

Functionalities of traditional foods in China

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Abstract

The Chinese have been exploring and making use of the functionalities of traditional foods for many years. In particular, preserving health through diet has been a very important part of the traditional dietetic culture of the Chinese, based on the theory of Chinese medicine. Increasingly, other people throughout the world are recognizing the functionality of Chinese traditional foods. But these foods are also facing challenges due to lack of continued investigation and coordination, changes in people's lifestyles, and the Western influence on food and medicine. For these reasons, Chinese traditional health foods have not advanced, and some are even in danger of being lost.

In order to preserve these foods for future generations, modern knowledge and technology should be applied to investigate, coordinate and develop them. Advances in this field would also have a significant role to play in meeting the requirements of an increasing population, improving the health of consumers, increasing value-addition of agricultural products in China, and vitalizing the rural economy.

In this paper, Chinese traditional foods are reviewed in terms of their functionalities and current standing. At the end of the paper, some countermeasures are suggested and some recommendations given on how to develop the traditional foods of China.

Introduction

ALTHOUGH traditional foods have a long history and are closely linked to life in China, they are facing challenges from the influence of Western foods (e.g. MacDonald's etc.), different requirements for food function caused by lifestyle changes, and differing sanitation standards between modern and traditional foods.

However, staple and traditional foods are still of primary importance in the Chinese menu. Thousands of years' experience has proven the value of these foods. In order to preserve these foods for future generations, modern knowledge and technology should be applied to investigate, coordinate and develop them. Advances in this field would also have a significant role to play in meeting the requirements of an increasing population, improving the health of consumers, increasing value-addition of agricultural products in China, and vitalizing the rural economy.

Chinese diet philosophy and food function

PRESERVING health through diet is a very important part of the traditional dietetic culture of the Chinese. 'Curing and eating have the same origin' and 'medicine and food have similar functions' are basic principles behind the Chinese diet. A famous physician of the Ming Dynasty, Li Shizhen, said, 'People began to know how to preserve health when Xian Yuan cooked foods to make up prescriptions' (Li 1996). The Chinese have been exploring the relationship between food and health protection for 6000 years, since the legend of a man named Shen Nong who tasted herbs to find Chinese materia medica. In Zhou Li's *Rituals of Zhou Dynasty*, there are four branches of medicine mentioned: dietary, internal, external, and veterinary. According to this document, the responsibilities of dietary medicine included 'governing the king's food, drink, flavors, rare foods etc.', and a royal ceremony of the Zhou Dynasty 4000 years ago, and recorded in detail, includes a description of the division of imperial cooks who comprised a chef, a cook to process flesh, a

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cook for the king and his family, a cook for praying and guests, a mess cook, dietitian, barman and so on. The dietitian was responsible for arranging cereals, drinks, meat, vegetables, pickles etc. (Zhou S.J. 1996), ensuring that each meal contained reasonable nutrition based on health protection.

The Chinese have produced many books about maintaining good health through diet. Although many of them are now lost, some splendid ones remain, such as *Shi Zhi (Dietotherapy)*, *Tui Ju Yin Shi (Dieting After Retirement)*, and *Yang Lao Shi Liao (Dietotherapy of the Aged)*, in addition to *Bei Ji Qian Jin Yao Fang (Valuable Prescriptions Worth a Thousand Gold for Emergencies)* written by Sun Simiao of the Tang Dynasty in the year 652, *Shi Liao Ben Cao (A Dietetic Materia Medica)* written by Meng Xian in 706, *Shi Yi Xin Jian (The Mind Mirrors of the Dietitian)* written by Jiu Yin in the middle of the ninth century, *Shi Xing Ben Cao (Materia Medica of Food Properties)* written by Chen Shiliang, *Yin Shan Zheng Yao (Principles of Correct Diet)* written by Hu Sihui of the Yuan Dynasty in 1330, and *Yin Shi Tiao Zhi (Curing Disease Through Diet)* written by Chen Zhi of the Song Dynasty in 1085. These examples illustrate that the Chinese have long attached much importance to 'dietotherapy'.

The Chinese not only give priority to cereals, but also emphasize that various foods should be eaten and arranged in particular ways. A medical work written more than 2500 years ago, *Huang Di Nei Jing (The Yellow Emperor's Internal Classic, The Yellow Emperor's Canon of Internal Medicine)* summarized how to preserve health by eating. It says, 'People should eat various foods, particularly cereals, animal foods, and vegetables and fruits. Hereinto, cereal is primary, fruit is secondary, some animal food is beneficial to health, and more vegetables should be eaten' (Lin and Wang 1994). More than 200 kinds of cereal, 100 kinds of vegetables, and about 100 kinds of animal foods were cited as items of Chinese traditional food in *Qi Min Yao Su (Important Technology of Qi Dynasty)*, all of which fitted into the Chinese traditional dietetic structure. This document held the same views as an American nutritional guidebook, but preceded the American book by 200 years. The Western culture tends to be monotonous in the way food is arranged, and Westerners eat more animal foods than vegetables. In order to make up consequent deficiencies in the diet, Westerners would rather extract an active component from some plant to make a medicine [dietary supplement] than prepare a dish using the plant itself (Suzuki 1998). In China, this is called the 'Western tablet culture'.

The Chinese have studied the functions of food for many years and accumulated much experience. For example, Sun Simiao wrote in *Bei Ji Qian Yao Fang (Valuable Prescriptions Worth a Thousand Gold for*

Emergencies), 'Those always eating cereal are intelligent, those always eating herbs are strong, and those always eating meat are brave.' He also wrote, 'Food could replenish the internal organs, delight the mind and provide vital energy. Those who always pay attention to health preservation by dieting and keep joyful in mood might live a long life' and 'A good doctor uses medicine to cure disease only when food is useless.' There are many well-known sayings in China about the functions of food. For example: 'Rice, beef, jujube, and melon seeds are beneficial to the spleen; wheat, mutton, and apricot are beneficial to the heart; soybean, pork, and plum are beneficial to the liver; and chicken and peach are beneficial to the lungs' and 'It is not appropriate to eat liver in the spring, heart in summer' and so on.

Food functions are closely tied to Chinese traditional medicine and are always related to the balance of Yin and Yang. According to traditional terminology, the five elements of metal, wood, water, fire and earth correspond to pungent, sour, salty, bitter and sweet, respectively. Cooking concerns not only the balance of the five flavors, but also the seasons. *Zhou Rituals* mentioned that is good for health to have more sour food in spring, bitter food in summer, pungent food in autumn, and salty food in winter. In *Yin Shi Tiao Zhi (Curing Disease through Diet)*, Chen Zhi said

Drugs and foods that are sweet and pungent in flavor and which induce perspiration are attributive to Yang, while drugs and foods that are sour and bitter have emetic-defecation-inducing and internal heat-removing effects. So food decides the Yin and Yang of the body and inter-promotion of the five elements.

In the theory of Chinese traditional medicine, the balance of Yin and Yang decides the health of the body. Yin and Yang show as exterior and interior, cold and heat, deficiency and excess. Foods can be divided into those with Yin and those with Yang properties. A symptom of Yin is blood-deficiency, and this should be treated with some food with Yang properties, such as liver, egg, red sugar, jujube etc., which can dispel cold and reinforce heat. Symptoms of Yang include high blood pressure, inflammation etc. and should be treated using foods with Yin properties, such as wax gourd, cucumber, lotus seed, green bean etc. Chinese medicine considers foods with Yin properties to counteract toxicity and decrease heat. The functions of different foods in harmonizing Yin and Yang are categorized as hot, warm, cool, normal, and cold. Some Chinese materia medica can also be eaten as food. The principle involves preparing an appropriate meal, e.g. treating a 'cold' syndrome with 'hot'-natured drugs, or treating a 'hot' syndrome with 'cold'-natured drugs. For example, if the face has a yellow color, this indicates a 'cold' deficiency of the spleen and stomach, and 'warm' or 'hot' foods should be eaten, such as ginger. Conversely, if the face is red, 'hot' foods, such as red

pepper, should not be eaten—instead ‘cold’ foods such as watermelon should be consumed.

Although there is not strong evidence to prove such dietary formulae, it is considered that a ‘Yin deficiency’ signifies poor nutrition or long-term illness which has left the body weak. In such cases, it is beneficial to eat some ‘Yang property’ foods, which are highly nutritious and easily digested. A ‘Yang excess’ is also called ‘accumulating much more pathogenic fire’, and it is usually caused by excessive tension, lack of sleep, reduced immunity caused by eating too much, or an imbalance of internal secretions. People in this condition should eat foods that are low in energy and high in edible fiber. Some functions of Chinese traditional foods have been verified by modern medical science, such as the use of adlay (*Coix lacryma-jobi* L., Gramineae. ‘Job’s tears’) seed. According to Chinese traditional belief, adlay seed is ‘cool’ in character and has a somewhat sweet taste. When eaten, the adlay seed can cure both acne (caused by pathogenic heat accumulation) and verruca (warts) (induced by toxic heat). An explanation for these effects was given in 1982, when a Japanese professor, Hirano Kyoko, showed that papain was the active component in adlay seed—with the ability to destroy the acne and verruca-causing agents, and to act as a defense against cancer (Jiang 1996).

The Chinese have always stressed the importance of vegetables in the diet. China is one of the ‘cradles’ of agricultural culture, and many plants were selected for domestication thousands of years ago. Chinese legend recorded that Sheng Nong tasted many plants and classified them as edible vegetable, inedible vegetable, weed, or medicine—the last of which can cure disease but should not be eaten often. The book *Li Ji* records that chopsticks should be used to eat only foods that include vegetables (Anon. 1996), thus illustrating the importance placed on the inclusion of vegetables in oriental food culture. Confucius provided some classic discussion on foods in *Lun Ju (Analects)*. He said that vegetables were indispensable on the table. Eating vegetables is not just for allaying one’s hunger, but for their functions in maintaining health. In *Ben Cao Gang Mu (Compendium of Materia Medica)*, Li Shizhen wrote that having a balanced diet can strengthen the organs, accelerate blood circulation, and improve bone rigidity and muscle flexibility, thus prolonging life, and hence vegetables are essential to humans. In various areas of China, there are many sayings relating to the functions of vegetables, for example, ‘You will not suffer from an illness if you eat garlic and onion every day’, ‘You will never fall ill if you eat ginger in the evening and radish in the morning’, and ‘Tender lotus root is more useful than a doctor.’

The functionalities of traditional foods

Cereals

The high nutritional value of cereals has long been appreciated by the Chinese, as indicated by the classification of only cereals as ‘staple foods’. Many cereals grow in the different climatic regions of China, including rice, broomcorn, wheat, beans, millet, maize, naked oat, buckwheat, adlay etc. In traditional Chinese food culture, much attention is paid to arranging cereals in pairs or groups and they are prepared in a wide variety of ways. Besides the usual rice, steamed bread and noodles, dishes include: ‘eight treasures gruel’ which is made with red bean, cowpea, horse bean, earthnut, walnut, sticky rice, japonica rice, mung bean and lotus seed; ‘eight treasure rice pudding’ which contains sticky rice, red sweetened bean paste, adlay seed, earthnut, melon seed, red jujube, walnut, and currants; rice porridge with nuts and dried fruit, eaten on the eighth day of the twelfth lunar month; buckwheat wontons; naked oat noodles; and various gruels and cakes made with a variety of cereal crops. Studies in modern nutrition are gradually verifying the long-held beliefs that cereals can cure and prevent diseases.

Pulses

The Chinese have recognized the health benefits of pulses since ancient times, and mung beans, peas, and sword bean are ingredients of Chinese medicines, as well as pulses being a nutritious part of the diet. Science has shown that pulses have many functionally active components. The protective effect of soybean and its products is one example. Soy foods are the only natural dietary sources of isoflavones, the oestrogenic effects of which decrease menopausal symptoms in women. In addition, genistein is effective against both hormone-dependent and hormone-independent cancer cells, including lung, colon, rectal, breast, stomach, and prostate cancers. The somewhat lower sulfur amino acid content of soy protein compared to animal protein may help to reduce calcium excretion and thus reduce the risk of osteoporosis. When nephritic patients consume soy protein, both their urinary protein and serum low-density lipoprotein-cholesterol (LDL-C) levels decrease compared to levels when on their usual diet, and consuming soy protein can decrease serum cholesterol levels. Hence, consuming soy protein can help to reduce the risk of developing kidney disease and heart disease in high-risk individuals.

Fermented foods

Chinese people have long recognized the health benefits of fermented foods, such as *Jui* (alcoholic beverages), vinegar, soy sauce, *Douchi*, pickle, *sufu*, sour liquor etc. The Chinese character for 'medicine' contains a component that means *Jui*, and there is a famous Chinese saying: 'Wine or alcohol is the captain of all medicines and herbs.' The health benefits of *Jui*, vinegar, and soy sauce have been widely published in a variety of countries and will not be further discussed here. Instead we concentrate on the health function of traditional Chinese fermented foods made from soybean, i.e. *Douchi* (salted black bean) and *sufu* (traditional Chinese fermented soybean curd, also known as 'Chinese cheese'). These foods originated in China over 2000 years ago. *Douchi* was found among the funerary objects in the Tome of the West Han Dynasty in Mawangdui, Changsha City, Hunan Province in 1972, indicating that it was popular in about 200 BC. *Douchi* and *sufu* have had similar functions as medicines ever since. Many historical medical books include descriptions of *Douchi* being able to protect from and cure diseases. Zhang Zhongjing of the Han Dynasty recorded that soup cooked with cape jasmine and *Douchi* could be used for tiredness, weakness, insomnia, and poor appetite. Wang Shixiong of the Qing Dynasty said in his book, *Xi Ju Yin Shi Pu*, that *sufu* made from soybean curd was most suitable for patients.

During the fermentation process, the activity of microorganisms causes a series of biochemical reactions such that the levels of free acid, aqueous solid substance, aqueous minerals, riboflavin, and flavonoid glycosides are much higher in the final products, as well as many physiologically active components such as soybean peptides, vitamin V₁₂ (VB₁₂), nucleic glycosides and aromatic compounds that do not exist in 'raw' soybean. All of these make *sufu* and *Douchi* deli-

cious and digestible and with a role in maintaining health and youthfulness, preventing cancer, and improving hypolipidemic effects. The VB₁₂ content of Beijing *Chou sufu* and *anka sufu* is as high as 1.88–9.8 µg/100 g and 0.42–0.78 µg/100 g, respectively—second only to dairy products. VB₁₂ is helpful in maintaining the normal function of the nervous system, and lack of it can cause senile dementia. Lysokinase in *Douchi* has been shown to be functional in anti-thrombus and preventing cardio-cerebral-vascular disease. During the fermentation process, large amounts of peptides are produced. These peptides can not only be digested easily and improve energy metabolism, but also function to refresh, strengthen muscles, decrease cholesterol, regulate insulin and act as antioxidants and antihypertensives. The conversion of isoflavones during *Douchi* fermentation has been studied in our laboratory. The results showed that isoflavones underwent conversion from glycosides (genistin and daidzine) to aglycons (genistein and daidzein) (see Figure 1), and there have been numerous studies which have concluded that aglycons have high antioxidative and anticancer activities.

Food cooked with medicinal herbs plays an important part in Chinese tradition, and mainly relates to the third function of food—to recuperate one's physiological condition, e.g. to treat a Yin deficiency and build up a Yang deficiency, to nourish the liver and lungs, to strengthen one's body, and to stay young. In general, food cooked with medicinal herbs consists of two types. The first is functional food, which can be used as a herbal medicine as well, such as terrapin, black-bone chicken, shark fin, agaric, bird's nest, holothurian (sea cucumber), mushrooms, ginger, jujube, garlic, wolfberry, pear, honey etc. The other is Chinese herbs, including *Radix ginseng*, *Codonopsis posolula*, *Poris cocos*, liquorice, *Radix rehmanniae preparata*, *Paeonia lactiflora*, *Angelica*, *Ligusticum wallichii*, *Astragalus membranaceus*, *Aweto* etc. These herbs, together with

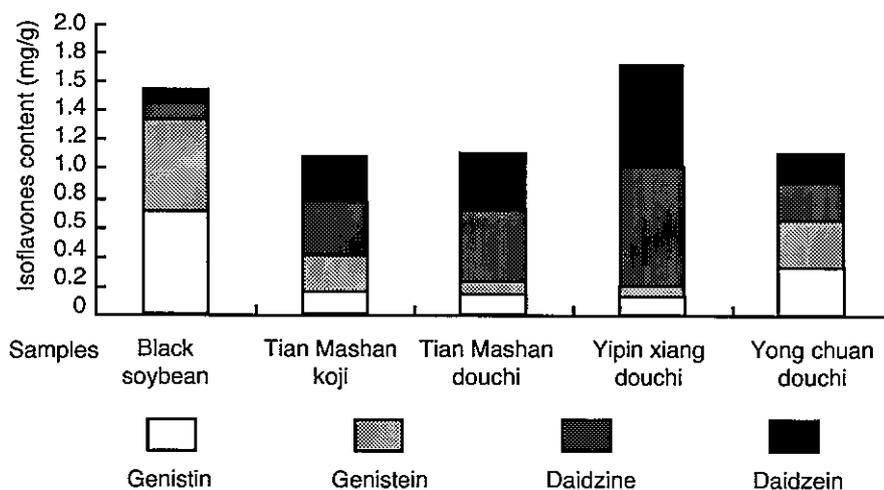


Figure 1. Isoflavone content of different *Douchi* (salted black bean) products.

pungent spices, can be used to season various meats during cooking. Foods cooked with medicinal herbs can be used to counteract weakness, retain energy, and to treat specific symptoms, e.g. ginger soup is used to treat colds and fever; weakness and anaemia can be cured by red jujube boiled with black *Auricularia auricula-juda*; while soup containing honey and pear is used to treat coughs, sore throats etc.

The current standing of Chinese traditional foods

THE traditional Chinese concept that 'food and medicine are of the same importance' is now being accepted more widely. In the past, the ancients accumulated much experience in health care using food, though the fundamental purpose of food was to allay hunger. Now, however, that adequate food supplies are assured in many countries, new problems caused by overeating and unbalanced diets are surfacing. In America and many European countries, the focus tends to be on making medicines/dietary supplements to remedy the problems caused by poor nutrition, while the Chinese prefer to optimize the diet directly. Consequently, there has been a great upsurge in 'black food', cereals other than wheat and rice, food cooked with medicinal herbs, and health food, and Chinese experts in medicine, nutrition, food and agriculture have begun to cooperate to try to develop various healthy food products.

Chinese traditional health food urgently needs to be investigated, collected, saved and sorted. At the cost of numerous lives, Chinese people have accumulated a wealth of knowledge about food over the past 5000 years. However, due to lifestyle changes and the influence of Western ideas on food and medicine, Chinese traditional health foods are less popular and some are even close to being lost, as we do not attach much importance to them, or we consider them old-fashioned, or one of their features does not meet modern demands—for example, a 'backward' processing method, inadequate hygiene standard, unattractive outward appearance or taste, and convenience.

Past experience and the literature on the functionalities of traditional foods need to be tested and substantiated using modern methods. For example, according to traditional knowledge, 'Pig fat has cold nature' and 'Mutton fat has warm nature', but is this true? And why? Furthermore, according to traditional theories, some food can 'nourish the heart to calm the mind', some can 'invigorate the spleen and relieve the stomach', some can 'reinforce the liver and replenish the kidney' and some can 'remove the liver-heat and improve the eyesight'. All of these experiences need to be studied scientifically—perhaps this could contribute

to scientific discoveries, or maybe we could dispel some of these old theories. Confucius once said that reviewing the past helps one to understand the present. In recent years, the development of such functional food materials as *Eucommia ulmoides*, ginkgo leaves, and Job's tears has been based on knowledge of Chinese traditional medicine.

Countermeasures and looking to the future

- Reconsider the value of traditional health foods and ensure that the legacy of these foods is not lost. In a sense, Chinese traditional foods are like a piece of virgin land—they contain vast potential and many commercial possibilities.
- Cooperate to make a comprehensive and systematic study of these foods. The development of the life sciences, medical science, and dietetics has provided us with powerful tools to understand and study Chinese traditional foods, but scientists should also cooperate with historians, archaeologists etc., since a vast amount of widely scattered historical information is available.
- Encourage entrepreneurs to develop as quickly as possible some of the 'better' Chinese traditional foods, using modern, industrialized methods. Development of such foods would certainly increase the value of agricultural products in many rural regions, thus increasing the income of local enterprises and farmers. It also has the potential to improve the nutritional status, and thus the health, of modern people. The wisdom accumulated over a very long time by the Chinese will be certain to make a contribution to the human race.

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