CONSUMER EVALUATION OF STRAWBERRY PRESERVES

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Master of Science

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by

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CHAPTER I

INTRODUCTION

Consumer evaluation of food is a major problem in food research. In the manufacture of a food product, producers have to decide which among the possible variations of an item will be preferred by the consumer.

Knowledge of consumer preference for preserves made from different varieties of strawberries is essential to strawberry growers and food processors engaged in preserve making. This information is needed in stimulating consumer demand and broadening the market. Due to constantly changing demand, consumer research is never consumated.

It is recognized that many factors influence consumer reactions to strawberry preserves. Extensive research by Worthington (32), Pangborn (17), and Warner-Jenkinson (27) has established that color, flavor, and texture greatly influences consumer acceptance of food.*

Consumer preference and acceptance can be determined

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*The numbers in parentheses represent similarly numbered references in the Bibliography.

by the frequency and quantity of consumption of a product. However, considering the complexity of food production and new product development, forecasting the acceptability of a food by this method would be impractical if not impossible. The alternative is to present the product to a representative group of consumers for evaluation.

In this study strawberry preserves made from Blakemore, Surecrop, and Tennessee Beauty varieties were evaluated for:

1. Differences in color, flavor and texture as determined by objective measurements.
2. Differences in color, flavor, and texture as determined by a trained laboratory panel.
3. Consumer preference on the basis of color, flavor, and texture.

CHAPTER II

LITERATURE REVIEW

I. SENSORY EVALUATION

The past thirty years have been marked by a rapid development in the field of sensory evaluation of foods. The slow transition from casual taste testing and sniffing to rigorously controlled food psychophysics has brought the field into a complete and trying adolescence that promises to be prolonged. Maturity is still in the distant future in relation to the growing list of unsolved problems. However, significant advances have been made in this dynamic area of food science and technology.

Consumer taste is the major problem in food research today. According to Parker (21), Pangborn and Nickerson (20), Pangborn (17), and Little (16) food processors are becoming increasingly aware of the importance of consumer opinion and their selection of foods.

Kiehl and Rhodes (12) state that the concepts of the terms preference and acceptance by research workers have

been understandably diverse. The connotation of preference refers to the choice or the ordering of choices among two or more alternate products in a given environment by a consumer or group of consumers. Acceptance refers to the degree of salability of the product in a given situation.

Consumer acceptance surveys and taste panel evaluations have become an integral part of most research pertaining to foods. Boggs and Hanson (2) suggest that experiments in this aspect of food research be designed to: (1) minimize within sample variation, (2) limit the number of samples and characteristics of each that are judged in one period, (3) submit at one time all the samples for which comparative data are desired, (4) relate experimental samples to control samples, (5) mask all characteristics except the one under consideration, (6) eliminate samples of strong odor or flavor when possible, and (7) judge sufficient replicates to show that trends can be reported or replicate sufficiently that data can be analysed statistically.

The number of samples which may be served to a flavor panel at one time is important. Calvin and Sather (4) reported that up to twenty samples may be included in one test period without suffering psychological fatigue, if the

products were mild flavored.

Gridgeman (7) performed an experiment to test the relative power of experimental designs for the detection of small differences in the intensity of quality of two flavors. They were: (1) paired tests (which is the stronger? or, which is the regular flavor?); (2) duo-trio tests (which of the two coded aliquots is identical with the third "standard" aliquot?); and (3) triangle tests (which of the three aliquots is odd?). The results suggest that paired tests and triangle tests are normally about equally superior to duo-trio tests.

Byer and Abrams (3) found that in tests using different concentrations of quinine or dextrose in acqueous solutions, the two sample tests reflected discrimination of higher statistical significance than the triangle tests.

There is a general understanding that accurate estimates of consumer preference require large numbers of tasters. Kramer et al. (13) reported that consumer preference for fruit drink was determined accurately and with reasonably good precision by panels of forty-eight untrained tasters. Larger panels were needed only where unusually high precision was required.

II. COLOR EVALUATION

Color is one of the most evident characteristics of food products and is recognized as an important quality factor. Eastmond et al. (5) and Wilson et al. (30) reported that the consumer associates certain color characteristics with fresh and wholesome quality.

Hoover and Mason (8) in studying the color of sweet potatoes reported that the color of sweet potato puree contributes greatly to its acceptance as a food product. Sondheimer and Kertesz (24) identified the pigment responsible for all or most of the red color in strawberries as pelargonidin-3-monoglucoside.

The U. S. D. A. Agriculture Marketing Service standards for grades of canned plums mention color explicitly and allot twenty points out of one hundred for color. Worthington (32) states that since it is the one physical characteristic distinctly set out and readily measurable, color appears to be more important than the twenty points indicate. In one study by Wiley (29), a laboratory panel correlated color with over-all flavor of canned purple plums, the highest of any measure studied, yielding a correlation

coefficient of 0.95.

In a study by Thompson et al. (25) strawberry preserves, of the Blakemore variety, were stored at room temperature in both light and darkness for three, six, ten, and fifteen months. They were also stored at 0 degrees Fahrenheit with periodic examinations for as long as fifteen months. All preserves were made using 45 per cent fruit and 55 per cent sugar. The chief factors affecting the quality of the strawberry preserves were time and temperature. No change in quality was noticed in any of the preserves after storage at 0 degrees Fahrenheit for fifteen months. There were slight changes in color and flavor at 34 degrees for fifteen months, but at room temperature there were constant changes in color, gradual losses in aroma and flavor, and increased firming of the jelly. There were no significant differences between preserves stored in light and in the dark.

Kertesz and Sondheimer (11), in studying the effects of various storage times and temperatures on shelf life of strawberry preserves, observed color changes during storage. They concluded that high temperatures have an adverse effect

upon the color of strawberry preserves. A progressive decrease in color occurred in anthocyanin content during storage, the loss being more rapid with higher temperatures. The loss at 75 degrees Fahrenheit was slightly greater after two months than the loss at 65 degrees for six months. At 34 degrees the loss after six months was only half as great as that found at 65 degrees after two months. At temperatures above 90 degrees Fahrenheit most of the red color was lost during two months of storage.

In the P. M. A. grades for tomato juice, color is a most important factor since thirty points out of one hundred are allocated to color. In addition, color is a "limiting" factor, that is, a sample of juice cannot be graded as "fancy" if its color is rated below the minimum requirement for fancy grade, however high the score for other factors. Robinson et al. (22).

Wegener et al. (28) conducted a test to ascertain whether or not a source of artificial illumination could be satisfactorily substituted for natural light in judging color of canned tomato juice on the basis of spinning Munsell color discs as outlined in the U. S. Standards for Grades of Canned Tomato Juice. Three light sources were

used:

1. Natural daylight between 10:00 a.m. and 2:00 p.m. Light meter readings showed a light intensity of 400-900 foot candles.
2. Four 1500 watt incandescent bulbs with a color temperature of 7,000 degrees Kelvin.
3. A 500 watt incandescent bulb with a flat circular cobalt glass filter. Color temperature was 7,000 degrees Kelvin.

This study indicated that it would be feasible to substitute a source of artificial illumination for natural light in the evaluation of color for canned tomato juice.

Wolford *et al.* (31) reports that appearance plays an important part in preserve sales and that it is essential that color be stable. Neither a pale, faded product nor a blackened preserve is desired. In this test, preserves made from the Cascade variety had the slowest color change which may be related to its lower ascorbic acid content.

III. FLAVOR EVALUATION

Flavor is among the important factors affecting consumer preferences for food products. Pangborn *et al.* (18)

did extensive research on consumer opinion of canned clingstone peaches, pears, and apricots concluding that the relationship between sweetness, acidity, and fruit flavor greatly influence acceptance.

Leonard et al. (15) in an attempt to correlate physical and chemical properties of cling peaches, studied the ratio of soluble solids, total acidity, volatile reducing substances and color with the flavor of the canned fruit as evaluated by organoleptic methods . The results of the tests showed that the correlation of the flavor of cling peaches with their color, texture, ascorbic acid content, soluble solids or total acidity is possible, but any one factor used alone is not sufficiently precise or unambiguous to establish a standard for flavor. These properties or analysis may only be used as auxiliary methods of flavor evaluation.

Pangborn and Leonard (19) reported that consumer acceptance of canned Bartlett pears is mainly dependent upon "flavor" and flavor is affected by sweetness. They found that trained panels associated sweetness with flavor in both acqueous solutions and fruit nectar.

Hunter (9) determined the relative consumer preference for a six to one apple juice concentrate as compared to two

single strength apple juices available on the commercial market. Results showed that the mean preference rating for the concentrate was significantly higher than the rating given the two single strength juices. Most of the reasons given for liking each juice referred to flavor.

Wolford et al. (31) obtained preferences for strawberry preserves by issuing paired samples to the Experiment Station Staff, along with a form asking for a report on the number of persons tasting and their preferences. On the basis of reports returned, it was found that preserves made from the three varieties having pronounced aromatic characteristics (Cascade, Puget Beauty, and Marshall) were preferred by tasters, although none had a wide margin of preference. In this test, flavor was described as a pleasing balance between acidity and sweetness with aromatic characteristics that were strawberry like and did not remind the taster of other fruit.

Zych and McGill (33) report that any kind of strawberry can be frozen into an edible product. Varieties differ widely, however, in suitability for freezing. A few multiple purpose varieties are good for freezing and preserves as well as for fresh use. In recent freezing tests, some new

varieties have been compared with older varieties. Berries were hulled, sliced and packed (four parts berries to one part sugar) in cardboard freezer cartons and then frozen and stored at -40 degrees Fahrenheit. An eight member panel evaluated the thawed pack. Each sample was scored on a nine point scale for flavor, off-flavor, flesh color, surface color, uniformity of color, texture and seediness. Weighted evaluation scores for each variety were recorded. In the forty-two varieties evaluated Tennessee Beauty, Blakemore and Surecrop ranked ninth, eleventh, and twelfth, respectively.

IV. TEXTURE EVALUATION

Kramer and Twigg (14) state that viscosity or consistency is an appearance property of great importance with such food products as preserves. Pangborn et al (18) found that the public was conscious of texture quality in clingstone peaches, pears, and apricots, although consumer appraisal of fruit texture very closely parallel flavor acceptability.

According to Wolford et al. (31), the desirable

strawberry texture is the fresh berry "feel" in the mouth. Top rated berries are neither soft and slippery nor rubbery, but have firmness without toughness.

CHAPTER III

MATERIALS AND METHODS

I. STRAWBERRY PRESERVES

The strawberry preserves used in this study were made from three varieties of strawberries grown in the Knoxville, Tennessee area, Blakemore, Surecrop and Tennessee Beauty. The preserves were processed by Food Technologists from The University of Tennessee, Department of Food Technology.

Processing procedures employed were similar to those normally followed in commercial operations. Each of the three varieties were thawed overnight at 55 degrees Fahrenheit and made into preserves using the following formula:

51.5 pounds of 4 to 1 strawberries

10.0 pounds of water

2.33 ounces of pectin (150 grade)

30.0 pounds of sugar

12.0 pounds of corn syrup

5.5 ounces of citric acid (50%)

The preserves were concentrated in an open steam-jacketed kettle to a soluble solids content of 68 degrees

Brix. Foam was removed prior to filling into 10 ounce jars and hand twisting the caps. The product was immediately cooled in a continuous spray tunnel, then cased in cartons for storage in a cooler at 34 degrees Fahrenheit.

II. COLOR DIFFERENCE MEASUREMENTS

The Hunter Color and Color Difference Meter was used to obtain the instrumental color measurements. Color readings were obtained by presenting the sample to the instrument in a clear, rigid plastic container measuring 5 inches square and 1-1/4 inches deep. A 10 ounce sample of preserve was placed directly from the jar into the plastic container in a manner to preclude the entrainment of air cells in the sample. According to Tinsley (26) air cells in the sample introduce error in color measurements due to decreased light reflectance. The Hunter "L" scale was used to obtain the color measurements and the instrument was standardized against the National Bureau of Standards white porcelain tile DC25-230 having the following values: "L" 94, a -1.0, b-16.6. (A ctc value of -17.4 was used for standardizing the instrument. This was necessitated by an excessive amperage through the voltage regulator.) The Hitching Post Technique using

N.B.S. pink tile #D25-232 was used in color difference readings. The area of the sample illuminated was 4 inches by 3-7/8 inches using the wide field illumination. A series of three readings from different samples for each variety was made. The means and standard deviation of these readings were computed and statistically analysed for color differences among the three varieties. The color differences were calculated by the method described by Hunter (10).

III. FLAVOR EVALUATION MEASUREMENTS

The Beckman pH meter was used to determine pH readings and titratable acidity. Ten gram samples were prepared in triplicate for each of the three varieties of preserves. The preserves were macerated thoroughly, then mixed with 40 milliliters of distilled water. The resulting mixture was titrated with standard 0.0918 N sodium hydroxide to an end point of 7.5 using a glass electrode. The results were expressed as citric acid per 100 grams using the formula:

$$\frac{\text{mls. of base x normality x .064}}{\text{10 grams of preserves}} \times 100 = \%\ \text{citric acid}$$

The soluble solids were determined with the Abbe Refractometer using the method described in A. O. A. C. (1).

A correction factor of 0.42 was added to each reading for a temperature of 81 degrees Fahrenheit. The results were expressed as degrees Brix. The means and standard deviation were computed and statistically analysed for possible differences.

IV. TEXTURE MEASUREMENTS

The Bostwick Consistometer was used for consistency measurements. Bostwick values were recorded as the distance in centimeters of flow which occurred within two minutes. Preserves were placed in the instrument directly from the jar and measurements were conducted at 81 degrees Fahrenheit. Triplicate samples were tested for each variety and the means computed and statistically analysed for possible differences.

V. TRAINED LABORATORY PANEL DIFFERENCE TEST

A difference test using eight experienced tasters, composed of faculty, staff, and students in the Department of Food Technology, was conducted to subjectively evaluate differences in color, flavor, and texture among three varieties of strawberry preserves.

The strawberry preserves were stored at 34 degrees

Fahrenheit for a period of four months prior to organoleptic evaluation. The samples were removed from the cooler 24 hours before testing and were served in uniformly filled 2 ounce paper cups. The panel members were asked to evaluate the samples and indicate their preference for flavor, texture, and color in relation to the control. All attributes among the three varieties were judged at one sitting. Each of the evaluations were made on separate score sheets and each judge received a different set of samples for flavor and texture in an attempt to minimize prejudice among separate factors. Color differences among samples were masked by reducing the room light to semidarkness. One set of samples at one station were viewed by all judges for color evaluation after the flavor and texture ratings were made. Color samples were illuminated by flourescent light supplemented by natural daylight, with light meter reading an average intensity of 60 foot candles.

The score sheet was similar to that used by Fry (6). Each of the three varieties were scored in relation to a control, a strawberry preserve obtained from a local food processor. The scale was as follows:

+3 - Very much better than standard

+2 - Better than standard

+1 - Slightly better than standard

0 - Standard

-1 - Slightly worse than standard

-2 - Worse than standard

-3 - Very much worse than standard

The Trained Panel data were statistically analysed using the analysis of variance and Duncan's Multiple Range Test. The analysis of variance was conducted according to the Method of Snedecor (23).

VI. CONSUMER PREFERENCE TEST

A paired comparison preference test for strawberry preserves was conducted among thirty families in the area of Knoxville, Maryville, and Alcoa, Tennessee. Participating families were selected at random and contact was made by telephone and personal visits. Each of the ninety-one participants were familiar with the product and none expressed a dislike for strawberry preserves.

In March and April, 1965, two 10-ounce jars of strawberry preserves were delivered to each participating household. Family members ages eight through sixty-five years were eligible and completed questionnaires directing them to compare the two samples and indicate their preference for strawberry color, strawberry flavor, and strawberry texture. The tasters were instructed to indicate choices by recording the coded sample number on the questionnaire. In addition, each taster indicated the degree of preference by checking one of the three choices as follows:

( ) like very much better.

( ) like much better.

( ) like slightly better.

In an attempt to avoid bias, color preferences were recorded first, then the preserves were tasted for flavor and texture preferences.

Additional information was obtained by personal interview as to the type of fruit spread in the home at the time of the test. A note was also made for the number of wives working outside the home. Additional paired samples were delivered weekly until all possible combinations of the three varieties had been made.

The data were statistically analysed by a method of Chi-Square described by Snedecor (23).

CHAPTER IV

RESULTS AND DISCUSSION

I. TRAINED LABORATORY PANEL EVALUATION OF STRAWBERRY PRESERVES

An analysis of variance of the Trained Laboratory Panel showed significant differences among the three varieties and the three attributes, color, flavor, and texture of strawberry preserves. A slight degree of variation in scoring was found among the eight judges, however, they were consistent as individuals.

An analysis of the panel data for color differences revealed a significant difference in the color of Surecrop from that of both Blakemore and Tennessee Beauty. No difference in color was found between Blakemore and Tennessee Beauty. Table I shows the mean color score for each judge. All eight judges scored the test samples higher than the Control, with Blakemore receiving the highest rating for color.

Table II shows that the panel found a significant difference in the flavor of the Blakemore preserves. No

TABLE I

ANALYSIS OF VARIANCE OF THE TRAINED PANEL EVALUATION OF COLOR IN THREE VARIETIES OF STRAWBERRY PRESERVES

	Average score of 5 replications			
Individual	Blakemore	Tenn. Beauty	Surecrop	Control
1	+3.0	+1.2	+0.4	0.0
2	+1.6	+0.8	+0.4	0.0
3	+1.6	+0.6	+0.4	0.0
4	-0.6	+1.0	+0.2	0.0
5	-0.6	+0.2	0.0	0.0
6	-0.2	+1.6	0.0	0.0
7	+0.6	+0.4	-0.2	0.0
8	+1.8	+0.6	+0.2	0.0
Total	+7.20	+6.40	+1.40	0.00
Mean	+0.90	+0.80	+0.17	0.00
Statistical significance at .05 level	_____			

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F. Ratio
Total	119	150.12		
Varieties	2	12.35	6.17	8.63*
Judges	7	29.19	4.17	5.82*
Interaction	14	39.78	2.84	3.90*
Within	96	68.79	0.72	

TABLE II

ANALYSIS OF VARIANCE OF THE TRAINED PANEL EVALUATION OF FLAVOR IN THREE VARIETIES OF STRAWBERRY PRESERVES

	Average score of 5 replications			
Individual	Blakemore	Tenn. Beauty	Surecrop	Control
1	+2.0	+1.6	+1.2	0.0
2	+1.0	+1.4	+0.2	0.0
3	+0.4	-0.4	-0.6	0.0
4	+1.2	+0.6	+0.8	0.0
5	+1.6	+1.4	+1.0	0.0
6	+1.8	+0.4	0.0	0.0
7	+1.2	+0.4	0.0	0.0
8	+2.4	+1.4	+0.6	0.0
Total	+11.60	+6.80	+3.20	0.0
Mean	+ 1.45	+0.85	+0.40	0.0
Statistical significance at .05 level				

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F. Ratio
Total	119	198.79		
Varieties	2	22.20	11.10	8.10*
Judges	7	35.60	5.08	3.70*
Interaction	14	8.60	0.61	0.004
Within	96	132.40	1.38	

difference was evident between the flavor of Tennessee Beauty and Surecrop. Average flavor scores were higher among all judges than for any of the other attributes tested.

Table III shows the panel ratings for texture. No difference was found between Blakemore and Tennessee Beauty. Surecrop was significantly different in texture at the .05 per cent level of probability, having received the lowest rating of the samples tested.

Presented in Table IV are the data for the over-all differences among the three varieties of strawberry preserves. Laboratory panel scores for color, flavor, and texture were combined and statistically analysed for over-all differences. Slight differences were found among all three varieties, with total average scores placing Blakemore first, Tennessee Beauty second, and Surecrop third.

II. OBJECTIVE MEASUREMENTS OF STRAWBERRY PRESERVES

Color measurements. Results of the instrumental color measurements are shown in Table V. No detectable differences in color were found among the preserves made from Tennessee Beauty, Surecrop, and the control. The

TABLE III

ANALYSIS OF VARIANCE OF THE TRAINED PANEL EVALUATION OF TEXTURE IN THREE VARIETIES OF STRAWBERRY PRESERVES

	Average score of 5 replications			
Individual	Blakemore	Tenn. Beauty	Surecrop	Control
1	+1.6	+1.2	+2.2	0.0
2	+0.6	+0.4	-0.6	0.0
3	+1.0	+0.6	-0.8	0.0
4	+1.6	+0.6	-0.2	0.0
5	+0.6	+1.2	+0.4	0.0
6	0.0	+0.6	-0.2	0.0
7	+1.8	+1.2	+0.8	0.0
8	+1.8	+0.8	+0.4	0.0
Total	+9.00	+6.60	+2.00	0.00
Mean	+1.12	+0.82	+0.25	0.00
Statistical significance at .05 level	_____			

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F.Ratio
Total	119	191.47		
Varieties	2	15.87	7.91	6.12*
Judges	7	32.53	4.65	3.59*
Interaction	14	19.11	1.36	0.01
Within	96	123.99	1.29	

TABLE IV

OVER-ALL DIFFERENCES IN THREE VARIETIES OF STRAWBERRY PRESERVES FOUND BY TRAINED LABORATORY PANEL

	Average score of eight judges			
Attribute	Blakemore	Tenn. Beauty	Surecrop	Control
Color	+ .90	+ .80	+ .17	0.0
Flavor	+1.45	+ .85	+ .40	0.0
Texture	+1.12	+ .82	+ .25	0.0
Total	+3.47	+2.47	+0.82	0.00
Mean	+1.15	+0.82	+0.27	0.00
Statistical significance at .05 level				

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F. Ratio
Total	359	544.99		
Varieties	2	47.75	23.87	17.15*
Within	357	497.24	1.39	

TABLE V

DIFFERENCES IN COLOR AMONG FOUR VARIETIES OF STRAWBERRY PRESERVES

Replicate	Color differences from standard pink plate #D25-232			
	Blakemore	Tenn. Beauty	Control	Surecrop
1	52.46	60.73	60.84	60.24
2	54.02	59.69	60.39	60.68
3	45.80	59.86	59.85	60.37
Total	152.28	180.28	181.08	181.29
Mean	50.76	60.09	60.36	60.43
Statistical significance at .05 level				

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F.Ratio
Total	11	244.06		
Treatment	3	204.72	68.24	11.67*
Within	8	39.33	4.91	

Blakemore variety was significantly different in color, having a higher reflectance value, with less variation from the N. B. S. Pink Color Plate. Lower "L", "a", and "b" values for Tennessee Beauty, Surecrop, and the control indicates a darker red color as opposed to the lighter red for Blakemore. Instrument values are shown in Appendix A.

Titratable acidity. Table VI shows the differences in total acidity among the test preserves and the control. Total titratable acidity levels were not significantly different between Blakemore and Tennessee Beauty preserves. Surecrop had the lowest acidity and was significantly lower than all samples. The control contained .30 per cent more acid than Surecrop, and was higher in acid than all test samples.

Soluble solids. A wide variation of soluble solids content in the preserves ranged from a mean low of 64.08 degree Brix for Blakemore to a high of 70.42 degree Brix for Tennessee Beauty. The difference here represents a sample somewhat below the standard of 68.00 degree Brix required for preserves, and one slightly above the standard in sugar

TABLE VI

DIFFERENCES IN TITRATABLE ACIDITY AMONG FOUR VARIETIES OF STRAWBERRY PRESERVES

	Total titratable acidity			
Replicate	Surecrop	Blakemore	Tenn. Beauty	Control
1	0.54	0.62	0.56	0.85
2	0.58	0.64	0.68	0.85
3	0.55	0.61	0.68	0.85
Total	1.67	1.87	1.92	2.55
Mean	0.55	0.62	0.64	0.85
Statistical significance at .05 level		_____		

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F.Ratio
Total	11	0.15582		
Treatment	3	0.14489	0.04830	35.25*
Within	8	0.01093	0.00137	

content. Soluble solids in Surecrop was almost identical with that of the control. Table VII shows the relative differences in soluble solids among the four varieties.

Consistency. Table VIII gives the relative differences in flow characteristics of the four varieties of strawberry preserves. The preserves having the least resistance to flow, and the most fluid-like was the control. The preserves having the properties most resistant to flow in ascending order were: Tennessee Beauty, Blakemore, and Surecrop. Analysis of variance of these data indicate significant differences in consistency as presented in the table.

III. CONSUMER PREFERENCE FOR STRAWBERRY PRESERVES

A total of forty-five males and forty-six females participated in the consumer preference survey for strawberry preserves, Table IX. Forty-five per cent of the wives participating in the survey held jobs outside the home. No preferences were found between working wives and non-working wives.

During the survey, among the thirty-one families, it

TABLE VII

DIFFERENCES IN SOLUBLE SOLIDS AMONG FOUR VARIETIES OF STRAWBERRY PRESERVES

	Soluble solids expressed as degree Brix			
Replicate	Blakemore	Control	Surecrop	Tenn. Beauty
1	63.92	68.42	68.92	70.42
2	64.42	68.62	68.42	70.42
3	63.92	68.42	68.42	70.42
Total	192.26	205.46	205.76	211.26
Mean	64.08	68.48	68.58	70.42
Statistical significance at .05 level		_____		

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F.Ratio
Total	11	65.4825		
Treatment	3	65.1225	21.7075	480.15**
Within	8	.3600	.0450	

TABLE VIII

DIFFERENCES IN CONSISTENCY AMONG FOUR VARIETIES OF STRAWBERRY PRESERVES

	Flow distance in centimeters in 2 minutes			
Replicate	Tenn. Beauty	Blakemore	Surecrop	Control
1	3.00	3.50	4.10	5.10
2	3.00	3.15	4.10	4.90
3	2.85	3.51	4.20	4.60
Total	8.85	10.16	12.40	14.60
Mean	2.95	3.38	4.13	4.86
Statistical significance at .05 level	———	———	———	

Summary of Analysis of Variance

Source	D.F.	S.S.	M.S.	F.Ratio
Total	11	6.64509		
Treatment	3	6.4126	2.137	73.70**
Within	8	0.2324	0.029	

TABLE IX

PARTICIPANTS ON STRAWBERRY PRESERVE CONSUMER PREFERENCE SURVEY

Age	Male	Female	Total
8 - 20	16	13	29
21 - 40	18	26	44
41 - 65	11	7	18
Total	45	46	91

was learned that the fruit spread most frequently purchased was strawberry preserves and grape jelly. Classification of preferences according to sex indicated no significant preferences at the .05 level of probability Table X. Analysis of the data in Table XI revealed no significant preferences between age groups. Pair-wise preferences by attribute and combined preferences indicated that all varieties of preserves were equally well liked. The differences in the three varieties of strawberry preserves, found by laboratory measurements and trained panel evaluation, were not sufficiently different in magnitude to elicit consumer preference.

TABLE X

CONSUMER PREFERENCE FOR STRAWBERRY PRESERVES BY SEX

	Blakemore		Surecrop		Tenn.Beauty	
	Male	Female	Male	Female	Male	Female
Color	17	17	12	13 NP1	15 NP1	16
Flavor	17	15	13	16	15	15
Texture	17 NP1	16 NP1	12	13	15	16
Total	51	48	37	42	45	47

TABLE XI

CONSUMER PREFERENCE FOR STRAWBERRY PRESERVES BY AGE GROUPS

	Blakemore vs. Surecrop		Blakemore vs. Tenn.Beauty		Surecrop vs. Tenn.Beauty	
Color Preference						
8 - 20	17	12	17	12	12	15 NP2
21 - 40	20	24	25	19	12	30 NP2
41 - 65	7	11	12	6	8	9 NP1
Total	44	47	54	37	32	54
Flavor Preference						
8 - 20	14	15	15	14	15	14
21 - 40	25	19	23	21	22	22
41 - 65	8	10	10	8	6	12
Total	47	44	48	43	43	48
Texture Preference						
8 - 20	18	11	17	11 NP1	13	16
21 - 40	23	19 NP2	20	22 NP2	21	22 NP1
41 - 65	9	9	11	7	10	8
Total	50	39	48	40	44	46

CHAPTER V

SUMMARY

A study was made to determine consumer preferences among three varieties of strawberry preserves. The blind paired comparison test was used in which ninety-one consumers expressed their preferences for strawberry color, flavor, and texture. Objective measurements were made in the laboratory for color, flavor, and texture differences among the three varieties of preserves. Subjective evaluation for color, flavor, and texture differences were made by a trained laboratory panel of eight tasters.

Under the conditions of the experiment in this study:

1. No significant consumer preferences were found. All preserves were equally well liked.

2. Significant differences in color, total acidity, soluble solids, and consistency were found by laboratory analysis. No appreciable differences were found in pH levels.

3. Significant differences were found in color, flavor, and texture by the trained laboratory panel.

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APPENDIX

TABLE XII

HUNTER COLOR DIFFERENCE VALUES FOR FOUR VARIETIES OF STRAWBERRY PRESERVES

Sample No.	Blakemore			Surecrop			Tenn. Beauty			Control		
	L	a	b	L	a	b	L	a	b	L	a	b
1	14.8	+8.7	+6.7	8.9	+4.6	+3.6	9.1	+3.0	+3.4	9.0	+3.4	+2.9
2	13.7	+7.8	+6.0	8.6	+4.6	+3.1	9.8	+4.0	+3.7	9.5	+3.4	+2.9
3	19.5	+12.7	+9.4	9.8	+2.8	+2.6	9.9	+3.4	+3.4	9.8	+4.0	+3.1
Total	48.0	+29.2	+22.1	27.3	+12.0	+9.3	28.8	+10.4	+10.5	28.3	+10.8	+8.9
Mean	16.0	+9.7	+7.3	9.1	+4.0	+3.1	9.9	+3.4	+3.5	9.4	+3.6	+2.9

VITA

The author was born March 13, 1926, in Albertville, Alabama. He attended Albertville High School and in 1944, entered the U. S. Navy, where he served for approximately two years. In 1946, he enrolled at Snead Junior College, Boaz, Alabama, and was graduated in May, 1950. Immediately he was employed as County Sanitation Officer with the Bullock County Health Department in Union Springs, Alabama. On March 1, 1957, he was appointed District Sanitarian with the Alabama State Department of Public Health. In June, 1962, he received a B. S. in Biological Science at Troy State College. In September, 1964, he enrolled at the University of Tennessee and since that time has been working to complete the requirements for the degree, Master of Science.

He was married to Miss Lucy Margaret Taylor on September 20, 1952, and is the father of one daughter.