

Sodium and Potassium Contents of Denjang (Bean paste) made in Korea and Japan

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한국과 일본 된장 중의 sodium과 potassium 함량에 관한 연구

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요 약

된장은 한국과 일본의 식생활상 중요한 전통식품이나 10~20%의 비교적 높은 염분함량으로 건강상 또는 여러가지 질병의 원인이 되고 있다고 보고 있다. 그러나 근래에는 Na함량 뿐만이 아니라 K함량과의 比도 중요하다고 보고 있어서 본 연구에서는 한국과 일본 된장들의 Na, K, NaCl함량과 동시에 Na/K比를 측정하고 양국간의 비교도 하였기에 보고한다.

한국의 시판 된장과 가내제품의 Na의 평균함량은 각각 4181.3 mg/100g, 6015.6 mg/100g 이고 일본에 있어서는 5082 mg/100g, 5890.6 mg/100g이다.

한국의 시판 된장과 가내제품의 K의 평균함량은 각각 595.8 mg/100g, 331.3 mg/100g 이고 일본에 있어서는 365.4 mg/100g, 381.3 mg/100g이다.

한국의 시판 된장과 가내제품의 NaCl의 평균함량은 각각 10.62%, 15.28%이고 일본에 있어서는 12.91%, 14.96%이다.

한국의 시판 된장과 가내제품의 Na/K比의 평균치는 각각 7.25, 21.54이고 일본에 있어서는 14.42, 16.14이다. 이상의 결과에서 예상과는 달리 한국의 시판 된장이 가내제품에 비해서 NaCl양이 적고 그외에도 Na양과 Na/K比에서도 다른 제품들에 비하여 낮으므로 영양상 유리함을 나타냈다.

I. Introduction

Denjang is a kind of common traditional food in Korea and Japan and it is indispensable food for the people in both countries. Therefore, it is easily supposed that people in Korea and Japan take a large amount of salt from denjang. Recently, in Japan, along with other processed foodstuffs, the movement to reduce the salt content of salted food like denjang is being promoted¹⁾, owing to the change in the public taste and a prevailing view that excessive ingestion of salt in the dietes closely related to high blood pre-

ssure¹⁾. The relation between high blood pressure and excessive salt ingestion can be prevalently seen with respect to excessive intake of sodium(hereinafter, sodium is referred to as Na) and insufficient intake of potassium(hereinafter, potassium is referred to as K). Since a diet to keep the balance between Na and K in the body is estimated to be very important¹⁾, the clear description of Na and K contents contained in salted food like denjang is rather meaningful.

We^{2,3)} reported Na and K content of salted and fermented foods like salted preserves and kimchi both in Korea and Japan in the previous papers. This

paper describes the measurement of Na and K contents contained in denjang of both countries, which was performed from the viewpoint of public nutrition.

II. Materials and Method

1. Materials

Denjang of Korea used as samples : 20 pieces in total, consisting of 12 commercial denjang and 8 home made denjang, which were gathered at the department store and the private house in Seoul and Incheon, Korea, in September, 1992.

Denjang of Japan used as samples : 50 pieces in total, consisting of 34 pieces of commercial denjang and 16 pieces home made denjang, which were gathered at the department store and the farmhouse in Koriyama, Fukushima, Japan, in April, 1992.

2. Measurement of Na and K contents

Preparation of samples : Each of the denjang samples was emulsified by the cell-crusher(HISCOTRON form NITION). Just 1.0 g of the emulsified denjang were placed in a crucible, heated at 400°C for 13 hours to turn them into ashes, and let to cool under normal conditions. 3.0 ml of thermal hydrochloric acid of 1.0% concentration was added to the ashes and filtrated. Finally, each sample was processed so that it was 50.0 ml in volume.

Measurement method : Na and K contents of the samples processed and prepared in the way as mentioned above were measured(in mg/100g) with the photometer(ANA-10KL from TOKYO KODEN).

Calculation of NaCl concentration : NaCl concentration was obtained by multiplying Na content by

NaCl coefficient, 2.54⁴⁾.

III. Results and Discussion

1. Na content of denjang made in Korea and Japan

Table 1 shows the minimum, maximum, mean and 95% confidence intervals of Na content of commercial denjang and home made denjang made in Korea and Japan.

Among the various denjang made both in Korea and Japan, the following ranked in mean Na content. Home made denjang made in Korea 6015.6 mg/100g. Home made denjang made in Korea 5890.6 mg/100g. Commercial denjang made in Korea 5082.5 mg/100g. Commercial denjang made in Korea 4181.3 mg/100g. Na content of home made denjang in both countries is higher than that of commercial denjang.

There were significant differences between commercial denjang and home made denjang made in Japan, between commercial denjang made in Japan and commercial denjang made in Korea, and between commercial denjang and home made denjang made in Korea($p < 0.05$).

According to the Tables of Food Composition, Na content are 2400 mg/100g, 4900 mg/100g, 5100 mg/100g, for Amakuchi denjang(Sweet denjang), Tanshyokukara denjang(Light yellow type) and Sekishyokukara denjang(Dark yellow type), respectively. The comparison of the actual measurement data with the values in the Table of food compositions⁵⁾ gives the following results : Na content of home made denjang made in both countries is higher than Sekishyokukara denjang. And commercial denjang made in Japan is almost equal with Sekichyokukara denjang, but Na

Table 1. Mean values and 95% confidence intervals of Sodium Contents of miso made in Korea and Japan (mg/100g)

Items	Number of samples	Min.	Max.	Mean ± S.D.	95% confidence intervals
Korea					
Commercial miso	12	3250	5575	4181.3+ 348.2	3839.6~4523.6
Home made miso	8	3950	8850	6015.6± 1587.5	4915.5~7115.7
Japan					
Commercial miso	34	4400	6250	5082.5+ 348.2	4965.4~5199.4
Home made miso	16	5100	6700	5890.6± 420.6	5684.5~6096.7

content of commercial denjang made in Korea is lower than Tanshyokukara denjang.

2. K content of denjang both in Korea and Japan

Table 2 shows the minimum, maximum, mean and 95% confidence intervals of Na content of commercial denjang and home made denjang made in Korea and Japan.

Among the various denjang made both Korea and Japan, the following ranked in content.

Commercial denjang made in Korea 595.8 mg/100g.

Home made denjang made in Japan 381.3 mg/100g.

Commercial denjang made in Korea 365.4 mg/100g.

Home made denjang made in Japan 331.3 mg/100g.

K content of commercial denjang made in Korea is higher than home made denjang and commercial denjang made in Japan. Particularly, K content of commercial denjang made in Korea is higher than twice as those of Japan.

There were significant differences between commercial denjang made in Korea and those of Japan, between home made denjang made in Japan and co-

mmercial denjang made in Korea, and between commercial denjang made in Korea and home made denjang made in Korea ($p < 0.05$).

According to the Tables of Food Composition⁵⁾, K contents are 340 mg/100g, 380 mg/100g, 440 mg/100g, for Amakuchi denjang, TanshyokuKara denjang, and Sekishyokukara denjang, respectively. The comparison of the actual measurement data with the values in the Tables of Food Compositions gives the following results: In respect to K content of commercial denjang made in Korea is higher than the Sekishyokukara denjang. But K content of home made denjang and commercial denjang made in Japan are almost equal to the Tanshyokukara denjang, and home made denjang made in Korea is equal to the Amakuchi denjang.

3. NaCl concentration of denjang made in Korea and Japan

Table 3 shows the minimum, maximum, mean and 95% confidence intervals of NaCl concentration of commercial denjang and home made denjang in Ko-

Table 2. Mean values and 95% confidence intervals of Potassium Contents of miso made in Korea and Japan (mg/100g)

Items	Number of samples	Min.	Max.	Mean ± S.D.	95% confidence intervals
Korea					
Commercial miso	12	425	775	595.8 + 103.5	537.2 ~ 654.4
Home made miso	8	175	600	331.3 ± 146.2	230.0 ~ 432.6
Japan					
Commercial miso	34	225	475	365.4 + 71.2	341.5 ~ 389.3
Home made miso	16	275	475	381.3 ± 64.7	349.6 ~ 413.0

Table 3. Mean values and 95% confidence intervals of Concentration of Sodium Chloride of miso made in Korea and Japan (mg/100g)

Items	Number of samples	Min.	Max.	Mean ± S.D.	95% confidence intervals
Korea					
Commercial miso	12	8.26	14.16	10.62 + 1.53	9.75 ~ 11.49
Home made miso	8	10.00	22.50	15.28 ± 4.05	12.47 ~ 18.09
Japan					
Commercial miso	34	11.18	15.88	12.91 + 0.89	12.61 ~ 13.21
Home made miso	16	12.95	17.02	14.96 ± 1.07	14.44 ~ 15.48

Table 4. Mean values and 95% confidence intervals of Na/K of miso made in Korea and Japan (mg/100g)

Items	Number of samples	Min.	Max.	Mean± S.D.	95% confidence intervals
Korea					
Commercial miso	12	5.44	11.24	7.25+ 1.78	6.24~ 8.26
Home made miso	8	9.40	38.14	21.54± 10.01	14.60~28.48
Japan					
Commercial miso	34	10.21	19.89	14.42+ 2.77	13.49~15.35
Home made miso	16	10.84	26.07	16.14± 3.90	13.44~18.84

rea and Japan.

Among the various denjang made both in Korea and Japan, the following ranked in content.

Home made denjang made in Korea 15.28%.

Home made denjang made in Japan 14.96%.

Commercial denjang made in Japan 12.91%.

Commercial denjang made in Korea 10.62%.

The NaCl concentration of home made denjang in both countries is higher than the NaCl concentration of commercial denjang.

There were significant differences between commercial denjang and home made denjang made in Japan, between commercial denjang made in Korea and Japan, and between home made denjang made in Japan and commercial denjang made in Korea ($p < 0.05$).

According to the Tables of Food Composition, the NaCl concentration are 6.1%, 12.5% and 13.0%, for Amakuchi denjang, Tanshyokukare denjang and Sekishyokukara denjang, respectively. The comparison of the actual measurement data with the values in the Tables of Food Compositions gives the following results: In respect to the NaCl concentration of denjang based on the Na content, home made denjang in both countries were higher than Sekishyokukara denjang. And commercial denjang made in Japan is almost equal to Sekishyokukara denjang and commercial denjang made in Korea is lower than Tanshyokukare denjang.

4. Ratio of Na content to K content of denjang made in Korea and Japan

Table 4 shows the minimum, maximum, mean and 95% confidence intervals of ratio of Na content to K content of commercial denjang and home made

denjang made in Korea and Japan. Among the various denjang made in both Korea and Japan, the following ranked in content.

Home made denjang made in Korea 21.54.

Home made denjang made in Japan 16.14.

Commercial denjang made in Japan 14.42.

Commercial denjang made in Korea 7.25.

The mean Na/K ratio of home made denjang made in Korea is the highest among all kinds samples.

There were significant differences between commercial denjang made in Korea and commercial denjang made in Japan, between home made denjang made in Japan and commercial denjang made in Korea, between commercial denjang and home made denjang made in Korea ($p < 0.05$).

We calculated the Na/K ratio using the Na content and K content of the Tables of Food Composition⁵⁾, the Na/K ratio are 7.1, 12.9, 11.6, for Amakuchi denjang, Tanshyokukara miso and Sekishyokukara denjang, respectively.

The comparison of the actual measurement data with the values in the Tables of Food Composition⁵⁾ gives the following results: In respect to Na/K ratio of home made denjang in both countries and commercial denjang made in Japan were higher than Tanshyoku and Sekishyokukara denjang. But commercial denjang made in Korea is equal to the Na/K ratio of Amakuchi denjang. The per capita day ingestion of denjang in Japan is 15.2 g⁶⁾. When this 15.2 g is multiplied by the mean salt content of denjang in Japan 12%, which was obtained through this measurement, the per capita day intake of NaCl from denjang in Japan is 1.8 g. Since the per capita day intake of salt by Japan is thought to be 12 g⁷⁾, Japanese owe 15.0% of their salt intake from denjang.

The other hand, the per capita day ingestion of denjang in Korea is 10.3 g⁸⁾. When this 10.3 g is multiplied by the mean salt content of denjang in Korea 15-20%, which was obtained through this measurement, the per capita day intake of NaCl from denjang in Korea 1.2-2.0 g. Since the per capita day intake of salt in Korea is thought to be 15-25 g, Koreans owe 8-10% of their salt intake from denjang.

These figures tell that denjang is one of the processed foodstuffs that is inseparable from food life style in Korea and Japan.

The per capita day intake of salt should be kept down at 10 g or less¹¹⁾ and the movement for salt reduction of processed foodstuffs has been actively developed. The background of such situation is followed as this : it is widely acknowledged that the Na content contained in salt causes high blood pressure, however, the increases of intake of K is effective for pervention against and cure of high blood pressure disease¹⁾. Yamori and his co-workers¹²⁾ investigated the relationship between the Na/K ratio in urine and blood pressure and reported that they had a close correlation. In other words, a diet to keep the balance between Na and K in the body is recommended.

In general, we are apt to image that the NaCl concentration of home made denjang is higher than that of commercial denjang. In fact, we recognized that the NaCl content of home made denjang is higher than commercial denjang in Korea. In this research, we found out that the Korean commercial denjang is a most idealitic denjang for the health among measured in these denjang. Because, the Na content, NaCl content and Na/K ratio of commercial denjang made in Korea is the lowest among the various denjang.

Incidentally, we¹³⁾ previously made an investigation in preference and intake of salted fishes with Korean housewives and found that they tended to pay attention to excessive intake of salt for reason of the health. Hence, it was reasoned that the movement to reduce the salt content of processed foodstuffs like salted preserves in Korea, would go further in the future like in Japan.

IV. Abstract

We obtained the following results from determina-

tion of the sodium and potassium content contained in Denjang made in Korea and Japan.

The mean sodium content of commercial denjang and home made denjang made in Korea and those of Japan are 4181.3 mg/100g, 6015.6 mg/100g and 5082.5 mg/100g, 5890.6 mg/100g, respectively.

The mean potassium content of commercial denjang and home made denjang made in Korea and those of Japan are 595.8 mg/100g, 331.3 mg/100g and 365.4 mg/100g, 381.3 mg/100g, respectively.

The mean NaCl concentration of commercial denjang and home made denjang made in Korea and those of Japan are 10.62%, 15.28% and 12.91%, 14.96 % respectively.

The mean Na/K ratios of commercial denjang and home made denjang made in Korea and those of Japan are 7.25, 21.54 and 14.42, 16.14 respectively.

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