ISSN: 2586-7342 © 2020 KODISA & KJFHC
KJFHC website: http://www.kjfhc.or.kr
doi: http://dx.doi.org/10.13106/kjfhc.2020.vol6.no5.11.

A Study on Physicochemical and Sensory Characteristics of Ssanghwa Tea

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Received: November 07, 2020. Revised: , 2020. Accepted: November 05, 2020.

Abstract

This study tried to analyze sensual properties by classifying the thermal water extract of the main material used in Ssanghwa tea. Through this study, we wanted to develop popular Ssanghwa tea and further carry out basic research for the development of various menus using it. The ingredients for the Ssanghwa tea were washed under running water, then dehydrated and put in a pot as 2L of purified water. Ssangwha tea were heated at 100°C for 10 minutes, then lowered the temperature to 75°C and boiled down to 200 ml for 110 minutes. This study evaluated sensory characteristics of four types of commercial products and the five types manufactured by the description analysis. Quantitative analysis of the commercial Ssanghwa tea showed significant differences between samples in seven of the total 13 sensory characteristics except OG(Smell of grass), OC(Oriental medicine smell), TG(Umami), RT(Thick), RC(Rough) and RS(Tub-Tub) ($p<0.05$). In particular, differences between samples were evident in CT(Transmittance), CB(Brownness), TW(Sweet taste) and TB(Bitter) ($p<0.001$), which appeared to be the main differentiated features of appearance, aroma and taste for commercial Ssanghwa tea. This study tried to analyze sensual properties by classifying the thermal water extract of the main material used in Ssanghwa tea. Through, we wanted to develop popular Ssanghwa tea and further carry out basic research for the development of various menus using it.

Keywords: Ssanghwa Tea, Traditional Drink, Physicochemical Characteristics, Sensory Evaluations

Major classifications: Food Nutrition

1. Introduction

Traditional drinks are beverages that come down from a long time ago in our country. Traditional drinks are mainly derived from nature and use various ingredients such as flowers, grains, fruits, roots, leaves and seeds.

With the development of living standards and growing interest in health, the demand for health drinks and traditional drinks is growing (Lee, 2002). In particular, in recent years, Sikhye(sweet rice punch), Sujeonggwa(cinnamon punch) and

jujube tea have been commercialized as canned beverages (Lee et al., 1991; Seo et al., 2002), and the efforts of the government and local governments have increased consumer awareness and preference for traditional beverages (Park et al., 2007). However, traditional drinks have better functions than Western beverages in comparison with historical and effective features, but the consumption of traditional beverages is limited, and the development of healthy and functional beverages is particularly insufficient (Kim, 2012).

Ssanghwa tea can be found in Donguibogam by Heo Jun (1611) as a Korean record (Kwon, 2018). In Donguibogam, Ssanghwa tea is often used as a remedy for fatigue recovery after hard work or serious illness (Oriental Medicine Dictionary, 2001). Ssanghwa tea contains ingredients for the white crop medicine, Sukji Huang, Cheongung, Hwanggi, Danggui, Gamcho, cinnamon, jujube, and ginger.

Among the traditional drinks, Ssanghwa tea has good medicinal properties and functionality, but the method of making it is complicated and its taste is bitter or there are many things that are not popularized due to its unique scent. Looking at the preceding studies on the effects of Ssanghwa tea on anti-inflammatory behavior (Kim et al., 1981), on sensual quality characteristics (Lee et al., 1987), literary consideration of traditional Korean beverages (Lee, 1991), the influence on sexual behavior and sex hormones (Kim et al., 1999), the quality characteristics according to extraction conditions (Park et al., 2004), the sensual properties of sweetener (Baek et al., 2008), etc. It is true that although there are many, there is a lack of research on the symbolism and foodological characteristics of Ssanghwa tea.

This study tried to analyze sensual properties by classifying the thermal water extract of the main material used in Ssanghwa tea. Through this study, we wanted to develop popular Ssanghwa tea and further carry out basic research for the development of various menus using it.

2. Research methods

2.1. Manufacture of a sample of Ssanghwa tea

When the taste of each ingredient of Ssanghwa tea was classified, it was particularly repulsed by the strong aroma of herbal medicine, which reduced the amount of danggui, increased the amount of sweet peony and jujube, and the rest of the ingredients were manufactured in the same amount as those in Donguibogam.

SWM (Sweet Removal), BIM (Sweet Removal), SPM (Spicy Removal), and GUM (Gourmet Removal) samples are made here, and Table 1 is as follows.

Table 1: Classification of raw ingredients of Ssanghwa tea according to sensory characteristics

Ingredients	Sample code				
	All	**SWM**	**BIM**	**SPM**	**GUM**
Paeonia japonica (g)	12	-	12	12	-
Rehmannia glutinosa (g)	6	-	6	6	6
Cnidium officinale (g)	3	3	-	3	3
Astragalus membranaceus (g)	4	4	4	4	-
Cinnamomum cassia (g)	3	3	3	-	3
Ziziphus jujuba (g)	20	-	20	20	20
Angelica gigantis (g)	1	1	-	1	1
Zingiber officinale (g)	3	3	3	-	3
Glycyrrhiza uralensis (g)	3	-	3	3	3
Water(L)	2	2	2	2	2

The ingredients for the Ssanghwa tea were washed under running water, then dehydrated and put in a pot as 2L of purified water. Ssanghwa tea were heated at 100℃ for 10 minutes, then lowered the temperature to 75℃ and boiled down to 200 ml for 110 minutes. The manufacturing process of Ssanghwa tea is as in Figure 1.

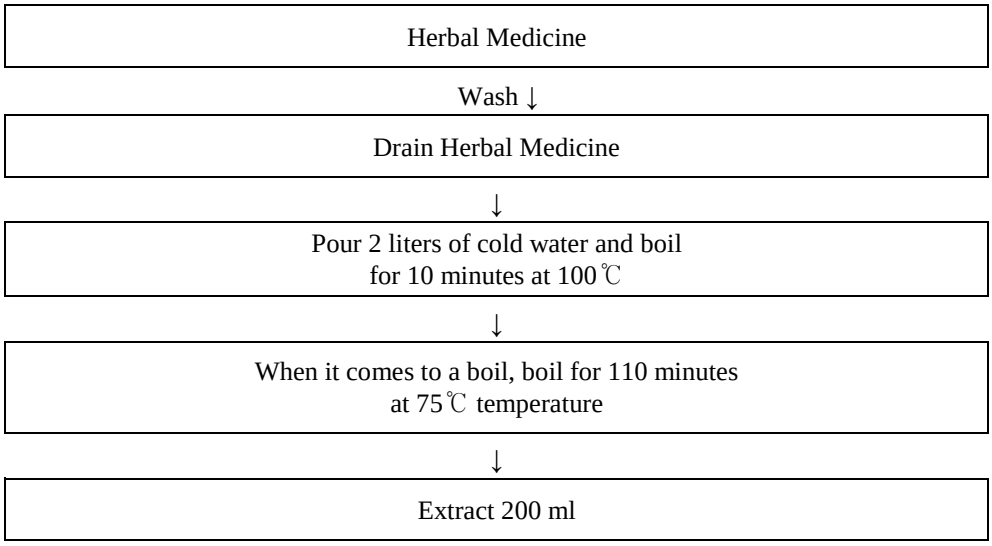

Figure 1: Manufacturing process of Ssanghwa tea

2.2. Physicochemical properties analysis

2.2.1. The content of sugar

The sugar content measurement of the Ssanghwa tea was measured by taking 30 ml using a digital saccarometer (MASTER-M, ATAGO Co. LTD, Tokyo, Japan) and marked with Brix. All analyses were represented as the average of the three repeated measurements.

2.2.2. pH

The pH of Ssanghwa tea was measured using pH meter (HM-17MX, TOA-DKK, Tokyo, Japan) by taking 30 ml each of the samples, and all analyses were shown as the average value of the three repeated measurements.

2.2.3. The content of moisture

The moisture of the Ssanghwa tea was measured by taking 1 ml of each specimen using a moisture meter (OHAUS-MB45, OHAUS, Seoul, Korea), and all analyses were expressed as the average of the three repeated measurements.

2.2.4. The evaluation of chromaticity

The chromaticity of the bifurcation was measured using the colour difference meter (CSP64, Y-Rite Pantone, Grand Rapids, MI, USA), and the Hunter's L value (white degree), a value (red degree), and b value (yellow degree) were measured as average values three times each.

2.3. Sensory evaluation

For the accurate sensory evaluation test, the panel selected nine graduate students and undergraduate students fro m the Food Technology and Services department who were interested in the sensory evaluation field and conducte d sensory panel training. Panel training explained to panel personnel the definitions, principles and procedures of sensory evaluation and the types of sensual characteristics and the purpose and importance of this study by referri ng to prior studies on sensory evaluation. The training period for the description analysis of Ssanghwa tea lasted four weeks and took more than an hour once a week, twice a week. During the training process, a series of desc riptive terms for the appearance, flavour and texture characteristics of the extract were conducted by presenting ex tracts by material. Through this process, 13 description terms were derived as seen in Table 2, and standard subst ances were determined to make it easier to recognize the concept of each characteristic term. The training was co nducted until all sensory assessors became familiar with the characteristics and evaluation methods of the Ssanghw

a tea. For the sensory evaluation, Ssanghwa tea sold on the market was kept at room temperature. 100 ml of wat er was boiled in 100℃ for each carton (15g) and 160 ml of water was added to 60 ml of concentrated Ssanghw a tea and boiled at 100℃. For the appearance evaluation, the beverage was presented in a transparent disposable plastic cup (50 ml) with a certain amount of 10 ml. In this case, the sample container is marked with a three-di git number extracted from the random number table so that there is no bias against the test specimen. The tempe rature of the specimen shall be 60±5 ℃ during evaluation. Water is provided to rinse the inside of the mouth du ring the sample evaluation.

The sensuality assessment of Ssanghwa tea required nine different beverages to be evaluated from the non-stimul ating taste. The characteristics of the samples were evaluated in order of flavor, taste, texture, and aftertaste. The inspection time was 1p.m. and was repeated three times over three weeks. Trainees participating in the evaluation were required to avoid drinking beverages or food other than water one hour before the evaluation, and the use o f cosmetics with strong scents was prohibited. The evaluation used the 9-point scale method, and the stronger the characteristic strength, the higher the score.

Table 2: Classification of raw ingredients of Ssanghwa tea according to sensory characteristics

Categories	Descriptors	Abbreviation	Definitions	Reference
Color attributes	Transmittance	CT	The intensity of transmittance	100 ml distilled water
	Brownness	CB	The intensity of brownness	Brown sugar
Odor attributes	Sweet smell	OS	The smell associated with brown sugar	White sugar
	Smell of grass	OG	The smell associated with green leaf	Green leaf
	Oriental medicine smell	OC	The smell associated with Ssanghwa tea	Oriental Medicine
Taste attributes	Sweet taste	TW	The taste associated with sweet taste	2% sucrose solution
	Sour	TS	The taste associated with sour taste	1% dilute solution of vinegar
	Bitter	TB	The taste associated with bitter taste	0.2% of caffeine solution
	Astringent	TA	The taste associated with astringent taste	Red wine
	Umami	TG	The taste associated with umami	0.05% msg solution
Texture attribute	Thick	RT	The mouth feeling of fresh cream	Fresh cream
	Rough	RC	The mouth feeling of coarse and powder	Grain flour
	Tub-Tub	RS	The mouth feeling of latte	Latte

2.4. Statistical processing

For statistical processing, the SPSS/PC computer program (Statistical Package for Social Science 25.0; SPSS Inc, Chicago, IL) was used. The significance of differences between samples was assessed by 1-way analysis of variance (ANOVA) coupled with Duncan multiple range test at a P value of less than 0.05.

3. Results & Discussion

3.1. Physicochemical properties analysis

For commercial Ssanghwa tea, such as Table 3, the highest sugar content was 26.23 Brix for CGC and 6.80 Brix for JSH. In the case of manufactured Ssanghwa tea, the sugar content of the entire sample was the highest at 6.40 Brix and SWM was the lowest at 0.80 Brix. In addition, the sugar content of SPM, GUM and BIM came similarly at 3.57 Brix, 3.93 Brix and 3.33 Brix, respectively.

Table 3: Physicochemical properties of commercial and manufactured Ssanghwa tea

Sample		pH	Sugar content (Brix)	Hunter's color value			Moisture content (%)
				L	a	b	
Commercial Ssanghwa tea sample	JSH	4.40	6.80	17.48	0.26	0.78	95.49
	GLI	4.01	12.00	18.47	0.44	1.45	88.68
	CGC	4.01	26.23	19.14	-0.13	-0.57	74.19
	DPO	5.15	15.17	18.49	0.23	0.84	84.43
Ssanghwa tea sample prepared with different formulation	ALL	5.00	6.40	17.14	0.12	0.53	94.32
	SPM	5.74	3.57	16.18	-0.03	0.03	96.08
	GUM	4.89	2.93	16.48	-0.14	0.15	97.28
	SWM	6.25	0.80	19.48	2.30	4.23	99.34
	BIM	5.67	3.33	16.61	-0.08	0.16	96.51
	DPO	5.15	15.17	18.49	0.23	0.84	84.43

3.2. Sensory characteristics of Ssanghwa tea samples

The results of the quantitative depiction analysis of the samples of the commercial and manufactured Ssanmghwa tea are as shown in Table 4. Of the total 13 sensual properties, 7 properties excluding OG, OC, TG, RT, RC, and RS showed significant differences between samples ($p<0.05$). In particular, differences between samples were evident in CT, CB, TW and TB ($p<0.001$), and the texture did not show significant differences between samples in all properties, indicating that appearance, sweetness and bitterness were the main differentiated characteristics of the marketing products. In other words, the appearance showed significant differences in both CT and CB ($p<0.05$) and significantly higher transparency in DPO and GLI, respectively, at 3.52±0.97 and 3.89±0.74. The chromaticity of the CGC and JSH was significantly higher with the brownness of 1.78±.0.78 and 2.35±1.66. Among the odor properties, significant differences between samples were found only in the OS and the DPO sample was 6.00±0.71 with significantly higher sweetness ($p<0.05$). Taste properties showed significant differences between samples in all properties except TG ($p<0.05$). It can also be seen that JSH samples have the lowest sweetness and the highest bitterness characteristics compared to other properties, resulting in the greatest significant difference ($p<0.001$). Texture properties do not show significant differences among all samples, which are thought to be not differentiated sensual properties among the marketing products.

The quantitative depiction analysis of the sample (ALL, SWM, BIM, SPM, GUM) of Ssanghwa tea prepared with different mixing ratios is shown in Table 4. A total of 13 descriptive terms showed significant differences between samples in six characteristics, including CT, CB, OS, OC, TW, and TB, excluding OG, TS, TG, TA, RT, RC, and RS ($p<0.05$). In particular, the difference between the degree of transparency, the degree of brownness, the characteristic smell of herbal medicine, the sweetness and the sweetness was evident in CT, CB, OS, OC and TW ($p<0.001$). Appearance showed significant differences in both CT and CB ($p<0.001$) BIM samples showed a higher transparency of 6.81±1.90 and a lower CB of 3.07±1.32. In the case of products where health factors are considered by consumers, it is believed that sensual information about the appearance of food is also needed because the influence of food external factors may be greater (Bae, 2013). Significant differences between the samples in the OS and OC for flavoring ($p<0.001$). In other words, the sweet smell had the highest value of 6.03±0.90 for ALL samples, and the smell of oriental medicine was the highest value of 6.45±1.33. It was thought that ALL samples contained all the ingredients for Ssanghwa tea, giving off a rich aroma. Taste showed statistically significant differences in TW, TB and TA, with ALL samples representing the highest values for each characteristic ($p<0.001$). As with the flavoring characteristics, ALL samples contained all the ingredients for Ssanghwa tea, so they were thought to have a rich flavor.

Since tea is a favorite beverage, it was thought that it would be necessary to understand the sensuality characteristics of the market's Ssanghwa tea because sensual quality is the most important factor in the selection of the product (Lee et al., 1987) rather than its health benefits.

Table 4: Sensory characteristics of commercial and manufactured ssanghwa tea

Sensory attributes[1)]		Commercial Ssanghwa tea				Manufactured Ssanghwa tea				
		DPO	CGC	GLI	JSH	ALL	SWM	BIM	SPM	GUM
Appearance attributes	CT	3.52±0.97[2)]	1.78±.0.78^{b}	3.89±0.74^{a}	2.35±1.66^{b}	2.59±0.78 b	3.26±1.69 b	6.81±1.90 a	3.67±1.95^{b}	3.07±1.50 b
	CB	6.33±0.58^{b}	8.48±0.85^{a}	6.72±0.37^{b}	8.46±.93^{a}	7.85±0.78^{a}	7.67±1.13^{a}	3.07±1.32^{b}	7.56±0.96^{a}	7.70±0.73^{a}
Odor attributes	OS	6.00±0.71^{a}	5.11±0.69^{ab}	4.44±1.52^{b}	4.74±1.33^{b}	6.03±0.90^{a}	5.74±1.19 b	3.15±1.51 a	5.30±1.59^{a}	5.30±0.95 a
	OG	4.37±1.66	5.11±1.72	4.54±1.52	4.58±1.96	3.59±1.60	3.72±1.16	3.76±1.79	4.89±0.97	4.41±0.88
	OC	5.96±1.31	6.78±1.13	5.96±1.78	7.33±1.13	6.45±1.33^{a}	4.59±0.96 b	4.00±1.40 b	6.04±1.10^{a}	4.81±1.08 b
Taste attributes	TW	8.22±0.71^{a}	7.00±1.12^{a}	7.33±1.22^{a}	4.63±1.76^{b}	6.37±0.89^{a}	4.78±2.08 a	2.58±1.13 b	5.15±1.62^{a}	5.26±2.05 a
	TS	3.04±0.99^{b}	3.18±1.14^{b}	5.43±2.19^{a}	5.43±2.97^{a}	4.07±1.98	3.74±1.74	3.11±1.14	3.81±1.86	4.11±2.20
	TB	2.89±1.18^{b}	3.07±1.30^{b}	4.17±1.24^{b}	6.09±1.60^{a}	5.44±1.17^{a}	3.11±1.21 c	3.74±1.29 bc	5.04±0.86^{a}	4.70±1.33 ab
	TA	3.70±1.12^{b}	3.85±0.93^{b}	4.11±1.18^{b}	5.39±1.40^{a}	4.37±1.10^{a}	3.09±1.11^{b}	3.41±1.61 ab	3.48±1.00^{ab}	3.85±0.85 ab
	TG	2.93±1.21	3.59±.85	3.00±1.23	3.15±1.29	3.82±0.85	3.78±2.13	3.15±1.50	3.33±1.36	3.60±1.22
Texture attributes	RT	4.85±1.52	5.33±1.54	4.35±1.94	5.37±1.81	5.33±1.31^{a}	4.24±1.42 ab	3.45±1.53 b	4.49±1.06^{ab}	4.44±1.17^{ab}
	RC	2.96±0.68	3.56±1.14	2.96±1.12	3.98±1.56	4.67±1.34	3.28±1.47	4.69±1.93	3.85±0.65	4.04±0.98
	RS	3.87±1.01	4.37±1.10	4.09±0.95	5.09±1.18	5.33±0.83 a	3.70±1.45 b	3.89±1.79 b	3.93±1.25^{b}	4.22±0.96^{ab}

Values in the same row with different superscripts (a and b) are significantly different ($p < 0.05$) by one-way ANOVA and Duncan's multiple range test.

[1)] See the Table 1.

[2)] Data expressed as mean ± S.E.M.

[a, b)] Means with different superscripts in the same row differ significantly ($p<0.05$).

4. Conclusion

This study evaluated sensory characteristics of the raw materials and four types of commercial products of Ssanghwa tea and the five types manufactured by the description analysis. First of all, we looked at the physiochemical characteristics of the materials used in Ssanghwa tea, among the raw materials, the sugar content of Sukjihwang among the raw materials was the highest at 2.33 Brix, and in the case of commercial Ssanghwa tea, the CGC sample was the highest at 26.23 Brix. In addition, JSH samples had 6.80 Brix, similar to ALL's 6.40 Brix, the full sample of the manufactured Ssanghwa tea.

A quantitative analysis was conducted for Ssanghwa tea, which is a commercial product (DPO, CGC, GLI, JSH) and for five manufactured products (ALL, SWM, BIM, SPM and GUM).

Quantitative analysis of the commercial Ssanghwa tea showed significant differences between samples in seven of the total 13 sensory characteristics except OG, OC, TG, RT, RC and RS ($p<0.05$). In particular, differences between samples were evident in CT, CB, TW and TB ($p<0.001$), which appeared to be the main differentiated features of appearance, aroma and taste for commercial Ssanghwa tea.

Quantitative analysis of manufacturing Ssanghwa tea showed significant differences between samples in six characteristics of CT, CB, OS, OC, TW and TB, excluding OG, TS, TG, TA, RT, RC, and RS in a total of 13 descriptive terms ($p<0.05$). In particular, differences in the transparency, brownness, characteristic smell of Oriental medicine, sweet smell, and sweetness of Ssanghwa tea were evident in CT, CB, OS, OC and TW ($p<0.001$).

References

Bae, K. H. (2012). *The Medicinal Plants of Korea*. Kyohaksa. 168-169.

Baek, S.E., & Jhee, O.H. (2008). Sensory Properties of Low Calorie Ssanghwa Beverages Containings Sweetener(Ⅱ)-Sensory Properties of Ssanghwa Beverages Sweetener with Acesulfame-K and Aspartame Glucosyl Stevia. *The Korean Journal of Food and Nutrition*, *21*(2), 197-203.

Oriental medicine dictionary editor committee. (2001). *Oriental medicine dictionary*, Seoul. Book publishing Jeongdam.

Kwon, J.W. (2018). *Quality Characteristics of Different Jelly amount Ssanghwatang.* Daegu. Deprtment of Herbal Food Science Graduate School. Deagu Hanyi University.

Kim, I.H., & Hwang, G. J. (1981). Studies on Anti-inflammatory Activities of "Ssanghwa-Tang. *Korean Journal of Pharmacognosy*, *12*(3), 131-135.

Kim, T. B., Kwon, K. B., Park, J. S., Park, K. H., Kim, B. R., & Lee, H. S. (1999). GugiSsanghwatang Water Extract on the Sexual Behavior and Serum Testosterone Concentration in Male Rats. *Journal of Physiology & Pathology in Korean Medicine*, *13*(1), 152-157.

Kim, G. S., & Park, K. S. (2012). Investigation into Preference and Demand for Functional Drinks (Korean Traditional Drinks). *Korean Journal of Food and Cookery Science*, *28*(4), 413-421.

Lee, C. H., Hong, S. H., Hwang, S. Y., & Shin, A. J. (1987). Studies on the Sensory Characteristics of Korean Tea and Related Products. *The Korean Society of Food Culture*. 1987, *2*(2), 133-147.

Lee, Y. M., Shun, M. J., & Kim, B. M. (1991). A Study on the Present State of Traditional Food. *Journal of The Korean Society of Food Culture*. *6*(1), 71-81.

Lee, C. H., & Kim, S. Y. (1991). Literature Review on the Korean Traditional Non-alcoholic Beverages -I. Types and Processing Methods. *The Korean Society of Food Culture*. *6*(1), 43-54.

Lee, H. J., Son, K. H., & Lee, M. J. (2002). Analysis of the factors that influence Korean beverage consumption. Korean journal of food and cookery science. *18*(1), 63-72.

Park, S. S., Lee, K. B., & Han, M. K. (2004). Quality Characteristics of Ssangwha Extract according to Extraction Conditions. *The Korean Journal of Food and Nutrition*. *17*(4), 368-373.

Park, E. Y., & Han, Y. S. (2007). A survey on the plans to market traditional Korean beverages as take-out products. *The Korean Journal of Food and Nutrition*. *20*(4), 501-508.

Seo, J. H., Sang, H. O., & Kim, M. R. (2002). *Quality Characteristics and Food and Nutrition Specialists' Opinion on Jujube Teas. Daejeon*. The Graduate School of Chungnam National University.