

UNIVERSITY HONORS PROGRAM

SENIOR PROJECT - APPROVAL

Name: April Parker

College: Agricultural Sciences Department: Food Science and Technology

Faculty Mentor: Dr. M. Penfield

PROJECT TITLE: Study of Four Commercial Brands
of Ice Cream

I have reviewed this completed senior honors thesis with this student and certify that it is a project commensurate with honors level undergraduate research in this field.

Signed: Mayme Penfield, Faculty Mentor

Date: 5/09/01

Comments (Optional):

Study of Four Commercial Brands of Ice Cream

April Parker
Advisor: Dr. M. Penfield

May 8, 2001

Background

Vanilla is produced from beans from a plant belonging to the orchid family. Three commercial varieties are available: *Vanilla fragrans* (otherwise known as *V. planifolia*), *V. tahitensis*, and *V. pompona* (Marshall and Arbuckle, 1996). Due to the growth requirements of these plants, only the climates in regions around the equator allow for the growth and production of vanilla beans. There are a variety of common names for the vanilla beans including: Mexican from Mexico; Bourbon from the islands off the east coast of Africa such as Madagascar; South American from Guadeloupe, Dominica and Martinique; Java from Java; Indonesian from Indonesia; and Tahitian from Tahiti and Society Islands (U. of Guelph, 2000). Between 25-30% of the world's supply of vanilla beans come from Indonesian while approximately 70% comes from Madagascar.

Vanilla contains vanillin and over 250 other compounds, many of which are volatile. These compounds include ester, oils, acids, aromatic aldehydes, and resins (Dairy Foods, 1996). Also, vanilla is the only flavor that has a standard of identity. Vanilla flavoring is available in liquid or powder form in four categories: pure vanilla extract, pure vanilla flavoring, vanilla reinforced with vanillin, and imitation vanilla.

Ice cream is also regulated by the standards of identity. This requires that ice cream be made with at least 10% milkfat even though premium and super-premium brands may use up to 12% milkfat (USDA, 2001). Also, the ice cream has to weigh a minimum of 4.5 lbs per gallon before bulky ingredients are added (USDA, 2001). Ice cream contains flavorings, sweeteners, emulsifiers, and stabilizers, all of which affect the taste and texture of the final products. Changes in one or more of these ingredients will

alter the overall outcome and provide for the extremely large variety of ice creams available on the market.

Vanilla ice cream account for 29.3 % of total production volume of ice cream during 1999 in the U.S. (U. of Guelph, 2000). This makes vanilla the most produced flavor of ice cream. Recent trends in vanilla ice cream have shown that the sales of regular fat ice cream have increased while sales of reduced-fat ice creams have decreased (Zaborsky, 2000a). The U.S. ice cream industry produces approximately \$19 billion in sales (Zaborsky, 2000b). Also, in recognition of about 90% of the population who eats ice cream, former President Reagan declared July as National Ice Cream Month and the third Sunday of July as National Ice Cream Day. Ice cream is a dessert that people of all ages love to eat and enjoy.

Purpose

The purpose of this project was to study the recognition of three types of vanilla flavoring in four commercial brands of ice cream. Determination if consumer panelists can identify the correct type of vanilla in each ice cream will be evaluated along with which commercial brand is preferred. The four commercial brands will also be evaluated against the ideal strength of sweetness and vanilla flavor of ice cream. A comparison between persons with dairy products evaluation training and persons without training will be evaluated. Also, common brands of ice cream eaten by consumers will be determined.

Materials and Methods

Seventy-two panelists were used to conduct a hedonic type of sensory test on four different commercial ice creams. The samples were presented under fluorescent lighting in the sensory booths and environmentally correct conditions. The order of samples was balanced. Each ice cream sample was presented in a labeled 2-oz plastic cup with a lid. The samples had been scooped with a metal ice cream scoop two days before the panel and placed into a blast freezer. The day of the panel, the samples were removed from the blast freezer and allowed to temper in a regular freezer at temperatures around -10°C. The ice cream was presented to the panelists in this frozen state. Metal spoons were used to taste the ice cream and water was provided for cleansing the palate between samples.

First the panelists were asked to identify their ideal strength of sweetness in ice cream and their ideal strength of vanilla in ice cream on a nine point scale. Then panelists were given each ice cream sample with a scorecard. A demographic page also was given with the last ice cream sample.

Discussion and Conclusion

Of the 72 panelists, 48 people were female and 24 were male. Forty-one of the 72 panelists were between the age group of 20 to 29. Also, 13 of the 72 panelists have had some type of dairy products evaluation training. It was also determined that 62 of the panelists eat ice cream once a month or more often while 50 of the panelists eat vanilla ice cream once a month or more often.

As shown in Table 1, there is no significant difference in the overall scores or the sweetness of the different ice creams.

Table 1: Mean values ^{ab} for several sensory characteristics of four types of vanilla ice cream measured by 72 consumer panelists.

	Mean Values			
	Kroger ^c	Mayfield ^d	Purity ^c	Country Club ^e
Overall	6.9a	6.6a	6.6a	6.6a
Appearance	7.5a	7.3a	6.9b	7.0b
Color	7.5a	7.3ab	7.1b	7.3ab
Overall Flavor	6.9a	6.4b	6.4ab	6.4ab
Vanilla Flavor	6.9a	6.2b	6.4ab	6.4ab
Strength of Vanilla Flavor	5.4a	5.5a	4.3b	5.0a
Sweetness	6.7a	6.5a	6.5a	6.4a
Strength of Sweetness	6.0a	5.1b	4.8b	5.6a

^a Scale ranged from 1=extremely dislike to 9=extremely like.

^b Values in the same row with like letters are not significantly different at $p < 0.05$.

^c Ice cream containing both artificial and natural flavorings.

^d Ice cream containing only natural flavorings.

^e Ice Cream containing artificial flavorings.

The overall scores indicate that all the ice cream samples were liked between liked slightly and liked moderately, being closer to liked moderately. For sweetness of the ice cream, all the mean values are between liked slightly and liked moderately.

For appearance, there is no significant difference between Kroger and Mayfield ice cream and there is no significant difference Purity and Country Club. There is a difference between the Mayfield and Kroger samples and Purity and Country Club samples. The mean values of the Kroger and Mayfield samples indicate they were liked between moderately and very much while the other two samples were liked moderately.

The color among the Kroger, Mayfield, and Country Club samples is not significantly different. The color among Mayfield, Country Club, and Purity is not significantly different, but the color between Kroger and Purity is significantly different. The mean value for the Kroger sample indicates that the sample was liked between liked

moderately and liked very much. The other three samples have mean values that indicate the samples were liked moderately.

There is no significant difference among the Kroger, Purity, and Country Club when comparing overall flavor or vanilla flavor. There is no significant difference between Mayfield, Purity, and Country Club, but there is a difference between Kroger and Mayfield. The Kroger sample was liked moderately. The other three samples were liked between liked slightly and liked moderately, being closer to liked slightly.

There is no significant difference among Kroger, Mayfield, or Country Club when comparing strength of vanilla flavor, but there is a difference among these three samples and Purity. The Country Club sample is neither liked nor disliked. The Purity sample was disliked slightly. The Kroger and Mayfield samples were liked between neither liked or disliked and liked slightly.

For strength of sweetness, there is no significant difference between Kroger and Country Club. There is no difference between Mayfield and Purity. There is a difference between Kroger and Country Club and Mayfield and Purity. The Mayfield and Purity samples were neither liked nor disliked. The Country Club sample was liked between neither liked or disliked and liked slightly. The Kroger sample was liked slightly.

As shown in Table 2, all the commercial brands of ice cream are significantly different from the ideal strength of vanilla flavor.

Table 2: Mean values ^{ab} for strength of vanilla flavor and strength of sweetness of four types of vanilla ice cream compared to an ideal measurement evaluated by 72 consumer panelists.

	Mean Values				
	Ideal ^c	Kroger ^d	Mayfield ^e	Purity ^d	Country Club ^f
Strength of Vanilla Flavor	6.3a	5.4bc	5.5b	4.3d	5.0c
Strength of Sweetness	5.9a	6.0a	5.1b	4.8b	5.8a

^a Scale ranged from 1=extremely weak to 9=extremely strong.

^b Values in the same row with like letters are not significantly different at $p < 0.05$.

^c Based on opinions of panelist before tasting any samples.

^d Ice cream containing both artificial and natural flavorings.

^e Ice cream containing only natural flavorings.

^f Ice Cream containing artificial flavorings.

The ideal also has the highest mean value. Kroger ice cream is not significantly different from Mayfield and Kroger is not different from Country Club. Mayfield and Country Club are significantly different. Purity is significantly different from all the other types of ice cream. The ideal strength of sweetness should be slightly strong. The strength of the vanilla in the Kroger and Country Club samples was neither strong nor weak. The Purity sample was described as slightly weak. The Mayfield sample was between neither weak nor strong and slightly strong.

For the strength of sweetness, Kroger had the highest mean value and is not significantly different from the ideal or Country Club. Mayfield is not significantly different from Purity, but these two are different from the other two samples and the ideal. The ideal, Kroger, and Country Club samples had a slightly strong strength of sweetness. The other two samples were neither strong nor weak.

As shown in Table 3, people eat a variety of brands of ice cream. The largest number of panelist eats Mayfield ice cream. Also, over half the panelist eat Breyers and Baskin Robbins. The demographics show that 62 of the panelists eat ice cream once a month or more often and 50 of the people eat vanilla ice cream once a month or more often.

Table 3: Number of panelists out of 72 and brands of ice cream that they eat.

Brand of Ice Cream	Number of People
Edy's	19
Bluebell	6
Breyers	57
Country Club	11
Haagen-Dazs	22
Ben and Jerry's	28
Mayfield	65
Store Brand	33
Purity	28
Texas Gold	17
Private Selection	3
Marble Slab	20
Baskin Robbins	45
Godiva	6
Other	11

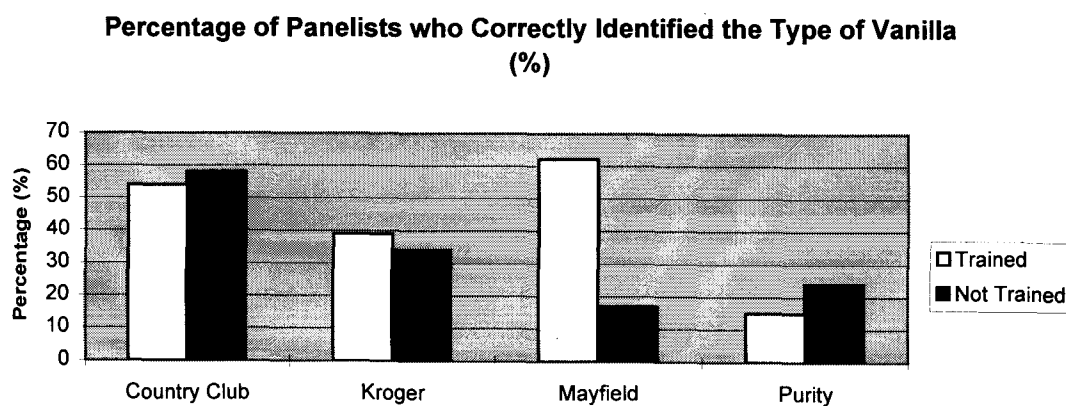
As shown in Table 4, most people the majority of people thought all the ice cream was artificial in vanilla flavoring. The highest number of people correctly identified the Country Club sample. The number of people who correctly identified the other samples correctly was not high.

Table 4: Number of 72 panelists who correctly identified which type of vanilla was used in 4 different brands of ice cream and what type of vanilla was chosen by the majority of panelists for each brand.

Brand of Ice Cream	Type of Vanilla	Number of panelists with correct identification	Type of vanilla chosen by the majority of panelists and number
Kroger	Mix	25	artificial (34)
Mayfield	Natural	19	artificial (30)
Purity	Mix	16	artificial (44)
Country Club	Artificial	41	artificial (41)

Thirteen of the 72 panelists had some type of dairy products evaluation training. As shown in Chart 1, a higher percentage of trained panelists were able to correctly identify the natural type of vanilla and the mixture of vanilla flavorings in the Purity sample. The other two samples had similar percentages for the trained and un-trained panelists.

Chart1:



^a Trained panelists only number 13 of 72 total panelists.

Overall most consumers believed that the four ice creams they tasted in the panel were flavored with artificial vanilla flavoring. Yet, the highest mean values for most characteristics were given to Kroger ice cream, which is a combination of artificial and natural flavorings. Although Mayfield's ice cream with natural flavoring was not undesired, it did receive the lowest mean value for vanilla flavoring. This may indicate that most consumers do not like the natural flavor when compared to other types available. This may be good news for companies so they can reduce production costs by using a mixture of vanilla flavorings instead all natural. This however would change the company's ice cream identity and not follow the "all natural" trend that is and has been popular.

Natural flavoring has not yet been completely created identically in the laboratory. Also, natural flavoring is dependent on land availability and lack of natural disasters. In 2000, a cyclone destroyed about 1/3 of the world's supply of vanilla after hitting Madagascar. It will take three years to replant, flower, and produce beans from these vines. It will then take another year to get ripened beans to the market so this will affect the vanilla availability and prices for several years. This is critical because the dairy industry uses about 70% of the vanilla extract produced. If companies can use some artificial flavoring and maintain the same quality and consumer desirability, then this will provide companies with alternatives when problems occur.

Further research should be conducted to determine if consumers truly like a mixture of artificial and natural flavoring rather than just natural or just artificial. By taking a trained panel, a point between amounts of natural and artificial flavorings where

it is completely desirable may be able to be determined. If there is a point where a mixture of flavorings is significantly different and preferred by consumers when compared to other mixtures, it could be advantageous for companies and consumers whom both get a great product. It is also possible that people prefer one variety of vanilla instead of another. Bourbon vanilla, the most abundant, could be preferred over other types or a mixture of types of vanilla might be preferred.

If further research is done, a basic mix that is the same except for the vanilla should be used because commercial ice creams use different ingredients and quality of ingredients that affect the overall taste of the ice cream. Also, there is no way of knowing what type of vanilla and which variety a company uses. The basic mix would put the vanillas on an even scale and allow for the evaluation of just the vanilla and how it works in the entire ice cream system.

References

Marshall RT, Arbuckle WS. 1996. Ice Cream. 5th ed. New York: Chapman & Hall. 349 p.

U. of Guelph. 2000. "Ice Cream Flavors." Dairy Science and Technology.

<<http://www.foodsci.uoguelph.ca>> (March 17, 2001).

USDA. 2001. Code of Federal Regulations. Vol. 3. Part 58.2825. p160-161.

<<http://www.access.gpo.gov/nara/cfr>> (May 5, 2001).

Zaborsky, V. 2000a. "Eating it Up." International Dairy Foods Association.

<<http://www.idfa.org>> (March 17, 2001).

Zaborsky, V. 2000b. "July in National Ice Cream Month." International Dairy Foods

Association. <<http://www.idfa.org>> (March 17, 2001).