



Mini-review article

Characterization of Korean Red Ginseng (*Panax ginseng* Meyer): History, preparation method, and chemical composition



Sang Myung Lee^{1,*}, Bong-Seok Bae², Hee-Weon Park², Nam-Geun Ahn², Byung-Gu Cho²,
Yong-Lae Cho², Yi-Seong Kwak^{2,**}

¹ Division of Biomedical and Cosmetics, College of Sciences & Technology, Mokwon University, Daejeon, South Korea

² Korea Ginseng Research Institute, Korea Ginseng Corp., Daejeon, South Korea

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ABSTRACT

It has been reported that Korean Red Ginseng has been manufactured for 1,123 y as described in the GoRyeoDoGyeong record. The Korean Red Ginseng manufactured by the traditional preparation method has its own chemical component characteristics. The ginsenoside content of the red ginseng is shown as Rg1: 3.3 mg/g, Re: 2.0 mg/g, Rb1: 5.8 mg/g, Rc: 1.7 mg/g, Rb2: 2.3 mg/g, and Rd: 0.4 mg/g, respectively. It is known that Korean ginseng generally consists of the main root and the lateral or fine roots at a ratio of about 75:25. Therefore, the red ginseng extract is prepared by using this same ratio of the main root and lateral or fine roots and processed by the historical traditional medicine prescription. The red ginseng extract is prepared through a water extraction (90 °C for 14–16 h) and concentration process (until its final concentration is 70–73 Brix at 50–60 °C). The ginsenoside contents of the red ginseng extract are shown as Rg1: 1.3 mg/g, Re: 1.3 mg/g, Rb1: 6.4 mg/g, Rc: 2.5 mg/g, Rb2: 2.3 mg/g, and Rd: 0.9 mg/g, respectively. Arginine-fructose-glucose (AFG) is a specific amino-sugar that can be produced by chemical reaction of the process when the fresh ginseng is converted to red ginseng. The content of AFG is 1.0–1.5% in red ginseng. Acidic polysaccharide, which has been known as an immune activator, is at levels of 4.5–7.5% in red ginseng. Therefore, we recommended that the chemical profiles of Korean Red Ginseng made through the defined traditional method should be well preserved and it has had its own chemical characteristics since its traditional development.

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1. Introduction

Korean ginseng (*Panax ginseng* Meyer, Araliaceae) is traditionally used as an important herbal medicine in Far East Asia. The root of ginseng is traditionally used as an adaptogen as it is stated to have the capacity to normalize body functions and strengthen systems that are compromised by stress. Adaptogens are reported to have a protective effect on health against a wide variety of environmental assaults and emotional conditions [1–4]. In addition, the main biological activities of Korean Red Ginseng are known to include immune enhancement effects, the recovery of vital energy as well as the alleviation of fatigue, blood flow improvement, antioxidant effects, and the positive effects on

memory enhancement and menopausal disorder [5–9]. Fresh ginseng is easily degraded at room temperature. Therefore, fresh ginseng is processed into red ginseng through the process of steaming and drying or processed into white ginseng by a simple drying process. According to general knowledge, red ginseng has significantly higher biological effects and fewer side effects compared with fresh and white ginseng.

Red ginseng (*Ginseng Radix Rubra*) and white ginseng (*Ginseng Radix Alba*) are individually regulated in Korean, Japanese, and Chinese Pharmacopoeias. These regulations imply that there is a difference in characteristics between red and white ginseng because these have the same origins of the plant but have different processing. The studies of the differences between red and white

* Corresponding author. Division of Biomedical and Cosmetics, College of Sciences & Technology, Mokwon University, Doanbuk-ro 88, Daejeon 302-729, South Korea. Tel.: +82 4 2829 7566; fax: +82 4 2829 7561.

** Corresponding author. Korea Ginseng Research Institute, Korea Ginseng Corp., Gajeong-ro 30, Daejeon 305-805, South Korea. Tel.: +82 4 2870 3071; fax: +82 4 2870 3142. E-mail addresses: smlee@mokwon.ac.kr (S.M. Lee), twostar@kgc.or.kr (Y.-S. Kwak).

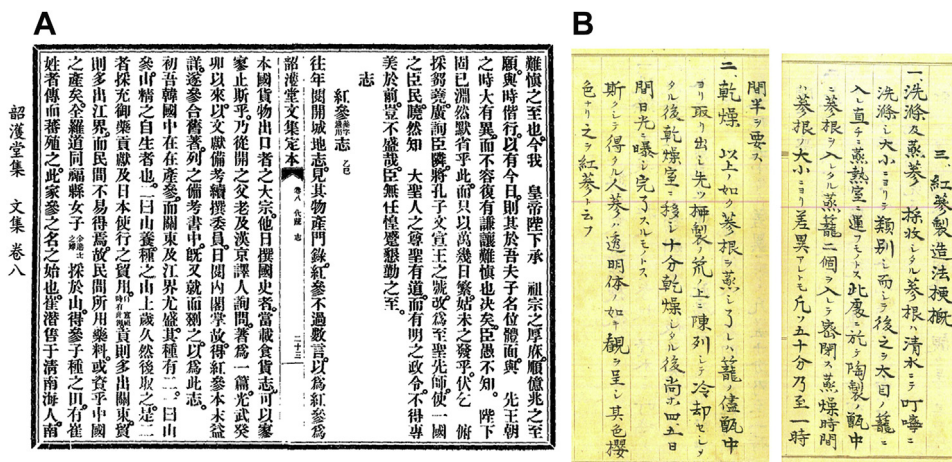


Fig. 1. SohoDang miscellany. (A) Detailed records about red ginseng were written by Taekyoung Kim (1850–1927) and Samjung-Yolam. (B) A bulletin of ginseng policy, 1908, Ministry of Strategy and Finance, The Greater Korean Empire.

ginseng have been carried out since the early 1980s [10]. These reports described the changes of the ginseng’s chemical profile due to the different processing methods. Thereafter classified according to the different processing methods of red ginseng, the components and pharmacological activities of red ginseng products have subsequently been reported in scientific research papers. Herein we will define the traditional preparation method of red ginseng and describe the characteristic chemical profiles of red ginseng and other preparations from it which were prepared by the traditional methods.

2. History of Korean Red Ginseng

Historically, the name “Red Ginseng” (Hongsam in Korean) has been reported in the Annals of King Jeongjo (1776–1800), which is a part of the Annals of the Joseon Dynasty. According to the records older than that literature, the process of steaming ginseng was introduced in GoRyeoDoGyeong (a record of personal experience in Korea, written in 1123) by Seo-Gung (1091–1153, Song Dynasty). According to GoRyeoDoGyeong, red ginseng (originally recorded as steamed ginseng) was prepared by steaming and drying fresh ginseng root. However, because the fragmentary records lack certain details, researchers could not identify the exact preparation method for red ginseng, i.e., undefined steaming time, numbers of repetition, and consecutive drying process. About 100 y later (late 1200s), more detailed records about red ginseng were written in the SohoDang miscellany by Taekyoung Kim (1850–1927). According to the record, ginseng roots were grown for > 6 y, their dirt shaken off, washed, and then steamed in a big steamer. The steamed ginseng roots were laid on bamboo racks in a drying warehouse and dried by heat from a fire or by sunlight and the wind.

Red ginseng is a product made by the primary processing of fresh ginseng. The preparation method of red ginseng applied in the modern age was written in detail in Samjung-Yolam (A Bulletin of Ginseng Policy, 1908, Ministry of Strategy and Finance, The Greater Korean Empire). According to this record, the steaming of ginseng was carried out as follows; “The fresh ginseng roots harvested were carefully washed with clear water and thereafter, classified based on their respective sizes. The washed fresh ginseng roots were then put in a large bamboo basket and moved directly to the steaming place. The baskets were put into a clayware steamer which was sealed. The time of steaming was about 50–90 min depending on the size of the ginseng”. The drying of steamed ginseng was carried

out as follows: “The steamed ginseng roots were sufficiently dried in the drying room, and then thereafter, placed under the sunlight for 4–5 d. The ginseng produced by these processes is a transparent material that represents the color of the cherry blossoms. This was called red ginseng.” The growing years of fresh ginseng was ≥ 6 y as speculated by the SohoDang miscellany (Fig. 1A), which was written in the same period with Samjung-Yolam (Fig. 1B). Harvesting season for fresh ginseng was estimated to be between October to November by considering the daylight conditions and the harvesting times of common medicinal plants. According to the record, fresh ginseng was screened by size and then steamed. These facts are similar to the current screening by size and shape as has been done in the past, the fresh ginseng with a large size and good shape was considered to be a good product presumably. Ginseng was produced under the leadership of the government very strictly, and could not be manufactured and sold privately. The so-called red ginseng monopoly system (1908–1996) was enforced by the Japanese colonial government and the overall red ginseng industry was managed under the supervision of government. Therefore, the traditional preparation method of red ginseng was standardized and applied to the manufacturing system at that time. From that, the ginseng production technology that is currently followed has been developed from the methods applied in the past.

3. Red ginseng production method

Currently in Korea, the dietary supplement products market has increased with the concern for health according to consumers increase of income. At the same time, consumer demand for red ginseng has rapidly increased. Reportedly, the ratio of primary processed to red ginseng from fresh ginseng was 67.1% in 2009. At that time, fresh ginseng production was 27,480 tons in Korea. Therefore, 18,439 tons of fresh ginseng were processed to red ginseng; however, red ginseng production facilities could not deal with these massive production demands [11]. Since 1908, the basic framework of traditional production methods for red ginseng was well structured and improved gradually. However, the ginseng manufacturing facilities scale was raised by the monopoly system and disappeared in 1996. The basic process of red ginseng production from fresh ginseng simply consists of three steps of washing, steaming, and drying. Fig. 2 is a ginseng process diagram from the major companies of red ginseng in Republic of Korea. Most manufacturers of red ginseng in the Republic of Korea are producing red ginseng by the utilization of the traditional production

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