

REVIEW ARTICLE

Open Access



The culinary culture, characteristics, and nutritional value of Su cuisine in China

Huilun Li¹ and Guansheng Ma^{2,3*}

Abstract

Su cuisine (Jiangsu cuisine) belongs to the Eight Great Cuisines in China. The origin of Su cuisine can be traced back to the Spring and Autumn period (771–476 B.C). The flourish of Su cuisine was the outcome of the economic boom in Tang (618–907) and Song (960–1279) Dynasties. The choice of ingredients is diverse since the region are rich in natural resources. After strict selection of ingredients and exquisite preparation of food, most dishes of Su cuisine have a fine presentation and a natural taste. Famous for the highly skilled processing technique, subtle flavor, and delicate appearance, Su cuisine is widely served on various occasions, including the state banquets of China. Currently, Cantonese and Sichuan cuisine are well accepted globally, while the international popularity and influence of Su cuisine remain low. Therefore, this article aims to introduce the culinary culture, characteristics, and traditional dishes of Su cuisine in detail. Moreover, a palatable taste is not equivalent to desirable health outcomes. The wide variety of vegetables, herbs, and high-quality animal proteins used in Su cuisine is allied with the recommended healthy eating behavior. On the other hand, some traditional Su cuisine dishes are rich in refined carbohydrates. Thus, we performed a literature review of the current scientific evidence regarding the health effect and nutritional value of Su cuisine. The related literature was searched in Chinese and English using the CNKI, WanFang Data, PubMed, Google Scholar, Web of Science, and Embase database.

Keywords: Chinese cuisines, Culinary culture, Su cuisine, Regional cuisine

Background

Su cuisine (苏菜), or Jiangsu cuisine, refers to regional cuisines around Jiangsu province, China. Famous for its delicacy and variety, Su cuisine is one of the Eight Great Cuisines in Chinese cuisine (八大菜系) [1]. The sufficient precipitation, well-developed irrigation system, and humid subtropical climate explain the ample natural resources in Jiangsu Province. Fertile farmlands alongside adequate coastal regions and lakes supported the flourish of fishing and agriculture since ancient times. Therefore, the place has been awarded the title of “the land of rice and fish (鱼米之乡).”

Originated during the Spring and Autumn period (771–476 B.C), Su cuisine has a history of more than 2000 years [2]. The first chief on the Chinese record, Keng Peng, was born in Jiangsu province [1]. During the Tang (618–907) and Song (960–1279) Dynasties, the golden age of Chinese history, economic boom, and frequent trading led to migration and cultural blend in Jiangsu. A wide range of cuisines and cooking techniques from elsewhere assimilate into Jiangsu’s culinary culture. On the other hand, wealthy salt merchants push the elegance of Su cuisine to another level, attempting to show their taste and fortune. When mentioning Su cuisine nowadays, it is commonly referring cuisines in both Jiangsu and Zhejiang province due to their geographical proximity and culinary similarities.

Since Jiangsu province encompasses a broad area of land, regional variations of culinary culture and diversity

*Correspondence: mags@bjmu.edu.cn

² Department of Nutrition and Food Hygiene, School of Public Health, Peking University, 38 XueYuan Road, Haidian District, Beijing 100191, China

Full list of author information is available at the end of the article



© The Author(s) 2022. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

of food have emerged. Four sub-regional styles are further diverged from Su cuisine, including Jinling cuisine (金陵菜), Huaiyang cuisine (淮扬菜), Suxi cuisine (苏锡菜), and Xuhai cuisine (徐海菜) [2], with Huaiyang cuisine being the most prominent and influential style. Due to its widely accepted flavor, Huaiyang cuisine is served at the state banquets in China [3]. Although the global influence of Su cuisine is not as substantial as Sichuan and Cantonese cuisine, its popularity and reputation are equivalent or even superior to the two cuisines above in China. In this article, we dissected the characteristics of Su cuisine to present a long-being-underestimated gourmet food. Further, we examined the nutritional values to comprehend the fitness of Su cuisine to the modern concept of healthy eating. The related literature was searched in Chinese and English using the CNKI, WanFang Data, PubMed, Google Scholar, Web of Science, and Embase database.

Features

Ingredients

Incorporating a wide variety of animals and plants, strictly selecting ingredients according to the seasons, and matching food based on their properties are the outstanding traits of Su cuisine. With abundant resources, a livable climate, and central geological location, food production and supply in Jiangsu have long been efficient. Agriculture has thrived in Jiangsu since the time of civilization. Grain crops, mainly rice and wheat, are the staple food of Jiangsu residents. Plentiful agricultural and aquaculture production provides numerous ingredient options, breeding a delicate and intricate cuisine style.

Neighboring the East China Sea and freshwater lakes and rivers, Jiangsu province is blessed with copious aquatic organisms. In 2019, the aquaculture production of Jiangsu province was 4.84 million tons (1.07 billion pounds), according to the National Bureau of Statistics of China, with 1.37 million tons being marine production and 3.47 million tons being freshwater production [4]. The high fishery production in Jiangsu province is equivalent to 1/10 of the National totals in the U.S [5]. Consequently, fish and crustaceans, ideal sources of high-quality proteins, are commonly served as the main course of Su cuisine.

For crustaceans, Chinese mitten crab (*Eriocheir Sinensis*, 大闸蟹), a nutritious meaty hairy crab, symbolizes of the arrival of Jiangsu's autumn [6]. Before the successful development of industrial agriculture, the Chinese mitten crab was not readily available because of its low production. Therefore, crawfish, an invasive species in many counties, became the alternative to crabs in Jiangsu. Nowadays, crawfish has gained much popularity in the younger generation and has been entitled "the soul of

nightlife." As crabs become more affordable, high-quality crawfishes even surpass the price of crabs. Crawfish production in Jiangsu was ranked in the top five in China in 2019 [7]. Xuyi (盱眙), a small county in Huaian city (淮安市), Jiangsu province, is famous for its crawfish course. In 2021, Xuyi crawfish has been listed in the China-EU Agreement on Geographical Indications [8].

Besides rich aquatic food options, the subtropical climate has also brought Su cuisine abundant herbs and vegetables. In 2019, the vegetable production in Jiangsu was ranked the fourth in China, contributing 55.355 million tons in total [9]. Tea leaves, bamboo shoots, mushrooms, lotus roots, wild rice stem, water caltrop, Chinese water chestnut, and watershield are indigenous vegetables frequently consumed by locals. Herbs, such as purple combe, amomum, tangerine's peel, nutmeg, cinnamon, cloves, Chinese pepper, star anise, cumin, costus root, angelica, kaempferia, alpinia, and dried ginger, are the choices of seasonings. The "Thirteen-spices Crawfish" (十三香小龙虾) is a well-known course that originated in the aforementioned Xuyi county. The dish uses "Thirteen Spices," a mixed powder of more than thirteen spices, as the main seasoning, endowing the course a unique and palatable aroma. Both the variety and quantity of crops and vegetables are prominent in standard, advocating the creativity and diversity of Su cuisine.

Culinary techniques

Encompassing an array of delicate food processing techniques, Su cuisine requires highly skilled workmanship and an aesthetic taste. Thus, it has been linked to a noble lifestyle and culinary arts since ancient times. Precise heating methods, temperature, and timing are the fundamentals to present ingredients in their optimal conditions. Braising, stewing, steaming, warming, stir-frying, and simmering are commonly applied when preparing Su cuisine [10, 11]. Among them, braising, stewing, stir-frying, and steaming appear more often than other heating methods [11].

The exquisite carving and cutting technique are the most extraordinary characteristic of Su cuisine. All ingredients are finely chopped, and all dishes are elegantly shaped in pursuit of perfection. Braised Dry Tofu (大煮干丝), a delicacy of Su cuisine, demonstrates the cutting skills of Jiangsu's Chief. A two-centimeter thick Dried Tofu is cut into thinner slices, sometimes as many as thirty pieces [12]. The idiom commonly used to describe the thinness is "as thin as the wings of a cicada (薄如蝉翼)" in Chinese. After slicing, the thin slices are further shredded into matchsticks, approximately two millimeters wide.

Food carving skills serve more of an artistic purpose compared to cutting skills. Yangzhou city in Jiangsu

province is an ancient city with early civilization and rich cultural heritage. Food carving in Yangzhou has gained its fame back in the Qing Dynasty (1644–1912) [13]. Now, it has been included as the Intangible Cultural Heritage in Jiangsu [13]. The four essential determinants of a complete food carving process are conceptualization, visualization, carving, and holism [14]. Melons, radishes, carrots, potatoes, and yams are common ingredients used for food carving. The intricate details are achieved using numerous knife techniques, such as carving, picking, cutting, scraping, stabbing, twisting, gouging, digging, and engraving, etc.

Flavor and appearance

Sour, sweet, salty, bitter, and umami are the well-known five primary tastes. Yet, Su cuisine is pursuing a more intricate flavor involving not only tastes but also sensations. The old saying, “seven taste and seven senses (七滋七味),” may be the best to describe the multilayered flavors of Su cuisine. The seven tastes contain sour, sweet, bitter, spicy, salty, aromatic, and stinky, while the seven senses include umami, soft, crispy, tender, brittle, thick, and fatty [15]. Su cuisine’s concept of moderation, in every perspective, is allied with one of the most influential and profound philosophies in China, the Golden Mean. Thus, chiefs tend to even the flavor out, balance the nutrition, and match the colors. Mild, refreshingly silky, lightly sweet, and umami tastes constitute the characteristics of Su cuisine [2, 10]. Since braising and stewing are strongly preferred by Jiangsu’s chief, the texture of meat or poultry courses is usually tender and soft but not mushy. Condiments and seasonings are not used heavily, aiming to preserve the natural taste and reveal the pure beauty of ingredients. Various indigenous plants and aquatic food bring a rich aroma to Su cuisine. A sip of the original stock is the taste of simplicity.

While the flavor of Su cuisine targets minimalist, the appearance is rather Byzantine. As the taste of the course relies more on the freshness and quality of the ingredients, the appearance becomes the chiefs’ arena. Dishes are shaped elegantly, displaying the creativity and skillfulness of the chief. As the finishing touch, courses are covered with alluring colors and decorated with carved food. The subtle flavor and appealing presentation are broadly favored by people nationwide, making Su cuisine the most popular choice of a banquet in China.

Traditional dishes

Since there is no concrete standard of a formal banquet, the types, forms, and servings size of the dishes may vary because of regional differences and personal preferences. In general, ten to twelve dishes are served for a group of ten people. Four to six cold dishes, eight to ten warm

dishes, one staple food, and one soup are the common match of a banquet. Here we introduce some typical traditional dishes in Su cuisine.

Cold dish

Appetizers are commonly named “cold dishes” in Chinese cuisines, as most of the dishes are served at room temperature. The aforementioned Braised Dry Tofu (大煮干丝) is a typical cold dish of Su cuisine. The tofu slices are not seasoned or marinated. However, the broth, made from chicken, shrimp, crab, and ham, is rich in flavor and aroma. Marinated Crabs is another popular cold dish of Su cuisine. Crabs are steamed and marinated in brines containing Huangjiu (Chinese rice wine), soy sauce, ginger, pepper, and other spices. After soaking in brine, the umami taste and tender texture of crab meat are significantly magnified. Osmanthus Sugar Lotus Root is a sweet choice of appetizer and can also be consumed as dessert. Lotus root is stuffed with sticky rice and stewed with Osmanthus and sugar. The flowery fragrance matches perfectly with the sweet taste.

Warm dishes

Nanjing Salted Duck (南京咸水鸭), the legendary duck dish in Jiangsu, has been entitled the geographic indication of China. A more poetic name of Nanjing salted duck is the “Osmanthus Duck (桂花鸭)” since it is commonly consumed during the Osmanthus bloom, around the Mid-Autumn Festival [16]. The preparation of this Nanjing specialty is not sophisticated. Duck is marinated with salt and pepper and then simmered in brine made of ginger, scallion, star anise, and other scented spices. Cooked duck is chopped to bitable pieces and lightly colored. Diners then may enjoy the tender and juicy duck meat and savor the rich fragrance.

Neighboring the natural habitats of freshwater fish, locals are versatile in cooking fish courses. As fish becomes essential in daily life, native dining etiquette appears spontaneously. A whole fish must be served by the end of the banquet, implying the ending of the gathering. Additionally, the fish should not be consumed completely. Leftover fish is a good wish for wealth and profit in future because “surplus (余)” and “fish (鱼)” are pronounced the same in Chinese [17].

Squirrel Fish (松鼠鱼), or sweet and sour mandarin fish, is the most appreciated delicacy of Suxi cuisine. Fresh and fatty mandarin fish is deep-fried and elegantly shaped with sweet and sour sauce covering the whole fish. The name “squirrel” describes its elaborate shape, like a squirrel. The dish was documented in the Records of the Grand Historian 2000 ago. In the Spring and Autumn period (771–476 B.C), Zhu Zhuan (专诸), one of the top four assassins in Chinese history, learned the

“All-fish banquet (全鱼宴)” from the founding chief in Suzhou [18]. In 515 B.C, Zhu Zhuan assassinated Liao, the king of State Wu, by hiding a sword inside the fish dish. Squirrel fish was one course of the “All-fish banquet.” Besides its dramatic history, the caramelized flavor and bright color of squirrel fish attract numerous gourmets and foodies.

Fish Hiding in Mutton (羊方藏鱼) is a typical traditional Chinese delicacy created by Chief Peng around 4300 years ago [19]. The preparation of this dish may seem rustic: seasonal fish is wrapped with deboned lamb ribs and stewed with spices. Yet, the perfect match creates a fascinating interaction. Fish and mutton neutralize the unpleasant scent of each other and generate a mouth-watering aroma and distinctive umami taste. Interestingly, the Chinese character for umami, “鲜,” consists of fish “鱼” on the left side and sheep “羊” on the right side. Therefore, the origin of the character “鲜” is associated with this specialty *per se*.

Lion's Head (狮子头), originated in the Northern and Southern dynasties (420–589), is large pork meatballs shaped similar to the head of a lion [20]. Two cooking methods are commonly applied, braising with soy sauce and stewing with light broth. Soy sauce colors the meatballs in reddish-brown, which is, therefore, named “red-braising.” The red-braised meatballs are set in gravy and have a saltier and thicker taste. On the other hand, less flavor can be experienced when eating the light-broth-stewed meatballs. Thus, the light-broth-stewed Lion's head serves more like a soup than a main course.

Staple food

Grains, particularly rice, are the staple food in most Asian diets. The iconic Yangzhou fried rice (扬州炒饭) has been served in almost every Chinese restaurant in foreign countries. The authentic Yangzhou fried rice is more exquisite in selecting ingredients and food preparation. Rice from Taizhou city, Jiangsu, is favored over other rice types [21]. Although adjustment of the ingredients may occur from recipe to recipe, rice, eggs, ham, shrimps, scallion, carrots, peas, and mushrooms are used in almost all recipes. Some local recipes may include rare delights, such as sea cucumbers. The wide variety of mixed food provides a vivid and attractive color that does not need further garnishment. This delectable but not overwhelming specialty pairs well with all types of dishes.

Various choices of noodles, such as belly noodles (肚皮面), plain noodles (清汤面), meaty noodles (大肉面), vegan noodles (素面), fish soup noodles (鱼汤面), fried noodles (炒面), silver silk noodles (银丝面), etc., are a gustatory way to experience the culture in Jiangsu. The name “belly noodles” mainly describes the toppings, pork belly fat chopped into small cubes and deep-fried.

Similarly, plain noodles are plain in its flavor and ingredients, only containing noodles and spices. Silver silk noodles are as thin as silk thread. The cooking time of silver silk noodles is much shorter than regular noodles due to their thinness. Vegan noodles are originated from the Guangfu temple, the toppings of which are made from mushrooms, tofu, and bamboo shoots.

Soups

Duck blood and vermicelli soup (鸭血粉丝汤) is a traditional soup originated in Jiangsu. Duck blood, duck organs, dried tofu, shrimps, and vermicelli are cooked as a mixture, generating a dense and diverse taste of the soup [22]. The dish is commonly consumed in the morning as a main course of breakfast since it is rich in carbohydrates and proteins. Another popular but simpler soup is the Chinese carp soup (清炖鲢鱼汤), a milky white soup made from carp. Fresh carp is cleaned and pan-fried before stewing with ginger, scallion, and pepper. The cleaning and frying of freshwater carp minimize the fishy smell while keeping the umami flavor. Last but not least, Umami Fried Pork Skin soup (肉皮三鲜汤) is a homemade choice of locals in Jiangsu. Deep-fried pork skins are boiled with bamboo shoots, mushrooms, cabbages, ham, sea cucumbers, and tendons. The fat of the pork skin renders a thick but smooth texture of the soup.

Nutritional value and possible health effect

The idea “food is medicine” is deeply rooted in Chinese culinary culture. As one of the earliest schools in China, Su cuisine tends to pair ingredients based on their nutritional and medical properties. However, these empirical matches and techniques may or may not agree with modern science. Here, we demonstrate an evidence-based discussion of Su cuisine's nutrition value from a modern health perspective.

The recipes of Su cuisine incorporate a wide range of fatty fish, an ideal source of high-quality proteins, minerals, and polyunsaturated fatty acids (PUFA) [10]. Consuming high-quality proteins from fish decreases energy intake and improves lipid profiles [23]. Additionally, the effectiveness of $n-3$ fatty acids in fish on hypertension and cardiovascular disease (CVD) has been well established [23, 24]. The high vitamin D content in fish is essential for calcium homeostasis and is associated with an anti-inflammatory effect. Furthermore, the trace minerals in fish, iodine and selenium, maintain a proper thyroid function [25]. Thus, the habitual consumption of fish in Su cuisine is allied with current dietary recommendations. Although fish consumption exerts various health benefits, one should not indulge in an all-fish feast because certain types of fish, particularly large marine fish, tend to accumulate mercury. Research has found

that modest fish consumption, 1–2 servings/week, outweighed the risk for most adults [26].

Selecting seasonal ingredients is another distinct characteristic of Su cuisine. Yet, the benefit of this choice is not concrete due to the vague definition of “seasonal food.” In most definitions, seasonal food is produced outdoors during the natural growing season without extra energy input. Therefore, growing seasonal food decreases the emission of greenhouse gas and promotes environmental sustainability [27]. Moreover, certain food may be more affordable and available in the local producing region. On the other hand, only depending on seasonal food may limit the food choices, resulting in insufficient nutrient intake [28]. Seasonal food is also highly dependent on seasonal laborers, a potential cause of instability in employment [28]. Therefore, incorporating but not solely relying on seasonal food may be a more desirable choice.

Scrumptious indigenous plants are frequently sorted in Su cuisines. Besides their unique taste, indigenous vegetables in Jiangsu are rich in nutrients, providing beneficial health effects. For instance, watershield (*Bra-senia schreberi*, 蕹菜), an aquatic plant found in America and Asia, is often added to soups of Su cuisine. Its leaves are coated with gelatinous mucilage, mainly consisting of polysaccharides [29]. The antibacterial effect of watershield extract has been illustrated by Elakovich et al. [30]. In a more recent animal study, the consumption of the watershield mucilage significantly decreases the total plasma cholesterol, low-density lipoprotein, and very low-density lipoprotein [29]. Another healthy local vegetable is Chinese water chestnuts, containing multiple bioactive compounds. The phenolic compounds acted as a free-radical scavenger, significantly inhibited lipid peroxidation in a vitro study [31]. In addition to its antioxidant activity, the polysaccharides in Chinese water chestnut have also shown immunomodulatory activities [32]. Notably, the nutritional and medical properties of these healthful vegetables are subject to variations due to the differences in processing methods and seasoning.

Although a single recipe of Su cuisine may provide dense energy, it is insufficient to support daily nutrition requirements. For instance, a standard serving (830 g) of Yangzhou fried rice is mainly composed of carbohydrates (394.5 g), contributing to most of the energy, 722.7 kcal out of 2543.0 kcal [21]. An evaluation of the nutritional value of Su cuisine has shown that the famous courses of Su cuisine may fulfill the energy and macronutrients demand, but not the micronutrients needs [33]. Therefore, thinking in a holistic perspective by considering the synergistic effect of food is essential in determining the health effect of Su cuisine.

The complex interaction between food and health outcomes is evaluated in some nutrition epidemiology studies. Using data from the 2006 China Health and Nutrition Survey (CHNS), one study identified four dietary patterns of residents in Jiangsu, Western, traditional, high wheat, and hedonic [34]. Among them, the traditional dietary pattern, characterized by high consumptions in eggs, tofu, aquatic products, poultry, organ meat, and pickled vegetables, resembles Su cuisine. The traditional dietary pattern did not increase nor decrease the risk of insulin resistance.

Another observational study sampled 1739 individuals from 12 different areas in Jiangsu province in 2014, aiming to examine the relationship between dietary patterns and overweight and obesity among adults [35]. The traditional dietary pattern determined in this study mainly consisted of poultry, light-colored vegetables, red meat, cereals and tubers products, condiment, oils, and dark-colored vegetables. Interestingly, such dietary pattern is associated with a higher risk of overweight and obesity in men. Explanations discussed in the study include the high intake of refined carbohydrates, in the form of cereals and tubers, and increased consumption of saturated fat from animal products.

A more recent study analyzed data of 13,944 participants from Jiangsu, who participated in the nutrition and diet investigation projects in 2002, 2007, and 2014 [36]. Three dietary patterns were determined, with modern dietary pattern (pattern I) covering the highest percent of variance. The main components of pattern I are pork, poultry, vegetables, seafood, pastry, other animal meats, fruits, milk and its products, soft drink, whole grains, nuts, and seeds. Additionally, wheat consumption is low in this dietary pattern. A higher risk of metabolic syndrome was observed among people who were following the modern dietary pattern.

Thus, following recommendations of the dietary guidelines when consuming Su cuisine is crucial in maintaining a healthy eating pattern and preventing adverse health outcomes. When habitually consuming Su cuisine, incorporating exotic sources of vitamins and minerals, such as fresh fruits, and paring the dishes to meet recommended dietary intakes are approaches to ensure sufficient but not excessive nutrient consumption while enjoying the delicacy. Additionally, cooking methods and seasoning should be considered along with the ingredients. For instance, deep fry or pan-fried vegetables with salty seasoning may undermine the intended health benefit.

Acknowledgments

Not applicable.

Author contributions

HL: conceptualization, writing, and editing of the original draft. GM: conceptualization, revision and supervision of the study. Both authors read and approved the final manuscript.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Availability of data and materials

Not applicable.

Declarations**Ethics approval and consent to participate**

Not applicable.

Consent for publication

The final version of the manuscript has been seen and approved by all authors before submission.

Competing interests

The authors declare that there is no competing interests.

Author details

¹Department of Nutrition and Food Studies, George Mason University, 4400 University Drive, Fairfax, VA 22030, USA. ²Department of Nutrition and Food Hygiene, School of Public Health, Peking University, 38 XueYuan Road, Haidian District, Beijing 100191, China. ³Laboratory of Toxicological Research and Risk Assessment for Food Safety, Peking University, 38 XueYuan Road, Haidian District, Beijing 100191, China.

Received: 20 January 2022 Accepted: 19 April 2022

Published online: 28 April 2022

References

- Lv X, Ding X, Dai Y. The formation and background of the eight major cuisines in China. *Food Nutr China*. 2009 [cited 2021 Nov 3];(10):62–4. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2009&filename=ZGWY200910023&uniplatform=NZKPT&v=3H2S3-Qwrz117k6F2YojJkkOIB6Tmgfx8Pna6RN10153qnRDERuYVRJH1G1KHkKNS>.
- Song Y. Analysis and research of Chinese style schools. *Mod Food*. 2020 Nov 15 [cited 2021 Nov 3];21:56–58, 72. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2021&filename=SPXD202021018&uniplatform=NZKPT&v=qUGw3rTFJY17L5xlgYy%25mmd2Biz05UHhU3Zg8kMuD8rK6P1s%25mmd2B%25mmd2F%25mmd2F%25mmd2BGD6MueOPEkiY8vehx>.
- Ma B. Anecdotes of the State Banquets II, Discourse of the Etiquette 136. *People's Daily Overseas Edition-people.cn*. 2014 [cited 2021 Oct 27]. Available from https://web.archive.org/web/20140827120735/http://paper.people.com.cn/rmrhbwb/html/2013-12/14/content_1361928.htm.
- National Bureau of Statistics (CN). Aquaculture production. National data. [Cited 2021 Nov 2]. Available from <https://data.stats.gov.cn/easyquery.htm?cn=E0103&zb=A0D11®=320000&sj=2020>.
- National Oceanic and Atmospheric Administration. Fisheries of the United States | NOAA Fisheries. NOAA. 2021 [cited 2021 Nov 2]. Available from <https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-united-states>.
- Li W. A prob into the economic and Cultural value of Yangchenghu Lake Crabs. *Culin Sci J Yangzhou Univ*. 2006 [cited 2021 Nov 3];(03):6–10. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2006&filename=YZPX200603002&uniplatform=NZKPT&v=akbn9Dq-7dHhBpsAVZlJuoogfAF3NQnjKUC14V1-e5xVdpHym0AvOOZrVAmWt7rL>.
- National Fisheries Technology Extension Center, China Society of Fisheries. Industry Development Report of Chinese Crawfish (2020). 2020 [cited 2021 Nov 4]. Available from <http://www.boyar.cn/article/1083701.html>.
- Xuyi Government. Xuyi crow fish is nominated in the the China-EU agreement on geographical indications. 2021 [cited 2021 Nov 4]. Available from http://www.xuyi.gov.cn/col/938_766423/art/16277472/1629709483485TGL8TU01.html.
- Department of Agriculture and Rural Affairs of Jiangsu Province. Create a high-quality Green vegetable industry. [Cited 2022 Jan 7]. Available from http://nynct.jiangsu.gov.cn/art/2019/12/27/art_13274_8861096.html.
- Zhang N, Ma G. Nutritional characteristics and health effects of regional cuisines in China. *J Ethn Foods*. 2020;1:7.
- Qiao X. A complex net work study of the Eight Chinese Cuisines [Thesis]. Yunnan University; 2018 [cited 2021 Nov 3]. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CMFD&dbname=CMFD202001&filename=1018245734.nh&uniplatform=NZKPT&v=ajunHb0YRGLaEaKybjbXgKkg-jXIOYSjdJYZrRUytDuwGUEWRllh8GacIBW_BB.
- Shao T, Gao Z. The discussion of the distinctions and connections of the four major Chinese cuisines. *China Food Saf Mag*. 2019 [cited 2021 Nov 3];(12):180–1. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2019&filename=SPAQ201912140&uniplatform=NZKPT&v=JUgnlzpexaXlVxO8LQ6LxuxHpjMsNsQJhu1HBGqVkyTgMduVoKyWpjOdsWz0hW9l>.
- Jiangsu Provincial Department of Culture and Tourism, Jiangsu Intangible Culture Heritage Protect Center. The Intangible Cultural Heritage in Jiangsu. [Cited 2021 Nov 5]. Available from http://www.jsfybh.com/Intangible/fyporlt/WEB-INF/views/portal_Vip/homepage/index.html.
- Ran W. The discussion on the improvement of food sculpture skills in catering and cooking. *Mod Food*. 2019 [cited 2021 Nov 8];(18):86–8. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2019&filename=SPXD201918028&uniplatform=NZKPT&v=CtXf1dCFWZruckZBLuAVOrsroe2drCtclubwZkzL_pgg4qDjNKaAaOi9qDKrPKg.
- Jiang Y. The eight major traditions of Chinese cuisine and the ninth major traditions. *J Essent Chin Humanit Hist 文史精华*. 2013 [cited 2021 Nov 3];(05):64–8. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2013&filename=WSJF201305014&uniplatform=NZKPT&v=HMPxLpesoLEmpAuHGpnAs0KOJGhTtXp8fcmfFa3z5WK4L_In4Mtf0cJn_GoISNS.
- Yuan X. The Exquisite Jiangsu Cuisine (Sequel 2)-Nanjing Cuisine. *Jiangsu Fang Zhi*. 2000 [cited 2021 Nov 9];(01):58–9. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2000&filename=JSDf200001025&uniplatform=NZKPT&v=kul-UsOjW3ap6NdM1vXnosOvEhYHrMYCYCD8Bm1d5c8uFoL1sG3a_yglgnrRVHsU.
- Du N. A study on the names of Suzhou dishes for Chinese teaching [Master]. Suzhou University; 2020 [cited 2021 Nov 10]. Available from <https://kns.cnki.net/kcms/detail/frame/list.aspx?dbcode=CMFD&filename=1020153620.nh&dbname=CMFD202101&RefType=1&v=F4f0uX87uF-8XBetTICAKm0B7ckAcZkNHRdqJcbmwU3JlIODm3sVlImZQfz-ez>.
- Su Q. As one of the “Four Great Traditions” in China, Su cuisines, include Yangzhou cuisine, Huaian cuisine, Wuxi cuisine, Suzhou cuisine, and Zhenjiang cuisine, outcompete other cuisines. *China Place Name*. 2014 [cited 2021 Nov 3];(03):22–4. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2014&filename=NAME201403007&uniplatform=NZKPT&v=Rj0LA5uMpKQzGz1CW-4-4cWPUXj_sbtK1ZmvQgG4Ur78dVWphkF3WpZrkBychyl.
- Zhao J. A cultural discussion of Fish Hidden in Mutton. *Sci Fish Farming*. 2012 [cited 2021 Nov 11];(10):77–78+93. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2012&filename=KXY201210074&uniplatform=NZKPT&v=-35v7YFvHBKfdaXbS_uMvF1qYdFFf2qXaGQ_pSnJZH3450dz3Paf2XpEiHAzN9.
- Yuan X. The Exquisite Jiangsu Cuisine (Sequel 1)-Huaiyang Cuisine. *Jiangsu Fang Zhi*. 1999 [cited 2021 Dec 31];(03):63. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD9899&filename=JSDf199903030&uniplatform=NZKPT&v=GKSc2snyjAK40KIFFOf5ANTT9C_TY0JR5YXSDlgMz4JoUnlToo_ZKVIaQ-U-N2TD.
- Zhou X, Tang J, Zhang J, Liu T, Huang Y. The research on the technological standardization of Yangzhou fried rice with scrambled egg. *Cuis J Yangzhou Univ*. 2002 [cited 2021 Nov 9];19(02):24–7. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2>

- 002&filename=YZPX200202005&uniplatform=NZKPT&v=zjhMG-wq7s5DzZAFNojydHckZITe68nwN6qMk8phGzbvs1p3c8DrTgmK91diAD5M.
22. MA X. Nanjing duck blood and vermicelli soup. *Jiangsu Fang Zhi*. 2016 [cited 2021 Dec 30];(04):44–6. Available from <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2016&filename=JSDF201604013&uniplatform=NZKPT&v=tAq9JE0CN5Rlqfte9rwDYb10qVm55n9M4nDEg5-2g3kqIREbdfc3vsVDpQ6RvSmb>.
 23. Tørris C, Småstuen MC, Molin M. Nutrients in fish and possible associations with cardiovascular disease risk factors in metabolic syndrome. *Nutrients*. 2018 Jul 23 [cited 2021 Nov 12];10(7):952. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6073188/>.
 24. Matsumoto C, Yoruk A, Wang L, Gaziano JM, Sesso HD. Fish and omega-3 fatty acid consumption and risk of hypertension. *J Hypertens*. 2019;37(6):1223–9.
 25. Schomburg L, Köhrle J. On the importance of selenium and iodine metabolism for thyroid hormone biosynthesis and human health. *Mol Nutr Food Res*. 2008;52(11):1235–46.
 26. Mozaffarian D, Rimm EB. Fish intake, contaminants, and human health: evaluating the risks and the benefits. *JAMA*. 2006;296(15):1885–99.
 27. Vargas AM, de Moura AP, Deliza R, Cunha LM. The role of local seasonal foods in enhancing sustainable food consumption: a systematic literature review. *Foods*. 2021 Sep [cited 2021 Nov 13];10(9):2206. Available from <https://www.mdpi.com/2304-8158/10/9/2206>.
 28. Macdiarmid JI. Seasonality and dietary requirements: will eating seasonal food contribute to health and environmental sustainability? *Proc Nutr Soc*. 2014;73(3):368–75.
 29. Kim H, Wang Q, Shoemaker CF, Zhong F, Bartley GE, Yokoyama WH. Polysaccharide gel coating of the leaves of *Brasenia schreberi* lowers plasma cholesterol in hamsters. *J Tradit Complement Med*. 2014 Dec 16 [cited 2021 Nov 13];5(1):56–61. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4488095/>.
 30. Elakovich SD, Wooten JW. An examination of the phytotoxicity of the water shield, *Brasenia schreberi*. *J Chem Ecol*. 1987;13(9):1935–40.
 31. You Y, Duan X, Wei X, Su X, Zhao M, Sun J, et al. Identification of major phenolic compounds of Chinese water chestnut and their antioxidant activity. *Mol J Synth Chem Nat Prod Chem*. 2007 Apr 25 [cited 2021 Nov 13];12(4):842–52. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6149449/>.
 32. Zeng F, Chen W, He P, Zhan Q, Wang Q, Wu H, et al. Structural characterization of polysaccharides with potential antioxidant and immunomodulatory activities from Chinese water chestnut peels. *Carbohydr Polym*. 2020;15(246): 116551.
 33. Zhang T, Li Y, Zhang H, Chen M, Huang F, Huang C, et al. The nutritional evaluation of <Chinese famous recipe jiangsu flavor. *Cuis J Yangzhou Univ*. 2000 [cited 2021 Nov 16];(03):26–31. Available from https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2000&filename=YZPX200003007&uniplatform=NZKPT&v=2IIJNrcN0unz882H1261aZae6Yx7PHoXKZ15avN-OmAQYNqvXU_XpM2ZJ-3fir_8.
 34. Zuo H, Shi Z, Yuan B, Dai Y, Pan X, Wu G, et al. Dietary patterns are associated with insulin resistance in Chinese adults without known diabetes. *Br J Nutr*. 2013 May [cited 2021 Dec 29];109(9):1662–9. Available from <https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/dietary-patterns-are-associated-with-insulin-resistance-in-chinese-adults-without-known-diabetes/1FF3BD159AA22F7A49050F64EE91264>.
 35. Wang Y, Tian T, Pan D, Zhang J, Xie W, Wang S, et al. The relationship between dietary patterns and overweight and obesity among adult in Jiangsu Province of China: a structural equation model. *BMC Public Health*. 2021 Jun 25 [cited 2021 Dec 27];21:1225. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8229268/>.
 36. Wang Y, Dai Y, Tian T, Zhang J, Xie W, Pan D, et al. The effects of dietary pattern on metabolic syndrome in Jiangsu Province of China: based on a nutrition and diet investigation project in Jiangsu Province. *Nutrients*. 2021;13(12):4451.

Publisher's Note

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

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

