



Original article

History of Korean *gochu*, *gochujang*, and kimchiDae Young Kwon^{a,*}, Dai-Ja Jang^a, Hye Jeong Yang^a, Kyung Rhan Chung^b^a Korea Food Research Institute, Seongnam, South Korea^b The Academy of Korean Studies, Seongnam, South Korea

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ABSTRACT

The *gochu* (Korean red pepper) that goes into Korean traditional fermented foods such as kimchi (fermented cabbage) and *gochujang* (spicy red pepper paste) should have a mild spiciness and its Scoville heat unit (the unit that measures spiciness) is <1,000. The kimchi and *gochujang* that are fermented only with Korean *gochu* can be eaten. Kimchi and *gochujang* cannot be prepared even with *cheongyangkochu* (Scoville heat unit is approximately 3,000), which is a hybrid of Korean *gochu* and Thai *gochu*. When these foods are prepared with other spicier *gochu*, such as Thai pepper, Southern Asian red pepper, Central American red pepper, or Mexico's *aji* (which is 500 times spicier than Korean *gochu*), they will be too spicy to consume. Biologically, Korean *gochu* is different from the red peppers of Central American countries (such as Mexico and Colombia), Indonesia, India, and Thailand. Therefore, the statement that the Central American red pepper came to Korea during the Japanese invasion of Korea in 1592 is not true. We can refer to a research paper in the magazine "Nature" that Korea's *gochu* arrived at the Korean peninsula millions of years ago, having been spread by birds. It states that *gochu* has evolved for millions of years, therefore, we can infer that Korean *gochu* existed as a completely different variety. In addition, *gochujang* and kimchi can be made using *gochu* only, which proves that people in Korea cultivated *gochu* thousands of years ago and have been eating it since then. Furthermore, many old Korean documents support the fact that Koreans have been planting and harvesting *gochu* for the last 1,500 years.

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1. Introduction

In agricultural history, storage of agriculture products and groceries has been the main focus of survival in all countries. In Korea, the development of fermented foods began in order to extend their storability. Normally, vegetables, such as a cabbage (previously called Chinese cabbage, but is now referred to as kimchi cabbage), decompose at normal temperatures as an action of microorganisms and, therefore, cannot be consumed. However, if special ingredients, such as red pepper powder (containing capsaicin), are added, the growth of putrefactive bacteria is suppressed and *Lactobacillus* (lactic acid bacteria) grows. These microorganisms grow and change into a form that humans can consume, solving the

issue of storability. In Korea, microorganisms, such as *Bacillus* and *Aspergillus*, are used to ferment soybeans, producing *cheonggukjang* (fermented soybean) and *doenjang* (fermented soybean paste), and extending their storability. As a result, the food can be served as a side dish with the main rice dish.

The most famous fermented food products in Korea are kimchi and *gochujang*. *Gochujang* is made using *meju* powder which was making while *doenjang*. *Gochujang* is produced by mixing *meju* powder with glutinous rice powder and red pepper powder, and then the mixture is fermented. Kimchi is another fermented food used in Korea, and is a popular side dish that makes other foods taste better. Kimchi comprises vegetables such as cabbage and white radish, along with the most important ingredient *gochu* (Korean red pepper) powder. Due to the presence of red pepper powder, the putrefactive microorganisms can be controlled and advantageous lactic acid fermentation occurs. Red pepper powder is the main ingredient in kimchi fermentation.

Thus, when talking about Korea's fermented foods, one needs to consider *gochu* and its history, variety, and taste. In old Korean documents, records of *gochu*, kimchi, and *gochujang* can be found.

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These records allow us to observe the uniqueness of Korea's gochu along with the history and science of kimchi and gochujang, Korea's own traditional fermented foods.

2. Gochu used in Korean fermented foods

With scientific development, there have been numerous studies on the varieties of gochu. Red pepper can be divided into four

categories. The most typical is the *Capsicum annum* category, which includes the Korean gochu, Hungarian pepper (paprika), China's Sichuan pepper (*choncho*: 川椒), Italian pepper, and Greek pepper [1]. Normally, these types of red peppers are only a few times spicier than the Korean gochu, but are not extremely spicy. Korean gochu is special because it also tastes sweet. In fact, vitamin C was found in paprika in 1933 [2]. Regarding the peppers that are included in the *Capsicum vaccatum* category, a particular kind of

京而須水則大同江是也何以知之唐書云平壤城漢樂浪郡也隨山屈繚為郭南涯須水又志云登州東北海行南徬海壩過須江口楸島得新羅西北又隋煬帝東征詔曰滄海道軍舟

(A)

三國史記

串介有二巖龍一立南顯十丈形顯如 楸島長百餘丈 貴林串今琵琶串之舊通上楸島者今商廟楸以故產 碧達浦高麗李芳實九年斬三十餘兵 大串有策 白沙汀今

(B)

萬機要覽

Fig. 1. The Chodo in rectangular box the island where gochu was planted, is written about in (A) "The Chronicles of Three States (三國史記)" (Kim Bu-sil, early Goryeo, 1145) and in (B) Mankiyoram (萬機要覽) described the chodo is the land where gochu cultivated in detail (1808).

pepper was transferred from West India to Spain in the late 15th century by Columbus. It is approximately 500 times spicier than the Korean *gochu* and is called *aji* [the Scoville heat unit (SHU), 30,000–50,000]. South Africa's less spicy peppers are also included in this category. The *Capsicum chinense* category includes *nagajolokia* (Indian pepper, SHU 855,000–1,000,000), which is more than 1,000 times spicier than the Korean *gochu*. Central and South American peppers are also included in this list. The *Capsicum frutescens* category includes Thai pepper (SHU 75,000–150,000), which is 400–500 times spicier than Korean *gochu*. Accordingly, the popular belief stating that the Central and South American red pepper, *aji*, came to Korea during the Japanese invasion of Korea through the route of Thailand and India is not scientifically viable [3]. Without current genetic engineering skills, these kinds of red peppers (peppers from Central and South America, Thailand, and India) would take millions or billions of years to evolve into Korea's *gochu*. The recent research states that *gochu* appeared on the earth billions of years ago [4], and might have been transferred by the birds that ate them [5,6]. One of the reasons for this statement was that some birds lack the receptor (TRPV1, vanilloid receptor) that helps register the spiciness of food, allowing them to fly even after consuming *gochu* that are much spicier than Korean *gochu*. This was investigated and observed through a video recording [4].

Therefore, it is impossible that Korea's *gochu* was transferred from Central America within such a short period of time (tens of years). In addition, Korea's *gochu* was transferred through a different route from that of Mexico's red pepper and became a

native Korean species. Based on scientific evidence, *gochu* started to grow on the Korean peninsula a few billions of years ago, and it is safe to say that it is original to Korea. In addition, *gochujang* and kimchi can possibly be made with Mexican or Thai red peppers, but they cannot be eaten as kimchi or *gochujang* because of their extreme spiciness. In the cytological sense, *gochu* that is made into *gochujang* and kimchi can only be grown and harvested on the Korean peninsula.

3. Kimchi and gochujang in Korea's old documents

There are many books that mention the cultivation of *gochu* on the Korean peninsula. There are no records that show that *gochu* grew in the wild; however, because it was recorded in “The Chapter of Dongyi in the Book of Wei, the records of the Three Kingdoms, 三國志魏志東夷傳” (years 233–297, Chen Shou) for the first time, it can be verified that it existed on the Korean peninsula 2,000 years ago. If “The Chronicles of Three States (三國史記)” (Kim Bu-sik, early Goryeo) is examined, records [Chodo (椒島), the island where *gochu* was planted; Fig. 1] show that *gochu* was already being cultivated during the period of the three kingdoms of the Korean peninsula, Kokuro, Paekje, and Shilla (37 BC – 668 AD), indicating that the demand for *gochu* was high even during that time. In addition, it can also be inferred that *gochujang* and kimchi were being made by fermenting *gochu* during this period as well.

The Chinese letter “Jeo (Zu, 菹)” shows that the word kimchi appears (in Hunmongjahoi; Fig. 2) in the “Book of Odes (Sikyung, 詩

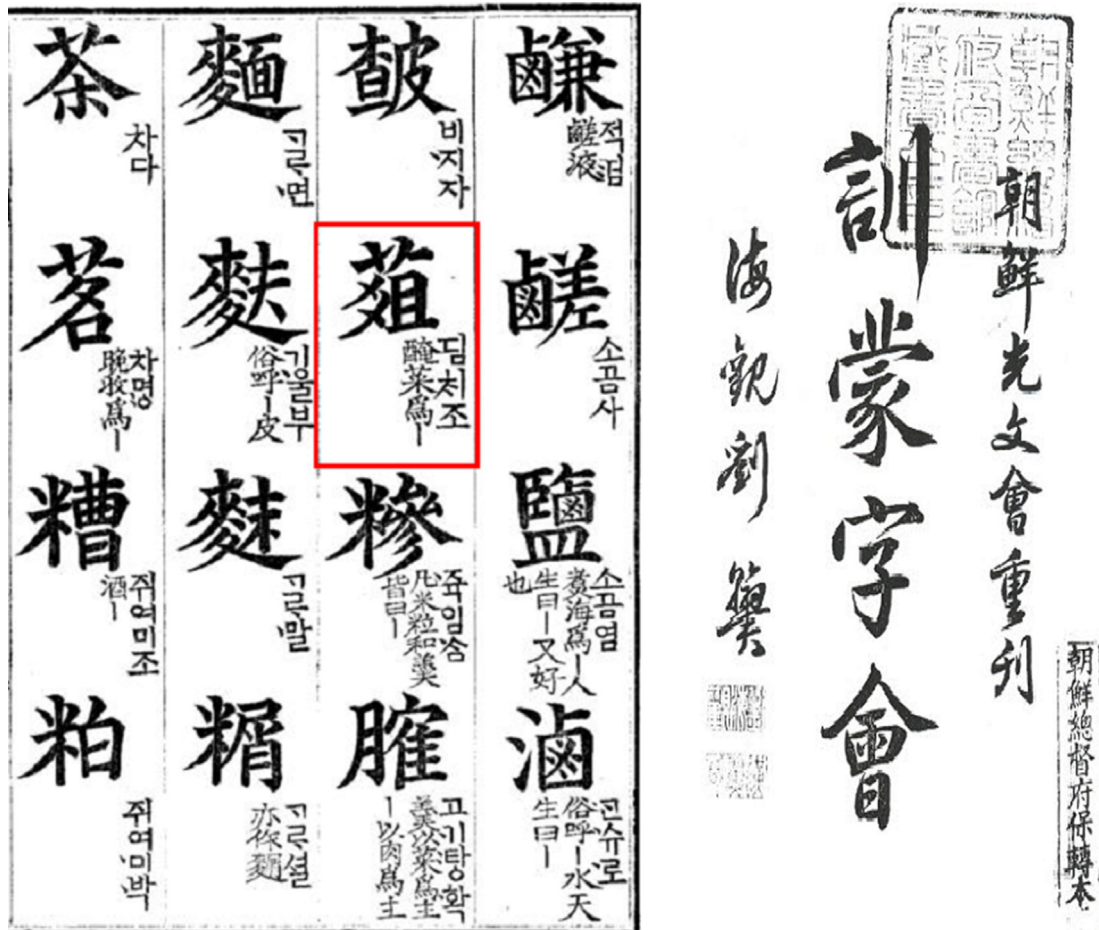


Fig. 2. The Chinese character Jeo (Zu,菹) in the box, which represents the kimchi, written clearly in the book of Hunmongjahoi by Choi Se-jin (1473?–1542) in chosun dynasty.

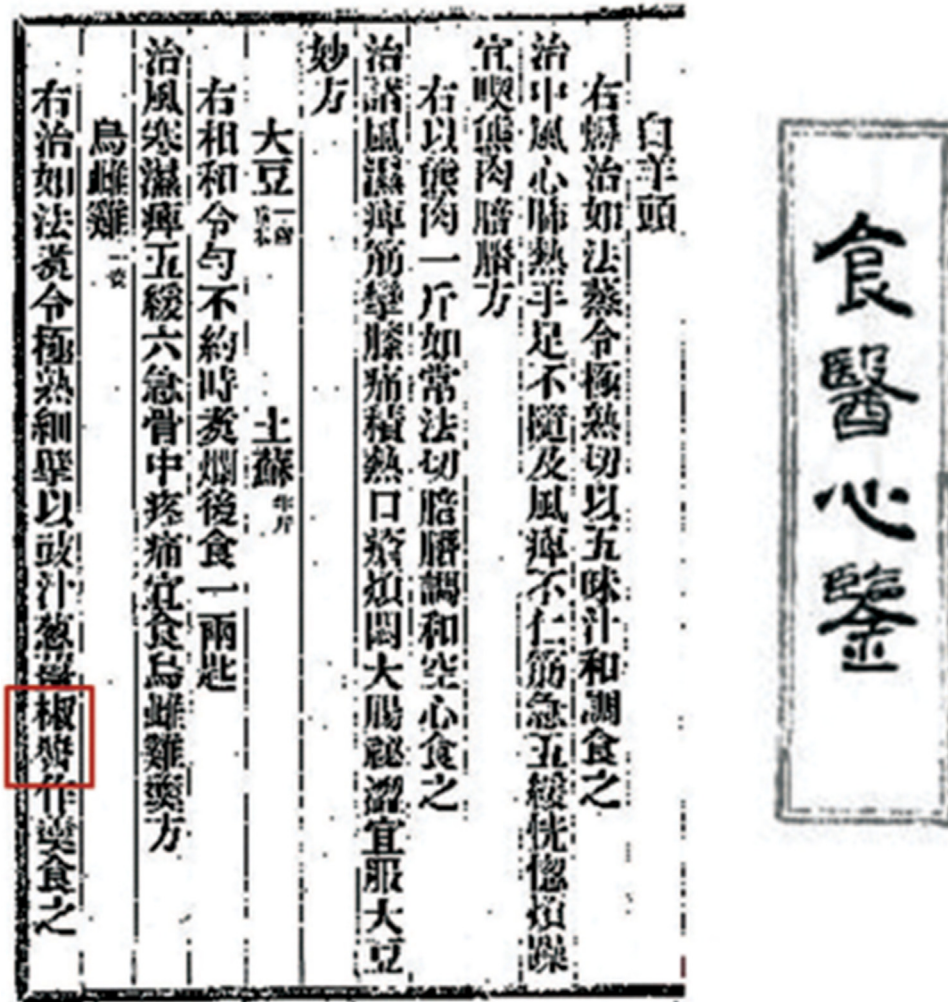


Fig. 3. The Chinese word “Chojang (椒醬)”, in the box, which represents *gochujang* is mentioned in the book “Sikui-singam (食醫心鑒, Book for Alimento-therapist)” a book published in the year 850 AD. This means Korean people have their fermented red pepper paste, *gochujang*.



Fig. 4. In Sasichanyocho, 四時纂要抄 (Kang Huimaeng, 1482–1483), the agricultural period and season of *gochu* harvesting have been mentioned. This means *gochu* was cultivated in Korean peninsula in early age.

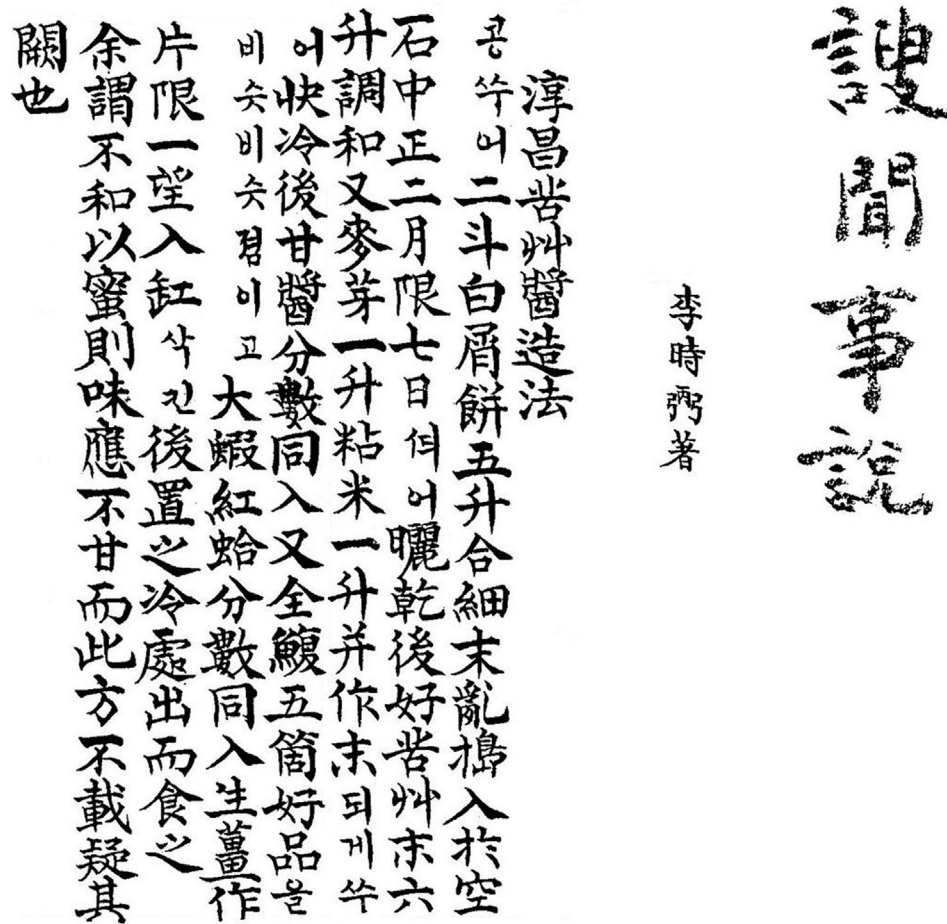


Fig. 5. Preparation of the famous *Sunchang gochujang* (*Sunchang* is the southern west part of Korea) is described very scientifically in the “*Somunsaseol* (諺聞事設)” of Lee Si-pil (1657–1724).

經)” (around 500 BC). The Chinese word that represents *gochujang* [“*Chojang* (椒醬)”) is mentioned in the book “*Sikui-simgam* (食醫心鑒, Book for Alimento-therapist),” a book published in the year 850 AD (Fig. 3).

The precise period of harvesting *gochu* has also been recorded as August in the lunar calendar, which illustrates the fact that *gochu* harvesting was considered a very exact and important agricultural period (Sasichanyocho, 四時纂要抄, Kang Huimaeng, 1482–1483; Fig. 4). From these records, it is evident that the history of kimchi and *gochujang* dates back to at least 1,500 years ago and quite possibly even earlier (> 2,000 years). The famous *Sunchang gochujang* (*Sunchang* is the southern west part of Korea) appears in the “*Somunsaseol* (諺聞事設)” of Lee Si-pil, and has been described very scientifically (Fig. 5). Thus, it can be assumed that *Sunchang gochujang* was famous hundreds of years prior to when Lee Si-pil started recording it.

4. Discussion

In Korea, kimchi and *gochujang* are fermented foods that contain *gochu* powder. The Korean red pepper (*gochu*) that goes into Korean traditional foods must be originally from Korea, and kimchi and *gochujang* can be made using only this variety of pepper. The SHU of the *gochu* has to be <1,000, similar to the SHU of the Korean *gochu*, in order for the foods to ferment. When it is made with spicier red pepper, such as *cheongyanggochu* (SHU, 2,500), Thai pepper, or Mexico’s *aji*, which is approximately 500 times spicier than Korean *gochu*, it cannot be consumed due to extreme spiciness. Even

biologically, Korean *gochu* is different from those from Mexico, Central America, Indonesia, India, and Thailand. Therefore, that statement claiming that Korean *gochu* arrived during the Japanese invasion of Korea (1592) from Mexico is false. Korean *gochu* existed as a separate variety of pepper, different from Mexican and Thai peppers. If one looks at old references, Koreans have been making their own fermented foods such as kimchi and *gochujang* for thousands of years. The records from the period of the Three States (1,500 years ago) prove that Koreans have been planting and harvesting *gochu* for a long time.

Conflicts of interest

The authors have no conflicts of interest.

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