

Chapter 6



Miso, Fermented Soybean-Barley Paste,
is the Source of our Power

Miso (味噌) is a common Japanese food and a seasoning. The first reference to *miso* appeared on the ancient Chinese text ‘Syu rai’ (周礼) around 700 BC. There is also a description about *miso* brewing in China’s oldest agricultural treatise, ‘*Qiming Yaoshu* (齐民要术)’. It says that a kind of *hishio* is made by steaming black soybeans and brewing them after adding barley *koji* and salt to them. Judging from these descriptions, the *hishio* must be *miso* and thus the origin of *miso* must be in China. However, we cannot find Chinese characters ‘味噌’ in this book. On the other hand, these Chinese characters are found in *Nihon-Sandai-Jitsuroku* (日本三代実録), an old Japanese book published in 901.

6.1 *Miso* is full of local colors

I will tell you about how to make *miso*. The common way of making *miso* is as follows; first, bean *koji*, rice *koji* and barley *koji* are made from soybeans, rice and barley, respectively, by inoculation of *koji* mold. The *miso-koji* mold is made with *Aspergillus oryzae*. Salt are added then to steamed or boiled soybeans, barely or rice. These mixtures are fermented under solid-state conditions and are ripened for several months at room temperature (Fig. 6.1). In some cases, a yeast, *Saccharomyces cerevisiae*, and lactic acid bacteria are used in addition to *koji* mold. The most common type of *miso* is made from soybeans by using the above-mentioned method. However, many kinds of it are produced with variations of the ingredients, the temperature and duration of fermentation, the salt content, variety of *koji*, and the fermentation vessel.

Miso is classified into rice *miso*, barley *miso* and bean *miso* according to the sorts and the mixed ratio of the ingredients. The duration of fermentation is about from one week to 20 months. The salt concentration is 5 to 13%. *Miso* becomes sweet if we increase the amount of *koji* and it becomes salty if we

decrease it. We sometimes hear, 'Aizu-miso', 'Edo-miso', 'Shinshu-miso', 'Echizen-miso', 'Aichi-miso', 'Huchu-miso', 'Goze-miso', etc. They are characteristic miso, which are full of local colors. Although these days traditional home-made *miso* has become a rarity, some people are making it even now, whereas a lot of *miso* is made by large fermentation factories now. Talking of home-made *miso*, there is a Japanese phrase, "Temae miso", meaning home-made miso. This phrase appeared in medieval times and is sometimes used even now, as a phrase of self-praise because everybody thinks that their home-made *miso* is the best. I heard that Korean people also say that their home-made *kimchi* is the best.

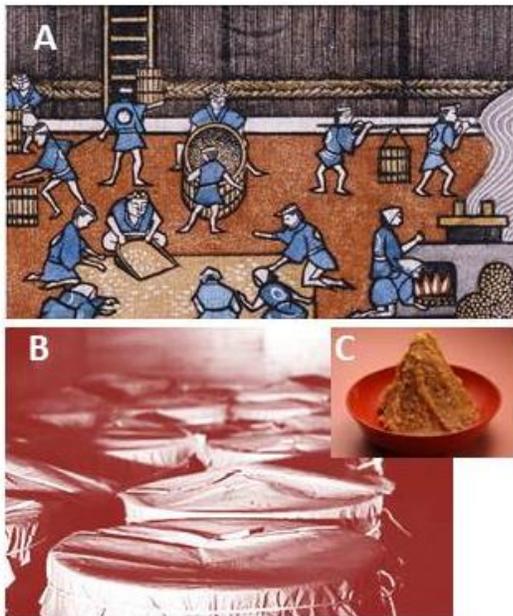


Fig. 6.1 Brewing of miso.

Miso is produced by fermentation of soybeans, rice and/or barley with *koji* mold under solid-state conditions and then mixed with salt. A, old painting of traditional *miso* production process; B, traditional fermentation in barrels; C, the typical product of a thick paste *miso*. (Miso-Kenko Zukuri Committee, <http://miso.or.jp>.)

6.2 Miso keeps the doctor away

The typical product is a thick paste that is used in *miso* soup, a Japanese culinary staple, which is prepared with vegetables, *tofu*, and dried sardines, seaweed or shellfish (Fig. 6.2). *Tofu* is pressed protein curds from steamed soybeans and is familiar in Asian countries and USA. Interesting epidemiological survey data about people who take *miso* soup were made public. As the data (Fig. 6.2) show, people who take *miso* soup every day reduce their risk of gastric cancer and live longer than those who don't take it, regardless of sex.



Fig. 6.2 Comparison of mortality rate between taking miso soup and non-taking it (left figure).

Miso soup is prepared with vegetable, *tofu*, dried sardines, seaweed and fish sausage, *kamaboko* (upper right), or shellfish (lower right). (Figure quoted from a report from the Miso Industries Association, Japan.)

While *miso* is fermented, proteins in the materials are degraded into peptides and amino acids by the enzymatic action of protease, which comes from *koji* mold. As a result, umami tastes and flavors are born and at the same time, starch is degraded into sugar by amylase and it becomes sweet. At the same time,

during the fermentation of *miso*, salt resistant yeasts, lactic acid bacteria and other microorganisms grow and they produce alcohol, lactic acid and other organic acids. As a result the flavor of *miso* is born. Thus, *miso* contains a high level of protein and is rich in vitamins, amino acids, organic acids and minerals. It has played an important and nutritional role in Japan. I suppose more than 95% of the Japanese people take *miso* now and *miso* can be said important part of the daily diet to the majority of Japanese people.

Table 6.1 Positive effects of *miso*.

Active element	Ingredient	Positive effect
Protein	Soybean	Reduction of cholesterol level, anti-cerebral, protection of high blood pressure, etc.
Vitamin E	Soybean	Anti-aging
Saponin	Soybean	Reduction of cholesterol level
Trypsin inhibitor	Soybean	Anti-carcinogenesis, protection of diabetes
Isoflavones	Soybean	Prevention of breast cancer
Lecithin	Soybean	Reduction of cholesterol level, prevention of arteriosclerosis, prevention of perceptual disturbance
Choline	Soybean	Prevention of fatty liver formation, anti-aging
Brown pigment	Soybean	Anti-aging
Dietary fiber	Soybean	Reduction of cholesterol level, prevention of colon cancer
Vitamin B ₂	By koji mold	Stimulation of redox reaction in body
Vitamin B ₁₂	By bacteria	Stimulation of hemopoiesis, protection of nerve strain
Enzymes	Koji mold, bacteria, yeast	Digestion of foods
Prostaglandin E	Soybean	Prevention of high blood pressure

(The Miso Industries Association, Japan.)

Miso has much effect on us since it contains a lot of bioactive substances (Table 6.1). The estrogenic effects of isoflavones in soybean products could limit growth of tumors. A study of human pulmonary adenomatosis cells and

human gastric cancer cells revealed that fatty acids, such as oleic and linoleic acids and their esters, which are found in *miso*, inhibit the proliferation of their cancer cells. *Miso* contains vitamin E, saponin, isoflavones, lecithin, choline, trypsin inhibitor, and dietary fiber taken from soybeans, and it also contains vitamin B₂ from *koji* mold; and vitamin B₁₂ from lactic bacteria or propionic acid bacteria. Japanese peoples believe that it is good for their health and, indeed, *miso* does lower cholesterol levels; it might even have anti-aging effects and prevent arteriosclerosis. In summary, *miso* is said to give us wonderful presents as follows^{*1}:

1. lowers the cholesterol levels.
2. inhibits growth of tumors.
3. prevents cancer of the breast.
4. resists aging.
5. reduces blood pressure.
6. prevents arteriosclerosis.
7. promotes metabolism of body.

It has been said since early times that “A cup of *miso* soup is the source of ability of running a long distance” or “*Miso* keeps the doctor away” in spite of the fact that it contains pretty much salt.

6.3 Content of salt in *Miso* is no problem, but

We sometimes hear that the high level of salt in *miso* might cause high blood pressure, but in fact one cup of *miso* paste soup (about 150 ml) contains 1.2 g salt (NaCl), which is less than that in other Japanese favorite foods. For

example, one piece of salted salmon contains approximately 5.7 g of NaCl per piece (70 g), and three pieces of yellow pickled radish, so called *takuwan* (30 g) contain about 7.1 g of NaCl.

However, as a matter of course, it is important that we have to take care so as not to eat foods containing salt too much.

6.4 *Miso* is exported abroad indeed

Although I had guessed that people in foreign countries dislike *miso* because it looks odd and gives off a peculiar smell, I found that some overseas Japanese restaurants serve *miso* soup, and actually I found *miso* soup served at a buffet styled breakfast at a European style hotel restaurant in Jakarta.

The amounts of export of *miso* are increasing. People of Chinese ancestry, in particular, seem to like *miso* soup like Japanese people. However, it will take pretty much time for *miso* to be accepted by many people in the world.

6.5 Summary

A variety of *miso* are produced from soybean, barley, rice and their mixed ingredients by adding salt. These mixtures are fermented with *koji* mold, salt-tolerant yeast and lactic acid bacteria under solid-state conditions. They are aged for several months at room temperature. Thus, *miso* contains a high level of protein and is rich in amino acids, organic acids, minerals and various physiological active substances such as vitamin E and B₁₂, saponin, isoflavones, lecithin, choline, *etc.* Epidemiological survey data show that people who take *miso* soup every day reduce their risk of gastric cancer and live longer than those who don't

take it. More than 95% of the Japanese people take *miso* and *miso* can be said to be important part of the daily diet to the majority of Japanese people.

*¹ Murooka, Y. and Yamashita, M., Traditional healthful fermented products of Japan, Journal of Industrial Microbiology and Biotechnology, 35: 791-798 (2008). Since all reports about *miso* have been written in Japanese and thus I translated in English from the following review article: Kawano, K., The course of Miso development and its expected effectiveness. Nihon Aji & Nioi Gakkaishi, 14:137-144 (2007) (in Japanese).

