TRADITIONAL INDIAN FERMENTED FOODS

Dahi (Sanskrit: *dadhi*) is a popular Indian fermented milk product, quite analogous to plain yogurt in appearance and consistency. It is popular with consumers due to its distinctive flavor and because it is believed to have good nutritional and therapeutic value. It is utilized in various forms in many Indian culinary preparations.

Idli The people of India have discovered methods of leavening cereal and legume batters with bacterial and yeast fermentations. The people of the Middle East had discovered that sour milks combined with wheat resulted in dried soup ingredients with superior nutritional value and excellent keeping quality. The cereal and legume-based mixed fermented products have complimentary nutritional value.

Idli and *dosa*, staple foods of South India are prepared from rice and legumes and each has had a long history, though not every detail can be clearly traced. *Idli* is frequently mentioned in 1025 AD; the poet Chavundaraya described it unequivocally as *urad dal* (black gram) soaked in buttermilk, ground to a fine paste, mixed with the clear water of curds, cumin, coriander, pepper, and asafoetida and then shaped. The *Manasollasa* of about 1130 AD, written in Sanskrit, describes *idli* as made from fine urad flour, fashioned into small balls, fried in ghee, and then spiced with pepper powder, cumin powder, and asafoetida.

Dosa *Dosa* is a pancake made from the batter of rice and black gram, and its first mention can be noted in the *Tamita Sangam* literature about the sixth century AD.

FERMENTED VEGETABLES

The lactic acid fermentation of vegetables undoubtedly originated from the preserving effect on the product. The growth of lactic acid bacteria during vegetable fermentations results in (1) restriction of the growth of undesirable organisms and delay or prevention of the normal spoilage and (2) production of various unique flavors because of the accumulation of organic acids or by-products, giving a characteristic and distinct finished product.

Sauerkraut

The federal definition is as follows:

Sauerkraut is the clean, sound product, of characteristic flavor, obtained by full fermentation, chiefly lactic, of properly prepared and shredded cabbage in the presence of not less than two percent nor more than three percent of salt. It contains, upon completion of the fermentation, not less than one and one-half percent of acid, expressed as lactic acid. Sauerkraut which has been rebrined in the process of canning or repacking contains not less than one percent of acid, expressed as lactic acid.

General Making Procedure Closely filled, fully matured heads of a variety of cabbage preferred for kraut making are wilted for 1 or 2 days to bring the cabbage to a uniform temperature and to facilitate shredding. Spoiled spots and defective outer leaves are trimmed off, the heads are washed with pure water, and the core is drilled out and shredded to be added to the rest of the cabbage. The head is cut to shreds of desired size, usually fairly slim ones. Then 2.25 to 2.5 percent of salt by weight is mixed with the shredded cabbage before transfer to the vat or is added during the packing of the shreds into the vat. The first method is preferable because it results in more uniform salting, allows time for penetration of the salt into the cabbage, and makes the packing easier. After the shreds have been packed into the vat, they are tamped down and finally weighted down, so that a layer of expressed, brined juice stands on the surface. A covering of some kind should protect the surface from contamination with dirt of insects. The temperature during the lactic acid fermentation should be about 21 to 24 C. If the temperature is below 15.6 C, the fermentation will be slow and incomplete; if it is above 26 to 29 C, abnormal fermentations may result. During the fermentation, film yeasts or molds will grow on the surface of the liquor if the surface of the expressed juice is left uncovered. Formerly, these were skimmed off or their growth was prevented by covering the surface with mineral oil (or paraffin in small fermentors) after the evolution of gas had ceased or by filling containers completely. At present, plastic bags filled with water are placed on top of the fermenting cabbage to seal the surface and serve as a weight. When the desired acidity has been attained, the fermentation is stopped by heat treatment during canning or by low temperatures.

Composition of Cabbage The composition of cabbage varies with the variety and the conditions during its growth. Especially significant in sauerkraut making is the sugar content because of its influence on the maximal acidity that can be produced by fermentation. Analyses have shown the sugar content to range from 2.9 to 6.4 percent in different lots of cabbage; the higher contents of sugar would permit the production of too much acidity if steps were not taken to stop the fermentation. The sugars are about 85 percent glucose and fructose and 15 percent sucrose.

FERMENTED DAIRY PRODUCTS

The numerous varieties of cheeses and fermented milks cannot be adequately covered in this book. We mention only briefly some of the fermented dairy products. The student should consult the references at the end of the chapter for a broader understanding and appreciation of the scope of the fermented-dairy-products industry. Fermented milks include cultured buttermilk, yogurt, Bulgarian buttermilk, acidophilus milk, kefir, kumiss, skyr, and taette as well as numerous others very similar to or identical with the ones listed. Cultured sour cream is a similar product. In all these fermented milks lactic acid bacteria carry on the main fermentation to produce lactic acid. Table 22.2 lists some of the cultures used in fermented dairy products.

Cultured buttermilk and sour cream employ the action of mixed cultures; one strain is usually responsible for the production of lactic acid, while another strain provides the aroma-forming bacteria. In both these products *Streptococcus lactis* subsp. *cremoris** or *S. lactis* subsp. *lactus** could be used to produce the acidity (0.7 to 0.9 percent as lactic acid), and *Leuconostoc mesenteroides* subsp. *cremoris* or *Streptococcus lactis* subsp. *diacetylactis* as the flavor- or aroma-forming strain to produce diacetyl, the characteristic flavor compound of buttermilk.

Bulgarian buttermilk is made with a pure culture of *Lactobacillus delbrueckii* subsp. *bulgaricus*, while yogurt employs a mixed culture of *Streptococcus thermophilus* and *L. delbrueckii* subsp. *bulgaricus*. The starter for kefir is kefir grains, which are aggregates of a mixture of microorganisms, chiefly *Lactobacillus brevis* and several yeasts. In addition to acid, a small amount of alcohol, 0.5 to 1.0 percent is produced, and enough carbon dioxide to carbonate the drink if it is kept tightly sealed during fermentation. Kumiss, ordinarily made from mare's milk, results from fermentation by a mixture of lactics and yeasts carried over from a previous lot. Acidophilus milk, prepared for its therapeutic properties for intestinal disorders, utilizes a pure culture of *Lactobacillus acidophilus* grown in milk that has been sterilized or nearly sterilized. Recently, the addition of large numbers (a frozen concentrate) of *L. acidophilus* has been used to make a nonfermented "sweet acidophilus" milk. Taette is a ropy buttermilk made with a ropy variety of *Streptococcus lactis* subsp. *lactis**, and skyr is a semisolid fermented milk in which chiefly *S. thermophilus* and *L. delbrueckii* subsp. *bulgaricus* have been active.

Table 22.2 *Cultures Used in Major Fermented Dairy Products*

Culture	*Culture function*	*Product use*
Propionibacterium freudenreichii	Flavor and eye formation	Emmental (Swiss) cheese
Lactobacillus delbrueckii subsp. *bulgaricus*,	Acid and flavor	Bulgarian buttermilk, yogurt, kumiss, and Emmental (Swiss) and Italian cheese
L. lactis,		
L. helveticus		
L. brevis		Kefir
L. acidophilus	Acid	Acidophilus buttermilk
Streptococcus *thermophilus*	Acid	Emmental, Cheddar, and Italian cheese and yogurt
S. lactis subsp. *diacetylactis**	Acid and flavor	Sour cream, ripened cream butter, cheese, buttermilk, and starter cultures
S. lactis subsp. *lactis**	Acid	Cultured buttermilk, sour cream, cottage cheese, all types of cheese, domestic and foreign, and starter cultures
Leuconostoc cremoris	Flavor	Cultured buttermilk, sour cream, cottage cheese, ripened cream butter, and starter cultures
S. faecium, *S. faecalis*	Acid and flavor	Soft Italian, Cheddar, and some Swiss cheeses

The acidity of the fermented milks is sufficient to prevent spoilage by proteolytic or other bacteria that are not acid-tolerant. Chilling is necessary to stop acid formation by the starter bacteria at the desired stage and packaging and sealing to avoid mold growth.

A lactic acid fermentation is involved in making most kinds of cheese. Unripened cheeses, such as cottage cheese and cream cheese, are made by starters similar to those used for cultured buttermilk. They must be chilled and kept cold until consumed and have a comparatively short keeping time. Ripened cheeses have an initial acid fermentation by lactic acid bacteria followed by action of their enzymes and those of other microorganisms; in some cheeses there is the additional action of rennet, a and in certain Italian cheeses the action of added animal lipases. The chief compounds contributing to the flavor of ripened cheeses are salt, lactic acid, fatty acids, amino acids, and carbonyl compounds (e.g., aldehydes and ketones). The soft, ripened cheeses, such as Lim-burger, are more perishable than the harder cheeses, e.g., Cheddar and Swiss, but all completely cured cheeses require storage at chilling temperatures to aid in their preservation. Cheeses with hard rinds, such as natural

Cheddar and Swiss, are protected by these rinds to some extent from drying and spoilage. Chilling also is necessary for most kinds of cheese, as well as packaging for perishable cheeses and cut pieces of larger, more stable cheeses. Packaging is done to minimize losses of moisture and penetration of oxygen, which otherwise would permit growth of molds.

In general, the curing or ripening processes do not greatly improve the keeping quality, although losses in moisture occur during the aging of long-cured hard cheeses and a protective rind forms on most of them. The chemical products formed during ripening have little preservative effect for the most part, although fatty acids repress the anaerobes; in fact, most cheeses become more alkaline as they age and hence more susceptible to spoilage by bacteria. the propionate formed in the ripening of good Swiss cheese delays the growth of most molds on the cheese, and the surface "smear" of organisms on surface-ripened cheeses such as brick or Limburger may produce products that are inhibitory to other organisms.

SPOILAGE AND DEFECTS OF FERMENTED DAIRY PRODUCTS

Fermented milks and cheese depend on a desired fermentation or succession of fermentations for their manufacture. Therefore, any abnormality in these fermentations will affect the quality of the product and may even spoil it. The finished product, too, may be subject to spoilage by microorganisms.

❑ Fermented Milks

In the manufacture of most fermented milks a starter is added to pasteurized milk, which is incubated until the desired acidity is attained. The chief product of the fermentation is lactic acid, but lesser amounts of flavoring substances may be produced or added. If the starter bacteria are inactive, other bacteria may grow and damage the curd and the flavor. Proteolytic bacteria, which ordinarily cannot compete with the lactics, may cause a poor curd and off-flavors. Coliform bacteria and lactose-fermenting yeasts should not be present but may enter from equipment and other sources to produce bad flavors and gas. The finished product is susceptible to spoilage by molds from air or equipment if air is available at the surface.

❑ Cheese

Defects of cheese may have mechanical or biological causes, but only the latter will be discussed. The types of spoilage can be divided into those developing during the manufacture and ripening of cured cheese and those occurring in the finished product.

ORIENTAL FERMENTED FOODS

Most of the Oriental fermented foods mentioned below have molds involved in their preparation. In the starter, termed **koji** by the Japanese and **chou** by the Chinese, molds serve as sources of hydrolytic enzymes, such as amylases to hydrolyze the starch in the grains, proteinases, lipases, and many others. For the most part the starters are mixtures of molds, yeasts, and bacteria, but for a few products pure cultures have been employed.

Soy Sauce

The chief Oriental fermented food imported into the United States and also made here is soy sauce, a brown, salty, tangy sauce used on dishes such as chop suey or as a constituent of other sauces. The methods of preparation of the starter and of manufacture of soy sauce have many variations and may result in different types of products.

The Starter The starters (koji or chou) may be mixed cultures carried over from previous lots or pure cultures grown separately. The substrate on which the starter is grown varies, although most often it is an autoclaved mixture of soybeans, cracked wheat, and wheat bran; a mixture of wheat bran and soybean flour; or rice. This moistened material is inoculated with spores of *Aspergillus oryzae* (*A. soyae*), spread in small boxes or trays, and held at 25 to 30 C until the mold growth on the surfaces of the mash is judged to have attained a maximal content of enzymes (usually after about 3 days). A flora of lactic acid bacteria, streptococci and lactobacilli, also develops in the koji and produces lactic acid, and some growth of *Bacillus* spp. takes place. The starter may be used at once as it is, may be dried and used later, or may be dried and extracted and the extract used.

Manufacture of soy sauce The mash may consist of autoclaved soybeans or defatted, chemically hydrolyzed soybeans, roasted and crushed wheat, and steamed wheat bran. The mash is inoculated with the koji and incubated in trays for 3 days at about 30 C. Then it is soaked with sterile, 24 percent sodium chloride brine (sometimes the koji is mixed directly with an equal amount of saline water). The

brined mash is held for from 2.5 months to a year or longer, depending on the temperature.

Fermentation The proteinases, amylases, and other enzymes of the koji continue to act throughout the holding period. There are three stages in the curing: (1) lactic acid fermentation by lactic acid bacteria from the koji, followed by more acid production by *Pediococcus halophilus*, (2) alcoholic fermentation by yeasts, such as *Saccharomyces rouxii* and *Zygosaccharomycessoyae*, and (3) completion of the fermentation and aging.

The various microorganisms important in the making of soy sauce may be added in pure culture or may come from previous lots of koji and from the ingredients. The chief organisms are *Aspergillus soyae* (*oryzae*), the most important organism, which grows in the koji to yield proteinases, amylases, and other enzymes for soy-sauce brewing and contributes aromas and flavors; lactic acid bacteria, e.g., *Lactobacillus delbrueckii*, which makes the koji acid enough to prevent spoilage and acidifies the mash; *Bacillus subtilis* and other bacilli, which grow in the koji to improve flavor and make the soy sauce less turbid; *Pediococcus halophilus*, which increases the acid in the mash, thereby stimulating the yeasts, contributing to essential aromas and flavors, decreasing color intensity, and reducing the activity of the mold proteinases; and *Hansenula* spp., *Saccharomyces rouxii*, and other yeasts, which produce alcohol and help the flavor.

Tempeh

In the manufacture of **tempeh,** an Indonesian food, soybeans are soaked overnight at 25 C, the seed coats are removed, and the beans, split into halves, are boiled in water for 20 min. dried on mats, cooled, and inoculated with a previous lot of tempeh or with mold spores of species of *Rhizopus* (*R. stolonifer, R. oryzae, R. oligosporus,* or *R. arrhizus*). The mash is packed into a plastic container or a hollow tube or is rolled in banana leaves. It then is incubated at about 32 C for 20 hr until there is good growth of mycelium but little sporulation. The product is sliced thin (Figure 22.3), dipped into salt water, and fried in vegetable fat to a golden brown.

CONCEPT OF PROBIOTICS

The concept of probiotics is the colonization of beneficial bacteria in the intestinal tract, promoting efficient functioning of digestion, helping prevent digestive upsets, and stimulating and maintaining the natural immunity of the body. Probiotic bacteria are normal inhabitants of the intestines and are normally found in the healthy gut of all humans.

Probiotics have been in use for as long as people have consumed fermented milks, but their association with health benefits dates only from the turn of the century when Metchnikoff drew attention to the adverse effects of the gut microflora on the host and suggested that ingestion of fermented milks ameliorated this so-called *auto-intoxication*. Later work, based on the assumption that colonization of the gut was essential for the maximum effect, used intestinal strains of *Lactobacillus acidophilus* for treatment of constipation.

The use of the term 'probiotic' to describe food supplements specifically designed to improve health, however, dates from 1974 when Parker used it to describe growth-promoting animal-feed supplements. He defined the term as 'organisms and substances which contribute to intestinal microbial balance'.

❑ Composition of Probiotics

Lactic acid bacteria (*lactobacilli*, *Streptococci*, and *bifidobacteria*), constitute the probiotic currently used preparations. These three genera have been shown to be important components of the gastrointestinal microflora, which are all relatively harmless. It has also been shown in recent experiments that administration of *Escherichia coli* to infants can prevent the colonization of the gut by the antibiotic resistant strains of *E. coli*. A probiotic preparation may contain one or several of the different strains of bacteria.

Lactobacilli Fermented foods and dairy products like yogurt contain the species of Lactobacilli. There are three types of lactobacilli, including *Lactobacillus plantarum*, *Lactobacillus casei*, and *Lactobacillus sporogenes*. It has been established that according to the Environmental Illness Resource, the benefits that *Lactobacilli* can provide include preventing and treating diarrhea caused by antibiotics; prevention of vaginal- and urinary-tract infections; prevention of overgrowth of bacteria like *H. pylori*, *Salmonella* and *E. coli;* and help with the digestion of lactose products. In addition to these benefits, *L. sporogenes* has also been shown to reduce LDL cholesterol levels, which is the "bad" cholesterol, and raise HDL cholesterol levels, making it a supplement for treating high cholesterol levels and heart disease.

Bifidobacteria The most common kind of intestinal bacteria found in infants include *Bifidobacteria*. As individuals get older, the level of the bacteria decreases, and they can be naturally found occurring in the vagina as well as the intestines. The most commonly seen species of these bacteria in humans include *Bifidobacterium longum*, *Bifidobacterium infantis*, *Bifidobacterium breve*, *Bifididobacterium adolescentis*, and *Bifidobacterium pseudocatenulatum*. The group of bifidobacteria contains several kinds of probiotics, all of which are beneficial. These probiotics are known to help protect the intestinal lining; they produce acids to keep the pH in the intestine balanced; they help decreases side effects of antibiotics; ensures regular bowel movements, and helps build B-complex vitamins.

Streptococcus Thermophilus The most important lactic acid bacteria for commercial purposes, typically used as a starter culture for dairy foods other than yogurt, like mozzarella cheese is *Streptococcus thermophilus*. The only probiotic in the *Streptococcus* group is *Streptococcus thermophilus*. This bacterium is known to help an individual with malnutrition, resulting due to fasting. It reduces intestinal atrophy from short-term fasting and also possesses anti-oxidant properties. This probiotic prevents nitrates from changing into nitrates that are known to cause cancer and has shown to protect the intestines from mucositis during chemotherapy treatment.

The different strains of lactic acid bacteria used in probiotics are mostly intestinal isolates of importance such as *L. acidophilus, L. casei, Enterococcus faecium*, and *Bifidobacterium bifidum*. Starter bacteria for yogurt (*L. bulgaricus and Streptococcus thermophilus*) are also included because yogurt has always been associated with health benefits in the past. The ability of the starter bacteria in yogurt to colonize the gut is extremely doubtful, although they can persist and remain viable throughout the gastrointestinal tract of rats. The necessity for continuous ingestion in these cases is obvious. Even with intestinal isolates such as *L acidophilus*, it is necessary to regularly give doses rather than to assume that a few doses will allow the organisms to help colonize the gut permanently. Work in the USA illustrates this point: when *L. acidophilus* was fed to human patients, there was a significant reduction in the activity of the bacterial enzymes glucuronidase, nitroreductase, and azoreductase. This reduced activity, however, persisted only as long as the lactobacillus supplement was being fed; when it was stopped, the enzyme activity slowly returned to the pre-supplementation values.

Similarly, experiments have revealed that if lactobacilli are administered to newborn rats, there is a significant decrease in intestinal coliform count, but on stopping the treatment, this returns to normalcy after a few days. It seems unlikely, therefore, that the probiotic bacteria will permanently colonize the intestine; thereby indicating that continuous feeding is necessary if a persistent effect is required.

The following mechanisms have shown that probiotics do work:

Competition for Nutrients Utilization of the same types of nutrients by the beneficial as well as pathogenic microorganisms is seen within the gut. Thus, there exists a general competition for these nutrients by the groups of microbes to grow and reproduce. Hence, if the gut is flooded with beneficial microorganisms, more competition is created between beneficial and pathogenic microorganisms.

Competition for Adhesion Sites Most intestinal pathogens rely on adhesion to the gut wall. Adhering to adhesion sites along the gut wall is an important factor in colonization to prevent the pathogenic forms from being swept away by peristaltic movement of the food along the gastro-intestinal tract.

One of the most important functions of these probiotic bacteria is to help prevent or limit the growth and colonization of potentially pathogenic bacteria such as *E. coli, Salmonella, Listeria, Campylobacter*, and *Clostridia* within the gut. Major disturbances within the gut are caused by pathogenic bacteria, thus preventing efficient digestion and ineffective nutrient absorption within the gut and may result in diarrhea or vomiting. When the gut microflora are well balanced with the beneficial microorganisms, colonizing the gut helps reduce the risk of pathogenic

Stimulation of Immunity An optimum balance of the microflora is maintained by the use of probiotics in order to stimulate and maintain the natural immune system of the host. It has been observed that when probiotics are used regularly, the enhanced immune effects help prevent illness.

Direct Antimicrobial Effect [illegible]

Improvement in Digestion Enzymes help in the breakdown of polysaccharides such as carbohydrates, thereby ensuring enough of nutrient flow is governed by the presence of the probiotics, which act effectively in the production of the requisite enzymes. The microflora also helps ferment the carbohydrates which have not been digested in the upper gut and produce vitamins which are a secondary source to the host.

❑ Why Take Probiotics?

If you consume a perfectly balanced diet without a lot of processed products and lead a stress-free life, probiotics may not be required as a supplementary aid to maintain your general health and immunity. However, in today's world, we encounter stress every day from our environment and from the foods we eat. In addition, we also tend to consume many different forms of chemicals such as antacids, antibiotics, food additives, alcohol, and other foods and drugs that may eventually lead to a disturbance and reduction in the concentrations of beneficial bacteria within our gastrointestinal tract.

By the age of two or three, most children have developed some degree of intestinal balance and a fairly effective immune system. However, as we age, environmental and nutritional factors very often disturb this balance and create the need for probiotic supplementation. The result is *dysbiosis*, a disruption of the microflora and an increased susceptibility to potentially pathogenic bacteria. Dysbiosis may be caused when we are subjected to stressors such as the following:

Antibiotic Therapy, Anti-inflammatory Steroids or Chemotherapy

The use of antibiotics, steroids, or chemotherapy can adversely affect gut flora. For instance, when antibiotics are used, a proportion of the beneficial microorganisms becomes disrupted and can lead to diarrhea and an increased susceptibility of the gut to the colonization of pathogenic bacteria such as *E. coli, Salmonella*, etc. The proportion of beneficial microorganisms generally killed in the gut (by an antibiotic) will depend on the action of the antibiotic (narrow or broad spectrum). The duration and the frequency of the course also is important.Changes in Food and Water

Changes in food and water normally associated with travel

When we travel, our bodies must endure the time taken during flights or other means of travel, which make us tired, and any time changes which might occur. Ultimately, this puts stress on our bodies. Taking drugs such as antimalarial tablets affects the gut microflora. In addition, the food and water sources will be different and varied in many cases, which may lead to digestive upsets associated with travel to foreign countries or even within the country.

Hormonal fluctuations around puberty, during menstruation, pregnancy, post natally or during the menopause

The hormonal effects during different stages of our lives are such that the balance of gut microflora can be disrupted at any given time.

❑ What Makes a Good Probiotic?

- *Safety* Non-pathogenic and non-toxic microorganisms must be chosen as the components of a probiotic
- *Multistrain* A good-quality probiotic must contain several species of beneficial microorganisms in order to have an improved overall spectrum of activity within the gut and with maximum benefit in a wider range of host species.
- *Viability Viability* of the microorganisms in a probiotic is very important as it can only work if the microorganisms contained within the probiotic remain viable during the storage of the product and when consumed through the gut to ensure proper colonization.
- *Minimum Dose* The concentration of a probiotic must be such that inclusion rates provide 10^7 to 10^8 CFU per dose (that is 10 million to 100 million beneficial bacteria per dose).

- *Quality Assurance* It is essential that a probiotic has not become exposed to contamination with any other microorganism other than the particular probiotic microorganisms chosen at any stage, e.g. fermentation of the manufacturing process or during transport and storage.

❑ Probiotic Products

Yogurt Yogurt is probably the most well-known probiotic food. All yogurt contains both *Streptococcus thermophilus* and some form of *Lactobacillus* bacteria. Additionally, some brands of yogurt have other strains of bacteria added to them. For full probiotic benefits, yogurt should have live and active cultures in it, since the process of pasteurization can kill helpful bacteria.

Kefir Kefir is a yogurt-like beverage made from milk fermented with kefir grains, which are actually bacteria such as *Lactobacillus kefiri*. The bacteria culture the milk, leaving it thickened and somewhat effervescent due to the release of carbon dioxide. Kefir is available in a variety of flavors, much like yogurt, and can now be found in many conventional supermarkets as well as in health-food stores.

Kombucha Bacteria and yeast fermented in tea form a symbiotic culture from which kombucha, a drink, is made. Kombucha has been brewed for centuries in different parts of the world and has recently become popular in the United States. People attribute many health benefits to kombucha, although these have not been evaluated by the FDA. Kombucha is sweet and tart as well as very fizzy due to the release of carbon dioxide during fermentation. It comes in different flavors and can be found in health-food stores.

Miso Miso is a popular Japanese food that is made from the fermentation of soybeans with a fungus called *koji*. Miso is the main ingredient in miso soup, which is easily made with miso paste and hot water. It is also used as a condiment in meals and snacks. Miso is rich in sodium and contains important minerals such as zinc and copper as well as a good amount of protein. Miso is easily available in supermarkets.