Plants traditionally used to make Cantonese slow-cooked soup in China

Yujing Liu¹,5, Qi Liu¹, Ping Li², Deke Xing¹, Huagang Hu³, Lin Li¹, Xuechen Hu⁵ and Chunlin Long⁴,5*

Abstract

Background: Lǎohuóliàngtáng (Cantonese slow-cooked soup, CSCS) is popular in Guangdong, China, and is consumed by Cantonese people worldwide as a delicious appetizer. Because CSCS serves as an important part of family healthcare, medicinal plants and plant-derived products are major components of CSCS. However, a collated record of the diverse plant species and an ethnobotanical investigation of CSCS is lacking. Because of globalization along with a renewed interest in botanical and food therapy, CSCS has attracted a growing attention in soup by industries, scientists, and consumers. This study represents the first attempt to document the plant species used for CSCS in Guangdong, China, and the associated ethnomedical function of plants, including their local names, part(s) used, flavors, nature, preparation before cooking, habitats, and conservation status.

Methods: In 2014–2017, participatory approaches, open-ended conversations, and semi-structured interviews were conducted with 63 local people and 48 soup restaurant owners (111 interviews) to better understand the biocultural context of CSCS, emphasizing ethnobotanical uses of plants in Guangdong Province, China. Product samples and voucher specimens were collected for taxonomic identification. Mention Index (QI), frequency of use index (FUI), and economic index (EI) were adopted to evaluate the significance of each plant in the food supply.

Results: A total of 97 plant species belonging to 46 families and 90 genera were recorded as having been used in CSCS in the study area. Recorded menus consisted of one or several plant species, with each one used for different purposes. They were classified into 11 functions, with clearing heat being the most common medicinal function. Of the 97 species, 19 grew only in the wild, 8 species were both wild and cultivated, and 70 species were cultivated. Roots and fruits were the most commonly used plant parts in the preparation of CSCS. According to the national evaluation criteria, six of these species are listed on “China’s red list” including two endangered, two critically endangered, one near-threatened, and one vulnerable species. The QI, FUI, and EI of the 97 species in the study varied between 0.09 and 1, 0.23 and 9.95, and 0.45 and 6.58, respectively.

Conclusions: As an important part of Cantonese culture, CSCS has been popularized as a local cuisine with a healthcare function. CSCS also reflects the plant species richness and cultural diversity of Guangdong Province. Future research on the safety and efficacy of CSCS as well as on ecological and cultural conservation efforts is needed for the sustainable growth of China’s botanical and medicinal plant industry.

Keywords: Cantonese slow-cooked soup, Ethnomedicine, Botanical industry, Food therapy, Cultural significance indices

* Correspondence: long@mail.kib.ac.cn
4Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, Yunnan 650201, China
5College of Life and Environmental Sciences, Minzu University of China, Beijing 100081, China

© The Author(s). 2018 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.
Background
In China, many communities have developed their own specific local type of soup, such as Simmer Soup in Hunan and Hubei provinces, Hot and Sour Soup in Sichuan province, Mutton Soup in Shandong province, and Cantonese slow-cooked soup (CSCS) in Guangdong Province. Among these soups, CSCS has the greatest number of varieties, and in general, it is well known locally and in foreign countries. As the name implies, CSCS is made with different kinds of ingredients from time to time and is cooked in a covered pot; the pot is allowed to simmer slowly at a low boil for an extended time. CSCS is a relatively low-fat, highly nutritious, and easily absorbed soup, used as a type of delicious appetizer, and has long been a form of traditional food therapy used by Cantonese people.

For a long time, CSCS and cooling herbal teas have epitomized Guangzhou food and drink culture [1]. The origin of CSCS can be traced back to 3500 years ago when it was used as an early form of Chinese herbal medicine [2]. Why? The heat and humidity of Guangdong inevitably penetrate the human body, making people feel very uncomfortable. Because Guangdong features a rich level of biodiversity, Chinese medicinal herbs are available for the Cantonese people to reduce a person's internal body heat or mitigate the humidity, but pure Chinese herbal tea is very bitter. Medicinal effects without this bitterness were desired. How was this problem solved? Clever Cantonese people added the medicinal herbs, such as ginger (Zingiber officinale Rosc.), which is used as an antinauseant [3], Lophatherum gracile Brong., used to cure mouth and tongue sores [4], Zea mays L., used to induce diuresis [5], and the seeds of Euryale ferox Salisb. ex Konig & Sims, which are used to cure kidney problems, to delicious soups [6].

Cantonese people have brought CSCS into many places where they live, such as Hong Kong, Macao, Taiwan, and other places in Southeast Asia as well as to the Chinatowns of different cities worldwide. CSCS provides a competitive advantage for immigrant Cantonese who markets this product in many places. However, many kinds of CSCS exist, so how does one select the right soup? Because many people lack an awareness of the use of traditional Chinese medicine (TCM) in support of human health, the development of CSCS has become disorganized. In addition, as food security has improved in recent years, international attention has been drawn to food therapy and food safety. As a result, the various types of CSCS need to be analyzed, so that the soup materials can be categorized according to their functions, part(s) used, preparation methods used before decoction and their nature (classified as hot, warm, cool, cold or neutral), and flavor. If these soup materials are classified and used correctly, the opportunity to develop Chinese medicine and expand food variety will emerge. In addition, it is imperative that steps are taken to preserve the heritage we have in TCM along with developing and protecting the nature of CSCS.

Methods
Study area
The coastal province of Guangdong is bounded by five southern Chinese provinces along with Hong Kong and Macao. Guangdong Province has a unique style with various dialects, customs, traditions, and historical culture. Guangdong covers an area of 179,800 km² and has 56 ethnic minorities with the Lingnan culture being generally representative. The total population of Han nationality is 102 million in 2013, accounted for 97.46% of Guangdong Province; the population of Zhuang, Yao, Tujia, Miao, and Dong nationality accounts for 86% of the total ethnic minorities’ population in Guangdong. The tropical and subtropical climates have a rich flora that thrives on a variety of geological features.

While Guangzhou serves as the capital of Guangdong Province, Shenzhen labels itself as an “emerging migrant city” (Fig. 1). Five villages (Mi Gang, Shi Hu, Luo Tang, Long Gang, and Bao An) and 48 restaurants in Guangzhou and Shenzhen were selected as the study sites. The criteria for selecting study sites, including soup chain stores and delivery outlets, were that the sites had a rich variety of CSCS materials so that the soup-drinking culture should be well preserved.

Ethnobotanical surveys
Our research findings are based on ethnobotanical surveys carried out from 2014 to 2017 with the objective of investigating, documenting, and interpreting which herbs Cantonese consumed in soup used to cure and prevent diseases and how these people produced and consumed these plants. A total of 63 local women in the five villages and 48 soup restaurant owners, both men and women, at other locations (111 interviews) were selected using participatory approaches, open-ended conversations, and semi-structured interviews (Fig. 1) [7]. The restaurant owners, all of whom had lived almost all of their lives in Guangdong, the local female residents over 40 years old, and could cook CSCS were invited to participate as informants; they all readily accepted the invitation to be interviewed. The study was carried out following the International Society of Ethnobiology Code of Ethics; all participants were informed of our intent prior to the start of the interviews. Prior to conducting interviews, we bought or took photos of plant materials used in restaurants in order to conduct a cross-validation of plant
identifications in the village; in addition, informants were presented with freshly pressed or gathered plant materials, so the species identifications could be confirmed. During all interviews, the interviewees were asked to speak freely about herb materials to allow us to acquire a list of those species used in making CSCS. In addition, when the interviewees permitted it, samples were collected with the help of local guides. Interviewees were given the option to answer the following questions about each plant species: (1) Have you ever used this plant for making CSCS or not? (2) How often do you eat it? (3) Did you sell or buy this plant? (4) Where do you gather this plant? (5) What plant part do you use of this plant? (6) What is the function of this plant in CSCS? (7) How do you prepare this plant for decoction? (8) How do you obtain plants to cure and prevent diseases in your daily life? (9) Which plants have you used during your lifetime to make CSCS, etc.? Finally, group discussions with key informants were organized separately from the 63 interviews in the five villages. Notes and photos were taken to record the relevant information provided by the informants; digital voice recorders and cameras were used to record the plants and activities of informants as they gathered plants in the field. We collected three specimens of each wild plant. Plants cultivated in home gardens were not used as voucher specimens. For those gathered from the wild and then planted in kitchen gardens, we also gathered the same species of plants from the wild. Voucher specimens of all wild plants available during field investigations were deposited in the Ethnobotany Lab of Minzu University of China. Plant identification was based on the Flora of China, and a review of specimens at PE, the herbarium of the Institute of Botany, Chinese Academy of Sciences, Beijing, China.

**Statistical analysis**

Mention Index (QI), frequency of use index (FUI), and Economic Index (EI) were adopted to develop and evaluate a cultural importance index for each plant species [8]. We use questions 1, 2, and 3 above to calculate the QI, FUI, and EI for each species where $QI = \frac{\text{number of mentions}}{\text{number of informants}}$. For FUI and EI, the final value of each plant is the average of all informant responses. For the details of the calculation method see Table 1.

Table 2 lists the ethnobotanical information for each plant, including scientific name, Chinese name, Cantonese name, and the values of QI, FUI, and EI calculated for each plant species. The table below provides a summary of the categorization of answers and values used for the cultural significance indices.

| Index | Answer                                                       | Value  |
|-------|--------------------------------------------------------------|--------|
| QI    | Not mentioned                                                | 0      |
|       | Mentioned                                                    | 1      |
| FUI   | Never                                                       | 0      |
|       | Less than once a month                                        | 2.5    |
|       | Once a month                                                 | 5      |
|       | 2–3 times a month                                            | 7.5    |
|       | 4 or more a month                                            | 10     |
| EI    | He/she does not sell or buy it                               | 0      |
|       | He/she sells or buys it occasionally at low prices           | 3.33   |
|       | He/she sells or buys it regularly                             | 6.67   |
|       | He/she sells or buys it at high prices                       | 10     |
| Scientific name | Chinese name | Chinese character | Cantonese name | Function | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation need | QI | FUI | EI | Voucher number |
|-----------------|--------------|------------------|----------------|----------|-------------|--------|--------|-----------------------------|---------|-------------------|----|-----|----|-----------------|
| Adenophora stricta Miq. | Sha Shen | 沙参 | Saa sam | Nourish yin, stop cough | Root | Sweet, pungent | Warm | Dry | Wild | 0.28 | 0.7 | 1.53 | GD107 |
| Alisma plantago-aquatica Linn. | Ze Xie | 泽泻 | Zaak Se | Clear heat | Stem | Sweet | Cold | Dry | Wild | 0.23 | 0.61 | 1.2 | GD22 |
| Anomorium villosum Lour. | Sha Ren | 砂仁 | Saa Jan | Tonify qi | Fruit | Pungent | Warm | Dry | Cultivated | 0.37 | 0.92 | 2.34 | GD44 |
| Angelica sinensis (Oliv.) Diels | Dang Gui | 当归 | Dong gwai | Replenish blood | Root | Bitter, pungent | Warm | Dry | Cultivated | 0.41 | 1.01 | 2.34 | GD99 |
| Arachishypogaea Linn. | Hua Sheng | 落花生 | Faa sang | Tonify qi | Seed | Sweet | Neutral | Dry | Cultivated | 0.95 | 8.58 | 5.38 | GD34 |
| Armeniaca vulgaris Lam. | Xing | 砂仁 | Saa jan | Tonify qi | Fruit | Sour, sweet | Warm | Fresh | Cultivated | 0.73 | 2 | 3.72 | GD19 |
| Astragalus membranaceus (Fisch.) Bunge | Huang Qi | 黄耆 | Wong kei | Tonify qi, tonify yang | Root | Sweet, Warm | Dry | Cultivated | 0.52 | 1.69 | 3.18 | GD56 |
| Atractylodes macrocephala Koidz. | Bai Zhu | 白术 | Baak seot | Tonify qi | Root | Bitter, sweet | Warm | Dry | Cultivated | 0.25 | 1.01 | 1.41 | GD78 |
| Benincasa hispida (Thunb.) Cogn. | Dong Gu | 冬瓜 | Dung gwaa | Clear heat, stop cough | Fruit | Sweet | Cool | Fresh | Cultivated | 0.68 | 4.08 | 3.39 | GD60 |
| Brassica pekinensis (Lour.) Rupr. | Bai Cai | 白菜 | Baak coi | Digestion, promote dampness | Leaf | Sweet | Neutral | Fresh | Cultivated | 0.97 | 6.78 | 3.97 | GD120 |
| Carthamus tinctorius L. | Hong Hua | 红花 | Hung faa | Promote circulation, tonify qi | Flower | Pungent | Warm | Dry | Wild (C) | 0.23 | 0.7 | 1.5 | GD86 |
| Castanea mollissima Bl. | Li Zi | 栗 | Leot zi | Tonify qi, promote circulation | Seed | Sweet | Warm | Fresh | Cultivated | 0.41 | 1.17 | 1.62 | GD111 |
| Chamaemelus sinensis (Thouin) Koehne | Mu Gua | 木瓜 | Muk gwaa | Digestion | Fruit | Sour | Warm | Dry | Cultivated | 0.44 | 1.53 | 2.13 | GD200 |
| Cistanche deserticola Ma | Rou Cong Rong | 肉苁蓉 | Juk cung jung | Tonify yang | Stem | Sweet, salty | Warm | Dry | Cultivated | CR | 0.17 | 0.43 | 0.45 | GD118 |
| Citrus limon (L.) Burm. f. | Ning Meng | 柠檬 | Ning mung | Clear heat, stop cough | Fruit | Sour, sweet | Neutral | Fresh or dry | Cultivated | 0.6 | 4.53 | 4.03 | GD105 |
| Citrus reticulata Blanco | Gan Ju | 柑橘 | Gam gat | Tonify qi | Fruit | Bitter, pungent | Warm | Dry | Cultivated | 0.66 | 5.02 | 2.88 | GD43 |
| Cocos nucifera L. | Ye Zi | 椰子 | Je zi | Tonify qi | Fruit | Sweet | Warm | Fresh | Cultivated | 0.59 | 2.73 | 3.06 | GD9 |
| Codonopsis pilosula (Franch.) Nanf. | Dang Shen | 党参 | Dong sam | Tonify qi, replenish blood | Root | Sweet | Neutral | Dry | Cultivated | 0.34 | 0.99 | 2.28 | GD6 |
| Coix lacryma-jobi L. | Yi Yi | 薏苡 | Ji ji | Tonify qi | Seed | Sweet | Cool | Dry | Cultivated | 0.6 | 3.42 | 3.82 | GD81 |
Table 2 Inventory of plants traditionally used for making Cantonese slow-cooked soup in Guangdong, China (species are listed alphabetically) (Continued)

| Scientific name | Chinese name | Chinese character | Cantonese name | Function | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation need | Qi | FUI | EI | Voucher number |
|-----------------|--------------|------------------|----------------|----------|-------------|--------|--------|-------------------------------|---------|------------------|----|-----|----|-----------------|
| Colocasia esculenta (L.). Schott | Yu | 芋 | Wu | Tonify qi | Bulb | Sweet, pungent | Neutral | Dry | Cultivated | 0.87 | 6.46 | 4.33 | GD67 |
| Cornus officinalis Sieb. et Zucc. | Shan Zhu Yu | 山茱萸 | Saan zyu ju | Astrigents | Fruit | Sour | Warm | Dry | Cultivated | 0.39 | 1.42 | 2.22 | GD87 |
| Crataegus pinnatifida Bge. | Shan Zha | 山楂 | Saan zaa | Digestion | Fruit | Sour, sweet | Warm | Dry | Cultivated | 0.74 | 3.24 | 3.18 | GD54 |
| Cuscuta chinensis Lam. | Tu Si Zi | 菟丝子 | Tou si zi | Tonify yang | Seed | Sweet | Warm | Dry | Wild | 0.38 | 1.1 | 1.53 | GD214 |
| Davallia mariesii Moore ex Bak. | Gu Sai Bu | 骨碎补 | Gwat seoi bou | Tonify yang | Root | Bitter | Warm | Dry | Wild | 0.28 | 0.7 | 1.35 | GD224 |
| Dendranthema morifolium (Ramat.) Tzvel. | Ju Hua | 菊花 | Guk faa | Clear heat | Flower | Sweet, bitter | Cold | Dry | Wild (cultivated) | 0.71 | 3.06 | 4.45 | GD207 |
| Dendrobium officinale Kimura et Migo | Tie Pi Shi Hu | 铁皮石斛 | Tit pei sek huk | Nourish yin, clear heat | Stem | Sweet, salty | Cold | Fresh or dry | Cultivated | CR | 0.17 | 0.43 | 1.2 | GD234 |
| Dendrobium wilsonii Rolfe | Guang Dong Shi Hu | 广东石斛 | Gwong dung sek huk | Nourish yin, clear heat | Stem | Sweet | Cold | Fresh or dry | Cultivated | EN | 0.09 | 0.23 | 0.6 | GD244 |
| Dioscorea esculenta (Lour.) Burkill | Gan Shu | 甘薯 | Syu ju | Tonify qi | Root | Sweet | Neutral | Dry | Cultivated | 0.47 | 1.58 | 2.34 | GD177 |
| Dumasia hirsute Craib | Ying Mao Shan Hei Dou | 硬毛山黑豆 | Ngaang mou san hak dau | Clear heat | Seed | Sweet | Neutral | Fresh | Cultivated | 0.53 | 2.25 | 2.76 | GD109 |
| Durio zibethinus Murr. | Liu Lian | 榴莲 | Lau lin | Nourish yin | Fruit | Sweet, pungent | Hot | Fresh | Cultivated | 0.25 | 1.33 | 1.32 | GD21 |
| Ephedra sinica Stapf | Cao Ma Huang | 草麻黄 | Cou ma mou | Promote dampness | Stem | Pungent, bitter | Warm | Dry | Wild | 0.19 | 0.68 | 0.84 | GD117 |
| Eriobotrya japonica (Thunb.) Lindl. | Pi Pa | 枇杷 | Pei paa | Stop cough | Leaf | Bitter | Cold | Dry | Cultivated | 0.04 | 1.31 | 1.86 | GD123 |
| Eucommia ulmoides Oliver | Du Zhong | 杜仲 | Dou zung | Tonify yang | Bark | Sweet | Warm | Dry | Wild | NT | 0.27 | 0.77 | 1.47 | GD134 |
| Euryale ferox Salisb. ex Konig & Sims | Qian Shi | 芡实 | Him sat | Astrigents | Seed | Sweet | Sour | Neutral | Dry | Cultivated | 0.26 | 1.1 | 1.65 | GD122 |
| Ficus carica Linn. | Wu Hua Guo | 无花果 | Mou faa gwo | Stop cough | Fruit | Sweet | Neutral | Fresh or dry | Cultivated | 0.43 | 1.71 | 2.49 | GD144 |
| Ficus hirta Vahl | Cu Ye Rong | 相思 | Cou jip jung | Tonify qi | Root | Sweet | Warm | Dry | Cultivated | 0.25 | 0.99 | 0.96 | GD199 |
| Flemingia philippinensis Merr. et Rolfe | Qian Jin Ba | 千斤拔 | Cin gan but | Tonify qi, promote circulation | Root | Sweet | Neutral | Cultivated | 0.55 | 2.55 | 2.91 | GD119 |
| Frutillaria cirrhosa D. Don | Chuan Bei Mu | 川贝母 | Cyun bei mou | Stop cough, promote dampness | Bulb | Bitter, sweet | Cold | Dry | Cultivated | 0.48 | 2.39 | 2.61 | GD156 |
| Scientific name | Chinese name | Chinese character | Cantonese name | Function | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation need | Qi | FUI | EI | Voucher number |
|-----------------|--------------|------------------|---------------|-----------|--------------|--------|-------|--------------------------------|---------|------------------|----|-----|----|-----------------|
| Ginkgo biloba L. | Yin Xing     | 銀杏            | Ngan hang     | Stop cough, astringents | Seed | Sweet, bitter, sour | Neutral | Dry | W                             | EN      | 067              | 3.81 | 3.36 | GD178          |
| Glycine max (Linn.) Merr. | Da Dou | 大豆          | Daai dau     | Clear heat, promote circulation | Seed | Sweet | Neutral | Fresh | Cultivated            | 077 | 5.25 | 3.57 | GD160          |
| Hordeum vulgare L. | Da Mai | 大麦          | Daai mak     | Digestion | Sprout | Sweet | Neutral | Raw or stir-baked form | Cultivated | 046 | 2.52 | 2.28 | GD112          |
| Houttuynia cordata Thunb. | Ji Cai | 菊菜          | Jyuu sing cou| Clear heat | Whole plant | Pungent | Cold | Fresh | Wild (cultivated) | 088 | 6.67 | 3.81 | GD186          |
| Hylocereus undatus (Haw.) Britt. et Rose | Liang Tian Chi | 量天尺      | Loeng tin cek | Clear heat, stop cough | Flower | Sweet | Cool | Fresh | Wild (cultivated) | 024 | 1.04 | 1.26 | GD111          |
| Ilex pubescens Hook. et Arn. | Mao Dong Qing | 毛冬青    | Mou dung cing | Clear heat, promote circulation | Root | Bitter | Cold | Dry | Wild | 035 | 1.91 | 1.74 | GD210          |
| Imperata cylindrica (L.) Beauv. | Bai Mao | 白茅      | Baak maau     | Clear heat | Root | Sweet | Cold | Dry | Wild | 051 | 2.91 | 2.64 | GD218          |
| Isatis tinctoria L. | Ou Zhou Song Lan | 欧洲菘蓝 | Sung Laam | Clear heat | Root | Bitter | Cold | Dry | Wild (cultivated) | 087 | 6.67 | 3.66 | GD205          |
| Jasminum sambac (L.) Ait. | Mo Li Hua | 茉莉花     | Mut lei faa | Clear heat | Flower | Pungent, sweet | Warm | Dry | Cultivated | 071 | 4.21 | 3.63 | GD243          |
| Juglans regia L. | Hu Tao | 胡桃          | Wu tou       | Soothe the nerves and brain | Seed | Sweet | Warm | Dry | Cultivated | 077 | 3.81 | 3.81 | GD226          |
| Juncus bufonius L. | Xiao Deng Xin Cao | 小灯心草   | Dang sam cou | Clear heat, promote dampness | Whole plant | Sweet | Cold | Fresh or dry | Wild | 08 | 4.03 | 3.36 | GD281          |
| Lablab purpureus (Linn.) Sweet | Bian Dou | 扁豆          | Bin dau       | Tonify yang | Seed | Sweet | Neutral | Dry | Cultivated | 011 | 0.61 | 0.63 | GD267          |
| Leonurus japonicus Houtt. | Yi Mu Cao | 益母草     | Jik mou cou | Promote circulation | Leaf | Bitter, pungent | Cold | Fresh or dry | Wild | 077 | 3.11 | 4.18 | GD287          |
| Liriope mucong Hort. | Chuan Xiong | 川芎        | Cyun hung    | Promote circulation | Root | Pungent | Warm | Fresh or dry | Cultivated | 037 | 1.19 | 2.07 | GD254          |
| Lilium brownii F. E. Brown ex Miellez | Ye Bai He | 野百合    | Baak hap | Nourish yin, stop cough, soothe the nerves and brain | Leaf | Sweet | Cold | Fresh or dry | Cultivated | 036 | 2.18 | 2.13 | GD241          |
| Juan Dan | 卷丹              | Leaf | Sweet | Cold | Cultivated | 064 | 3.51 | 3.57 | GD146          |
| Scientific name | Chinese name | Chinese character | Cantonese name | Function | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation need | Qi | FUI | EI | Voucher number |
|-----------------|--------------|-------------------|----------------|----------|-------------|--------|--------|-----------------------------|---------|------------------|----|-----|----|-----------------|
| Lilium lancifolium Thunb. | Gyun daan baak hap | 菊花 | Gyun daan baak hap | Nourish yin, soothe the nerves and brain | Fruit | Sweet, sour | Warm | Fresh or dry | Cultivated | 0.77 | 4.05 | 4.24 | GD165 |
| Litchi chinensis Sonn. | Li Zhi | 荔枝 | Lai zi | Tonify qi, replenish blood, soothe the nerves and brain | Fruit | Sweet, sour | Warm | Fresh | Cultivated | 0.78 | 5.27 | 4.21 | GD110 |
| Lophatherum gracile Brongn. | Dan Zhu Ye | 淡竹叶 | Daam zuk jip | Clear heat, promote dampness | Whole plant | Sweet | Cold | Fresh or dry | Wild | 0.88 | 7.18 | 4.9 | GD119 |
| Luffa acutangula (L.) Roem. | Guang Dong Si Gua | 广东丝瓜 | Si gwaa | Clear heat | Fruit | Sweet | Cool | Fresh | Cultivated | 0.88 | 7.18 | 4.9 | GD119 |
| Lycium chinense Mill. | Gou Qi | 梅杞 | Geoi gei | Nourish yin | Fruit | Bitter | Cold | Dry | Cultivated | 0.91 | 7.93 | 6.58 | GD66 |
| Magnolia officinalis Rehd. et Wils. | Hou Pu | 厚朴 | Hau buk | Clear heat | Flower | Bitter, pungent | Warm | Dry | Cultivated | 0.61 | 3.42 | 3.12 | GD45 |
| Malus pumila Mill. | Ping Guo | 苹果 | Ping gwo | Tonify qi, replenish blood | Fruit | Sweet | Cool | Fresh | Cultivated | 0.43 | 2.12 | 2.61 | GD90 |
| Mentha haplocalyx Briq. | Bo He | 薄荷 | Bok ho | Clear heat | Whole plant | Pungent | Cool | Dry or fresh | Cultivated | 0.59 | 4.32 | 3.06 | GD88 |
| Momordica charantia L. | Ku Gua | 苦瓜 | Fu gwaa | Clear heat | Fruit | Bitter | Cold | Fresh | Cultivated | 0.53 | 4.12 | 2.79 | GD142 |
| Nelumbo nucifera Gaertn. | Lian | 莲 | Lin | Soothe the nerves and brain | Seed and flower | Sweet, sour | Neutral | Seed: dry/flower: fresh | Cultivated | 0.06 | 3.6 | 3.33 | GD168 |
| Olea europaea L. | Mu Xi Lan | 木犀榄 | Muk sai laam | Clear heat | Fruit | Sweet, sour | Neutral | Fresh | Cultivated | 0.35 | 1.82 | 0.57 | GD175 |
| Ophiopogon japonicas (Linn. f.) Ker-Gawl. | Mai Dong | 麦冬 | Mak dung | Nourish yin, stop cough | Root | Sweet, Bitter | Cold | Dry | Wild | 0.7 | 4.26 | 1.11 | GD169 |
| Oryza sativa L. | Dao | 稻 | Dou | Nourish yin, astringents | Root | Sweet | Neutral | Dry | Cultivated | 0.26 | 1.19 | 1.08 | GD184 |
| Osmunda japonica Thunb. | Zi Qi | 紫萁 | Gun zung | Clear heat | Root | Bitter | Cool | Dry | Cultivated | 0.31 | 1.15 | 1.65 | GD143 |
| Panax ginseng C. A. Mey. | Ren Shen | 人参 | Jan sam | Tonify qi, soothe the nerves and brain | Root | Sweet, bitter | Neutral | Dry | Cultivated | 0.08 | 2.91 | 5.23 | GD132 |
| Panax notoginseng (Burkili) F. | San Qi/Tian Qi | 三七 | Saam cat | Promote circulation | Root | Sweet, bitter | Warm | Dry | Cultivated | 0.79 | 3.33 | 4.96 | GD187 |
Table 2 Inventory of plants traditionally used for making Cantonese slow-cooked soup in Guangdong, China (species are listed alphabetically) (Continued)

| Scientific name                     | Chinese name   | Chinese character | Cantonese name | Function                  | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation | Qi | FUI | EI | Voucher number |
|--------------------------------------|----------------|-------------------|----------------|---------------------------|--------------|--------|--------|--------------------------------|---------|--------------|----|-----|----|----------------|
| H. Chen ex C. H. Chow                |                |                   |                |                           |              |        |        |                                |         |              |    |     |    |                |
| Panax quinquefolius Linn.            | Xi Yang Shen   | 西洋参 | Sai joeng sam | Tonify qi, nourish yin | Root         | Sweet, bitter | Cool | Dry | Cultivated                   |         | 0.23          | 0.59 | 1.53 | GD1 |
| Pinus koraiensis Seb. et Zucc.       | Hong Song      | 红松            | Hung sung     | Nourish yin              | Seed         | Sweet | Warm | Dry | Cultivated                   |         | 0.58          | 2.23 | 3.91 | GD91 |
| Polygonatum cyrtomena Hua           | Duo Hua Huang Jing | 多花黄精 | Wong zing     | Nourish yin, tonify qi   | Root         | Sweet | Neutral | Dry | Cultivated                   |         | 0.53          | 1.91 | 2.73 | GD58 |
| Polygonatum odoratum (Mill.) Druce   | Yu Zhu         | 玉竹            | Juk zuk       | Nourish yin              | Root         | Sweet | Cold | Dry | Cultivated                   |         | 0.58          | 2.12 | 0.87 | GD65 |
| Prunella vulgaris L.                 | Xia Ku Cao     | 夏枯草         | Haa fu cou    | Clear heat               | Leaf         | Pungent, bitter | Cold | Dry | Wild                         |         | 0.88          | 5.83 | 4.48 | GD229 |
| Pseudostellaria heterophylla (Miq.) Pax | Hai Er Shen | 孩儿参       | Taai zi sam  | Tonify qi                | Root         | Sweet, bitter | Neutral | Dry | Wild (cultivated)            |         | 0.26          | 0.83 | 1.65 | GD300 |
| Psoralea corylifolia Linn.           | Bu Gu Zhi      | 补骨脂         | Bou gwat zi   | Tonify yang, tonify qi   | Fruit        | Pungent, bitter | Warm | Dry | Cultivated                   |         | 0.22          | 0.61 | 1.17 | GD209 |
| Pueraria lobata (Wild.) Ohwi         | Ge Gen         | 葛             | Fan got       | Tonify yang, astringents | Root         | Sweet, pungent | Cool | Dry | Wild                         |         | 0.32          | 1.17 | 1.77 | GD273 |
| Pyrus pyrifolia (burrm. f) Nakai     | Sha Li         | 沙梨           | Syut lei      | Clear heat, stop cough    | Fruit        | Sweet, sour | Cool | Fresh | Cultivated                   |         | 0.92          | 4.64 | 5.35 | GD181 |
| Quisqualis indica L.                 | Shi Jun ZI     | 使君子         | Sai gwan zhi | Digestion                | Fruit        | Sweet | Warm | Dry | Wild (cultivated)            |         | 0.26          | 0.68 | 1.35 | GD315 |
| Ranunculus ternatus Thunb.           | Mao Zhua Cao   | 猫爪草         | Maau zaau cou | Stop cough               | Root         | Sweet, pungent | Warm | Dry | Wild                         |         | 0.19          | 0.47 | 0.78 | GD320 |
| Raphanus sativus L.                  | Hu Luo Bo      | 萝卜            | Wu lo baak   | Digestion                | Root         | Sweet | Neutral | Fresh | Cultivated                   |         | 1             | 9.71 | 1.71 | GD331 |
| Reynmania glutinosa (Gaetn.) Libosch. et Mey. | Di Huang | 地黄           | Dei wong     | Nourish yin, replenish blood, tonify qi | Root         | Sweet | Warm | Dry | Wild (cultivated)            |         | 0.5           | 1.78 | 2.52 | GD18 |
| Rosa laevigata Michx.                | Jin Ying Zi    | 金樱子         | Gam jing zii | Astringents              | Fruit        | Sour, sweet | Neutral | Dry | Wild                         |         | 0.62          | 2    | 3.3 | GD347 |
| Rosa rugosa Thunb.                   | Mei Gui        | 玫瑰            | Mui gwai     | Tonify qi                | Flower       | Sweet, bitter | Warm | Dry | Cultivated                   |         | 1             | 3.83 | 4.99 | GD10 |
| Zhu Zhe                              |                | 竹蔗           | Zuk ze       |                         | Juice        | Sweet | Neutral | Fresh | Cultivated                   |         | 1             | 4.14 | 4.68 | GD121 |
| Scientific name | Chinese name | Chinese character | Cantonese name | Function | Part(s) used | Flavor | Nature | Preparation before decoction | Habitat | Conservation need | Qi  | FUI  | EI  | Voucher number |
|-----------------|--------------|------------------|----------------|----------|-------------|--------|-------|-------------------------------|---------|---------------------|-----|------|-----|-----------------|
| *Saccharum* sinense Roxb. | | | | | | | | | | | | | |
| *Salvia miltiorrhiza* Bunge | Dan Shen | 丹参 | Daan sam | Clear heat, digestion | Root | Bitter | Cold | Dry | Cultivated | 0.34 | 1.35 | 2.4 | GD316 |
| *Scrophularia ningpoensis* Hemsl. | Xuan Shen | 玄参 | Duk gok gam | Clear heat, nourish yin | Root | Sweet, bitter, salty | Cold | Dry | Cultivated | 0.26 | 0.83 | 1.74 | GD326 |
| *Stratiota grosvenorii* (Swingle) C. Jeffrey ex Lu et Z. Y. Zhang | Luo Han Guo | 罗汉果 | Lo hon gwo | Stop cough | Fruit | Sweet | Cool | Dry | Cultivated | 1 | 7.66 | 6.07 | GD333 |
| *Stellaria nipponica* Ohwi | Bai Hua Fan Lv | 多花繁缕 | Baak faa se sit cou | Clear heat, promote dampness | Whole plant | Sweet | Cool | Dry | Wild | 0.44 | 2.7 | 2.22 | GD3 |
| *Striga asiatica* (L.) O. Kuntze | Du Jiao Jin | 独脚金 | Duk gok gam | Clear heat, digestion | Whole plant | Sweet | Cool | Dry | Wild | 0.42 | 2.43 | 2.34 | GD336 |
| *Triticum aestivum* L. | Pu Tong Xiao Mai | 普通小麦 | Pou tung siu mak | Astringents, tonify qi, clear heat | Fruit | Sweet | Cool | Dry | Cultivated | 0.35 | 1.31 | 1.74 | GD312 |
| *Vigna radiata* (Linn.) Wilczek | Lv Dou | 绿豆 | Luk dau | Clear heat | Seed | Sweet | Cool | Dry | Cultivated | 1 | 8.49 | 5.83 | GD228 |
| *Vigna umbellate* (Thunb.) Ohwi et Ohashi | Chi Xiao Dou | 赤小豆 | Cik siu dau | Promote dampness | Seed | Sweet, sour | Neutral | Dry | Cultivated | 1 | 7.7 | 4.63 | GD171 |
| *Vigna unguiculata* (Linn.) Walp. | Jiang Dou | 玉豆 | Gong dau | Digestion | Seed | Sweet | Neutral | Fresh or dry | Cultivated | 1 | 7.34 | 4.96 | GD180 |
| *Zea mays* L. | Yu Shu Shu | 玉蜀黍 | Juk mai | Promote dampness | Seed | Sweet | Neutral | Fresh | Cultivated | 0.87 | 5.56 | 4.48 | GD50 |
| *Ziziphus jujuba* Mill. | Zao | 枣 | Mou ci zou | Tonify qi | Fruit | Sweet | Warm | Dry | Cultivated | 1 | 8.99 | 6.07 | GD342 |
Results and discussion

Diversity of plants used in CSCS

Our ethnobotanical surveys documented 113 kinds of plants or plant parts, as defined below, used as ingredients in CSCS (Table 4), including ingredients from 97 species in 90 genera and 46 families (Table 2). In terms of the number of species, the eight species found in each caused the Gramineae and Rosaceae to rank first, followed by seven species each in the Fabaceae and Liliaceae (Fig. 2). The ingredients used in CSCS refer not only to whole herbaceous plants but also to the leaf, bark, root, seed, fruit, stem, bulb, juice, stigma, and flower. Root and fruit were used most commonly. Among these 97 species, 28 and 26 species were collected for the harvesting of roots and fruits, respectively (Fig. 3). Local people also prefer to preserve plants by drying for later use as food materials.

We checked the status of the plant species used in CSCS by following the evaluation criteria established by the International Union for Conservation of Nature (Table 2). Six species are listed on the “China red list”; Dendrobium officinale Kimura et Migo and Cistanche deserticola Ma are CR (critically endangered), Dendrobium wilsonii Rolfe is listed as EN (endangered), and Atractylodes macrocephala Koidz. is VU (vulnerable). The remaining 91 species are in the “least concern” category. For the six endangered or vulnerable wild species, reasonable cultivation protocols and ex situ conservation methods need to be established as soon as possible.

The QI of the 97 species in the present study varied between 9 and 100%. The QIs of 46 species were ranked at 0–50% (~47.4%) and were 51–99% for 42 species (~43.3%); only nine species had a QI of 100% (~9.3%). The nine species mentioned above are familiar to almost everyone and include Lycopersicon esculentum Mill., Vigna umbellata (Thunb.) Ohwi et Ohashi, Saccharum sinense Roxb., Vigna unguiculata (Linn.) Walp., Rosa rugosa Thunb., Vigna radiata (Linn.) Wilczek, Raphanus sativus L., Siraitia grosvenorii (Swingle) C. Jeffrey ex Lu et Z. Y. Zhang, and Ziziphus jujuba Mill.

The FUI varied between 0.23 and 9.95. Nineteen species (~19.6%) were used more than once a month (FUI > 5). Table 2 clearly shows that the most frequently mentioned species were also the most commonly used, with the exceptions of R. rugosa (FUI = 3.83) and S. sinense (FUI = 4.14). Fifty-one species were used only occasionally in some years (FUI < 2.5); they are relatively somewhat difficult to obtain either by collection or through commerce.

The EI varied between 0.45 and 6.58. Also, 89 species had an appreciable economic importance (EI > 1). Lycium chinense Mill. had the highest EI value (EI = 6.58); L. chinense is very significant because most people like to add it to CSCS to flavor the soup and nourish the body.

Function and five elements of plants

Chinese people attached great importance to the therapeutic role of food during the early stages of the development of Chinese medicine [10]. CSCS has the concomitant function of serving as both food and medicine based on past experience and the theory of TCM. In the present study, the medicinal functions of CSCS can be classified into 11 categories (Table 2 and Fig. 4). In TCM, “qi” is considered to be a natural energy and
the central underlying principle of life. Symptoms of various illnesses are believed to be the product of deficiencies or imbalances in the qi of the organs of the body [11]. If a qi deficiency exists in the spleen, a person will be tired and experience a loss of appetite. If a qi deficiency occurs in the lung, a person will experience shortness of breath and cough, have pale skin color, and sweat spontaneously. The Cantonese often relieve these types of imbalances by adjusting the circulation of qi using food therapy. During our field surveys, we found 24 species involved in tonifying a person’s qi (Fig. 4). In addition, some kinds of CSCS have significant effects in promoting digestion, dampness, and circulation as well as in tonifying a person’s yang; these soups will have an astringent, soothing effect on the nerves and brain while replenishing the blood. Chinese philosophy considers yin and yang to be the two complementing principles of life; yin has the female characteristics of earth, cold, and darkness, and yang has the male characteristics of heaven, heat, and light. Any one person has both yin and yang, and these characteristics need to be balanced to maintain good health.

Although the precepts of Chinese food therapy are neither systematic nor identical in different times and places, some basic concepts have been isolated. The Chinese Pharmacopoeia (2010) classifies herbs as having five natures and five flavors based on the five elements theory, which determines their usage. The five natures (hot, warm, cool, cold, and neutral) are summarized mainly from the body’s response after Chinese herbs are consumed [12]. In addition, herbs are classified into five flavors by their efficacy, using their true taste [12] including sweet, bitter, sour, pungent, and salty [13]. The five elements theory is similar with the concept of organoleptic characteristics introduced by Nina Etkin [14], how people use taste to select food or medicine; the taste of plants can define the curing properties or specific diseases of food or medicine, for example, sour tastes are useful for curing fever and nausea. In this study, each herb was linked with the theory of the five elements (Table 3). The natures of these 97 species range from cold (22 species), cool (16), neutral (27), warm (31), and hot (only Durio zibethinus Murr.). Because Guangdong is located in the East Asia monsoon region, it experiences a hot and humid climate. Practitioners of TCM hold that inner heat will accumulate in summer, and this causes many types of illness. However, many people prefer to select cool and cold herbs to clear heat from the body. In our study, the most common function of herbs related to their nature was clearing heat, with 31 plant species having this function. Also, a small amount of a hot herb was often used in CSCS, which is consistent with the ethnobotanical survey conducted here.

We analyzed the relationship between plant nature and function. Thirty-eight species having a cool or cold nature, among which 23 species are mainly used to clear heat, account for 60.5%. In addition, we can see that the warm herbs are mainly used to tonify qi and yang, which accounts for 61.3% of all herbs analyzed (Fig. 4). Aside from tonifying qi and clearing heat, neutral herbs are mainly used to aid digestion and as astringents. However, no definite corresponding relationship was found to exist between nature and function.

In TCM, an herb with a sour taste would be assumed to be astringent; an herb with a bitter taste would be useful to eliminate dampness; pungent substances are thought to induce sweat; sweetness is supplementing, harmonizing, and moistening; and saltiness can soften hard masses [13]. In this study, 75, 26, 14, 18, and 3 species were classified as sweet, bitter, sour, pungent, and salty, respectively. We tried to find the corresponding relationship between flavor and function. Here, we indicated that sweet, bitter, and pungent herbs can be used as astringents and not just sour herbs. In addition, the main functions of sour herbs are clearing heat, stopping cough, and helping digestion. The main functions of sweet herbs are clearing heat, tonifying qi, nourishing yin, and stopping a cough. The main functions of bitter herbs are clearing heat, tonifying qi, nourishing yin, stopping a cough, and promoting circulation. The main functions of pungent herbs are clearing heat and tonifying qi (Fig. 5). Generally, clearing heat is the main

![Fig. 4 The relationship between five natures (cold, cool, neutral, warm, and hot) and function of plants in CSCS](image)

| Table 3 The relationship between five plant natures and five plant flavor |
|-----------------------------|----------------|----------------|---------|---------|----------------|
| Nature         | Sweet | Bitter | Sour | Salty | Pungent |
| Neutral        | 25    | 3      | 7    | 0      | 1       |
| Warm           | 21    | 8      | 5    | 1      | 11      |
| Cold           | 14    | 11     | 1    | 2      | 3       |
| Cool           | 14    | 2      | 1    | 0      | 2       |
| Hot            | 1     | 0      | 0    | 0      | 1       |
function of all herbs. It seems that there is no obvious connection between flavor and function. In fact, substances may also have more than one flavor. For example, *Angelica sinensis* (Oliv.) Diels is sweet and pungent, *Lycopersicon esculentum* Mill. is sweet and sour, and *Scrophularia ningpoensis* Hemsl. is sweet, bitter, and salty. In addition, each herb has its unique nature. Chinese herbal nature is an important part of TCM theory; a single characteristic (a nature, flavor, element, function, etc.) or two such characteristics cannot reveal the internal law of a particular herb systematically. Also, the 97 species discussed here cannot fully reveal the internal law; additional species will need to be analyzed. The relationship between each of the five elements of an herb and its function needs to be studied comprehensively, with the discussion not only confined to CSCS materials. In addition, we should combine the flavor and nature of an herb to explain the complicated relationship between the five elements and function and not separate flavor from nature.

Modern scientific research has been undertaken on the five natures since 1960, mainly in China and Japan, with a focus on pharmacodynamic and substantial foundational research [12]. So far, no definitive compatibility of the five elements and function has been found for Chinese medicinal herbs. The experience from ethno-botanical research related to CSCS will supply some materials for studying the relationship between the five elements and function; this will help to match ingredients with different symptoms.

**How to choose a type of soup?**

Cantonese people usually match ingredients based on the symptoms, medicinal effect, seasonal changes, physical quality, job, age, and gender of a patient to help people keep physically fit and to prevent and cure diseases.

(1) Soup choice depends on the symptoms: Herbs comprise most of the ingredients in CSCS. Chinese medicine emphasizes matching the remedy to the case [12], so the Cantonese will choose different soups for patients with different symptoms. For example, a mix of *Ziziphus jujuba* Mill. and *Angelica sinensis* (Oliv.) Diels or *Leonurus japonicus* Houtt. was used to regulate menstruation; a mix of *Ligusticum chuanxiong* Hort. and *Dumasia hirsuta* Craib was used to stop coughing and replenish *qi*; see Table 2 for details.

(2) Soup choice depends on the season: The Cantonese choose different soups in different seasons. In spring or summer, the Cantonese tend to choose plants to nourish the liver, such as *L. chinense* and *Cuscuta chinensis* Lam., or to nourish the *yin*, such as *S. ningpoensis*, *D. wilsonii*, and *Polygonatum odoratum* (Mill.) Druce. In autumn or winter, the Cantonese tend to choose plants to moisten the lungs, such as *Lilium brownii* F. E. Brown ex Miellez, *Polygonatum cyrtonema* Hua, *Pinus koraiensis* Sieb. et Zucc., and *Panax ginseng* C. A. Mey., or to tonify the kidneys, such as *Rehmannia glutinosa* (Gaetn.) Libosch. ex Fisch. et Mey., *Davallia mariesii* Moore ex Bak., and *Eucommia ulmoides* Oliver.

(3) Soup choice depends on physical quality: TCM contains nine kinds of physical qualities known as *moderation*, *qi* deficiency, *yang* deficiency, phlegm-dampness, blood stasis, *qi* stagnation, *yin* deficiency, damp-heat, and allergic qualities [15]. In our field surveys, menu nos. 77 and 100 are suitable for the *qi* deficiency group; menu nos. 1, 5, 75, 96, 97, and 99 are suitable for the *yang* deficiency group; menu nos. 2 and 101 are suitable for the phlegm-dampness group; menu nos. 15, 73, 102, and 103 are suitable for the blood stasis group; and nos. 104 and 105 are suitable for the *qi* stagnation group (Table 4). Epidemiological studies have shown 14–50% of people with hypertension have a *yin* deficiency. Shen et al. indicated that Chinese food therapy can restore the constitution of the body with

![Fig. 5 The relationship between plant flavor and function](image-url)
### Table 4: Menus documented in this study

| Menu no. | Plant ingredients (Latin name) | Other ingredients (English name) |
|----------|-------------------------------|----------------------------------|
| 1        | Codonopsis pilosula, Dioscorea fordii, Zingiber officinalis | Quail, pork                      |
| 2        | Ficus hirta, Flemingia philippinensis | Chicken                          |
| 3        | Dumasia hirsuta Craib          | Crucian, chicken                 |
| 4        | Cornus officinalis, Euryale ferox | Pork                             |
| 5        | Dioscorea fordii               | Crucian, pork                    |
| 6        | Dioscorea fordii, Euryale ferox, Lycium chinense, Adenophora stricta, Polygonatum odoratum, Ziziphus jujuba, Zingiber officinalis | Squab, pork                      |
| 7        | Striga asiatica               | Pork                             |
| 8        | Hordeum vulgare                | Duck kidney                      |
| 9        | Pseudostellaria heterophylla, Ficus carica, Ziziphus jujuba, Zingiber officinalis | Pork                             |
| 10       | Amomum villasum               | Pork tripe, chicken, Hericium erinaceus |
| 11       | Amomum villasum               | Crucian                          |
| 12       | Castanea mollissim, Dioscorea fordii, Ziziphus jujuba, Zingiber officinalis | Trotters                         |
| 13       | Brassica pekinensis, Euryale ferox, Coix lacryma-jobi, Ziziphus jujuba, Citrus reticulata, Zingiber officinalis | Duck, tofu                       |
| 14       | Puertaria lobata               | Dace                            |
| 15       | Vigna umbellata, Stellaria nipponica |                                  |
| 16       | Triticum aestivum, Codonopsis pilosula, Dioscorea fordii, Zingiber officinalis | Pork, beef                       |
| 17       | Artemisia scoparia             | Crucian                          |
| 18       | Rosa laevigata, Alisma plantago-aquatica | Pork                      |
| 19       | Raphanus sativus, Zingiber officinalis | Duck                             |
| 20       | Chaemomeles sinensis, Zingiber officinalis | Duck, pork                      |
| 21       | Adenophora stricta, Dioscorea fordii, Polygonatum odoratum, Zingiber officinalis | Goose, pork                      |
| 22       | Dumasia hirsuta, Citrus reticulata, Zingiber officinalis | Carp, pork                      |
| 23       | Lilium lancifolium, Citrus reticulata, Zingiber officinalis | Crucian, pork                    |
| 24       | Armeniaca vulgaris             | Crocodile                        |
| 25       | Erinotrya japonica (leaves)    | Fish                             |
| 26       | Chaemomeles sinensis, Zingiber officinalis | Cuttlefish, pork                |
| 27       | Astragalus membranaceus, Oryza sativa var. glutinosa (root) | Fish                             |
| 28       | Vigna unguiculata, Zingiber officinalis | Fish                             |
| 29       | Oryza sativa var. glutinosa (root), Pseudostellaria heterophylla | Loach                            |
| 30       | Polygonatum cyrtomomo, Zingiber officinalis | Oyster, chicken                  |
| 31       | Polygonatum odoratum, Adenophora stricta, Coix lacryma-jobi, Zingiber officinalis | Pork, tendon                     |
| 32       | Armeniaca vulgaris, Pyrus pyrifolia, Ephedra sinica, Ziziphus jujuba | Pork                             |
| 33       | Malus pumila, Ephedra sinica, Ziziphus jujuba | Pork, tremella                   |
| 34       | Olea europaea                  | Conch, pork                      |
| 35       | Glycine max, Sauropus spatulifolius (leaf) | Crucian                          |
Table 4  Menus documented in this study (Continued)

| Menu no. | Plant ingredients (Latin name)                                                                 | Other ingredients (English name) |
|----------|---------------------------------------------------------------------------------------------|----------------------------------|
| 36       | Panax quinquefolius, Ginkgo biloba (fruit), Nelumbo nucifera, Zingiber officinalis           | Pork                             |
| 37       | Glycine max, Momordica charantia, Raphanus sativus, Ziziphus jujuba, Zingiber officinalis     | Pork ribs                        |
| 38       | Glycine max, Momordica charantia, Raphanus sativus, Ziziphus jujuba, Zingiber officinalis     | Pork ribs                        |
| 39       | Nelumbo nucifera, Luffa acutangula, Zingiber officinalis                                     | Chicken                          |
| 40       | Panax quinquefolius, Dioscorea fordii, Lycium chinense, Citrus reticulata                   | Squab                            |
| 41       | Dendrobium wilsonii, Dioscorea fordii, Lycium chinense, Citrus reticulata                   | Pork                             |
| 42       | Dendrobium wilsonii, Pyrus pyrifolia                                                        | Duck                             |
| 43       | Dendrobium officinale, Ophiopogon japonicus, Ziziphus jujuba                                | Pork liver                       |
| 44       | Dendrobium wilsonii, Lycium chinense, Citrus reticulata                                     | Pork liver                       |
| 45       | Angelica sinensis, Ziziphus jujuba                                                           | Chicken or pork                  |
| 46       | Arachis hypogaea, Citrus reticulata                                                          | Pork                             |
| 47       | Olea europaea, Castanea mollissima, Raphanus sativus                                       | Quail, pork                      |
| 48       | Hylocereus undatus (flower), Imperata cylindrica, Armeniaca vulgaris, Ziziphus jujuba        | Pork lung                        |
| 49       | Dendrobium wilsonii, Dioscorea fordii, Euryale ferox, Nelumbo nucifera                      | Pine fish, pork                  |
| 50       | Dendrobium wilsonii, Dioscorea fordii, Euryale ferox, Nelumbo nucifera                      | Pine fish, pork                  |
| 51       | Paeonia suffruticosa, Panax quinquefolius                                                    | Pork                             |
| 52       | Pinus karaiensis                                                                            | Pork                             |
| 53       | Arachis hypogaea, Citrus reticulata                                                          | Pork                             |
| 54       | Olea europaea, Castanea mollissima, Raphanus sativus                                       | Quail, pork                      |
| 55       | Hylocereus undatus (flower), Imperata cylindrica, Armeniaca vulgaris, Ziziphus jujuba        | Pork lung                        |
| 56       | Dendrobium officinale, Polygonatum odoratum, Adenophora stricta                             | Pork                             |
| 57       | Laminaria japonica, Vigna unguiculata, Panax notoginseng                                    | A: scorpion, pork; B: squab      |
| 58       | Vigna radiata, Liliym lancifolium, Dendrobium officinale, Panax quinquefolius               | Pork                             |
| 59       | Vigna radiata, Momordica charantia                                                          | Pork                             |
| 60       | Lycium chinense, Zingiber officinalis, Althaea fistulosa                                    | Beef                             |
| 61       | Glycine max, Cocos nucifera, Ficus carica, Zingiber officinalis                              | Chicken                          |
| 62       | Ranunculus tematus, Zingiber officinalis                                                     | Pork                             |
| 63       | Gummi purpureus, Arachis hypogaea, Ziziphus jujuba, Zingiber officinalis                     | Fish, pork                       |
| 64       | Ficus carica, Arachis hypogaea, Zingiber officinalis                                         | Pork, tripe                      |
| 65       | Durio zibethinus, Zingiber officinalis                                                       | Crucian                          |
| 66       | Dioscorea fordii, Euryale ferox, Nelumbo nucifera                                            | Hippocampus, pork                |
Table 4 Menus documented in this study (Continued)

| Menu no. | Plant ingredients (Latin name)                                                                 | Other ingredients (English name)         |
|----------|-----------------------------------------------------------------------------------------------|------------------------------------------|
| 71       | Ilex pubescens, Lycium chinense, Cuscuta chinensis, Rehmannia glutinosa, Zingiber officinalis    | Pork                                     |
| 72       | Lycopersicon esculentum, Daucus carota subsp. sativus, Zingiber officinalis, Allium fistulosum  | Pork                                     |
| 73       | Ligusticum chuanxiong, Dumasia hirsuta                                                        | Pork                                     |
| 74       | Ranunculus tematus, Prunella vulgaris, Glycine max                                               | Pork                                     |
| 75       | Dendrobiurn officinal, Panax quinquefolius, Dioscorea fordii                                  | Chicken or pork                          |
| 76       | Saccharum sinense, Raphanus sativus, Citrus reticulata, Zingiber officinalis                    | Pork                                     |
| 77       | Codonopsis pilosula, Liliurn lancifolium, Zingiber officinalis                                 | Squab                                    |
| 78       | Euryale ferox, Zingiber officinalis                                                            | Chitterlings, scallops                   |
| 79       | Nelumbo nucifera, Zingiber officinalis                                                        | Carp                                     |
| 80       | Fritillaria cirrhosa, Eriobotrya japonica (leaves)                                             | Fish, pork                               |
| 81       | Salvia miltiorrhiza                                                                             | Chicken                                  |
| 82       | Nelumbo nucifera, Castanea mollissima, Zingiber officinalis                                   | Pork kidney                              |
| 83       | Armeniaca vulgaris, Pyrus pyrifolia, Liliurn lancifolium                                       | Goose                                    |
| 84       | Dumasia hirsuta, Tricium aestivum, Rehmannia glutinosa, Zingiber officinalis, Citrus reticulata| Oyster, pork                             |
| 85       | Euryale ferox, Juglans regia, Dioscorea fordii, Zingiber officinalis                           | Pork kidney                              |
| 86       | Astragalus membranaceus, Zaiphus jujube, Zingiber officinalis                                 | Eel, pork kidney                         |
| 87       | Ficus carica, Zaiphus jujube, Zingiber officinalis                                             | Chicken                                  |
| 88       | Colocasia esculenta, Zingiber officinalis                                                      | Pork, scallops                           |
| 89       | Allium fistulosum, Zingiber officinalis                                                        | Chicken, mushroom                        |
| 90       | Eucommia ulmoides, Cistanche deserticola                                                       | Pork                                     |
| 91       | Nelumbo nucifera, Vigna umbellata, Zingiber officinalis, Zaphis jujuba                        | Squid, pigeon                            |
| 92       | Mentha hapolcalyx, Magnolia officinalis                                                        | Pork                                     |
| 93       | Atractylodes macrocephala                                                                      | Crucian                                  |
| 94       | Houttuynia cordata, Siraitia grosvenorii                                                      | Pork lung                                |
| 95       | Pyrus pyrifolia, Armeniaca vulgaris                                                            | Jellyfish                                |
| 96       | Lycium chinense, Zaiphus jujube                                                               | Chicken                                  |
| 97       | Angelica sinensis, Zingiber officinalae                                                        | Mutton                                   |
| 98       | Angelica sinensis, Rehmannia glutinosa                                                          | Squab                                    |
| 99       | Dioscorea fordii, Raphanus sativus, Zaiphus jujube, Lycium chinense                          | Chicken                                  |
| 100      | Panax ginseng, Zaiphus jujube, Lycium chinense                                                | Silkie                                   |
| 101      | Coix lacymo-jobi, Lablab purpureus, Citrus reticulate, Zaiphus jujube                         | Squab                                    |
| 102      | Crataegus pinnatifida, Raphanus sativus                                                        | Pork feet                                |
| 103      | Rosa rugosa, Carthamus tinctarius, Angelica sinensis                                           | Pork                                     |
| 104      | Dendranthera morifolium, Jasminum sambac                                                      | Chicken liver, tremella                  |
| 105      | Citrus limon, Zaiphus jujube, Lycium chinense                                                 | Chicken                                  |
| 106      | Lophatherum gracile, Juncus bufonius, Ophiopogon japonicus                                     |                                        |
| 107      | Rehmannia glutinosa, Scaphularia ningpoensis                                                  | Pork                                     |
a yin-yang imbalance and may be beneficial in controlling blood pressure in hypertensive patients [16]. *Benincasa hispida* (Thunb.) Cogn., *V. radiata*, and *Glycine max* (Linn.) Merr. are good for nourishing the yin.

(4) Soup choice depends on job category: Night workers, such as taxi drivers, easily suffer from fatigue and anorexia; therefore, they should choose *Crataegus pinnatifida* Bge. and *Citrus reticulata* Blanco to increase their appetites. Workers who use computers should choose *R. sativus*, *Dendranthera morifolium* (Ramat.) Tzvel., and *L. chinense* to improve vision.

(5) Soup choice depends on age and gender: Middle-aged women may have symptoms of endocrine dyscrasia, metabolic disorders, anemia, and osteoporosis caused by hormone problems; for them, the Cantonese would boil *A. sinensis*, *R. glutinosa*, *Z. jujuba*, and *R. glutinosa* to nourish the yin and tonify the blood. Middle-aged men may be given *Psoralea corylifolia* Linn. and *E. ulmoides* to tonify the yang. The metabolism of an elderly person may gradually weaken; thus, elderly people should use *Z. jujuba* and *Dioscorea fordii* Prain et Burkill to invigorate the spleen and stomach as well as to tonify the qi and the blood.

CSCS can help to keep a person in good health; however, not everyone will want to eat it because of some taboos related to their diets. Herbs not only have nutrients but also numerous chemical components, some of which are known to have biological actions; however, others may have a potential to influence human physiology and pathophysiology, but this area of research remains unexplored [10]. *Codonopsis pilosula* (Franch.) Nannf. can tonify the qi, replenish the blood [17], and has antitumor activity [18, 19]. *Astragalus membranaceus* (Fisch.) Bunge can tonify the qi and the yang [20, 21]. *Panax quinquefolius* Linn. possesses certain effects on tonifying the qi and nourishing the yin [22] and is active against human breast cancer [23]. *Polygonatum cyrtonema* Hua can tonify the qi, nourish the yin [24], and has anti-HIV properties [25]. *Eucommia ulmoides* Oliver can tonify the yang [26, 27] and improve the human immune system [28]. In this survey, the Cantonese told us that pregnant women should not eat much *Armeniaca vulgaris* Lam., *C. lacryma-jobi* L., and *Hordeum vulgare* L. They told us that people who are deficient in cold of the spleen and stomach should not eat much *V. radiata*, *Panax ginseng* C. A. Mey. and *Panax quinquefolius* Linn, cannot be eaten with *R. sativus* and *C. pinnatifida*. People who suffer from superfluity syndrome or warm syndrome cannot have *C. pilosula*. Patients with acute illnesses cannot have *A. membranaceus*. The Cantonese also told us that people with frequent diarrhea should not eat *P. cyrtonema*, and those with kidney ailments should not eat *E. ulmoides*.

**Conclusions**

The number of groups of people with less than robust health continues to increase. In the long course of development of CSCSs, the quintessence of TCM has been adopted. Different soups have different functions. CSCS has four dimensions: social, functional, cultural, and economic. As soup materials, traditional knowledge of various plants used in CSCS was documented, including local plant name, function, part(s) used, flavor, nature, preparation before decoction, habitat, and cultural significance indices. Knowledge of these herbs used in food therapy will provide a broad socio-anthropological context related to eating. The relationships among the nature, flavor, and function of herbs seem to be related to each other but are not absolute, which will be a key point of consideration in TCM. In addition, these theories of CSCS will provide the essential basis for the analyses and clinical usage of Chinese herbs.

**Abbreviations**

CR: Critically endangered; CSCS: Cantonese slow-cooked soup; EI: Economic Index; EN: Endangered; FUI: Frequency of use index; MI: Mention Index; TCM: Traditional Chinese medicine; VU: Vulnerable

**Acknowledgments**

We are very grateful to the local people in Guangdong Province who provided invaluable information. We appreciate the funding received from the National Natural Science Foundation of China (Grant No. 31600254), the Natural Science Foundation of Jiangsu Province of China (Grant No. BK20150491), the Start-Up Fund for Advanced Talents of Jiangsu University (Grant No. 14JDG150), the School of Agricultural Equipment Engineering at
Jiangsu University, and the Priority Academic Program Development of Jiangsu Higher Education Institutions (PAPD, 2014)37. “Youth backbone teacher training project” for young academic leaders cultivation candidates of Jiangsu University.

Funding
National Natural Science Foundation of China (Grant No. 31600254), the Natural Science Foundation of Jiangsu Province of China (Grant No. BK20150491), the National Science Foundation for Post-doctoral Scientists of China (Grant No.2017M621651), the Jiangsu Postdoctoral Sustentation Fund (Grant No. 17010708), the Start-Up Fund for Advanced Talents of Jiangsu University (Grant No. 14JDG150), “Youth backbone teacher training project” for young academic leaders cultivation candidates of Jiangsu University, the School of Agricultural Equipment Engineering at Jiangsu University, and the Priority Academic Program Development of Jiangsu Higher Education Institutions (PAPD, 2014)37.

Availability of data and materials
We are willing to share the data generated or analyzed during the current study.

Authors’ contributions
LYJ and LCL conceived of and designed the study, conducted the data collection, and interpreted the data. Literature retrieval was done by LYJ, LQ, and XDK. Field surveys were done by LYJ, LP, and LCL. LL and HHG analyzed the data. LYJ drafted the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate
We followed ethical guidelines adopted by the International Society of Ethnobiology (2008). Permissions were verbally informed by all participants in this study, including the owner of soup material store shown in the cover of the book. We obtained verbal permission from the owner of the store.

Consent for publication
Not applicable

Competing interests
The authors declare that they have no competing interests.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 10 November 2017 Accepted: 28 December 2017
Published online: 15 January 2018

References
1. Liu YJ, Ahmed S, Long CL. Ethnobotanical survey of cooling herbal drinks from southern China. J Ethnobiol Ethnomed. 2013;9:82.
2. Cai SF. The development and research on nutritional therapy soup and diet of Hong Kong Guangzhou University of Chinese Medicine; 2009.
3. Fulder S, Tenne M, Ginger as an anti-nausea remedy in pregnancy: the issue of safety. HerbalGram (USA). 1996(12):2521-31.
4. Shao Y, Wu Q, Wen H, Chai C, Shan C, Yue W, Yan S, Xu H. Determination of flavones in lophatherum gracile by liquid chromatography tandem mass spectrometry. Instrum Sci Technol. 2014;42:73–83.
5. Doan DD, Nguyen N, Doan H, Nguyen T, Phan T, Van Dau N, Grabe M, Johansson R, Lindgren G, Stenström N. Studies on the individual and combined diuretic effects of four Vietnamese traditional herbal remedies (Zea mays, Imperata cylindrica, Plantago major and Orthosiphon stamineus). J Ethnopharmacol. 1992;36:225–31.
6. Zhang S, Cheng H, Dong J. Amino-acid and mineral composition of the seeds of Euryale ferox. Chem Nat Compd. 2011;47:490–1.
7. Maria S, Maddalena P, Piero B. Plants and traditional knowledge: an ethnobotanical investigation on Monte Ontobene (Nuoro, Sardinia). J Ethnobiol Ethnomed. 2009;5:1-4.
8. Garibayorjeel R, Caballero J, Estradoretes A, Cifuentes J. Understanding cultural significance, the edible mushrooms case. J Ethnobiol Ethnomed. 2007;3:1-8.
9. Yu HY, Xu CG. Relationship between nature and other properties of traditional Chinese medicine based on association rule. Chin J Exp Tradit Med Formulae. 2013;19:943–6.
10. Mclean AJ, Wahlgqvist ML. Current problems in nutrition pharmacology and toxicology. Herto. John Libibey, 1988.
11. Ni M. The Yellow Emperor’s classic of medicine. Boulder: Shambhala Publications; 1995.
12. Liao H, Banbury LR, Leach DN. Antioxidant activity of 45 Chinese herbs and the relationship with their TCM characteristics. Evid Based Complement Alternat Med. 2008;5:429–34.
13. Ung CY, Li H, Cao ZW, Li YX, Chen YZ. Are herb-pairs of traditional Chinese medicine distinguishable from others? Pattern analysis and artificial intelligence classification study of traditionally defined herbal properties. J Ethnopharmacol. 2007;111:371–7.
14. Thomburg K, Nina L, Etkin: edible medicines: an ethnopharmacology of food. J Agric Environ Ethics. 2011;24:92.
15. Wang Q. Classification and diagnosis basis of nine basic constitutions in Chinese medicine. J Beijing Univ Tradit Chin Med. 2005;28:1–8.
16. Chen P, SMC, Kwong EW, Cheng Z. The effect of Chinese food therapy on community dwelling Chinese hypertensive patients with yin-deficiency. J Clin Nurs. 2010;19:1008–20.
17. Xue-mei M. Advances in studies on Codonopsis pilosula. J Anhui Agric Sci. 2009;15:071.
18. Xin T, Zhang F, Jiang Q, Chen C, Huang D, Li Y, Shen W, Jin Y, Sui G. The inhibitory effect of a polysaccharide from Codonopsis pilosula on tumor growth and metastasis in vitro. Int J Biol Macromol. 2012;51:788–93.
19. Yang C, Gou Y, Chen J, An J, Chen W, Hu F. Structural characterization and antitumor activity of a polysaccharide from Codonopsis pilosula. Carbohydr Polym. 2013;88:86-95.
20. Zhang Q, Gao WY, Tan SL. Chemical composition and pharmacological activities of Astragalus radix. China J Chin Mater Med. 2012;37:3203.
21. Dong TT, Ma XQ, Clarke C, Song ZH, Ji ZN, Lo CK, Tsim KW. Phylogeny of Astragalus in China: molecular evidence from the DNA sequences of SS rRNA spacer, ITS, and 18S rRNA. J Agric Food Chem. 2003;51:679–14.
22. Guo YQ, Wei GL, Zhong QM, Wang DS. Clinical application of Panax quinquefolius. Chin J Mod Drug Appl. 2011;5:128-9.
23. Wang C, Aung H, Zhang B, Sun S, Li X, He H, Xie J, He T, Du W, Yuan C. Chemopreventive effects of heat-processed Panax quinquefolius root on human breast cancer cells. Anticancer Res. 2008;28:2545.
24. Chen Y, Sun X. Pharmacological research progress in Polygonatum cyrtonema. Tradis Chin Drug Res Clin Pharmacol. 2010;21:328-30.
25. Ding JJ, Bao JK, Zhu DY, Zhang Y, Wang DC. Crystal structures of a cyanobacterial rRNA spacer, ITS, and 18S rRNA. J Agric Food Chem. 2010;58:3203.
26. Xiao L, Zhou RG. The research progresses of Eucommia ulmoides’ anthypertensive effect. Chin Med Guide. 2013;11:501–2.
27. Liu N, Shu KX, Liu CS. The domestic and abroad research progresses of Eucommia ulmoides. Med J Natl Def Forces Southwest China. 2002;12:449.
28. Feng H, Fan J, Song Z, Du X, Chen Y, Wang J, Song C. Characterization and immunoenhancement activities of Eucommia ulmoides polysaccharides. Carbohydr Polym. 2016;136:803.