

## Establishment of Sensory Evaluation Panel for A Biscuits Manufacturing Industry

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**Abstract-** The food sector is highly reliant on quality and price of the product. Sensory evaluation is a scientific approach to assess food sensorial quality criteria while eating. The purpose of this study was to establish a new sensory panel and train the members to evaluate their performances on product-oriented sensory panel in the Ceylon Biscuits Limited, a conglomerate and well grown and popular food industry in Sri Lanka. Therefore, the necessity has arisen to possess a properly structured framework of sensory analysis for obtaining reliable, accurate and repeatable results which may be important in the critical business decisions that are heavily depended on assessment of the quality of product. Initially interested 52 staff members, with good health, were selected from the questionnaire distributed among them from the same organization. Then they were defined by a set of screening tests, including basic taste identification test, odor identification test, ranking test for basic taste. Results of the sensory evaluation data were statistically analyzed using Friedman test and chi-square tests with SPSS software. In each test, the samples showed to be significantly different from one another ( $p < 0.05$ ). The performance of the panelists was not found to be significantly different for basic taste and odor ( $p > 0.05$ ). Hence, they can be considered as a homogenous trained sensory panel. Finally, 13 members who were able to identify all the tastes and more than 80% of the odors of the samples were selected as sensory panel members for the company.

**Keywords:** Ceylon Biscuits Limited, Screening test, Sensory evaluation, Sensory panel

### I. INTRODUCTION

Sensory evaluation is the process of identifying, measuring, analyzing and interpreting a product's features (attributes) as determined by the five senses of sight, smell, taste and hearing (Jayashantha, 2006). Sensory characteristics are

more important than most of the other factors. Foods are complex mixtures of organic and inorganic compounds (Nunez *et al.*, 2005). During consumption various physio-chemical characteristics of the food stimulate all of human senses to some extent. These stimulations are saltiness, sweetness, redness, toughness, acidity, iciness, viscosity, size, shape, opacity, gloss, lightness, blueness, greenness and earthiness (Jayashantha, 2006).

Sensory professionals are invited to make decisions during the different stages of a product development, from the conception to post – launch monitoring. Sensory evaluation and consumer testing can provide precise information related to human behavior and perception at a deeper level (Kemp *et al.*, 2011). Identifying the key sensory features is important for determining acceptability across a product categories and sensory – based target consumer segments, as well as analyzing competitor products and evaluating novel concepts. Sensory testing is done for several purposes such as ensuring the standard products do not enter onto the market and determining shelf life and product variability through the supply chain. It is also performed to identify new technologies to improve product development and understanding consumer behavior (Kemp *et al.*, 2009).

Both trained personals and consumers can make a sensory panel where trained personals are used to evaluate treatment variations in the product being evaluated. A range of factors need to be considered when forming a consumer panel such as the target populations, demographics, the number of the markets to test, and product consumption trends. A trained panel may have fewer members because they are highly trained and selected. Utilizing a sensory panel when available is beneficial because it concerns from people's impressions (Ramanathan, 2020).

A sensory analysis panel consists of actual “measuring instruments” and due to that the results are depended on the panel members. Therefore, the process of recruiting people who are interested in participating in a panel should be handled with care and treated as a real tool, both in terms of time and money (Murray *et al.*, 2001). It is essential to undertaken a preliminary screening of the candidates during the hiring process, in order to identify those who are unsuitable for sensory analysis (Carpenter *et al.*, 2000). However, the final selection and training are important. The panel leader is in charge of overseeing the group of expert assessors and ensuring that they are properly trained. Since having a well-trained sensory evaluation panel is very important to a company related to food sector, the present study is aimed to establish a sensory panel and train new members to evaluate their performances on product-oriented sensory panel in the Ceylon Biscuits Limited, a conglomerate and well grown and popular food industry in Sri Lanka.

## II. METHODOLOGY

### A. Recruiting panelist

The panelist for the trained panel was chosen among the staff members of the organization. All prospective panelists were instructed to fill out a google sheet including the details being furnished such as their food likes/ dislike, level of interest in the project to be carried out, any food restriction, allergic reactions, age, medical treatments (for diabetes and hypertension), involvement in product testing and decision making activities regarding product quality, their habits (Consuming alcohol, smoking cigarettes and consumption of spicy foods regularly) and presence at a given time period. After obtaining responses from adequate numbers of personals, all the details were arranged and 66 personals were finally selected for the whole organization.

### B. Screening the panelist for the training

01) *Ranking test for selecting the threshold level:* Ranking test for basic test samples, each sample was prepared with different concentration of the stock solutions as given in Table 01 and diluted to a certain concentration and presented to the randomly selected persons. They were then requested to rank each sample and mention the taste of each series. The instructions for the members were given on top of the ballot paper to rinse their mouth with water between the samples. All the sample containers were with three digits

which coded with random patterns before presenting to the participants who recorded their results in their own ballot paper which were in ascending order for each basic taste of sample and in an identical level according to the sample concentration (Table 02). Considered all the ballot paper results were selected average of the threshold level for basic taste samples.

Table 01: Stock solutions

Basic Taste	Stock Solution		Percentage (%)
	Sample weight (g)	Water amount (ml)	
Sweet (sucrose solution)	25	250	10%
Salt (NaCl)	25	250	10%
Sour (citric acid)	2.5	250	1%
Bitter (caffeine)	0.25	250	0.1%

Table 02: Concentration of each basic taste for ranking test

Basic Taste	Stock Solutions	Concentration
Sweet (Sucrose solution)	A- 25g/250ml	A1- 5ml of A/500ml A2- 10ml of A/500ml A3- 15ml of A/500ml A4- 20ml of A/500ml A5- 25ml of A/500ml A6- 30ml of A/500ml A7- 35ml of A/500ml A8- 40ml of A/500ml
Salty (NaCl Solution)	B- 25/250ml	B1- 2ml of B/500ml B2- 4ml of B/500ml B3- 7.5ml of B/500ml B4- 10ml of B/500ml B5- 12.5ml of B/500ml B6- 15ml of B/500ml B7- 17.5ml of B/500ml B8- 20ml of B/500ml
Salty (NaCl Solution)	C- 2.5g/250ml	C1- 5ml of C/500ml C2- 10ml of C/500ml C3- 15ml of C/500ml C4 - 20ml of C/500ml C5- 25ml of C/500ml C6 -30ml of C/500ml C7- 35ml of C/500ml C8- 40ml of C/500ml
Bitter (Caffeine)	D- 0.25g/250ml	D1- 4 ml of D/500ml D2- 5 ml of D/500ml D3- 6 ml of D/500ml D4- 7.5 ml of D/500ml D5- 10 ml of D/500ml D6- 15 ml of D/500ml D7- 20 ml of D/500ml D8- 30 ml of D/500ml D9- 40 ml of D/500ml

02) *Basic taste identification:* The basic selection for the sensory panel was done using questionnaires considering the candidate's age, health status, availability, interest, and motivation. The selected individuals were subjected to a series of screening tests outlined in ISO standards (ISO 8586:2012). The Basic Taste Identification Test used four basic tastes (sweet, sour, bitter, and salt) that were made with food-grade reference substances (Table 03) and presented to each assessor at random, with the task of identifying the taste of the samples.

Table 03: Basic Taste Recognition Test

Taste Basic	Stock solutions	Concentration
Sweet (sucrose solution)	A – 25g/250ml	A – 40ml of A/500ml
Salty (NaCl solution)	B – 25g/250ml	B – 3ml of B/500ml
Sour (Citric acid solution)	C – 2.5g/250ml	C – 30ml of C/500ml
Bitter (Caffeine)	D – 0.27g/250ml	D-30ml of D/500ml

03) *Basic odor recognition test:* This testing was carried out by a common house hold odors as given in Table 04. One liter of water was measured with measuring cylinder and poured into six of

blank plastic jugs as one liter for each jug. Then 1g/1ml of each sample (vinegar, vanillin, cinnamon, clove, lemon and mustard) as powder or liquid was measured and mixed well with spoon with water separately. Assessors were provided with reference samples randomly (Silva *et al.*, 2014).

Table 04: Basic Odor test

Substance	Odor
Vinegar	Sour/ Acetic
Vanillin	Vanillin
Cinnamon	Cinnamon
Cloves	Clove
Lemon	Lemon
Mustard	Mustard

### C. Training of the Selected Panelists

Finally, 10-15 number of persons having high sensory sensitivity were selected. Then they were moved to the basic sensory training which was conducted by qualified professionals. Since the Ceylon Biscuits Limited is mainly manufacture biscuit, the selected candidates were specifically trained for biscuit production.

## III. RESULTS AND DISCUSSION

Out of 52 candidates who filled and submitted their questionnaire, only 13 candidates were screened out being considered their health conditions, whether they were taking long term medicine that could damage their senses and suffer from any food allergies.

Table 05: Summary of the basic taste recognition test

		Participant	TI (Sweet)	DI (Sweet)	TI (Salt)	DI (Salt)	TI (Sour)	DI (Sour)	TI (Bitter)	DI (Bitter)
N	Valid	52	52	52	52	52	52	52	52	52
	Missing	0	0	0	0	0	0	0	0	0
Mean		26.50	.96	.96	.81	.67	.92	.92	.63	.44
Median		26.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
Mode		1 <sup>a</sup>	1	1	1	1	1	1	1	0
Std. Deviation		15.155	.194	.194	.398	.474	.269	.269	.486	.502
Sum		1378	50	50	42	35	48	48	33	23

Taste Identification – TI, Difference Identification – DI, Taste identification (Sweet) was most frequency 50 out of 52 which was 96.2 %.

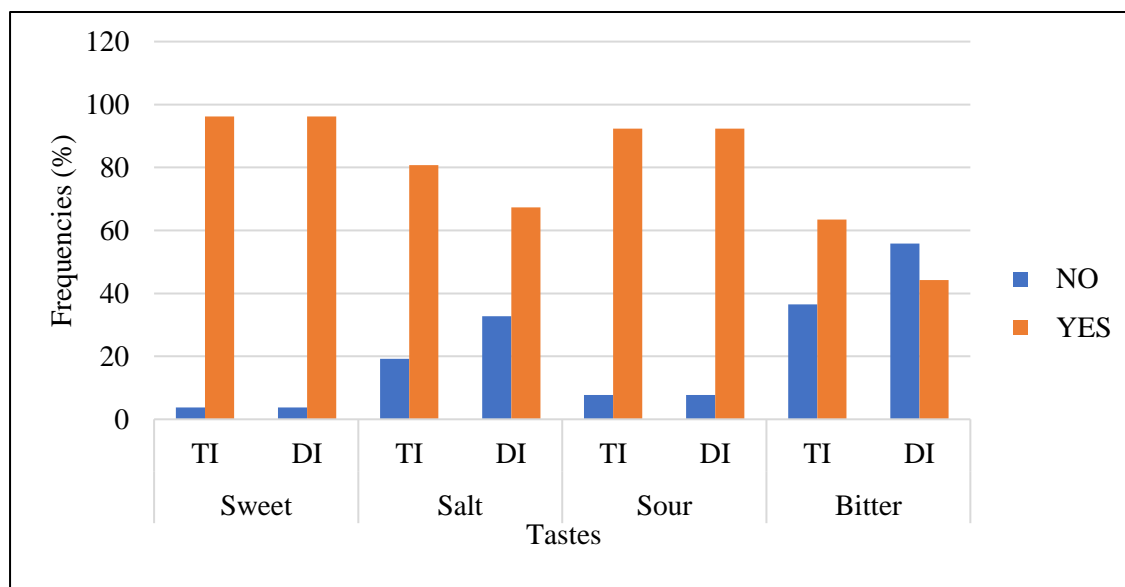


Figure 1: Frequencies of scores obtained for different tastes

Table 06: Summary of the basic odor recognition test

		Participant	Vinegar (A)	Vanilla (B)	Cinnamon (C)	Cloves (D)	Lemon (E)
N	Valid	52	52	52	52	52	52
	Missing	0	0	0	0	0	0
Mean		26.00	.57	.53	.76	.63	1.00
Median		26.00	1.00	1.00	1.00	1.00	1.00
Mode		1 <sup>a</sup>	1	1	1	1	1
Std. Deviation		14.866	.500	.504	.428	.488	.000
Sum		1326	29	27	39	32	51

a. Multiple modes exist. The smallest value is shown

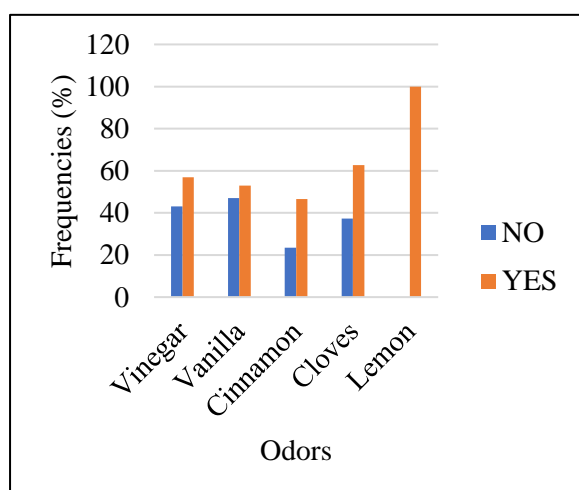


Figure 2: Frequencies of scores obtained for different odors

Figure 1 shows the frequencies of scores obtained for different tastes and figure 2 shows the

frequencies of scores obtained for different odors tested in this study. The tastes of all the samples were identified by 13 candidates out of 52 correctly in the basic taste identification test and they were also able to describe the odors of more than 80% of the samples correctly in basic odor recognition test. Some people found difficulties in describing certain odors, even though they felt that they were familiar with these odors. Hence, these 13 candidates were selected as the panelists for the sensory panel. The selected panel was trained in the detection and recognition of different tastes and odors. In a previous study done by Silva *et al.* (2014) to recruit and train the product oriented sensory panel, 19 out of 29 members were able to identify all the tastes (sweet, salt, sour and bitter) in the basic taste identification test and a total of 17 participants were able to describe the odors of

more than 65% of the samples correctly in the odor recognition test.

According to the output of the non-parametric Friedman test, sample, taste and odor were significantly different among the tested samples ( $p < 0.05$ ) (Table 07). The members of the panel were taught how to identify and recognize tastes and odors using paired comparison test for both taste and odors. The acquired results were statistically analyzed at significance level of 0.05. The analysis was performed by chi-square test. Performance of the existing panel was confirmed to meet the requirements. Then 13 new members were recruited for the sensory panel. The performance of the panelists was found to be not significantly different in for basic taste and odor (Table 08). Hence, they can be considered as a homogenous trained sensory panel.

Table 07: Results of Friedman test for sensory evaluation performance of candidates

	N	Mean	Std. Deviation	Min	Max	Rank
Sample	52	3.00	.863	1	4	1.71
Taste	52	3.33	.944	1	4	2.01
Odor	52	3.50	1.213	1	5	2.28

Test Statistics <sup>a</sup>	
N	52
Chi-Square	11.386
df	2
Asymp. Sig.	.003
a. Friedman Test	

Significant level of  $p < 0.05$

Table 08: chi-square test for the performances of the panelists

	Pearson chi Square	Asymptotic Significance (2-sided)
Taste	52.000 <sup>a</sup>	0.435
Odor	51.000 <sup>a</sup>	0.434

Significant level of  $p < 0.05$

#### IV. CONCLUSION

A sensory evaluation panel having thirteen new members was formed for Ceylon Biscuits Limited, Sri Lanka. These 13 members were able to

identify all the tastes and more than 80% of the odors of the samples. The performance of the panelists was found to be not significantly different in for basic taste and odor test. Therefore, this panel can be considered as a homogenous trained panel and can be used for the sensory evaluation of biscuit products of the company in future.

#### REFERENCES

Carpenter, R.P., Lyon, D.H. and Hasdell, T.A., 2000. Who are the right people for sensory analysis. In Guidelines for sensory analysis in food product development and quality control Springer, pp. 71-93.

Jayashantha, D. H. V., 2006. Establishing a sensory testing laboratory panel and procedure for biscuit industry. University of Sri Jayawardhanapura. pp 1-80.

Kemp, S. E., Hollowood, T. and Hort, J., 2009. Sensory evaluation practical hand book, John wiley and sons, 2-4

Kemp, S.E., Hollowood, T. and Hort, J., 2011. Sensory evaluation: a practical handbook. John Wiley & Sons

Murray, J.M., Delahunty, C.M. and Baxter, I.A., 2001. Descriptive sensory analysis: past, present and future. Food research international, 34(6), pp.461-471.

Nunez, O., Moyano, E. and Galceran, M.T., 2005. LC-MS/MS analysis of organic toxics in food. TrAC Trends in Analytical Chemistry, 24(7), pp.683-703.

Ramanathan, R., Mafi, G.G., Yoder, L., Perry, M., Pfeiffer, M., VanOverbeke, D.L. and Mheswarappa, N.B., 2020. Biochemical changes of postmortem meat during the aging process and strategies to improve the meat quality. In Meat quality analysis Academic press, pp. 67-80.

Sharif, M. K., Sadiq, M. B., Hafiz, R. S. and Muhammad, N., 2017. Sensory Evaluation and Consumer Acceptability. National Institute of Food Science and Technology, University of Agriculture. 6 (1), pp 362- 386.

Silva, A.Y.S.L., Binduhewa, A.M.C.U. and Subodinee, A.A.M., 2014. A study to recruit and train the product oriented sensory panel. International Journal of Multidisciplinary Studies. 1(2), pp. 247-250.