acid. This component of amino acid imparts umami to the food. Inside our body, it contributes to memory and learning as a neurotransmitter, and is also related to the production of γ-aminobutyric acid (GABA), which has calming and relaxing effects on the brain. Glutamic acid also has ammonia detoxification and diuretic effects, and is also reported to be lowering the blood pressure.

#### Citations

Vitamin A, glutamic acid

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

## Cetacean

### Fish catch and properties

Main fishing sites	Pacific ocean
Landing	150 t (2017)
The volume is based on the total landings of small marine mammals.	
Fishing season	Throughout the year



### Features

Taiji town, Higashimuro-gun is known as the ancient whaling site in Japan, where whale dishes have been an important staple in the local diet for a long time.

The red meat of whale is lower in fat and richer in proteins as compared to that of beef, pork or chicken with low lipid content. The fat is rich in  $\alpha$ -linolenic acid, IPA and DHA. However, each part of the fish contains nutrients significantly different from those in the other parts.

### Nutritional value <per 100 g>

#### Red meat

Energy	106 kcal	Sodium	62 mg
Protein	24.1 g	Iron	2.5 mg
Fats	0.4 g	Icosapentaenoic acid	25 mg
Carbohydrates	0.2 g	Docosahexaenoic acid	12 mg

Meat/Whale/Meat, Red Meat, Raw

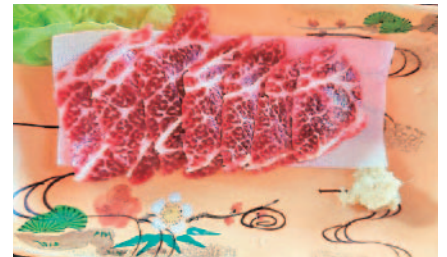
Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

#### Skin

Energy	689 kcal	Sodium	59 mg
Protein	9.7 g	Selenium	0.2 mg
Fats	68.8 g	Icosapentaenoic acid	4,300 mg
Carbohydrates	0.2 g	Docosahexaenoic acid	3,400 mg

Meat/Whale/Skin, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



The quality of meat depends entirely on the type and part of the animal

### Main nutrients and their benefits

### Prevents lifestyle diseases!

#### $\alpha$ -linolenic acid

This is one of the n-3 series polyunsaturated fatty acids<sup>1)</sup>. Being an essential fatty acid<sup>2)</sup> that cannot be biosynthesized in the body, its dietary intake is a must.

This fatty acid is found in many plant oils such as perilla oil and linseed oil. However, it is also found in large quantities in whale skin. It suppresses the rise of level of neutral fat in the blood and blood pressure and helps prevent thrombogenesis.

#### Citations

$\alpha$ -linolenic acid

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

1)n-3 series polyunsaturated fatty acids: Fatty acids with two or more double bonds are called polyunsaturated fatty acids and depending on the position of the double bond, they are categorized to be belonging to either n-3 or n-6 series.

2)Essential fatty acids refers to  $\alpha$ -linolenic, linolic acid and arachidonic acid.

# Kishu Ume Chicken

## Production and properties

Main production areas	Aridagawa town Hidakagawa town, etc.
Amount of production	4,350 t (2018)
Production season	Throughout the year



## Features

Kishu ume chickens are raised on the feed that includes ume vinegar (umesu), byproduct of umeboshi. As the ume vinegar (umesu) reduces the visceral fat, the poultrys are raised healthy. They are almost free of the smell typical of chicken and have a pleasing texture and delicious taste.

The chicken won the best prestigious award in the "Free-range/Brand Chicken Taste Contest" held at the 2008 Japan Meat Industry Fair, and the second prize at the 2015 Grand Champion Competition.

It contains various nutrients such as fatty acids, amino acids, and high quality proteins.

## Nutritional value <per 100 g>

Energy	145 kcal	Sodium	42 mg
Protein	21.3 g	Oleic acid	2,670 mg
Fats	5.9 g	Linolic acid	850 mg
Carbohydrates	0.1 g	Methionine	550 mg

Chicken/[Chicken Meat]/Breast/With Skin, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Prevents arteriosclerosis!

#### Oleic acid

It is one of the monounsaturated fatty acids. Oleic acid suppresses the rise in blood cholesterol level and LDL-cholesterol level without affecting the amount of HDL-cholesterol in the blood. As the Oleic acid does not oxidize easily, it does not generate peroxidized fat, and thus prevents arteriosclerosis, aging process and cancer.

### Supplies the essential fatty acids!

#### Linolic acid

Linolic acid is one of the n-6 polyunsaturated fatty acids, and belongs to the group of the essential fatty acids. However, while suppressing the rise in blood cholesterol level and LDL-cholesterol level, it also lowers blood HDL-cholesterol level. It oxidizes easily and excessive intake generates peroxidized fat, which leads to arteriosclerosis, aging and cancer.

### Protects liver function!

#### Methionine

Methionine is a type of essential amino acid. Methionine expels toxins and waste outside the body, protecting liver function, and inhibits accumulation of lipids in the liver, reducing risk of fatty liver and hepatic cirrhosis. It also acts as an anti-allergen, inhibits aging of cells and improves the immunity.

#### Citations

Oleic acid, linolic acid, methionine

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

## Kishu Ume Eggs

### Production and properties

Main production areas	Kinokawa City, Wakayama city, etc.
Amount of production	144 t (2018)
Production season	Throughout the year



### Features

Egg-laying hens fed on umesu (ume vinegar) are healthy and lay more eggs. These eggs are characterized by bulging egg whites.

The results of the tests conducted at the Wakayama Prefecture's Livestock Experiment Station show that the Kishu Ume Eggs contain various nutrients including high-quality protein, and are richer in vitamin A, folic acid and pantothenic acid than dinary eggs.

### Nutritional value <per 100 g>

Energy	151 kcal	Sodium	140 mg
Protein	12.3 g	Retinol	140 µg
Fats	10.3 g	Folic acid	43 µg
Carbohydrates	0.3 g	Pantothenic acid	1.45 mg

Chicken Eggs/Whole Eggs/Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



### Main nutrients and their nutritional benefits

#### Improves the vision! / Improves skin health!

#### Vitamin A

Vitamin A (retinol) is one of the fat-soluble vitamins. It maintains the functions of the skin and mucous membrane and prevents drying. By blocking the pathogenic bacteria and viruses, it prevents the body from infectious diseases. It improves the function of eyes.

It also has cancer-suppressing effects.

#### Induces Hematopoiesis! / Prevents arteriosclerosis!

#### Folic acid

It is one of water-soluble vitamin. Folic acid is instrumental in nucleic acid synthesis, and synthesizing methionin, one of the amino acids, from homocysteine. Thus, the deficiency of folic acid causes difficulties in synthesis of red blood corpuscles, which leadsto megaloblastic anemia. Folic acid deficiency of pregnant women may cause infant neural tube defects and heart failure.

#### Improves skin health!

#### Pantothenic acid

Pantothenic acid is one of the a water-soluble vitamins. Pantothenic acid is responsible for burning sugars, fats and proteins to generate energy. When you are stressed, it stimulates the synthesis of adrenocortical hormone, improving stress resistance. It promotes the synthesis of HDL-cholesterol and prevents arteriosclerosis. Pantothenic acid helps the effects of vitamin C, stimulates collagen synthesis, and maintains skin healthy.

#### Citations

Vitamin A, folic acid, pantothenic acid

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

# Wakayama Gibier (meat of deer and wild boar)

## Production and properties

Main production areas	Kozagawa town, Hidakagawa town, Wakayama city
Amount of production	1,785 animals (2017)
Production season	Throughout the year



## Features

The meat of boar and deer hunted in Wakayama Prefecture and processed appropriately at a certified facility is branded as "Wakayama Gibier."

The prefecture also boasts the first-ever meat grading in Japan, and allows you to select product suitable for each application. Venison is low in fat, high in protein and contains high amounts of iron.

Boar meat is rich in taurine, Vitamin B<sub>1</sub> and B<sub>6</sub>.

## Nutritional value <per 100 g>

### Deer meat

Energy	140 kcal	Sodium	55 mg
Protein	23.9 g	Iron	3.9 mg
Fats	4.0 g	Calcium	4 mg
Carbohydrates	0.3 g		

Meat/Deer/Japanese deer/Red meat, raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)

### Boar meat

Energy	268 kcal	Sodium	45 mg
Protein	18.8 g	Vitamin B <sub>1</sub>	0.24 mg
Fats	19.8 g	Vitamin B <sub>6</sub>	0.35 mg
Carbohydrates	0.5 g	Linolic acid	2,300 mg

Meat/Boar/Meat, Fatty Meat, Raw

Source: STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2015 - (Seventh Revised Edition)



## Main nutrients and their benefits

### Prevents anemia!

#### Iron

Iron is a type of mineral. The iron found in venison is heme iron, which is easier to absorb than nonheme iron, which is found in green and yellow vegetables. Inside our body, iron exists as hemoglobin in red blood corpuscles, enzymes such as myoglobin, cytochrome and catalase in muscles, and ferritin in the liver.

### Helps overcome fatigue!

#### Vitamin B<sub>1</sub>

Vitamin B<sub>1</sub> stimulates the metabolism of carbohydrates to generate energy.

#### Citations

Iron and Vitamin B<sub>1</sub>

"Karada ni Oishii Atarashii Eiyogaku", compiled under the supervision of Kiyoko Yoshida, Honorary Professor, Kagawa Nutrition University, and Sanae Matsuda, Professor, Junior College, Kagawa Education Institute of Nutrition

## Nutrients Revers Lookup List

Category	Nutrients/Composition	Major functions	Foods that include mainly the components performing the functions listed in the left column
Proteins	High-quality proteins	Actively involved in protein synthesis	Whitebait, Horse Mackerel/Mackerel, Kishu Ume Chicken, Kishu Ume Eggs
Amino acids	$\gamma$ -aminobutyric acid	Has relaxing effects, prevents hypertension	Cherry tomatoes
	Glutamic acid	Has relaxing effects	Hairtail, chicken grunt
	Methionine	Protects the liver function	Kishu Ume Chicken
Organic acids	Oleanolic acid	Prevents diabetes	Ume
	Citric acid	Prevents arteriosclerosis, purify blood purifying properties, prevent food poisoning, prevent osteoporosis, help in recovery from fatigue	Ume, yuzu, cherry tomatoes
	Limonene	Has antioxidant effects	Yuzu
Unsaturated fatty acids	Icosapentaenoic acid	Restores the eyesight, prevents thrombosis and arteriosclerosis, activates the brain, prevents the lifestyle diseases	Albacore tuna, Japanese horse mackerel, mackerel, hairtail, chicken grunt and cetaceans
	Oleic acid	Prevents arteriosclerosis	Kishu Ume Chicken
	Docosahexaenoic acid	Restores the eyesight, prevents thrombosis and arteriosclerosis, activates the brain, prevents the lifestyle diseases	Albacore tuna, Japanese horse mackerel, mackerel, hairtail, chicken grunt and cetaceans
	Linolic acid	Supplies the essential fatty acids!	Kishu Ume Chicken
	$\alpha$ -linolenic acid	Prevents lifestyle diseases	Cetacean
Dietary fiber	Water-soluble dietary fiber (pectin)	Improves your intestinal environment	Mikan, peach, fig
	Insoluble dietary fiber	Prevents constipation	Kiwifruit, Usui peas
Minerals	Potassium	Prevents hypertension	Ume, peach, fig, kiwifruit, fig, strawberries, cherry tomatoes
	Calcium	Creates strong bones	Whitebait
	Selenium	Has antioxidant effects	Albacore tuna
	Iron	Prevents anemia!	Usui peas, bonito, deer meat (Wakayama Gibier)
Fat-soluble vitamins	Vitamin A	Maintains healthy eye functions and healthy skin	Chicken grunt, Kishu Ume Eggs
	Vitamin D	Creates strong bones	Whitebait, bonito, hairtail
	Vitamin E	Has antioxidant effects	Peach, kiwifruit, cherry tomatoes
Carotenoid	Lycopene	Has skin beautifying effects	Cherry tomatoes
	$\beta$ -Carotene	Has antioxidant effects	Ume, kaki, kiwifruit, cherry tomatoes
	$\beta$ -cryptoxanthin	Creates strong bones, suppresses cancer	Mikan, kaki
Water-soluble vitamins	Pantothenic acid	Improves skin health!	Kishu Ume Eggs
	Vitamin B <sub>1</sub>	Helps recovery from fatigue	Usui peas, wild boar meat (Wakayama Gibier)
	Vitamin B <sub>6</sub>	Aids protein metabolism	Bonito, wild boar meat (Wakayama Gibier)
	Vitamin B <sub>12</sub>	Prevents hematopoiesis and arteriosclerosis	Bonito
	Vitamin C	Has antioxidant and skin beautifying effects, prevents osteoporosis, fights stress	Mikan, yuzu, kaki, kiwifruit, cherry tomatoes, strawberries
	Folic acid	Prevents hematopoiesis and arteriosclerosis	Strawberry, Kishu Ume Egg
Polyphenols	Anthocyanin	Has antioxidant effects and improves eye strain	Peach, fig, strawberry
	Ume polyphenols	Prevents influenza infections	Ume
	Catechin	Prevents lifestyle diseases	Peach
	Sanshool	Reduces salt intake, prevent hypertension	Japanese "Sansho" pepper
	Shogaol	Prevents food poisoning, increase appetite, promotes blood flow and has anti-inflammatory effects	Young ginger
	Syringaresinol	Prevents stomach cancer	Ume
	Zingerone	Promotes blood flow, prevent food poisoning	Young ginger
	Tannins	Has antioxidant effects and intestine regulating function	Kaki
	Narirutin	Suppresses allergies	Jabara
	Vanillin	Burns fat	Ume
	Hesperidin	Prevents lifestyle diseases	Mikan, yuzu
	Rutin	Prevents hypertension and improve blood flow	Cherry tomatoes
Others	Actinidine	Promotes protein digestion!	Kiwifruit
	Taurine	Digest fats	Albacore tuna, wild boar meat (Wakayama Gibier)

## **Regarding the supervision of the Wakayama Functional Food Guide**

Aya Kagawa, one of the founders of this school, is from Wakayama prefecture. Our school has deep ties with Wakayama. While Aya Kagawa was a physician, while working as a doctor, she realized the importance of diet in disease prevention as well as in the maintenance and promotion of good health. This school was founded to succeed her mission and reflect her ideology even today. As a student of this school, I convey the importance of food not only to our students, but also to the general population. I was honored to be involved, even in a small way, in the creation of this health handbook that features the health foods from Wakayama prefecture with which we share an eternal bonding.

Today, we are in the face of the risks of various health problems through each life stage, such as childhood obesity, excessively thin young girls, metabolic syndrome owing to obesity in adolescents and adults, diabetes, hypertension, hyperlipidemia, lifestyle diseases such as the chronic kidney disease, malnutrition, sarcopenia<sup>1)</sup> and frailty<sup>2)</sup> in the elderly population. This has not only created a broad gap in the average life expectancy and healthy life but also resulted in a huge burden of medical fees. The major cause of these health problems is nutrition. In the nutrition and food science field, mysteries of functional components have been clarified with the hope that it will help solve these health problems.

While creating this handbook, I got opportunities to relearn that Wakayama prefecture is gifted with natural foods from the mountains and ocean, rich in functional components. Eating foods with a good nutritional balance is at the core of maintaining and promoting good health and preventing lifestyle diseases. I hope that this book will help the readers to live a spiritually and physically healthy life by having enjoyable conversations about food at dinner table with fresh foods from mountain and sea of Wakayama Prefecture.

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1) Sarcopenia

This refers to the reduced skeletal muscle mass, weakening of muscles and reduced body function that accompanies aging.

2) Frailty

This refers to a state of being susceptible to a variety of health problems (hampered ADLs, need for long-term care, onset of disease, hospitalization) due to reduction in the functional fitness with aging.

# Wakayama Locality map



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This pamphlet is a compilation of highly reliable data published by the national government for the purpose of disseminating knowledge regarding the fascinating farm and marine products from Wakayama Prefecture.

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