

Consumer Perception of Cookies Made with Onion Powder

Eun Ju Seog, Hye Ran Kim, and Jun Ho Lee*

Department of Food Science and Engineering, Daegu University,
Gyeongsan, Gyeongbuk 712-714, Korea

Abstract

A consumer acceptance test was conducted on 50 consumers of cookies in age group, between 20 and 30 years. Cookies were made using AACC method 10-52 by substituting 0-8% (based on the total weight of the soft wheat flour and onion powder mixture) of onion powder according to the formulation given. In terms of color, 6% sample received the most favorable mean score, which is significantly higher than others ($p < 0.05$) followed by the control sample (0%). The sensory preference on taste and texture was not significantly affected by the amount of onion powder substituted in the formulation ($p > 0.05$). Samples with 6% onion powder received the highest mean flavor score of 4.74 which is significantly higher than that of control and 2% sample ($p < 0.05$). In overall, substitution of 6% onion powder in the formulation would result in the most favorable onion cookies by the consumers.

Keywords: consumer, cookies, onion, powder, sensory attributes

Introduction

Onions (*Allium cepa* L.) have long been used as both spice and food during processing and cooking because of its distinctive flavor and taste (Kim and Lee, 2001; Hong *et al.*, 2003). Onion contains very high level of flavonoids, especially quercetin and its glycosides (Kim and Kim, 2006). These flavonoids have received special attention as dietary constituents due to their possible role in preventing cardiovascular diseases and cancer. The flavonoids showed antibacterial (Kim and Kim, 2006), antioxidative (Bros *et al.*, 1990), anti-inflammatory (Kim *et al.*, 1998), and antiangiogenic (Bjeldanes and Chang, 1977) effects, and they were believed to prevent or delay cancer and cardiovascular disease (Block, 1992; Renaud and Delorgeril, 1992).

By taking advantages of the functional properties of onion, several attempts were made to develop new types of processed foods containing onions, such as white bread (Chun *et al.*, 2000), strawberry jam (Kim and

Chun, 2001), extruded snack (Kee *et al.*, 2001), sponge cake (Chun, 2003), and *kochujang* (Kim *et al.*, 2005). In spite of previous investigations, studies on the quality of cookies made with onion powder are scarce in the literature.

The objectives of this research were to assess consumer liking of cookies made with onion powder; and to provide suitable consumer experimental data in developing new types of functional foods.

Materials and Methods

Preparation of raw material

Fresh onions, harvested in June 2006, were obtained from Daelim Farm in Changnyeong-Gun, Gyeongnam, Korea. The soft wheat flour (ranked 1st; CJ Corp., Seoul, Korea), granulated sugar (CJ Corp., Incheon, Korea), butter (Seoul Milk Coop., Yongin, Gyeonggi, Korea), baking powder (Samjin Foods Co., Ltd., Jincheon, Chungbuk, Korea), salt (Hanju Co., Ltd., Ulsan, Korea), and eggs were procured from a local market and stored at room temperature except for eggs before use. The soft wheat flour (100 g) contained 77 g of carbohydrates, 5 g of protein, 1.5 g of lipids, and 10 mg of sodium, respectively.

*Corresponding author: Jun Ho Lee, Department of Food Science and Engineering, Daegu University, Gyeongsan, Gyeongbuk 712-714, Korea.

Phone: +82-53-850-6535, Fax: +82-53-850-6539
E-mail: leejun@daegu.ac.kr

Pre-washed onions were shredded using a food processor (model RVSA, Whirlpool Corp., St. Joseph, Michigan, USA) attached with rotor slicer, dried at room temperature for 2 hours, then lyophilized using a freeze dryer (FDU-1100, Tokyo Rikakikai Co., Japan) at a vacuum pressure of 8.5 Pa after being frozen at -50°C for 48 hours in a deep freezer (VLT 1450-3-D-14, Thermo Electron Corp., Asheville, NC, USA). Dehydrated onions were milled using an analytical mill (DA-282, Daesung Artlon Co., Ltd., Paju, Gyeonggi, Korea) at maximum speed for 90 s and sieved to yield particle sizes less than 300 µm (50 mesh). Onion powders were placed in a desiccator containing saturated LiCl solution prior to cookie making which took within a day.

Cookie baking

Cookie dough was prepared in a mixer (model 5K5SS, Whirlpool Corp., St. Joseph, MI, USA) using a flat beater attachment as described in AACC method 10-52 (AACC, 2000) by substituting 0-8% (based on the total weight of the soft wheat flour and onion powder mixture) of onion powder according to the formulation given in Table 1. The dough was aged for 20 min in a -4°C freezer and then sheeted to a thickness of 0.5 cm with the help of a rolling pin. The cookies were cut with a cookie die of diameter 4.5 cm and transferred to a lightly greased baking tray. The cookies were baked at 170°C for 14 min in a multi-functional convection oven (model GOR-704C, TongYang Magic Corp., Seoul, Korea). The baked cookies were cooled to room temperature for 1 hr and packed in airtight bags. The

range of the independent variable was selected based on the preliminary experiments where onion contents varied 0, 5, and 10%. Samples with 10% onion powder had poor quality, and especially the flavor was too strong. Thus, 8% concentration was chosen as the maximum.

Consumer test

The consumer test, an acceptance test, was conducted on 50 adults (ages between 20 and 30 years old). The consumers were informed that the cookies baked with different amount of onion powder. All samples were labeled with randomly generated three-digit numbers and five samples were presented in random order. The consumers were asked to evaluate the sensory attributes of color, taste, flavor, texture, and overall acceptability. Consumers expressed judgments about samples using a structured numeric scale of seven points (7-point hedonic scale), wherein 7=like extremely, 6=like very much, 5=like moderately, 4=neither like or dislike, 3=dislike moderately, 2=dislike very much, and 1=dislike extremely, for each attribute evaluated. Consumers received a tray containing the samples, a glass of water, and an evaluation sheet. The consumers were given enough space to handle the samples and the questionnaire, and evaluation time was not constrained.

Statistical analysis

The statistical analysis was done using the SAS Statistical Analysis System for Windows v8.1 (SAS Inst. Inc., Cary, N.C., U.S.A.). The means were compared with Duncan's Multiple Range test at 5% level of significance.

Results and Discussion

A 7-point hedonic scale was used to determine which products (cookies made with different amount of onion powder) were preferred by the majority of consumers. Table 2 shows the mean scores of consumer sensory results on the several attributes including color, taste, flavor, texture, and overall acceptability whilst Fig. 1 presents the spider charts on each attribute, respectively. In terms of color, 6% sample received the most

Table 1. Formulation of cookie on substitution of onion powder for soft wheat flour

Ingredients (g)	Sample				
	0%	2%	4%	6%	8%
Soft wheat flour	300	294	288	282	276
Onion powder	0	6	12	18	24
Granulated sugar	135	135	135	135	135
Butter	180	180	180	180	180
Baking powder	7.5	7.5	7.5	7.5	7.5
Salt	0.3	0.3	0.3	0.3	0.3
Egg	30	30	30	30	30
Total	652.8	652.8	652.8	652.8	652.8

Table 2. Mean scores of consumer sensory results (7-point hedonic scale) for cookies substituted with onion powder

Sample	Consumer sensory attributes				Overall acceptability
	Color	Taste	Flavor	Texture	
0% Onion powder	4.64 ^b	4.12 ^a	3.56 ^b	4.20 ^{ab}	3.56 ^c
2% Onion powder	3.12 ^d	4.26 ^a	3.34 ^b	4.10 ^{ab}	3.62 ^c
4% Onion powder	3.48 ^{cd}	4.74 ^a	4.32 ^a	4.00 ^{ab}	4.30 ^b
6% Onion powder	5.52 ^a	4.66 ^a	4.74 ^a	4.62 ^a	5.30 ^a
8% Onion powder	3.98 ^e	4.42 ^a	4.34 ^a	3.78 ^b	4.60 ^b

^{a-d}Different letters within the same column indicate significant difference ($p < 0.05$).

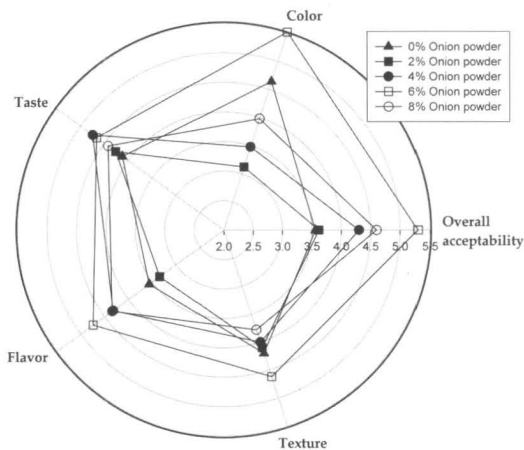


Fig. 1. Consumer sensory profiles of onion cookies found by the consumers.

favorable mean score of 5.52, which is significantly higher than others ($p < 0.05$) followed by the control sample (0%). On the other hand, 2% sample received the lowest score with respect to color among all samples tested. Kim *et al.* (2007) reported significant decreases in L^* -values of onion cookies with increasing the amount of onion powder. The substitution of onion powder increased the total sugar content, which may have resulted cookies with lower L^* -values after baking. It appeared that the consumers did not prefer highly dark cookies, which may look burnt.

The sensory preference on taste was not significantly affected by the amount of onion powder. The scores of sensory taste varied from 4.12 to 4.74, and they were not significantly different each other ($p > 0.05$). This also

indicates that all samples were considered as somewhere between “like moderately” and “neither like or dislike”. It is noted that cookies with onion powder regardless of the concentration received the higher scores of taste than that of the control (cookies without onion powder).

The scores of sensory flavor ranged from 3.34 to 4.74. Samples with 6% onion powder received the highest mean score of 4.74 which is significantly higher than that of control and 2% sample ($p < 0.05$). There were no significant differences found among 4%, 6%, and 8% samples in terms of sensory flavor ($p > 0.05$). It is also noted that the consumers appeared to accept the onion flavor when consuming the cookies unless it is too strong.

The onion powder content was not a strong factor to influence the consumer preference on texture. Seog *et al.* (2007) reported that the hardness of onion cookies when determined objectively was not strongly related to the onion powder in the formulation. Nonetheless, 6% samples received the highest score of 4.62 as compared to that of 8% samples (=3.78) and they were significantly different ($p < 0.05$).

With respect to overall acceptability, 6% samples received the highest mean score of 5.30, which is significantly higher than others ($p < 0.05$). Control received the lowest mean score of 3.56 and this is not significantly different each other with that of 2% sample ($p > 0.05$). It is noted that 6% samples received the highest score in all sensory attributes tested although they were not significantly different each other in some cases. It is recognized that increase in the amount of onion (or powder, onion pomace) is not directly related to produce the most acceptable (preferred) products. For example, addition of 10% onion pomace or onion received significantly higher values ($p < 0.05$) of overall eating quality when producing extruded snack with up to 30% (Kee and Park, 2000). In addition, 10% substitution of onion with strawberry when preparing strawberry jam with up to 40% resulted in a product with significantly higher values in the overall acceptability (Kim and Chun, 2001).

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