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Quality Characteristics of Jinmal Dasik Containing Calcium-rich Shrimp Powder

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Abstract

Looking at the dietary patterns of women in their 20s and 30s as well as postmenopausal women, the intake of most nutrients was lower than the recommended levels. Shrimp is a low-calorie, high-protein food, and contains abundant minerals, and it is expected to help prevent osteoporosis. In this study, jinmal dasik was prepared by varying the shrimp content at 0, 1, 5, and 7%, and the quality characteristics were measured. Hardness, adhesion, chewiness, and cohesiveness of physical properties increased significantly as the amount added increased (p<0.001). The springiness decreased significantly as the amount of addition increased in the addition group (p<0.001). In the calcium, there was a significant increase as the amount added increased (p<0.001). In the potassium, there was a significant increase as the amount added increased (p=0.049). This study intends to highlight the benefits and possible uses of shrimp.

Key words: jinmal dasik, shrimp, calcium, quality characteristics

Introduction

Marin organism is divided into fish, crabs, shellfish, plants, and others (Hong GO 2013). And their utilization is being developed in diverse way, including the seamustard jelly (Park et al. 2005), the mackerel sausage (Kim et al. 2013). Among them, shrimps are crustacean and contain a lot of carotene and it is a low-calorie food at 82 kcal/100 g and high-protein food at 18 g/ 100 g. Also, It contains a lot of minerals, especially the most abundant calcium, which is 74 mg/ 100 g. It has been reported that calcium in shrimp contains 3~4 times as mush as fish, and 7~8 times as much as meat, which is effective in preventing osteoporosis (Lee MS 2006; Roh HS 2014). In addition, taurine contained in shrimp lowers cholesterol levels, good for overcoming fatigue, strengthen immunity, control blood pressure, and control blood sugar (Lee MS 2006).

Dasik is one of the traditional Korean sweets (Kim et al. 2005), and it made by kneading grain flour, nuts, etc. with honey and dipping it into a dasik plate. Among them, jinmal dasik is white flour dasik, the main ingredient is flour, and honey is used for binding strength (Choi & Kim 2011). Dasik using various ingredients include the silkworm dasik (Kim JE 2008), the longanae arillus dasik (Yang et al. 2018), the sesame dasik (Cho & Bae 2005). The nutritional value and functionality are improved by using these various ingredients, and the manufacturing method is simple, also it has high practical value (Kim et al. 2005).

Osteoporosis is a disease in which bones become weak and easily cracked or broken. Primary osteoporosis is postmenopausal osteoporosis and secondary osteoporosis is aging-induced osteoporosis (Chung HY 2008). Menopausal women's diet was high in carbohydrate intake, low in protein intake. In addition, the intake of most nutrients except phosphorus and iron in menopause women was low than the recommended intake (Kim et al. 2019). According to a previous study on osteoporosis prevention in 20s and 30s women, 1.3% of the subjects were diagnosed with osteoporosis or osteopenia, 16% of them drank 2~3 cups of milk daily, 19.4% ate the fish, bone and all 2~3

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times a week, and 42.6% drank soda (Kang S 2020). As such, the incidence of osteoporosis of 20s and 30s are expected to be high in the future due to the low intake of calcium (Hong JY 2004).

Therefore, this study used shrimp that is rich in calcium and helps prevent osteoporosis. The quality characteristics were compared after manufacture jinmal dasik, a health snack with different levels of shrimp powder.

Materials and Methods

1. Experimental materials and jinmal dasik manufacturing of jinmal dasik

In this study, shrimp powder (Gogunsanfood, Gunsan, Korea), white flour (CJ Cheijedang), oligosaccharide (CJ Cheijiedang, Seoul, Korea), and sesame oil (Ottogi, Anyang, Korea) used in the preparation of the shrimp Jinmal dasik in this experiment were purchased on the Internet.

Table 1 shows the mixing ratio of jinmal dasik with shrimp powder. The mixing ratio of shrimp powder was 0, 1, 5, 7% through preliminary experiments, referring to previous studies of Shin et al. (2018).

The white flour used for jinmal dasik was put on a sieve, stir-fried for 5 minutes at medium heat and 10 minutes at low heat, and then put it on a sieve again. The stir-fried flour, shrimp powder, oligosaccharide, and sesame oil were evenly mixed, and kneaded for 5 minutes. Thereafter, the jinmal dasik was prepared in petridish(Petridish 150*20, Mediland, Seoul, Korea), stored at room temperature, and used in the experiment.

2. Texture measurement of jinmal dasik

Texture was measured using CTX Texture analyzer (Ametek Brookfield, U.S.A) and TPA (Texture Profile Analysis), and hardness, adhesiveness, chewiness, cohesiveness and springiness were measured. The experiment was repeatedly measured three times, and the measurement conditions of the CTX Texture analyzer are shown in Table 2.

3. Moisture, calcium and potassium measurement of jinmal dasik

For the moisture measurement, according to the AOAC method (1995), sample 3g was dried in a dry oven (LO-FS150, LK Lab, Namyangju, Korea) at 105℃ for 1 hour, and desiccator (ADC47, LK Lab) was repeated for 30 minutes until constant weight was reached.

For the potassium measurement, sample 0.1 g and 70% HNO_3 10 mL were added and decomposed into a microwave digestion system (Mars 230/60, CEM, North Carolina, U.S.A). And It was pre-treated by diluting up to 50 mL with 14% HNO_3 solution. After that, calcium, and potassium were analyzed by Inductively coupled plasma - optical emission spectrometer (ICP-OES,

Table 1. Formula for jinmal dasik with different levels of dry shrimp powder

Ingredients (g)	Samples			
	0%	1%	5%	7%
Roasted wheat flour powder	100	99	95	93
Dry shrimp powder	0	1	5	7
Fructo-oligosaccharide	100	100	100	100
Sesame oil	10	10	10	10

Table 2. Measurement condition for the texture analyzer

Measuring	Condition
Probe	Ø5 mm, 5 cm
Trigger force	10 g
Sample compressed	25%
Sample height	20 mm
Pretest speed	10 mm/s
Posttest speed	10 mm/s
Sample diameter	30 mm

Teledyne Leeman Labs, Ohio, U.S.A). The standard solution for minerals measurement was used by diluting stock standard solutions with 14% HNO_3 solution. And potassium measurement wavelengths were 766.490 nm.

4. Statistical processing

The experimental results showed the quality characteristics as an average±standard error using the SPSS 22.0 package (Ver. 22.0 for window, Chicago, IL, U.S.A.). The mean value was compared by one-way ANOVA analysis, and if there was a significant difference, the significant difference between each sample was verified at $p<0.05$ level using LSD (Least Squares distance).

Results and Discussion

1. Texture measurement results of jinmal dasik

Table 3 show the texture measurement results.

Hardness was 532.67 g in the control group, and 595.07~804.73 g in the additive group. The 7% additive group was the highest and the control group was the lowest ($p<0.001$). This showed a similar result to that of the longanae arillus dasik (Yang et al. 2018), but the lotus root dasik (Yoon et al. 2009) was significantly decreased. In the previous study of the longanae arillus dasik (Yang et al. 2018), as the amount of the longanae arillus added increased, the longanae arillus tightly combined the interior of the dasik and increased hardness. Also, in this study, it is considered that the hardness increased due to the amount of shrimp powder added.

Adhesiveness was 3.33 mJ in the control group, and 5.21~8.81 mJ in the additive group. The 7% additive group was the highest and the control group was the lowest ($p<0.001$). This showed similar results to the carrot perilla dasik (Han et al. 2015), but the longanae arillus dasik (Yang et al. 2018) was significantly decreased.

Chewiness was 2.21 mJ in the control group, and 2.36~8.88 mJ in the additive group. The 7% additive group was the highest and the control group was the lowest ($p<0.001$). This showed similar results to the fermented rice bran dasik (Shin & Chung 2017), but the starch oddi dasik (Lee et al. 2005) was significantly decreased.

Cohesiveness was 0.24% in the control group, and 0.40~0.72% in the additive group. The 7% additive group was the highest and the control group was the lowest ($p<0.001$). This showed similar results to the mosidae brown rice dasik (Kim et al. 2009), but the spirulina soybean dasik (Kim et al. 2008) was significantly decreased.

Springiness was 1.77 mJ in the control group, and 0.68~2.95 mJ in the 1% additive group. The 7% additive group was the lowest ($p<0.001$). This showed similar results to the hericium erinaceus dasik (Choi & Jegal 2012), but the dotori dasik (Lee & Yoon 2006) was significantly increased.

In this study, the hardness, the adhesiveness, the chewiness, and the cohesiveness of shrimp jinmal dasik significantly increased as the amount added increased, and springiness significantly decreased as the amount added increased. Also, It is considered that shrimp powder has an effect on the hardness, the adhesiveness, the chewiness, and the cohesiveness of jinmal dasik. In the lotus root dasik (Yoon et al. 2009), hardness, chewiness, springiness, and cohesiveness significantly decreased, and adhesiveness significantly increased. In addition, in the silkworm dasik (Kim JE 2008), hardness, gumminess and chewiness significantly decreased as the amount added increased. According to a previous study on the quality characteristics of ingredients added in dasik manufacturing, the higher the moisture of the dasik, the springiness and springiness were low,

Table 3. Texture characteristics of jinmal dasik with dry shrimp powder

Sample	Hardness (g)	Adhesiveness (mJ)	Chewiness (mJ)	Cohesiveness (%)	Springiness (mm)
0%	532.67±25.74$^{a1)}$	3.33±0.11^{a}	2.21±0.18^{a}	0.24±0.01^{a}	1.77±0.13^{b}
1%	595.07±9.04^{b}	5.21±0.12^{b}	2.36±0.03^{a}	0.40±0.02^{b}	2.95±0.18^{c}
5%	776.33±3.11^{c}	7.82±0.08^{c}	5.98±0.07^{b}	0.49±0.01^{c}	1.54±0.15^{b}
7%	804.73±4.94^{d}	8.81±0.07^{d}	8.88±0.17^{c}	0.72±0.01^{d}	0.68±0.09^{a}
p-value	<0.001	<0.001	<0.001	<0.001	<0.001

[1)] Each value is presented as Mean±S.E. of 3 times.

[a-d]Means with different superscripts are significantly different at $p<0.05$ by LSD(least squares distance).

and cohesiveness was high. The higher hardness, the preference of texture and appearance were high. And the higher the cohesiveness, the overall preference was high (Chung & Park 2002).

2. Moisture, calcium and potassium measurement results of jinmal dasik

Table 4 show the moisture and potassium measurement results.

Moisture was 6.92% in the control group, and 8.35~9.37% in the additive group. The 1% additive group was the highest and the 5% additive group was the lowest. The moisture increase in the 7% additive group is thought to have less evaporated during the jinmal dasik cooking process. And this study showed a similar tendency in the platycodon grandiflorum dasik (Jhee et al. 2010), whereas the lotus leaf dasik (Yoon et al. 2009) was significantly increased, and the longanae arillus dasik (Yang et al. 2018) was significantly decreased.

Calcium was 60.05 mg/100 g in the control group, and 82.42~641.22 mg/100 g in the additive group. The 7% additive group was the highest and the control group was the lowest. And there was significantly increased as the amount added increased (p<0.001). This seems to increase the calcium as the amount added increased because the ingredient of the shrimp is rich in calcium.

Potassium was 192.51 mg/100 g in the control group, and 203.28~298.08 mg/100 g in the additive group. The 7% additive group was the highest and the control group was the lowest (p=0.049).

In this study, the calcium of shrimp jinmal dasik significantly increased as the added amount increased, and the potassium significantly increased as the added amount increased. And calcium, potassium of the pollen powder brown rice dasik (Kim et al. 2010) significantly increased as the added amount increased. In the starch oddi dasik (Lee et al. 2005), calcium and potassium significantly increased as the added amount increased. In addition, the mulberry leaf rice dasik (Kim et al. 2001) also significantly increased as the calcium, potassium, phosphorus, and magnesium contents increased. In the mulberry leaf rice dasik, calcium, potassium was significantly increased as the amount added increased (Kim et al. 2001). Also, It was considered availability as a treatment for chronic diseases (Kim et al. 2001).

Conclusion

Looking at the diet of 20s and 30s women as well as menopause women, most of the nutrients were less than the recommended intake. And in particular, calcium intake was insufficient, so the incidence of osteoporosis is expected to be high in the future. Calcium is a nutrient related to bone health, and it also affects the formation of maximum bone mass and bone loss. Shrimp is a low-calorie, high-protein food, and contains abundant minerals, so it is expected to help prevent osteoporosis. In this study, Jinmal dasik manufactured by varying the shrimp contents to 0%, 1%, 5%, and 7%, and quality characteristics were measured. In the hardness, adhesiveness, chewiness, cohesiveness were significantly increased as the amount added increased (p<0.001). In the springiness, the 1% additive group was the highest and the 7% additive group was the lowest (p<0.001). In the calcium was significantly increased as the amount added increased (p<0.001). In the potassium, the 7% additive group was the highest and the control group was the lowest (p=0.049). In this study, it is considered to be used as basic data on the possibility of various applications of shrimp rich in calcium, and it is expected to the development of jinmal

Table 4. Moisture and texture characteristics of jinmal dasik with dry shrimp powder

Sample	Moisture contents(%)	Calcium(mg/100 g)	Potassium(mg/100 g)
0%	6.92±0.07$^{a1)}$	60.05±3.54^{a}	192.51±1.46^{a}
1%	9.37±0.04^{d}	82.42±8.56^{a}	203.28±5.04^{ab}
5%	8.35±0.09^{b}	412.87±35.42^{b}	281.25±17.2^{bc}
7%	8.85±0.07^{c}	641.22±114.28^{c}	298.08±49.75^{c}
p-value	<0.001	<0.001	0.049

[1)] Each value is presented as Mean±S.E. of 3 times.

[a-d]Means with different superscripts are significantly different at p<0.05 by LSD (least squares distance).

dasik containing a variety of functional substances, and various studies using marin organism are needs in the future.

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