

REVIEW ARTICLE

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The globalization of bibimbap: focusing on the diversity of modernization of bibimbap

Eun-Gyung Mun^{1,4}, Young-Eun Lee^{3*} and Youn-Soo Cha^{1,2*} 

Abstract

Korea is developing a food culture based on various vegetation. Bibimbap is a one-dish meal that harmonizes the characteristics of Korean food. Bibimbap is made by placing seasoned meat, vegetables (*namul*), vegetable oil (sesame and perilla), and jang (gochujang, ganjang, or doenjang) on top of warm rice. Since ancient times, bibimbap has been served on a table of various classes, from the royal court to the common people, and it has the convenience of meals and the spirit of community. Therefore, bibimbap is for many people to gather and eat deliciously. The famous bibimbap regions in Korea include Jeonju, Jinju, and Andong, and each has its characteristics. Depending on the serving style, they can be divided into brass or stone pot bowls. Depending on the main ingredients, it is also divided according to vegetables, grains, meat, and seafood. Additionally, restaurants specializing in bibimbap are prevalent in Korea, and there are many commercially launched products such as retort food, in-flight meal, and ingredients for bibimbap. Bibimbap is responsible for the Korean table by combining various fields from gourmet to homemade meals. As can be seen from this point, bibimbap has the characteristics of a customized meal as the characteristic of consumers being able to choose food ingredients are remarkable. Bibimbap is a food that can be applied without time, space, and individual restrictions by combining various foods in one bowl to balance and harmonize with each other.

Keywords Bibimbap, Personalization, Characteristic, Commercial

Introduction

Korea is a small country in Northeast Asia, but it boasts various food cultures. The topography of the peninsula consists of the sea on three sides, land connected to the

continent, numerous islands, and tidal flats. 64% of the land is mountains, and plains including hilly areas where farming is possible, and abundant rivers are gathered. In addition, the climate belongs to the mid-latitude temperate climate zone, but the four seasons appear clearly and regularly due to the influence of the four major air masses. These topographical and climatic characteristics show the diverse vegetation of the Korean Peninsula. So, Koreans could safely consume a variety of plants and seafood and apply it to various foods. Since ancient times, Koreans have eaten a variety of plants, and it is called '*namul*' by seasoning grass or leaves that can be eaten by humans [1]. The *namul* are a component of Korean diet and are a kind of '*banchan*' (side dish). The *namul* can be divided into '*saengchae*' eaten raw and '*sukchae*' eaten cooked [1].

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The Korean diet is called '*hansik*' (韓食) and the characteristics of Korean food (K-food) are specified in the 'Seoul Declaration' [2]. Korean traditional meal consists of *bap* (rice), *kuk* (soup), and various *banchan* (side dishes) on the same table [3]. *Banchan* contain not only vegetables but also meat, fish, and other sea foods that maintain perfect harmony with nature and contain balanced nutrients essential for a healthy human body [4]. In other words, *banchan* aid digestion and make food taste better while replenishing the body with nutrients [3]. The main points of the K-food are high vegetable, soy, and fish consumption, and low red meat consumption. The vegetables *banchan* are mainly seasoned with various *jang* (i.e., *doenjang*, *ganjang*, and *gochujang*), sesame (or perilla) seeds oil [5]. It is a Korean eating habit to set the table for one person using various types of tableware. However, with *bibimbap*, *bap* and *banchan* such as *namul* are included in one bowl.

Bibimbap is a balanced one-dish meal that combines warm rice with seasoned vegetables, marinade meat, vegetable oil (sesame or perilla), and fermented Korean condiments (*gochujang*, *ganjang*, or *doenjang*, etc.). Then, the reason why rice was mixed and eaten is to eat 'together' and 'tasty'. *Bibimbap* has several origins, such as '*Eumbok*', which is eaten during ancestral rites, and '*Deulbap*' eaten while working in the farmland [6, 7]. There are various theories, but the common point is that the community is in harmony, and this is shown in *bibimbap*. Although the recipe for *bibimbap* has changed over time, the essence has been handed down. *Bibimbap* is a food written in Chinese characters as *Goldongban*, *Goldong*, and *Hondonban*, and was first recorded in Korean as *Bubyum* [6]. All these letters have the meaning of 'to mix rice' and are derived from '*bibida*' (mixed) and '*bap*' (rice). The concept of '*bibida*' (mixed) expresses 'all together'.

Bibimbap is commercially used in various fields. *Bibimbap* can be expressed in various ways depending on the main ingredient, serving style, restaurant, and commercialization. This transformation is considered to respect the diversity of materials. As can be seen from this point, *bibimbap* has the characteristics of a customized meal as the characteristic of consumers being able to choose food ingredients are remarkable. *Bibimbap* is very useful as a diet to meet individual needs. *Bibimbap* is one of the representative foods of Korea for not only Koreans but also foreigners. *Bibimbap* has emerged and evolved over the past 1,000 years to become a famous national food in Korea and a popular food worldwide [7]. *Bibimbap* continues to change, but it contains all the characteristics of

K-Food. This review focuses on the diversity of modernization of *bibimbap*.

History of *bibimbap*

About 500 years ago, *bibimbap* was expressed in Chinese characters such as '*Koldongban*' (骨董飯, 汨董飯), '*Koldong*' (骨董, 汨董), and '*Hondonban*' (混沌飯), and it was called '*Bubimbap*'. The record of *bibimbap* first appeared in *Yokjokumun* (歷朝舊聞) of 『*Kijaijabki* (寄齋雜記; comprehensive compilation of *yasa* (history not official) and diaries by Park Dong-Ryang around 1590)』 as *Hondonban* [8]. The first record of the recipe for *bibimbap* is the 『*Siuijonseo* (是議全書; a cookbook compiled by categorizing and organizing foods in the late Joseon Dynasty according to recipes)』, and it is written in Korean under the name of '*Koldonban/bubeimbap*' [7]. The name of *bibimbap* in Hangeul first appeared in 1810 as '*Bubuyum*' in 『*Mongyupyeon* (夢諭篇; an encyclopedia created by Jang Hon for the learning of young people)』, and was variously recorded as *Bubyum*, *Bubimbap*, *Bubumbap*, *Bubumbap*, *Bubuumbap*, and *Bubueumbap*, and then settled down as *Bibimbap* today [6, 7]. *Goldongban* expresses the substance of *bibimbap* in writing (Chinese characters), and *bibimbap* comes from the Korean word '*bubyeumbap*' [6]. During the Joseon Dynasty, people borrowed the meaning and sound of words to write in Chinese characters, an ideogram. Therefore, while the food called *bibimbap* has existed for a long time, various expressions have been used because the Korean writing system has not yet been established [8]. The fact that the Korean expression of *bibimbap* appeared late does not mean that the history is short. It only reflects the culture that values Chinese characters even before Hangeul was created.

As the word suggests, the unique characteristic of *bibimbap* is that it is mixed. When several foods that can be eaten individually are mixed together, they become a different food than the first one. It is a mixture by rubbing of various foods, and you can feel the taste of each ingredient. This kind of *bibimbap* reflects the Korean characteristic of mixing and forming a group. There are many Korean foods that include mixing and harmony [9]. *Bibimbap* is beautifully decorated to reflect harmony. Yellow bean sprouts, egg garnish, white bellflower and *muk*, brown bracken and shiitake mushrooms, red meat and carrots, and green pumpkins are put in a bowl like flowers. When you mix *bibimbap*, these things disappear and give it a deep taste. *Bibimbap* is a harmonious food that you enjoy with your eyes and mouth before eating [10].

Also, *bibimbap* has been served on a table of various classes, from the royal court to the community cuisine. People may have tried to find a way to make delicious

food to serve important guests and dignitaries. Ancient literature show that Bibimbap was a famous dish among rich and high-ranking officials and dignified guests [7]. As community cuisine, the whole family and clan assembled to hold a memorial service and gathered the leftover food together, and ate it. Ancestral rites are considered very important because it is considered that the greatest responsibility is to serve ancestors with utmost sincerity and to entertain guests. There is a custom of eating leftover food after performing ancestral rites, which is called 'Eumbok'. Bibimbap came out to make eating delicious and easy to share among many people. It is also possible to find the origin of eating a mixture of rice and side dishes that each person brought during a very busy farming season, 'Deulbap' [4]. There are various theories, but the common point is that the community is in harmony, and this is shown in bibimbap. As such, bibimbap is a communal food with the spirit of mixing and harmony.

Variations of bibimbap

Bibimbap is a generic term for food mixed with rice, and can be transformed in various ways depending on the ingredients or regional characteristics. Here, we divided it according to the ingredients and characteristics of bibimbap (Fig. 1).

Variations of bibimbap on ingredients

Depending on the material, the expected functionality is different. In particular, *namul* are expected to contain various nutrients including dietary fiber, vitamins, minerals, and phytochemicals. Even if the main ingredient is protein, bibimbap always includes vegetables. Bibimbap can be a good way to eat vegetables as vegetable intake is decreasing in modern times.

Namul include *Sanchae*, sprout, flower, and barley

There is a perception that *Sanchae* (wild vegetables) Bibimbap is made with wild vegetables and does not contain meat. It is the most similar in form to eating bibimbap with *jinchae*sik (陳菜食) and *Oshiban* (五辛飯). *Jinchae* is a food made by soaking and boiling sun-dried vegetables such as bracken, pumpkin, cucumber, eggplant, and radish. It was dried to eat vegetables during the winter, and on *Jeongwol Daeboreum* (the 15th day of the New Year according to the lunar calendar) before spring, the leftover *jinchae* was gathered to make and eat bibimbap. Dried *namul* was a great source of nutrients, dietary fiber, minerals, and vitamin D, which was difficult to source during the winter [4]. *Oshinban* is one of the *Ipchun* (立春, onset of spring) meals, which is made by raw and blanching five kinds of spicy sprouts (green onion, leaf mustard, angelica root, water parsley, radish). *Oshinban* played a role in replenishing the nutrients of

fresh vegetables that were lacking after spending the winter and stimulating lost appetite. *Sanchae* Bibimbap, as a temple food, is characterized by its lightness as it does not use five vegetables (garlic, leek, green onion, Korean wild chive, Asafoetida) [9].

A barley bibimbap is made with barley to save rice when rice is scarce. Barley is not easy to eat because of its chewy and rough texture. It was a grain representing poverty in the past, but now it is eaten as a delicacy or healthy food. Barley bibimbap is eaten with vegetables with beans products such as cheongkukjang or tofu instead of meat. Add gochujang, sesame oil, and young radish kimchi and eat them coolly.

With modified bibimbap, sprout bibimbap is made by mixing ingestible sprouts such as broccoli, red cabbage, radish, cabbage, and alfalfa with red pepper paste with vinegar. Flower bibimbap uses edible flowers, such as plum, canola, forsythia, plum, shepherd's purse, pansy, and nasturtium. These bibimbap is also eaten by mixing raw vegetables and flowers with blanched vegetables. It maximizes the beautiful plating of bibimbap and also provides a salad-like texture.

The functionality of the ingredients in bibimbap

The most important thing in bibimbap is the *namul*. Seasoned ingredients used in bibimbap have lower anti-inflammatory effects in relation to TNF- α and IL-6 secretion than raw ingredients in mast cell line. In addition, the seasoned ingredients showed a tendency to increase antioxidative activity [11]. Cooked soybean sprout by seasoning is the most efficient to ingest antioxidant compounds, total polyphenol, and flavonoid than non- or blanched, due to garlic, green onion, and sesame oil used as seasoning [12]. Seasonings such as sesame oil, perilla oil, red pepper powder, and red pepper paste added when cooking vegetables contribute to increasing the levels of beta-carotene and vitamin E in cooked vegetables. Overall, 19 kinds of cooking vegetables consumed in Korea are good sources of water-soluble and fat-soluble vitamins [13]. *Sanchae namul* was useful in alleviating insulin resistance and hyperglycemia in obese mice. Improvement of insulin resistance by eating *namul* reduces oxidative stress [14]. *Namul* make digestion easier, make it possible to consume fat-soluble ingredients that are lacking in vegetables, and reduce oxidative stress.

Barley's nutritional value as a health food is increasing due to its fiber (typical beta-glucan), phytochemicals including phenolic acids, flavonoids, lignans, tocopherols, and folate [15]. The ethanol extracts of different barley cultivars represent potential natural antioxidant and hepatoprotective agents [16]. Also, whole barley lowers the blood glucose and insulin response compared to



Fig. 1 Variations of bibimbap. Bibimbap can be made in various forms. **A** It is the most basic bibimbap, and if you take out meat, it becomes *Sanchae* bibimbap. **B** *Notseo* bibimbap, **C** *Dolsot* bibimbap, **D** Jeonju bibimbap include *hwangpomuk*, **E** Andong bibimbap as Andong *Heotjesabap* ©Andong-si, **F** *Huangdeung* bibimbap as *yukhoe* bibimbap, **G** Jinju bibimbap with *seonjiguk* ©Encyclopedia of Korean Culture

rice, so it can be a good diet for patients such as diabetes and obesity. Polyphenols and tocopherols contained in barley act as antioxidants to remove reactive oxidative stress. Folic acid is involved in homocysteine metabolism as well as the function of itself such as DNA methylation, and amino acid metabolism. Therefore, barley intake can help reduce cardiovascular disease [15].

Yukhoe bibimbap include hoe, fish egg, and snails

Yukhoe bibimbap uses seasoned raw beef slice, and Jeonju, Jinju, and Hampyeong are famous. Add raw egg yolks to enhance the taste of raw meat. There are various origins, such as the theory that it appeared as cattle breeding and consumption increased [17], the meal of stonemasons in the Huangdeung area (the origin of Iksan in Jellabuk-do), the meal with meat from the slaughterhouse next to the cattle market (the origin of Hampyeong in Jellanam-do), and the meal that can be eaten quickly during the Imjin war (Japanese Invasion of Korea in 1592; the origin of Jinju). *Yukhoe* bibimbap seems to have developed around places where beef distribution is convenient. *Yukhoe* is a traditional Korean dish that has been enjoyed since the Joseon Dynasty at least (in 1766), and is a dish that is seasoned with raw beef, intestines, boiled pork, shells, and frozen pheasants. It is a food made through a pretreatment process for each meat, and is a hygienic and unique recipe [18]. But sometimes raw beef is vulnerable to microbial contamination. Food safety was induced by suppressing microbial propagation through heat, low pH, and salt down. Soy sauce base marinade prevent the growth of the pathogens in raw beef. The use of marinades also increases the safety of beef [19].

Hoe (raw fish slice) bibimbap is called *hoedeopbap*, and it was mainly developed in the seaside. It is made with raw fish such as tuna, salmon, shark, various vegetables, and gochujang with vinegar. *Al* (roe) bibimbap is called *albap* and uses flying fish, salmon, and sea urchin. It is usually served in a hot stone pot with fish roe, radish sprouts, eggs, pickled radish, and stir-fried kimchi. *Ureong* (water snails) is boiled down in soybean paste (doenjang) to make bibimbap with '*Ureong gang-doenjang*'. As the name suggests, gochujang is not used. It is also eaten as bibimbap, and is used as '*ssambap*', which is eaten with rice wrapped in various leafy vegetables.

Serving styles of bibimbap

Introducing the serving style for bibimbap. Bibimbap is eaten in a wide bowl, but special bowls such as brass and stone bowls are explained. In addition, it can be plated in various ways such as cups and plates.

Notseo (brass bowl) bibimbap

Brass (銅) is an alloy of copper mixed with tin, zinc, or nickel. The brass used for tableware is called '*bangjjasoe*' and is tin bronze, an alloy of copper and tin. '*Bangjja*' refers to a forging method in which a lump of brass is heated and pounded. The bowl made in this way is called '*Bangjja Yugi*' and has the highest value as a bowl. Brass is yellow, and appetizing color [20]. The bronze alloy may be more effective at reducing the cross-contamination of *Salmonella Typhimurium*, *Escherichia coli*, and *Escherichia sakazakii* than stainless steel in the food processing surface [21]. It keeps the temperature of the food at a comfortable temperature for eating. For this reason, Jeonju bibimbap and Jinju bibimbap use a brass bowl.

Dolsot (stone pot bowl) bibimbap

Dolsot bibimbap is served by putting rice, carrots, mushrooms, and beef in a hot stone pot and mixing it with red pepper paste. The stone pot bibimbap itself was developed at a bibimbap restaurant of Jeonju in the late 1960s and 1970s. Since the Joseon Dynasty, *gobdol* (talca) was chosen as the best bowl for cooking rice, and the rice cooked here was called '*dolsotbap*' (stone pot rice). The stone pot has the advantage of being able to cook rice in small quantities on the spot and maintaining an even temperature until the end of the meal. The rice cooked in a stone pot was showed less grain hard and undamaged, but it had a burnt and cooked rice flavor [22].

The restaurant, which set this as a differentiation strategy, developed a stone pot and served hot bibimbap. Pine nuts, jujubes, ginkgo nut, and chestnuts were added to the existing bibimbap with rice, vegetables, and meat to serve as a nutritious meal. It gained sensational popularity and spread nationwide, but due to the mixed meal policy in the 1970s, it was recognized as a luxury item. After that, as the rice self-sufficiency rate increased in the 1980s, it gained popularity again. Now, it has become a popular bibimbap among foreigners [23].

Regional characteristics of bibimbap

In South Korea, where bibimbap is famous, policies and characteristics related to bibimbap will be discussed.

Jeonju bibimbap

Currently, the most famous bibimbap is Jeonju in Jellabuk-do. Jeonju has been the most famous city for 'food' in Korea, and 'bibimbap' has been recognized as a representative food of Jeonju. Jeonju bibimbap was registered as a 'Trademark and geographical indication' to acquire intellectual property rights and represent tradition. In addition, the 'Jeonju bibimbap Festival' has been held every year since 2007 and is the only bibimbap festival in the country promoting the taste of Jeonju [24]. An image

of 'the best city of Korean taste' and a festival under the theme of 'bibimbap' was created as a part of the regional revitalization policy to attract Korean tourists over the nation [25]. The recipe for bibimbap is diverse, so in 2008, Jeonju City designated the standard recipe for Jeonju bibimbap. Ingredients such as rice cooked with beef bone broth, *hwangpomuk* from Jeonju, water parsley, wild vegetables from the clean regions of Muju, Jinan, and Jangsu, and fried kelp are essential ingredients [26, 27].

The characteristic of Jeonju bibimbap is that it uses broth as the water for cooking and uses bean sprouts, raw egg yolk, *hwangpomuk*, and Sunchang gochujang. Rice is cooked in broth so that it does not break even when rubbed with a spoon and served with about 30 ingredients. The main ingredients are *yukhoe* (raw beef slice), raw egg yolk, dried shiitake mushrooms, vegetables (bean sprouts, water parsley, bellflower, bracken, zucchini, radish, cucumber, carrots), fried kelp, pine nuts [28]. Jeonju bibimbap stimulates the appetite by eating with clear bean sprout soup. It is the best food that gives visual pleasure with beautiful plating and also takes care of taste and nutrition. Soybean sprouts grown in the Jeonju area are famous as one of 'Jeonju's top 10 foods' and are one of the essential ingredients for Jeonju bibimbap. Soybean sprouts from Jeonju have a better overall preference than bean sprouts grown in other regions. Cultivation water can affect the free amino acid content and taste of bean sprouts [29]. *Hwangpomuk* is a local food of Jeonju and Namwon and is a food made by mung bean jelly dyed with gardenia. *Muk* itself is tasteless, so it is seasoned and used in seasoned salad, *tangpyeongchae*, and Jeonju bibimbap. Mung bean is a legume with high protein, carbohydrate, iron and mineral content, and its bioavailability is superior to other legumes [30].

Jinju bibimbap

Jinju bibimbap is a local food in Jinju, Gyeongsangnam-do. Jinju bibimbap was called 'flower rice' or '*chilbohwa-ban* (七寶花盤, seven treasures and flower plate)' because various seasonal vegetables were mixed in a golden round brass bowl to form a beautiful flower shape in seven colors. It is characterized by making rice with broth and adding seasoned raw beef slice. Various vegetables (mung-bean sprouts, bean sprouts, young bracken, tender spinach, zucchini, bellflower, radish), and seasoned raw meat are placed on top of the rice [31]. In *Seonjiguk*, which comes with bibimbap, small and thickly sliced radish, bean sprouts, and green onion are added to the soup made with lean meat, *seonji* (clotted blood from slaughtered cows and pigs), liver, lungs, tripe, and intestines to soften the taste buds and give it a unique spicy taste [32].

Tongyeong bibimbap

Tongyeong bibimbap is unique in that it uses seaweed such as hizikia fusiforme and raw sea mustard, and is served with soup boiled with clam and tofu. Tongyeong is a coastal area, so seaweed is included in bibimbap. Bean sprouts, spinach, leek, radish, zucchini, eggplant, and cucumber are also used. It has a thick texture because it is mixed with tofu and clam soup [28].

Andong bibimbap

Andong bibimbap is known as Andong *Heotjesabap*. The '*heot*' is fake, and '*Jesabap*' means ritual food, which means a diet eaten without holding ancestral rites. The hungry Confucian scholars prepared food for ancestral rites, performed, and shared the food. It started when commoners made and ate fake food for ancestral rites because they wanted to eat rice. Various cultural properties and houses that were in danger of being submerged due to the construction of the Andong Dam between 1974 and 1976 were moved to the vicinity of the Andong Folk Museum. It seems that *Heotjesabap* first appeared in restaurants, as some houses sold only Andong's traditional food. In 1978, as part of the policy of Andong City, many other restaurants also sold *Heotjesabap*, and commercialization began in earnest [33]. Andong bibimbap is a tourist food made by consumers and the local economy with storytelling added. It can be seen as a successful local product with local history and culture.

Market of bibimbap

Currently, bibimbaps have been born as an industrial product through various commercialization. There are a variety of specialty restaurants, retort food, and in-flight meals (Fig. 2).

Specialty restaurants for bibimbap

The food service industry in the Joseon Dynasty was not developed compared to China or Japan, at least under the pre-modern social system, so home-style bibimbap became the mainstream. However, modern cities were formed in Korea from the end of the nineteenth century. These cities served as economic centers along with population concentration, and as the food service industry developed, bibimbap appeared on restaurant menus. However, since bibimbap loses its flavor if mixed too much, so the recipe had to be different from home-made bibimbap. So, after the chef puts the warm white rice in a bowl and tops it with the ingredients, the bibimbap was born [17]. The older bibimbap restaurant is '*Cheonhwang Restaurant*' in Daehan-dong, Jinju-si. It started business in 1929, but it was 1965 as



Fig. 2 Various commercial products related to bibimbap. It is a bibimbap product released in Korea. **A** This is a bibimbap meal kit made by Company B that provides dried *namul* that can be cooked with rice. **B** It is an instant bibimbap served with instant rice, retort *namul*, and doenjang, and is a product of company C. **C** It is a triangular *gimbal* product released in a bibimbap taste and is sold at S convenience stores. **D** Bibimbap in-flight meal provided by Korean Air ©Korean Air

of the business report date. Jinju bibimbap has been handed down since *Baekban* (home-style table), which was sold in the market, changed into bibimbap. Even through the Korean War, it has continued to sell bibimbap [34]. The 'Hankukjib' in 1952, the late Lee Bun-rye opened a Korean restaurant specializing in bibimbap by upgrading the ingredients of bibimbap, which was the first Korean restaurant to sell Jeonju bibimbap [35]. As described, Jeonju and Andong activated bibimbap by implementing bibimbap-related policies. *Dolsot* bibimbap started as a restaurant's competitiveness.

In-flight meals for bibimbap

Korean Air, the national flag carrier of Korea, introduced bibimbap as an in-flight meal in 1997, playing a leading role in the globalization of Korean food. It won the Grand Prize in Mercury Award from the International Travel Catering Association in 1998. In the satisfaction survey of K-food in-flight meals of foreigners visiting Korea, the highest incidence of responses was because of the nutritional value of the meal, followed by aesthetics, and ease of digestion. In addition,

customer satisfaction has a significant effect on K-food purchase intentions and national image [36]. Korean Air serves bibimbap, one of the representative Korean cuisines, to attract its target market. Also, subjects who were exposed to retrieval cues that were relevant to the themes of the event demonstrated better memory recall [37]. In this way, providing K-food combined with cultural content to foreigners visiting Korea has an impact on imprinting Korea.

Commercialization of bibimbap

As a combat ration, bibimbap was released into a freeze-dried or rehydrated form. It can be consumed when soaked in hot water and is very portable, so campers use it a lot. In addition, various products such as retort food, home meal replacement (HMR), and meal kits are on the market. It is a product that includes instant rice, retorted vegetables, and tube-shaped red pepper paste, and is the same type as in-flight meals. Alternatively, consumers can purchase sauce or a collection of vegetables that determine the taste of bibimbap. Bibimbap products are being released with the concept of fusion as well as tradition. Bibimbap with



Fig. 3 Globalization of bibimbap. Bibimbap made from around the world, using ingredients familiar to each person. **A** Seoul Bowl (vegan bibimbap) with gochujang-baked tempeh, steamed veggies, kimchi, and coriander ©Sylvia Fountaine. **B** The bibimbap with bean sprouts, shredded carrot, sautéed shiitake mushroom, sautéed spinach, cucumber, and a sunny-side up egg ©Jeanine and Jack. **C** Vegetarian bibimbap with basmati rice, roasted zucchini and carrots in sesame oil, and sriracha ©chef'd. **D** Delivery package of ingredients for Japanese bibimbap ©BIBI&BAP. **E** Sriracha chicken bibimbap rice bowl with sriracha-seasoning chicken breast, and red bean and rice mix ©CONTEMPORARY AMERICAN. **F** The bibimbap with sesame spinach, pickled carrot, and sweet chili sauce ©Rachel Phipps

differentiated flavors such as chicken, long-legged octopus, *jangjorim* (beef or pork boiled down in soy sauce) with butter, and *gondre* (Korean thistle) released as ready-to-cook foods. CJ introduced '*Bibicone*', a ready-to-eat type of bibimbap [38].

Globalization of bibimbap

The representative food was Kimchi and favorite Korean foods were kimchi, bulgogi, bibimbap, galbijjim, etc. Koreans reported that the main advantages of Korean food were its 'home-made style', but non-Koreans reported 'health functionality'. The response to bibimbap in foreign countries is favorable. The food culture spread through entertainment has been modified to suit the tastes of the locals, and recipes are being provided (Fig. 3).

For example, foreigners can put in ingredients familiar to them, and those who are interested in health can choose ingredients according to their diet. Localized

bibimbap may not suit Koreans' tastes, but use ingredients familiar to them. Variations are being made in various categories, such as cilantro, annam rice, sriracha sauce, seasoned vegetables and meat wrapped in tortillas, and eating with chopsticks. In addition to these variations, foreigners' favorite menu is *dolsot* bibimbap. Bibimbap can be fishy depending on certain ingredients, because the heat of the stone pot removes the fishy taste cleanly, and the sizzling sound stimulates appetite. Successful Korean restaurants cite targeting locals' tastes, access to local languages, and services from locals.

Bibimbap is a great dish, but it is hard to carry around and eat it. As a healthy convenience food, packaging is needed due to changes in serving size or shape. Only when it succeeds in localization will it be interested in traditional Korean bibimbap.

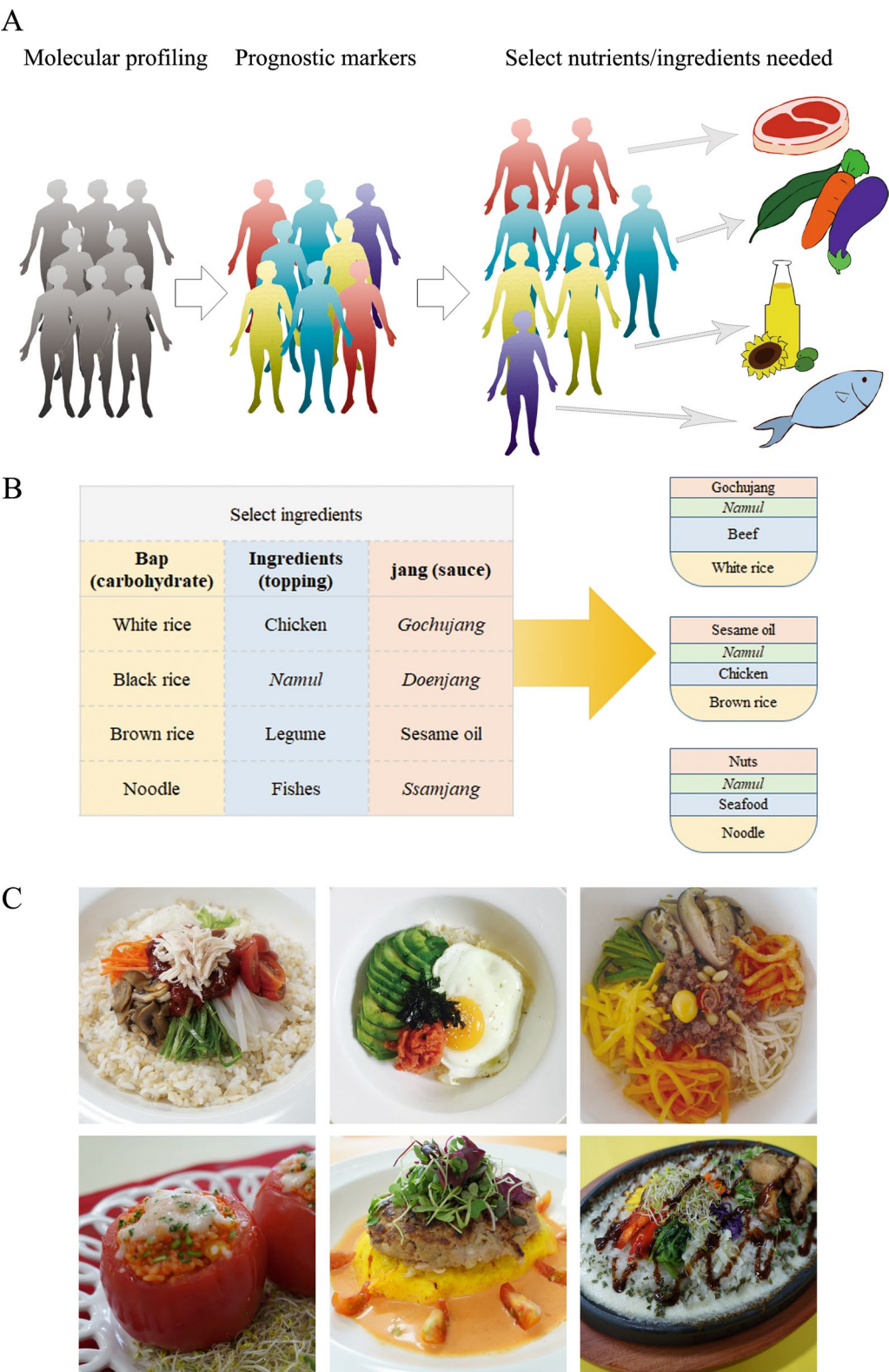


Fig. 4 Personalization of bibimbap. Bibimbap can be made to meet individual needs. **A** It is to select the intake amount or nutritional components according to individual needs. **B** Choose various ingredient for personalization of bibimbap. **C** Personalized bibimbap dish such as chicken breast, avocado, tomato, cream, and risotto ©Bibimbap Project Group

Bibimbap as personalized foods

In the past few years, 'personalization' has been getting a lot of attention. After the 'mekonomy' of 'consumption for myself' was introduced, personalized nutrition service was launched in the field of nutrition and health. Personalized nutrition service is provided to maintain optimal health according to the individual's genetics and physiological metabolism. In addition, it is a service that considers everything that can influence the health of an individual by considering lifestyle, surrounding environment, and gut microbiome. Services are provided considering everything from eating habits based on what and how much food to eat, eating behavior based on when to eat, physical activity, body phenotype considering genetic factors, gut microbiome, and metabolome [39].

It is to select the intake amount or nutritional components according to individual needs. Bibimbap can be easily modified [24]. In the following manner, bibimbap can support personalized compositions (Fig. 4).

- (1) Choose various grains such as rice, brown rice, and barley as carbohydrate sources. If you don't like rice, you can choose tortilla, naan, or bread.
- (2) Choose a variety of protein sources such as beef, pork, chicken, seafood, and legumes as needed. If you are a vegetarian, you can choose soybeans or tofu.
- (3) *Namul* is selected according to taste, need, and disease. If you don't like vegetables with a strong flavor, you can choose stir-fried onions, lettuce, or boiled cabbage.
- (4) Choose seasoning from gochujang, ganjang, doenjang, or cheongkukjang to suit your taste. If you can't eat spicy food, you can choose soy sauce.
- (5) Choose oil for flavor from perilla oil and sesame oil. May not include it.
- (6) In addition, nuts, jujubes, ginkgo, etc., are selected as garnish.

By reflecting this, individual access can be facilitated. Combining with the latest AI technology, it is possible to provide a variety of personal bibimbap recipes, and providing services through mobile apps will be one way. People who received the service eat bibimbap, but they can taste different flavors each time.

Conclusion

Bibimbap is a food that is eaten by mixing bap, namul, and jang in one bowl. K-food, which can be expressed with bap, kuk, and banchan, is expressed in a simple way. Bibimbap is a recipe and food that has been handed down for thousands of years, and has been expressed in

different words with the same meaning. The history and evolution of bibimbap has been covered in many other studies. In this review, we wanted to point out that there is a bibimbap that reinterprets the traditional bibimbap. And above all, we tried to make it clear that the commercial use of bibimbap is limitless. Bibimbap is responsible for the table of K-food, with various combinations from meat restaurants to home-cooked meals. Bibimbap is a food that can be applied without time, space, and individual restrictions by putting various foods in one bowl and creating balance and harmony.

Abbreviation

K-food Korean food

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Author contributions

YSC devised the project, the main conceptual ideas. EGM took the lead in writing the manuscript. YEL augmented the manuscript. All authors commented on the manuscript.

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Availability of data and materials

Not applicable on 'The globalization of bibimbap: Focusing on the diversity of modernization of bibimbap'.

Declarations

Competing interests

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