SENSORY EVALUATION OF CAKE-MIX SAMPLES

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ABSTRACT

The quality of cake and batter samples from selected commercial cake-mixes were assessed by sensory panel evaluation and instrumental analyses. There was no relationship between mean sensory scores for sample texture and the consistency & compressibility values obtained. However, consistometer readings for batter seem to follow a similar trend as the sensory scores of the corresponding cake samples. If this relationship is well established, it could serve a very convenient and inexpensive role in predicting sensory characteristics of cake from instrumental analysis of the batter. Sensory panel judges were very consistent and no significant variations were observed among judges' decisions.

INTRODUCTION

Instant cake-mixes were developed to facilitate a more convenient and less time-consuming way of preparing cakes. As with most bakery products, the textural characteristics as well as other sensory properties of cakes are delicate attributes that have a great influence on consumer acceptability. A cake-mix is therefore expected to possess the necessary ingredients in the right proportions to impart these desirable sensory characteristics to the batter and cake. A manufacturer must device a reliable method of sensory quality evaluation of the product to maintain consistency of quality.

Although sensory panels are the most widely used method of establishing the quality of foods in industry (Nakayam and Wessman, 1979), this is time-consuming, complex and subject to error due to the variability of human judgment. Present attempts are therefore to replace sensory panel evaluation with instrumental analyses. However, as noted by Trent et al (1981), there is the need to initially establish the extent to which the instrumental measurements correlate with the sensory judgments for which they are to substitute. Objective measurements lack real meaning without correlation to sensory measurements (Ellis, 1970; Szczeniak, 1977).

The purpose of this study was to relate intensity of perceived sensory characteristics of batter and cake from different cake mixes with selected instrumental analyses. The judges' performance as well as differences in the brands of the cake-mix used were also evaluated.

MATERIALS AND METHODS

Cake-Mix Samples

Three popular commercial cake-mixes (Duncan-Hines delux 11 yellow cake-mix, Betty - Crocker instant pudding yellow cake-mix, and jiffy yellow cake-mix) were obtained from a local grocery store; being selected as representative of instant cake-mixes in the US. Fresh eggs, and vegetable oil required as additional ingredients were also obtained locally.

Preparation of batter and cake samples

The manufacturer's instructions regarding additions and preparation procedures as stated on the packages were strictly followed for the preparation of batter and cake samples from each product. Basically each sample was mixed for a specified time with eggs and water and the resulting batter divided into three portions. One portion was reserved at room temperature for sensory evaluation while the other two portions were used for instrumental measurements and cup cake preparation respectively.

Judges

Six milling participants from the Food Quality Evaluation Class at W.S.U., aged between 20 and 25 yrs, were chosen for the test. Judges tested samples at the same time each day (Between 4:00pm & 4:30pm). An orientation session, and three replicate sessions were obtained for each judge.

Sensory Methods

Structured category scaling with a 7-point scale and anchor words (Larmond, 1977) was used to evaluate the intensity of selected sensory qualities of the batter and cake samples. Specified characteristics evaluated were texture (fluffy/compact for cake and smooth/lumpy for batter), color (bright/pale), sweetness (very sweet/not sweet), and

overall acceptability (good/bad). Because the batter was found to be a great deal sweeter than the cake, panelists were asked to evaluate the batter first to avoid any contrast effects. Cake samples were all cooled to room temperature (24°C) before presenting to judges. All tests were conducted in individual booths under white illumination; and judges were required to evaluate samples for each sensory characteristic described.

Instrumental Analysis

The Baker Compressimeter as described by Platt and Powers (1940), and Pomeranz et al (1966), was used to determine the compressibility of cake samples. Sample size, temperature (24°C) and degree of depression (25mm) were factors kept constant. This analysis is to test if the compressibility as measured instrumentally will have any relationship with the fluffiness or compactness (firmness) as evaluated organoleptically,

The Adams Consistometer (Marsh et al 1978) was used for measuring the consistency of batters by quantitatively observing the spread of fixed amount (3/4 cup) in 30 seconds. Four readings were taken in different directions of spread and the average determined. Temperature was kept constant at 24°C.

RESULTS AND DISCUSSIONS

The mean sensory scores of batter and cake samples are given in Table 1, for the different sensory characteristics. Variance ratio tests used to determine statistical significance of observed differences among samples and also among judges indicate no significant judge variation except for batter color and cake sweetness. All sensory attributes determined for batter were also the same except for color where a high degree of paleness in color was scored for "Jiffy". Betty-Crocker samples were scored very bright. Significant differences were observed for color and overall preference in different cake samples. The color differences were the same as observed in the batter.

Table 1. Mean sensory scores of Batter and Cake Samples from three brands of Instant Cake mixes

	Brands			Variance Ratio - F	
	B-Crocker	D-Hines	Jiffy	Samples	Judges
BATTER					
Texture	2.59a	2.09a	2.74a	1.33ns	1.65ns
Sweetness	2.34a	2.31a	2.90a	1.00ns	1.73ns
Color	1.51c	4.10b	5.60a	106.00**	4.14*
Preference	2.50a	2.84a	3.16a	1.00ns	1.10ns
CAKE					
Texture	2.86a	3.29a	3.20a	1.5ns	0.6ns
Sweetness	2.59b	2.66b	2.93a	9.8**	3.8*
Color	1.60c	3.26b	5.37a	92.70**	2.9ns
Preference	2.27b	2.04b	3.51a	5.8ns	0.8ns

a,b,& c, Means followed by the same letters are not significantly different (P 0.05)

* = Significant differences (P 0.05)

** = Highly significant differences (P 0.01)

ns = not significant

The instrumental analyses for textural characteristics of the samples are listed in Table 2. The mean consistency (Units/30 secs.) of batter samples were found to be the same for all the 3 brands (using Tukey's Test of Significance; Steel & Torrie, 1980). The cakes however had a relatively high-compressibility values (gram force) for Jiffy samples than for the other two brands. The sensory scores, it would be recalled, did not show any differences for both cake and batter samples.

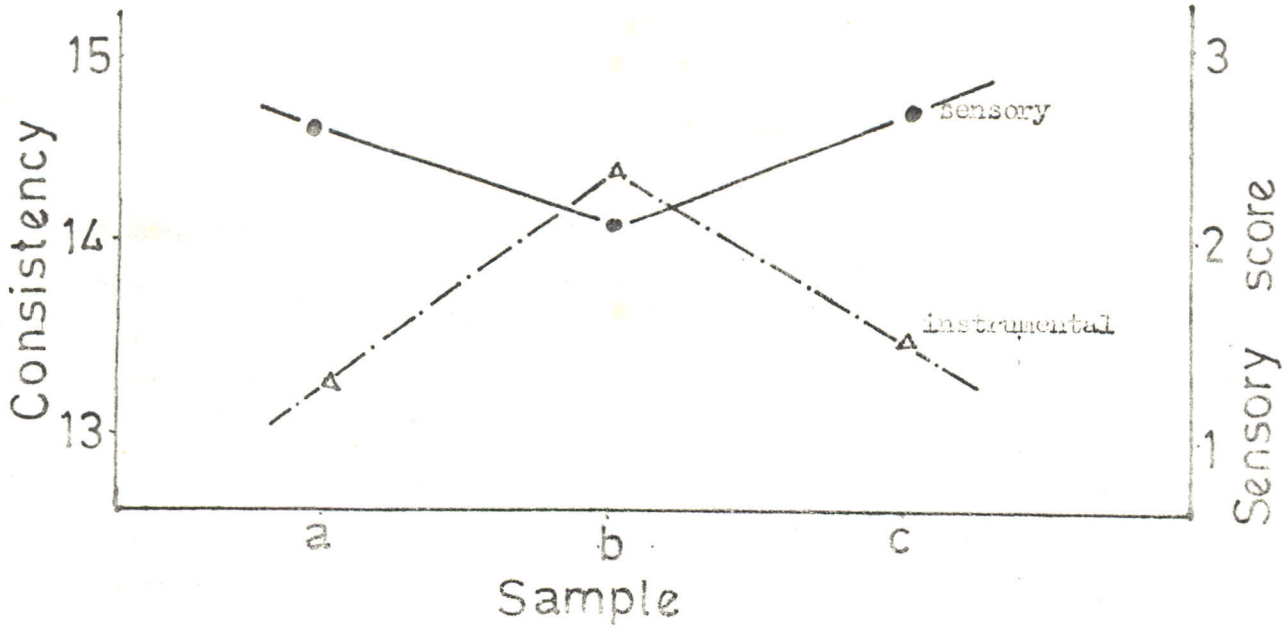
Tsble 2. Consistency (Spread/30 secs.) and Compressibility (gm force per 25mm depression) of Batter and Cake Samples respectively.

	Betty Crocker	Duncan Hines	Jiffy
BATTER			
Mean Consistency	13.3a	14.4a	15.5a
Std. deviation	0.7	0.9	1.4
CAKE			
Mean compressibility	7.8b	8.5b	13.2a
Std. deviation	1.4	1.8	1.6

a,b : Means followed by the same letters are not significantly different (P 0.05)

Fig. 1 shows the relative shapes of curves obtained for sensory scores and physical measurements for texture and overall preference of the samples. Correlation coefficients were not used because of the small number of samples involved (Krammer, 1969). The shapes of the curves for the texture of batter and cake samples (Fig 1a and 1b) indicate no relationship between two methods of textural quality assessment. However, the shape of the batter consistency curve as measured instrumentally (Fig.1a) is similar to that of the organoleptic assessment of the cake texture (Fig. 1b). If this indicates a relationship, then the consistometer can be used to predict the cake texture as would be perceived organoleptically; and thus provide an inexpensive, convenient and reliable way of assessing the quality of a cake-mix. However, further studies with more data than obtained in this study will be required to establish this possibility.

a. Texture of Batter



b. Texture of Cake

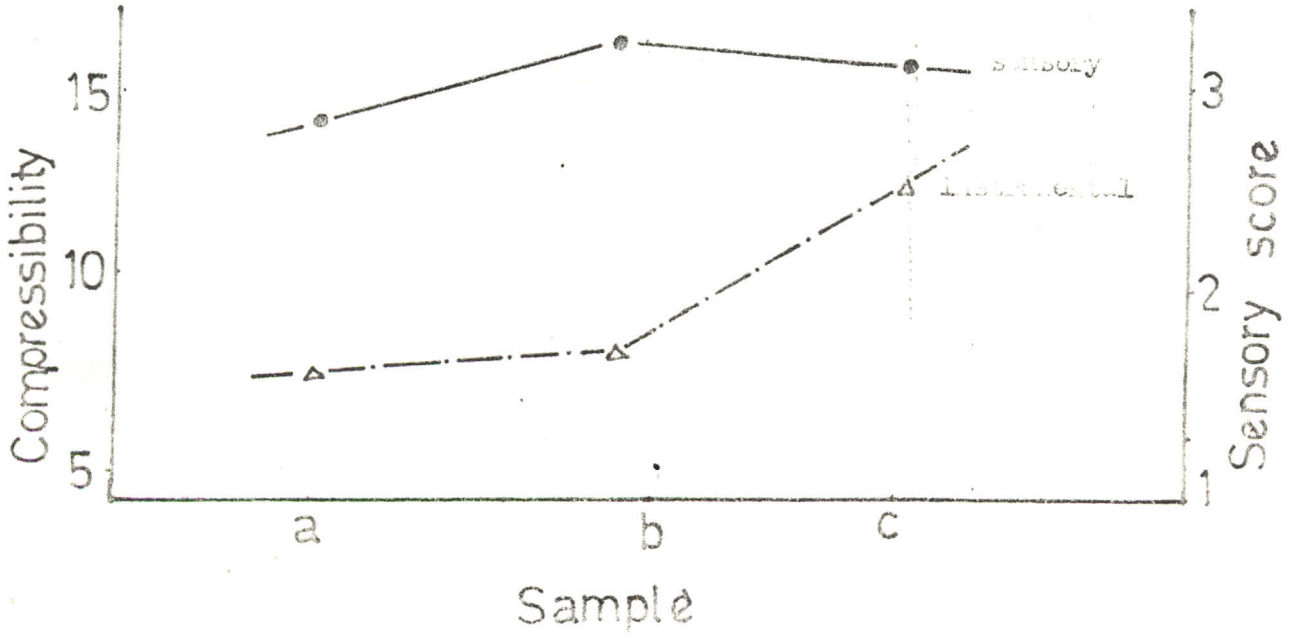


Fig. 1: Curves for sensory scores (●) and instrumental analysis (Δ) for batter and cake texture.

Figs 2a & 2b show curves for mean sensory scores for overall preference and also for the instrumental measurements of consistency and compressibility of batter and cake respectively. Consumer preference does not depend on any one characteristic property of a a sample and cannot therefore be correlated with a particular instrumental measurement (Trant, et al. 1981). The purpose here is just to compare the shapes of the curves to see if there is any indication of texture being an influence on acceptability. From the curves, only the cake compressibility seem to follow a similar trend as the preference scores.

Concerning the performance of judges, the variance ratios shown in Table 1 indicate no significant variation among judges for a number of the characteristics determined. Individual judge's consistency in scoring also appears to be quite good as indicated by the low standard deviations for individual mean scores (Tables 3 & 4). A number of judges had zero standard deviation for some scores.

In conclusion, this study has shown that sensory assessment of certain characteristics of the texture of cake and batter does not seem to correlate with the compressibility and consistency respectively, as measured instrumentally. However, preference of cake samples may be influenced highly by the texture. Also, instrumental assessment of batter consistency may be able to predict the sensory appraisal of the cake texture. Judges used in this study were quite consistent and there was little or no significant variation among judges' decision s. Considering the cake-mix brands, color appears to be the main difference in the samples used.

For a more reliable and meaningful conclusions, however, more samples than used in this study are required.

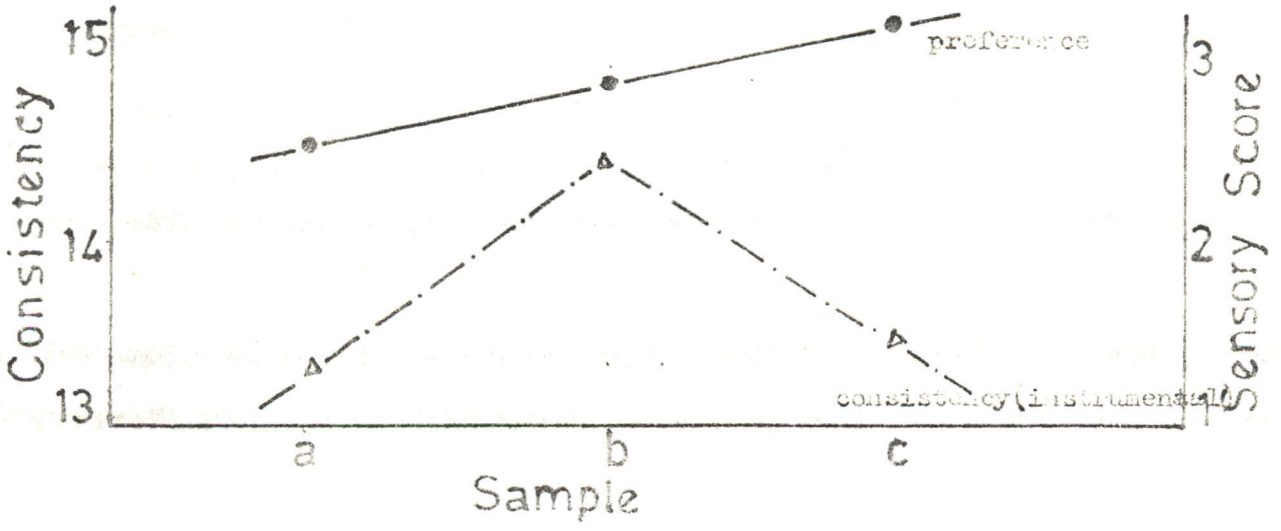


Fig. 2a : Batter consistency and overall preference curves

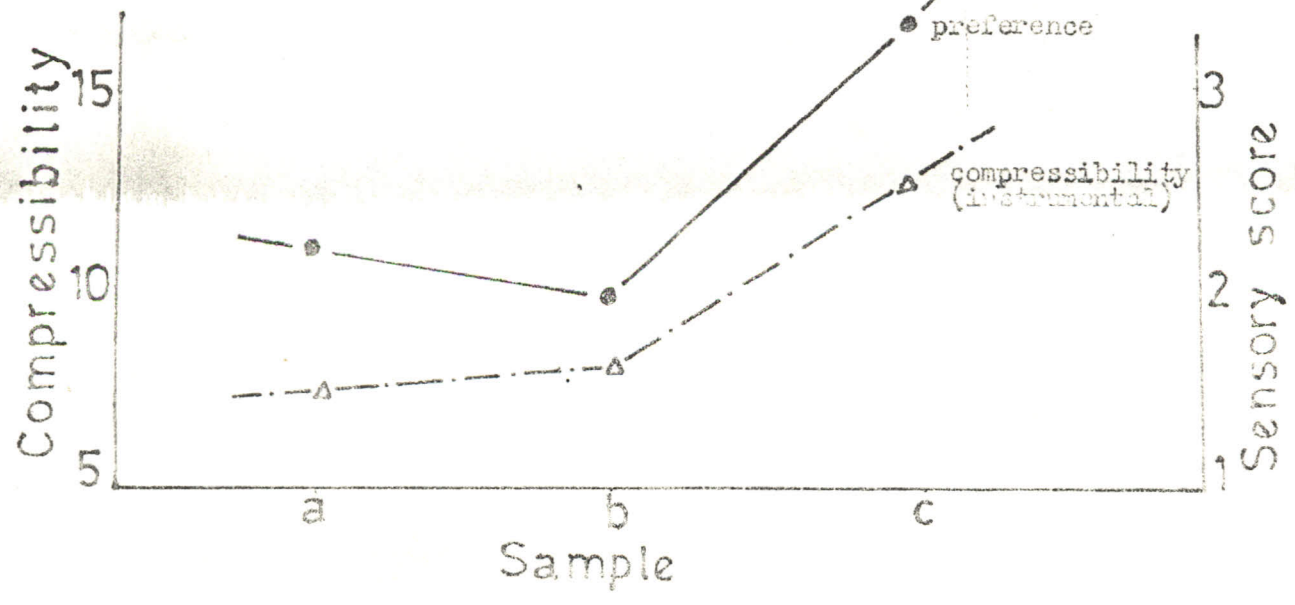


Fig. 2b: Cake compressibility and overall preference curves.

Table 3. Individual mean scores for Batter Sensory Characteristics

		JUDGES					
Texture(creamy-lumpy)		1	2	3	4	5	6
B-Crocker	Mean score	1.7	1.7	3.0	2.3	3.7	3.7
	std. dev.	0.2	0.3	1.0	1.5	1.5	1.2
D-Hines	Mean score	1.7	1.9	1.7	2.3	2.7	1.3
	std. dev.	0.2	0.8	0.2	0.6	0.6	0.6
Jiffy	Mean score	1.7	1.5	3.7	4.3	3.0	3.0
	std. dev.	0.6	0.3	1.5	1.5	1.7	2.0
Color (bright-pale)							
B-Crocker	Mean score	1.0	2.3	2.0	1.0	1.3	1.1
	std. dev.	0.0	0.5	0.0	0.0	0.6	0.0
D-Hines	Mean score	2.7	4.3	4.0	4.0	3.7	4.0
	std. dev.	0.6	0.8	0.0	1.0	0.6	1.0
Jiffy	Mean score	4.3	5.6	6.0	5.3	5.7	6.3
	std. dev.	1.5	1.2	0.0	1.5	1.5	1.2
Sweetness							
B-Crocker	Mean score	2.0	2.0	2.7	2.0	3.0	2.7
	std. dev.	1.0	0.4	0.5	1.0	1.0	1.1
D-Hines	Mean score	2.0	1.2	2.7	3.7	3.3	1.3
	std. dev.	1.0	1.0	1.2	0.6	1.5	0.6
Jiffy	Mean score	1.3	1.7	4.0	5.3	2.7	3.0
	std. dev.	0.6	0.6	1.0	0.6	0.6	0.5

Table 4 . Individual mean scores for Cake Sensory Characteristics

		JUDGES					
Texture (fluffy-compact)		1	2	3	4	5	6
B-Crocker	Mean score	2.7	2.5	1.0	2.7	2.7	3.7
	std. dev.	0.6	0.2	0.0	0.6	0.6	1.2
D-Hines	Mean score	2.0	2.6	2.7	5.3	3.7	2.7
	std. dev.	0.6	0.3	0.6	1.5	1.2	0.6
Jiffy	Mean score	4.0	2.8	4.0	3.3	3.3	3.0
	std. dev.	1.0	1.0	1.0	0.6	1.5	0.0
Color (bright-pale)							
B-Crocker	Mean score	1.7	1.5	1.7	1.3	2.0	1.0
	std. dev.	0.6	0.3	0.6	0.6	0.0	0.0
D-Hines	Mean score	2.7	3.1	2.3	3.7	3.0	3.0
	std. dev.	0.6	0.5	0.2	0.2	0.0	1.0
Jiffy	Mean score	5.3	5.6	4.7	6.3	5.7	5.0
	std. dev.	1.2	0.7	0.6	0.6	0.6	1.0
Sweetness (increasing)							
B-Crocker	Mean score	2.3	2.1	2.7	4.0	2.3	1.7
	std. dev.	0.6	0.6	0.6	1.0	0.6	0.6
D-Hines	Mean score	1.7	2.1	2.7	2.7	3.7	2.7
	std. dev.	0.6	0.6	0.6	0.6	1.0	0.6
Jiffy	Mean score	3.3	2.6	3.3	6.0	5.0	3.3
	std. dev.	1.5	0.7	1.5	1.0	1.0	1.0
Preference (decreasing)							
B-Crocker	Mean score	2.0	2.3	1.3	2.0	2.3	2.0
	std. dev.	0.2	0.2	0.6	0.6	0.6	0.0
D-Hines	Mean score	2.0	1.7	2.0	1.3	3.3	2.0
	std. dev.	0.2	0.2	0.5	0.6	0.6	0.5
Jiffy	Mean score	3.3	2.3	3.7	5.3	4.3	2.7
	std. dev.	1.1	0.9	0.6	0.6	1.1	0.6

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