

## Preferences of U.S. consumers for setting quality factors of *Bibimbap*

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### Abstract

The purpose of this study was to identify U.S. consumers' preferences for *Bibimbap* and to determine whether or not *Bibimbap* can be adopted into the American palate. A total of 214 people tasted a controlled amount of *Bibimbap* and *Gochujang* sauce (red chili pepper sauce) and then completed a preference test. *Bibimbap* was highly rated overall in the areas of appearance, color, smell, and taste. *Gochujang* sauce was also well-accepted in terms of taste and spiciness. Most of the participants disliked the seaweed and *shiitake* mushrooms, which means that *Bibimbap* can improve its garnish taste and aroma by removing them. Further, a more watery sauce was served as foreigners are not familiar with mixing food culture. Therefore, by offering diverse ingredient options, the acceptance of traditional *Bibimbap* can be increased in the U.S.

Key words: U.S. consumer, *Bibimbap*, preference

### 1. Introduction

Although Korean food is outstanding scientific and nutritional value, insufficient awareness so have a low competitiveness in the world. Therefore from overseas expansion of Korean food-service industry point of view, taste of Korean food, ingredients, application possibility of globalization are important factors. For globalization of Korean food, need to survey and investigate about a basic data (such as- preference, consumption, awareness on country by country and present status of Korean food) and standard evaluation of value about ingredients (KFRI 2010).

The Korean government, local and overseas Korean restaurants, and Korean food and beverage companies have been putting great efforts into the promotion of Korean food all over the world. Beginning in April 2009, the Korean government's goals were to "bump up the number of overseas Korean restaurants from 2007's 10,000 to 40,000 by 2017, to have up to 100 top-tier *Hansik* [Korean food] restaurants throughout the world by 2017 and to more than double agricultural and seafood exports from \$4.4 billion in 2008 to \$10 billion by 2012" (Park 2010). Organizations like the Korea Agro-Fisheries Trade Corporation, the Ministry of Food, Agriculture, Forestry and Fisheries, and the Korean Food Foundation were formed to oversee these goals and

kick start the campaign agenda. One of the basic efforts taken to globalize *Bibimbap* was to register *Gochujang*, the red chili pepper paste that accompanies *Bibimbap*, under Codex Alimentarius in July 2009. Other efforts to expand the reach of Korean cuisine include the development of an official English-language menu of Korean dishes, clinical studies to prove its health benefits, and Korean cuisine classes at famous culinary schools overseas (Park 2010). To increase interest in *Bibimbap* in the states even further, "Seoul-based foodservice company CJ Foodville launched a new Korean concept in Los Angeles that officials say will be the first of 200 to open in the United States over the next five years" in an effort to become "the McDonald's of *Bibimbap*" (Jennings 2010).

Also *Jeonju* has effort to globalization of *Jeonju Bibimbap* by establishment and management of *Jeonju Bibimbap* research center, constitution of *Jeonju Bibimbap* producer alliance farming system, enforcement of *Jeonju* local dish master system (Jang 2010).

Hopefully, efforts like these will attract the American public to the dishes that feature the true characteristics of Korean food as showcased in *Bibimbap*. To gauge Americans' interest and preference for Korean food, studies such as this one are needed to determine the potential for the success of Korean food in the United States.

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*Bibimbap* means “rice mixed with vegetables and beef.” It is served as a bowl of warm white rice topped with vegetables such as soy bean sprouts, carrots, zucchini, spinach, mushrooms, and lettuce. Chopped beef and a fried or raw egg are a top of the vegetables. Red chili pepper sauce, *Gochujang*, is served along side the dish so that diners will be able to control its spiciness. The ingredients are served hot or cold and are stirred thoroughly before eating. *Bibimbap* is a very adaptable dish that can be modified for both vegetarians’ and vegans’ tastes. It is also a very balanced dish that provides lean protein (meat and egg), grain (rice), and a variety of vegetables to support a healthy diet and lifestyle. Clinical studies are currently being carried out in Korea to assess the possible health benefits of *Bibimbap*, such as weight loss, blood sugar control, and chronic disease prevention (Park 2010). Because of these reasons, *Bibimbap* has the potential to become popular in the United States for those who enjoy ethnic food and want to be healthy. *Bibimbap* is one of the most representative items of Korean cuisine for its variety of ingredients, colorful appearance, and level of spiciness.

The purposes of this study included identifying U.S. consumers’ favored taste of *Bibimbap* using a consumer preference test and developing ways that *Bibimbap* can be adopted into American palate.

## II. Subjects and Methods

### 1. Survey subjects

The population for this study was middle-class U.S. (Sacramento, California) consumers who were willing to taste foreign foods. A convenient sampling method was used to invite participants by distributing flyers electronically and manually. 214 people voluntarily responded to attend this research study.

### 2. Pilot study

For quality assurance, a pilot study was conducted. This pilot study verified the quality of food preparation, portion size, presenting/plating, time consumed to complete the test, and any potential problems through data collection steps. The study was conducted during lunchtime for four consecutive days in a quiet dining room adjacent to the kitchen area. A vegetarian option, including vegan, was available upon request. Beef was omitted for vegetarians and beef and egg were omitted for a vegan diet.

### 3. Survey methods and contents

The recipe used is presented in <Table 1>. The traditional *Bibimbap* recipe for one serving size was provided by Food Industry Promotion Division, Korea Food Research Institute (literature and own investigation). The subcontracted cook and the researcher modified the ingredients to meet U.S. consumers’ favored taste and expanded the recipe for 60 servings. Two uncommon ingredients by U.S. consumers, *Doraji* (balloon flower root), *Gosari* (braken), were removed and soybean sprout was replaced with green bean sprout which were more available in a grocery and familiar with consumers.

The questionnaire developed for the respondents consisted of two sections: (1) preference test of *Bibimbap* and (2) demographic information. Also participants were asked to choose two toppings each they would like to add on or removed from *Bibimbap*, respectively.

We rated each factor by 9 scale. Preference- 1: dislike 9: like, Proportion of rice and vegetables- 1: not appropriate 9: appropriate, size of vegetables- 1: difficult to eat 9: easy to eat, spiciness of sauce (JAR test) - 1: not spicy at all 9: too spicy, saltiness of sauce (JAR test) - 1: not salty at all 9: too salty, sweetness of sauce (JAR test) - 1: not sweet at all, 9: too sweet. JAR test measure the intensity of each factor using 9 scale. This means high score is strong intensity.

The validity of the questionnaire was verified by other faculty and professionals and was approved by the Committee for the Protection of Human Subjects.

The type of service was a table-service style (i.e. sit-down dinner). A seat number was labeled on each tablemat and it was cross-matched with the number labeled on the *Bibimbap* bowl and *Gochujang* sauce container. An actual plated dish of *Bibimbap* is shown in <Figure 1>. A portion of *Bibimbap* (250 g including 120 g of cooked rice) and a controlled amount of *Gochujang* sauce (35 g) were served with directions of how to mix together. Participants were then asked to taste *Bibimbap* and complete the questionnaire. Consumed amount of *Bibimbap* was determined by weighing plate wastes to check the proper serving size and the acceptance of the dish. Also, remaining *Gochujang* sauce was also measured to examine its preference and any trend related to its use.

### 4. Data analysis

Data were analyzed with Statistical Package for Social Sciences 17.0 (SPSS for Windows). Descriptive analysis, T-

<Table 1> Topping ingredients for *Bibimbap*

(60 servings)

	<i>Shiitake</i> Mushroom <sup>1)</sup>	Beef <sup>1)</sup>	Green bean sprouts	Spinach	Zucchini	Carrot	Egg <sup>2)</sup>
	1500 g <sup>3)</sup>	1400 g	1600 g <sup>3)</sup>	1600 g <sup>3)</sup>	2300 g	800 g	900 g
Soy Sauce	2 T	8 T					
Sugar	1 T	2 T					
Minced Green Onion	5 T						
Minced Garlic	3 T	3 T			2 t		
Cooking Wine	2 T	4 T					
Sesame Seed			2 T	2 T			
Pepper	1/4 t	1/2 t					
Sesame Oil	2 T	4 T	2 T	2 T			
Veg. Oil	2 T				2 T	2 T	
Salt	2 t	1 t	2 t	3/2 t	1/4 t	1 t	

<sup>1)</sup>*Shiitake* mushroom and beef had been marinated.

<sup>2)</sup>Pan-fried egg

<sup>3)</sup>Edible Portion after trimming, soaking, blanching or draining



<Figure 1> One serving of *Bibimbap* (250 g) and *Gochujang* sauce (35 g)

test, ANOVA were performed to detect significant differences *Bibimbap*'s preference with various demographic characteristics such as gender and ethnicity. The relationships between preferences and consumed (amount of intake) *Bibimbap* and/or *Gochujang* sauce were examined to find out any U.S. consumers' affinity for an unfamiliar ethnic food.

### III. Results and Discussion

#### 1. Demographic characteristics

A total of 214 U.S. consumers attended the preference test for *Bibimbap*. 193 participants tasted regular *Bibimbap*, which included beef and egg, while 21 participants, including 2 vegans, requested vegetarian and vegan options. Participants' demographic information is shown in <Table 2>. The majority of participants were women (76.2%) and below 30

&lt;Table 2&gt; Participants' demographic information

	Characteristics	Frequency	%
Gender	Male	49	22.9
	Female	163	76.2
	no response	2	0.9
Age	≤30	70	32.8
	31-40	40	18.7
	41-50	37	17.3
	≥51	64	29.9
	no response	3	1.4
R/V	Regular	182	85.0
	Vegetarian	21	9.8
	no response	11	5.1
Ethnicity	Asian	45	21.0
	African American	20	9.3
	Hispanic/Latino	22	10.3
	White	103	48.1
	Other (AI/AN, NH/OPI) <sup>1)</sup>	19	8.9
	no response	5	2.3
Occupation	Student	41	19.2
	Government employee	74	34.6
	Non-government employee	15	7.0
	Independent business	2	0.9
	Professional	51	23.8
	Housewife	1	0.5
	Other <sup>2)</sup>	14	6.5
	no response	16	7.5
		Total	214

<sup>1)</sup>American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander

<sup>2)</sup>University employee, not working

years old (32.8%) or over 51 years old (29.9%). About half of them were White (48.1%), followed by Asian (21.0%).

2. Preference test

The results for preference of *Bibimbap* are presented in <Table 3>. Appearance and color of *Bibimbap* presented were very attractive to participants with averages of 8.32 and 8.49, respectively. Means of other characteristics of *Bibimbap* such as rice and vegetables were ranged from 7.37 (texture of rice) to 8.26 (size of vegetables). Overall flavor of

*Bibimbap* were asked to indicate in smell and taste, which scores were 7.48 and 8.00. It seems that U.S. consumers showed their positive preference on *Bibimbap*.

*Gochujang* sauce was rated on saltiness, sweetness, spiciness, and aftertaste. Saltiness and sweetness of *Gochujang* sauce were scaled as 3.62 and 3.68, respectively, while spiciness (5.25) and aftertaste (5.39) were on the just right

<Table 3> Preference test of *Bibimbap*

M±SD(n)

	Total		Gender		T-value
	M±SD (214)		Male	Female	
<b>Presentation of <i>Bibimbap</i> before mixing</b>					
Appearance (Plating/ style) <sup>1)</sup>	8.32±1.13		8.35±0.79(48)	8.31±1.23(157)	0.257
Color (contrast/harmony) <sup>1)</sup>	8.49±0.89		8.54±0.65(48)	8.47±0.96(156)	0.454
<b><i>Bibimbap</i> mixed with sauce</b>					
Doneness of rice <sup>1)</sup>	7.94±1.40		7.90±1.37(48)	7.94±1.42(158)	-0.203
Texture of rice <sup>2)</sup>	7.37±1.78		7.27±1.99(48)	7.38±1.73(156)	-0.374
Proportion of rice and vegetable <sup>3)</sup>	7.85±1.39		8.00±1.00(49)	7.79±1.49(159)	1.120
Size of vegetables <sup>4)</sup>	8.26±1.02		8.14±0.96(49)	8.29±1.04(159)	-0.878
Overall smell <sup>1)</sup>	7.48±1.75		7.63±1.33(49)	7.42±1.86(152)	0.704
Overall taste <sup>1)</sup>	8.00±1.24		8.19±0.96(49)	7.94±1.31(152)	1.203
<b><i>Gochujang</i> sauce</b>					
Taste of sauce <sup>1)</sup>	7.89±1.36		8.00±1.10(49)	7.84±1.43(158)	0.712
Spiciness (hotness) <sup>5)</sup>	5.25±2.07		5.25±1.51(48)	5.28±2.22(159)	-0.096
Spicy (hot) aftertaste <sup>5)</sup>	5.39±2.16		5.54±1.69(48)	5.37±2.30(158)	0.573
Saltiness <sup>6)</sup>	3.62±1.96		3.86±1.70(49)	3.56±1.92(159)	0.971
Sweetness <sup>7)</sup>	3.68±1.96		3.92±1.84(48)	3.63±2.00(158)	0.876

<sup>1)</sup>1: dislike, 9: like <sup>2)</sup>JAR 1: not sticky, 9: sticky <sup>3)</sup>1: not appropriate, 9: appropriate <sup>4)</sup>1: difficult to eat, 9: easy to eat <sup>5)</sup>JAR 1: not spicy at all, 9: too spicy <sup>6)</sup>JAR 1: not salty at all, 9: too salty <sup>7)</sup>JAR 1: not sweet at all, 9: too sweet

<Table 4> Preference of *Bibimbap* by ethnicity

M±SD (n)

	Asian (45)	AA <sup>8)</sup> (19)	HL <sup>9)</sup> (22)	White (101)	other (19)	F-value
<b>Presentation of <i>Bibimbap</i> before mixing</b>						
Appearance (Plating/ style) <sup>1)</sup>	8.71±0.66 <sup>b</sup>	7.56±1.54 <sup>a</sup> (18)	8.10±1.97 <sup>ab</sup> (21)	8.31±0.99 <sup>b</sup>	8.47±0.72 <sup>b</sup> (17)	3.820**
Color (contrast/harmony) <sup>1)</sup>	7.56±1.54 <sup>c</sup>	7.89±1.53 <sup>a</sup> (18)	8.20±1.20 <sup>ab</sup> (20)	8.50±0.77 <sup>bc</sup>	8.82±0.39 <sup>c</sup> (17)	4.237**
<b><i>Bibimbap</i> mixed with sauce</b>						
Doneness of rice <sup>1)</sup>	7.51±1.56	8.21±0.92	7.91±1.60	8.09±1.26(98)	7.74±1.82	1.607
Texture of rice <sup>2)</sup>	6.89±1.87(44)	6.92±2.45	7.86±1.32	7.54±1.73(97)	7.21±1.51	1.769
Proportion of rice and vegetable <sup>3)</sup>	7.93±0.96	7.74±1.33	7.45±2.06	7.97±1.27(100)	7.68±1.89	0.772
Size of vegetables <sup>4)</sup>	8.53±0.59	7.95±0.97	8.27±1.03	8.23±1.05(100)	8.11±1.37	1.456
Overall smell <sup>1)</sup>	8.24±0.91 <sup>b</sup>	7.06±2.31 <sup>a</sup> (18)	7.10±2.34 <sup>a</sup> (20)	7.28±1.67 <sup>a</sup> (96)	7.22±2.05 <sup>a</sup> (18)	3.155*
Overall taste <sup>1)</sup>	8.32±0.93(44)	8.06±1.00(18)	7.57±1.91(21)	7.79±1.21(96)	7.78±1.26(18)	1.528
<b><i>Gochujang</i> sauce</b>						
Taste of sauce <sup>1)</sup>	8.36±0.77	7.94±1.00(18)	7.64±1.73	7.72±1.53(100)	7.84±1.17	1.938
Spiciness (hotness) <sup>5)</sup>	4.71±2.20	5.00±2.36	5.45±2.09	5.62±1.81(100)	4.89±2.52(18)	1.842
Spicy(hot) aftertaste <sup>5)</sup>	4.62±2.14 <sup>a</sup>	5.05±2.64 <sup>ab</sup>	5.76±2.41 <sup>ab</sup> (21)	5.93±1.89 <sup>b</sup> (99)	4.63±2.22 <sup>a</sup>	4.010 **
Saltiness <sup>6)</sup>	4.04±1.82 <sup>c</sup>	2.89±1.28 <sup>ab</sup> (18)	3.50±2.24 <sup>abc</sup>	3.79±1.86 <sup>bc</sup>	2.63±1.64 <sup>a</sup>	2.935*
Sweetness <sup>7)</sup>	4.04±2.03	3.74±1.97	3.82±2.30	3.64±1.86(98)	3.11±1.97	0.817

<sup>1)</sup>1: dislike, 9: like <sup>2)</sup>JAR 1: not sticky, 9: sticky <sup>3)</sup>1: not appropriate, 9: appropriate <sup>4)</sup>1: difficult to eat, 9: easy to eat <sup>5)</sup>JAR 1: not spicy at all, 9: too spicy <sup>6)</sup>JAR 1: not salty at all, 9: too salty <sup>7)</sup>JAR 1: not sweet at all, 9: too sweet <sup>8)</sup>AA: African American <sup>9)</sup>H/L: Hispanic/Latino

\*\* : p<0.01

Means with the same letter in a row are not significantly different at p<0.05 level by Duncan's multiple range test

range (Intensity- 1: weak 5: just about right 9: strong). It appeared that this condiment was favorably accepted by U.S. consumers.

### 3. Preference of *Bibimbap* according to gender and ethnicity

The preference for *Bibimbap* did not show any significant differences by gender whereas appearance and color (before mixing,  $p<0.01$ ), smell (mixed with sauce,  $p<0.05$ ) show significant difference by ethnicity.

The preference of *Gochujang* sauce show significant differences in aftertaste ( $p<0.01$ ) and saltiness ( $p<0.05$ ) by ethnicity <Table 3, 4>.

### 4. Preference according to consumption of *Bibimbap* and *Gochujang* sauce

#### 1) Consumption of *Bibimbap*

The majority of participants (85.1%) had consumed either all or the majority of the serving amount of *Bibimbap*. There is a statistical significance between women's and men's consumption of *Bibimbap* ( $p<0.001$ ). Significant difference was shown between consumption and preference test results on smell and taste ( $p<0.05$ , Table 5,6).

#### 2) Amount of used *Gochujang* sauce

There is a statistical significance between women's and

<Table 5> Consumption of *Bibimbap* (250 g served) by gender

N (%)

		All eaten (>200 g)	Majority eaten (150-200 g)	Over half eaten (100-150 g)	Less than half eaten (50-100 g)	Barely eaten (<50 g)	$\chi^2$ -value
Total		138(64.5)	44(20.6)	22(10.3)	8(3.7)	2(0.9)	
Gender	Male	45(91.8)	4(8.2)	0(0.0)	0(0.0)	0(0.0)	21.539***
	Female	92(56.4)	39(23.9)	22(13.5)	8(4.9)	2(1.2)	

\*\*\* $p<0.001$

<Table 6> Preference by consumption of *Bibimbap*

M $\pm$ SD(n)

		All eaten (>200 g)	Majority eaten (150-200 g)	Over half eaten (100-150 g)	Less than half eaten (50-100 g)	Barely eaten (<50 g)	F-value
<b>Presentation of <i>Bibimbap</i> before mixing</b>							
Appearance (Plating/ style) <sup>1)</sup>		8.38 $\pm$ 0.89(133)	8.19 $\pm$ 1.42(42)	8.45 $\pm$ 0.91(22)	7.38 $\pm$ 2.67(8)	9.00 $\pm$ 0.00(2)	1.921
Color (contrast/harmony) <sup>1)</sup>		8.58 $\pm$ 0.70(132)	8.26 $\pm$ 1.23(42)	8.50 $\pm$ 0.91(22)	8.25 $\pm$ 1.49(8)	8.50 $\pm$ 0.71(2)	1.138
<b><i>Bibimbap</i> mixed with sauce</b>							
Doneness of rice <sup>1)</sup>		7.95 $\pm$ 1.31(133)	7.79 $\pm$ 1.68(43)	8.00 $\pm$ 1.57(22)	8.38 $\pm$ 0.74(8)	8.00 $\pm$ 1.41(2)	0.324
Texture of rice <sup>2)</sup>		7.22 $\pm$ 1.92(132)	7.57 $\pm$ 1.56(42)	7.66 $\pm$ 1.43(22)	7.75 $\pm$ 1.58(8)	8.00 $\pm$ 1.41(2)	0.662
Proportion of rice and vegetable <sup>3)</sup>		7.99 $\pm$ 1.19(134)	7.82 $\pm$ 1.32(44)	7.41 $\pm$ 1.87(22)	6.88 $\pm$ 2.70(8)	8.00 $\pm$ 1.41(2)	1.942
Size of vegetables <sup>4)</sup>		8.28 $\pm$ 1.03(134)	8.23 $\pm$ 0.99(44)	8.32 $\pm$ 1.04(22)	8.38 $\pm$ 0.74(8)	6.50 $\pm$ 0.71(2)	1.578
Overall smell <sup>1)</sup>		7.72 $\pm$ 1.36 <sup>ab</sup> (128)	7.31 $\pm$ 1.94 <sup>ab</sup> (42)	6.90 $\pm$ 2.63 <sup>ab</sup> (21)	5.88 $\pm$ 2.53 <sup>a</sup> (8)	8.00 $\pm$ 1.41 <sup>b</sup> (2)	3.128*
Overall taste <sup>1)</sup>		8.21 $\pm$ 0.95(128)	7.64 $\pm$ 1.53(44)	7.80 $\pm$ 1.15(20)	7.14 $\pm$ 2.85(7)	8.00 $\pm$ 1.41(2)	2.953*

<sup>1)</sup>1: dislike, 9: like <sup>2)</sup>JAR 1: not sticky, 9: sticky <sup>3)</sup>1: not appropriate, 9: appropriate <sup>4)</sup>1: difficult to eat, 9: easy to eat

\*:  $p<0.05$

Means with the same letter in a row are not significantly different at  $p<0.05$  level by Duncan's multiple range test

<Table 7> Amount of used *Gochujang* sauce (35 g served) by gender

N(%)

Classification		All used (>30 g)	More than half used (15-30 g)	Less than half used (5-15 g)	Not used at all (<5 g)	$\chi^2$ -value
Total		37(173)	42(19.6)	115(53.7)	20(9.3)	
Gender	Male	17(34.7)	14(28.6)	17(34.7)	1(2.0)	22.141***
	Female	19(11.7)	28(17.2)	98(60.1)	18(11.0)	

\*\*\*:  $p<0.001$

<Table 8> Preference by consumption of Used *Gochujang* sauce

M±SD(n)

Classification	All used (>30 g)	More than half used (15-30 g)	less than half used (5-15 g)	Not used at all (<5 g)	F-value
Taste of sauce <sup>1)</sup>	8.39±1.05 <sup>b</sup> (36)	7.98±1.33 <sup>b</sup> (42)	7.87±1.12 <sup>b</sup> (111)	6.90±2.34 <sup>a</sup> (20)	5.586**
Spiciness (hotness) <sup>2)</sup>	4.51±2.08 <sup>a</sup> (35)	4.88±2.18 <sup>a</sup> (41)	5.43±1.85 <sup>ab</sup> (113)	6.30±2.54 <sup>b</sup> (20)	4.091**
Spicy(hot) aftertaste <sup>2)</sup>	4.53±1.99 <sup>a</sup> (36)	5.17±2.42 <sup>ab</sup> (41)	5.66±1.94 <sup>b</sup> (111)	5.95±2.69 <sup>b</sup> (20)	3.159*
Saltiness <sup>3)</sup>	3.69±1.92(35)	3.86±1.80(42)	3.58±1.87(113)	3.25±1.94(20)	0.512
Sweetness <sup>4)</sup>	3.75±1.87(36)	3.97±1.94(39)	3.59±1.92(113)	3.50±2.46(20)	0.434

<sup>1)</sup>1: dislike, 9: like <sup>2)</sup>1: not spicy at all, 9: too spicy <sup>3)</sup>1: not salty at all, 9: too salty <sup>4)</sup>1: not sweet at all, 9: too sweet

\*: p<0.05 \*\*: p<0.01

Means with the same letter in a row are not significantly different at p<0.05 level by Duncan's multiple range test

<Table 9> Chi-square test of consumption *Bibimbap* and *Gochujang* sauce

N(%)

<i>Gochujang</i> \ <i>Bibimbap</i>	All eaten (>200 g)	Majority eaten (150-200 g)	Over half eaten (100-150 g)	Less than half eaten (50-100 g)	Barely eaten (<50 g)	$\chi^2$ -value
All used (>30 g)	32(23.2)	2(4.5)	3(13.6)	0(0.0)	0(0.0)	22.441*
More than half used(15-30 g)	32(23.2)	7(15.9)	1(4.5)	1(12.5)	1(50.0)	
less than half used (5-15 g)	63(45.7)	30(68.2)	14(63.6)	7(87.5)	1(50.0)	
Not used at all (<5 g)	11(8.0)	5(11.4)	4(18.2)	0(0.0)	0(0.0)	
Total	138(100.0)	44(100.0)	22(100.0)	8(100.0)	2(100.0)	

\*: p<0.05

men's use of the sauce. Out of the female participants, over half of the women chose to use less than half of the amount of the sauce served. However, the male participants were divided equally among the categories of more than half of the sauce used, less than half used, and not used at all (p<0.001). Also significant difference was shown between used amount of *Gochujang* sauce and preference test results on spiciness (p<0.01), spicy aftertaste (p<0.05) and taste (p<0.01) <Table 7, 8>.

### 3) Relationship between *Bibimbap* and *Gochujang* sauce

Significant difference was shown between the consumption of sauce and *Bibimbap* (p<0.05, Table 9). Out of 138 participants who ate all of the *Bibimbap* served, 20 did not use any sauce at all.

### 5. Ingredients to add in and remove from *Bibimbap*

The ingredients that participants want to add in *Bibimbap* were cabbage (27.7%), egg plant (20.6%) and cucumber (15.8%) <Table 10>. This result showed different opinion with results of Han (2002) study (add in *Bibimbap* were celery, kimchi, potato, tomato, bell pepper).

The ingredients which participants want to remove from served *Bibimbap* were presented in <Table 10>. However, only about quarter of all participants (50 participants) answered this question and the majority did not answer, which meant all ingredients used in *Bibimbap* for this study

were acceptable. From responses, seaweed (n=21, 9.8%), *shiitake* mushroom (n=14, 6.5%), and egg (n=9, 4.2%) were the selected ingredients that participants would like to remove from *Bibimbap*. Because seaweed was used as a garnish, it could be excluded or each individual could pick it out before mixing with the *Gochujang* sauce. The *shiitake* mushroom, which was the most concerning ingredient introduced to U.S. consumers, was pointed out by a minor number of participants (14 out of 214). According to Han (2002) study's result, high preference of *Bibimbap* ingredients

<Table 10> Ingredients to add in and remove from *Bibimbap*

N(%)

Add In			Removed From		
Ingredients	Frequency <sup>1)</sup>	%	Ingredients	Frequency <sup>3)</sup>	%
Cabbage	86	27.7	Seaweed	21	9.8
Egg plant	65	20.6	<i>Shiitake</i> mushroom	14	6.5
Cucumber	50	15.8	Egg	9	4.2
Celery	35	11.1	Spinach	7	3.3
Radish	25	7.9	Bean sprout	5	2.3
Lettuce	12	3.8	Zucchini	3	1.4
Other <sup>2)</sup>	43	20.1	Beef	2	0.9

<sup>1)</sup>Total number and percent values do not equal N=214 and 100, respectively, as multiple responses were given.

<sup>2)</sup>Others: Kimchi, green onion, red onion, broccoli, nuts, meat, cilantro and else

<sup>3)</sup>The number of responses is 61, therefore total number and percent values do not equal N=214 and 100, respectively, as only participants who wanted to remove any ingredient from *Bibimbap* were answered.

showed that bean sprout > spinach > meat > *shiitake* mushroom. If *shiitake* mushroom is available and there is no other replacement, it would be alright to include it in *Bibimbap*.

#### IV. Summary and Conclusion

*Bibimbap* was highly rated overall in the areas of appearance, color, smell, and taste. *Gochujang* sauce was also well-accepted in terms of taste and spiciness. Comments from the majority of participants stated that *Bibimbap* is an extremely healthy dish due to incorporating high nutrient density foods with a low calorie count despite its adequate portion size. With its attractive appearance and participants' involvement in pouring their sauce and mixing the ingredients in their own bowl, eating *Bibimbap* proved to be a pleasant sensory experience.

However, the participants rated saltiness and sweetness of the sauce in the lower range, meaning that more seasoning could be added to enhance the flavors of the sauce. Americans are accustomed to consuming exceptionally salty foods (potato chips, French fries, etc.) or exceptionally sweet foods (soda, candy, etc.), which could affect their perception of the intensity of saltiness and sweetness of the sauce.

This dish could be successful in the U.S. if the traditional theme of *Bibimbap* was preserved yet allowed for flexibility and customization. This customization will allow for an assembly style of service and create diverse options from which customers can choose. For example, instead of traditional white rice, brown rice, red rice, or black rice could be offered. Other kinds of protein sources such as chicken, pork, or turkey could replace beef. A variety of vegetables not conventionally found in *Bibimbap* can be displayed as options as well, such as cabbage, eggplant, cucumber, celery, and asparagus. These accommodations are efforts to Americanize *Bibimbap* so that the public will be comfortable enough to try Korean foods by giving them control over what they want to include in their bowl. Also modification of the traditional *Gochujang* sauce may increase the acceptance of *Bibimbap* in the U.S. even further. Customization of flavor preference for the sauce (offering green chili sauce, soy sauce, shrimp sauce, etc.) and level of spiciness (mild, medium, hot) will allow the U.S. consumer to have control over the composition and taste of their *Bibimbap*.

In addition to we should select ingredients which are easy to get and local people eat frequently in the field. Thus need time to period of adjustment to indigenous ingredients like bracken, bellflower, water parsley etc. American does not eat

raw ingredients (materials) like *Yukhoe* (raw beef), raw egg and soft cooked egg except for vegetables and fruit generally. So need to be careful to using raw ingredients (materials). Because American does not use a spoon except for soup, when providing *Bibimbap* we need to control size of ingredients (materials) they can eat only use chopsticks.

The American public is selective with their technology as much as their taste in food. By drawing the connection between well-known Korean technology and Korean food, American consumers may respond to and be willing to accept Korean food even more. Korean food may not be as foreign to the typical American consumer once they learn that they already own Korean appliances in their homes. Therefore, by creating these associations, the cuisine and culture of Korea may become more recognized, acknowledged, and consumed in U.S.

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2011년 9월 24일 신규논문접수, 12월 21일 수정논문접수, 2012년 2월 7일 수정논문접수, 2월 7일 채택