Effects of Pressure Cooker Brand Awareness on the Consumer Acceptability of Cooked Rice

Dong Hee Kim and Hee Sup Kim*

Department Food and Nutrition, The University of Suwon, Hwaseong 445-743, Korea

ABSTRACT   The effects of pressure cooker brand awareness, in terms of rice cooking performance, were evaluated using consumer acceptability tests. A blind test was performed using rice samples cooked by 3 different pressure cookers without any brand information, and a brand awareness test followed with the same informed consumer panel. Overall acceptability, glossiness, stickiness, hardness, flavor, and color were evaluated and compared to determine whether or not there were changes on consumer choice for acceptability. Brand A and brand B were not significantly different in their overall acceptability, moisture content, flavor, or color ($p > 0.05$), but they were significantly different for glossiness, stickiness, and hardness. Brands A and C were significantly different for all the attributes ($p < 0.05$). In the brand awareness test, brands A and B were not significantly different in their liking scores for all the attributes ($p > 0.05$). Brand C had significantly lower liking scores for overall acceptability, glossiness, stickiness, hardness, and moisture content than the other brands ($p < 0.05$). When comparing the liking scores for all the attributes with those of the blind test, the scores of the brand awareness test were slightly higher. For brand A, there were changes in its liking scores for overall acceptability, flavor, and glossiness ($p < 0.05$). However, brands B and C had brand awareness effects for all the attributes ($p < 0.05$).

KEYWORDS: *pressure cooker, brand awareness effect, cooked rice, sensory attributes, consumer acceptability*

INTRODUCTION

The personal liking for cooked rice taste is developed throughout life by preference, as well as by family background, based on physiology and geography. Some people like softer, sticky rice, while others like harder and less sticky rice. Most people can perceive subtle differences among various kinds of cooked rice.

Cooked rice quality is affected by many factors such as the type of rice (1), cooking conditions (2), soaking time (3), the amount of added water (4,5,6), cooking temperature (7), cooking time, type of energy source (8), cookware (9), and milling degree (10).

Pressure cooking is very convenient, as it reduces the cooking time and maintains nutrients better than other cooking methods (11,12). There are several brands of rice cookers available on the market, but their price range is broad considering similar functions.

Branding has been introduced as a marketing strategy, and

*Corresponding author
Tel: 82-31-220-2228
Fax: 82-31-220-2189
E-mail: hs6482@suwon.ac.kr

people often decide their preference for a favorite brand, and then literally never change their preference over a lifetime. Consumer brand loyalty is often considered positive product attribute (13). And brand familiarity and brand attitudes can influence product evaluations (14).

The purpose of this study was to evaluate the brand awareness effects of pressure cookers on the consumer acceptability of cooked rice, providing information on how consumer brand familiarity and brand attitude affected the evaluation of cooked rice according to the pressure cookers used.

MATERIALS AND METHODS

Materials

The rice (Pyongtak Kyonggimee, Pyongtak Nonghyop) was purchased at a local market, and stored in the refrigerator for 1 month throughout the experimental period. Three pressure cookers (brand A, brand B, brand C) were also purchased at a local store. Three cooked rice samples were cooked in each pressure cooker according to the optimal recipes provided with each pressure cooker (Table 1). The sensory characteristics of the three cooked rice samples were defined in a preliminary study using descriptive analysis (Fig. 1).

Table 1. Recipes for cooked rice according to pressure cooker

Sample	Cooking Procedure
Brand A	1. Weigh 500 g of rice and 600 ml of water. Wash the rice 3 times and soak for 30 min and then drain. Put the wet rice with the water (1 : 1.1) in the pressure cooker. Set the pressure selector to the 2nd position. 2. Cook at the highest temperature. The pressure indicator moves up after a few minutes. As soon as the indicator is shown, lower the heat to the lowest temperature. After 3 min at the lowest temperature, turn off the heat and wait until the pressure indicator moves down. 3. Open the lid and mix the rice gently with a spatula, trying not to press the rice too hard.
Brand B	1. Weigh 500 g rice and 600 ml of water. Wash the rice 3 times and soak for 30 min. and then drain. Put the wet rice with the water (1:1.1) in the pressure cooker. 2. Cook at the highest temperature. The pressure regulator valve starts rotating after a few minutes, and air & steam release can be heard momentarily. When steam starts escaping from the steam outlet, lower the heat source to the lowest temperature. After 3 min at the lowest temperature, turn off the heat and wait until the pressure releases completely. 3. Open the lid and mix the rice gently with a spatula, trying not to press the rice too hard.
Brand C	1. Weigh 500 g rice and 600 ml of water. Wash the rice 3 times and soak for 30 min. and then drain. Put the wet rice with the water (1 : 1.2) in the pressure cooker. Select the pressure selector to the 2nd position. 2. Cook at the highest temperature. When the steam starts escaping continually from the regulator valve outlet, lower the heat source to the medium temperature. After 4 min at the medium temperature, turn off the heat and wait until the pressure indicator moves down. 4. Open the lid and mix the rice gently with a spatula, trying not to press the rice too hard.
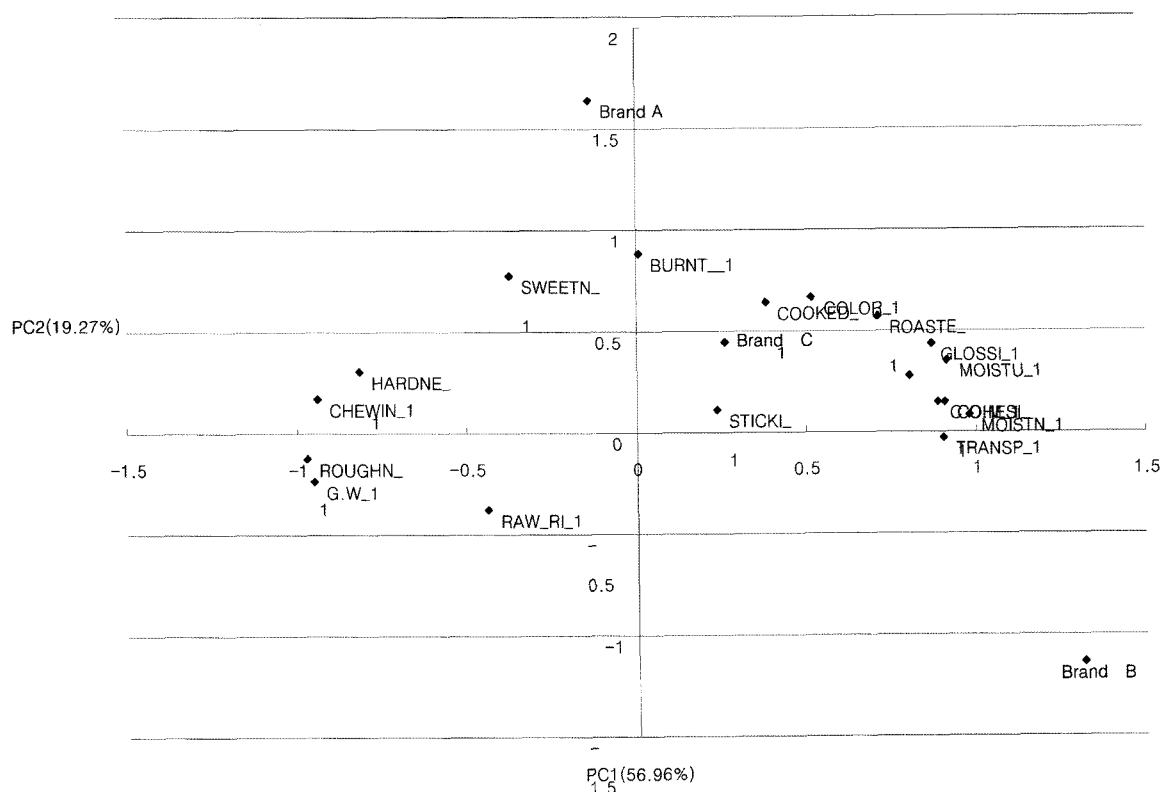
Fig. 1. Principal component plot for the sensory attributes of the cooked rice.

Consumer panel

Untrained consumers (n = 130), ages 20 to 59, were chosen from Seoul and its vicinity for the testing.

Consumer acceptance test

Blind test: All three cooked rice samples from the 3 different pressure cookers were presented to each consumer.

The samples were coded with 3 digit numbers and presented in white plastic bowls with lids on a white tray. The samples were kept warm until served. The panelists were allowed to rinse their mouths using spring water between samplings.

The questionnaire included 6 attributes: overall acceptability, glossiness, stickiness, hardness, flavor, and color. All the samples were presented in different orders for randomization. A nine-point hedonic scale was used to evaluate the attributes (1 = dislike extremely, 5 = neither like nor dislike, 9 = like extremely).

Brand awareness test: The brand awareness test followed after a 30 minute recess, with the same consumer participants. In this test, the panelists were informed of the pressure cooker brands used to cook the rice samples.

Statistical design and data analysis

A complete randomized block design was used for the test, and descriptive statistics were used for the frequency distributions and percentages. The comparisons of mean differences were analyzed by ANOVA, LSD tests, and t-tests, using the SPSS Win program (Ver.10.0, SPSS Inc, Chicago).

RESULTS AND DISCUSSION

Demographic background of consumers

Only female consumers were recruited for the tests due to their more sensitive palates in noticing subtle differences. Most of the participants (81.6%) were between the ages of 30 to 49 years. In regards to their frequency of eating cooked rice per day, 57.6% ate cooked rice 3 times per day, also, 36.2% cooked rice twice a day. Approximately 63.8% of the participants typically ate their rice mixed with other grains, and 23.1% ate polished rice. In regards to the types of rice cookers, 46.2% used an electric rice pressure cooker and 40% used non-electric pressure cooker. The purchase intent according to pressure cooker was brand A (43.8%), brand B (31.5%), and brand C (22.3%) (Table 2).

Sensory Characteristics of cooked rice samples

The sensory characteristics of the rice samples cooked by each pressure cooker were studied using descriptive analysis and are expressed in a PCA (principal component analysis) plot (Fig. 1). Two PCs explained nearly 76% of the total variance. PC1 was responsible for the highest percentage of separation (57%) and PC2 gave the next highest percentage

Table 2. Demogarphic background of consumer participants

Characteristics		Number (percent)
Age	20s	12 (9.2)
	30s	63 (48.5)
	40s	43 (33.1)
	50s	12 (9.2)
Job	Office worker	20 (15.4)
	Housewife	94 (72.3)
	Student	6 (4.6)
	Other	10 (7.7)
Frequency of eating rice/day	One time	7 (5.4)
	Two times	47 (36.2)
	Three times	75 (57.6)
	Other	1 (0.8)
Type of rice typically eaten	Polished rice	30 (23.1)
	Brown rice	14 (10.8)
	Rice mixed with other grains	83 (63.8)
	others	3 (2.3)
Type of rice cooker	Electric pressure cooker	60 (46.2)
	Electric rice cooker	12 (9.2)
	Non-electric pressure cooker	52 (40.0)
	Other	6 (4.6)
Purchase intent	Brand A	57 (43.8)
	Brand B	41 (31.5)
	Brand C	29 (22.3)

Table 3. Consumer acceptance of pressure cooked rice by blind test

Attribute Sample	Overall acceptability	Glossiness	Flavor	Color	Stickiness	Hardness	Moisture content
Brand A	6.50[a1)]	6.81[a]	6.33[a]	6.42[a]	6.76[a]	6.54[a]	6.28[a]
Brand B	5.94[ab]	5.85[b]	5.88[ab]	5.93[ab]	5.87[b]	5.92[b]	5.73[ab]
Brand C	5.48[b]	5.45[b]	5.32[b]	5.69[b]	5.40[b]	5.42[b]	5.52[b]

1) a.b: Means within a column with different letters are significantly different from one another ($p < 0.05$)
2) 9-point hedonic scale (1 = dislike extremely, 3 = dislike moderately, 5 = neither like nor dislike , 7 = like moderately, 9 = like extremely)

of separation (19%). PC1 primarily separates the samples by texture intensity. The samples that fell into the positive end of PC1 were characterized by moistness, stickiness, moisture content, cohesiveness, glossiness, and transparency. The samples that fell into the negative end of PC1 were characterized by hardness, chewiness, roughness, and grain wholesomeness. The axis separates the samples by flavor intensity according to the first two PC scores, and the samples were separated according to texture along the sensory direction from left to right, and by flavor from up to down. Brand A was in the upper left quadrant, brand C was in the upper right quadrant, and brand B was in the lower right quadrant. Thus, brand A had moderate intensity for all the textural attributes located near the center. Brand A had more burnt flavor notes on PC2. Brand C had moist, cohesive, glossy notes and brand B was more moist, cohesive, and glossy on PC1, but had negative loading for PC2.

Consumer acceptance test

Blind Test: The consumer acceptance results for the rice samples cooked by the various pressure cookers are as shown in Table 3. The rice cooked by brand A (referred to as brand A hereafter) had the highest liking scores for overall liking, glossiness, color, stickiness, and hardness, by being rated as 'slightly liked'. Brand A had significantly higher liking scores than the other two brands for glossiness, stickiness, and hardness ($p < 0.05$). Brand A was not significantly different from the rice cooked by brand B (referred to as brand B hereafter) for overall acceptability, flavor, color, and moisture content. However, brand A was significantly different from brand B in glossiness, stickiness, and hardness ($p < 0.05$). Brand B was not significantly different from brand C for any of the attributes ($p > 0.05$).

The overall acceptability of brand A was defined as 'slightly liked'. Brand B wasn't significantly different from brands A and C (p > 0.05). However, brand C was significantly different from brand A.

Glossiness is important attribute of cooked rice. Brand A had the highest glossiness liking scores ($p < 0.05$), and it was defined as 'slightly liked' by the consumers. Brand B was not significantly different from brand C ($p > 0.05$) which were evaluated as 'neither like nor dislike' ($p < 0.05$).

The flavor liking scores of brand A were characterized as

'slightly like', but there were no significant differences between brands A and B ($p > 0.05$). The flavor scores for brands B and C were not significantly different, which were rated as 'neither like nor dislike'.

The color liking scores of brand A and brand B were not significantly different ($p > 0.05$), which were rated as 'slightly like'. Brand C was not significantly different from brand B, and it was rated as 'neither like nor dislike' by the consumers.

The stickiness liking scores of brand A were significantly different from the other brands ($p < 0.05$), and it was rated as 'slightly like'. The stickiness liking scores of brand B were not significantly different from brand C, and were rated as 'neither like nor dislike' The hardness liking scores of brand A were significantly different from the other brands ($p < 0.05$),and it was characterized as 'slightly like'. Brand B was not significantly different from brand C, and was rated as 'neither like nor dislike'.

The moisture content liking scores between brand A and brand B were not significantly different from each other, and brand C was not significantly different from brand B.

The hedonic scores of the cooked rice for all the attributes ranged from 5 to 7 out of a 9-point scoring scale. One explanation for this phenomenon may be that some consumers liked the rice texture softer, less chewable, and stickier, while others liked it harder, less sticky, and more chewable. Another plausible explanation is their possible tendency to avoid extreme scores, using scores in the middle of the hedonic range (15).

Brand awareness test: The results of the brand awareness test for the 3 pressure cooker brands are shown in Table 4.

The data were compared with the previous liking scores of the specific attributes to see whether or not there was a brand effect on the liking scores.

Brand A and brand B were not significantly different in their liking scores for overall acceptability, glossiness, stickiness, hardness, flavor, color, and moisture content ($p > 0.05$); the overall acceptability, hardness, and moisture content were each rated as 'slightly like'. However, brand A was only rated as 'moderately like' for its glossiness and stickiness. The flavor and color liking scores of all the brands were not significantly different ($p > 0.05$). Brand C had significantly lower liking scores for overall acceptability,

Table 4. Consumer acceptance of pressure cooked rice by brand awareness test

sample	Overall acceptability	Glossiness	Flavor	Color	Stickiness	Hardness	Moisture content
Brand A	$6.93^{a1)}$	7.19^a	6.95	6.72	7.02^a	6.88^a	6.60^a
Brand B	6.74^a	6.78^a	6.56	6.64	6.69^a	6.58^a	6.55^a
Brand C	5.86^b	5.87^b	$5.76^{n.s2)}$	$5.93^{n.s.}$	5.61^b	5.61^b	5.64^b

1) a.b.c: Means within a column with different letters are significantly different from one another ($p < 0.05$)
2) n.s: Not significantly different from one another.
3) 9-point hedonic scale, (1 = dislike extremely, 3 = dislike moderately, 5 = neither like nor dislike , 7 = like moderately, 9 = like extremely)

Table 5. Comparison of hedonic scores before and after brand awareness

Attributes		Brand A	Brand B	Brand C
Overall acceptability	Before	$6.50(1.54)^{1)}$	$5.94(1.72)$	$5.48(1.82)$
	After	$6.93(1.55)$	$6.74(1.60)$	$5.86(1.76)$
		$p = 0.015*$	$p = 0.000***$	$p = 0.048*$
Glossiness	Before	$6.80(1.48)$	$5.85(1.96)$	$5.45(1.61)$
	After	$7.19(1.35)$	$6.78(1.51)$	$5.87(1.72)$
		$p = 0.008**$	$p = 0.000***$	$p = 0.000***$
Flavor	Before	$6.33(1.46)$	$5.88(1.79)$	$5.32(1.72)$
	After	$6.95(1.43)$	$6.56(1.46)$	$5.76(1.62)$
		$p = 0.000***$	$p = 0.000***$	$p = 0.006**$
Stickiness	Before	$6.76(1.70)$	$5.87(1.83)$	$5.40(1.79)$
	After	$7.02(1.56)$	$6.69(1.49)$	$5.60(1.79)$
		$p = 0.162$	$p = 0.000***$	$p = 0.010*$
Hardness	Before	$6.54(1.53)$	$5.92(1.93)$	$5.42(1.74)$
	After	$6.88(1.70)$	$6.58(1.63)$	$5.61(1.80)$
		$p = 0.066$	$p = 0.000***$	$p = 0.002**$
Moisture Content	Before	$6.28(1.69)$	$5.73(1.93)$	$5.52(1.81)$
	After	$6.60(1.59)$	$6.55(1.56)$	$5.64(1.78)$
		$p = 0.071$	$p = 0.000***$	$p = 0.000***$
Color	Before	$6.42(1.59)$	$5.95(1.96)$	$5.69(1.71)$
	After	$6.72(1.49)$	$6.64(1.59)$	$5.93(1.74)$
		$p = 0.068$	$p = 0.002**$	$p = 0.000***$

1) mean (SD)
2) * significant at $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

glossiness, stickiness, hardness, and moisture content than the other brands ($p < 0.05$). The liking scores of brand C for all the attributes were characterized as 'neither like nor dislike'.

Brand awareness effects on consumer acceptability: In comparison with the results of the blind test, there was a tendency for the hedonic scores of all the attributes in the brand awareness test to be slightly higher than those of the blind test. There were significant differences in the liking scores of brand B for all attributes ($p < 0.05$). For brand A, there were only changes in the liking scores of overall acceptability, flavor, and glossiness ($p < 0.05$). There were no effects for hardness and moisture content. Brand C had

brand awareness effects for all the attributes ($p < 0.05$) (Table 5). It was previously observed that product evaluations, as well as purchase intent, were affected when consumers were informed of the manufacture's country of origin (14). Therefore, we can conclude there were some brand awareness effects, but not enough to change the ranking of the hedonic liking scores for the specific products.

CONCLUSIONS

In this study, the brand awareness effects of pressure cookers, in terms of rice cooking performance, were evaluated using consumer acceptability tests. A blind test and brand awareness test were performed with rice samples

cooked in 3 different pressure cookers. Overall acceptability, glossiness, stickiness, hardness, flavor, and color were evaluated and compared to determine whether on not there were changes in consumer choice for acceptability. Brand A and brand B were not significantly different in their overall acceptability, moisture content, flavor, or color ($p > 0.05$); but they were significantly differentin glossiness, stickiness, and hardness. Brand A and brand C were significantly different for all the attributes ($p < 0.05$). Brand C had significantly lower liking scores in the blind test as compared to the other brands ($p < 0.05$).

In the brand awareness test, the liking scores of each attribute were slightly higher than the liking scores in the blind test. Brand A and brand B were not significantly different in their liking scores for overall acceptability, glossiness, stickiness, hardness, flavor, color, and moisture content ($p > 0.05$). However, brand C had significantly lower liking scores for overall acceptability, glossiness, stickiness, hardness, and moisture content than the other two brands ($p < 0.05$).

There was a tendency for the hedonic scores of all the attributes to be slightly higher in the brand awareness test than in the blind test. For brand A, there were changes only in its liking scores for overall acceptability, flavor, and glossiness ($p < 0.05$). However, brand B and brand C had brand awareness effects for all the attributes ($p < 0.05$).

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