KOMBU

*Laminaria japonica*

**Family:** Laminariaceae

**Names:** laminaria, Brown Seaweed, Seaweed, Marine Algae, Kelp, limu, haidan, kun bu sea tangle; makombu (Japan), shinori-kombu (Japan), hababiro-kombu (Japan), oki-kombu (Japan), uchi kombu (Japan), moto-kombu (Japan), minmaya-kombu (Japan), ebisume (Japan), hirome (Japan), umiyama-kombu (Japan), hai dai (China), hai t'ai (China), kunpu (China), hae tae (Korea), tasima (Korea).

**Description:** A massive seaweed of the giant kelp family. Holdfast well-developed, branched; growing attached to shoreline rocks. Stalk fluxuous, slender, short. Blade well-developed, several meters long, brown leather. The best species of kombu grow in the cool precoastal waters of the northern-most Japanese island of Hokkaido. Their broad, sweet-tasting, thalli (leaves) grow up to thirty-three feet long.

**Cultivation:** *Laminaria japonica* is the most important economic seaweed in China. Mariculture on artificial floating rafts started in 1952 and production increased steadily until 1980 when the highest production of 252,907 dry tons (about 1,500,000 wet tons) were achieved. In the late 1980s, the cultivation area and total yield declined due to the development of shellfish culture as farmers preferred cultivating shellfish to kelp. Currently, the yield of kelp seems to be about 700,000 dry tons, amounting to some 3,500,000 wet tons, but precise figures are difficult to get.

The first step consists in the collection of the zoospores onto the seeding cords. To do this fronds with mature sporangial sori are subjected to partial drying in the air and then placed in a small container with seawater. The liberated zoospores readily attach themselves to the the seeding cords. The gametophytes and early sporophytes are cultured in water of 43–46°F in glasshouse for about three months, by which time the juvenile sporophytes are 2–3 cm in length.

When the water temperature has dropped to about 68°F, sporeling cords are removed from the glasshouse and on floating rafts. In a month or so, the sporelings will have grown to juveniles of 10–15 cm or longer. These juvenile sporophytes will be eventually brought to the transplanting room and placed in tanks filled with seawater. Due to their fast growth on the cords they are thinned. Plants are removed from the original sporeling cord and inserted in the twists of the kelp ropes, at a density of about 30 juveniles to each rope of 2 m.

There are two basic floating-raft kelp cultivation methods. One is the hanging-kelp rope (also called single-raft) cultivation
method. The other is the horizontal kelp rope (also called double-raft) cultivation method. The floating line, about 60 meters long, floated at the surface by buoys generally made of glass or plastics and anchored terminally by anchoring lines to wooden pegs driven into the sea bottom. Each kelp rope has about 30 plants twisted in it and is about 2 m in length. In the single-raft method, the kelp ropes are hung down from floating line and weighted down by a small piece of stone. In the double-raft method, the two kelp ropes are linked or tied together at one end and the other ends tied to floating lines. The hanging kelp rope method has the advantage of better water movement but has the defect of uneven growth of kelps. The horizontal kelp rope method gives an even growth of kelp. However, it has the disadvantage of being more resistant to water motion. Generally, the single-raft method is better adapted to comparatively clearer water regions, and the double-raft method to turbid regions with lower water transparency, such as the Zhejiang coast.

Harvesting takes place when the fronds are mature. The time for harvesting is important to kelp farmers. Since Laminaria is sold on the market on the basis of dry weight, and since the wet weight to dry weight ratio changes from month to month, the criterion for selecting harvest time must take into consideration the highest per-unit area production rate plus the lowest wet-to-dry ratio. In harvesting Laminaria, the kelp ropes are detached from the floating line, and collected in small boats, many of which are towed in a long line by a motor boat. When the boats reach the wharf or shore, the plants are transported to land and dried under the sun.

History: One of the major economic seaweeds, L. japonica has been used for centuries in China as a dietary iodine supplement to prevent goiter. In Europe, Laminaria has been a main source of alginate for quite some time. Alginates have been used in paints (for texture), film (as base) and food products (as an emulsifier). The seaweed was burned for its salt mixture content to be used in explosives in World War I and was also used in raw form as a feed supplement for horses during the same period. It is used as a food, principally in Asian countries, where it is valued for its flavor, mineral content, and health giving benefits.

Constituents: The dried seaweed contains iodine, alginic acid, mannite, iron, calcium, arsenic, Glyconutrients (Fucose, Galactose, Glucose, Mannose, N-Acetylglucosamine and Xylose. Polyphenols, Organic Iodine, polysaccharides (Fucans and Fucoidan)

Medicinal Uses: The ancient Chinese, prescribed for goiter a tincture and powder of these plants. Employed as alterative in the treatment of goiter and other iodine deficiencies. It is used to induce labor and abortion. Kombu possesses a strong anticancer activity and inhibits the growth of cancer. Studies have shown that a regular use of Laminaria japonica reduces risk of the breast cancer considerably.

Imbibition is employed in medicine to dilate the ear canals so they will drain properly. A slender porous cylinder called an "ear wick" is inserted into the blocked ear canal where it gradually imbibes water and swells. This same mechanism also involves one of the most unusual uses for brown algae. A slender cylinder of Laminaria japonica called "dilateria" is used to dilate the cervix in routine gynecological examinations. The cylinder of brown algae is inserted into the cervix where it imbibes water and swells. Laminaria has been preferred by many Japanese physicians for more than a century; they have found its gradual dilatation far less traumatic than the rapid dilatation induced by rigid dilators.’

As a dietary supplement, Laminaria is rich in several constituents that can be very beneficial to the health, aside from being a great natural source of iodine for the thyroid gland. It is high in calcium, potassium, magnesium, iron, and trace minerals such as manganese, copper, selenium, and zinc. It also provides chromium, which is instrumental in blood sugar control, and vitamins B1 and B2. Somewhat more interesting are the
polysaccharides. It contains alginates, laminarin, laminine, and fucoidan as well as a number of other polysaccharides and simple sugars. The alginates are adept at absorbing toxic heavy metals and radioactive isotopes from the body by binding with them in the gastrointestinal tract when they are present in the bile. Levels of dangerous metals like mercury, lead and aluminum can be significantly reduced in the body if Laminaria japonica is consumed on a regular basis for at least 4 months. This period of time is necessary, as it takes time for the body to cycle accumulated toxins into the bile. Laminaria has been used with great success in treating radiation sickness in the victims of the Chernobyl, Russia disaster via this mechanism.

Fucoidan, a sulphated fucopolysaccharide constituent is the subject of extensive research for its anticancer properties. Studies have shown fucoidan to be effective in stopping the growth of tumors, inducing cancer cell apoptosis (programmed cell death) in leukemia, stomach and colon cancer lines, and in interfering with metastasis by inhibiting interaction between tumor cells and the host tissue basement membrane. Laminarin, another constituent, has been found to assist with this process via a tumor angiogenesis blocking mechanism. Fucoidan also has some beneficial effects on the immune system. It enhances phagocytosis by macrophages, and helps to reduce inflammation.

Kombu is also excellent for the hair, skin and nails, taken either internally or applied topically in masks and creams. Because of its high mineral content and polysaccharides, the seaweed helps by adding important nutrients to the skin, and by removing toxins. In its extract form, this seaweed can be easily incorporated into a range of skin care products to help give the skin a silky smoothness.

**TCM:**
A cold, salty herb, it is prescribed to cleanse heat, resolve phlegm, and soften and disperse hard accumulations (goiters, for example). It is often used to control edema, as an expectorant and antitussive, and as a remedy for testicular pain and swelling. Despite its salty character, the herb is slightly hypotensive.

**Dosage:** 10-40 gm

**Toxicity:** Complications during the use of Laminaria for dilation of the cervix include cervical lacerations (tears to the cervix), endometriosis, and Laminaria fragments remaining in the cervix

**Culinary Uses:** In Japan, kombu is used in the preparation of fish, meat dishes, soups and also as a vegetable with rice. Powdered kombu is employed either in sauces and soups or is added to rice in the same way as curry. Some kinds are used in making an infusion similar to tea. In China, haidai is regarded as a health vegetable because of its mineral and vitamin content, especially in the north, where green vegetables are scarce in winter. It is usually cooked in soups with other ingredients. In Japan, it is used in everyday food, such as a seasoned and cooked kombu that is served with herring or sliced salmon. Suboshi kombu can be treated by placing it in a boiling solution of a dye, malachite green, to give it a dark green color, after which it is partly dried and then shredded with a plane; this is aokombu or green kombu. Kombu tea is like green kombu but shaved a second time so the shavings are like tea leaves. Other variations are used to produce different kombu types. In cooking, green kombu is boiled with meat, fish and soups. Powdered kombu is added to sauces and soups, and to rice. Green kombu and tea kombu are used to make a tea-like beverage.

Kombu is usually sold in 5 to 6-inch dried pieces and can be found in health food stores and Japanese groceries. It is also sold as nalto kombu (shredded kombu that cooks quickly), tororo kombu (vinegared, shaved kombu that needs little or no cooking), shio-kombu (boiled, soy sauce flavored kombu), kombu-zuke (lightly pickled kombu), and kombu-ko (powdered kombu that can be sprinkled on food or used in drinks).

Dried kombu needs to be simmered for at least 20 minutes to soften it and flavor the
liquid. If used only for flavoring stock, the kombu itself is removed from the simmer liquid at the end of cooking and discarded.

The taste is bitter and salty. It is used extensively in Japanese and Chinese cuisine. A rich stock (dashi) can be prepared from kelp because of its concentration of the flavor-enhancer glutamic acid. Umami was identified by the Japanese researcher Ikeda in 1908 as the taste in laminaria, used as a component of soup stocks in Japanese cuisine, and was associated with glutamate (monosodium L-glutamic acid). Later, ribonucleotides were discovered as having umami taste and also having a synergistic effect with glutamates that greatly enhance the perception of the umami taste. Umami is more prevalent and often found in higher concentrations in Asian cuisines. The umami taste in food can have an effect on taste elements of a wine that is served with it, bringing out bitter and often metallic tastes. The reaction between umami and wine can be negated by salty tastes in food.

Recipes:

**Dashi**

- 6 cups water
- 6 inches of kombu

Simmer kombu in water for half hour in uncovered pot. Remove kombu.

**Vegetable Stock**

A good start is to soak a 6” piece of kombu and a small handful of shiitake mushrooms in 3 qt of water overnight. Then simmer for as long as you can, at least 4 hours. You can use this as is for a soup stock. Cut up whatever veggies you like and add them. If you like a bit more depth, add some miso.

References: