

DEVELOPMENT OF LOW-FAT SUGAR-FREE ORANGE SHERBET CONTAINING SOY
PROTEIN

A Thesis

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ABSTRACT

Consumer interest in healthy eating and self-medication is not just a passing fad. Soy-based products have become increasingly popular and gradually moved into the mainstream market. Many consumers associate soy with a healthy consumption pattern. Development of frozen desserts that indulge consumers' eating desire, yet provide potential health benefits, is a challenge. Product appraisal to identify specific sensory attributes driving product acceptance is vital to the introduction of this new product. This thesis research was designed to develop low-fat sugar-free orange sherbet products containing soy protein and to determine the consumer sensory profile driving product acceptance and purchase intent.

Two consumer studies were performed to evaluate consumer sensory properties of orange sherbets containing soy protein. In study 1, twelve sherbets were formulated with soy protein, SP (3.25, 4.25, 5.25 or 6.25%) and maltodextrin, MD (10, 11, or 12%), and a control (0% SP and 12% MD). Each consumer (n=130) evaluated 3 (of 13) sherbet formulations for acceptability of appearance, color, flavor, sweetness, sourness, texture/mouthfeel, and overall liking using a 9-point hedonic scale. Overall acceptability (yes/no) and purchase intent (buy/not buy) were determined. Data were statistically analyzed. Study 2 was carried out in a similar manner with 140 consumers. Each consumer evaluated 4 (of 4) sherbets with four levels of soy protein concentrate (7.09, 7.05, 6.5, or 6.0g).

In both studies there were significant differences ($p < 0.05$) in texture and overall liking among the sherbet formulations. For study 1, the highest rated acceptable product was the formulation containing 4.25% SP and 11% MD. For study 2 the formulation with 6.0 g soy protein per serving was most acceptable. Flavor, texture, and overall liking were identified as

attributes critical to acceptance and purchase intent of the low-fat sugar-free sherbets containing soy protein. The information is useful for further product refinement.

CHAPTER 1. INTRODUCTION

Consumer interest in healthy eating and self-medication is not just a passing fad. Soy-based products have become increasingly popular and gradually moved into the mainstream market. Many consumers associate soy with a healthy consumption pattern. Development of frozen desserts that indulge consumers' eating desire, yet provide potential health benefits, is a challenge. Product appraisal to identify specific sensory attributes driving product acceptance is vital to the introduction of this new product. This thesis research was designed to develop low-fat sugar-free frozen sherbet products containing soy protein and to determine the consumer sensory profile driving product acceptance and purchase intent.

While regular commercially available sherbets are made with corn syrup and sugar as sweeteners, we developed a sugar-free, health promoting product aimed at health conscious individuals as the target market. Research has shown that eating a diet high in sugar and refined foods can lead to an increased body cholesterol and obesity due to an increase in the anabolic hormone insulin. A 1995 survey showed that orange was the most popular flavor for sherbets commanding 29% of sales in 1994-1995 (IICA, 1995). Therefore, we selected an orange flavor for our products.

In the first study, Splenda[®] (sucralose) and Sunnet[®] (acesulfame-K) were chosen as sweeteners because they work synergistically together which results in a cost saving for a large scale production. In addition, both provide similar sweetness profiles compared to sugar. A high concentration of acesulfame-K can result in a bitter aftertaste in the product. A ratio 70:30 (sucralose: acesulfame-K) was recommended for use by Nutrinova, Inc. In study 2, erythritol (a low calorie sugar alcohol with no laxative effect) was added to the sherbet formulations. It was

used as a mild sweetener (70% as sweet as sucrose), to increase the total solids of the product and to impart a cooling sensation similar to xylitol.

The choice to add soy protein into the sherbet formulation was based on the established relationship between soy proteins and a reduced risk of heart disease. The FDA now allows food products that contain a minimum of 6.25 grams of protein from soy and its derivatives per serving to claim such a health benefit on the product label. One of the additional requirements to make this claim was that the product needs to be low-fat which is defined as less than 3 grams of fat per serving.

Although the initial attempt to create an all natural product was our goal, to produce sugar-free sherbets, artificial sweeteners were required. The recent explosion of low carbohydrate diets was also taken into consideration. Among others, diets from Dr. Atkins' New Diet Revolution, Sugar Busters™ Cut Sugar to Trim Fat, Protein Power have become popular and so have products that fit into these eating styles. Although these products are more expensive to manufacture, with the resulting increase being passed onto consumers, many people are willing to pay more to enjoy a healthy eating style.

This thesis is divided into 5 chapters. Chapter one provides a brief introduction and discusses the research justification. Chapter two presents a literature review of key concepts which are related to studies one and two. Chapters three and four are the two consumer studies reporting the responses of consumers towards low-fat sugar-free orange sherbet containing soy protein. Chapter five presents an overall summary and conclusions of this research and opportunities for future research. Following chapter five is a list of all references cited for this thesis. The final section is the appendices which contain the consumer study questionnaire and

research consent form, SAS code and other items. The last page concludes with a VITA of the author of this work.

CHAPTER 2. REVIEW OF LITERATURE

2.1 Sherbet

Sherbet is a frozen foam containing water, nutritive sweeteners, fruit juice or fruit flavorings, fruit acid, milk solids, stabilizer, and colorings (Marshall and Arbuckle, 1996). Sherbets differ from ice cream products in many ways. They have a much higher fruit acid content resulting in a tart sensation. Citric acid, usually as a 50% solution, is the most commonly used acid in sherbet formulations. The amount used depends on the fruit used, sugar content, and consumer preferences. For instance, some consumers prefer a sherbet that is sweeter and less sour than normal. As a general rule, the titratable acidity should be 0.36% at 25-30% sugar and should be increased by about 0.01% for each 1% increase in sugar above 30% (Marshall and Arbuckle, 1996).

The overrun of sherbets is lower than ice creams, ranging from 25-50%. This can be controlled by an addition of stabilizers such as locust bean gum that restricts whipping and foam formation. Most stabilizers used for ice creams can also be used for sherbets. Stabilizers commonly used in sherbets include carboxymethylcellulose at 0.20%, guar gum at 0.20%, pectin at 0.18%, algin products at 0.20%, locust bean (carob) at 0.25%, and gelatin (200 Bloom) at 0.45% (Flores and Goff, 1999; Sutton et al., 1997; Sutton and Wilcox, 1998). Not all stabilizers work the same and some stabilizers work well under acidic conditions. Because of their varied properties, a mixture of stabilizers is often used to accomplish the desired effect (McPherson et al., 1978). Sherbets that contain milk solids will bind water and require slightly less stabilizer than ices. Sherbet stabilizers are varied in composition in order to obtain the desired texture at an acceptable cost. For example, locust bean gum is a higher cost stabilizer used at 0.3% and the drawing temperature (i.e., temperature to achieve the desired percent water crystallization)

should be set at 21° F to enhance smoothness. A lower cost stabilizer/emulsifier used at a concentration of 0.4% (40% mono and diglycerides, 25% guar gum, 25% cellulose gum (CMC), and 10% pectin) can result in a sherbet product with coarse texture. The drawing temperature can be as high as 23° F (Marshall and Arbuckle, 1996).

Sherbets contain a higher sugar content (25-35%) than ice creams, resulting in a lower melting point. In general the sugar content of sherbets is about twice that of ice cream. They are typically sweetened with a combination of corn syrup solids and sugar. It is important to use the correct amount to obtain acceptable flavor, body, and texture. Using too much sugar can result in a soft sticky product while a deficiency will cause the product to be hard and crumble. Sherbets containing sucrose as the sole sweetener tend to develop a hard crust on the surface as a result of sugar crystallization. Substituting corn sugar (dextrose) for 20-25% of the sugar will lower the freezing point and lessen the chance for the hard crust defect (Day et al., 1959; Ross 1963; Turnbow et al., 1946). Compared to corn sugar, corn syrup solids may be better in preventing the hard crust defect because of its much higher molecular weight which lowers the freezing point much less than does corn sugar (Schaller-Povolny and Smith, 1999). Corn syrup solids can be substituted for about one-third of sucrose (Marshall and Arbuckle, 1996).

Sherbets have a more icy, coarser texture and more of a cooling effect than ice cream. The coarseness or the size of the ice crystal formation is a major factor affecting overall consumer acceptability (Sutton and Wilcox, 1998; Trgo et al., 1998). If the mean ice crystal size exceeds a formulation-dependent threshold, the crystals become detectable by consumers (Arbuckle, 1986). Sensory detection of ice crystals is probably affected by ice crystal size distribution (Hough et al., 1990). The lower richness in taste compared to ice cream is the result of a low milk solids content.

2.1.1 Formulations

In 1995, about 1.5 billion gallons of frozen desserts were produced in the United States. Of these, sherbets comprised 3.3% and water ices 3.7%. Only 1% of soft-served products were sherbets. In Canada, the total annual production of frozen desserts is about 366 million gallons, of which 1% is for sherbets. These products have their greatest demand during the summer months with the most popular flavors being orange, pineapple, and raspberry constituting 80-85% of the flavors produced. In 1994-1995, orange was the most popular flavor for sherbets commanding 29% of sales with over 6.4 million gallons sold. 6.2 million gallons of rainbow sherbets were sold and other top selling flavors were raspberry (11%), lime (9%) and pineapple (8%). In all, the top ten flavors were listed (IICA 1995). In 1998, rainbow sherbet was ranked first with 30.6% of supermarket sales while orange was second at 26% (Soloman, 2000). Sales in 2001 showed that sherbets comprised about 3.5% of the frozen dairy dessert market, a slight increase from six years ago. Although ice cream still leads the frozen dairy market at almost 92%, sales of all ice cream have dropped 2.3% of the one year period ending on April 22, 2001 (Berry, 2001). According to the 2001 supermarket sales volume, ice cream had 80% of the frozen dessert market compared with sherbet (4.5%), frozen yogurt (4%), and sorbet (0.5%) (Information Resources Inc., 2001). Total sales volume for ice cream and sherbet for the 52 week period ending on January 27, 2002 showed a total sales close to \$4.7 billion, an increase of 4.9% (Information Resources Inc., 2001)

Compositions of sherbets can vary significantly. Natural and artificial flavors can be used in sherbets. The Code of Federal Regulations (CFR) sets specific requirements for ingredients and amounts used in sherbet formulations. A survey on nutrition labels conducted in 1995 for orange sherbets revealed characteristics for five regional brands. Weight per serving

ranged from 83-86 g with an average of 85 g, calories ranged from 110-150 kcal with an average of 130 kcal, fat was 1 g, carbohydrate ranged from 25-34 g with an average of 29, sugar ranged from 20-45 g with an average of 28 g, protein ranged from 0-1 g with an average of 1 g, and calcium (% of daily value) ranged from 2-6 with an average of 4. A typical ingredient label might read: water, milk (including nonfat milk and cream), sugar, corn syrup, dextrose, orange puree (water, natural flavorings, concentrated orange juice, orange pulp, gum tragacanth, yellow 6, citric acid), high fructose corn syrup, whey, citric acid, mono-and diglycerides, polysorbate 80, guar gum, locust bean gum, and pectin (Marshall and Arbuckle, 1996).

Sherbets can be flavored by using either fruit juices or artificial flavors. When using fruit juices the amount varies between 15-20% depending on the type of fruit and its intensity. When fruit is used for flavoring, it varies from 5-20 lbs per 100 lbs of the finished product. Fruit extract and artificial flavors can be used. Although they may not provide as desirable flavor as fruit juices, they can be used to fortify the flavor and produce a more consistent and uniform product (Marshall and Arbuckle, 1996).

2.1.2 Regulations

Specific guidelines as to what can be called sherbet are set by the FDA. These can be found in 21 CFR 130.140 (2001) and include a description of the product, specifications, and required and optional ingredients. Sherbet is defined as a food produced by freezing, and stirring a pasteurized mix. It should weigh not less than six pounds per gallon of the finished product and the milkfat content should not be less than 1 nor more than 2%. The non-fat milk solids cannot be less than 1% and the total milk or milk derived solids not less than 2% nor more than 5% by weight of the finished product. Sherbet that contains fruit as an ingredient shall have a titratable acidity, calculated as lactic acid, of not less than 0.35%. Sweet cream buttermilk,

concentrated sweet cream buttermilk or dried sweet cream buttermilk, when adjusted with water to a total solids content of 8.5%, shall have a titratable acidity of not more than 0.17% calculated as lactic acid.

The optional fruit ingredients are any mature fruit or the juice of any mature fruit. The fruit or juice may be fresh, frozen, canned, concentrated, or partially or wholly dried. The fruit may be thickened with pectin or other optional ingredients. The fruit is prepared by the removal of seeds, skins, and cores, where the removal is usual in preparing that kind of fruit for consumption as fresh fruit. The fruit may be screened, crushed, or otherwise comminuted. It may be acidulated. In the case of concentrated fruit or fruit juices, from which part of the water is removed, substances contributing flavor volatilized during water removal may be condensed and reincorporated in the concentrated fruit or fruit juice. The quality of the fruit ingredients used is such that, in relation to the weight of the finished product, the weight of fruit or fruit juice (including water necessary to reconstitute partially or wholly dried fruits or fruit juices to their original moisture content) is not less than 6% in the case of berry sherbets, 2% in the case of citrus sherbets, and 10% in the case of sherbets prepared with other fruits (Klahorst, 1997).

Specific regulations have been set for foods containing fat and sugar. Regulations regarding the total fat content can be found in 21 CFR 101.62(b) (2001). For a food to be called “low in fat” it must contain 3 grams of fat or less per reference amount (and per 50 g if the reference amount is small). 21 CFR 101.60(c) (2001) describes labeling for food products containing sugar. To be labeled as “sugar-free” the product must contain less than 0.5 g sugar per reference amount and per labeled serving (or for meals and main dishes, less than 0.5 g per labeled serving). If no sugar or sugar containing ingredient is added, “No Added Sugars” and “Without Added Sugars” can be stated on the label.

The FDA also sets specific requirements for the reference amount customarily consumed (RACC). These regulations can be found in Table 2 of the 21 CFR 101.12. This amount depends on the food and it is calculated for persons 4 years of age and older. The RACC is designed to reflect the amount of food customarily consumed per eating occasion by persons in this population group. The reference amounts are determined by data set forth in appropriate national food consumption surveys. The RACC as defined for sherbet is ½ cup.

2.2 Sucralose

2.2.1 Use in Sherbets/Related Products

Sucralose can be used in frozen desserts like sherbets and ice cream. Since sucralose has hit the mainstream market many items have been reformulated to include it. Well's Dairy was the first company to formulate dairy foods with Splenda[®] sucralose. Early in 2001 Well's Dairy developed Lite 85 yogurt, Blue Bunny's first item to contain sucralose. It was originally formulated in 1988 as the first no-sugar added yogurt in the market. Since the introduction of Lite 85 yogurt with sucralose, Blue Bunny has developed several other items including the Health Smart[®] frozen dessert line. Despite declining sales of "better-for-you" ice cream, Health Smart[®] sales continue to grow. The R&D department is currently researching the use of sucralose in other products where quality can be improved (Berry, 2001).

Anderson Erikson has developed YoLite Yogurts. This is a product line of fat-free yogurts containing Splenda. Several flavors are available including Black Cherry, Blueberry, Cherry Vanilla, Lemon Chiffon, Orange Cream, Peach, Raspberry, Strawberry, Strawberry Banana, and Vanilla. The Orange Cream variety has 80 calories for a 6 oz. serving.

Low-fat and fat-free items are not the only products formulated with Splenda[®]. Velvet has developed a line of ice creams with no-sugar added and 7-8 g of fat per serving. They are

available in four flavors: Vanilla, Dutch Chocolate, Butter Pecan & Cashew, and Cherry Fudge Cordial. One of the newest Splenda[®] containing desserts comes from the SouthWest Dairy company. In March 2002, they launched a low-sugar, low- carbohydrate line called LeCarb Frozen Dessert. It has 7 g of fat per serving but is safe for diabetics and is a great snack for low carb dieters. The product is a rich full-bodied dessert with the creamy consistency of ice cream. It is available in four flavors: chocolate, lemon, strawberry and vanilla, and is sold nationally (Dairy Foods Online, 2002).

2.2.2 Physical and Chemical Properties

Sucralose (1,6-dichloro-1,6-dideoxy- β -D-fructofuranosyl 4-chloro-4-deoxy- α -D-galactopyranoside) was approved for use in food products by the US Food and Drug Administration in April 1998. It is made from sugar with a chemical formula of $C_{12}H_{19}O_8Cl_3$ and is a free-flowing, white crystalline powder. Sucralose is available to food and beverage manufacturers in either crystalline powder or 25% solution in water. The sweetness is about 600x that of sugar (Quinlan and Jenner, 1990) with a range of 320-1,000x depending on the food product. When used alone in water it is about 500-750x sweeter than sucrose. The sweetness can be influenced by a number of factors including pH, temperature, and food ingredients such as gelling agents, starches, and fats. In cola, for example, sucralose gives a sweetness of 450x of sucrose, while in strawberry milk it is 680x sweeter (Tate and Lyle, 1997). The crystalline form is highly soluble even at low temperatures. At 68^oF, its solubility in water is 28%, significantly higher than many other high-intensity sweeteners. This allows it to be readily incorporated into most food products (Tate and Lyle, 1997).

The manufacturing process involves a five-step process that selectively substitutes three chlorines for three hydroxyl groups in the sugar molecule resulting in an approximate purity of

98% (Federal Register Vol.63, No.64, 1998; Wiet and Beyts, 1992). Only a small amount of sucralose is metabolized resulting in limited digestibility. The small amount, which is absorbed, is not metabolized for energy (Pszczola, 1999). Studies, using a model solution of 1% sucralose, have shown that the breakdown does occur due to simple hydrolysis and no further degradation products are formed. The breakdown results in only a loss of sweetness with no off-flavor development (Tate and Lyle, 1997). The hydrolysis products including 4-chloro-4-deoxy-galactose (4-CG) and 1,6-dichloro-1,6-dideoxyfructose (1,6-DCF) have been shown to be safe through numerous studies performed.

The chemical properties of sucralose are more similar to sugar than many other artificial sweeteners. One of the problems with using some artificial sweeteners lies in their ability to remain stable and maintain sweetness under extreme conditions. Sucralose has excellent stability under a broad range of processing conditions (Quinlan and Jenner, 1990; Barndt and Jackson, 1990). When exposed to high temperatures, such as those used for cooking and baking, it does not lose sweetness over an extended period of time (Pszczola, 1999). It also retains sweetness when exposed to pasteurization, sterilization, and UHT processing (Tate and Lyle, 1997). A study performed on a UHT processed dairy dessert showed 0.012% hydrolysis at pH 6.7 at 140°C for 15 seconds. In a study to examine the effects of pasteurization, after a tropical beverage containing sucralose was heated to 93°C for 24 seconds at pH 2.8, 0.0126% hydrolysis product was detected (Tate and Lyle, 1997).

A detailed study on the stability of sucralose in baked products has been performed. Three different products used in industrial production, with diverse baking conditions, were chosen: a sponge cake cooked at 180°C for 25 mm, cookies baked at 210°C for 8 minutes, and

crackers baked at 230°C for 4 minutes. Analysis of the products showed no measurable loss of sucralose during baking (Barndt and Jackson, 1990).

Sucralose solubility in water was determined over a wide range of 20°C- 60°C and measured in a thermostatically controlled Wheaton jacketted glass vessel and stirred with a PTFE covered magnetic follower. The solubility in water increased with increased temperature. Sucralose had a high solubility at 20°C indicating that it could easily be used by conventional food and beverage manufacturing operations (Jenner and Smithson, 1989).

Dynamic viscosities of aqueous sucralose at 10%-50% w/w were measured from 20°C- 60°C. There was an insignificant difference in viscosity over the four shear rates of 512, 691, 939, and 1,280 sec⁻¹ demonstrating that sucralose solutions exhibited Newtonian behavior. The sucralose solutions of 20% to 50% w/w had very similar viscosities. Due to its low viscosities and Newtonian behavior, sucralose when used at normal levels in food manufacturing would not cause mixing or dispersion problems (Jenner and Smithson, 1989).

A tensiometer was used to measure the surface tension of aqueous sucralose solutions (10%, 1%, 0.1%) at 20°C. Dilute solutions of sucralose (0.1 and 1 g/100 mL) showed negligible lowering of surface tensions, decreasing by 0.8 and 3.1 mN/m, respectively. This negligible decrease of surface tension implied that sucralose is not a surfactant and should not cause excessive foaming when used for soft drink products (Jenner and Smithson, 1989).

The pH of a 10% sucralose in water solution was 6.13 ± 0.05 at 20°C. The water used was tested and had a pH of 5.21 at 20°C. This indicated that sucralose may have a negligible effect on the pH of aqueous solutions (Jenner and Smithson, 1989). The refractive index of 5, 10, 15, 20 and 25% w/w aqueous solutions of sucralose was measured with the Abbe refractometer at 20°C. The linear relationship between the refractive index and the sucralose

concentration implied that the refractive index provides a practical method for determining the concentration of sucralose solutions (Jenner and Smithson, 1989).

The partition coefficient of saturated octanol-water mixtures was determined at 20° C. The limit in either phase was 0.01 mol/L which restricted the maximum concentration in either phase to 3.98 g/L. The partition coefficient of sucralose, over the range of octanol-water ratios studied, was found to be $\log_{10} P = -0.51 + 0.05$. This result showed that sucralose was poorly soluble in lipids and therefore likely to behave similar to sucrose in multi-phase systems (Jenner and Smithson, 1989).

The melting point of sucralose was determined using an electrothermal series 1 A melting point apparatus in which samples were melted at the bottom of vertical capillary tubes. The melting point of the sucralose heated at a rate of approximately 1°C per minute and corrected using Chemical Reference Materials for calibration, was determined to be 114.5°C. When the rate of heating was changed to 5°C per minute, the melting point was 125.5 (Jenner and Smithson, 1989).

2.2.3 Sensory Properties

Many high-intensity sweeteners used today are similar to sugar, but lack one or more attributes which makes them noticeably different. Previous studies have shown that single high intensity sweeteners (HIS) carried attributes such as aftertaste (sweetness, bitter), non-sweet side tastes, and bitterness (Redlinger and Setser, 1987; Ott et al., 1991; von Rymon Lipinski, 1991; Ketelsen et al., 1993). Sucralose has similar flavor and sweetness profiles compared to sucrose. The time intensity rating of sucralose and a 5% sugar solution at varied time increments (1-135 seconds) on an intensity scale of zero to eight was similar (Tate and Lyle, 1997). A Flavor profile of sucralose and sucrose at 9% equivalence was performed by Tate and Lyle (1997) using

a 50 point scale. The taste profile descriptors included sweetness, peaked, caramelized, saltiness, bitterness, numbing, body/thickness, fruity, metallic, astringent, sweet aftertaste, and bitter aftertaste. Most of the attribute ratings for sucralose are very close to that of sucrose, except the sweet aftertaste with a mean difference of about 5. National Food Laboratories USA conducted a flavor profile of sucralose and sucrose in which the food system was either 5% sucrose or sucralose in water at neutral pH. The taste profile descriptors compared were sweetness, sharpness of onset, body/thickness, bitterness, sweetness aftertaste, nonsweetness aftertaste, and metallic sensation. The results showed that the flavor profile of sucralose is similar to that of sucrose with sharpness of onset being the only noticeable difference (Pszczola, 1999).

Wiet and Beyts (1992) compared bitterness, sourness, body, sweetness aftertaste, non-sweetness aftertaste of sucrose with that of sucralose, aspartame, saccharine, and acesulfame-K. Trained panelists provided a sweetness estimation for each sweetener at six different concentrations using the magnitude estimation scale. The results indicated that sucralose, sucrose and aspartame had similar taste properties (Wiet and Beyts, 1992).

Hanger et al. (1996) conducted a study on “Descriptive Profiles of Selected High Intensity Sweeteners (HIS), HIS Blends, and Sucrose.” High intensity sweeteners including acesulfame-K, aspartame, sucralose, saccharine, and cyclamate were evaluated either singly or in selected blends by descriptive analysis to determine similarity to sucrose at 4%. The study showed that the variation among sweeteners and blends was due to off flavor, bitter, sweet aftertaste, and bitter aftertaste rather than sweetness.

2.2.4 Shelf-Life

Although studies show that sucralose does hydrolyze, much like sucrose into monosaccharides under acidic conditions, it does so at a much slower rate. Sucralose has been

shown to retain its sweetness through extended storage periods. While sucralose is most stable at pH 5-6 its stability increases as the pH increases from 1 to 5. It has been shown to be remarkably stable in acidic solutions. At pH 3 (20°C), there is less than 0.5% hydrolysis products after 52 weeks of storage, and no significant changes occur at pH 4, 6, and 7. This shows the ability of sucralose to remain stable in both neutral and acidic conditions (Tate and Lyle, 1997).

In a study conducted by Quinlan and Jenner (1990), beverages sweetened with sucralose were subjected to conditions designed to simulate that of the typical shelf life of the product under some extreme conditions. Cola, lemon/lime, and coffee beverages were stored in either a dark or light environment for up to 26 weeks at 20°C, 25°C, or 80°C. Sucralose was stable under all the conditions tested, thus confirming the suitability for its use as a sweetener in soft drinks (Quinlan and Jenner, 1990). Further evidence of its stability was confirmed with a study performed by Tate and Lyle (1997). Sucralose in an aqueous solution at pH 2.5 and 3.0 stored at 20°C or 30°C, respectively, for a period of one year had a retention of over 98% (Tate and Lyle, 1997).

2.2.5 Safety

The safety of sucralose has been evaluated since its discovery in 1976. Over 110 scientific studies involving humans and animals have been conducted, many of which were designed to identify possible carcinogenic, reproductive, and neurological effects. Sucralose has been shown to be safe for all populations, and thus products which contain sucralose are not required to carry a health warning label. The estimated daily intake of sucralose was established by the U.S. FDA from projections based both on the amount of sucralose proposed for use and the consumption levels of these particular foods. The EDI (Estimated Daily Intake) of the

additive is compared to the ADI (Acceptable Daily Intake) established through the toxicity data. Chronic exposure for a food additive is commonly referred to as how much the 90th percentile consumer would eat. The FDA has determined that this 90th percentile EDI for sucralose for consumers two years and older (“all ages”) to be 98 mg/person/day, equivalent to about 1.6 mg/kg bw/day. Since sucralose can hydrolyze in some foods, and therefore be ingested by the consumer, the 90th percentile EDI was determined to be 285 µg/person/day or equivalent to about 4.7 µg/kg bw/day (Federal Register Vol.63, No. 64, 1998).

In a reproductive/development toxicity study, sucralose was evaluated in a two-generation study. The subjects were 30 male and 30 female rats and the treatments used included 0.3%, 1.0%, and 3.0% sucralose in the diet for 10 weeks prior to breeding and through two successive generations. No treatment-related effects on any reproductive endpoints were observed in either generation. The FDA concluded that sucralose did not cause any reproductive effects in rats fed with sucralose up to 3% in the diet (memorandum 5, 10, 11, 12). The hydrolysis products were tested similarly in a two-generation study with 30 male and 30 female rats with the equimolar mixture of sucralose hydrolysis products (4-CG and 1,6-DCF) at 0, 200, 600, and 2000 ppm for ten weeks. Decreased food intake was observed in males and females in the high dose group. In both generations there was a reduction in weight gain of females during pregnancy and in offspring from birth to weaning. No treatment related-effects were observed on reproductive organs or functions and no other effects, other than reduced body weight, were observed (memorandum 5, 10, 14, 16).

In a chronic/toxicity carcinogenicity study, sucralose was evaluated in three phases, i.e., breeding, carcinogenicity, and chronic toxicity. The sample size was 70 male and 70 female Sprague-Dawley CD rats. The treatments used were 0%, 0.3%, or 3.0 % sucralose in the diet for

a four week period prior to mating and during gestation. No treatment-related effects on reproductive performance or fertility were observed during the breeding phase. In the chronic toxicity and carcinogenicity phases, survival was unaffected by the sucralose treatment. In the carcinogenicity phase, no evidence of treatment-related neoplasia was observed in any of the rats (memorandum 19). There was an apparent increased incidence in male rats with hepatocellular clear cell foci but the FDA concluded this was incidental and not treatment-related (memorandum 5, 20).

The hydrolysis products were tested on 50 male and 50 female Sprague-Dawley CD rats. The treatment included an equimolar mixture of hydrolysis products at 0, 200, 600, and 2,000 ppm in the diet for 104 weeks. There was no evidence of treatment-related neoplasia in any of the dose groups. The FDA concluded that sucralose hydrolysis products were not carcinogenic when administered as an equimolar mixture in the diet up to 2,000 ppm (memorandum 5, 19, 31). The female group which received 2,000 ppm had a 24% reduction in bodyweight relative to the control. It could not be determined whether body weight loss was fully accounted for by the reduced food intake. The FDA concluded that the mid-dose of 600 ppm was the no-observed-effect level for hydrolysis products of sucralose in rats (memorandum 5, 10).

Several studies were performed to evaluate sucralose acceptability and palatability when administered to rats via drinking water. Sucralose was acceptable when administered up to 3,200 ppm but resulted in reduced food intake when consumption was above 800 ppm. In a paired-feeding study, Sprague-Dawley CD rats were divided into five groups based on body weight. Twenty rats were randomly selected from each of the weight categories and assigned to one of the five groups. The study lasted for eight weeks. Significant differences in food consumption and body weight were observed in both the 3% dietary administration group and its pair-fed

control group relative to the ad libitum controls. McNeil Specialty Products Co. (McNeil) identified reasons for the loss of body weight. However, FDA disagreed with these reasons and stated that additional data were needed to resolve this issue (Federal Register Vol.63 No.64, 1998).

A new study was performed for two reasons: to determine whether weight gain decrement observed in sucralose-fed rats subjected to the combined chronic toxicity/carcinogenicity study could be solely explained by reduced food intake and to establish a no-observed-effect level for body weight loss after chronic administration. Eight groups of Sprague-Dawley CD rats, 20 males and 20 females per group, were used for the study. Three groups were fed with ad libitum basal diets containing 0, 1, or 3% sucralose. Three groups were fed with restricted amounts of basal diets at 85, 90, or 95% of that eaten by the ad libitum controls. Two groups were on restricted diets, 90% of ad libitum controls, and also contained either 1% or 3% sucralose. Significant differences in body weight were observed in both 3% groups (memorandum 33). A 3.9-6.3% reduction in body weight was observed after adjustment for food consumption and initial body weight. Thus food consumption only partially accounted for the weight loss observed in the 3% groups. Weight loss in the 3% groups stabilized after 15 weeks for males and 20 weeks for females, therefore the FDA concluded that the 26 week study was sufficient to evaluate weight loss effects. The no-observed-effect level in this study was the 1% sucralose-fed group (500 mg/kg bw/day) (memorandum 34).

Using the no-effect level stated above (500 mg/kg bw/day) and applying a 100-fold safety factor, the FDA has determined the ADI of sucralose to be 5 mg/kg bw/day, which is well above the 90th percentile EDI of 1.6 mg/kg bw/day (memorandum 10, 45). A two-year carcinogenicity study of sucralose hydrolysis products established a no-observed-effect level at

0.6% dose level (equivalent to 30 mg/kg bw/day). This also was well above the 90th percentile EDI of 0.0048 mg/kg bw/day (Federal Register Vol.63 No.64, 1998).

2.3 Acesulfame-K

2.3.1 Use in Sherbets/Related Products

In many dairy products, sugar and carbohydrate sweeteners are used mostly for taste but not for functionality. Dairy products that may contain high intensity sweeteners include fruit-flavored yogurts, white cheese, flavored milk, cocoa beverages, milk-based desserts, ice cream, and related products. In ice cream products sugar plays a role more than just a sweetening agent. It has certain functional properties which cannot be provided by artificial sweeteners. Compared to sugar, sugar alcohols provide similar characteristics, but have a lower sweetness, and can be combined with acesulfame-K resulting in a pleasant taste and texture (Lipinski, 1991).

2.3.2 Chemical Properties

Acesulfame-K is the generic name for 6-methyl- 1,2,3-oxathiazine-4(3H)-one-2,2-dioxide potassium salt or 3,4-dihydro-6-methyl-1,2,3-oxathiazin-4-one-2,2-dioxide potassium salt. Its formula is $C_4H_4NO_4SK$ with a molecular weight of 201.2 and can be referred to as a cyclic ester of acetoacetamide-N-sulfonic acid in the enol form. Acesulfame has characteristics similar to that of acids because of the acid hydrogen in position three on the ring system. Salts like acesulfame potassium are formed in the presence of bases. Salts such as sodium and calcium salt can be produced but they have no commercial importance (Clauß, 1976). Acesulfame-K forms monoclinic crystals and a $P2_1/c$ order is shown using X-ray diffraction crystal structure analysis (Paulus, 1975).

The density of solid acesulfame-K is 1.81 g/cm³ while that of the commercial acesulfame-K has a range of 1.1-1.3 kg/dm³. Acesulfame-K does not show a defined melting

point although decomposition starts at above 200°C. The decomposition point depends on the heating rate and at about 225°C it is normally observed under conditions of melting point determination (Clauß, 1976). Acesulfame-K forms colorless to white crystals and has a maximum absorption at 227 nm in the UV range with an extinction coefficient of 1.0762×10^4 . It is freely soluble in water and its solubility increases with increased temperatures. Solubility rates are shown in Tables 1 and 2 below. Because of its solubility, acesulfame-K can be dissolved in bulk sweetener syrups or homogeneously distributed in beverages or foods (Clauß, 1976).

Acesulfame-K, an artificial sweetener about 200 times sweeter than sucrose, is manufactured by Nutrinova Inc., Somerset, N.J., a subsidiary of the Germany-based Hoechst AG. It is being marketed in the United States under the trade name Sunnet[®]. Over 2,000 commercial food and beverage products in over 90 countries worldwide, from dessert mixes to alcoholic beverages, are formulated with this sweetener. Acesulfame-K is made from a process which involves the transformation of an organic intermediate, acetoacetic acid, and when combined with potassium forms a highly stable crystalline structure which is not metabolized. It contains no calories and provides a sweet, clean taste and remains stable over high temperatures. Because of its stability, beverages can be pasteurized without loss of sweetness and even baked foods can be heated to higher than 200°C with no indication of acesulfame-K breaking down or losing its sweet taste. Like sucralose it has stability over a wide pH range and storage temperature conditions and requires no health claim label. It also has no effect on blood glucose levels, cholesterol, total glycerol, or free glycerol levels (Pszczola, 1999).

Table 1. Solubility of acesulfame-K in water

<u>Temperature (°C)</u>	<u>Solubility (g/L)</u>
0	150
10	210
20	270
30	360
40	460
50	580
70	830
100	1300

Modified from Clauß et al. *Z. Lebensm.Unters. Forsch.* (1976)

Table 2. Solubility of acesulfame-K in organic solvents

<u>Organic Solvent</u>	<u>Temperature (°C)</u>	<u>Solubility (g/L)</u>
Methanol	20	10
Ethanol (anhydrous)	20	1
Ethanol – water (80:20, v/v)	23	46
Ethanol – water (60:40, v/v)	23	100
Ethanol – water (40:60, v/v)	23	155
Ethanol – water (20:80, v/v)	23	221
Glycerol (anhydrous)	20	30
Glycerol – water (80:20, v/v)	20	82
Glycerol – water (50:50, v/v)	20	162
Acetone	20	0.8
Glacial acetic acid	20	130

Modified from Clauß et al. *Z. Lebensm.Unters. Forsch.* (1976)

2.3.3 Sensory Properties

Acesulfame-K acts in synergy with other sweeteners, including both nutritive and nonnutritive. For example, when it is combined with aspartame, a more sugar-like taste is observed and sweetness intensification can be up to 40%. In a study conducted in Frankfurt by Nutrinova, blends of acesulfame-K and aspartame were combined with 10% oligosaccharides such as inulin, oligofructose, or galactooligosaccharide syrup. The blend had an additional sweetness intensification of 35% (Pszczola, 1999). Acesulfame-K in an aqueous solution has a sweetness intensity that is based not only on concentration, but also on the presence of other food constituents. This synergism has been studied in several systems particularly acesulfame-K and aspartame as mentioned above. The greatest synergy resulted when a 1:1 ratio was used although variations in the blend ratio resulted in higher sweetness levels than expected (Lipinski, 1989). Since acesulfame-K is generally perceived quickly, and fades fast, it should combine well with sweeteners having a more lasting sweetness. Studies have shown that when blends are used rather than individual sweeteners the result is a more balanced sweetness profile. Synergism in blends of acesulfame-K and aspartame were studied by van Tournout et al (1985). An increase in synergism was observed from 4% (2.5% fructose and 0.032% acesulfame-K) to 10% (5% fructose and 0.012% acesulfame-K) (van Tournout et al., 1985).

Multi-dimensional evaluations were performed by Schiffman et al. (1979) on taste characteristics of a variety of sweet-tasting compounds. The results of the study may have been impaired because of the high concentrations of acesulfame-K used exceeded the amount needed for maximum sweetness (Hoppe and Gaßmann, 1985). When used in high concentrations, acesulfame-K has some bitterness and some aftertaste. A variety of side-tastes including astringent, bitter, soapy, and metallic were determined by Paulus and Braun (1988) for the

sweeteners saccharin, cyclamate, a saccharin-cyclamate blend, aspartame, and acesulfame-K. Side-tastes varied significantly between different applications. The most common side taste for acesulfame-K was bitter or astringent (Schiffman et al., 1979).

2.3.4 Shelf-Life

Stability of acesulfame-K in aqueous environments is important, because most foods contain some water. When exposed to temperature levels and storage periods common in food manufacturing, only slight decomposition of acesulfame-k was observed. Exposure of dry acesulfame-K to elevated temperatures, i.e., 100°C for 24 hr, resulted in no change in product characteristics. The stability in an aqueous solution depends on both pH and temperature. Acesulfame-K works excellent when foods have a pH of 3 to 7. As the pH increases so does its stability. When a solution buffered to pH 7.5 was held for 10 years storage time and analyzed, about 99% acesulfame-K remained, showing no significant difference from the original amount. At pH 3 and after continuous exposure at 30°C for one year, more than 90% of the acesulfame-K remained (Table 3). Furthermore, the recovery level increased at pH 3.5 at both 20°C and 30°C (Table 3). An exposure of acesulfame-K at 120°C for 1 hour in a solution of pH 4 showed no sign of decomposition (Clauß et al., 1976). A number of studies have shown that acesulfame-K does not react with food constituents or other food ingredients, nor is it attacked by microorganisms. Only some actinomycetes, like *Nocardia* spp., were able to degrade acesulfame-K (Lipinski, 1999).

2.3.5 Safety

Acesulfame-K was approved for food use by the US Food and Drug Administration in 1988. An estimated daily intake (EDI) of 1.6 mg/kg body weight/day was established along with an acceptable daily intake (ADI) of 15 mg/kg body weight/day. The toxicity has been tested in

Table 3. Storage stability of acesulfame-K in buffered aqueous solutions

Temperature 20°C

Storage Time (weeks)	pH 3 % recovery	pH 3.5 % recovery
0	100	100
15	98	98
30	98	98
50	98	99
100	95	98

Temperature 30°C

Storage Time (weeks)	pH 3 % recovery	pH 3.5 % recovery
0	100	100
16	97	100
30	95	97
40	92	98
50	91	96

Modified from Clauß et al. *Z. Lebensm.Unters. Forsch.* (1976)

rats and it was determined that the acute oral toxicity (LD₅₀) level is at 7,431 mg/kg body weight and the intraperitoneal at 2,243 mg/kg body weight. Some of the studies which were important to the approval of acesulfame-K for food use are briefly reviewed below. In a 90-day study by Sinkeldam et al. (1991) to determine the toxicity effect of acesulfame-K, ten male and ten female Wistar rats were supplemented with 0%, 1.0%, 3.0% or 10% acesulfame-K in the diet. Results showed that the behavior and survival rate were unaffected by treatment, although in the male group which received 10% acesulfame-K, slight diarrhea occurred. Also at this dose, growth rate was inhibited for both sexes during the first four weeks of treatment. Hematological parameters were unchanged except for an isolated slight decrease in the percentage of neutrophils observed in the females at the 3% dose level. Urinalysis did not indicate any adverse effects from supplementation with acesulfame-K. Post-mortem findings did show an increase in liver and kidney weights at the 10% level in females. The weights of ceca increased in the 10% group for both sexes but in the 3% level group for female only. It has been seen in other studies that the increased ceca contents were mainly due to increased water content (Sinkeldam et al., 1999)

In a combined chronic toxicity and carcinogenicity study, 20 male and 40 female weanling CPB-WK SPF rats were supplemented with 0 (control), 3,000, 10,000, and 30,000 ppm acesulfame-K. After 120 weeks for males and 113 weeks for females, the surviving rats were decapitated and an autopsy performed. The mortality of the male controls compared similarly to that of the males in the 1% level group while mortality in the female controls was similar to that of the females in the 1% level group. At 3% level low mortality rates were observed in both male and female rats. At the end of the experiment the mortality rate of females in the high dose group was significantly lower than all other groups. Mean body weights taken throughout the

study showed slightly lower weights in males and females for the top dose group although the difference was not consistently significant from the controls. A statistically significant decrease in body weight was observed for the males that received 10,000 ppm, but only at week 10 and 12 of the study. Other differences between the control and treated animals included a decrease of blood urea nitrogen at week 52 in the 1% female group and a decrease of serum glutamic-pyruvic transaminase at week 52 in the 0.3% male group. These results are not considered to be of toxicological significance (Sinkeldam et al., 1991).

In a long term study to determine the oral toxicity of acesulfame-K, a two-year study was performed on 16 male and 16 female pure-bred beagle dogs of age 17-21 weeks. Acesulfame-K was supplemented in the diet at 0%, 0.3%, 1.0%, or 3%. No abnormal behavior was observed in any of the dogs that received acesulfame-K. Growth rates varied considerably although all dogs gained weight. After week 24 the mean body weight of all females in the test groups was lower than in controls. This was explained by the presence of two heavy dogs in the control group rather than by growth depression. The quantity of food consumed varied considerably between weeks, but there were no consistent differences between groups. Significant differences were observed in hematological analysis such as slightly decreased lymphocyte percentages and white blood cells, neither of which were dose-related or consistent, and therefore were not considered to be of toxicological significance. Urine analyses revealed that none of the test compound was in urine composition. There were a large number of erythrocytes found at early stages in some dogs, but this was attributed to damage of the urine bladder caused by catheterization. There were no significant differences in absolute or relative organ weights between test groups and controls (Reuzel and Heijden, 1991).

2.4 Soy Protein

2.4.1 Properties

Soybeans were originally added to foods to increase shelf life, inactivate or remove anti-nutritional components, reduce the chance of food-borne illness, improve sensory properties, increase convenience of the food, and to add value to soybeans. With health concerns about fat consumption there has been an increased development in lower fat foods. Unfortunately many consumers find these lower fat foods unacceptable because the foods have poor texture, less flavor, and a higher cost. Soy can be added to foods to increase quality (tenderness, juiciness, reduce fat content, emulsification, reduce cooking losses and shrink). In the last ten years the health benefits of soy in the diet have been shown in epidemiological studies involving animals and humans. These studies have led to health claims on labels that soy can reduce the risk from heart disease, cancer, osteoporosis, and menopausal symptoms (Wilson, 1995; 1996).

Sales of products containing soy (Table 4) have increased significantly since 1980 with total U.S. soyfood sales of \$394 million. As of 1998 this figure had grown to over \$1.7 billion annual (Golbitz, 1999). 90% of the soymilk in the U.S. market is aseptically processed and does not require refrigeration. Soymilk sales, the fastest growing soyfood, have jumped from \$2 million in 1980 to \$201 million in 1998. Tofu sales have increased from \$38 million in 1980 to \$207 million in 1998. 60% of the tofu sold in the U.S. is produced by six companies. Fermented soyfoods such as tempeh have increased in sales from \$1 million in 1980 to \$18 million in 1998, miso from \$6 million in 1980 to \$76 million in 1998, and soy sauce from \$126 million in 1980 to \$490 million in 1998. In addition to these foods, roasted soynuts, soy butter, and canned soybean products can be found in many stores. Soy proteins, as soy flour, concentrates, isolates,

Table 4. Soyfood sales in million dollars in the U.S. from 1980-1998

	1980	1985	1990	1996	1997	1998
Non-fermented soyfoods						
Soynuts	3	7	10	12	15	19
Soymilk	2	20	60	124	161	201
Tofu	38	59	94	144	173	207
Soy proteins	218	282	364	616	685	753
Fermented soyfoods						
Soy sauce	126	313	360	458	481	490
Miso	6	15	45	69	72	76
Tempeh	1	3	8	13	16	18
Total	\$394	\$699	\$941	\$1,436	\$1,603	\$1,764

Million \$, Retail Value

*Includes sales to food industry and consumers

Modified from Golbitz, Soyatech Inc., 1999

and textured products, are being used in many food formulations because of their functionality. Soy protein sales increased from \$218 million in 1980 to \$753 million in 1998 (Wilson, 1999).

2.4.2 Chemical Properties

Soybeans are composed of 30-40% protein, 16-20% unsaturated fatty acids, 13% moisture, 4-5% ash, 31% carbohydrates (which can be broken down into 2.5-8.2% sugars, .15-5% oligosaccharides, 1-2% raffinose, 1.4-4.1% stachyose, less than 1% starch and fiber), phospholipids, trypsin inhibitors, isoflavones, phytatic acid, vitamins, saponins, and other trace compounds. They also contain no cholesterol or lactose. Soybeans are cracked and the hull removed and rolled into full-flat flakes. The oil is extracted creating defatted soy flakes. These flakes can then be ground to produce soy flour. Further processing of the flakes produces soy protein concentrates and soy protein isolate (Wilson, 1992; 1995; Lambrecht et al., 1996; Murphy et al., 1997).

Soy protein concentrates are manufactured by using aqueous-alcohol to remove soluble sugars. The concentrates must contain at least 70% protein by dry weight. The non-heated soy protein concentrates have low solubility, can absorb water, but lack the ability to gel or emulsify fat. Soy protein concentrates bind water, emulsify fat, and form gels after heating (Egbert, 1999). Solubility is expressed as the nitrogen solubility index and varies depending on the processing.

The functionality of soy protein isolates can vary dramatically depending on the processing parameters. Three factors greatly influencing their functionality are heat, homogenization, and pH. Important functional characteristics include gelation, emulsification, and viscosity. The viscosity aspect has a wide range of beverage applications. Enzyme-modification can be used to produce low viscosity soy protein isolates. Viscosity and gelation

properties are important for the manufacturing of soy yogurt. Emulsification and viscosity of soy protein are important in cream soups and high fat sauces since it adds stability and texture to the finished product (Egbert, 1999).

2.4.3 Sensory Properties

Although soybeans are an excellent source of protein they pose a problem with off flavors. These undesirable flavors are characterized as “beany”, “green”, “grassy”, “painty”, and bitter (Wold and Cowan, 1975; Watanabe and Kishi, 1984; Snyder and Kwon, 1987; Wilson et al., 1992; Wilson, 1995). The beany flavor is caused from hydroperoxidation of cis-cis 1,4-pentadiene containing linolenic and linoleic fatty acids by lipoxygenase in raw soybeans when damaged, crushed, ground, or rehydrated during processing or after storage. Hydroperoxides and its breakdown product hexanal are known to produce these undesirable flavors. Masking the beany flavor of soy products with sugar and desirable flavors, such as chocolate, vanilla, and mango has traditionally been done. Wilson (1996) studied the effect of soy milk processing, cultivar, and sucrose on sensory characteristics of soymilks. The addition of 3% sucrose resulted in a statistically lowered beany flavor perceived by a trained panel, showing a masking effect. Terres-Penarada et al. (1998) reported that soymilk made from lipoxygenase-free soybeans had a less beany aroma, less beany flavor, and less astringency than those soybeans with normal lipoxygenase. No differences were observed between lipoxygenase-free and normal soybeans for milky flavor, wheat flavor, thickness, chalkiness or aftertaste (Terres-Penarada et al., 1998)

2.5 Product Optimization

Product optimization is the statistical technique used to attain the most acceptable formulation within its category given a fixed set of ingredients. Mathematical calculations are used to obtain an established predictive model. For optimization to be effective a selected set of

product quality indices should be those characteristics when altered significantly affect the product acceptability. If the wrong indices are chosen then the results obtained from the optimization will not be useful, meaningful, and actionable. Specific features of the product need to be considered during identification of these indices. Shelf life would also be an important factor for products which are shipped or consumed at a high environmental temperature and humidity in tropical regions. When considering sensory quality, environmental conditions such as time, temperature and humidity, the region where the food is sold and, the product usage should be evaluated. The selection of independent variables (factors) should be verified before their effect on the quality indices (responses) is determined. It is important that the significant variables be screened and selected for testing. For effective screening of test variables and their test ranges, information must be obtained from literature, personal experience, and preliminary experiments (Hu, 1999).

The term optimization has become quite popular in the food industry and can be defined as developing the best possible product in its class or category (Sidel and Stone, 1983). Consumer testing is used to obtain information about a product. Information frequently gathered includes the like/prefer measure as the dependent variable and the properties of the product, i.e., sensory characteristics and formulation as the independent variables. The use of data analysis is to relate these variables and an appropriate model is formed.

Most foods contain several ingredients which are added at different processing steps (blending, heating, and cooling). Not all ingredients in a product are of equal importance in terms of consumer acceptance. Optimization is used to identify those variables, or combinations of variables, which are important to the products acceptance and then to identify a level of

importance for each of them, which can be used to predict the independent variables that will yield optimum acceptance.

For optimization to be successful it must satisfy three requirements. Firstly, it maximizes consumer acceptance for a product given a fixed set of ingredients in that it contains the best possible formulation. Any other formulation besides this one will yield a less acceptable product. Secondly, the formulation must be cost effective because of competition in the corporate world and to ensure profitability. Finally the product must perform at the action standard level of the company. For a new product introduced, it must perform significantly better than the competitors product. For a product improvement it must perform significantly better than current product available and among users of this product (Fishken, 1983).

Product optimization consists of five steps (Fishken, 1983). The first step is ingredient screening. Food products contain many ingredients which come from numerous suppliers. Consumer research should be used to select the final set of ingredients for the finished product. Ingredient selection based on an executive panel or by a small in-house taste test have proven inaccurate when consumer opinions are later obtained. Because the cost of consumer research is high, many companies conduct preliminary screening through employees not directly working with the product before formal consumer research.

The second step is an identification of high-impact ingredients. These are those ingredients when varied have a significant impact on the overall sensory properties, consumer acceptance, and/or cost of the product. An optimal formulation which is expensive is not truly optimal because it fails to meet one of the practical aspects of optimal formulation, i.e., the formulation must be cost effective.

The third step is a design of test products, the most critical step in product optimization. To attain true optimization, ingredient levels above and below optimum must be set. The central-composite design uses 3-5 ingredient levels. The levels chosen are not “just noticeably different” but “significantly different” enough that affect the acceptability either positively or negatively. This can be achieved by the use of a 9-point hedonic scale to rate product acceptability. The relationship between acceptability scores and ingredients is not necessarily linear. This is especially true for ingredients such as sugar, salt, colorants or thickening agents.

The fourth and fifth steps are consumer tests and data analysis. Consumer testing is an important part of the optimization process. The prototype product is introduced to consumers and information gathered as to whether the product is liked. Consumers recruited should be chosen so that they are representative of the target market. The selection should be based on demographic, socioeconomic, and psychographic criteria as well as competitive brand usage. For the testing, regular untrained consumers are used to obtain acceptance measures. There is no perfect number of consumers for an optimization study but a minimum of 100 is recommended. If extensive preparation is required then pre-recruiting consumers to attend test sessions and facilities with test kitchens must be sought. If the product is to be shipped, prepared, and tested, careful product planning is required. Questionnaires should be carefully designed. The test location should be carefully selected. Commonly used test locations include: laboratory, central location (CLT), home use (HUT).

Stone and Sidel (1983) suggested four major steps for product optimization. Planning involves selection of product category and optimization method (e.g., response surface methodology, multiple regression, mixture design and LP). A representative number of products consisting of competitors and experimental ones are chosen (Schutz, 1983). The products tested

should have the range of characteristics similar to those found in the marketplace and the range should be technically feasible. It is preferred to have twenty or more samples to increase reliability of correlation coefficients between sensory and acceptance scores and also represent those characteristics which are different.

Screening of the products are conducted to decide how closely the target products match that from the optimized model before they are included in the validation study. Once products are consistent with the model, the validation study begins which involves consumer acceptance testing. Processing conditions or ingredient availability may preclude a perfect match, thus it may be possible to use the model to determine how much product acceptance will be lowered by a less-than-optimum product. The less-than optimum products may show a significant improvement over the one currently available and therefore could still be a viable product. At this point a decision should be made as to whether the less-than-optimum product is good enough for launching.

It is important to remember that an optimum product will not last forever in the market because consumers will eventually lose interest in a product. Alternative samples delivering optimum acceptance will become important. The attainment of optimum properties alone does not guarantee success in the marketplace. Other factors that play a role in acceptance include: brand name loyalty, advertising and promotion, price, quality control, competitors, and economic factors (Schutz, 1983).

2.5.1 Data Analysis

Several approaches can be used to identify properties which are important to the product optimization. Some of the more common ones are listed below.

2.5.1.1 Linear Programming

Linear Programming is a tool which narrows a number of alternatives that can be chosen and performs a search of these alternatives to find the optimal one. The variables for this technique include the decision variables (ingredients), constraints (the sums of constant multiples of the decision variables compared to other constants) and an objective function (the sums of constant multiples of the decision variables, but not compared to the other constants) (Norback and Evans, 1983).

2.5.1.2 Mixture Design

The mixture design involves a mixture of two or more high-impact ingredients which serve as the independent variables. The development of any new food product containing more than one ingredient requires some form of mixture experimentation and, if properly applied, can guide the developer to the optimum product. Each ingredient is represented by a fraction between 0-1 and the sum of the ingredient fractions must equal 1.0 or 100%. In a mixture design the food quality indices depend only on the proportions of the ingredient components in the mixture and not the amount of mixture. If the amount of mixture is held constant then the value of response changes occurs in proportion to the ingredient changes. The restricted non-intercept multiple regression models are used to obtain prediction models which can be used to generate contour plots for sensory attributes or acceptance based on ingredient amounts (independent variables). Superimposition of acceptable areas of contour plots on sensory attributes or acceptance yields the optimum formulation ranges.

2.5.1.3 Multiple Regression

Multiple Regression Analysis is a technique in which the important variables are not known beforehand. A broad range of characteristics and levels are used to ensure that important

variables have been included (Sidel and Stone, 1983). Before generating the models the analysis should begin by comparing acceptability ratings for the product formulations tested. The regression model shows the relationship between sensory attributes and ingredient levels. Cost data can be included if the development of reduced cost products is desired.

2.5.1.4 Response Surface Methodology (RSM)

Response Surface Methodology is a multivariate statistical method which uses quantitative data to simultaneously solve equations (Giovanni, 1983). These equations can be used to generate a response surface to describe how independent variables affect the response or dependent variables, to determine the interrelationships between the test variables, and to describe the combined effect of all test variables on the response. Central composite design (CCD) is the foundation of response surface methodology (RSM) and is used to estimate parameters of a full second-degree model. It can be used in all scientific research areas and provides one of its main advantages in that it can be constructed in a sequential program of experimentation by adding to the information previously gathered from a 2^n factorial design. Extra trials can be designed, according to the principles of CDD, to repair the model if the linear model based on a 2^n factorial design turns out to be insignificant. The data will be used to build a quadratic model and normally this model will meet the needs for accuracy in practical product development (Hu, 1999).

CHAPTER 3. A NOVEL LOW-FAT SUGAR-FREE SHERBET CONTAINING SOY PROTEIN: PRODUCT ACCEPTANCE AND MARKET OPPORTUNITY DRIVEN BY SPECIFIC CONSUMER SENSORY ATTRIBUTES

3.1 Introduction

Ice creams and sherbets had the largest share of the frozen dessert market at about 84.5% in 2001. The frozen dessert novelties had a growth of 7.1% with more than \$2.1 billion sold in 2001 (IRI, 2001; IDFA, 2001). Of these novelties, ice cream bars with a stick captured 17.9% of the dollar share, a 2.2% increase from 2000. Sandwiches, the second largest category of frozen novelties, had 13.5% of the dollar share, an increase of 19.8% from 2000.

Fruit-containing frozen novelties are available in many forms including variations of sorbet or water ices. In general, they contain the same traditional ingredients such as sweeteners and stabilizers, but the primary difference is the amount of added fruit pieces and/or fruit juice. Common store brands have a fruit content ranging from 30-55% with some as low as 10-15% and others as high as 80%. Some fruit based novelties claim to contain as much as 90% fruit juice (Hegenbart, 2002). Fruit pieces in many forms and sizes may also be added. Some frozen novelties products require a smooth texture and for these fruit juice concentrates or juice (usually reconstituted from a concentrate) will make a good choice. Fruit juice contributes sweetness and may be used to replace some or even all of the sweeteners in a frozen dessert formula (Hegenbart, 2002).

An increase in the growth of frozen novelties is allowing smaller companies to explore new product concepts that may not be of interest to larger companies due to small profit. In 1992, Marigold Foods launched Yo-J, a fruit juice blended with fat-free yogurt and skim milk, in 1994, Kemps Duos, a layered mixture of gelatin and yogurt, and, in 1995, Sherbursts, a creamy, fat-free sherbet with contemporary flavors (Fusaro, 1996).

Consumer interest in healthy eating and self-medication is not just a passing fad. Soy-based products have become increasingly popular and gradually moved into the mainstream market. Many consumers associate soy with a healthy consumption pattern. Development of frozen desserts that indulge consumers' eating desire, yet provide potential health benefits, is a challenge. Product appraisal to identify specific sensory attributes driving product acceptance is vital to the introduction of this new product.

The objectives of this research were to formulate a low-fat sugar-free orange sherbet containing soy protein and to identify consumer sensory attribute profile driving consumer acceptance and purchase intent.

3.2 Materials and Methods

3.2.1 Soy Protein Isolate

PRO-FAM[®] 873 isolated soy protein was used for this consumer study. It is a very bland, low viscosity, readily dispersible, highly soluble, and functional soy protein specially designed for nutritional bars, extruded cereal pieces, beverages/supplements, sauces, gravies, soups, and dairy blends. PRO-FAM[®] 873 contains isoflavones at a minimum level of 2 mg/g of product. It contained 6.0% moisture (max), 90% protein (min), 1% fat (max), 4% ash (min) and 90% granulation through #100 U.S. Standard Screen. Microbial tests showed 10,000 CFU/gm (max) for Standard Plate Count, negative for Salmonella (class I), and negative for E.coli. The storage temperature should be below 75° F and 60% relative humidity to promote a longer shelf life.

3.2.2 Sherbet Preparation

Thirteen sherbet formulations were prepared according to (Table 5). Due to the blender size and the amount to be prepared, each formulation was prepared twice and combined, and the

Table 5. Sherbet formulations with ingredients varied¹

<u>Formulation</u>	<u>Soy Protein (SP)</u>	<u>Maltodextrin (MD)</u>	<u>Water</u>
1	3.25%	10%	50.95%
2	4.25%	10%	49.95%
3	5.25%	10%	49.00%
4	6.25%	10%	48.00%
5	3.25%	11%	50.00%
6	4.25%	11%	49.00%
7	5.25%	11%	48.00%
8	6.25%	11%	47.00%
9	3.25%	12%	49.00%
10	4.25%	12%	48.00%
11	5.25%	12%	47.00%
12	6.25%	12%	46.00%
13	0%	12%	52.25%

¹ Fixed ingredients which make up a total of 100% for each formulation.

Heavy cream	3.89%
Skim milk	10.79%
Buttermilk	2.71%
Orange juice	17.58%
Orange flavoring	0.14%
Citric acid	0.36%
Sucralose	0.11%
Acesulfame-K	0.02%
Annatto color	0.15%
Locust bean gum	0.05% (formulations 1-3 only)

mixture transferred into a smoothie machine. The Coyote Brand Locust Bean Gum “H” (Gum Technology Corporation, Tucson, Arizona) and Citric Acid Anhydrous Fine Granular (ADM, Southport, North Carolina) were accurately weighed using an analytical scale (Mettler Toledo Model #AG104, Columbus, Ohio).

Natural orange flavoring (WONF) (Flavors of North America, Carol Stream, Illinois), annatto color (Food Ingredient Solutions, New York, New York), Splenda[®] Brand sucralose as liquid concentrate 25% aqueous solution (McNeil Specialty Products Co., McIntosh, Alabama), and Sunnet[®] Brand acesulfame-K (Nutrinova Inc., Somerset, New Jersey) were combined before mixing with other ingredients. Water was heated to about 48.5°C, then weighed (CAS Computing Scale model AP-1, Korea) and transferred into a blender (Vita-Mix model VM0100A, Cleveland, Ohio). Maltodextrin (Malta*Gran[®] 10, Primera Foods, Faribault, Minnesota), soy protein (PRO-FAM[®] 873 Isolated Soy Protein, Archers Daniel Midland Co., Decatur, Illinois), citric acid and locust bean gum were added to the blender. These ingredients were mixed in a blender for 5 minutes using 20 second cycles consecutively. The resulting mixture had a temperature of 68.8°C due to heat generated from blending the mixture. Grade-A Ultra-Pasteurized Heavy Whipping Cream (Kleinpeter Farms Dairy, Baton Rouge, Louisiana), Grade-A Pasteurized Homogenized Skim Milk (Kleinpeter Farms Dairy, Baton Rouge, Louisiana), Golden Churn Cultured Reduced-Fat Buttermilk (Milk Products LLC, Dallas, Texas), Pure Premium Original - No Pulp orange juice (Tropicana, Bradenton, Florida) were added. The mixture of sweeteners, orange flavoring, and annatto coloring solution was added to the blended mixture and thoroughly blended for 1 minute. One gallon of the mix was transferred to a smoothie machine (Taylor model 430-12, Rockton, Illinois). The machine was operated for about 15 minutes and the smooth mixture was transferred to a 5 gallon container.

The sherbet product was then proportioned into 2 oz plastic cups and sealed with lids; this was done inside the walk-in cooler (38°F) to prevent products from quickly melting. These samples were placed on the proper tray labeled with 3 digit numbers corresponding to the formulation numbers and stored in the blast freezer (-25°F).

The day before the start of the consumer study, all samples on each of the 13 trays were transferred to the freezer (-20°F) in the Food Science building and covered with foil to eliminate odors from surrounding products. Due to the high water content and low total solids, the samples were too hard to consume immediately after being taken out of the freezer. On the day of the consumer test, the samples were allowed to soften in the walk-in cooler (38°F) approximately 1- 1.5 hours before the actual taste test.

3.2.3 Experimental Design and Consumer Tests

Untrained consumers (n=130) were randomly recruited from Louisiana State University. Panelists were recruited by flyers, faxes, phone, and email. A database of consumers, who had previously participated in the sensory studies at LSU, was used first. The rest of the subjects were randomly recruited from the LSU directory either by phoned or email. A day or two before the consumer test, the consumers were reminded through a phone call to attend a particular session. Criteria for recruitment were: (1) at least 18 years of age, (2) not allergic to soy or milk products, and (3) available and willing to participate on particular testing dates. Since not every consumer had participated in consumer acceptance tests, the testing procedures were briefly discussed, particularly about sample handling and evaluation. Consumers were told that each sample had a 3 digit code corresponding to each page of the questionnaire. Consumers were asked to complete the socioeconomic and demographic questionnaires regarding age, gender, race, marital status, educational level, employment status, and household income. Consumers

also provided information on consumption of low-fat and sugar-free desserts, frequency of purchase, the most important quality attribute of these desserts, the most preferred fruit flavor for frozen sherbets, history of purchasing low-fat sugar-free sherbets, and willingness to purchase these sherbets if they contained a health promoting ingredient like soy protein. A total of 19 test sessions were conducted at 10:00 AM, 10:45 AM, 2:00 PM, 2:45 PM, 3:30 PM, and 4:15 PM during a 3 day period. A special session at 10 AM was conducted on day 4 for ten panelists who had missed previous sessions.

Samples were evaluated using a balanced incomplete block design (Plan 11.21, $t=13$, $k=3$, $r=6$, $b=26$, $\lambda=1$, $E=0.72$, Type III) described by Cochran and Cox (1957) because an individual consumer finds it increasingly difficult to evaluate a product as the number increases. This design allowed each consumer to evaluate three out of thirteen samples. With a total of 130 consumers, each of the thirteen formulations was evaluated 30 times. All 30 responses for each formulation were used to generate predictive models relating sensory qualities and acceptability, purchase intent, and purchase intent after acknowledgement of the products containing soy protein.

Orange sherbet samples were presented to consumers in 2-oz opaque white plastic cups labeled with a 3 digit number on the lids. Water, unsalted crackers, and expectoration cups were provided for consumers to use to minimize any sensory carryover effect that may have occurred between samples. Consumers were instructed to evaluate each sample for acceptability of appearance, color, flavor, texture/mouthfeel, and overall liking using a 9-point hedonic scale (1=dislike extremely, 5=neither dislike nor like, and 9=like extremely) (Peryam and Pilgrim, 1957). Consumers were also asked to evaluate each sample as “acceptable” or “unacceptable” as suggested by Moskowitz (1994) using a likert scale. Purchase intent (buy/not buy) and purchase

intent, after additional information about soy protein had been provided consumers, were also asked. The process of asking consumers to make judgments regarding how much they like or dislike products is frequently performed (Schutz, 1983).

3.2.4 Statistical Analysis

The analysis of variance (Proc Mixed, SAS version 8.2, 2001) was performed to determine differences in acceptability for each sensory attribute and overall liking. Paired-wise comparisons were performed to compare the acceptability of each formulation with the control (no soy protein). Post-hoc multiple comparisons using the Tukey's studentized range test were conducted (Data shown in the appendix). Group differences, expressed in terms of mean vectors of acceptabilities (appearance, color, flavor, texture, and overall liking), were determined using multivariate analysis of variance (MANOVA). Descriptive discriminant analysis (DDA, 1994) (PROC CANDISC, SAS version 8.2, 2001) was performed to identify sensory acceptability attributes that largely underlied group differences among 13 sherbet formulations. Predictive discriminant analysis (PDA, Huberty, 1994) (PROC DISCRIM, SAS version 8.2, 2001) and logistic regression analysis were performed to identify sensory attributes critical to overall product acceptance and purchase intent. For PDA, the test of homogeneity of within covariance matrices was conducted (POOL=TEST) using a X^2 test. The logistic regression models, both full and restricted to one dependent variable, were generated to predict acceptability, purchase intent, and purchase intent after notification that the product contained soy protein.

3.3 Results and Discussion

3.3.1 Consumer Characteristics

Demographic and socioeconomic characteristics of participating consumers are shown in Table 6. The consumers totaled 130, with 90 females and 40 males. The majority (92) was

Table 6. Demographic and socioeconomic information

	Male	Female	Total
Age:			
18-24 years	9 (22.5%)	37 (44.1%)	46
25-34 years	10 (25.0%)	15 (16.7%)	25
35-44 years	9 (22.5%)	12 (13.3%)	21
45-54 years	4 (10.0%)	15 (16.7%)	19
over 54 years	8 (20.0%)	11 (12.2%)	19
Gender:	40 (30.8%)	90 (69.2%)	130
Race:			
African-American	1 (2.6%)	8 (8.9%)	9
Asian	12 (30.8%)	13 (14.4%)	25
Hispanic/Spanish	1 (2.6%)	3 (3.3%)	4
White (Caucasian)	23 (59.0%)	62 (68.9%)	85
Other	2 (5.1%)	4 (4.4%)	6
Missing data			1
Household:			
Single parent with children in home	1 (2.5%)	6 (6.7%)	7
Couple with children in home	10 (25.0%)	27 (30.0%)	37
Couple without children in home	13 (32.5%)	16 (17.8%)	29
Single adult	16 (40.0%)	39 (43.3%)	55
Other	0 (0%)	2 (2.2%)	2
Level of Education:			
Less than high school	0 (0%)	0 (0%)	0
High school	1 (2.5%)	5 (5.6%)	6
Some college	5 (12.5%)	35 (38.9%)	40
Completed college	6 (15.0%)	21 (23.3%)	27
Graduate (M.S., M.A., Ph.D., Ed.)	28 (70.0%)	29 (32.2%)	57
Employment:			
Employed full-time	24 (60.0%)	38 (42.7%)	62
Employed part-time	0 (0%)	4 (4.5%)	4
Unemployed	0 (0%)	0 (0%)	0
Homemaker	0 (0%)	1 (1.1%)	1
Student	14 (35.0%)	43 (48.3%)	57
Retired	2 (5%)	3 (3.4%)	5
Missing data			1

Table 6. (continued)

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Household Income:			
Under \$9,999	4 (10.0%)	17 (20.0%)	21
\$10,000 – 19,999	7 (17.5%)	17 (20.0%)	24
\$20,000 – 29,999	5 (12.5%)	14 (16.5%)	19
\$30,000 – 39,999	5 (12.5%)	5 (5.9%)	10
\$40,000 – 49,999	3 (7.5%)	5 (5.9%)	8
\$50,000 – 59,999	3 (7.5%)	2 (2.4%)	5
\$60,000 – 69,999	2 (5.0%)	4 (4.7%)	6
\$70,000 – 79,999	3 (7.5%)	6 (7.1%)	9
\$80,000 – 89,999	3 (7.5%)	2 (2.4%)	5
\$90,000 – 99,999	1 (2.5%)	3 (3.5%)	4
\$100,000-109,999	3 (7.5%)	3 (3.5%)	6
\$110,000-119,999	1 (2.5%)	3 (3.5%)	4
Over \$120,000	0 (0%)	4 (4.7%)	4
Missing data			5

distributed between the ages of 18-44. The remainder were in the 45-54 (19) and over 54 (19) year groups. Most were white (85) followed by Asian (25), African-American (9), Other (6), and Hispanic/Spanish (4). Their household status was single adult (55), couple with children in home (37), and couple without children in home (29), single parent with children in home (7), and other (2). Most had a graduate degree (57) with the remainders having completed college (27), some college (40), and high school degrees (6). Sixty-two consumers were employed full-time while 57 consumers were students. The remaining were employed part-time (4), homemaker (1), and retired (5). The majority of consumers (82) had annual incomes of less than \$50,000 and 43 consumers having an annual income in excess of \$50,000. Note that although consumers were not representative of the U.S. population, they did represent regular consumers of sherbet products.

Product information about frozen desserts gathered from participating consumers is shown in Table 7. The vast majority (97) said they normally eat frozen desserts low in fat and 73 said they eat frozen desserts that are sugar-free. When questioned about purchase frequency regarding frozen desserts, most of the consumers (38) indicated they buy frozen desserts once a month. Other reported purchase frequencies included more than once a week (6), once a week (19), and twice a month (27). Taste (96) was the most important quality attribute while texture/mouthfeel (14) and nutrition (10) were less important for sherbets. Color/appearance and aroma/odor were not listed as important attributes.

The most preferred fruit flavor was strawberry (35), then orange (29), pineapple (15), lemon/lime (15), peach (14), cherry (6), grape (3), and other (2). Most of the consumers (69) preferred sherbet products which were sweeter and less sour, some (45) preferred sweet and sour equally, and others (13) preferred more sour and less sweet. Almost half (59) have

Table 7. Consumer product information about frozen desserts

	Male	Female	Total
Eat low-fat frozen desserts			
Yes	29 (72.5%)	68 (75.6%)	97
No	11 (27.5%)	22 (24.4%)	33
Eat sugar-free frozen desserts			
Yes	17 (42.5%)	56 (63.6%)	73
No	23 (57.5%)	32 (36.4%)	55
Buy frozen desserts			
More than once a week	2 (5.0%)	4 (4.4%)	6
Once a week	8 (20%)	11 (12.2%)	19
Twice a month	6 (15.0%)	21 (23.3%)	27
Once a month	9 (22.5%)	29 (32.2%)	38
Very rarely	13 (32.5%)	25 (27.8%)	38
Never	2 (5.0%)	0 (0%)	2
Most important quality attribute			
Color/appearance	0 (0%)	0 (0%)	0
Taste	26 (74.3%)	70 (82.4%)	96
Aroma/odor	0 (0%)	0 (0%)	0
Texture/mouthfeel	6 (17.1%)	8 (9.4%)	14
Nutrition	3 (8.6%)	7 (8.2%)	10
Other	0 (0%)	0 (0%)	0
Most preferred fruit flavor			
Grape	2 (5.4%)	1 (1.2%)	3
Orange	11 (29.4%)	18 (22.0%)	29
Lime/lemon	4 (10.8%)	11 (13.4%)	15
Strawberry	7 (18.9%)	28 (34.2%)	35
Cherry	3 (8.1%)	3 (3.7%)	6
Peach	4 (10.8%)	10 (12.2%)	14
Pineapple	6 (16.2%)	9 (11.0%)	15
Other	0 (0%)	2 (2.4%)	2
Taste preference for sherbets			
Sweeter and less sour	22 (55.0%)	47 (52.8%)	69
More sour and less sweet	6 (15.0%)	7 (7.9%)	13
Sweet / sour equally	12 (30.0%)	33 (37.1%)	45
Other	0 (0%)	2 (2.3%)	2
Purchased/consumed low-fat sugar-free sherbet products?			
Yes	17 (42.5%)	42 (46.7%)	59
No	23 (57.5%)	48 (53.3%)	71
Purchase intent if product contains a health-promoting ingredient such as soy protein?			
Yes	31 (77.5%)	74 (82.2%)	105
No	9 (22.5%)	16 (17.8%)	25

purchased/consumed low-fat sugar-free sherbet products before. When asked about purchase intent if the sherbet product contained a health-promoting ingredient such as soy protein, 105 gave positive responses and 25 gave negative responses.

3.3.2 Consumer Acceptability

The control formulation (0% SP, 12% MD) had the highest mean score for all sensory attributes (Table 8). Excluding the control sample, formulation 10 (4.25% SP, 12% MD) had the highest mean acceptability score (6.50) for appearance while formulation 1 (3.25% SP, 10% MD) had the highest score (6.70) for color. The highest mean acceptability score for flavor was observed with formulation 9 (3.25% SP, 12% MD) and 10 (4.25% SP, 12% MD), both were scored at 5.47. The texture score for formulation 9 was the highest among those containing SP although it was not acceptable. With respect to overall liking, formulation 10 was rated the highest with a mean score of 5.2 while formulation 3 was rated the lowest with a mean acceptance score of 3.87. When comparing all 13 formulations there were significant differences with respect to all attributes (see appendix). For flavor, texture, and overall liking, all products containing soy protein were significantly different from the control with p-values of 0.0484, 0.0194, and 0.0094, respectively. Sweetness and sourness were significantly different depending on whether the 12 formulations containing SP were analyzed or whether they were analyzed with the control. Excluding the control, there were no significant differences for sweetness and sourness among 12 products containing SP. A series of paired comparison tests, comparing each formulation to the control for each attribute, revealed a number of interesting observations. There were significant differences between each formulation and the control for flavor, texture and overall liking. For appearance and color acceptability scores, the formulations 3,4,7,8,9,11 and 12 were significantly lower than the control.

Table 8. Mean consumer scores^a for acceptability of appearance, color, flavor, sweetness, sourness, texture/mouthfeel, and overall liking of orange sherbet formulations^b

Formulation ^c	Soy (SP) %	MD %	Appearance	Color	Flavor	Sweetness	Sourness	Texture	Overall liking
1	3.25	10	6.07 (1.62)	6.70 (1.62)	5.33* (2.19)	5.87 (2.11)	5.37* (1.52)	4.33* (2.28)	5.03* ^a (2.01)
2	4.25	10	6.10 (1.65)	6.40 (1.63)	4.77* (2.08)	5.63 (1.73)	5.13* (1.89)	3.77* (2.28)	4.30* (1.82)
3	5.25	10	5.83* (1.53)	6.30* (1.58)	4.17* ^a (1.93)	5.40* (1.65)	5.47* (1.70)	3.00* (1.58)	3.87* (1.74)
4	6.25	10	5.87* (1.68)	6.13* (1.55)	4.37* (2.09)	4.97* (1.83)	5.20* (1.69)	3.93* (2.12)	4.30* (2.15)
5	3.25	11	6.37 (1.54)	6.47 (1.74)	5.13* (1.93)	5.87 (1.87)	5.97 (1.47)	4.17* (2.18)	5.17* (1.93)
6	4.25	11	6.27 (1.78)	6.50 (1.48)	5.07* (2.20)	5.38* ^a (2.23)	5.70 (1.95)	3.93* (2.02)	4.77* (2.21)
7	5.25	11	5.83* (1.70)	6.30* (1.58)	4.97* (1.75)	5.62* ^a (1.80)	5.50* (1.55)	3.67* (1.63)	4.48* ^a (1.74)
8	6.25	11	6.30* (2.10)	6.53* (1.78)	4.53* (2.06)	5.17* (2.00)	5.07* (1.76)	3.70* (2.37)	4.17* (2.25)
9	3.25	12	5.83* (2.00)	6.40* (1.65)	5.47* (1.98)	5.87 (1.87)	5.87 (1.48)	4.67* (2.25)	4.97* (2.28)
10	4.25	12	6.50 (1.50)	6.57 (1.36)	5.47* (1.85)	5.70 (1.73)	5.43* (1.79)	4.57* (1.83)	5.20* (1.99)
11	5.25	12	5.77* (1.89)	5.93* (1.86)	4.90* (2.12)	4.90* (2.04)	5.00* (1.82)	3.97* (2.17)	4.40* (2.09)
12	6.25	12	5.37* (1.27)	5.50* (1.83)	4.79* ^a (1.93)	5.28* ^a (1.77)	5.10* (1.84)	4.23* (2.05)	4.53* (1.89)
13 (control)	0	12	6.77 (1.25)	7.00 ^a (1.20)	6.97 (1.22)	6.50 (1.66)	6.43 (1.10)	6.97 (1.33)	6.93 (1.23)
P-Value*			0.0324	0.0238	0.0484	0.1924	0.1859	0.0194	0.0094

^a Indicates only 29 responses reported

^b Numbers in parentheses refer to standard deviation of 30 consumer responses. A 9-point hedonic scale was used (1=dislike extremely, 5=neither like nor dislike, and 9=like extremely)

^c Refer to Table 5 for detailed product formulations

* Indicates a significant difference between each formulation and the control at $p \leq 0.05$

3.3.3 Acceptability and Purchase Intent

Each formulation was evaluated separately using a likert scale (yes/no) for consumer acceptance, purchase intent, and purchase intent if the product contained SP as a health promoting ingredient (Table 9). Note that the percent (%) used in Table 9 is referred to as % frequency of positive responses for acceptability and purchase intent. Of the products containing SP, formulation 6 (4.25% SP, 11% MD) had the highest consumer acceptability (60.0%) while formulation 3 was (5.25% SP, 10% MD) rated lowest (26.7%). Formulation 13 (control) was rated highest for acceptability (90.0%) and purchase intent with soy (80.0%). Although formulation 3 was rated lowest in acceptability, it was one of only 2 formulations (i.e., formulation 2 and 3) which had a higher percent purchase intent than acceptability after consumers had been informed that it contained SP. Although this was a small difference, it leads to the conclusion that some consumers would purchase the product even though it was unacceptable, presumably for soy's health promoting benefits. When consumers were asked about purchase intent, formulation 5 was (3.25% SP, 11% MD) rated highest (36.7%) and formulation 7 (5.25% SP, 11% MD) scored the lowest (6.7%). Both formulation 1 (3.25% SP, 10% MD) and formulation 2 (4.25% SP, 10% MD) had a 20% increase in positive purchase intent after consumers had been informed that the products contained soy protein as a health promoting ingredient.

Although the purchase intent percentages were lower than expected, 80% of the consumers would be willing to purchase sherbet products which contained SP as an ingredient (Table 10). This is an interesting observation considering that SP was added to the sherbet formulations as a health promoting ingredient. The survey results indicated that 20% of the consumers from this study (Table 10) would not buy the product containing SP. None of the

Table 9. The positive (yes) responses for product acceptability and purchase intent of orange sherbet formulations^a

Formulation ^c	Acceptability			Purchase Intent			Purchase Intent with soy ^b		
	Male	Female	Combined	Male	Female	Combined	Male	Female	Combined
1	4	12	16 (53.3%)	1	6	7 (23.3%)	4	9	13 (43.3%)
2	4	5	9 (30.0%)	1	4	5 (16.7%)	3	8	11 (36.7%)
3	2	6	8 (26.7%)	0	4	4 (13.3%)	2	7	9 (30.0%)
4	1	11	12 (40.0%)	1	5	6 (20.7%)	1	8	9 (30.0%)
5	6	9	15 (50.0%)	4	7	11 (36.7%)	5	10	15 (50.0%)
6	5	13	18 (60.0%)	2	8	10 (33.3%)	4	8	12 (40.0%)
7	6	7	13 (43.3%)	0	2	2 (6.7%)	3	4	7 (23.3%)
8	3	5	8 (26.7%)	2	3	5 (16.7%)	2	3	5 (16.7%)
9	6	10	16 (53.3%)	3	5	8 (26.7%)	6	6	12 (40.0%)
10	9	7	16 (53.3%)	5	5	10 (33.3%)	7	6	13 (43.3%)
11	6	6	12 (40.0%)	3	2	5 (16.7%)	4	4	8 (26.7%)
12	5	6	11 (36.7%)	4	2	6 (20.0%)	4	3	7 (23.3%)
13	9	18	27 (90.0%)	5	14	19 (63.3%)	8	16	24 (80.0%)
Overall	66	115	181(46.4%)	31	67	*98 (25.2%)	53	92	145(37.2%)

^a Each product was evaluated 30 times.

^b When the consumers were informed of the health benefit of sherbets containing soy protein

^c Refer to Table 5 for detailed product formulations

*Out of 389 responses

Table 10. Purchase intent if the sherbet contains a health-promoting ingredient such as soy protein

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Yes	31 (77.5%)	74 (82.2%)	105 (80.8%)
No	9 (22.5%)	16 (17.8%)	25 (19.2%)

consumers were allergic to SP though negative perception about soy protein and its sensory properties could underlie part of the reason for its unacceptability (Robinson et al., 1995; Liu, 1999).

3.3.4 Overall Product Differences – Pooled Within Canonical Structure r 's

MANOVA was performed to determine if the products were overall different considering all sensory attributes simultaneously. Results of a Wilks' Lambda P-value of 0.0001 (Table 11) indicated that all thirteen sherbet formulations were overall different. We determined which attributes underlied the differences among thirteen formulations using descriptive discriminant analysis (DDA). The first dimension of the pooled within canonical structure (Table 12) reveals that flavor (0.661), texture (0.919), and overall liking (0.726) significantly contributed to the overall difference among formulations 1-13.

3.3.5 Logistic Regression vs. Predictive Discriminant Analysis for Acceptance and Purchase Intent

Logistic regression and predictive discriminant analysis can both be used to predict consumer behavior although the mechanisms by which they work are different. Logistic regression works in a similar manner to linear regression in that both methods produce prediction equations and the regression coefficients measure the predictive capability of the independent variables. However, in logistic regression the response variable is dichotomous (yes/no) or categorical and it follows a S-shaped distribution curve. Logistic regression does not predict a yes/no response (% hit rate) directly, which is done under discriminant analysis, but instead it predicts the log odds ratio. The odds ratio has an indicator equal to 1. Probabilities can range from 0 to 1 with 0.5 meaning that both outcomes are equally likely to occur (Dallal, 2001).

Table 11. Multivariate statistics and F approximations

MANOVA Test Criteria and F Approximations for
the Hypothesis of No Overall Form Effect

H = Type III SSCP Matrix for Form
E = Error SSCP Matrix

S=7 M=2 N=181

<u>Statistics</u>	<u>Value</u>	<u>F Value</u>	<u>Num DF</u>	<u>Den DF</u>	<u>Pr > F</u>
Wilks' Lambda	0.68552390	1.69	84	2237.3	0.0001
Pillai's Trace	0.35362193	1.64	84	2590	0.0003
Hotelling-Lawley Trace	0.40479589	1.75	84	1538.1	<.0001
Roy's Greatest Root	0.23634513	7.29	12	370	<.0001

Table 12. Canonical structure r's describing group differences among sherbet formulations^a

<u>Variable</u>	<u>Can1</u>	<u>Can2</u>
Appearance acceptability	0.210	0.578
Color acceptability	0.173	0.723
Flavor acceptability	0.661*	0.467
Sweet acceptability	0.286	0.653
Sour acceptability	0.309	0.711
Texture/mouthfeel acceptability	0.919*	0.253
<u>Overall Liking</u>	<u>0.726*</u>	<u>0.587</u>
Cumulative variance explained (%)	58.39	71.61

^a Based on pool within-group variances.

*Indicates sensory attributes which largely account for group differences in the first dimension.

Predictive discriminant analysis (PDA) is based on the concept of group membership and classification. It is useful for classification of cases (formulations) in which group membership is not known beforehand. Discriminant analysis allows examination of a set of variables (attributes) for group distinctiveness in which the variables distinguish groups that relate to similar qualities and quantities. The paradoxical advantage of identification of the multidimensionality of the underlying correlated dependent variables also poses a potential problem when dependent variables are highly correlated (Betz, 1987; Bray and Maxwell, 1982; Brown and Tinsley, 1983).

The results of predictive discriminant analysis show that all seven attributes together as predictors yield a hit rate of 89% (Table 13). The single attribute contributing the most to prediction of product acceptability was overall liking with a hit rate of 88.7%, followed by flavor (83.8%), and texture (82.0%). With the seven predictor variables we can predict the acceptability of the products correctly 89% of the time. With overall liking alone, the correct prediction dropped slightly to 88.7%. Results of PDA with purchase intent were slightly lower than acceptability. With all seven attributes, we can correctly predict 83% of the time whether a consumer would purchase a particular formulation. This percentage drops to 78.7% utilizing just texture, 77.5% for sweetness alone, and 74.2% for flavor alone. For both acceptability and purchase intent, appearance and color were least important as predictors.

Stepwise discriminant analysis can be used to determine the “best” subset of discriminator variables that distinguish groups. However, caution should be taken in that this technique is far less likely to yield repeatable results compared to leave-one-out discriminant analysis due to the “outrageous” capitalization on chance and the nuances of the particular sample (Thompson, 1995). Even using large sample sizes with a small number of predictors, it

Table 13. Classification results from predictive discriminate analysis (PDA) - % Hit Rate

	<u>Acceptability</u>	<u>Purchase Intent</u>
Appearance acceptability	66.4%	62.8%
Color acceptability	62.9%	57.0%
Flavor acceptability	83.8%	74.2%
Sweet acceptability	73.4%	77.5%
Sour acceptability	74.6%	69.2%
Texture acceptability	82.0%	78.7%
Overall Liking	88.7%	82.5%
<u>All 7 Attributes</u>	<u>89.0%</u>	<u>83.0%</u>

only reduces the problem slightly (Thompson, 1995). Lastly, the tests for significance for stepwise discriminant analysis are positively biased and erroneous (Rencher and Larson, 1980; Stevens, 1996; Thompson, 1995) and it is felt that this technique should be eschewed for publication purposes (Thompson, 1995; Tinsley and Brown, 2000) and thus was not performed for this study.

3.3.6 Logistic Regression Analysis for Acceptability

Logistic regression analysis was used to determine which attributes influence acceptability, purchase intent, and purchase intent with soy protein. The predictive models are shown in Tables 14 and 15. Using all 7 attributes as predictors the analysis revealed that the attributes appearance, texture, and overall liking have a significant influence on acceptability ($\text{prob} > X^2 < 0.05$) (Table 16). These attributes had corresponding odds ratio estimates of 1.694, 1.667, and 3.167, respectively (Table 16). Therefore, product improvement can have a very significant result in future studies and should be mainly focused on appearance and texture improvement.

The strength of association of logistic regression can be performed similar to that of the multiple regression. Unlike multiple regression which uses least squares estimation, logistic regression uses a maximum likelihood estimation procedure. Each variable that is added to the model gives a better prediction as to whether the product is acceptable or if the consumer would purchase it. If a variable is not significant ($H_0: \beta=0$), then it can be dropped from the equation. The R^2 for the full model relating all attributes to consumer acceptance is 0.6018 with overall liking alone being just slightly lower at 0.5776 (Table 16). For purchase intent the R^2 was 0.5271 with all the attributes in the model and 0.5104 when only with overall liking. The R^2 for the purchase intent model after consumers had been notified that products contained soy drops

Table 14. Full logistic regression models for predicting acceptability, purchase intent, and purchase intent with soy protein.

<u>Dependent Variable</u>	<u>Predictive model</u>
Acceptability	$Y=0.5273X_1 - 0.2864X_2 + 0.1751X_3 + 0.0157X_4 + 0.2382X_5 + 0.5111X_6 + 1.1527X_7 - 11.7944$
Purchase Intent	$Y=0.3894X_1 - 0.4100X_2 + 0.3636X_3 + 0.0358X_4 + 0.5478X_5 - 0.0407X_6 + 1.9381X_7 - 18.4081$
Purchase Intent with soy ^a	$Y=0.1643X_1 - 0.0116X_2 + 0.1708X_3 + 0.1419X_4 + 0.0369X_5 + 0.0554X_6 + 0.7579X_7 - 7.7103$

^a After the consumers had been informed the products contained a health-promoting soy protein

Table 15. Logistic regression models restricted to one independent variable for predicting acceptability, purchase intent, and purchase intent with soy protein^a

<u>Independent variable</u>	<u>Predictive model</u>		
	<u>Acceptability</u>	<u>Purchase Intent</u>	<u>Purchase Intent with soy^a</u>
Appearance (X ₁)	Y=0.5897X ₁ - 3.7802	Y=0.6164X ₁ - 5.0783	Y=0.5279X ₁ - 3.8363
Color (X ₂)	Y=0.5048X ₂ - 3.4053	Y=0.5575X ₂ - 4.8281	Y=0.4956X ₂ - 3.7781
Flavor (X ₃)	Y=1.1089X ₃ - 6.0117	Y=1.4728X ₃ - 10.1156	Y=0.9241X ₃ - 5.6423
Sweetness (X ₄)	Y=0.7815X ₄ - 4.6027	Y=1.1953X ₄ - 8.7125	Y=0.7591X ₄ - 5.0084
Sourness (X ₅)	Y=0.9213X ₅ - 5.3228	Y=1.1502X ₅ - 8.0992	Y=0.7690X ₅ - 4.9510
Texture (X ₆)	Y=1.0760X ₆ - 4.6604	Y=0.8196X ₆ - 5.1832	Y=0.6613X ₆ - 3.5070
Overall Liking (X ₇)	Y=1.6916X ₇ - 8.5358	Y=2.3041X ₇ - 15.1260	Y=1.0808X ₇ - 6.1985

^a After the consumers had been informed the products contained a health-promoting soy protein

Table 16. The R² and odds ratio estimates for the logistic regression models used to predict consumer acceptance

<u>Independent variable</u>	<u>R-Square</u>	<u>Prob>X² (full)</u>	<u>Odds Ratio Estimate (single)</u>	<u>Odds Ratio Estimate (full)</u>
Appearance (X ₁)	0.1717	0.0251	1.803	1.694
Color (X ₂)	0.1280	0.1962	1.657	0.751
Flavor (X ₃)	0.4465	0.3012	3.031	1.191
Sweetness (X ₄)	0.2926	0.9230	2.185	1.016
Sourness (X ₅)	0.2921	0.2146	2.513	1.269
Texture (X ₆)	0.4582	0.0009	2.933	1.667
Overall Liking (X ₇)	0.5776	<.0001	5.428	3.167
All Attributes (X ₁ -X ₇)	0.6018			

even further to 0.4343 with all attributes and 0.4260 with only overall liking as a predictor.

The odds ratio (Table 16) indicated that the overall product acceptance will be increased by 69.4%, 66.7%, and 216.7% respectively, for every one point increase in the mean hedonic score of appearance, texture, and overall liking on a 9-point hedonic scale. Although overall liking is very significant with respect to overall acceptability it is important to remember that it is the sum total of other attributes the consumer experiences. Therefore, increasing overall liking directly may not be feasible but increasing the acceptability of other attributes, such as appearance and texture, is certainly possible.

A few suggestions can be made for the low R^2 values. First of all, only 30 consumers evaluated each of the 13 formulations. The low number of responses for each formulation was combined with the fact that there were large variations in the responses from these consumers.

Multiple regression was used to find a relationship between soy protein and maltodextrin (independent variables) and each sensory attribute (dependent variable). A multitude of models (linear, cubic, quadratic, and log) were generated but each attempt resulted in a low R^2 of less than 0.5. Caution should be noted before concluding that there is very little correlation between the amount of soy protein and maltodextrin and the sensory attributes appearance, color, flavor, sweetness, sourness, texture, and overall liking. For the reasons mentioned above, sample size and variability also play a role and could partially account for this effect.

3.3.7 Logistic Regression Analysis for Purchase Intent

The full and a-single-attribute logistic regression models are shown in Tables 14 and 15. Prediction of purchase intent revealed that consumers found that sourness and overall liking were significant ($\text{prob} > X^2 < 0.05$). This is not surprising since one of the distinctive characteristics of sherbet is its sourness which is normally is more sour than ice cream (Marshall and Arbuckle,

2000, 1996) The odds ratio for overall liking was very high (6.945) compared to the other attributes and sourness (1.73) (Table 17). The higher odds ratio means that consumers feel overall liking is more important when it comes to purchasing the product. With an increase in overall liking score of 1, it is 6.9 times more likely that consumers will purchase the product. Based on the odds ratio for acceptance and purchase intent, appearance, texture and sourness should be the focus for further product improvement.

3.3.8 Logistic Regression Analysis for Purchase Intent with Soy Protein

Prediction of purchase intent of the product with soy was less accurate than that of the acceptance and purchase intent. The only significant predictor was overall liking ($\text{prob} > X^2 < .05$). The odd ratio for overall liking was 2.134 showing that although it is a significant predictor for purchase intent, it is not nearly as strong an indicator compared to the previous model which contained no soy protein (Table 18). One reason could be the compromise some consumers are willing to make because of the nutritional benefits of soy protein. This compromise results in a lower odds ratio for overall liking and this value would be expected to drop even further as the number of positive responses for purchase intent increases. It should be noted that the R^2 dropped from 0.5271 in the previous model (Table 17) to 0.4343 in this one. Although overall liking is the only significant attribute affecting purchase intent, improving the other critical attributes based on the results of the previous models, will naturally increase purchase intent and thus purchase intent with soy.

3.4 Conclusion

This study identified specific sensory attributes driving acceptance and purchase intent of low-fat sugar-free sherbets containing soy protein. The addition of soy protein to sherbet formulations causes significant differences in consumer responses towards certain sensory

Table 17. The R² and odds ratio estimates for the logistic regression models used to predict consumer purchase intent

<u>Independent variable</u>	<u>R-Square</u>	<u>Prob>X² (full)</u>	<u>Odds Ratio Estimate (single)</u>	<u>Odds Ratio Estimate (full)</u>
Appearance (X ₁)	0.1304	0.1343	1.852	1.476
Color (X ₂)	0.1041	0.1221	1.746	0.664
Flavor (X ₃)	0.3969	0.1752	4.362	1.438
Sweetness (X ₄)	0.3150	0.8671	3.305	1.036
Sourness (X ₅)	0.2833	0.0104	3.159	1.730
Texture (X ₆)	0.3197	0.8045	2.269	0.960
Overall Liking (X ₇)	0.5104	<.0001	10.016	6.945
All Attributes (X ₁ -X ₇)	0.5271			

Table 18. The R² and odds ratio estimates for the logistic regression models used to predict consumer purchase intent after notification that the formulation contained soy protein

Attribute	R-Square	Prob>X ² (full)	Odds Ratio Estimate (single)	Odds Ratio Estimate (full)
Appearance (X ₁)	0.1330	0.3264	1.695	1.179
Color (X ₂)	0.1123	0.9439	1.641	0.988
Flavor (X ₃)	0.3548	0.2475	2.520	1.186
Sweetness (X ₄)	0.2587	0.2613	2.136	1.152
Sourness (X ₅)	0.2214	0.7942	2.158	1.038
Texture (X ₆)	0.2918	0.6105	1.937	1.057
Overall Liking (X ₇)	0.4260	<.0001	2.947	2.134
All Attributes (X ₁ -X ₇)	0.4343			

attributes. 130 consumers participated in the study. Results of the Wilks' Lambda P-value 0.0001 showed differences in the 13 sherbet formulations. The first dimension of the canonical structure accounted for 58.4% of the variance and indicated that flavor, texture, and overall liking contributed to most of the differences. Specifically, texture was identified as the most critical attribute affecting overall liking. Overall liking affected the purchase intent. Formulation 6 (4.25% SP) had the highest acceptance (60%) and formulation 5 (3.25% SP) was highest in purchase intent (36.7%). Consumers would be more willing to purchase sherbet products with soy protein added as a health promoting ingredient.

CHAPTER 4. A NOVEL LOW-FAT SUGAR-FREE SHERBET CONTAINING SOY PROTEIN BELOW OR ABOVE THE FDA REQUIREMENT : PRODUCT ACCEPTANCE AND MARKET OPPORTUNITY DRIVEN BY SPECIFIC CONSUMER SENSORY ATTRIBUTES

4.1 Introduction

The annual ice cream sales for the 52 week period ending January 27, 2002 totaled about \$4.7 billion, an increase of 4.9%. Ice cream novelties looked even better with a sales growth of 7.1% and sales topping \$2.1 billion in 2001. The frozen dessert realm is rapidly expanding as companies continue to develop new and innovative products. Today there are a variety of items to choose from and those holding the top market share include: ice cream bars with a stick (17.9%), sandwiches (13.5%), frozen ice (12.5%), ice cream cones (9.8%), and fruit/juice (9.5%). All five categories had retail dollar sales higher in 2001 than in 2000 except the frozen ice category (International Dairy Foods Association, 2001).

Developing a successful product that will survive in the competitive market environment is challenging. Consumer acceptability is vital, but this alone will not guarantee product success. Acceptability is dependent on those sensory attributes such as appearance, color, flavor, texture/mouthfeel, and overall liking as well as brand name loyalty, advertising and promotion, price, quality control, competitors, and economic factors (Schutz, 1983). Appearance (Prinyawiwatkul et al., 1997a) of a food has been defined as a basic sensory attribute encompassing color, shape, and size as well as more complex attributes including surface texture, and overall texture. Color (Blouin et al., 1981) is probably the first characteristic of a food evaluated by a consumer. Flavor is frequently the most important quality attribute for a food while texture/mouthfeel is the second most readily identifiable sensory property (Rakosky, 1989).

A consumer study was previously conducted to evaluate the sensory qualities and acceptance of orange sherbet with soy protein. Poor texture was a result of added soy protein. Selection of the type of soy protein for sherbet formulations must be done carefully. The soy protein should be highly dispersible and soluble in water when used at or above the FDA requirements. The FDA requires that the food products contain at least 6.25 g of protein from soy and its derivatives per serving in order to state a health claim¹ on the product label. A model health claim would include “25 grams of soy protein a day, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of (name of food) supplies xx grams of soy protein.” Erythritol can be used in the sherbet formulations for its low caloric value, its effect as a bulking agent to increase total solids content, and ability to mask off flavors.

The objectives of this study were to evaluate the consumer acceptability of low-fat non-sugar orange sherbet containing soy protein below or above the FDA requirement and to identify attributes driving overall acceptance and purchase intent.

4.2 Materials and Methods

4.2.1 Soy Protein Concentrate

ALPHA™ 5800 is a spray-dried, powdered soy protein carefully processed to retain the natural solubility of the protein. The protein is ideal for use in liquid UHT, pasteurized refrigerated and retort soy and dairy beverages as well as powdered drink mix applications. It is ideally suited, because of its chemical properties, for inclusion at levels at or above the FDA

¹ Criteria to Meet Health Claim

6.25 grams of soy protein/RACC (Reference Amount Customarily Consumed)

3 grams or less fat - FDA's criterion for low fat

1 gram or less of saturated fat

20 mg or less of cholesterol

Sodium Restrictions: 480 mg/RACC, 960 mg/meal, 720 mg/maindish

health claim level. The total isoflavones range from 2.5-3.9 mg/g of product. Typical product characteristics include: 76% protein, 1.1% crude fiber, 4% total dietary fiber, 0.1% fat, 5% moisture, and 6.3% ash. Microbial analysis showed a microbial count (per g) of <20,000 CFU/g, Salmonella (per 750 g) as none detected, and E. coli (per g) as negative. The product should be stored on pallets or skids in a cool, dry place, preferably below 80°F at a relative humidity of 60% or less.

4.2.2 Sherbet Preparation

Four sherbets were formulated with various levels of soy protein isolate, SP (7.09, 7.5, 6.5 and 6.0 g/serving), according to Table 19. Due to the blender size and the amount of each formulation to be prepared, each formulation was prepared twice and combined, and uniform mixture transferred to the smoothie machine. Citric Acid Anhydrous Fine Granular (ADM, Southport, North Carolina) was weighed using an analytical scale (Mettler Toledo Model #AG104, Columbus, Ohio). Natural orange flavoring (WONF) (Flavors of North America, Carol Stream, Illinois), annatto color (Food Ingredient Solutions, New York, New York), Splenda[®] brand sucralose as liquid concentrate 25% aqueous solution (McNeil Specialty Products Co., McIntosh, Alabama), and Sunnet[®] brand acesulfame-K (Nutrinova Inc., Somerset, New Jersey) were combined before mixing with other ingredients.

Water was warmed until it reached 48.5°C, and weighed (CAS Computing Scale model AP-1, Korea) and transferred into a blender (Vita-Mix model VM0100A, Cleveland, Ohio). Soy protein (82% protein) (ALPHA[™] 5800, Central Soya, Fort Wayne, Illinois), maltodextrin (Malta*Gran[®] 10, Primera Foods, Faribault, Minnesota), and erythritol (C*Eridex 16952, Cerestar USA Inc., Hammond, Indiana) were added to the blender. These ingredients were

Table 19. Orange sherbet formulations with ingredients varied²

<u>Formulation</u>	<u>Soy Protein (g/serving)</u>	<u>Maltodextrin</u>
1	7.09	14.27%
2	7.05	13.84%
3	6.5	14.91%
4	6.0	15.45%

² Fixed ingredients which make up a total of 100% for each formulation

	% Total
Water	31.94%
Heavy cream	3.77%
Skim milk	8.74%
Buttermilk	2.71%
Orange juice	19.82%
Orange flavoring	0.44%
Citric acid	0.36%
Sucralose	0.10%
Acesulfame-K	0.02%
Erythritol	0.10%
Annatto color	0.20%

blended for 3 minutes, using 20 second cycles consecutively, and were transferred to a metal container for holding. Premium Original orange juice with no pulp (Tropicana, Bradenton, Florida), Grade-A Ultra-Pasteurized Heavy Whipping Cream (Kleinpeter Farms Dairy, Baton Rouge, Louisiana), Grade-A Pasteurized Homogenized Skim Milk (Kleinpeter Farms Dairy, Baton Rouge, Louisiana), and Reduced-Fat Buttermilk (Kleinpeter Farms Dairy, Baton Rouge, Louisiana) were added and mixed for 1 minute. The solution of sweeteners, orange flavoring and annatto coloring was added to the blended mixture and was thoroughly blended for 1 minute. The liquid mixture was transferred to the metal container holding the soy/maltodextrin/erythritol mixture. The solutions were then blended for 1.5 minutes to attain a uniform mixture. One gallon of the mix was transferred to a smoothie machine (Taylor model 430-12, Rockton, Illinois). The machine was operated for about 15 minutes and the smooth sherbet mixture was transferred into ½ gallon plastic containers each labeled with a number corresponding to each formulation and stored in a blast freezer overnight (-25 °F).

The following day the sherbet formulations were moved to a walk-in cooler and allowed to soften. Once softened, each formulation was scooped and put into 2 oz. opaque plastic cups and sealed with lids. These individual cups (200 cups per formulation) were stored on trays according to the 3 digit number which represented the formulation number. All samples were placed back inside the freezer (-25 °F) for storage until evaluated for consumer sensory acceptability. They were covered with foil to prevent odor contamination from surrounding products. On the day of the consumer study, the samples were taken out of the freezer approximately 30-45 minutes before the actual taste test, and placed in the cooler to soften. The melting time of these products was faster than those made for the first consumer study due to the higher solids content.

An estimated 40% overrun was calculated beforehand and ingredients adjusted accordingly (Table 19). The actual % overrun level per one gallon product per formulation is listed in Table 20. The minimum weight requirement for sherbet is 6 lb /gallon. The weight of each formulation was determined by weighing two ½ half gallon containers and subtracting the tare of both. The % overrun was calculated as [the weight of one gallon of finished product x 100] / the original mix weight of 9.5 lb/gallon.

4.2.3 Experimental Design and Consumer Tests

Untrained in-house consumers (n=140) were randomly recruited from Louisiana State University. Consumers were recruited by flyers, faxes, phone calls, and emails. A database of consumers who had participated in the previous consumer studies was used first, then the Louisiana State University student and faculty directory was used. A day before the scheduled test session, the consumers were reminded through a phone call about a particular session. Criteria for recruitment were: (1) at least 18 years of age, (2) not allergic to soy or milk products, and (3) available and willing to participate on particular testing dates. Since not every consumer had participated in consumer acceptance tests, the testing procedures were briefly discussed, particularly about sample handling and evaluation. Consumers were informed that each sample was labeled with a 3 digit code corresponding to each page of the questionnaire. Consumers were asked to complete the demographic and socioeconomic questionnaires regarding age, gender, race, marital status, educational level, employment status, and household income. Consumers also provided information on consumption of low-fat and sugar-free desserts, frequency of purchase, the most important quality attribute of these desserts, the most preferred fruit flavor for frozen sherbets, history of purchasing low-fat sugar-free sherbets, and willingness to purchase these sherbets if they contained a health promoting ingredient like soy protein. A

Table 20. The % overrun of 4 sherbet formulations with soy protein

<u>Formulation</u>	<u>Weight</u>	<u>% Overrun</u>
1	6.20 lb.	34.7
2	5.36 lb.	43.6
3	5.58 lb.	41.3
4	6.26 lb.	34.1

total of eighteen test sessions were conducted at 10:00 AM, 10:45 AM, 2:00 PM, 2:45 PM, 3:30 PM, and 4:15 PM during a 3 day period.

The sherbet formulations were evaluated using a randomized complete block design (RCBD). The use of this design allowed all 4 samples to be evaluated by each consumer and each sample evaluated once. The RCBD is the simplest of blocking designs used to control experimental error. Each formulation was presented once to each consumer (experimental unit) and 140 consumers made a block. Using blocks allows more precise comparisons among treatments within the homogeneous set of experimental units (Kuehl, 2000). Each of the four samples was evaluated 140 times. All 140 consumer responses were used to generate models relating sensory qualities and acceptability, purchase intent, and purchase intent after acknowledgement of the products containing soy protein.

Orange sherbet samples were presented to consumers in 2-oz opaque white plastic cups labeled with a 3 digit number corresponding to a particular formulation number. Water and expectoration cups were provided for consumers to use to minimize any sensory residual or carryover effects that may have occurred between samples. Consumers were instructed to evaluate each sample for acceptability of appearance/color, flavor, texture/mouthfeel, and overall liking using a 9-point hedonic scale (1=dislike extremely, 5=neither dislike nor like, and 9=like extremely) (Peryam and Pilgrim, 1957). Consumers were also asked to evaluate each sample as “acceptable” or “unacceptable” as suggested by Moskowitz (1994) using a likert scale. Purchase intent (buy/not buy) before and after additional information about soy protein was provided was also asked. The process of asking consumers to make judgments regarding how much they like or dislike is frequently performed (Schutz, 1983).

4.2.4 Statistical Analysis

The analysis of variance (Proc Mixed, SAS version 8.2, 2001) was performed to determine differences in acceptability for each sensory attribute and overall liking. Post-hoc multiple comparisons using Tukey's studentized range test were performed. Group differences, expressed in terms of mean vectors of acceptabilities (appearance/color, flavor, texture, and overall liking), were determined using multivariate analysis of variance (MANOVA). Descriptive discriminant analysis (DDA)(Huberty, 1994) (PROC CANDISC, SAS version 8.2, 2001) was performed to identify sensory acceptability attributes that largely underlied group differences among four sherbet formulations. Predictive discriminant analysis (PDA) (Huberty, 1994) (PROC DISCRIM, SAS version 8.2, 2001) and logistic regression analysis both full and restricted models (one dependent variable) (PROC LOGISTIC, SAS version 8.2, 2001) were performed to identify sensory attributes critical to overall product acceptance and purchase intent. For PDA, the test of homogeneity within covariance matrices was conducted (POOL=TEST) using a X^2 test. Frequency calculated for acceptability, purchase intent, and purchase intent after notification that the product contained soy protein.

4.3 Results and Discussion

4.3.1 Consumer Characteristics

Demographic and socioeconomic characteristics of participating consumers are given in Table 21. The consumers totaled 140 with 82 females and 58 males. More than half (79) were between the ages of 18 and 34. The remainder (61) were 35-44 (23), 45-54 (20), and over 54 (18) years of age. The majority were white (Caucasian) (86), followed by Asian (33), African-

Table 21. Demographic and socioeconomic information

	Male	Female	Total
Age:			
18-24 years	17 (29.3%)	29 (35.4%)	46
25-34 years	9 (15.5%)	24 (29.3%)	33
35-44 years	10 (17.2%)	13 (15.9%)	23
45-54 years	10 (17.2%)	10 (12.2%)	20
over 54 years	12 (20.7%)	6 (7.3%)	18
Gender:	58 (41.4%)	82 (58.6%)	140
Race:			
African-American	3 (5.4%)	8 (9.8%)	11
Asian	21 (37.5%)	12 (14.6%)	33
Hispanic/Spanish	2 (3.6%)	3 (3.7%)	5
White (Caucasian)	29 (51.8%)	57 (69.5%)	86
Other	1 (1.8%)	2 (2.4%)	3
Missing data			2
Household:			
Single parent with children in home	0 (0 %)	9 (11.0%)	9
Couple with children in home	10 (17.5%)	18 (22.0%)	28
Couple without children in home	19 (33.3%)	17 (20.7%)	36
Single adult	28 (49.1%)	35 (42.7%)	63
Other	0 (0%)	3 (3.7%)	3
Missing data			1
Level of Education:			
High school	0 (0%)	3 (3.7%)	3
Some college	7 (12.1%)	25 (30.5%)	32
Completed college	5(8.6%)	19 (23.2%)	24
Graduate (M.S., M.A., Ph.D., Ed.)	46 (79.3%)	35 (42.7%)	81
Employment:			
Employed full-time	30 (51.7%)	39 (37.6%)	69
Employed part-time	5 (8.6%)	3 (3.7%)	8
Unemployed	1 (1.7)	0 (0%)	1
Homemaker	0 (0%)	1 (1.2%)	1
Student	22 (37.9%)	39 (47.6%)	61

Table 21 (Continued)

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Household Income:			
Under \$9,999	8 (14.0%)	20 (24.4%)	28
\$10,000 – 19,999	16 (28.1%)	16 (19.5%)	32
\$20,000 – 29,999	5 (8.8%)	9 (11.0%)	14
\$30,000 – 39,999	3 (5.3%)	5 (6.1%)	8
\$40,000 – 49,999	3 (5.3%)	5 (6.1%)	8
\$50,000 – 59,999	3 (5.3%)	6 (7.3%)	9
\$60,000 – 69,999	4 (7.0%)	7 (8.4%)	11
\$70,000 – 79,999	2 (3.5%)	1 (1.2%)	3
\$80,000 – 89,999	2 (3.5%)	4 (4.9%)	6
\$90,000 – 99,999	3 (5.3%)	1 (1.2%)	4
\$100,000-\$109,999	1 (1.8%)	3 (3.7%)	4
\$110,000-119,999	3 (5.3%)	3 (3.7%)	6
Over \$120,000	4 (7.0%)	2 (2.4%)	6
Missing data			1

American (11), Hispanic/Spanish (5), and other (3). Household status was single adult (63), couple without children in home (36), couple with children in home (28), and single parent with children in home (9), and other (3). For level of education, most had a graduate degree (81), with the remainder (59) having completed college (24), some college (32), and high school (3). Sixty-nine consumers were employed full time while 61 were students. The remaining 10 consumers were employed part time (8), unemployed (1), and homemaker (1). For income, 74 consumers had an annual income of less than \$29,999, 36 were \$30,000-\$69,999, and the remaining 29 made over \$70,000 a year.

Consumers were asked about their consumption pattern of frozen desserts and the results are shown in Table 22. Most of the consumers stated they eat low fat frozen desserts (87) with almost twice as many females (57) compared to males (30). Sugar-free consumption of frozen desserts was much greater with females (31) more than males (17). Responses for purchase frequency of frozen desserts included more than once a week (12), once a week (30), twice a month (27), once a month (28), very rarely (41), and never (2). 69 percent of the consumers purchased frozen desserts at least once a month. 75 percent of the consumers (105) stated that taste was the most important sensory attribute, and of these, 62 responses were from female and 43 from male. Texture/mouthfeel (15), nutrition (7), and aroma/odor (2) were much less important. The most preferred fruit flavor was strawberry (49) followed by orange (27), pineapple (19), lemon/lime (14), and peach (13). For taste preference, 67 consumers preferred sherbets that were sweeter and less sour, 62 sweet and sour equally, and 11 more sour and less sweet. Almost half (65) have purchased or consumed low-fat sugar-free products before, with twice as many females (44) as males (21). When asked about purchase intent if the products

Table 22. Consumer product information about frozen desserts

	Male	Female	Total
Eat Low-fat frozen desserts?			
Yes	30 (51.7%)	57 (69.5%)	87
No	28 (48.3%)	25 (30.5%)	53
Eat Sugar-Free frozen desserts?			
Yes	17 (29.3%)	31 (37.8%)	48
No	41 (70.7%)	51 (62.2%)	92
Buy frozen desserts?			
More than once a week	4 (6.9%)	8 (9.8%)	12
Once a week	14 (24.1%)	16 (19.5%)	30
Twice a month	7 (12.1%)	20 (24.4%)	27
Once a month	11 (19.0%)	17 (20.7%)	28
Very rarely	21 (36.2%)	20 (24.4%)	41
Never	1 (1.7%)	1 (1.2%)	2
Most important quality attribute			
Color/appearance	0 (0%)	0 (0%)	0
Taste	43 (82.7%)	62 (80.5%)	105
Aroma/odor	1 (1.9%)	1 (1.3%)	2
Texture/mouthfeel	6 (11.5%)	9 (11.7%)	15
Nutrition	2 (3.9%)	5 (6.5%)	7
Most preferred fruit flavor			
Grape	2 (3.5%)	2 (2.5%)	4
Orange	11 (19.3%)	16 (20.0%)	27
Lime/lemon	5 (8.8%)	9 (11.3%)	14
Strawberry	24 (42.1%)	25 (31.3%)	49
Cherry	0 (0%)	1 (1.3%)	1
Peach	5 (8.8%)	8 (10.0%)	13
Pineapple	7 (12.3%)	12 (15.0%)	19
Other	3 (5.3%)	7 (8.8%)	10
Taste preference for sherbets			
Sweeter and less sour	30 (51.7%)	37 (45.1%)	67
More sour and less sweet	5 (8.6%)	6 (7.3%)	11
Sweet / sour equally	23 (39.7%)	39 (47.6%)	62
Purchased/consumed low-fat sugar-free sherbet products?			
Yes	21 (36.2%)	44 (53.7%)	65
No	37 (63.8%)	38 (46.3%)	75
Would you purchase if they contain a health-promoting ingredient such as soy protein?			
Yes	48 (84.2%)	76 (93.8%)	124
No	9 (15.8%)	5 (6.2%)	14

contained soy protein as an added health ingredient, 124 consumers gave positive responses of which 76 were females and 48 were males.

4.3.2 Consumer Acceptability

Of the four formulations (7.09 g SP, 7.5 g SP, 6.5 g SP, 6.0 g SP), formulation 4 (6.0 g SP) had the highest mean hedonic score for appearance although there were no significant differences between the formulations (P-value 0.1996)(Table 23). Since appearance and color are highly correlated, a quantitative mean score for each was not obtained. All products had desirable flavor and sweetness. Flavor for formulation 3 (6.5 g SP) was highest with a mean score of 6.05 and formulation 1 (7.09 g SP) was lowest with a mean of 5.79. There were significant differences (P-value 0.0085) between formulation 2 compared to 3 and 4. For the sourness acceptability, formulation 1 was highest (5.84) with significant differences (P-value 0.04) observed between formulations 1 and 2 only. Texture acceptability scores were the lowest among the 6 sensory attributes. Formulation 3 had the highest mean (5.16) and there were no significant differences among formulations (P-value 0.0776). Formulation 4 (6.0 g SP) had the highest mean score for overall liking (5.66) and there were significant differences (P-value .0039) between formulation 1 and 2 and between formulation 2 compared with formulations 3 and 4.

4.3.3 Acceptability and Purchase Intent

Each formulation was evaluated separately for consumer acceptance, purchase intent, and purchase intent if the product contained SP as a health promoting ingredient (Table 24). The frequency (%) reported in Table 24 is referred to as % positive responses for acceptability and purchase intent. For acceptability, consumers rated formulation 4 (6.0 g SP) highest (65%) and

Table 23. Mean consumer scores^g for acceptability of appearance/color, flavor, sweetness, sourness, texture/mouthfeel, and overall liking of orange sherbet formulations.

Formulation ^h	Soy (g)	Appearance/ color	Flavor	Sweetness	Sourness	Texture/ mouthfeel	Overall liking
1	7.09	6.57 (1.59)	*5.79 ab (1.88)	6.30 (1.82)	5.84 a (1.72)	4.70 (2.21)	5.60 a (1.90)
2	7.5	6.26 (1.53)	5.41 b (1.89)	5.80 (1.69)	5.28 b (1.65)	4.58 (2.04)	*4.91 c (1.93)
3	6.5	6.46 (1.43)	6.05 a (1.57)	6.10 (1.58)	5.55 ab (1.51)	5.16 (2.19)	5.50 b (1.91)
4	6.0	6.61 (1.50)	6.03 a (1.76)	*6.14 (1.60)	5.63 ab (1.64)	*5.04 (2.10)	5.66 a (1.94)
P-Value		0.1996	0.0085	0.0893	0.0400	0.0776	0.0039

^gNumbers in parentheses refer to standard deviation of 140 consumer responses. A 9-point hedonic scale was used (1=dislike extremely, 5=neither like nor dislike, and 9=like extremely). Mean values in the same column not followed by the same letter are significantly different (p<0.05)

^hRefer to Table 19 for detailed product formulations

* Only 139 responses of 140 responses reported

Table 24. The positive (yes) responses for product acceptability and purchase intent of orange sherbet formulations^a

Formulation ^c	Acceptability			Purchase Intent			Purchase Intent with soy ^b		
	Male	Female	Combined	Male	Female	Combined	Male	Female	Combined
1	36	45	81 (58.3%)	25	25	50 (35.7%)	30	41	71 (50.7%)
2	20	36	56 (40.0%)	12	25	37 (26.4%)	16	36	52 (37.1%)
3	35	46	81 (58.3%)	21	30	51 (36.4%)	28	43	71 (50.7%)
4	37	54	91 (65.0%)	20	32	52 (37.1%)	28	50	78 (55.7%)
Overall	128	181	309(55.4%)*	78	112	190(33.9%)	102	170	272(48.6%)
Percent ^d	55.2	55.2		33.6	34.4		43.9	51.8	

^a Each product was evaluated 140 times.

^b When consumers were informed of the health benefit of sherbets containing soy protein

^c Refer to Table 19 for detailed product information

^d Calculated per gender

* Only 558 out of 560 responses reported

formulation 2 (7.5 g SP) lowest (40%). For all formulations combined, acceptability and purchase intent scores were rated equally by males and females. When consumers were asked if they would purchase the product, formulation 4 scored highest at 37.1% while formulation 2 scored lowest at 26.4%. For both acceptability and purchase intent the product containing the lowest amount of SP (6.0 g) received the most positive responses while the one with the highest amount of soy (7.5 g) received the most negative responses. When consumers were asked about purchase intent after they had been notified that the products contained soy protein, formulation 4 rated highest at 55.7%, an increase of 18.6%. Overall positive responses for all formulations combined were 55.4% for acceptability, 33.9% for purchase intent, and 48.6% for purchase intent with soy.

4.3.4 Overall Product Differences – Pooled Within Canonical Structure r 's

MANOVA was performed to determine if the sherbet formulations were overall different considering all sensory attributes simultaneously. Results of the Wilks' Lambda P-value of 0.0003 (Table 25) indicated that all four formulations were significantly different. Descriptive discriminant analysis (DDA) was used to determine which attributes underlied the differences among the four formulations (Table 26). Appearance was not important and not used by the consumers to differentiate the 4 sherbet formulations. The first canonical dimension accounts for 66.7% variance explained and indicates that sourness acceptability contributed most to the differences. There were significant differences in sourness of 4 sherbet formulations (Table 23). The second dimension of the pooled within canonical structure (Table 26) reveals flavor canonical structure r 's=(0.899), texture (0.602), and overall liking (0.826) as discriminating attributes. From Table 22, consumers indicated that taste is the most important quality attribute for frozen desserts.

Table 25. Multivariate Statistics and F Approximations

MANOVA Test Criteria and F Approximations for
the Hypothesis of No Overall Form Effect

H = Type III SSCP Matrix for Form
E = Error SSCP Matrix
S=3 M=1 N=272.5

<u>Statistic</u>	<u>Value</u>	<u>F Value</u>	<u>Num DF</u>	<u>Den DF</u>	<u>Pr > F</u>
Wilks' Lambda	0.91932560	2.60	18	1547.6	0.0003
Pillai's Trace	0.08223159	2.58	18	1647	0.0003
Hotelling-Lawley Trace	0.08606265	2.61	18	1088	0.0003
Roy's Greatest Root	0.05746298	5.26	6	549	<.0001

Table 26. Canonical structure r's describing group differences among sherbet formulations^a

<u>Variable</u>	<u>Can1</u>	<u>Can2</u>
Appear acceptability	0.250514	0.391609
Flavor acceptability	0.015731	0.898973*
Sweet acceptability	0.350071	0.444734
Sour acceptability	0.442708*	0.441945
Texture acceptability	-0.161588	0.601917*
Overall Liking acceptability	0.331995	0.826023*
<hr/>		
Cumulative variance explained (%)	66.7	98.1

^a Based on pooled within-group variances.

*Indicates sensory attributes which largely account for group differences in the first and second dimension.

4.3.5 Logistic Regression vs. Predictive Discriminant Analysis

Logistic regression and predictive discriminant analysis can both be used to predict consumer behavior although the mechanisms by which they work are different. Logistic regression works in a similar manner to linear regression in that both methods produce prediction equations and the regression coefficients measure the predictive capability of the independent variables. However, in logistic regression the response variable is dichotomous (yes/no) or categorical and it follows a S-shaped distribution curve. Logistic regression does not predict a yes/no response directly, which is done under discriminant analysis, but instead it predicts the log odds ratio. The odds ratio has an indicator equal to 1. Probabilities can range from 0 to 1 with 0.5 meaning that both outcomes are equally likely to occur (Dallal, 2001). Predictive discriminant analysis is based on the concept of group membership and classification. It is useful for classification of cases (formulations) in which group membership is not known beforehand. Discriminant analysis allows examination of a set of variables (attributes) for group distinctiveness in which the variables distinguish groups that relate to similar qualities and quantities. The paradoxical advantage of identification of the multidimensionality of the underlying correlated dependent variables also poses a potential problem when dependent variables are highly correlated (Betz, 1987; Bray and Maxwell, 1982; Brown and Tinsley, 1983).

Stepwise discriminant analysis can be used to determine the “best” subset of discriminator variables that distinguish groups. However, caution should be taken in that this technique is far less likely to yield repeatable results compared to the leave-one-out discriminant analysis due to the “outrageous” capitalization on chance and the nuances of the particular sample (Thompson, 1995). Even using large sample sizes with a small number of predictors, it only reduces the problem slightly (Thompson, 1995). Lastly, the tests for significance for

stepwise discriminant analysis are positively biased and erroneous (Rencher and Larson, 1980; Stevens, 1996; Thompson, 1995) and it is felt that this technique should be eschewed for publication purposes (Thompson, 1995; Tinsley and Brown, 2000) and thus was not performed for this study.

4.3.6 Logistic Regression Analysis for Acceptability

Logistic regression analysis was used to determine which attribute most influences acceptability, purchase intent, and purchase intent with soy protein. The predictive models are and the odds ratio estimates are shown in Tables 27, 28, 29, 30, and 31. The sensory attributes appearance, flavor, sweetness, sourness, texture, and overall liking were used to predict overall acceptability. Results revealed that only texture and overall liking have a significant effect on acceptance ($\text{prob} > X^2 < 0.05$) for a full model (Table 29). These attributes had a corresponding odds ratio estimate of 1.28 and 3.51, respectively (Table 29). The odds ratio indicated that the probability that overall product acceptance will be increased by 28% and 251%, respectively, for every one point increase of the mean 9 point-hedonic score of texture and overall liking. Although overall liking is significant to the acceptance it is important to remember that it is the sum total of other attributes the consumer experiences. Therefore, increasing overall liking directly may not be feasible but increasing the acceptability of other attributes, such as texture, is certainly possible. A single logistic regression model generated for each attribute to predict product acceptability is also shown in Table 28 and the corresponding odds ratio is shown in Table 29. Appearance when used as the only independent variable for prediction of acceptability has an odds ratio of 1.494 compared to 1.05 from the full model. In this case, if the mean hedonic score for appearance, on a 9-point hedonic scale, increases by one point, then the

Table 27. The full logistic regression models for predicting acceptability, purchase intent, and purchase intent with soy protein^a

All Attributes (X ₁ -X ₆)	Predictive model
Acceptability	$Y=0.0494X_1 - 0.0829X_2 + 0.1436X_3 - 0.00034X_4 + 0.2444X_5 + 1.2550X_6 - 8.3418$
Purchase	$Y=-0.1303X_1 + 0.1577X_2 - 0.1549X_3 + 0.0760X_4 + 0.2487X_5 + 1.4285X_6 - 10.3624$
Purchase with soy ^a	$Y= 0.0370X_1 - 0.2090X_2 - 0.0331X_3 + 0.0364X_4 + 0.1661X_5 + 1.2287X_6 - 6.7314$

^a After the consumers had been informed the products contained a health-promoting soy protein

Table 28. The single logistic regression models for predicting acceptability, purchase intent, and purchase intent with soy protein ^a

<u>Independent variable</u>	<u>Predictive model</u>		
	<u>Acceptability</u>	<u>Purchase</u>	<u>Purchase with soy</u>
Appearance (x1)	0.4017X ₁ - 2.3740	0.4313X ₁ - 3.5308	0.3863X ₁ - 2.5693
Flavor (x2)	0.9491X ₂ - 5.3303	1.2152X ₂ - 8.4170	0.8053X ₂ - 4.8608
Sweetness (x3)	0.8628X ₃ - 5.0564	0.9003X ₃ - 6.5022	0.7273X ₃ - 4.5756
Sourness (x4)	0.6781X ₄ - 3.5273	0.7102X ₄ - 4.8251	0.6023X ₄ - 3.4405
Texture (x5)	0.7609X ₅ - 3.3603	0.7826X ₅ - 4.8606	0.6713X ₅ - 3.3517
Overall Liking (x6)	1.4424X ₆ - 7.5046	1.6252X ₆ - 10.6477	1.1914X ₆ - 6.7019

^a After the consumers had been informed the products contained a health-promoting soy protein

Table 29. The R² and odds ratio estimates for the full and single logistic regression models for predicting overall acceptance

Independent variable	R-Square	prob>X ² (single)	Prob>X ² (full)	Odds Ratio Estimate (single)	Odds Ratio Estimate (full)
Appearance (X ₁)	0.0813	<.0001	0.6232	1.494	1.05
Flavor (X ₂)	0.3401	<.0001	0.5460	2.583	0.92
Sweetness (X ₃)	0.2810	<.0001	0.2843	2.370	1.15
Sourness (X ₄)	0.2018	<.0001	0.9979	1.970	1.0
Texture (X ₅)	0.3364	<.0001	0.0081	2.140	1.28
Overall Liking (X ₆)	0.5111	<.0001	<0.0001	4.231	3.51
All Attributes (X ₁ -X ₆)	0.5170				

Table 30. The R² and odds ratio estimates for the full and single logistic regression models for predicting purchase intent

Attribute	R-Square	prob>X ² (single)	prob>X ² (full)	Odds Ratio Estimate (single)	Odds Ratio Estimate (full)
Appearance (X1)	0.0787	<0.0001	0.2521	1.539	0.878
Flavor (X2)	0.3343	<0.0001	0.3606	3.371	1.171
Sweetness (X3)	0.2355	<0.0001	0.2907	2.460	0.857
Sourness (X4)	0.1913	<0.0001	0.5359	2.034	1.079
Texture (X5)	0.3213	<0.0001	0.0075	2.187	1.282
Overall Liking (X6)	0.4656	<0.0001	<0.0001	5.079	4.173
All Attributes (X1-X6)	0.4777				

Table 31. The R² and odds ratio estimates for the full and single logistic regression models for predicting purchase intent with soy^a

Independent variable	R-Square	Prob>X ² (single)	prob>X ² (full)	Odds Ratio Estimate (single)	Odds Ratio Estimate (full)
Appearance (X ₁)	0.0752	<0.0001	0.6886	1.472	1.038
Flavor (X ₂)	0.2759	<0.0001	0.1168	2.237	0.811
Sweetness (X ₃)	0.2209	<0.0001	0.7896	2.070	0.967
Sourness (X ₄)	0.1706	<0.0001	0.7440	1.826	1.037
Texture (X ₅)	0.2970	<0.0001	0.0426	1.957	1.181
Overall Liking (X ₆)	0.4452	<0.0001	<.0001	3.292	3.417
All Attributes (X ₁ -X ₆)	0.4515				

^a After the consumers had been informed the products contained a health-promoting soy protein

probability that the product will become acceptable increases by 49.4%. When appearance is combined with the other prediction variables (a full model) this probability drops to 5% and then it is not a significant predictor for acceptability. This can be verified through the X^2 value of 0.6232 (Table 29).

4.3.7 Logistic Regression Analysis for Purchase Intent

Prediction of purchase intent using six sensory attributes revealed that texture and overall liking were significant ($\text{prob} > X^2 < 0.05$) (Table 30). The odds ratio from a full model was very high (4.173) for overall liking compared to texture (1.282) and other variables for predicting purchase intent. This indicates that consumers feel overall liking is very important when it comes to purchasing the product. With an increase in the overall liking score of 1, on a 9-point hedonic scale, it is 3.1 times more likely that consumers will purchase the product. The significance of overall liking can be verified through $X^2 < 0.0001$ (Table 30).

4.3.8 Logistic Regression Analysis for Purchase Intent with Soy Protein

The full model using all six attributes for prediction of purchase intent with soy protein resulted in the lowest R^2 (Table 31) compared to that for acceptability (Table 29) and purchase intent (Table 30). The R^2 for the acceptance, purchase intent, and purchase intent with soy models using six variables for prediction was 0.51, 0.47, and 0.45 respectively. After consumers were asked to re-evaluate their decision to buy the product if it contained soy protein as a health promoting ingredient, overall liking became less critical for prediction. The odds ratio was decreased from 4.173 to 3.417 for the full model and from 5.079 to 3.292 for the single model (Table 30 and 31). This means that consumers may compromise the overall acceptability with the health benefit from soy. If the mean overall liking score increases by one point, it is about 2.5 times more likely the consumers will purchase the product knowing it contains soy protein

(Table 31). Recall that this one point increase resulted in a 3 times greater chance of the product being purchased in the model without soy protein (Table 30). As indicated in Table 24, consumers were more willing to buy the sherbet products knowing they will get the health benefit. Hypothetically, if the overall liking score increased by 1 unit, there is, however, a greater chance of the product being purchased if the consumer does not know the product contains soy protein.

4.3.9 Predictive Discriminant Analysis for Acceptability and Purchase Intent

The results of predictive discriminant analysis for acceptance shows that with all six attributes the hit rate was 85.43% (Table 32). Knowing the six predictor variables we can predict the acceptability of the product correctly 85.43% of the time. The attributes most significant to predicting acceptance are overall liking with a hit rate of 85.50%, followed by flavor (77.28%), and texture (75.67%). Unlike regression analyses, adding more predictor variables does not always increase the chance of better prediction as can be seen with acceptance and purchase intent with soy. In both of these models using all six attributes to predict acceptability and purchase intent with soy results in a slightly lower % hit rate than using overall liking alone. Results of PDA with purchase intent were slightly lower than acceptability. Knowing all six attributes we can correctly predict 80.21% of the time whether a consumer would purchase a particular formulation. This percentage drops to 77.28% for just flavor alone, 76.38% for overall liking alone, and 75.49% for texture alone. For acceptability and purchase intent, appearance and sour were least important as predictors, which is substantiated by the results from a single-attribute logistic regression models (Table 29 and 30).

Table 32. Classification results from predictive discriminate analysis (PDA) - % Hit Rate

Attributes	Accept	Buy	Buy with soy
Appearance acceptability	62.14%	59.80%	62.32%
Flavor acceptability	77.28%	77.28%	70.66%
Sweet acceptability	73.70%	72.09%	73.70%
Sour acceptability	69.28%	67.14%	68.57%
Texture acceptability	75.67%	75.49%	74.59%
Overall liking acceptability	85.50%	76.38%	81.39%
All 6 attributes combined	85.43%	80.21%	80.93%

^a After the consumers had been informed the products contained a health-promoting soy protein

4.4 Conclusion

This study identified specific sensory attributes driving acceptance and purchase intent of low-fat sugar-free sherbets containing soy protein below or above the FDA requirement. 140 consumers participated in the study. The addition of soy protein to sherbet formulations causes significant differences in consumer responses to certain sensory attributes. Results of the Wilks' Lambda test showed significant differences among formulations. Descriptive discriminant analysis showed appearance was not important and not used by the consumers to differentiate the 4 sherbet formulations. The first dimension of the canonical structure accounted for 66.7% variance and indicated that sourness contributed most to differences. Formulation 4 (6.0 g SP) had the highest acceptance (65.0%) and purchase intent (55.7%). There were significant differences in sourness of the 4 sherbet formulations. For all formulations combined, acceptability and purchase intent scores were rated equally by males and females. Specifically, flavor and texture were identified as the most critical attributes affecting acceptance.

CHAPTER 5. SUMMARY AND CONCLUSIONS

The frozen dessert market is a multibillion dollar industry. Ice creams command most of the market share at 84.5% although frozen dessert novelties had a growth of 7.1% with more than \$2.1 billion sold in 2001. This growth has allowed smaller companies to explore new concepts that may not be of interest to larger companies due to small profits. These fruit containing novelties, including variations of sorbet and water ices, contain the traditional ingredients like sweeteners and stabilizers but they differ primarily in the amount of fruit juice.

Soy-based products have become increasingly popular and have gradually moved into the mainstream market. Total U.S. soyfood sales have jumped from \$394 million in 1980 to \$1.76 billion in 1998. These include the non-fermented soyfoods soynuts, soymilk, tofu and soy proteins as well as the fermented soyfoods miso, soy sauce, and tempeh. Many consumers associate soy with a healthy consumption pattern. Many new products have been reformulated to include soy as an ingredient. Typical products including hotdogs, bacon, and cheese can now be found in meatless varieties. Besides the health benefits of lowering cholesterol and the presence of isoflavones and phytochemicals, soy protein can be added to foods to increase quality (tenderness, juiciness, lower fat content, emulsification, reduced cooking losses and shrink).

Development of frozen desserts that indulge consumers' eating desire, yet provide potential health benefits, is a challenge. Product appraisal to identify specific sensory attributes driving product acceptance is vital to the introduction of this new product although acceptance alone will not guarantee product success in the marketplace. Other

aspects such as brand name loyalty, advertising and promotion, price, quality control, competitors, and economic factors play a role.

This research was designed to develop low-fat sugar-free frozen sherbet products containing soy protein and to determine consumer sensory profile driving product acceptance and purchase intent.

A low-fat sugar-free frozen sherbet with soy protein has not been commercially developed. Similar products such as frozen confectionary bars on a stick have been developed but formulated without soy protein. The addition of soy protein to our products was done, in part, due to studies showing a relationship between the intake of soy protein and the decreased risk of coronary heart disease. Food products which are low in fat and contain a minimum of 6.25 g of soy protein per serving are allowed to state this relationship on the product label.

Two consumer studies were performed to evaluate consumer sensory properties of orange sherbets containing soy protein. In study 1, twelve sherbets were formulated with soy protein, SP (3.25, 4.25, 5.25 or 6.25%) and maltodextrin, MD (10, 11, or 12%), and a control (0% SP and 12% MD). Each consumer (n=130) evaluated 3 (of 13) sherbet formulations for acceptability of appearance, color, flavor, sweetness, sourness, texture/mouthfeel, and overall liking using a 9-point hedonic scale. Overall acceptability (yes/no) and purchase intent (buy/not buy) were determined. Data were statistically analyzed. Study 2 was carried out in a similar manner with 140 consumers. Each consumer evaluated 4 (of 4) sherbets with four levels of soy protein concentrate (7.09, 7.05, 6.5, or 6.0g).

In both studies there were significant differences ($p < 0.05$) in texture and overall liking among the sherbet formulations. For study 1, the highest rated acceptable product was the formulation containing 4.25% SP and 11% MD. For study 2 the formulation with 6.0 g soy protein per serving was most acceptable. Flavor, texture, and overall liking were identified as attributes critical to acceptance and purchase intent of the low-fat sugar-free sherbets containing soy protein.

In consumer study 1, Results of the Wilks' Lambda P-value 0.0001 showed differences in the 13 sherbet formulations. The first dimension of the canonical structure accounted for 58.4% of the variance and indicated that flavor, texture, and overall liking contributed to most of the differences. Specifically, texture was identified as the most critical attribute affecting overall liking. Overall liking affected the purchase intent. Formulation 6 (4.25% SP) had the highest acceptance (60%) and formulation 5 (3.25% SP) was highest in purchase intent (36.7%).

In consumer study 2, descriptive discriminant analysis showed appearance was not important and not used by the consumers to differentiate the 4 sherbet formulations. The first dimension of the canonical structure accounted for 66.7% variance and indicated that sourness contributed most to differences. Formulation 4 (6.0 g SP) had the highest acceptance (65.0%) and purchase intent (55.7%). There were significant differences in sourness of the 4 sherbet formulations. For all formulations combined, acceptability and purchase intent scores were rated equally by males and females. Specifically, flavor and texture were identified as the most critical attributes affecting acceptance.

An important area for future research would be to investigate scale up procedures. A very smooth sherbet product was produced as a lab prototype but when the formulation was scaled-up, the product characteristics changed. This was observed in both lab scale up and the consumer study scale up. As a result, a linear increase in ingredients did not result in the best possible product. A modified procedure that was time extensive was required to achieve a formulation similar to that made in lab. The product would not have been an optimal formulation because it violated one of the requirements that the formulation must be cost effective.

Due to FDA regulations, our formulations would probably better be suited as a frozen fruit novelty rather than a frozen sherbet. Certain sherbet properties, i.e., low pH would be difficult to achieve due to the presence of soy protein which has a tendency to precipitate and cause sandiness in the finished product. This is dependent on the processing steps and can be reduced to some extent by proper mixing of ingredients. Sherbet by definition is sweetened with nutritive sweeteners so a “sugar-free” sherbet would be in violation of FDA regulations. Interestingly, many consumers during the consumer tests stated they had tried sugar-free sherbet products before. Reformulation of this product as a frozen novelty would lift those regulations, allowing more flexibility in the development of this product. Whatever the case may be, this product must still undergo further refinement such as shelf-life tests, scale-up production, market research, and further sensory testing, to ensure product quality and ability to compete with other similar products, before it is launched in the real market.

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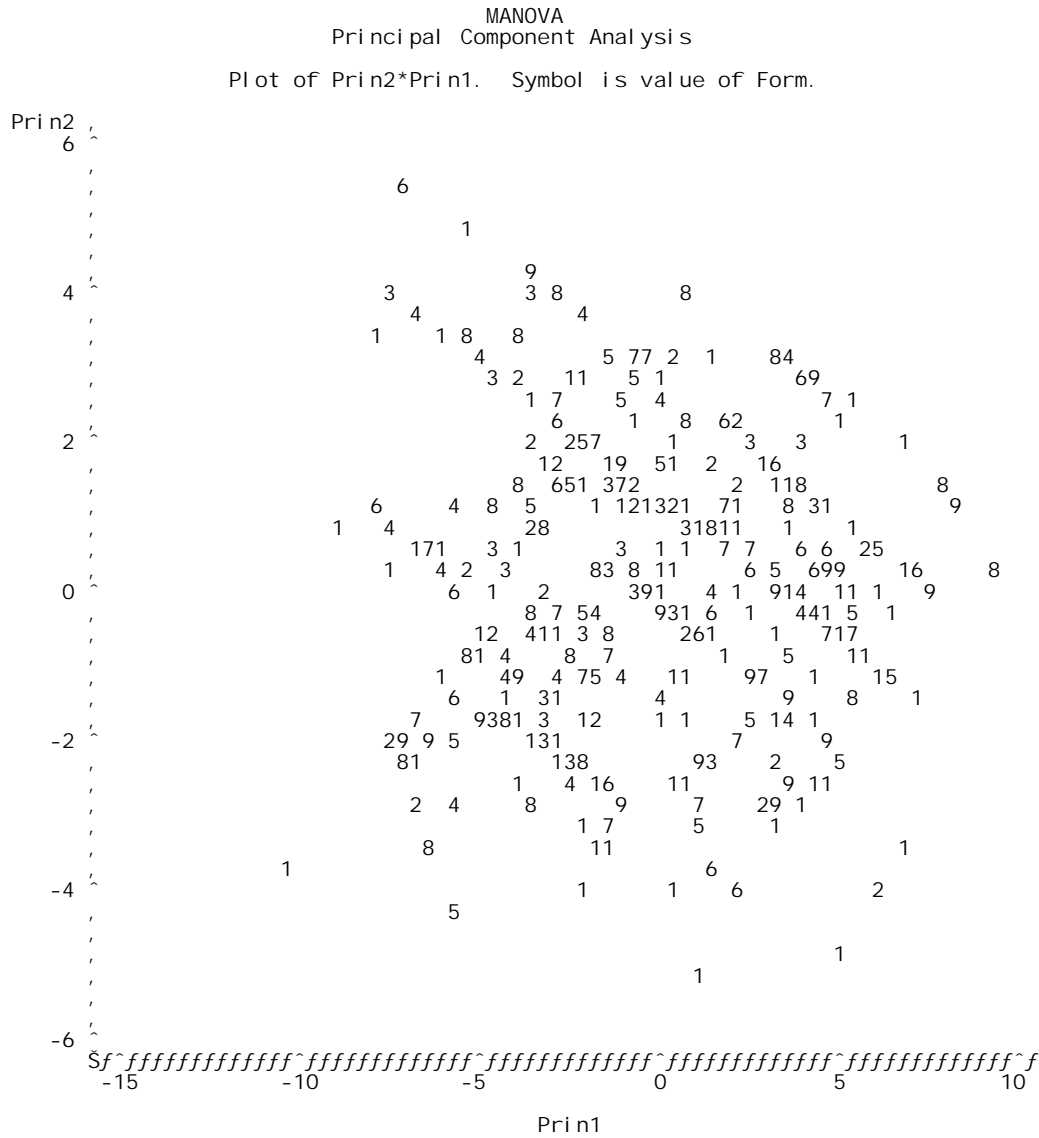
APPENDICES

APPENDIX A. COMPARISON OF 13 SHERBET FORMULATIONS FOR ACCEPTABILITY OF APPEARANCE, COLOR, FLAVOR, SWEETNESS, SOURNESS, TEXTURE/MOUTHFEEL, AND OVERALL LIKING

Formulation ^c	Soy (SP) %	MD %	Appearance	Color	Flavor	Sweetness	Sourness	Texture	Overall liking
1	3.25	10	6.07 (1.62)	6.70 (1.62)	5.33 ^{ab} (2.19)	5.87 (2.11)	5.37 ^a (1.52)	4.33 ^b (2.28)	5.03 ^b (2.01)
2	4.25	10	6.10 (1.65)	6.40 (1.63)	4.77 ^b (2.08)	5.63 (1.73)	5.13 ^a (1.89)	3.77 ^b (2.28)	4.30 ^b (1.82)
3	5.25	10	5.83 (1.53)	6.30 (1.58)	4.17 ^b (1.93)	5.40 (1.65)	5.47 ^a (1.70)	3.00 ^b (1.58)	3.87 ^b (1.74)
4	6.25	10	5.87 (1.68)	6.13 (1.55)	4.37 ^b (2.09)	4.97 (1.83)	5.20 ^a (1.69)	3.93 ^b (2.12)	4.30 ^b (2.15)
5	3.25	11	6.37 (1.54)	6.47 (1.74)	5.13 ^b (1.93)	5.87 (1.87)	5.97 ^a (1.47)	4.17 ^b (2.18)	5.17 ^b (1.93)
6	4.25	11	6.27 (1.78)	6.50 (1.48)	5.07 ^b (2.20)	5.38 (2.23)	5.70 ^a (1.95)	3.93 ^b (2.02)	4.77 ^b (2.21)
7	5.25	11	5.83 (1.70)	6.30 (1.58)	4.97 ^b (1.75)	5.62 (1.80)	5.50 ^a (1.55)	3.67 ^b (1.63)	4.48 ^b (1.74)
8	6.25	11	6.30 (2.10)	6.53 (1.78)	4.53 ^b (2.06)	5.17 (2.00)	5.07 ^a (1.76)	3.70 ^b (2.37)	4.17 ^b (2.25)
9	3.25	12	5.83 (2.00)	6.40 (1.65)	5.47 ^{ab} (1.98)	5.87 (1.87)	5.87 ^a (1.48)	4.67 ^b (2.25)	4.97 ^b (2.28)
10	4.25	12	6.50 (1.50)	6.57 (1.36)	5.47 ^{ab} (1.85)	5.70 (1.73)	5.43 ^a (1.79)	4.57 ^b (1.83)	5.20 ^b (1.99)
11	5.25	12	5.77 (1.89)	5.93 (1.86)	4.90 ^b (2.12)	4.90 (2.04)	5.00 ^a (1.82)	3.97 ^b (2.17)	4.40 ^b (2.09)
12	6.25	12	5.37 (1.27)	5.50 (1.83)	4.79 ^b (1.93)	5.28 (1.77)	5.10 ^a (1.84)	4.23 ^b (2.05)	4.53 ^b (1.89)
13 (control)	0	12	6.77 (1.25)	7.00 (1.20)	6.97 ^a (1.22)	6.50 (1.66)	6.43 ^a (1.10)	6.97 ^a (1.33)	6.93 ^a (1.23)
			0.1324	0.1097	<0.0001	0.0854	0.0357	<0.0001	<0.0001

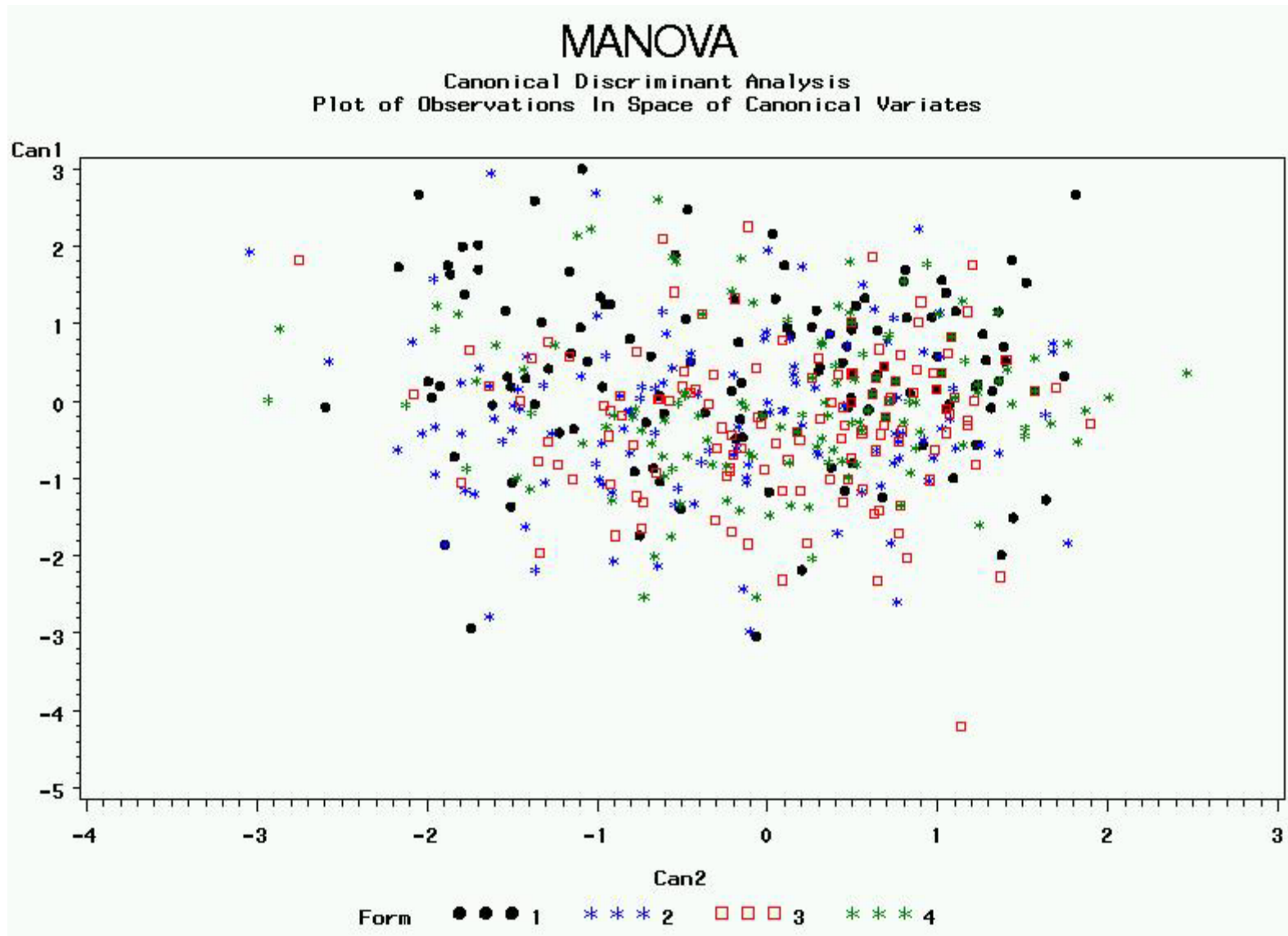
^b Numbers in parentheses refer to standard deviation of 30 consumer responses. A 9-point hedonic scale was used (1=dislike extremely, 5=neither like nor dislike, and 9=like extremely). Mean values in the same column not followed by the same letter are significantly different (p<0.05)

APPENDIX B. PRINCIPLE COMPONENT ANALYSIS FOR CONSUMER STUDY 1



NOTE: 6 obs had missing values. 85 obs hidden.

APPENDIX C. CANONICAL DISCRIMINANT ANALYSIS FOR CONSUMER STUDY 2



APPENDIX D. RESEARCH CONSENT FORM

I, _____, agree to participate in the research entitled “Consumer Sensory Evaluation of Sugar-Free Orange Sherbet Products” which is being conducted by Jonathan Walker and Witoon Prinyawiwatkul, Department of Food Science, at Louisiana State University, phone number (225)-578-5188.

I understand that participation is entirely voluntary and whether or not I participate will not affect how I am treated on my job. I can withdraw my consent at any time without penalty or loss of benefits to which I am otherwise entitled and have the results of the participation returned to me, removed from the experimental records, or destroyed. 180-200 consumers will participate in this research. For this particular research, about 30 min participation will be required for each consumer.

The following points have been explained to me:

1. In any case, it is my responsibility to report prior to participation to the investigators any allergies I may have.
2. The reason for the research is to gather information on consumer attitude and their acceptance of orange sherbet products. The benefit that I may expect from it is a satisfaction that I have contributed to solution and evaluation of problems relating to such examinations.
3. The procedures are as follow: Coded samples will be placed in front of me and I will evaluate them by normal standard methods and indicate my evaluation on score sheets. All procedures are standard methods as published by the American Society for Testing and Materials and the Sensory Evaluation Division of the Institute of Food Technologists.
4. Participation entails minimal risks: The only risk that can be envisioned is an allergic reaction to **milk or soy products**. However, because it is known to me beforehand what type of food to be tested, the situation can normally be avoided.
5. The results of this participation will not be released in any individual identifiable form without my prior consent unless required by law.
6. The investigator will answer any further questions about the research, either now or during the course of the project.

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to investigators listed above. In addition, I understand that research at Louisiana State University, which involves human participation, is carried out under the oversight of the Institutional Review Board. Questions or problems regarding these activities should be addressed to Vice Chancellor of the LSU Office of Research and Economic Development at 578-5833. I agree with the terms above and acknowledge I have been given a copy of the consent form.

Signature of Investigator

Signature of Participant

Date: _____

Witness: _____

APPENDIX E. CONSUMER STUDY QUESTIONNAIRE FOR CONSUMER STUDY 1

DEMOGRAPHIC SURVEY: All information is confidential and will not be identified with your name.

1. What is your age group? (Please check one)
18-24 years_____ 25-34 years_____ 35-44 years_____ 45-54 years_____ Over 54 years_____
2. What is your gender? Male_____ Female_____
3. Which do you consider yourself to be? (Please check one)
African-American_____ Hispanic/Spanish_____ Other (Please specify)
Asian_____ White (Caucasian)_____
4. How do you best describe your household? (Please check one)
Single parent with children in home_____ Couple without children in home_____
Couple with children in home_____ Single adult_____ Other_____
5. Level of education? (Please check one)
Less than high school_____ Some college_____ Graduate (M.S., M.A., Ph.D., Ed.)_____
High school_____ Completed college_____
6. Which of the following best describes you?
Employed full-time_____ Unemployed_____ Student_____
Employed part-time_____ Homemaker_____ Retired_____
7. Which of these categories best describes your gross 2000 household income? (Please check one)
Under \$9,999_____ \$10,000 - 19,999_____ \$20,000 - 29,999_____ \$30,000 - 39,999_____
\$40,000 - 49,999_____ \$50,000 - 59,999_____ \$60,000 - 69,999_____ \$70,000-79,999_____
\$80,000 - 89,000_____ \$90,000 - 99,999_____ \$100,000-\$109,000_____ \$110,000 -119,999_____
Over \$120,000 _____

PRODUCT INFORMATION: Frozen desserts (e.g., sherbets, ice cream, etc.)

1. Do you normally eat foods that are low in fat? _____YES _____NO
2. Do you normally eat foods that are sugar-free? _____YES _____NO
3. How often do you buy frozen desserts? (Please check one)
_____ More than once a week _____ Once a week _____ Twice a month
_____ Once a month _____ Very rarely _____ Never
4. What is the most important quality attribute that you want in this type of product? (Please check one)
_____ Color/appearance _____ Texture /mouthfeel
_____ Taste _____ Nutrition
_____ Aroma/odor _____ Other (please specify) _____
5. What is your most preferred fruit flavor in frozen sherbets?
_____ Grape _____ Orange _____ Lime/lemon
_____ Strawberry _____ Cherry _____ Other (please specify)
_____ Peach _____ Pineapple
6. Which taste do you prefer most for frozen sherbet products? (Please check one)
_____ Sweeter and less sour _____ More sour and less sweet sour _____ Sweet / sour equally
_____ Other (please specify) _____
7. Have you purchased or consumed low-fat sugar-free sherbet products? _____YES _____NO
8. Would you purchase these products if they contain a health-promoting ingredient such as soy protein?
_____YES _____NO

Sample No. _____

Please evaluate this product and check the space that best reflects your feeling about the product.

1. How would you rate the **APPEARANCE** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

2. How would you rate the **COLOR** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

3. How would you rate the **OVERALL FLAVOR (taste and odor)** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

4. How would you rate the **SWEETNESS** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

5. Please rate the **SWEETNESS** of this product based on your preference

Not sweet enough	Just about right	Too sweet
[₁]	[₂]	[₃]

6. How would you rate the **SOURNESS** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

7. How would you rate the **TEXTURE/MOUTHFEEL** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

8. Please rate your **OVERALL LIKING** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[₁]	[₂]	[₃]	[₄]	[₅]	[₆]	[₇]	[₈]	[₉]

9. Is this product **ACCEPTABLE**? Yes [] No []

10. Would you **BUY** this product if it were commercially available? Yes [] No []

11. Would you **BUY** this product if it contains a health-promoting ingredient? Yes [] No []

Thank you !! (Last page only !!)

APPENDIX F. CONSUMER STUDY QUESTIONNAIRE FOR CONSUMER STUDY 2

DEMOGRAPHIC SURVEY: All information is confidential and will not be identified with your name.

1. What is your age group? (Please check one)

18-24 years_____ 25-34 years_____ 35-44 years_____ 45-54 years_____ Over 54 years_____

2. What is your gender?

Male_____

Female_____

3. Which do you consider yourself to be? (Please check one)

African-American_____

Hispanic/Spanish_____

Other (Please specify)

Asian_____

White (Caucasian)_____

4. How do you best describe your household? (Please check one)

Single parent with children in home_____

Couple without children in home_____

Couple with children in home_____

Single adult_____

Other_____

5. Level of education? (Please check one)

Less than high school_____

Some college_____

Graduate (M.S., M.A., Ph.D., Ed.)_____

High school_____

Completed college_____

6. Which of the following best describes you?

Employed full-time_____

Unemployed_____

Student_____

Employed part-time_____

Homemaker_____

Retired_____

7. Which of these categories best describes your gross 2000 household income? (Please check one)

Under \$9,999_____

\$10,000 - 19,999_____

\$20,000 - 29,999_____

\$30,000 - 39,999_____

\$40,000 - 49,999_____

\$50,000 - 59,999_____

\$60,000 - 69,999_____

\$70,000-79,999_____

\$80,000 - 89,000_____

\$90,000 - 99,999_____

\$100,000-\$109,999_____

\$110,000-119,999_____

Over \$120,000 _____

PRODUCT INFORMATION: Frozen desserts (e.g., sherbets, ice cream, etc.)

1. Do you normally eat foods that are low in fat?

___YES ___NO

2. Do you normally eat foods that are sugar-free?

___YES ___NO

3. How often do you buy frozen desserts? (Please check one)

___ More than once a week

___ Once a week

___ Twice a month

___ Once a month

___ Very rarely

___ Never

4. What is the most important quality attribute that you want in frozen sherbet products? (Please check one)

___ Color/appearance

___ Texture /mouthfeel

___ Taste

___ Nutrition

___ Aroma/odor

___ Other (please specify) _____

5. What is your most preferred fruit flavor in frozen sherbets?

___ Grape

___ Orange

___ Lime/lemon

___ Strawberry

___ Cherry

___(please specify) _____

___ Peach

___ Pineapple

6. Which taste do you prefer most for frozen sherbet products? (Please check one)

___ Sweeter and less sour

___ More sour and less sweet

___ Sweet / sour equally

___ Other (please specify) _____

7. Have you purchased or consumed low-fat sugar-free sherbet products? ___YES ___NO

8. Would you purchase these products if they contain a health-promoting ingredient such as soy protein?

___YES ___NO

Sample No. 438

Please evaluate this product and check the space that best reflects your feeling about the product.

1. How would you rate the **APPEARANCE/COLOR** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

2. How would you rate the **OVERALL FLAVOR (taste and odor)** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

3. How would you rate the **SWEETNESS** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

4. Please rate the **SWEETNESS** of this product based on your preference

Not sweet enough	Just about right	Too sweet
[]	[]	[]

5. How would you rate the **SOURNESS** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

6. How would you rate the **TEXTURE/MOUTHFEEL** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

7. Do you detect "**BITTERNESS AFTERTASTE**" in this product? Yes [] No []

8. Please rate your **OVERALL LIKING** of this product?

Dislike Extremely	Dislike Very much	Dislike Moderately	Dislike Slightly	Neither Like nor Dislike	Like Slightly	Like Moderately	Like Very much	Like Extremely
[] 1	[] 2	[] 3	[] 4	[] 5	[] 6	[] 7	[] 8	[] 9

9. Is this product **ACCEPTABLE**? Yes [] No []

10. Would you **BUY** this product if it were commercially available? Yes [] No []

11. Would you **BUY** this product knowing that it contains health-promoting soy protein?
Yes [] No []

Thank you !! (Last page only !!)

APPENDIX G. SAS CODE FOR CONSUMER STUDY 1

Study 1

```
/*  
* Adjustments to program:  
* 1. Used Predicted Means (OutPM=) rather than Predicted Values (OutP=)  
* since predicted values also include random effect predictions, while  
* predicted means do not. We want to average over random effects.  
* 2. When generating contour plots and other plots of the predicted  
* values, you must specify the variable PRED in the OUTPM or OUTP  
* dataset.  
* 3. Modified the CONTOUR macro to be able to produce a PROC PLOT  
* contour plot which is useful for debugging purposes, and added  
* the "fishnet" and 3-D scatter plots. The fishnet plot is useful  
* for understanding the contour plot, while the scatter plot is  
* useful when the number of grid values is small.  
* 4. Modified the length of the BLK variable so that you don't get  
* messages from MIXED that it is truncating the BLK variable.  
* 5. To have MIXED generate the predicted values for you, you must  
* supply all of the predictor variables, including random effects,  
* that are specified in the model. Originally only MALTO and SOY  
* were given, but some models required SOYSQUARED, and all required  
* values for REP and BLK. I added these values to the GRID data set  
* and now MIXED can generate the predicted values.  
*/
```

```
dm 'log;clear;output;clear';  
options ps=55 ls=80 PageNo=1 center nodate mprint nolabel;  
title1 'SoyData ';
```

```
Libname path "a:";  
data one;  
Set path.Soydata5;  
Run;  
Data SoyMalto;  
length blk $2;  
set one;  
select (form);  
when (1) list= "1 6 12 22 23 26";  
when (2) list= "2 7 13 14 23 24";  
when (3) list= "1 3 8 15 24 25";  
when (4) list= "2 4 9 16 25 26";  
when (5) list= "3 5 10 14 17 26";  
when (6) list= "4 6 11 14 15 18";
```

```

when (7) list= "5 7 12 15 16 19";
when (8) list= "6 8 13 16 17 20";
when (9) list= "1 7 9 17 18 21 ";
when (10) list= "2 8 10 18 19 22";
when (11) list= "3 9 11 19 20 23";
when (12) list= "4 10 12 20 21 24";
when (13) list= "5 11 13 21 22 25";
otherwise put "error";
end;
blk=scan(list, (mod(Rep-1,6)+1));
drop list;
maltoquare=malto*malto;
soysquare=soy*soy;
soycubic=soysquare*soy;
run;
proc sort data=soymalto;
  by blk;
run;
proc sort data=soymalto;
  by sex;
run;

proc freq data=soymalto;
  by sex;
run;

/*proc print data=soymalto;  by blk; run;*/

/***** ANOVA *****/
%macro contrasts(dataSource,dependent);
proc mixed data=&dataSource;
class form rep blk;
model &dependent=form / outpm=&dependent._pred;
random rep*blk;
contrast "soy_linear" form -3 -1 1 3 -3 -1 1 3 -3 -1 1 3 0;
contrast "soy_quad" form 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 0;
contrast "soy_cubic" form -1 3 -3 1 -1 3 -3 1 -1 3 -3 1 0;
contrast "malto_linear" form -1 -1 -1 -1 0 0 0 0 1 1 1 1 0;
contrast "malto_quad" form 1 1 1 1 -2 -2 -2 -2 1 1 1 1 0;
contrast "soy_linear*malto_linear" form 3 1 -1 -3 0 0 0 0 -3 -1 1 3 0;
contrast "soy_linear*malto_quad" form -3 -1 1 3 6 2 -2 -6 -3 -1 1 3 0;
contrast "soy_quad*malto_linear" form -1 1 1 -1 0 0 0 0 1 -1 -1 1 0 ;
contrast "soy_quad*malto_quad" form 1 -1 -1 1 -2 2 2 -2 1 -1 -1 1 0;
contrast "soy_cubic*malto_linear" form 1 -3 3 -1 0 0 0 0 -1 3 -3 1 0;
contrast "soy_cubic*malto_quad" form -1 3 -3 1 2 -6 6 -2 -1 3 -3 1 0;
contrast "contro vs. others" form 1 1 1 1 1 1 1 1 1 1 1 1 -12;

```

```

/* Contrasts for comparing Form 1-12 vs. 13 */

contrast "1 vs. Control" form 1 0 0 0 0 0 0 0 0 0 0 0 0 -1;
contrast "2 vs. Control" form 0 1 0 0 0 0 0 0 0 0 0 0 0 -1;
contrast "3 vs. Control" form 0 0 1 0 0 0 0 0 0 0 0 0 0 -1;
contrast "4 vs. Control" form 0 0 0 1 0 0 0 0 0 0 0 0 0 -1;
contrast "5 vs. Control" form 0 0 0 0 1 0 0 0 0 0 0 0 0 -1;
contrast "6 vs. Control" form 0 0 0 0 0 1 0 0 0 0 0 0 0 -1;
contrast "7 vs. Control" form 0 0 0 0 0 0 1 0 0 0 0 0 0 -1;
contrast "8 vs. Control" form 0 0 0 0 0 0 0 1 0 0 0 0 0 -1;
contrast "9 vs. Control" form 0 0 0 0 0 0 0 0 1 0 0 0 0 -1;
contrast "10 vs. Control" form 0 0 0 0 0 0 0 0 0 1 0 0 0 -1;
contrast "11 vs. Control" form 0 0 0 0 0 0 0 0 0 0 1 0 0 -1;
contrast "12 vs. Control" form 0 0 0 0 0 0 0 0 0 0 0 0 1 -1;
run;
%mend contrasts;
/*lsmeans form/adjust=tukey;*/
%contrasts(soymalto,appear);
%contrasts(soymalto,color);
%contrasts(soymalto,flavor);
%contrasts(soymalto,sweet);
%contrasts(soymalto,sour);
%contrasts(soymalto,texture);
%contrasts(soymalto,liking);
/***** Response Surface *****/
title '* 1 appear*';
proc mixed data=SoyMalto;
class rep blk ;
model appear=soy malto/ HTYPE=1 3 outpm=appear_pred;
random rep*blk;
run;
title '* 2 color*';
proc mixed data=SoyMalto;
class rep blk;
model color=soy malto/HTYPE=1 3 outpm=color_pred;
random rep*blk;
run;
title '* 3 flavor *';
proc mixed data=SoyMalto;
class rep blk;
model flavor=soy malto /HTYPE=1 3 outpm=flavor_pred;
random rep*blk;
run;
title '* 4 sweet *';
proc mixed data=SoyMalto;
class rep blk;

```

```

model sweet=soy/HTYPE=1 3 outpm=sweet_pred;
random rep*blk;
run;
title '* 5 sour *';
proc mixed data=SoyMalto;
class rep blk;
model sour=soy /HTYPE=1 3 outpm=sour_pred;
random rep*blk;
run;
title '* 6 texture *';
proc mixed data=SoyMalto;
class rep blk;
model texture=soy malto /HTYPE=1 3 outpm=texture_pred;
random rep*blk;
run;
title '* 7 liking*';
proc mixed data=SoyMalto;
class rep blk;
model liking=soy/HTYPE=1 3 outpm=liking_pred;
random rep*blk;
run;

/***** Contour Plot *****/
%macro Contour(sourceData, dependent,plot=0,contour=1,g3d=1,scatter=0);
  %If &plot %Then
  %Do;
    Proc Plot Data=&sourcedata;
      Plot malto*soy=&dependent / contours=5;
    Run;
    Quit;
  %End;
  %If &contour %Then
  %Do;
    proc gcontour data=&sourceData;
      plot malto*soy=&dependent;
    run;
  %End;
  %If &g3d %Then
  %Do;
    Proc G3D Data=&sourceData;
      Plot malto*soy=&dependent / rotate=20;
    Run;
  %End;
  %If &scatter %Then
  %Do;
    Proc G3D Data=&sourceData;

```

```

        Scatter malto*soy=&dependent / rotate=20 shape="balloon";
Run;
%End;
Quit;
%mend;
title1 'Soydata Contour Plot';
title2 'appear';%Contour(appear_pred,pred);
title2 'color';%Contour(color_pred,pred);
title2 'flavor';%Contour(flavor_pred,pred);
title2 'sweet';%Contour(sweet_pred,pred);
title2 'sour';%Contour(sour_pred,pred);
title2 'texture';%Contour(texture_pred,pred);
title2 'liking';%Contour(liking_pred,pred);

/*****
***** ELiminate Control Form *****/
title1 'ELiminate Control Form';
data withoutControl;
set soymalto;
select (form);
when (13) ;
otherwise output;
end;
run;
/*proc sort data=withoutControl;
by form;
run;
proc print data=withoutControl;
run;*/
title2 'appear';%contrasts(withoutControl,appear);%Contour(appear_pred,pred,scatter=1);
title2 'color';%contrasts(withoutControl,color);%Contour(color_pred,pred,scatter=1);
title2 'flavor';%contrasts(withoutControl,flavor);%Contour(flavor_pred,pred,scatter=1);
title2 'sweet';%contrasts(withoutControl,sweet);%Contour(sweet_pred,pred,scatter=1);
title2 'sour';%contrasts(withoutControl,sour);%Contour(sour_pred,pred,scatter=1);
title2 'texture';%contrasts(withoutControl,texture);%Contour(texture_pred,pred,scatter=1);
title2 'liking';%contrasts(withoutControl,liking);%Contour(liking_pred,pred,scatter=1);

/***** Response Surface *****/
title2 '* 1 appear*';

proc mixed data=withoutControl;
class rep blk;
model appear=soy soycubic/HTYPE=1 3 outpm=appear_pred;
random rep*blk;
run;

```

```

title2 '* 2 color*';
proc mixed data=withoutControl;
class rep blk;
model color=soy /HTYPE=1 3 outpm=color_pred;
random rep*blk;
run;
title2 '* 3 flavor *';
proc mixed data=withoutControl;
class rep blk;
model flavor=soy malto /HTYPE=1 3 outpm=flavor_pred;
random rep*blk;
run;
title2 '* 4 sweet *';
proc mixed data=withoutControl;
class rep blk;
model sweet=soy/HTYPE=1 3 outpm=sweet_pred;
random rep*blk;
run;
title2 '* 5 sour *';
proc mixed data=withoutControl;
class rep blk;
model sour=soy /HTYPE=1 3 outpm=sour_pred;
random rep*blk;
run;
title2 '* 6 texture *';
proc mixed data=withoutControl;
class rep blk;
model texture=soy malto /HTYPE=1 3 outpm=texture_pred;
random rep*blk;
run;
title2 '* 7 liking*';
proc mixed data=withoutControl;
class rep blk;
model liking=soy/HTYPE=1 3 outpm=liking_pred;
random rep*blk;
run;
/***** Contour Plot *****/
title2 'appear';%Contour(appear_pred,pred,scatter=1);
title2 'color';%Contour(color_pred,pred,scatter=1);
title2 'flavor';%Contour(flavor_pred,pred,scatter=1);
title2 'sweet';%Contour(sweet_pred,pred,scatter=1);
title2 'sour';%Contour(sour_pred,pred,scatter=1);
title2 'texture';%Contour(texture_pred,pred,scatter=1);
title2 'liking';%Contour(liking_pred,pred,scatter=1);

/***** smooth contour plot *****/

```

```

title2 'smooth countour plot';
data grid;
  blk="1 ";
  Rep=1;
  do soy=3.25 to 6.25 by 0.25;
    soysquare=soy*soy;
    soycubic=soysquare*soy;
    do malto=10 to 12 by 0.5;
      maltosquare=malto*malto;
      output;
    end;
  end;
run;
data both;
  set withoutControl grid;
run;
/***** Response Surface *****/
title2 '* 1 appear*';
proc mixed data=both update;
class rep blk;
model appear=soy soycubic/HTYPE=1 3 outpm=appear_pred;
random rep*blk;
run;
title2 '* 2 color*';
proc mixed data=both;
class rep blk;
model color=soy /HTYPE=1 3 outpm=color_pred;
random rep*blk;
run;
title2 '* 3 flavor *';
proc mixed data=both;
class rep blk;
model flavor=soy malto /HTYPE=1 3 outpm=flavor_pred;
random rep*blk;
run;
title2 '* 4 sweet *';
proc mixed data=both;
class rep blk;
model sweet=soy/HTYPE=1 3 outpm=sweet_pred;
random rep*blk;
run;
title2 '* 5 sour *';
proc mixed data=both;
class rep blk;
model sour=soy /HTYPE=1 3 outpm=sour_pred;
random rep*blk;

```

```

run;
title2 '* 6 texture *';
proc mixed data=both;
class rep blk;
model texture=soy malto /HTYPE=1 3 outpm=texture_pred;
random rep*blk;
run;
title2 '* 7 liking*';
proc mixed data=both;
class rep blk;
model liking=soy/HTYPE=1 3 outpm=liking_pred;
random rep*blk;
run;
/***** Contour Plot *****/
title1 'Smooth Countour Plot';
title2 'appear';%Contour(appear_pred,pred);
title2 'color';%Contour(color_pred,pred);
title2 'flavor';%Contour(flavor_pred,pred);
title2 'sweet';%Contour(sweet_pred,pred);
title2 'sour';%Contour(sour_pred,pred);
title2 'texture';%Contour(texture_pred,pred);
title2 'liking';%Contour(liking_pred,pred);

/*To explain the attributes (for example, 'appear')
using ten most possible important demographic or product information. */

/*data demographProduct;
    set withoutControl(keep=sex age income race house lf sf fdesrt quality fruit appear
        color flavor sweet sour texture liking sweet2);
run;
*/
data demographProduct;
    set withoutControl(keep=sex age income race house lf sf fdesrt quality fruit
        appear color flavor sweet sour texture liking sweet2);
run;
proc print data=demographProduct;run;
/***** Response Surface *****/
%macro sortData(byVariable,sortOutDataset);
    proc sort data=demographProduct out=&sortOutDataset;
        by &byVariable;
    run;
%mend sortData;
%macro freqTable(byVariable,sortOutDataset, attribute);
    proc freq data=&sortOutDataset;
        table &attribute ;
        by &byVariable;

```

```

run;
%mend freqTable;
%macro logistic(dataSet,attribute, predictor1,predictor2,predictor3,predictor4,
    predictor5,predictor6,predictor7,predictor8, predictor9,predictor10);
proc logistic data=&dataSet;
    freq freq;
    class &predictor1 &predictor2 &predictor3 &predictor4 &predictor5
        &predictor6 &predictor7 &predictor8 &predictor9 &predictor10 ;
    model &attribute=&predictor1 &predictor2 &predictor3 &predictor4 &predictor5
        &predictor6 &predictor7 &predictor8 &predictor9 &predictor10;
run;
%mend logistic;

title 'AppearBySex';
%sortData(sex, sexSortOut);
%freqTable(sex, sexSortOut, appear);
data AppearBySex;
    do sex = 1 to 2;
        do appear = 1 to 9;
            input freq @@;
            output;
        end;
    end;
    datalines;
    0 0 1 21 18 16 37 11 5
    2 7 15 36 38 32 64 50 7
    ;
run;
%logistic(AppearBySex,appear,sex);

title 'AppearByAge';
%sortData(age, ageSortOut);
%freqTable(age, ageSortOut, appear);
data AppearByage;
    do age = 1 to 5;
        do appear = 1 to 9;
            input freq @@;
            output;
        end;
    end;
    datalines;
    1 3 6 23 17 15 38 19 6
    0 0 3 8 16 9 15 16 0
    0 1 0 11 5 11 19 10 0
    1 2 5 12 8 7 8 8 3
    0 1 2 3 10 6 21 8 3

```

```

1 2 5 12 8 7 8 8 3
0 1 2 3 10 6 21 8 3
;
run;
%logistic(AppearByage, appear ,age);

title 'AppearByincome';
%sortData(income, incomeSortOut);
%freqTable(income, incomeSortOut, appear);
data AppearByincome;
  do income = 1 to 2;
    do appear = 1 to 13;
      input freq @@;
      output;
    end;
  end;
  datalines;
0 0 0 0 1 5 5 3 0
1 2 3 13 8 4 11 14 2
0 0 2 11 9 9 15 13 6
1 3 5 2 5 7 20 7 1
0 0 1 5 6 2 9 3 2
0 0 0 3 3 5 5 5 1
0 0 0 0 4 1 8 1 0
0 0 0 5 4 2 2 3 0
0 2 2 3 4 4 9 2 0
0 0 1 4 2 4 2 0 0
0 0 1 4 2 0 4 2 0
0 0 0 1 1 4 9 3 0
0 0 0 0 6 1 3 2 0
0 0 1 5 3 0 1 2 0
;
run;
%logistic(AppearByincome, appear, income);

title 'AppearByhouse';
%sortData(house, houseSortOut);
%freqTable(house, houseSortOut, appear);
data AppearByhouse;
  do house = 1 to 5;
    do appear = 1 to 9;
      input freq @@;
      output;
    end;
  end;
  datalines;

```

```

0 0 1 0 0 4 4 5 6
0 2 4 17 9 17 35 18 0
1 0 4 11 24 7 24 11 1
1 5 7 29 23 19 37 24 5
0 0 0 0 0 1 1 3 0
;
run;
%logistic(AppearByhouse,appear, house);

```

```

/* If sf fdesrt quality fruit */

```

```

/*title 'AppearBySex*age';*/

```

```

title 'AppearBylf';
%sortData(lf, lfSortOut);
%freqTable(lf, lfSortOut, appear);
data AppearBylf;
do lf = 1 to 2;
do appear = 1 to 9;
input freq @@;
output;
end;
end;
datalines;
26 28 31 42 16 20 25 13 3
15 31 35 29 9 13 13 6 0
;
run;
%logistic(AppearBylf,appear,lf);

```

```

title 'textureBysf';
%sortData(sf, sfSortOut);
%freqTable(sf, sfSortOut, texture);
data textureBysf;
do sf = 1 to 2;
do texture = 1 to 9;
input freq @@;
output;
end;
end;
datalines;
2 5 11 34 38 38 82 53 9
0 2 5 23 18 10 19 8 3
;

```

```

run;
%logistic(textureBysf,texture,sf);

title 'likingBysf';
%sortData(sf, sfSortOut);
%freqTable(sf, sfSortOut, liking);
data likingBysf;
  do sf = 1 to 2;
    do liking = 1 to 9;
      input freq @@;
      output;
    end;
  end;
  datalines;
16 20 24 44 12 33 35 17 2
3 27 24 35 15 20 20 6 0
;
run;
%logistic(likingBysf,liking,sf);

```

```

title 'likingBylf';
%sortData(lf, lfSortOut);
%freqTable(lf, lfSortOut, liking);
data likingBylf;
  do lf = 1 to 2;
    do liking = 1 to 9;
      input freq @@;
      output;
    end;
  end;
  datalines;
17 30 32 55 21 43 48 22 2
2 17 16 24 7 10 11 1 0
;
run;
%logistic(likingBylf,liking,lf);
fdesrt

```

```

title 'textureByfdesrt';
%sortData(fdesrt, fdesrtSortOut);
%freqTable(fdesrt, fdesrtSortOut, texture);
data textureByfdesrt;
  do fdesrt = 1 to 6;
    do texture = 1 to 9;

```

```

        input freq @@;
        output;
    end;
end;
datalines;
1 5 2 2 1 1 4 1 0
3 7 6 13 4 9 10 1 0
1 4 13 20 8 11 8 8 1
6 17 14 21 4 17 17 8 0
8 14 12 22 9 15 19 5 1
0 0 1 1 2 0 1 0 0
;
run;
%logistic(textureByfdesrt,texture,fdesrt);

title 'likingByfdesrt';
%sortData(fdesrt, fdesrtSortOut);
%freqTable(fdesrt, fdesrtSortOut, liking);
data likingByfdesrt;
    do fdesrt = 1 to 6;
        do liking = 1 to 9;
            input freq @@;
            output;
        end;
    end;
datalines;
3 3 2 0 2 3 2 2 0
5 11 9 12 4 4 9 0 0
5 14 17 15 4 4 7 6 2
13 17 19 20 6 12 11 7 0
15 13 19 24 10 12 7 4 1
0 1 0 0 1 0 3 0 0
;
run;
%logistic(likingByfdesrt,liking,fdesrt);

/* proc logistic to determine which attributes cause unacceptability.
This is preferred to proc discrim */

/**** Acceptability (yes/no) - single attribute model*****/

Proc logistic data = SoyMalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Appearance';
model accept = appear / rsquare;
Run;

```

```

Proc logistic data = SoyMalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Color';
model accept = color / rsquare;
Run;
Proc logistic data = SoyMalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Flavor';
model accept = flavor / rsquare;
Run;
Proc logistic data = SoyMalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sweetness';
model accept = sweet / rsquare;
Run;
Proc logistic data = SoyMalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sourness';
model accept = sour / rsquare;
Run;
Proc logistic data = SoyMalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Texture';
model accept = texture / rsquare;
Run;
Proc logistic data = SoyMalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Overall Liking';
model accept = liking / rsquare;
Run;

/**** Acceptability (yes/no) all attributes model *****/
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Appearance';
model accept = appear color flavor sweet sour texture liking / rsquare;
Run;
/**** Buy Intent (yes/no) single attribute model *****/

Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Appearance / buysoying intent';
model buy = appear/ rsquare;

```

```

Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Color / buysoying intent';
model buy = color/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Flavor / buysoying intent';
model buy = flavor/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sweetness / buysoying intent';
model buy = soymalto/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sourness / buysoying intent';
model buy = sour/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Texture / buysoying intent';
model buy = texture/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buy = liking/ rsquare;
Run;

/**** Buy Intent (yes/no) all attribute model ****/
Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buy = appear color flavor sweet sour texture liking / rsquare;
Run;

/**** Buy Intent with soy (yes/no) single attribute model ****/

Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Appearance / buysoying intent';
model buysoy = appear/ rsquare;

```

```

Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Color / buysoying intent';
model buysoy = color/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Flavor / buysoying intent';
model buysoy = flavor/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sweetness / buysoying intent';
model buysoy = sweet/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Sourness / buysoying intent';
model buysoy = sour/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Texture / buysoying intent';
model buysoy = texture/ rsquare;
Run;
Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buysoy = liking/ rsquare;
Run;

/**** Buy Intent with soy (yes/no) all attribute model *****/

Proc logistic data = soymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buysoy = appear color flavor sweet sour texture liking / rsquare;
run;

/*****
****/
/***** NEW *****/
****/

```

```

/* logistic analysis and prediction*/
data testSoymalto;set soymalto;targetBuySoy=2-buysoy;keep targetBuySoy liking;run;
Proc logistic data = testSoymalto;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
    model targetBuySoy = liking/ rsquare influence ;
    output out=predict p=ph_hat lower=LCL upper=UCL;
    proc print data=predict;
Run;

```

```

/*MANOVA */
title 'MANOVA';
proc glm data = withoutControl;
    class form;
    model appear color flavor sweet sour texture liking= form;
    manova h=form;
run;
quit;

```

```

/** Canonical Discriminant Analysis **/
Title2 'Canonical Discriminant Analysis';
Proc CanDisc data=withoutControl All Out=CanDiscOut;
    class form;
    var appear color flavor sweet sour texture liking;
Run;
Title3 'Plot of Observations In Space of Canonical Variates';
Proc GPlot Data=CanDiscOut;
    plot can1 *can2=form;
    symbol1 v=dot h=0.7 I=none c=black;
    symbol2 v=star h=0.7 I=none c=blue;
    symbol3 v=square h=0.7 I=none c=red;
    symbol4 v=star h=0.7 I=none c=green;
    symbol5 v=star h=0.7 I=none c=red;
run;

```

```

/** Principal Component Analysis **/;
Title2 'Principal Component Analysis ';
Proc Princomp data=withoutControl COV Out=PrincompOut;
    var appear color flavor sweet sour texture liking;
Run;
Proc plot data=PrincompOut;
    plot prin2*prin1=form;

Run;

```

APPENDIX H. SAS CODE FOR CONSUMER STUDY 2

Study 2

```
dm 'log;clear;output;clear';
options ps=55 ls=80 PageNo=1 center nodate;
title 'SoyData';
data one;
input Panelist Form Age Sex Race House Ed Employ IncomeLF SF
      Fdesrt quality fruit taste purch1 purch2 AppearFlavor Sweet Sour Texture
      Bitter Liking Accept Buy BuySoy Sweet2
;

datalines;
;
run;
proc print data=one;
run;
/* FREQUENCY */
proc sort;
by form;
run;
proc freq data=one;
by form;
tables accept buy buysoy;
run;
/* MEANS AND STANDARD DEVIATION */
proc sort;
by form;
run;

proc means mean std cv n maxdec=2;
by form;
var Appear Flavor Sweet Sour Texture Liking;
run;

/* ANOVA */

proc mixed data=one;
class form ;
model appear=form;
lsmeans form / adjust=tukey;
quit;
run;
proc mixed data=one;
```

```
class form ;  
model flavor=form;  
lsmeans form / adjust=tukey;  
quit;  
run;
```

```
proc mixed data=one;  
class form ;  
model sweet=form;  
lsmeans form / adjust=tukey;  
quit;  
run;
```

```
proc mixed data=one;  
class form ;  
model sour=form;  
lsmeans form / adjust=tukey;  
quit;  
run;
```

```
proc mixed data= one;  
class form ;  
model texture=form;  
lsmeans form / adjust=tukey;  
quit;  
run;
```

```
proc mixed data=one;  
class form ;  
model liking=form;  
lsmeans form / adjust=tukey;  
quit;  
run;
```

```
/* MANOVA */
```

```
title 'MANOVA';  
proc glm data = one;  
  class form;  
  model appear flavor sweet sour texture liking= form;  
  manova h=form;  
run;  
quit;
```

```
/** Canonical Discriminant Analysis **/
```

```

Title2 'Canonical Discriminant Analysis';
Proc CanDisc data=one All Out=CanDiscOut;
  class form;
  var appear flavor sweet sour texture liking;
Run;
Title3 'Plot of Observations In Space of Canonical Variates';
Proc GPlot Data=CanDiscOut;
  plot can1*can2=form;
  symbol1 v=dot h=0.7 I=none c=black;
  symbol2 v=star h=0.7 I=none c=blue;
  symbol3 v=square h=0.7 I=none c=red;
  symbol4 v=star h=0.7 I=none c=green;
  symbol5 v=star h=0.7 I=none c=red;
run;

/**** Acceptability (yes/no) all attributes model *****/
Proc logistic data = one;
Title1 'Logistic regression (Difference Test Variables)';
Title2 'Appearance';
model accept = appear flavor sweet sour texture liking / rsquare;
Run;

/**** Buy Intent (yes/no) all attribute model *****/
Proc logistic data = one;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buy = appear flavor sweet sour texture liking / rsquare;
Run;

/**** Buy Intent with soy (yes/no) all attribute model *****/

Proc logistic data = one;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
model buysoy = appear flavor sweet sour texture liking / rsquare;
run;

/* logistic analysis and prediction*/
data Soy;set one;targetBuySoy=2-buysoy;keep BuySoy liking;run;

Proc logistic data = Soy;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buysoying intent';
  model BuySoy = liking/ rsquare influence ;

```

```
output out=predict p=ph_hat lower=LCL upper=UCL;
proc print data=predict;
Run;

data Soy2;set one;targetAccept=2-buysoy;keep Accept liking;run;
```

```
Proc logistic data = Soy2;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / Accept intent';
model Accept = liking/ rsquare influence ;
output out=predict p=ph_hat lower=LCL upper=UCL;
proc print data=predict;
Run;
```

```
data Soy3;set one;targetBuy=2-buysoy;keep Buy liking;run;
```

```
Proc logistic data = Soy3;
Title1 'Logistic regression (Acceptance Test Variables)';
Title2 'Liking / buy intent';
model Buy = liking/ rsquare influence ;
output out=predict p=ph_hat lower=LCL upper=UCL;
proc print data=predict;
Run;
```

APPENDIX I. DATA SET FOR CONSUMER STUDY 1

A. DEMOGRAPHIC AND PRODUCT INFORMATION

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
1	1	3.25	10	2	2	4	2	4	1	8	1	1	3	2	4	3	1	1
2	1	3.25	10	1	2	2	4	5	5	1	2	1	5	.	.	3	2	1
3	1	3.25	10	2	2	4	4	4	5	2	1	2	5	2	2	1	2	1
4	1	3.25	10	5	2	4	3	2	1	10	1	1	3	2	4	1	1	1
5	1	3.25	10	5	1	4	3	5	1	11	1	1	3	2	5	3	1	1
6	1	3.25	10	2	2	3	4	5	5	.	1	1	5	2	2	3	2	1
7	1	3.25	10	1	2	2	4	4	5	3	2	2	4	4	4	2	1	1
8	1	3.25	10	1	1	2	4	4	5	3	1	2	4	2	1	1	1	1
9	1	3.25	10	5	2	4	3	4	1	10	2	2	4	2	6	1	1	1
10	1	3.25	10	1	2	4	4	4	.	2	1	1	5	2	3	3	2	1
11	1	3.25	10	2	1	5	4	5	1	4	1	1	5	5	2	1	2	1
12	1	3.25	10	3	2	2	2	5	5	5	1	2	5	2	.	1	2	1
13	1	3.25	10	3	2	4	2	2	1	3	1	1	4	2	2	2	2	1
14	1	3.25	10	4	2	1	4	2	1	3	2	2	4	2	6	3	1	1
15	1	3.25	10	1	2	4	4	3	5	1	2	2	5	2	2	1	2	2
16	1	3.25	10	2	2	3	2	4	5	2	1	1	3	2	2	3	1	1
17	1	3.25	10	1	2	4	4	4	5	2	2	2	3	2	2	3	2	2
18	1	3.25	10	3	2	4	2	5	1	13	1	1	3	2	4	3	1	1
19	1	3.25	10	4	2	4	2	5	1	8	1	2	4	2	7	1	2	2
20	1	3.25	10	1	2	2	4	5	5	2	1	1	3	2	6	1	2	1
21	1	3.25	10	4	2	4	2	3	1	13	1	1	2	2	2	1	1	1
22	1	3.25	10	1	1	3	2	5	5	3	2	2	3	2	2	3	1	1
23	1	3.25	10	3	2	4	2	4	4	7	1	1	2	2	4	3	1	1
24	1	3.25	10	1	2	4	2	3	5	1	1	1	4	2	2	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	1	3.25	10	3	2	4	2	5	1	11	1	1	3	2	7	3	1	1
26	1	3.25	10	1	2	4	4	3	5	1	2	2	4	2	4	1	1	1
27	1	3.25	10	1	2	4	4	3	5	2	1	1	4	2	5	1	2	1
28	1	3.25	10	1	1	4	4	3	5	1	1	2	5	2	4	3	2	2
29	1	3.25	10	5	2	4	3	4	1	12	1	1	4	4	3	2	1	1
30	1	3.25	10	1	2	2	4	5	5	2	2	1	5	2	.	1	2	1
1	2	4.25	10	5	1	4	3	5	1	6	1	1	5	2	7	1	1	1
2	2	4.25	10	3	2	1	2	3	1	7	1	1	3	5	4	2	1	1
3	2	4.25	10	4	2	4	2	5	1	7	2	2	4	2	4	1	1	1
4	2	4.25	10	2	1	4	2	5	1	4	1	2	1	2	2	2	2	2
5	2	4.25	10	5	1	4	3	5	1	11	1	1	3	2	5	3	1	1
6	2	4.25	10	1	1	4	4	5	5	1	1	2	4	4	6	1	2	1
7	2	4.25	10	2	2	1	3	5	5	5	1	1	3	2	7	2	2	1
8	2	4.25	10	4	1	5	2	4	1	8	2	2	2	5	2	1	2	1
9	2	4.25	10	4	2	4	2	3	1	3	1	1	3	2	.	1	2	1
10	2	4.25	10	1	2	1	4	4	5	1	1	2	4	2	2	1	1	1
11	2	4.25	10	2	1	5	4	5	1	4	1	1	5	5	2	1	2	1
12	2	4.25	10	2	2	5	4	5	5	2	2	2	5	.	3	1	2	2
13	2	4.25	10	4	2	4	1	5	1	5	1	1	2	2	3	3	1	1
14	2	4.25	10	1	2	4	4	3	5	1	1	1	3	2	2	1	1	1
15	2	4.25	10	1	2	4	4	3	5	1	2	2	4	2	4	1	2	2
16	2	4.25	10	2	1	2	4	5	5	2	1	1	5	.	2	1	2	1
17	2	4.25	10	1	2	4	4	4	5	2	2	2	3	2	2	3	2	2
18	2	4.25	10	3	1	4	2	4	1	9	2	2	5	2	4	1	1	1
19	2	4.25	10	4	2	4	3	3	1	7	1	1	5	2	7	1	1	2
20	2	4.25	10	2	2	2	4	5	5	2	1	1	4	5	4	3	2	1
21	2	4.25	10	3	2	2	2	5	5	3	1	1	2	5	2	1	1	1
22	2	4.25	10	1	2	4	4	3	5	1	1	1	5	2	4	1	1	1
23	2	4.25	10	3	2	4	2	4	4	7	1	1	2	2	4	3	1	1
24	2	4.25	10	1	2	4	2	3	5	.	1	1	3	2	2	1	2	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	2	4.25	10	5	2	4	3	4	1	4	2	1	2	2	3	1	2	1
26	2	4.25	10	1	2	4	2	3	5	8	1	1	4	2	4	3	2	1
27	2	4.25	10	1	2	4	3	3	5	9	1	1	5	2	4	1	2	1
28	2	4.25	10	1	2	2	4	3	5	2	2	2	3	2	2	3	2	1
29	2	4.25	10	5	2	4	3	4	1	12	1	1	4	4	3	2	1	1
30	2	4.25	10	2	2	5	4	5	5	1	1	2	5	2	3	1	2	1
1	3	5.25	10	2	2	4	2	4	1	8	1	1	3	2	4	3	1	1
2	3	5.25	10	4	2	1	3	5	1	12	1	2	5	2	3	1	2	1
3	3	5.25	10	5	2	4	4	3	1	4	2	2	4	2	7	3	2	1
4	3	5.25	10	1	2	4	4	4	2	3	1	1	4	5	6	3	1	1
5	3	5.25	10	1	1	4	4	5	5	1	1	2	4	4	6	1	2	1
6	3	5.25	10	2	2	2	4	5	5	2	2	2	5	2	4	3	2	1
7	3	5.25	10	1	2	2	4	4	5	3	2	2	4	4	4	2	1	1
8	3	5.25	10	4	2	4	2	5	1	13	1	2	4	2	3	3	2	2
9	3	5.25	10	1	1	2	4	5	5	2	2	2	2	.	.	1	2	1
10	3	5.25	10	3	1	2	2	5	5	3	1	2	2	2	2	3	1	1
11	3	5.25	10	2	2	5	4	5	5	2	2	2	5	.	3	1	2	2
12	3	5.25	10	3	2	5	5	5	5	2	1	.	1	2	6	3	1	1
13	3	5.25	10	3	2	4	2	2	1	3	1	1	4	2	2	2	2	1
14	3	5.25	10	1	2	4	2	4	1	4	1	1	4	2	4	1	2	2
15	3	5.25	10	3	2	4	2	3	1	8	1	1	4	2	.	1	1	1
16	3	5.25	10	2	1	2	4	5	5	2	1	2	2	.	6	1	2	1
17	3	5.25	10	3	1	4	2	4	1	9	2	2	5	2	4	1	1	1
18	3	5.25	10	3	1	4	4	5	1	7	1	2	3	2	3	3	2	2
19	3	5.25	10	4	2	4	2	5	1	8	1	2	4	2	7	1	2	2
20	3	5.25	10	3	2	4	2	3	1	10	2	2	2	4	4	3	1	2
21	3	5.25	10	4	2	4	1	4	1	3	1	1	4	2	4	1	2	1
22	3	5.25	10	5	2	4	3	5	6	5	1	1	5	2	3	3	1	1
23	3	5.25	10	1	2	4	2	3	5	.	1	1	3	2	2	1	2	1
24	3	5.25	10	1	2	4	2	3	5	.	1	1	3	2	4	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	3	5.25	10	3	2	4	2	5	1	11	1	1	3	2	7	3	1	1
26	3	5.25	10	1	2	4	4	3	2	2	1	1	5	2	2	3	2	2
27	3	5.25	10	1	2	1	4	3	5	1	1	1	5	2	2	1	2	1
28	3	5.25	10	1	1	2	4	3	5	1	2	2	4	2	5	2	2	1
29	3	5.25	10	2	2	5	4	5	5	1	1	2	5	2	3	1	2	1
30	3	5.25	10	5	2	4	4	5	1	4	1	1	4	5	5	3	2	1
1	4	6.25	10	5	1	4	3	5	1	6	1	1	5	2	7	1	1	1
2	4	6.25	10	2	1	4	4	5	1	4	2	2	4	2	4	2	2	2
3	4	6.25	10	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
4	4	6.25	10	1	2	4	2	3	5	11	1	2	3	2	2	1	2	1
5	4	6.25	10	2	2	2	4	5	5	2	2	2	5	2	4	3	2	1
6	4	6.25	10	2	2	3	4	5	5	.	1	1	5	2	2	3	2	1
7	4	6.25	10	2	2	1	3	5	5	5	1	1	3	2	7	2	2	1
8	4	6.25	10	1	2	4	4	3	5	1	1	2	3	.	4	1	1	1
9	4	6.25	10	4	2	1	1	3	1	2	1	.	1	2	.	1	1	2
10	4	6.25	10	3	1	4	2	5	1	11	1	2	5	2	2	1	2	2
11	4	6.25	10	3	2	5	5	5	5	2	1	.	1	2	6	3	1	1
12	4	6.25	10	3	2	2	2	5	5	5	1	2	5	2	.	1	2	1
13	4	6.25	10	4	2	4	1	5	1	5	1	1	2	2	3	3	1	1
14	4	6.25	10	3	2	2	3	5	1	5	1	1	5	4	4	4	1	1
15	4	6.25	10	4	2	4	3	2	1	3	1	1	1	.	6	1	1	1
16	4	6.25	10	5	1	4	2	5	1	10	1	1	4	4	6	1	2	1
17	4	6.25	10	3	1	4	4	5	1	7	1	2	3	2	3	3	2	2
18	4	6.25	10	3	2	4	2	5	1	13	1	1	3	2	4	3	1	1
19	4	6.25	10	4	2	4	3	3	1	7	1	1	5	2	7	1	1	2
20	4	6.25	10	2	2	4	3	5	1	13	1	1	5	4	7	3	1	1
21	4	6.25	10	5	2	4	1	4	1	8	1	1	5	2	7	2	1	1
22	4	6.25	10	5	2	4	4	3	6	4	1	1	4	2	4	3	2	1
23	4	6.25	10	1	2	4	2	3	5	.	1	1	3	2	4	1	1	1
24	4	6.25	10	1	2	4	2	3	5	1	1	1	4	2	2	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	4	6.25	10	5	2	4	3	4	1	4	2	1	2	2	3	1	2	1
26	4	6.25	10	1	2	4	3	3	5	.	1	1	2	2	6	1	1	1
27	4	6.25	10	1	2	4	5	3	5	1	1	1	1	2	4	3	1	1
28	4	6.25	10	2	2	1	1	4	1	3	1	2	5	.	.	1	1	1
29	4	6.25	10	5	2	4	4	5	1	4	1	1	4	5	5	3	2	1
30	4	6.25	10	1	2	2	4	5	5	2	2	1	5	2	.	1	2	1
1	5	3.25	11	4	2	1	3	5	1	12	1	2	5	2	3	1	2	1
2	5	3.25	11	1	2	2	4	5	5	2	1	1	2	2	7	2	2	1
3	5	3.25	11	1	2	4	2	3	5	1	1	2	2	5	2	1	2	1
4	5	3.25	11	2	1	4	2	5	1	4	1	2	1	2	2	2	2	2
5	5	3.25	11	1	2	4	2	3	5	12	1	2	3	2	4	3	2	1
6	5	3.25	11	2	2	3	4	5	5	.	1	1	5	2	2	3	2	1
7	5	3.25	11	4	2	4	2	5	1	13	1	2	4	2	3	3	2	2
8	5	3.25	11	3	1	4	4	5	1	5	1	2	3	2	7	3	2	1
9	5	3.25	11	4	1	4	3	5	1	9	1	1	5	4	4	1	1	1
10	5	3.25	11	1	2	1	4	4	5	1	1	2	4	2	2	1	1	1
11	5	3.25	11	3	1	4	3	5	1	7	1	1	1	4	4	3	1	1
12	5	3.25	11	3	2	2	2	5	5	5	1	2	5	2	.	1	2	1
13	5	3.25	11	1	2	4	2	4	1	4	1	1	4	2	4	1	2	2
14	5	3.25	11	4	2	4	2	4	1	8	2	2	4	2	4	1	1	1
15	5	3.25	11	5	2	4	4	2	1	3	1	1	4	2	6	4	2	1
16	5	3.25	11	2	1	2	4	5	5	2	1	1	5	.	2	1	2	1
17	5	3.25	11	5	1	4	3	5	1	8	1	1	2	2	4	1	1	2
18	5	3.25	11	3	2	4	2	5	1	13	1	1	3	2	4	3	1	1
19	5	3.25	11	3	2	4	2	3	1	10	2	2	2	4	4	3	1	2
20	5	3.25	11	1	1	2	4	3	1	2	1	1	5	2	2	1	1	1
21	5	3.25	11	5	1	4	3	5	1	12	1	2	5	2	7	1	2	1
22	5	3.25	11	1	2	4	4	3	5	1	1	1	5	2	4	1	1	1
23	5	3.25	11	4	2	4	3	3	6	11	1	1	3	2	3	.	1	1
24	5	3.25	11	1	2	4	2	3	5	1	1	1	4	2	2	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	5	3.25	11	1	2	4	4	3	2	2	1	1	5	2	2	3	2	2
26	5	3.25	11	2	1	4	4	3	5	1	2	2	4	2	4	1	2	1
27	5	3.25	11	4	1	4	4	5	1	6	1	1	5	2	7	2	1	1
28	5	3.25	11	1	2	2	4	3	5	2	2	2	3	2	2	3	2	1
29	5	3.25	11	4	2	4	2	5	1	9	1	2	3	2	7	3	2	2
30	5	3.25	11	1	2	2	4	5	5	2	2	1	5	2	.	1	2	1
1	6	4.25	11	2	1	4	4	5	1	4	2	2	4	2	4	2	2	2
2	6	4.25	11	1	2	2	4	5	5	1	2	1	5	.	.	3	2	1
3	6	4.25	11	2	2	5	1	5	5	1	2	2	4	4	8	1	2	1
4	6	4.25	11	2	1	4	2	5	1	4	1	2	1	2	2	2	2	2
5	6	4.25	11	1	2	4	4	4	2	3	1	1	4	5	6	3	1	1
6	6	4.25	11	2	2	3	4	5	5	.	1	1	3	4	8	3	2	1
7	6	4.25	11	1	2	4	4	3	5	1	1	2	3	.	4	1	1	1
8	6	4.25	11	1	1	2	4	4	5	3	1	2	4	2	1	1	1	1
9	6	4.25	11	2	1	.	3	5	5	3	1	1	4	2	7	3	2	1
10	6	4.25	11	1	2	1	4	4	5	1	1	2	4	2	2	1	1	1
11	6	4.25	11	3	1	2	2	5	5	3	1	2	2	2	2	3	1	1
12	6	4.25	11	1	1	1	1	2	5	2	2	2	3	4	2	1	2	1
13	6	4.25	11	3	2	2	3	5	1	5	1	1	5	4	4	4	1	1
14	6	4.25	11	4	2	1	4	2	1	3	2	2	4	2	6	3	1	1
15	6	4.25	11	3	2	4	4	4	1	3	1	1	5	2	5	1	2	2
16	6	4.25	11	2	1	2	4	5	5	2	1	1	5	.	2	1	2	1
17	6	4.25	11	2	1	2	4	5	5	2	1	2	2	.	6	1	2	1
18	6	4.25	11	1	2	4	3	4	1	2	2	2	4	2	2	1	2	2
19	6	4.25	11	2	2	4	3	5	1	13	1	1	5	4	7	3	1	1
20	6	4.25	11	1	2	2	4	5	5	2	1	1	3	2	6	1	2	1
21	6	4.25	11	1	2	4	4	3	2	3	2	2	2	2	6	1	2	1
22	6	4.25	11	1	2	4	4	3	5	1	1	1	5	2	4	1	1	1
23	6	4.25	11	5	2	4	3	5	6	5	1	1	5	2	3	3	1	1
24	6	4.25	11	1	2	2	4	3	5	1	1	1	4	2	4	1	2	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	6	4.25	11	1	2	4	3	3	5	.	1	1	2	2	6	1	1	1
26	6	4.25	11	1	2	4	4	3	5	1	2	2	4	2	4	1	1	1
27	6	4.25	11	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
28	6	4.25	11	1	2	2	4	3	5	2	2	2	3	2	2	3	2	1
29	6	4.25	11	1	1	2	4	3	5	1	2	2	4	2	5	2	2	1
30	6	4.25	11	4	1	4	2	4	1	6	1	2	4	2	7	2	2	1
1	7	5.25	11	1	2	2	4	5	5	2	1	1	2	2	7	2	2	1
2	7	5.25	11	3	2	1	2	3	1	7	1	1	3	5	4	2	1	1
3	7	5.25	11	2	2	4	4	4	5	2	1	2	5	2	2	1	2	1
4	7	5.25	11	1	2	4	4	4	2	3	1	1	4	5	6	3	1	1
5	7	5.25	11	1	2	4	2	3	5	11	1	2	3	2	2	1	2	1
6	7	5.25	11	1	2	4	4	5	2	3	1	1	2	5	3	1	2	2
7	7	5.25	11	3	1	4	4	5	1	5	1	2	3	2	7	3	2	1
8	7	5.25	11	4	1	5	2	4	1	8	2	2	2	5	2	1	2	1
9	7	5.25	11	5	2	4	3	4	1	10	2	2	4	2	6	1	1	1
10	7	5.25	11	3	1	2	2	5	5	3	1	2	2	2	2	3	1	1
11	7	5.25	11	3	1	4	2	5	1	11	1	2	5	2	2	1	2	2
12	7	5.25	11	2	2	4	3	4	1	6	2	2	3	4	6	1	2	2
13	7	5.25	11	4	2	4	2	4	1	8	2	2	4	2	4	1	1	1
14	7	5.25	11	1	2	4	4	3	5	1	1	1	3	2	2	1	1	1
15	7	5.25	11	1	2	4	4	3	5	1	2	2	5	2	2	1	2	2
16	7	5.25	11	2	1	2	4	5	5	2	1	2	2	.	6	1	2	1
17	7	5.25	11	5	1	4	2	5	1	10	1	1	4	4	6	1	2	1
18	7	5.25	11	3	1	2	2	5	1	8	1	2	2	5	6	1	2	1
19	7	5.25	11	1	1	2	4	3	1	2	1	1	5	2	2	1	1	1
20	7	5.25	11	2	2	2	4	5	5	2	1	1	4	5	4	3	2	1
21	7	5.25	11	4	2	4	2	3	1	13	1	1	2	2	2	1	1	1
22	7	5.25	11	5	2	4	3	5	6	5	1	1	5	2	3	3	1	1
23	7	5.25	11	5	2	4	4	3	6	4	1	1	4	2	4	3	2	1
24	7	5.25	11	5	1	4	3	4	6	11	1	1	2	2	3	3	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	7	5.25	11	2	1	4	4	3	5	1	2	2	4	2	4	1	2	1
26	7	5.25	11	1	2	4	2	3	5	8	1	1	4	2	4	3	2	1
27	7	5.25	11	1	2	4	4	3	5	2	1	1	4	2	5	1	2	1
28	7	5.25	11	1	1	2	4	3	5	1	2	2	4	2	5	2	2	1
29	7	5.25	11	2	2	1	1	4	1	3	1	2	5	.	.	1	1	1
30	7	5.25	11	1	1	4	3	3	1	3	1	1	2	2	3	3	1	1
1	8	6.25	11	1	2	2	4	5	5	1	2	1	5	.	.	3	2	1
2	8	6.25	11	5	2	4	4	3	1	4	2	2	4	2	7	3	2	1
3	8	6.25	11	4	2	4	2	5	1	7	2	2	4	2	4	1	1	1
4	8	6.25	11	1	2	4	2	3	5	11	1	2	3	2	2	1	2	1
5	8	6.25	11	1	2	4	2	3	5	12	1	2	3	2	4	3	2	1
6	8	6.25	11	2	1	4	3	5	1	4	1	1	3	2	.	1	1	2
7	8	6.25	11	1	1	2	4	4	5	3	1	2	4	2	1	1	1	1
8	8	6.25	11	1	1	2	4	5	5	2	2	2	2	.	.	1	2	1
9	8	6.25	11	4	2	4	2	3	1	3	1	1	3	2	.	1	2	1
10	8	6.25	11	3	1	4	2	5	1	11	1	2	5	2	2	1	2	2
11	8	6.25	11	3	1	4	3	5	1	7	1	1	1	4	4	3	1	1
12	8	6.25	11	3	1	2	3	5	5	2	2	2	6	.	2	1	2	1
13	8	6.25	11	4	2	1	4	2	1	3	2	2	4	2	6	3	1	1
14	8	6.25	11	3	2	4	2	3	1	8	1	1	4	2	.	1	1	1
15	8	6.25	11	1	2	4	4	3	5	1	2	2	4	2	4	1	2	2
16	8	6.25	11	5	1	4	2	5	1	10	1	1	4	4	6	1	2	1
17	8	6.25	11	5	1	4	3	5	1	8	1	1	2	2	4	1	1	2
18	8	6.25	11	5	2	4	4	3	1	3	1	1	5	2	1	3	1	1
19	8	6.25	11	1	2	2	4	5	5	2	1	1	3	2	6	1	2	1
20	8	6.25	11	4	2	4	1	4	1	3	1	1	4	2	4	1	2	1
21	8	6.25	11	3	2	2	2	5	5	3	1	1	2	5	2	1	1	1
22	8	6.25	11	5	2	4	4	3	6	4	1	1	4	2	4	3	2	1
23	8	6.25	11	4	2	4	3	3	6	11	1	1	3	2	3	.	1	1
24	8	6.25	11	5	1	4	3	4	6	5	1	1	5	2	3	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	8	6.25	11	1	2	4	4	3	5	1	2	2	4	2	4	1	1	1
26	8	6.25	11	1	2	1	4	3	5	1	1	1	5	2	2	1	2	1
27	8	6.25	11	1	2	4	3	3	5	9	1	1	5	2	4	1	2	1
28	8	6.25	11	2	2	1	1	4	1	3	1	2	5	.	.	1	1	1
29	8	6.25	11	4	2	4	2	5	1	9	1	2	3	2	7	3	2	2
30	8	6.25	11	1	2	2	4	5	5	2	1	1	4	2	.	1	1	1
1	9	3.25	12	2	2	4	2	4	1	8	1	1	3	2	4	3	1	1
2	9	3.25	12	3	2	1	2	3	1	7	1	1	3	5	4	2	1	1
3	9	3.25	12	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
4	9	3.25	12	1	2	4	2	3	5	12	1	2	3	2	4	3	2	1
5	9	3.25	12	2	2	3	4	5	5	.	1	1	3	4	8	3	2	1
6	9	3.25	12	2	1	2	4	5	1	4	2	2	6	2	1	2	2	2
7	9	3.25	12	1	2	2	4	4	5	3	2	2	4	4	4	2	1	1
8	9	3.25	12	4	1	5	2	4	1	8	2	2	2	5	2	1	2	1
9	9	3.25	12	4	2	1	1	3	1	2	1	.	1	2	.	1	1	2
10	9	3.25	12	3	1	4	3	5	1	7	1	1	1	4	4	3	1	1
11	9	3.25	12	1	1	1	1	2	5	2	2	2	3	4	2	1	2	1
12	9	3.25	12	3	1	2	2	5	1	5	2	2	4	4	2	1	2	2
13	9	3.25	12	3	2	4	2	2	1	3	1	1	4	2	2	2	2	1
14	9	3.25	12	1	2	4	4	3	5	1	1	1	3	2	2	1	1	1
15	9	3.25	12	4	2	4	3	2	1	3	1	1	1	.	6	1	1	1
16	9	3.25	12	5	1	4	3	5	1	8	1	1	2	2	4	1	1	2
17	9	3.25	12	1	2	4	3	4	1	2	2	2	4	2	2	1	2	2
18	9	3.25	12	5	1	4	3	5	1	9	1	1	5	2	5	3	1	1
19	9	3.25	12	4	2	4	2	5	1	8	1	2	4	2	7	1	2	2
20	9	3.25	12	2	2	2	4	5	5	2	1	1	4	5	4	3	2	1
21	9	3.25	12	5	2	4	1	4	1	8	1	1	5	2	7	2	1	1
22	9	3.25	12	4	2	4	3	3	6	11	1	1	3	2	3	.	1	1
23	9	3.25	12	1	2	2	4	3	5	1	1	1	4	2	4	1	2	1
24	9	3.25	12	2	1	2	4	5	5	2	1	1	5	.	.	3	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	9	3.25	12	3	2	4	2	5	1	11	1	1	3	2	7	3	1	1
26	9	3.25	12	1	2	4	2	3	5	8	1	1	4	2	4	3	2	1
27	9	3.25	12	1	2	4	5	3	5	1	1	1	1	2	4	3	1	1
28	9	3.25	12	4	2	4	2	5	1	9	1	2	3	2	7	3	2	2
29	9	3.25	12	4	1	4	2	4	1	6	1	2	4	2	7	2	2	1
30	9	3.25	12	2	2	4	2	4	1	6	2	2	4	2	4	3	2	1
1	10	4.25	12	5	1	4	3	5	1	6	1	1	5	2	7	1	1	1
2	10	4.25	12	5	2	4	4	3	1	4	2	2	4	2	7	3	2	1
3	10	4.25	12	1	2	4	2	3	5	1	1	2	2	5	2	1	2	1
4	10	4.25	12	2	2	3	4	5	5	.	1	1	3	4	8	3	2	1
5	10	4.25	12	1	2	4	4	5	2	3	1	1	2	5	3	1	2	2
6	10	4.25	12	5	2	4	3	2	1	10	1	1	3	2	4	1	1	1
7	10	4.25	12	2	2	1	3	5	5	5	1	1	3	2	7	2	2	1
8	10	4.25	12	1	1	2	4	5	5	2	2	2	2	.	.	1	2	1
9	10	4.25	12	4	1	4	3	5	1	9	1	1	5	4	4	1	1	1
10	10	4.25	12	1	1	1	1	2	5	2	2	2	3	4	2	1	2	1
11	10	4.25	12	2	2	4	3	4	1	6	2	2	3	4	6	1	2	2
12	10	4.25	12	1	2	4	4	4	.	2	1	1	5	2	3	3	2	1
13	10	4.25	12	4	2	4	1	5	1	5	1	1	2	2	3	3	1	1
14	10	4.25	12	3	2	4	2	3	1	8	1	1	4	2	.	1	1	1
15	10	4.25	12	5	2	4	4	2	1	3	1	1	4	2	6	4	2	1
16	10	4.25	12	1	2	4	3	4	1	2	2	2	4	2	2	1	2	2
17	10	4.25	12	3	1	2	2	5	1	8	1	2	2	5	6	1	2	1
18	10	4.25	12	2	2	3	2	4	5	2	1	1	3	2	2	3	1	1
19	10	4.25	12	4	2	4	3	3	1	7	1	1	5	2	7	1	1	2
20	10	4.25	12	4	2	4	1	4	1	3	1	1	4	2	4	1	2	1
21	10	4.25	12	5	1	4	3	5	1	12	1	2	5	2	7	1	2	1
22	10	4.25	12	1	2	2	4	3	5	1	1	1	4	2	4	1	2	1
23	10	4.25	12	5	1	4	3	4	6	11	1	1	2	2	3	3	1	1
24	10	4.25	12	1	1	3	2	5	5	3	2	2	3	2	2	3	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	10	4.25	12	5	2	4	3	4	1	4	2	1	2	2	3	1	2	1
26	10	4.25	12	1	2	1	4	3	5	1	1	1	5	2	2	1	2	1
27	10	4.25	12	4	1	4	4	5	1	6	1	1	5	2	7	2	1	1
28	10	4.25	12	4	1	4	2	4	1	6	1	2	4	2	7	2	2	1
29	10	4.25	12	1	1	4	3	3	1	3	1	1	2	2	3	3	1	1
30	10	4.25	12	1	1	4	4	3	5	1	1	2	5	2	4	3	2	2
1	11	5.25	12	4	2	1	3	5	1	12	1	2	5	2	3	1	2	1
2	11	5.25	12	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
3	11	5.25	12	2	2	5	1	5	5	1	2	2	4	4	8	1	2	1
4	11	5.25	12	1	2	4	4	5	2	3	1	1	2	5	3	1	2	2
5	11	5.25	12	2	1	4	3	5	1	4	1	1	3	2	.	1	1	2
6	11	5.25	12	5	1	4	3	5	1	11	1	1	3	2	5	3	1	1
7	11	5.25	12	4	2	4	2	5	1	13	1	2	4	2	3	3	2	2
8	11	5.25	12	4	2	1	1	3	1	2	1	.	1	2	.	1	1	2
9	11	5.25	12	2	1	.	3	5	5	3	1	1	4	2	7	3	2	1
10	11	5.25	12	2	2	4	3	4	1	6	2	2	3	4	6	1	2	2
11	11	5.25	12	3	1	2	3	5	5	2	2	2	6	.	2	1	2	1
12	11	5.25	12	2	1	5	4	5	1	4	1	1	5	5	2	1	2	1
13	11	5.25	12	1	2	4	2	4	1	4	1	1	4	2	4	1	2	2
14	11	5.25	12	4	2	4	3	2	1	3	1	1	1	.	6	1	1	1
15	11	5.25	12	3	2	4	4	4	1	3	1	1	5	2	5	1	2	2
16	11	5.25	12	3	1	2	2	5	1	8	1	2	2	5	6	1	2	1
17	11	5.25	12	5	2	4	4	3	1	3	1	1	5	2	1	3	1	1
18	11	5.25	12	1	2	4	4	4	5	2	2	2	3	2	2	3	2	2
19	11	5.25	12	3	2	4	2	3	1	10	2	2	2	4	4	3	1	2
20	11	5.25	12	5	2	4	1	4	1	8	1	1	5	2	7	2	1	1
21	11	5.25	12	1	2	4	4	3	2	3	2	2	2	2	6	1	2	1
22	11	5.25	12	5	1	4	3	4	6	11	1	1	2	2	3	3	1	1
23	11	5.25	12	5	1	4	3	4	6	5	1	1	5	2	3	1	1	1
24	11	5.25	12	3	2	4	2	4	4	7	1	1	2	2	4	3	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	11	5.25	12	1	2	4	4	3	2	2	1	1	5	2	2	3	2	2
26	11	5.25	12	1	2	4	5	3	5	1	1	1	1	2	4	3	1	1
27	11	5.25	12	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
28	11	5.25	12	1	1	4	3	3	1	3	1	1	2	2	3	3	1	1
29	11	5.25	12	1	2	2	4	5	5	2	1	1	4	2	.	1	1	1
30	11	5.25	12	5	2	4	3	4	1	12	1	1	4	4	3	2	1	1
1	12	6.25	12	2	1	4	4	5	1	4	2	2	4	2	4	2	2	2
2	12	6.25	12	1	2	4	2	3	5	1	1	2	2	5	2	1	2	1
3	12	6.25	12	2	2	4	4	4	5	2	1	2	5	2	2	1	2	1
4	12	6.25	12	2	1	4	3	5	1	4	1	1	3	2	.	1	1	2
5	12	6.25	12	2	1	2	4	5	1	4	2	2	6	2	1	2	2	2
6	12	6.25	12	1	1	4	4	5	5	1	1	2	4	4	6	1	2	1
7	12	6.25	12	1	2	4	4	3	5	1	1	2	3	.	4	1	1	1
8	12	6.25	12	4	1	4	3	5	1	9	1	1	5	4	4	1	1	1
9	12	6.25	12	5	2	4	3	4	1	10	2	2	4	2	6	1	1	1
10	12	6.25	12	3	1	2	3	5	5	2	2	2	6	.	2	1	2	1
11	12	6.25	12	3	1	2	2	5	1	5	2	2	4	4	2	1	2	2
12	12	6.25	12	2	2	5	4	5	5	2	2	2	5	.	3	1	2	2
13	12	6.25	12	3	2	2	3	5	1	5	1	1	5	4	4	4	1	1
14	12	6.25	12	5	2	4	4	2	1	3	1	1	4	2	6	4	2	1
15	12	6.25	12	1	2	4	4	3	5	1	2	2	5	2	2	1	2	2
16	12	6.25	12	5	2	4	4	3	1	3	1	1	5	2	1	3	1	1
17	12	6.25	12	5	1	4	3	5	1	9	1	1	5	2	5	3	1	1
18	12	6.25	12	3	1	4	2	4	1	9	2	2	5	2	4	1	1	1
19	12	6.25	12	2	2	4	3	5	1	13	1	1	5	4	7	3	1	1
20	12	6.25	12	5	1	4	3	5	1	12	1	2	5	2	7	1	2	1
21	12	6.25	12	4	2	4	2	3	1	13	1	1	2	2	2	1	1	1
22	12	6.25	12	5	1	4	3	4	6	5	1	1	5	2	3	1	1	1
23	12	6.25	12	2	1	2	4	5	5	2	1	1	5	.	.	3	1	1
24	12	6.25	12	1	2	4	2	3	5	.	1	1	3	2	2	1	2	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	12	6.25	12	1	2	4	3	3	5	.	1	1	2	2	6	1	1	1
26	12	6.25	12	4	1	4	4	5	1	6	1	1	5	2	7	2	1	1
27	12	6.25	12	1	2	4	4	3	5	2	1	1	4	2	5	1	2	1
28	12	6.25	12	1	2	2	4	5	5	2	1	1	4	2	.	1	1	1
29	12	6.25	12	2	2	4	2	4	1	6	2	2	4	2	4	3	2	1
30	12	6.25	12	2	2	5	4	5	5	1	1	2	5	2	3	1	2	1
1	13	0	12	1	2	2	4	5	5	2	1	1	2	2	7	2	2	1
2	13	0	12	2	2	5	1	5	5	1	2	2	4	4	8	1	2	1
3	13	0	12	4	2	4	2	5	1	7	2	2	4	2	4	1	1	1
4	13	0	12	2	1	2	4	5	1	4	2	2	6	2	1	2	2	2
5	13	0	12	5	2	4	3	2	1	10	1	1	3	2	4	1	1	1
6	13	0	12	2	2	2	4	5	5	2	2	2	5	2	4	3	2	1
7	13	0	12	3	1	4	4	5	1	5	1	2	3	2	7	3	2	1
8	13	0	12	2	1	.	3	5	5	3	1	1	4	2	7	3	2	1
9	13	0	12	4	2	4	2	3	1	3	1	1	3	2	.	1	2	1
10	13	0	12	3	1	2	2	5	1	5	2	2	4	4	2	1	2	2
11	13	0	12	1	2	4	4	4	.	2	1	1	5	2	3	3	2	1
12	13	0	12	3	2	5	5	5	5	2	1	.	1	2	6	3	1	1
13	13	0	12	4	2	4	2	4	1	8	2	2	4	2	4	1	1	1
14	13	0	12	3	2	4	4	4	1	3	1	1	5	2	5	1	2	2
15	13	0	12	1	2	4	4	3	5	1	2	2	4	2	4	1	2	2
16	13	0	12	5	1	4	3	5	1	9	1	1	5	2	5	3	1	1
17	13	0	12	2	2	3	2	4	5	2	1	1	3	2	2	3	1	1
18	13	0	12	3	1	4	4	5	1	7	1	2	3	2	3	3	2	2
19	13	0	12	1	1	2	4	3	1	2	1	1	5	2	2	1	1	1
20	13	0	12	1	2	4	4	3	2	3	2	2	2	2	6	1	2	1
21	13	0	12	3	2	2	2	5	5	3	1	1	2	5	2	1	1	1
22	13	0	12	2	1	2	4	5	5	2	1	1	5	.	.	3	1	1
23	13	0	12	1	1	3	2	5	5	3	2	2	3	2	2	3	1	1
24	13	0	12	1	2	4	2	3	5	.	1	1	3	2	4	1	1	1

Rep	Form	Soy	Malto	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	13	0	12	2	1	4	4	3	5	1	2	2	4	2	4	1	2	1
26	13	0	12	1	2	4	4	3	5	1	1	1	5	2	4	3	1	1
27	13	0	12	1	2	4	3	3	5	9	1	1	5	2	4	1	2	1
28	13	0	12	2	2	4	2	4	1	6	2	2	4	2	4	3	2	1
29	13	0	12	1	1	4	4	3	5	1	1	2	5	2	4	3	2	2
30	13	0	12	5	2	4	4	5	1	4	1	1	4	5	5	3	2	1

B. CONSUMER EVALUATIONS

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
1	1	3.25	10	5	8	5	7	7	2	4	2	2	2	2
2	1	3.25	10	5	5	8	8	4	7	7	1	2	1	2
3	1	3.25	10	7	8	8	8	7	6	8	1	1	1	2
4	1	3.25	10	3	7	1	4	3	1	1	2	2	2	2
5	1	3.25	10	7	7	7	8	8	7	7	1	1	1	2
6	1	3.25	10	7	8	7	7	7	7	7	1	1	1	2
7	1	3.25	10	7	8	7	8	6	4	6	2	1	2	2
8	1	3.25	10	7	8	3	4	7	4	6	1	2	1	1
9	1	3.25	10	7	5	7	7	6	7	7	1	1	1	2
10	1	3.25	10	7	7	3	4	4	2	2	2	2	2	1
11	1	3.25	10	8	8	5	7	7	6	6	1	2	2	1
12	1	3.25	10	8	8	5	4	5	4	4	2	2	2	1
13	1	3.25	10	7	7	2	2	2	1	2	2	2	2	1
14	1	3.25	10	3	7	2	3	3	1	2	2	2	2	1
15	1	3.25	10	5	4	7	8	5	3	4	1	2	2	2
16	1	3.25	10	8	8	6	8	5	4	6	2	2	1	2
17	1	3.25	10	4	8	7	8	4	3	4	2	2	2	2
18	1	3.25	10	4	6	4	3	6	3	3	2	2	2	3
19	1	3.25	10	4	4	2	2	5	3	2	2	2	2	1
20	1	3.25	10	7	8	7	8	6	7	7	1	1	1	2
21	1	3.25	10	8	8	7	8	7	7	7	1	1	1	2
22	1	3.25	10	7	7	7	6	6	3	6	1	2	1	1
23	1	3.25	10	8	8	8	6	6	4	6	1	2	1	2
24	1	3.25	10	7	7	7	7	7	6	7	1	2	2	3
25	1	3.25	10	7	8	4	3	6	2	3	2	2	2	3
26	1	3.25	10	4	7	8	8	6	6	7	1	2	2	2
27	1	3.25	10	4	2	6	6	4	8	6	1	2	1	2

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	1	3.25	10	5	4	2	3	3	2	4	2	2	1	1
29	1	3.25	10	5	5	4	6	4	8	.	1	2	2	3
30	1	3.25	10	7	6	4	5	5	2	5	2	2	2	1
1	2	4.25	10	7	7	7	7	6	5	7	1	1	1	2
2	2	4.25	10	7	7	7	7	7	7	7	1	1	1	3
3	2	4.25	10	5	4	3	3	4	2	3	2	2	2	1
4	2	4.25	10	7	7	2	7	3	8	2	2	2	2	3
5	2	4.25	10	5	6	6	7	7	7	6	1	2	2	2
6	2	4.25	10	7	7	4	4	5	3	4	2	2	2	2
7	2	4.25	10	8	8	6	7	7	4	6	2	2	2	2
8	2	4.25	10	8	8	7	8	7	7	7	1	2	1	2
9	2	4.25	10	6	6	7	7	7	2	4	2	2	2	2
10	2	4.25	10	7	8	7	5	7	4	5	1	2	1	1
11	2	4.25	10	5	4	5	4	5	4	4	2	2	2	1
12	2	4.25	10	4	8	2	4	6	1	4	2	2	2	2
13	2	4.25	10	6	7	3	3	3	2	4	2	2	1	3
14	2	4.25	10	3	2	3	4	2	1	2	2	2	2	3
15	2	4.25	10	3	5	6	6	6	3	4	2	2	2	2
16	2	4.25	10	7	8	5	4	3	8	5	1	2	1	1
17	2	4.25	10	6	7	3	7	3	2	3	2	2	2	1
18	2	4.25	10	7	7	5	6	5	4	4	2	2	2	1
19	2	4.25	10	5	5	3	5	2	1	2	2	2	2	1
20	2	4.25	10	8	8	8	9	7	6	7	1	1	1	2
21	2	4.25	10	7	7	4	5	5	4	4	2	2	1	1
22	2	4.25	10	4	6	7	8	8	4	6	1	1	1	2
23	2	4.25	10	8	8	8	4	6	4	5	2	2	2	1
24	2	4.25	10	7	6	4	4	3	3	3	2	2	2	1
25	2	4.25	10	7	7	3	3	3	1	4	2	2	2	1
26	2	4.25	10	2	4	2	4	2	1	1	2	2	2	2
27	2	4.25	10	7	4	2	6	6	2	2	2	2	2	2

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	2	4.25	10	7	7	2	7	5	2	2	2	2	2	1
29	2	4.25	10	5	5	8	8	8	8	8	1	1	1	2
30	2	4.25	10	8	9	4	6	6	3	4	2	2	1	1
1	3	5.25	10	5	8	5	7	7	2	4	2	2	2	2
2	3	5.25	10	5	4	2	7	8	1	2	2	2	2	2
3	3	5.25	10	8	8	2	6	3	1	2	2	2	2	1
4	3	5.25	10	7	8	6	7	8	7	7	1	2	1	2
5	3	5.25	10	5	4	3	5	5	3	3	2	2	2	2
6	3	5.25	10	5	6	2	5	5	2	2	2	2	2	1
7	3	5.25	10	4	7	3	7	5	3	3	2	2	2	2
8	3	5.25	10	4	4	2	5	7	1	2	2	2	2	1
9	3	5.25	10	4	6	6	7	6	4	6	1	2	1	2
10	3	5.25	10	7	7	2	4	4	1	2	2	2	2	1
11	3	5.25	10	3	8	2	6	4	1	2	2	2	2	2
12	3	5.25	10	6	6	6	4	5	5	5	1	2	1	1
13	3	5.25	10	6	6	.	5	5	4	3	2	2	2	2
14	3	5.25	10	7	7	6	7	7	2	4	2	2	2	2
15	3	5.25	10	6	7	3	7	5	3	4	2	2	1	2
16	3	5.25	10	8	8	7	7	6	6	6	1	2	1	2
17	3	5.25	10	6	6	4	5	5	3	4	2	2	2	1
18	3	5.25	10	4	5	4	4	4	3	4	2	2	2	1
19	3	5.25	10	4	4	3	5	5	4	4	2	2	2	2
20	3	5.25	10	5	5	2	2	5	2	2	2	2	2	1
21	3	5.25	10	8	8	8	8	8	4	7	1	1	1	2
22	3	5.25	10	7	7	6	6	8	3	7	1	1	1	3
23	3	5.25	10	6	6	4	5	5	5	4	2	2	2	2
24	3	5.25	10	7	6	6	3	5	2	4	2	2	2	1
25	3	5.25	10	7	7	4	6	7	3	4	2	2	2	3
26	3	5.25	10	7	7	1	1	1	1	1	2	2	2	3
27	3	5.25	10	8	8	7	4	7	4	6	1	1	1	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	3	5.25	10	4	4	4	4	4	3	4	2	2	2	3
29	3	5.25	10	8	9	6	7	7	5	6	1	1	1	2
30	3	5.25	10	4	3	5	6	3	2	2	2	2	2	2
1	4	6.25	10	7	7	7	7	7	5	7	1	1	1	2
2	4	6.25	10	4	6	3	3	3	6	2	2	2	2	1
3	4	6.25	10	2	4	2	4	4	3	2	2	2	2	1
4	4	6.25	10	6	7	7	8	7	1	5	2	2	2	2
5	4	6.25	10	5	6	4	4	5	4	4	2	2	2	1
6	4	6.25	10	8	8	4	6	6	2	5	2	2	2	2
7	4	6.25	10	6	4	6	4	5	4	4	2	2	2	1
8	4	6.25	10	6	7	7	6	6	6	6	1	2	1	3
9	4	6.25	10	9	9	6	5	5	6	7	1	2	2	1
10	4	6.25	10	6	4	2	5	7	4	2	2	2	2	2
11	4	6.25	10	7	7	7	8	7	5	7	1	1	1	2
12	4	6.25	10	6	8	7	5	6	7	7	1	1	1	2
13	4	6.25	10	6	6	6	7	6	7	7	1	1	1	2
14	4	6.25	10	4	4	6	7	7	6	6	1	2	2	2
15	4	6.25	10	3	6	3	5	5	2	2	2	2	2	2
16	4	6.25	10	8	8	4	7	6	2	4	2	2	2	2
17	4	6.25	10	4	5	3	4	3	3	3	2	2	2	1
18	4	6.25	10	4	4	3	6	7	3	3	2	2	2	2
19	4	6.25	10	5	5	1	4	1	1	1	2	2	2	1
20	4	6.25	10	5	5	1	3	5	1	2	2	2	2	3
21	4	6.25	10	8	8	4	6	6	3	4	1	2	1	2
22	4	6.25	10	8	8	8	8	7	8	8	1	1	1	2
23	4	6.25	10	6	6	3	3	5	6	4	2	2	2	1
24	4	6.25	10	6	4	5	5	5	4	6	1	2	2	2
25	4	6.25	10	5	6	2	2	4	2	2	2	2	2	1
26	4	6.25	10	7	7	1	2	2	1	1	2	2	2	1
27	4	6.25	10	8	8	4	4	4	2	3	2	2	2	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	4	6.25	10	7	7	3	2	2	2	2	2	2	2	1
29	4	6.25	10	4	4	6	3	7	7	7	1	.	1	3
30	4	6.25	10	6	6	6	6	6	5	6	1	1	1	1
1	5	3.25	11	5	4	4	8	8	4	6	1	1	1	2
2	5	3.25	11	7	7	4	7	7	3	5	2	2	1	2
3	5	3.25	11	8	8	3	6	4	2	4	1	2	1	2
4	5	3.25	11	7	7	7	8	8	8	8	1	2	2	2
5	5	3.25	11	7	8	6	4	4	2	4	2	2	2	1
6	5	3.25	11	8	8	7	8	8	7	7	1	1	1	2
7	5	3.25	11	4	4	5	5	4	3	4	2	2	2	2
8	5	3.25	11	6	5	7	7	7	4	6	1	1	1	2
9	5	3.25	11	4	7	4	6	6	2	3	2	2	2	2
10	5	3.25	11	8	8	7	6	6	7	7	1	1	1	2
11	5	3.25	11	6	4	4	6	5	3	4	2	2	2	2
12	5	3.25	11	8	8	8	8	8	8	8	1	1	1	2
13	5	3.25	11	7	7	4	6	5	3	4	2	2	2	1
14	5	3.25	11	5	7	5	6	4	3	6	2	2	2	2
15	5	3.25	11	2	2	2	5	5	2	2	2	2	2	2
16	5	3.25	11	7	8	5	7	8	8	8	1	1	1	2
17	5	3.25	11	7	5	7	8	8	7	7	1	1	1	2
18	5	3.25	11	8	8	7	7	6	3	6	1	2	1	2
19	5	3.25	11	5	5	2	2	5	2	2	2	2	2	1
20	5	3.25	11	5	5	6	7	5	4	4	1	2	1	2
21	5	3.25	11	7	7	8	5	7	4	7	1	1	1	1
22	5	3.25	11	7	8	3	7	7	3	4	2	2	2	2
23	5	3.25	11	8	8	8	8	8	7	8	1	1	1	2
24	5	3.25	11	8	8	7	7	5	7	8	1	1	1	2
25	5	3.25	11	8	8	4	3	6	4	4	2	2	2	2
26	5	3.25	11	6	7	4	4	4	3	3	2	2	2	1
27	5	3.25	11	7	7	4	3	5	3	3	2	2	2	3

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	5	3.25	11	4	3	2	2	6	1	3	2	2	2	1
29	5	3.25	11	6	6	3	3	4	2	4	2	2	2	3
30	5	3.25	11	6	7	7	7	6	6	6	1	1	1	1
1	6	4.25	11	6	4	1	1	3	1	1	2	2	2	1
2	6	4.25	11	5	5	3	6	2	6	4	2	2	2	2
3	6	4.25	11	8	7	8	8	8	3	7	1	1	1	2
4	6	4.25	11	7	7	2	2	3	7	2	2	2	2	1
5	6	4.25	11	8	8	8	8	7	8	8	1	1	1	2
6	6	4.25	11	6	7	3	5	6	2	2	2	2	2	2
7	6	4.25	11	7	7	8	8	8	6	7	1	1	1	2
8	6	4.25	11	7	8	6	6	7	6	7	1	1	1	2
9	6	4.25	11	4	4	2	4	5	1	2	2	2	2	3
10	6	4.25	11	8	8	7	7	6	4	6	1	2	1	2
11	6	4.25	11	7	7	3	.	5	2	3	2	2	2	2
12	6	4.25	11	9	9	7	6	8	3	7	1	1	1	2
13	6	4.25	11	7	7	6	6	6	6	7	1	1	2	3
14	6	4.25	11	2	7	6	1	7	1	2	2	2	2	1
15	6	4.25	11	7	7	6	7	7	4	6	1	2	2	2
16	6	4.25	11	6	6	6	5	5	5	6	1	2	1	2
17	6	4.25	11	7	6	5	7	7	4	5	1	2	1	3
18	6	4.25	11	4	4	4	4	5	2	4	2	2	2	3
19	6	4.25	11	5	5	1	5	5	1	1	2	2	2	2
20	6	4.25	11	8	7	5	4	3	4	4	1	2	2	1
21	6	4.25	11	8	8	6	4	7	7	6	1	2	2	1
22	6	4.25	11	7	7	7	8	8	6	7	1	1	1	2
23	6	4.25	11	7	7	6	6	8	3	7	1	1	1	3
24	6	4.25	11	7	8	6	9	8	5	6	1	2	2	2
25	6	4.25	11	8	8	1	1	1	1	1	2	2	2	1
26	6	4.25	11	4	6	3	3	4	4	3	2	2	2	1
27	6	4.25	11	8	8	6	6	5	4	5	1	1	1	2

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	6	4.25	11	3	5	7	7	6	5	7	1	1	1	2
29	6	4.25	11	4	4	6	5	4	4	4	1	2	2	3
30	6	4.25	11	4	4	7	7	7	3	6	2	2	2	2
1	7	5.25	11	4	7	4	7	6	3	6	2	2	2	2
2	7	5.25	11	4	4	4	4	4	4	4	2	2	2	1
3	7	5.25	11	6	8	8	7	7	7	7	1	2	1	1
4	7	5.25	11	7	7	7	8	8	6	6	1	2	2	2
5	7	5.25	11	6	8	7	8	6	2	5	2	2	2	2
6	7	5.25	11	5	6	3	7	7	2	4	2	2	2	2
7	7	5.25	11	5	4	6	7	7	4	5	1	2	2	2
8	7	5.25	11	7	7	3	8	7	2	2	2	2	1	2
9	7	5.25	11	4	5	4	4	4	3	4	2	2	2	1
10	7	5.25	11	7	7	4	4	5	3	3	2	2	2	2
11	7	5.25	11	4	7	3	7	5	2	2	2	2	2	2
12	7	5.25	11	8	8	6	4	4	3	4	2	2	2	1
13	7	5.25	11	6	6	6	7	6	6	6	1	2	2	2
14	7	5.25	11	4	5	4	4	6	3	3	2	2	2	1
15	7	5.25	11	4	4	4	4	5	3	3	2	2	2	1
16	7	5.25	11	8	7	4	7	6	5	5	1	2	1	3
17	7	5.25	11	8	8	5	5	5	2	4	2	2	2	1
18	7	5.25	11	7	8	3	6	5	2	.	1	2	2	2
19	7	5.25	11	5	5	4	4	5	5	3	2	2	2	1
20	7	5.25	11	8	8	8	.	7	6	7	1	1	1	2
21	7	5.25	11	7	7	6	6	6	4	4	1	2	2	1
22	7	5.25	11	8	7	8	8	8	3	8	1	1	1	2
23	7	5.25	11	9	9	6	6	6	8	6	1	2	1	1
24	7	5.25	11	7	7	7	6	6	4	6	1	2	1	2
25	7	5.25	11	4	6	2	2	2	2	2	2	2	2	1
26	7	5.25	11	3	4	2	3	4	2	1	2	2	2	1
27	7	5.25	11	4	3	5	5	3	4	6	2	2	2	2

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	7	5.25	11	4	4	6	4	4	4	5	1	2	2	3
29	7	5.25	11	7	7	4	3	3	3	3	2	2	2	1
30	7	5.25	11	5	6	6	8	8	3	6	1	2	2	2
1	8	6.25	11	5	5	4	7	1	4	3	2	2	2	2
2	8	6.25	11	7	8	3	3	3	2	2	2	2	2	2
3	8	6.25	11	7	5	6	4	4	4	4	2	2	2	1
4	8	6.25	11	7	7	7	8	6	1	5	2	2	2	2
5	8	6.25	11	8	8	4	4	3	2	2	2	2	2	1
6	8	6.25	11	6	7	7	8	5	8	8	1	1	1	2
7	8	6.25	11	9	9	6	4	7	6	6	1	2	2	1
8	8	6.25	11	4	4	5	4	4	4	4	2	2	2	1
9	8	6.25	11	3	4	3	6	4	3	3	2	2	2	1
10	8	6.25	11	6	6	2	6	4	1	1	2	2	2	.
11	8	6.25	11	6	5	4	6	5	3	4	2	2	2	2
12	8	6.25	11	8	8	5	7	7	7	5	2	2	2	2
13	8	6.25	11	2	7	2	2	8	1	2	2	2	2	2
14	8	6.25	11	2	3	2	5	5	1	1	2	2	2	2
15	8	6.25	11	6	6	3	3	6	2	3	2	2	2	3
16	8	6.25	11	8	8	4	6	6	4	4	2	2	2	2
17	8	6.25	11	7	5	4	5	6	3	3	2	2	2	1
18	8	6.25	11	5	7	3	3	3	2	4	2	2	2	3
19	8	6.25	11	8	8	7	7	5	7	7	1	2	2	2
20	8	6.25	11	8	8	7	7	6	4	7	1	1	1	2
21	8	6.25	11	7	7	2	2	2	2	2	2	2	2	1
22	8	6.25	11	9	9	8	8	8	8	8	1	1	1	2
23	8	6.25	11	8	8	8	8	8	7	8	1	1	1	2
24	8	6.25	11	9	8	9	9	7	9	9	1	1	1	2
25	8	6.25	11	4	6	4	4	4	2	3	2	2	2	1
26	8	6.25	11	9	9	4	5	6	3	5	1	2	2	2
27	8	6.25	11	3	3	1	3	6	1	1	2	2	2	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	8	6.25	11	7	7	4	4	4	4	4	2	2	2	1
29	8	6.25	11	4	4	4	4	4	2	3	2	2	2	3
30	8	6.25	11	7	7	4	3	5	4	4	2	2	2	1
1	9	3.25	12	5	7	5	7	6	4	3	2	2	2	2
2	9	3.25	12	4	4	4	4	4	4	4	2	2	2	1
3	9	3.25	12	2	4	2	2	4	1	2	2	2	2	1
4	9	3.25	12	8	8	7	6	5	4	4	1	2	2	1
5	9	3.25	12	6	6	6	5	6	4	3	1	2	1	2
6	9	3.25	12	5	4	3	4	5	2	3	2	2	2	3
7	9	3.25	12	7	8	6	7	7	7	7	1	1	1	2
8	9	3.25	12	7	7	7	7	3	2	2	2	2	1	2
9	9	3.25	12	9	9	7	6	5	6	7	1	1	1	1
10	9	3.25	12	4	6	5	6	5	6	6	1	2	1	2
11	9	3.25	12	9	9	8	8	9	8	8	1	1	1	2
12	9	3.25	12	5	7	5	3	6	7	6	1	2	2	1
13	9	3.25	12	8	8	6	7	8	7	7	1	2	2	2
14	9	3.25	12	5	6	7	8	7	8	4	2	2	2	2
15	9	3.25	12	1	6	1	5	5	1	1	2	2	2	1
16	9	3.25	12	7	5	7	4	7	3	3	2	2	2	1
17	9	3.25	12	5	5	7	8	5	6	7	1	2	2	2
18	9	3.25	12	5	7	7	7	7	5	7	1	2	1	2
19	9	3.25	12	4	4	4	6	5	4	5	2	2	2	2
20	9	3.25	12	8	8	8	8	8	7	8	1	1	1	2
21	9	3.25	12	6	6	6	6	6	6	6	1	1	1	2
22	9	3.25	12	8	8	8	8	8	8	8	1	1	1	2
23	9	3.25	12	7	7	6	7	6	5	7	1	2	2	2
24	9	3.25	12	5	7	6	8	8	7	7	1	1	1	2
25	9	3.25	12	7	7	6	6	6	3	4	2	2	2	3
26	9	3.25	12	3	3	2	3	5	1	1	2	2	2	1
27	9	3.25	12	8	8	3	2	3	2	3	2	2	2	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	9	3.25	12	6	6	6	6	6	4	6	2	2	2	3
29	9	3.25	12	7	8	7	8	5	6	8	1	1	1	2
30	9	3.25	12	4	4	2	4	6	2	2	2	2	2	1
1	10	4.25	12	7	7	7	7	6	5	7	1	1	1	2
2	10	4.25	12	7	7	6	6	6	2	2	2	2	2	1
3	10	4.25	12	7	7	3	2	4	5	4	2	2	2	1
4	10	4.25	12	7	6	6	7	6	4	7	1	1	1	2
5	10	4.25	12	8	6	7	8	7	6	7	1	1	1	2
6	10	4.25	12	7	8	6	6	6	4	6	2	2	2	2
7	10	4.25	12	5	6	5	5	5	5	6	1	2	2	1
8	10	4.25	12	6	7	7	7	6	7	7	1	1	1	2
9	10	4.25	12	4	4	4	4	3	3	3	2	2	2	1
10	10	4.25	12	9	9	6	6	8	8	5	1	2	2	3
11	10	4.25	12	7	8	3	4	5	2	3	2	2	2	1
12	10	4.25	12	7	7	2	2	2	2	2	2	2	2	1
13	10	4.25	12	7	7	7	7	8	7	7	1	1	1	2
14	10	4.25	12	7	6	6	7	5	3	3	2	2	2	2
15	10	4.25	12	3	4	4	5	5	4	4	2	2	2	2
16	10	4.25	12	4	4	4	4	5	4	4	2	2	2	3
17	10	4.25	12	7	7	4	7	5	3	7	1	2	2	2
18	10	4.25	12	8	8	8	7	5	4	5	2	2	1	1
19	10	4.25	12	5	5	1	4	1	1	1	2	2	2	1
20	10	4.25	12	8	8	8	8	7	7	8	1	1	1	2
21	10	4.25	12	7	6	5	6	4	6	7	1	1	1	2
22	10	4.25	12	8	8	8	6	8	7	7	1	2	2	3
23	10	4.25	12	7	7	7	8	7	7	7	1	1	1	2
24	10	4.25	12	7	7	6	5	6	3	5	1	2	1	1
25	10	4.25	12	5	6	3	3	2	4	3	2	2	2	1
26	10	4.25	12	9	9	8	8	7	6	8	1	1	1	2
27	10	4.25	12	7	7	5	4	5	3	3	2	2	2	3

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	10	4.25	12	4	5	6	6	5	5	6	2	2	2	2
29	10	4.25	12	6	6	6	7	8	6	6	1	1	1	2
30	10	4.25	12	5	5	6	5	6	4	6	1	2	1	2
1	11	5.25	12	5	4	4	4	8	3	3	2	2	2	1
2	11	5.25	12	1	1	1	1	1	1	1	2	2	2	1
3	11	5.25	12	3	3	5	6	8	2	3	2	2	1	2
4	11	5.25	12	5	6	7	7	7	7	8	1	1	1	2
5	11	5.25	12	5	6	8	9	5	9	9	1	1	1	2
6	11	5.25	12	7	7	8	8	8	8	8	1	1	1	2
7	11	5.25	12	3	3	2	2	4	2	2	2	2	2	1
8	11	5.25	12	9	9	7	7	5	7	7	1	1	1	2
9	11	5.25	12	5	4	3	4	5	1	2	2	2	2	3
10	11	5.25	12	7	8	6	6	5	3	4	2	2	2	1
11	11	5.25	12	8	8	6	6	6	7	5	2	2	2	1
12	11	5.25	12	3	4	3	6	4	2	3	2	2	2	1
13	11	5.25	12	7	7	4	6	5	4	4	2	2	2	2
14	11	5.25	12	3	5	3	3	4	1	2	2	2	2	1
15	11	5.25	12	7	7	6	4	6	4	4	1	2	2	3
16	11	5.25	12	7	7	6	4	5	5	7	1	2	2	1
17	11	5.25	12	6	7	7	4	4	4	6	2	2	2	2
18	11	5.25	12	7	7	6	7	4	5	5	2	2	2	2
19	11	5.25	12	5	5	4	4	5	4	4	1	2	1	1
20	11	5.25	12	6	6	5	5	5	4	5	1	2	2	2
21	11	5.25	12	7	6	3	3	6	3	4	1	2	2	1
22	11	5.25	12	7	7	7	7	6	6	6	1	2	1	2
23	11	5.25	12	8	8	7	7	7	5	7	1	1	1	1
24	11	5.25	12	8	8	8	4	6	4	4	2	2	2	1
25	11	5.25	12	6	7	1	1	1	1	1	2	2	2	3
26	11	5.25	12	8	8	2	2	2	1	2	2	2	2	1
27	11	5.25	12	4	4	4	4	4	4	4	2	2	2	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	11	5.25	12	6	6	7	7	7	4	4	1	2	2	2
29	11	5.25	12	5	5	3	5	3	3	4	2	2	2	1
30	11	5.25	12	5	5	4	4	4	5	4	2	2	2	1
1	12	6.25	12	4	5	2	2	2	1	1	2	2	2	1
2	12	6.25	12	7	6	4	5	5	3	3	2	2	2	2
3	12	6.25	12	6	8	8	7	8	8	7	1	1	1	1
4	12	6.25	12	4	4	8	7	6	9	8	1	1	1	2
5	12	6.25	12	5	5	5	6	6	5	4	2	2	2	2
6	12	6.25	12	4	5	4	5	5	3	3	2	2	2	2
7	12	6.25	12	7	8	8	8	8	6	8	1	1	1	2
8	12	6.25	12	4	3	.	.	3	1	2	2	2	2	1
9	12	6.25	12	5	3	4	3	3	3	3	2	2	2	1
10	12	6.25	12	8	8	7	7	7	7	7	1	1	1	1
11	12	6.25	12	4	3	5	5	7	5	6	2	2	2	2
12	12	6.25	12	7	8	3	7	4	3	4	1	2	2	2
13	12	6.25	12	4	3	5	4	4	6	4	2	2	2	3
14	12	6.25	12	6	7	7	7	5	6	6	1	2	2	2
15	12	6.25	12	4	4	4	7	6	2	4	2	2	2	2
16	12	6.25	12	6	6	3	3	5	5	5	2	2	2	3
17	12	6.25	12	5	7	6	6	6	4	6	2	2	2	1
18	12	6.25	12	6	7	6	6	5	4	4	2	2	2	1
19	12	6.25	12	5	5	3	7	5	3	3	2	2	2	2
20	12	6.25	12	6	7	3	4	3	3	3	1	2	2	3
21	12	6.25	12	4	4	4	3	3	5	4	2	2	2	1
22	12	6.25	12	7	8	7	7	7	7	7	1	1	1	1
23	12	6.25	12	5	5	7	7	8	6	6	1	1	1	3
24	12	6.25	12	6	6	5	5	5	3	6	2	2	2	2
25	12	6.25	12	5	4	1	1	1	1	1	2	2	2	1
26	12	6.25	12	6	5	6	6	6	4	5	2	2	2	3
27	12	6.25	12	4	3	4	4	6	5	5	1	2	2	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	12	6.25	12	5	5	2	5	2	2	3	2	2	2	1
29	12	6.25	12	4	4	3	4	6	3	3	2	2	2	1
30	12	6.25	12	8	9	5	5	6	4	5	1	2	1	2
1	13	0	12	7	8	8	8	7	8	8	1	1	1	2
2	13	0	12	8	8	8	8	6	8	9	1	1	1	2
3	13	0	12	7	7	8	7	6	8	8	1	1	1	2
4	13	0	12	6	6	5	3	5	4	5	2	2	2	3
5	13	0	12	9	9	9	9	9	9	9	1	1	1	2
6	13	0	12	7	7	6	6	6	7	7	1	2	1	2
7	13	0	12	6	6	7	7	7	7	7	1	1	1	2
8	13	0	12	4	5	6	4	5	6	6	1	2	1	3
9	13	0	12	4	7	6	4	4	3	4	2	2	1	1
10	13	0	12	5	5	7	7	7	7	7	1	1	1	2
11	13	0	12	7	7	7	7	7	7	7	1	1	1	2
12	13	0	12	8	9	8	8	7	6	8	1	1	1	2
13	13	0	12	7	7	8	8	8	7	7	1	1	2	2
14	13	0	12	8	8	8	8	8	8	8	1	2	2	2
15	13	0	12	5	5	6	6	5	6	6	1	2	1	2
16	13	0	12	7	.	6	6	6	6	6	1	2	1	2
17	13	0	12	8	8	8	8	7	8	8	1	1	1	2
18	13	0	12	5	6	3	4	6	5	4	2	2	2	1
19	13	0	12	6	6	7	7	7	7	7	1	1	1	2
20	13	0	12	8	8	8	7	6	7	7	1	1	1	2
21	13	0	12	7	7	7	7	7	7	7	1	1	1	2
22	13	0	12	6	6	8	8	8	8	8	1	1	1	2
23	13	0	12	7	7	6	4	5	6	6	1	2	1	1
24	13	0	12	8	8	6	4	5	8	6	1	2	2	3
25	13	0	12	7	7	7	7	6	7	7	1	2	2	1
26	13	0	12	8	8	8	8	7	9	8	1	1	1	2
27	13	0	12	7	7	6	4	6	8	6	1	1	1	1

Rep	Form	Soy	Malto	Appear	Color	Flavor	Sweet	Sour	Texture	Liking	Accept	Buy	BuySoy	Sweet2
28	13	0	12	6	7	7	6	7	7	7	1	1	1	2
29	13	0	12	7	5	7	7	6	7	7	1	1	1	2
30	13	0	12	8	9	8	8	7	8	8	1	1	1	2

APPENDIX J. DATA SET FOR CONSUMER STUDY 2

A. DEMOGRAPHIC AND PRODUCT INFORMATION

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
1	1	4	1	4	3	5	1	13	1	2	2	2	1	1	1	1
2	1	2	1	2	4	5	5	2	2	2	2	.	8	1	2	1
3	1	1	2	2	4	3	5	1	1	2	1	2	7	3	2	2
4	1	1	2	4	4	3	5	1	1	1	2	2	4	1	1	1
5	1	1	2	4	4	3	5	1	2	2	3	2	2	1	1	1
6	1	1	2	4	3	4	5	3	1	2	4	2	4	1	1	1
7	1	2	2	4	3	4	5	9	1	2	3	5	7	3	2	1
8	1	2	2	4	4	5	5	1	2	2	3	4	3	1	2	1
9	1	3	1	2	2	5	5	3	1	2	1	2	2	1	2	1
10	1	2	1	2	4	5	3	1	1	2	5	.	3	1	1	1
11	1	3	2	4	2	5	1	12	1	2	4	.	7	3	2	1
12	1	5	1	4	3	5	1	7	1	1	5	2	4	1	1	1
13	1	1	2	4	4	3	5	1	1	1	2	2	4	3	1	1
14	1	1	1	2	4	5	5	2	2	2	3	.	4	3	1	1
15	1	1	1	2	4	5	5	3	2	2	2	2	4	1	1	1
16	1	2	2	1	3	5	5	4	1	1	4	2	7	3	1	.
17	1	1	1	2	4	5	5	1	1	2	5	2	7	1	2	1
18	1	1	1	2	2	5	5	.	2	2	5	2	7	1	1	1
19	1	2	2	2	4	5	5	1	1	1	3	2	4	3	2	1
20	1	1	1	4	3	3	1	4	2	2	5	2	4	3	1	1
21	1	3	1	2	4	5	5	2	1	2	5	.	4	3	2	2
22	1	5	1	4	3	5	1	12	1	1	2	2	7	2	1	1
23	1	4	2	4	2	5	2	7	2	2	2	2	8	1	1	1
24	1	3	1	2	4	5	5	2	1	1	4	.	.	3	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	1	4	1	4	2	4	1	7	1	2	4	2	4	1	2	1
26	1	4	1	4	4	5	1	9	1	1	5	4	2	3	2	1
27	1	1	2	4	2	3	5	11	1	2	5	2	4	3	1	1
28	1	1	2	4	1	4	1	2	2	2	4	2	3	3	2	1
29	1	4	2	4	2	5	1	7	2	2	1	2	4	2	1	1
30	1	1	2	4	1	3	5	1	2	2	2	2	2	1	2	1
31	1	4	2	4	1	2	1	4	1	1	4	2	6	1	2	1
32	1	3	2	4	2	3	1	5	1	2	3	2	2	1	2	1
33	1	1	1	2	4	5	5	2	2	2	2	2	4	1	2	1
34	1	1	2	4	4	3	5	1	2	2	4	4	8	3	2	1
35	1	4	2	4	2	3	1	13	1	2	2	2	4	3	1	1
36	1	1	1	4	4	3	5	1	1	1	4	2	2	1	1	1
37	1	1	2	2	4	4	5	2	2	2	4	2	4	2	1	1
38	1	3	1	4	4	5	1	5	1	1	5	2	7	3	2	2
39	1	4	2	4	3	5	1	11	1	2	5	2	5	3	2	1
40	1	4	2	4	3	5	1	12	1	2	5	2	2	1	2	1
41	1	2	1	4	4	5	5	2	2	2	2	2	6	3	2	1
42	1	4	2	4	3	5	1	11	1	2	3	2	7	3	2	1
43	1	4	1	4	2	5	1	9	2	2	3	4	4	3	1	1
44	1	5	2	4	1	5	1	5	1	1	1	2	7	1	1	1
45	1	3	2	4	4	5	1	9	1	2	4	2	4	1	1	1
46	1	5	1	4	2	5	1	13	1	2	5	4	4	1	2	1
47	1	5	1	4	3	5	1	6	1	1	5	2	7	3	1	1
48	1	3	2	4	2	5	2	6	2	2	3	4	6	3	2	1
49	1	5	1	4	3	5	1	13	2	2	4	2	7	1	2	1
50	1	5	1	4	4	5	1	8	1	1	6	2	3	3	2	2
51	1	5	1	4	4	5	1	5	1	1	5	2	6	2	2	1
52	1	1	2	4	4	4	1	4	1	1	3	4	2	1	2	1
53	1	3	2	4	4	5	1	4	1	1	5	2	4	3	1	1
54	1	2	2	4	2	4	1	5	2	1	4	2	4	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
55	1	2	2	3	3	5	5	7	1	1	2	5	2	1	1	1
56	1	3	2	4	4	5	1	6	2	2	3	2	4	2	1	1
57	1	4	1	4	2	5	1	13	2	2	2	2	2	1	2	.
58	1	5	1	4	3	5	1	6	1	1	4	2	4	1	1	1
59	1	1	1	2	4	5	5	1	2	1	2	2	4	2	1	1
60	1	3	2	4	2	4	1	9	1	2	3	2	3	1	1	1
61	1	4	1	4	3	5	1	7	1	1	5	2	2	1	2	1
62	1	5	1	4	3	5	1	12	1	2	5	2	6	3	2	1
63	1	5	2	1	3	2	1	2	1	2	2	5	6	3	1	1
64	1	5	2	4	3	4	1	13	1	1	2	4	3	2	1	1
65	1	3	2	4	2	3	1	12	2	2	4	2	4	3	2	1
66	1	2	2	1	2	4	1	7	1	1	2	2	2	3	1	1
67	1	1	2	4	4	5	1	2	2	2	3	2	2	3	1	1
68	1	1	1	2	4	5	2	2	2	2	5	3	1	3	2	1
69	1	4	1	4	2	5	1	11	2	2	1	2	4	3	1	1
70	1	5	2	4	5	3	1	6	2	1	1	2	4	3	1	1
71	1	5	2	4	3	5	1	10	2	2	4	2	7	3	2	2
72	1	1	2	2	4	5	5	2	1	1	6	.	8	1	2	1
73	1	4	2	4	1	3	1	3	2	2	1	2	4	3	1	1
74	1	3	2	4	2	4	1	6	1	1	1	2	4	1	1	1
75	1	3	1	5	3	5	1	4	2	2	5	2	2	1	2	1
76	1	1	2	2	4	5	5	2	1	2	4	5	7	1	2	1
77	1	1	2	2	4	5	5	2	1	1	5	.	.	1	1	1
78	1	2	2	5	3	5	5	3	1	2	5	2	6	1	2	1
79	1	4	2	4	3	3	1	7	1	1	4	2	4	3	1	1
80	1	1	2	4	4	4	5	2	1	1	3	2	4	1	1	1
81	1	4	2	4	4	5	1	6	1	2	4	2	7	2	2	1
82	1	2	2	4	4	5	5	1	1	1	1	2	3	1	1	1
83	1	1	2	4	4	3	5	1	2	2	3	2	3	3	2	1
84	1	1	2	4	4	3	5	1	1	1	2	2	2	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
85	1	1	2	4	4	3	5	1	1	2	5	2	6	1	1	1
86	1	1	2	2	4	5	5	2	1	2	5	2	7	1	2	1
87	1	1	1	4	4	3	5	1	2	2	5	2	4	1	2	2
88	1	1	2	2	4	3	5	1	1	2	5	2	4	1	2	2
89	1	2	1	2	4	5	5	2	1	2	5	2	4	1	2	1
90	1	5	2	4	4	3	1	3	1	1	5	2	1	3	2	1
91	1	2	2	4	3	5	1	5	1	2	2	2	3	3	2	2
92	1	2	2	4	4	5	1	3	2	1	5	.	4	2	1	1
93	1	2	2	5	1	5	5	2	1	2	5	2	3	1	2	1
94	1	5	1	4	3	5	1	12	2	2	4	2	6	1	2	2
95	1	4	1	3	4	4	2	3	2	2	5	2	4	3	2	2
96	1	2	2	1	1	3	5	2	1	2	3	2	8	3	2	1
97	1	3	1	4	3	3	1	6	2	2	4	2	4	1	2	1
98	1	2	2	4	4	4	1	3	2	1	4	4	4	3	2	1
99	1	2	2	4	3	4	1	5	2	2	2	4	6	1	2	2
100	1	2	2	4	2	4	1	9	1	1	5	2	4	3	1	1
101	1	2	2	4	4	5	5	2	1	2	5	3	2	3	2	1
102	1	2	2	1	2	4	1	7	2	2	2	2	6	3	2	1
103	1	4	1	.	3	5	1	8	2	2	1	5	2	3	1	1
104	1	2	1	3	4	5	5	2	2	2	4	2	8	1	2	1
105	1	2	2	4	4	4	1	3	1	1	3	2	8	3	1	1
106	1	2	2	1	4	4	5	1	1	2	3	2	2	1	1	1
107	1	2	1	2	3	5	5	2	1	1	3	2	2	2	2	1
108	1	1	2	2	4	5	5	2	1	2	5	2	8	3	2	1
109	1	2	1	2	2	5	5	3	2	2	2	2	2	3	2	1
110	1	1	2	2	5	3	5	1	2	2	5	2	2	1	1	1
111	1	3	2	4	2	5	1	8	1	1	4	5	2	3	1	1
112	1	1	2	4	3	5	5	6	1	1	3	2	2	1	2	1
113	1	1	2	4	4	3	5	1	2	2	5	2	7	1	2	1
114	1	1	1	2	4	5	2	2	1	1	2	2	7	3	2	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
115	1	1	1	1	4	3	5	1	2	2	3	2	4	1	2	1
116	1	1	1	4	3	4	1	3	1	2	2	2	8	3	1	1
117	1	1	1	1	2	3	2	1	2	2	4	2	4	3	2	1
118	1	2	2	1	5	5	5	2	1	1	1	2	8	3	1	1
119	1	1	2	3	4	3	5	1	1	1	2	4	7	3	1	1
120	1	2	1	1	4	5	5	2	2	2	2	2	3	1	1	2
121	1	3	1	2	2	5	1	5	2	2	1	2	4	1	2	2
122	1	3	2	4	2	4	4	7	1	1	4	2	.	3	1	1
123	1	1	1	4	4	4	1	2	1	2	4	4	4	3	2	2
124	1	2	2	1	1	4	1	3	1	1	2	.	3	1	1	1
125	1	2	2	3	3	3	5	1	1	2	3	2	4	3	1	1
126	1	3	1	4	3	3	2	2	1	2	3	2	4	1	2	1
127	1	3	2	4	3	5	1	4	2	2	5	2	2	1	1	1
128	1	3	1	.	.	5	1	4	1	1	3	5	4	3	2	1
129	1	1	2	4	4	3	5	1	1	2	3	2	1	1	2	1
130	1	3	2	4	1	2	1	3	1	2	5	2	4	3	1	1
131	1	1	1	2	4	5	5	1	2	2	4	4	6	3	2	1
132	1	1	1	2	4	5	5	2	2	2	2	2	4	1	1	1
133	1	1	2	2	2	5	5	2	1	2	3	2	6	1	2	1
134	1	4	1	4	3	5	1	10	1	1	5	.	4	1	1	1
135	1	5	1	4	3	4	1	10	1	2	3	2	2	1	1	1
136	1	1	2	4	4	3	5	1	1	2	2	2	4	1	1	1
137	1	2	1	2	4	5	5	2	1	2	2	4	2	1	2	1
138	1	2	2	2	2	5	2	2	2	2	5	4	2	3	2	1
139	1	5	1	4	3	5	1	10	1	1	5	2	3	3	2	1
140	1	3	1	2	4	5	1	7	2	2	5	2	3	2	2	1
1	2	4	1	4	3	5	1	13	1	2	2	2	1	1	1	1
2	2	2	1	2	4	5	5	2	2	2	2	.	8	1	2	1
3	2	1	2	2	4	3	5	1	1	2	1	2	7	3	2	2
4	2	1	2	4	4	3	5	1	1	1	2	2	4	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
5	2	1	2	4	4	3	5	1	2	2	3	2	2	1	1	1
6	2	1	2	4	3	4	5	3	1	2	4	2	4	1	1	1
7	2	2	2	4	3	4	5	9	1	2	3	5	7	3	2	1
8	2	2	2	4	4	5	5	1	2	2	3	4	3	1	2	1
9	2	3	1	2	2	5	5	3	1	2	1	2	2	1	2	1
10	2	2	1	2	4	5	3	1	1	2	5	.	3	1	1	1
11	2	3	2	4	2	5	1	12	1	2	4	.	7	3	2	1
12	2	5	1	4	3	5	1	7	1	1	5	2	4	1	1	1
13	2	1	2	4	4	3	5	1	1	1	2	2	4	3	1	1
14	2	1	1	2	4	5	5	2	2	2	3	.	4	3	1	1
15	2	1	1	2	4	5	5	3	2	2	2	2	4	1	1	1
16	2	2	2	1	3	5	5	4	1	1	4	2	7	3	1	.
17	2	1	1	2	4	5	5	1	1	2	5	2	7	1	2	1
18	2	1	1	2	2	5	5	.	2	2	5	2	7	1	1	1
19	2	2	2	2	4	5	5	1	1	1	3	2	4	3	2	1
20	2	1	1	4	3	3	1	4	2	2	5	2	4	3	1	1
21	2	3	1	2	4	5	5	2	1	2	5	.	4	3	2	2
22	2	5	1	4	3	5	1	12	1	1	2	2	7	2	1	1
23	2	4	2	4	2	5	2	7	2	2	2	2	8	1	1	1
24	2	3	1	2	4	5	5	2	1	1	4	.	.	3	1	1
25	2	4	1	4	2	4	1	7	1	2	4	2	4	1	2	1
26	2	4	1	4	4	5	1	9	1	1	5	4	2	3	2	1
27	2	1	2	4	2	3	5	11	1	2	5	2	4	3	1	1
28	2	1	2	4	1	4	1	2	2	2	4	2	3	3	2	1
29	2	4	2	4	2	5	1	7	2	2	1	2	4	2	1	1
30	2	1	2	4	1	3	5	1	2	2	2	2	2	1	2	1
31	2	4	2	4	1	2	1	4	1	1	4	2	6	1	2	1
32	2	3	2	4	2	3	1	5	1	2	3	2	2	1	2	1
33	2	1	1	2	4	5	5	2	2	2	2	2	4	1	2	1
34	2	1	2	4	4	3	5	1	2	2	4	4	8	3	2	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
35	2	4	2	4	2	3	1	13	1	2	2	2	4	3	1	1
36	2	1	1	4	4	3	5	1	1	1	4	2	2	1	1	1
37	2	1	2	2	4	4	5	2	2	2	4	2	4	2	1	1
38	2	3	1	4	4	5	1	5	1	1	5	2	7	3	2	2
39	2	4	2	4	3	5	1	11	1	2	5	2	5	3	2	1
40	2	4	2	4	3	5	1	12	1	2	5	2	2	1	2	1
41	2	2	1	4	4	5	5	2	2	2	2	2	6	3	2	1
42	2	4	2	4	3	5	1	11	1	2	3	2	7	3	2	1
43	2	4	1	4	2	5	1	9	2	2	3	4	4	3	1	1
44	2	5	2	4	1	5	1	5	1	1	1	2	7	1	1	1
45	2	3	2	4	4	5	1	9	1	2	4	2	4	1	1	1
46	2	5	1	4	2	5	1	13	1	2	5	4	4	1	2	1
47	2	5	1	4	3	5	1	6	1	1	5	2	7	3	1	1
48	2	3	2	4	2	5	2	6	2	2	3	4	6	3	2	1
49	2	5	1	4	3	5	1	13	2	2	4	2	7	1	2	1
50	2	5	1	4	4	5	1	8	1	1	6	2	3	3	2	2
51	2	5	1	4	4	5	1	5	1	1	5	2	6	2	2	1
52	2	1	2	4	4	4	1	4	1	1	3	4	2	1	2	1
53	2	3	2	4	4	5	1	4	1	1	5	2	4	3	1	1
54	2	2	2	4	2	4	1	5	2	1	4	2	4	1	1	1
55	2	2	2	3	3	5	5	7	1	1	2	5	2	1	1	1
56	2	3	2	4	4	5	1	6	2	2	3	2	4	2	1	1
57	2	4	1	4	2	5	1	13	2	2	2	2	2	1	2	.
58	2	5	1	4	3	5	1	6	1	1	4	2	4	1	1	1
59	2	1	1	2	4	5	5	1	2	1	2	2	4	2	1	1
60	2	3	2	4	2	4	1	9	1	2	3	2	3	1	1	1
61	2	4	1	4	3	5	1	7	1	1	5	2	2	1	2	1
62	2	5	1	4	3	5	1	12	1	2	5	2	6	3	2	1
63	2	5	2	1	3	2	1	2	1	2	2	5	6	3	1	1
64	2	5	2	4	3	4	1	13	1	1	2	4	3	2	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
65	2	3	2	4	2	3	1	12	2	2	4	2	4	3	2	1
66	2	2	2	1	2	4	1	7	1	1	2	2	2	3	1	1
67	2	1	2	4	4	5	1	2	2	2	3	2	2	3	1	1
68	2	1	1	2	4	5	2	2	2	2	5	3	1	3	2	1
69	2	4	1	4	2	5	1	11	2	2	1	2	4	3	1	1
70	2	5	2	4	5	3	1	6	2	1	1	2	4	3	1	1
71	2	5	2	4	3	5	1	10	2	2	4	2	7	3	2	2
72	2	1	2	2	4	5	5	2	1	1	6	.	8	1	2	1
73	2	4	2	4	1	3	1	3	2	2	1	2	4	3	1	1
74	2	3	2	4	2	4	1	6	1	1	1	2	4	1	1	1
75	2	3	1	5	3	5	1	4	2	2	5	2	2	1	2	1
76	2	1	2	2	4	5	5	2	1	2	4	5	7	1	2	1
77	2	1	2	2	4	5	5	2	1	1	5	.	.	1	1	1
78	2	2	2	5	3	5	5	3	1	2	5	2	6	1	2	1
79	2	4	2	4	3	3	1	7	1	1	4	2	4	3	1	1
80	2	1	2	4	4	4	5	2	1	1	3	2	4	1	1	1
81	2	4	2	4	4	5	1	6	1	2	4	2	7	2	2	1
82	2	2	2	4	4	5	5	1	1	1	1	2	3	1	1	1
83	2	1	2	4	4	3	5	1	2	2	3	2	3	3	2	1
84	2	1	2	4	4	3	5	1	1	1	2	2	2	1	1	1
85	2	1	2	4	4	3	5	1	1	2	5	2	6	1	1	1
86	2	1	2	2	4	5	5	2	1	2	5	2	7	1	2	1
87	2	1	1	4	4	3	5	1	2	2	5	2	4	1	2	2
88	2	1	2	2	4	3	5	1	1	2	5	2	4	1	2	2
89	2	2	1	2	4	5	5	2	1	2	5	2	4	1	2	1
90	2	5	2	4	4	3	1	3	1	1	5	2	1	3	2	1
91	2	2	2	4	3	5	1	5	1	2	2	2	3	3	2	2
92	2	2	2	4	4	5	1	3	2	1	5	.	4	2	1	1
93	2	2	2	5	1	5	5	2	1	2	5	2	3	1	2	1
94	2	5	1	4	3	5	1	12	2	2	4	2	6	1	2	2

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
95	2	4	1	3	4	4	2	3	2	2	5	2	4	3	2	2
96	2	2	2	1	1	3	5	2	1	2	3	2	8	3	2	1
97	2	3	1	4	3	3	1	6	2	2	4	2	4	1	2	1
98	2	2	2	4	4	4	1	3	2	1	4	4	4	3	2	1
99	2	2	2	4	3	4	1	5	2	2	2	4	6	1	2	2
100	2	2	2	4	2	4	1	9	1	1	5	2	4	3	1	1
101	2	2	2	4	4	5	5	2	1	2	5	3	2	3	2	1
102	2	2	2	1	2	4	1	7	2	2	2	2	6	3	2	1
103	2	4	1	.	3	5	1	8	2	2	1	5	2	3	1	1
104	2	2	1	3	4	5	5	2	2	2	4	2	8	1	2	1
105	2	2	2	4	4	4	1	3	1	1	3	2	8	3	1	1
106	2	2	2	1	4	4	5	1	1	2	3	2	2	1	1	1
107	2	2	1	2	3	5	5	2	1	1	3	2	2	2	2	1
108	2	1	2	2	4	5	5	2	1	2	5	2	8	3	2	1
109	2	2	1	2	2	5	5	3	2	2	2	2	2	3	2	1
110	2	1	2	2	5	3	5	1	2	2	5	2	2	1	1	1
111	2	3	2	4	2	5	1	8	1	1	4	5	2	3	1	1
112	2	1	2	4	3	5	5	6	1	1	3	2	2	1	2	1
113	2	1	2	4	4	3	5	1	2	2	5	2	7	1	2	1
114	2	1	1	2	4	5	2	2	1	1	2	2	7	3	2	1
115	2	1	1	1	4	3	5	1	2	2	3	2	4	1	2	1
116	2	1	1	4	3	4	1	3	1	2	2	2	8	3	1	1
117	2	1	1	1	2	3	2	1	2	2	4	2	4	3	2	1
118	2	2	2	1	5	5	5	2	1	1	1	2	8	3	1	1
119	2	1	2	3	4	3	5	1	1	1	2	4	7	3	1	1
120	2	2	1	1	4	5	5	2	2	2	2	2	3	1	1	2
121	2	3	1	2	2	5	1	5	2	2	1	2	4	1	2	2
122	2	3	2	4	2	4	4	7	1	1	4	2	.	3	1	1
123	2	1	1	4	4	4	1	2	1	2	4	4	4	3	2	2
124	2	2	2	1	1	4	1	3	1	1	2	.	3	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
125	2	2	2	3	3	3	5	1	1	2	3	2	4	3	1	1
126	2	3	1	4	3	3	2	2	1	2	3	2	4	1	2	1
127	2	3	2	4	3	5	1	4	2	2	5	2	2	1	1	1
128	2	3	1	.	.	5	1	4	1	1	3	5	4	3	2	1
129	2	1	2	4	4	3	5	1	1	2	3	2	1	1	2	1
130	2	3	2	4	1	2	1	3	1	2	5	2	4	3	1	1
131	2	1	1	2	4	5	5	1	2	2	4	4	6	3	2	1
132	2	1	1	2	4	5	5	2	2	2	2	2	4	1	1	1
133	2	1	2	2	2	5	5	2	1	2	3	2	6	1	2	1
134	2	4	1	4	3	5	1	10	1	1	5	.	4	1	1	1
135	2	5	1	4	3	4	1	10	1	2	3	2	2	1	1	1
136	2	1	2	4	4	3	5	1	1	2	2	2	4	1	1	1
137	2	2	1	2	4	5	5	2	1	2	2	4	2	1	2	1
138	2	2	2	2	2	5	2	2	2	2	5	4	2	3	2	1
139	2	5	1	4	3	5	1	10	1	1	5	2	3	3	2	1
140	2	3	1	2	4	5	1	7	2	2	5	2	3	2	2	1
1	3	4	1	4	3	5	1	13	1	2	2	2	1	1	1	1
2	3	2	1	2	4	5	5	2	2	2	2	.	8	1	2	1
3	3	1	2	2	4	3	5	1	1	2	1	2	7	3	2	2
4	3	1	2	4	4	3	5	1	1	1	2	2	4	1	1	1
5	3	1	2	4	4	3	5	1	2	2	3	2	2	1	1	1
6	3	1	2	4	3	4	5	3	1	2	4	2	4	1	1	1
7	3	2	2	4	3	4	5	9	1	2	3	5	7	3	2	1
8	3	2	2	4	4	5	5	1	2	2	3	4	3	1	2	1
9	3	3	1	2	2	5	5	3	1	2	1	2	2	1	2	1
10	3	2	1	2	4	5	3	1	1	2	5	.	3	1	1	1
11	3	3	2	4	2	5	1	12	1	2	4	.	7	3	2	1
12	3	5	1	4	3	5	1	7	1	1	5	2	4	1	1	1
13	3	1	2	4	4	3	5	1	1	1	2	2	4	3	1	1
14	3	1	1	2	4	5	5	2	2	2	3	.	4	3	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
15	3	1	1	2	4	5	5	3	2	2	2	2	4	1	1	1
16	3	2	2	1	3	5	5	4	1	1	4	2	7	3	1	.
17	3	1	1	2	4	5	5	1	1	2	5	2	7	1	2	1
18	3	1	1	2	2	5	5	.	2	2	5	2	7	1	1	1
19	3	2	2	2	4	5	5	1	1	1	3	2	4	3	2	1
20	3	1	1	4	3	3	1	4	2	2	5	2	4	3	1	1
21	3	3	1	2	4	5	5	2	1	2	5	.	4	3	2	2
22	3	5	1	4	3	5	1	12	1	1	2	2	7	2	1	1
23	3	4	2	4	2	5	2	7	2	2	2	2	8	1	1	1
24	3	3	1	2	4	5	5	2	1	1	4	.	.	3	1	1
25	3	4	1	4	2	4	1	7	1	2	4	2	4	1	2	1
26	3	4	1	4	4	5	1	9	1	1	5	4	2	3	2	1
27	3	1	2	4	2	3	5	11	1	2	5	2	4	3	1	1
28	3	1	2	4	1	4	1	2	2	2	4	2	3	3	2	1
29	3	4	2	4	2	5	1	7	2	2	1	2	4	2	1	1
30	3	1	2	4	1	3	5	1	2	2	2	2	2	1	2	1
31	3	4	2	4	1	2	1	4	1	1	4	2	6	1	2	1
32	3	3	2	4	2	3	1	5	1	2	3	2	2	1	2	1
33	3	1	1	2	4	5	5	2	2	2	2	2	4	1	2	1
34	3	1	2	4	4	3	5	1	2	2	4	4	8	3	2	1
35	3	4	2	4	2	3	1	13	1	2	2	2	4	3	1	1
36	3	1	1	4	4	3	5	1	1	1	4	2	2	1	1	1
37	3	1	2	2	4	4	5	2	2	2	4	2	4	2	1	1
38	3	3	1	4	4	5	1	5	1	1	5	2	7	3	2	2
39	3	4	2	4	3	5	1	11	1	2	5	2	5	3	2	1
40	3	4	2	4	3	5	1	12	1	2	5	2	2	1	2	1
41	3	2	1	4	4	5	5	2	2	2	2	2	6	3	2	1
42	3	4	2	4	3	5	1	11	1	2	3	2	7	3	2	1
43	3	4	1	4	2	5	1	9	2	2	3	4	4	3	1	1
44	3	5	2	4	1	5	1	5	1	1	1	2	7	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
45	3	3	2	4	4	5	1	9	1	2	4	2	4	1	1	1
46	3	5	1	4	2	5	1	13	1	2	5	4	4	1	2	1
47	3	5	1	4	3	5	1	6	1	1	5	2	7	3	1	1
48	3	3	2	4	2	5	2	6	2	2	3	4	6	3	2	1
49	3	5	1	4	3	5	1	13	2	2	4	2	7	1	2	1
50	3	5	1	4	4	5	1	8	1	1	6	2	3	3	2	2
51	3	5	1	4	4	5	1	5	1	1	5	2	6	2	2	1
52	3	1	2	4	4	4	1	4	1	1	3	4	2	1	2	1
53	3	3	2	4	4	5	1	4	1	1	5	2	4	3	1	1
54	3	2	2	4	2	4	1	5	2	1	4	2	4	1	1	1
55	3	2	2	3	3	5	5	7	1	1	2	5	2	1	1	1
56	3	3	2	4	4	5	1	6	2	2	3	2	4	2	1	1
57	3	4	1	4	2	5	1	13	2	2	2	2	2	1	2	.
58	3	5	1	4	3	5	1	6	1	1	4	2	4	1	1	1
59	3	1	1	2	4	5	5	1	2	1	2	2	4	2	1	1
60	3	3	2	4	2	4	1	9	1	2	3	2	3	1	1	1
61	3	4	1	4	3	5	1	7	1	1	5	2	2	1	2	1
62	3	5	1	4	3	5	1	12	1	2	5	2	6	3	2	1
63	3	5	2	1	3	2	1	2	1	2	2	5	6	3	1	1
64	3	5	2	4	3	4	1	13	1	1	2	4	3	2	1	1
65	3	3	2	4	2	3	1	12	2	2	4	2	4	3	2	1
66	3	2	2	1	2	4	1	7	1	1	2	2	2	3	1	1
67	3	1	2	4	4	5	1	2	2	2	3	2	2	3	1	1
68	3	1	1	2	4	5	2	2	2	2	5	3	1	3	2	1
69	3	4	1	4	2	5	1	11	2	2	1	2	4	3	1	1
70	3	5	2	4	5	3	1	6	2	1	1	2	4	3	1	1
71	3	5	2	4	3	5	1	10	2	2	4	2	7	3	2	2
72	3	1	2	2	4	5	5	2	1	1	6	.	8	1	2	1
73	3	4	2	4	1	3	1	3	2	2	1	2	4	3	1	1
74	3	3	2	4	2	4	1	6	1	1	1	2	4	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
75	3	3	1	5	3	5	1	4	2	2	5	2	2	1	2	1
76	3	1	2	2	4	5	5	2	1	2	4	5	7	1	2	1
77	3	1	2	2	4	5	5	2	1	1	5	.	.	1	1	1
78	3	2	2	5	3	5	5	3	1	2	5	2	6	1	2	1
79	3	4	2	4	3	3	1	7	1	1	4	2	4	3	1	1
80	3	1	2	4	4	4	5	2	1	1	3	2	4	1	1	1
81	3	4	2	4	4	5	1	6	1	2	4	2	7	2	2	1
82	3	2	2	4	4	5	5	1	1	1	1	2	3	1	1	1
83	3	1	2	4	4	3	5	1	2	2	3	2	3	3	2	1
84	3	1	2	4	4	3	5	1	1	1	2	2	2	1	1	1
85	3	1	2	4	4	3	5	1	1	2	5	2	6	1	1	1
86	3	1	2	2	4	5	5	2	1	2	5	2	7	1	2	1
87	3	1	1	4	4	3	5	1	2	2	5	2	4	1	2	2
88	3	1	2	2	4	3	5	1	1	2	5	2	4	1	2	2
89	3	2	1	2	4	5	5	2	1	2	5	2	4	1	2	1
90	3	5	2	4	4	3	1	3	1	1	5	2	1	3	2	1
91	3	2	2	4	3	5	1	5	1	2	2	2	3	3	2	2
92	3	2	2	4	4	5	1	3	2	1	5	.	4	2	1	1
93	3	2	2	5	1	5	5	2	1	2	5	2	3	1	2	1
94	3	5	1	4	3	5	1	12	2	2	4	2	6	1	2	2
95	3	4	1	3	4	4	2	3	2	2	5	2	4	3	2	2
96	3	2	2	1	1	3	5	2	1	2	3	2	8	3	2	1
97	3	3	1	4	3	3	1	6	2	2	4	2	4	1	2	1
98	3	2	2	4	4	4	1	3	2	1	4	4	4	3	2	1
99	3	2	2	4	3	4	1	5	2	2	2	4	6	1	2	2
100	3	2	2	4	2	4	1	9	1	1	5	2	4	3	1	1
101	3	2	2	4	4	5	5	2	1	2	5	3	2	3	2	1
102	3	2	2	1	2	4	1	7	2	2	2	2	6	3	2	1
103	3	4	1	.	3	5	1	8	2	2	1	5	2	3	1	1
104	3	2	1	3	4	5	5	2	2	2	4	2	8	1	2	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
105	3	2	2	4	4	4	1	3	1	1	3	2	8	3	1	1
106	3	2	2	1	4	4	5	1	1	2	3	2	2	1	1	1
107	3	2	1	2	3	5	5	2	1	1	3	2	2	2	2	1
108	3	1	2	2	4	5	5	2	1	2	5	2	8	3	2	1
109	3	2	1	2	2	5	5	3	2	2	2	2	2	3	2	1
110	3	1	2	2	5	3	5	1	2	2	5	2	2	1	1	1
111	3	3	2	4	2	5	1	8	1	1	4	5	2	3	1	1
112	3	1	2	4	3	5	5	6	1	1	3	2	2	1	2	1
113	3	1	2	4	4	3	5	1	2	2	5	2	7	1	2	1
114	3	1	1	2	4	5	2	2	1	1	2	2	7	3	2	1
115	3	1	1	1	4	3	5	1	2	2	3	2	4	1	2	1
116	3	1	1	4	3	4	1	3	1	2	2	2	8	3	1	1
117	3	1	1	1	2	3	2	1	2	2	4	2	4	3	2	1
118	3	2	2	1	5	5	5	2	1	1	1	2	8	3	1	1
119	3	1	2	3	4	3	5	1	1	1	2	4	7	3	1	1
120	3	2	1	1	4	5	5	2	2	2	2	2	3	1	1	2
121	3	3	1	2	2	5	1	5	2	2	1	2	4	1	2	2
122	3	3	2	4	2	4	4	7	1	1	4	2	.	3	1	1
123	3	1	1	4	4	4	1	2	1	2	4	4	4	3	2	2
124	3	2	2	1	1	4	1	3	1	1	2	.	3	1	1	1
125	3	2	2	3	3	3	5	1	1	2	3	2	4	3	1	1
126	3	3	1	4	3	3	2	2	1	2	3	2	4	1	2	1
127	3	3	2	4	3	5	1	4	2	2	5	2	2	1	1	1
128	3	3	1	.	.	5	1	4	1	1	3	5	4	3	2	1
129	3	1	2	4	4	3	5	1	1	2	3	2	1	1	2	1
130	3	3	2	4	1	2	1	3	1	2	5	2	4	3	1	1
131	3	1	1	2	4	5	5	1	2	2	4	4	6	3	2	1
132	3	1	1	2	4	5	5	2	2	2	2	2	4	1	1	1
133	3	1	2	2	2	5	5	2	1	2	3	2	6	1	2	1
134	3	4	1	4	3	5	1	10	1	1	5	.	4	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
135	3	5	1	4	3	4	1	10	1	2	3	2	2	1	1	1
136	3	1	2	4	4	3	5	1	1	2	2	2	4	1	1	1
137	3	2	1	2	4	5	5	2	1	2	2	4	2	1	2	1
138	3	2	2	2	2	5	2	2	2	2	5	4	2	3	2	1
139	3	5	1	4	3	5	1	10	1	1	5	2	3	3	2	1
140	3	3	1	2	4	5	1	7	2	2	5	2	3	2	2	1
1	4	4	1	4	3	5	1	13	1	2	2	2	1	1	1	1
2	4	2	1	2	4	5	5	2	2	2	2	.	8	1	2	1
3	4	1	2	2	4	3	5	1	1	2	1	2	7	3	2	2
4	4	1	2	4	4	3	5	1	1	1	2	2	4	1	1	1
5	4	1	2	4	4	3	5	1	2	2	3	2	2	1	1	1
6	4	1	2	4	3	4	5	3	1	2	4	2	4	1	1	1
7	4	2	2	4	3	4	5	9	1	2	3	5	7	3	2	1
8	4	2	2	4	4	5	5	1	2	2	3	4	3	1	2	1
9	4	3	1	2	2	5	5	3	1	2	1	2	2	1	2	1
10	4	2	1	2	4	5	3	1	1	2	5	.	3	1	1	1
11	4	3	2	4	2	5	1	12	1	2	4	.	7	3	2	1
12	4	5	1	4	3	5	1	7	1	1	5	2	4	1	1	1
13	4	1	2	4	4	3	5	1	1	1	2	2	4	3	1	1
14	4	1	1	2	4	5	5	2	2	2	3	.	4	3	1	1
15	4	1	1	2	4	5	5	3	2	2	2	2	4	1	1	1
16	4	2	2	1	3	5	5	4	1	1	4	2	7	3	1	.
17	4	1	1	2	4	5	5	1	1	2	5	2	7	1	2	1
18	4	1	1	2	2	5	5	.	2	2	5	2	7	1	1	1
19	4	2	2	2	4	5	5	1	1	1	3	2	4	3	2	1
20	4	1	1	4	3	3	1	4	2	2	5	2	4	3	1	1
21	4	3	1	2	4	5	5	2	1	2	5	.	4	3	2	2
22	4	5	1	4	3	5	1	12	1	1	2	2	7	2	1	1
23	4	4	2	4	2	5	2	7	2	2	2	2	8	1	1	1
24	4	3	1	2	4	5	5	2	1	1	4	.	.	3	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
25	4	4	1	4	2	4	1	7	1	2	4	2	4	1	2	1
26	4	4	1	4	4	5	1	9	1	1	5	4	2	3	2	1
27	4	1	2	4	2	3	5	11	1	2	5	2	4	3	1	1
28	4	1	2	4	1	4	1	2	2	2	4	2	3	3	2	1
29	4	4	2	4	2	5	1	7	2	2	1	2	4	2	1	1
30	4	1	2	4	1	3	5	1	2	2	2	2	2	1	2	1
31	4	4	2	4	1	2	1	4	1	1	4	2	6	1	2	1
32	4	3	2	4	2	3	1	5	1	2	3	2	2	1	2	1
33	4	1	1	2	4	5	5	2	2	2	2	2	4	1	2	1
34	4	1	2	4	4	3	5	1	2	2	4	4	8	3	2	1
35	4	4	2	4	2	3	1	13	1	2	2	2	4	3	1	1
36	4	1	1	4	4	3	5	1	1	1	4	2	2	1	1	1
37	4	1	2	2	4	4	5	2	2	2	4	2	4	2	1	1
38	4	3	1	4	4	5	1	5	1	1	5	2	7	3	2	2
39	4	4	2	4	3	5	1	11	1	2	5	2	5	3	2	1
40	4	4	2	4	3	5	1	12	1	2	5	2	2	1	2	1
41	4	2	1	4	4	5	5	2	2	2	2	2	6	3	2	1
42	4	4	2	4	3	5	1	11	1	2	3	2	7	3	2	1
43	4	4	1	4	2	5	1	9	2	2	3	4	4	3	1	1
44	4	5	2	4	1	5	1	5	1	1	1	2	7	1	1	1
45	4	3	2	4	4	5	1	9	1	2	4	2	4	1	1	1
46	4	5	1	4	2	5	1	13	1	2	5	4	4	1	2	1
47	4	5	1	4	3	5	1	6	1	1	5	2	7	3	1	1
48	4	3	2	4	2	5	2	6	2	2	3	4	6	3	2	1
49	4	5	1	4	3	5	1	13	2	2	4	2	7	1	2	1
50	4	5	1	4	4	5	1	8	1	1	6	2	3	3	2	2
51	4	5	1	4	4	5	1	5	1	1	5	2	6	2	2	1
52	4	1	2	4	4	4	1	4	1	1	3	4	2	1	2	1
53	4	3	2	4	4	5	1	4	1	1	5	2	4	3	1	1
54	4	2	2	4	2	4	1	5	2	1	4	2	4	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
55	4	2	2	3	3	5	5	7	1	1	2	5	2	1	1	1
56	4	3	2	4	4	5	1	6	2	2	3	2	4	2	1	1
57	4	4	1	4	2	5	1	13	2	2	2	2	2	1	2	.
58	4	5	1	4	3	5	1	6	1	1	4	2	4	1	1	1
59	4	1	1	2	4	5	5	1	2	1	2	2	4	2	1	1
60	4	3	2	4	2	4	1	9	1	2	3	2	3	1	1	1
61	4	4	1	4	3	5	1	7	1	1	5	2	2	1	2	1
62	4	5	1	4	3	5	1	12	1	2	5	2	6	3	2	1
63	4	5	2	1	3	2	1	2	1	2	2	5	6	3	1	1
64	4	5	2	4	3	4	1	13	1	1	2	4	3	2	1	1
65	4	3	2	4	2	3	1	12	2	2	4	2	4	3	2	1
66	4	2	2	1	2	4	1	7	1	1	2	2	2	3	1	1
67	4	1	2	4	4	5	1	2	2	2	3	2	2	3	1	1
68	4	1	1	2	4	5	2	2	2	2	5	3	1	3	2	1
69	4	4	1	4	2	5	1	11	2	2	1	2	4	3	1	1
70	4	5	2	4	5	3	1	6	2	1	1	2	4	3	1	1
71	4	5	2	4	3	5	1	10	2	2	4	2	7	3	2	2
72	4	1	2	2	4	5	5	2	1	1	6	.	8	1	2	1
73	4	4	2	4	1	3	1	3	2	2	1	2	4	3	1	1
74	4	3	2	4	2	4	1	6	1	1	1	2	4	1	1	1
75	4	3	1	5	3	5	1	4	2	2	5	2	2	1	2	1
76	4	1	2	2	4	5	5	2	1	2	4	5	7	1	2	1
77	4	1	2	2	4	5	5	2	1	1	5	.	.	1	1	1
78	4	2	2	5	3	5	5	3	1	2	5	2	6	1	2	1
79	4	4	2	4	3	3	1	7	1	1	4	2	4	3	1	1
80	4	1	2	4	4	4	5	2	1	1	3	2	4	1	1	1
81	4	4	2	4	4	5	1	6	1	2	4	2	7	2	2	1
82	4	2	2	4	4	5	5	1	1	1	1	2	3	1	1	1
83	4	1	2	4	4	3	5	1	2	2	3	2	3	3	2	1
84	4	1	2	4	4	3	5	1	1	1	2	2	2	1	1	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
85	4	1	2	4	4	3	5	1	1	2	5	2	6	1	1	1
86	4	1	2	2	4	5	5	2	1	2	5	2	7	1	2	1
87	4	1	1	4	4	3	5	1	2	2	5	2	4	1	2	2
88	4	1	2	2	4	3	5	1	1	2	5	2	4	1	2	2
89	4	2	1	2	4	5	5	2	1	2	5	2	4	1	2	1
90	4	5	2	4	4	3	1	3	1	1	5	2	1	3	2	1
91	4	2	2	4	3	5	1	5	1	2	2	2	3	3	2	2
92	4	2	2	4	4	5	1	3	2	1	5	.	4	2	1	1
93	4	2	2	5	1	5	5	2	1	2	5	2	3	1	2	1
94	4	5	1	4	3	5	1	12	2	2	4	2	6	1	2	2
95	4	4	1	3	4	4	2	3	2	2	5	2	4	3	2	2
96	4	2	2	1	1	3	5	2	1	2	3	2	8	3	2	1
97	4	3	1	4	3	3	1	6	2	2	4	2	4	1	2	1
98	4	2	2	4	4	4	1	3	2	1	4	4	4	3	2	1
99	4	2	2	4	3	4	1	5	2	2	2	4	6	1	2	2
100	4	2	2	4	2	4	1	9	1	1	5	2	4	3	1	1
101	4	2	2	4	4	5	5	2	1	2	5	3	2	3	2	1
102	4	2	2	1	2	4	1	7	2	2	2	2	6	3	2	1
103	4	4	1	.	3	5	1	8	2	2	1	5	2	3	1	1
104	4	2	1	3	4	5	5	2	2	2	4	2	8	1	2	1
105	4	2	2	4	4	4	1	3	1	1	3	2	8	3	1	1
106	4	2	2	1	4	4	5	1	1	2	3	2	2	1	1	1
107	4	2	1	2	3	5	5	2	1	1	3	2	2	2	2	1
108	4	1	2	2	4	5	5	2	1	2	5	2	8	3	2	1
109	4	2	1	2	2	5	5	3	2	2	2	2	2	3	2	1
110	4	1	2	2	5	3	5	1	2	2	5	2	2	1	1	1
111	4	3	2	4	2	5	1	8	1	1	4	5	2	3	1	1
112	4	1	2	4	3	5	5	6	1	1	3	2	2	1	2	1
113	4	1	2	4	4	3	5	1	2	2	5	2	7	1	2	1
114	4	1	1	2	4	5	2	2	1	1	2	2	7	3	2	1

Panelist	Form	Age	Sex	Race	House	Ed	Employ	Income	LF	SF	Fdesrt	quality	fruit	taste	purch1	purch2
115	4	1	1	1	4	3	5	1	2	2	3	2	4	1	2	1
116	4	1	1	4	3	4	1	3	1	2	2	2	8	3	1	1
117	4	1	1	1	2	3	2	1	2	2	4	2	4	3	2	1
118	4	2	2	1	5	5	5	2	1	1	1	2	8	3	1	1
119	4	1	2	3	4	3	5	1	1	1	2	4	7	3	1	1
120	4	2	1	1	4	5	5	2	2	2	2	2	3	1	1	2
121	4	3	1	2	2	5	1	5	2	2	1	2	4	1	2	2
122	4	3	2	4	2	4	4	7	1	1	4	2	.	3	1	1
123	4	1	1	4	4	4	1	2	1	2	4	4	4	3	2	2
124	4	2	2	1	1	4	1	3	1	1	2	.	3	1	1	1
125	4	2	2	3	3	3	5	1	1	2	3	2	4	3	1	1
126	4	3	1	4	3	3	2	2	1	2	3	2	4	1	2	1
127	4	3	2	4	3	5	1	4	2	2	5	2	2	1	1	1
128	4	3	1	.	.	5	1	4	1	1	3	5	4	3	2	1
129	4	1	2	4	4	3	5	1	1	2	3	2	1	1	2	1
130	4	3	2	4	1	2	1	3	1	2	5	2	4	3	1	1
131	4	1	1	2	4	5	5	1	2	2	4	4	6	3	2	1
132	4	1	1	2	4	5	5	2	2	2	2	2	4	1	1	1
133	4	1	2	2	2	5	5	2	1	2	3	2	6	1	2	1
134	4	4	1	4	3	5	1	10	1	1	5	.	4	1	1	1
135	4	5	1	4	3	4	1	10	1	2	3	2	2	1	1	1
136	4	1	2	4	4	3	5	1	1	2	2	2	4	1	1	1
137	4	2	1	2	4	5	5	2	1	2	2	4	2	1	2	1
138	4	2	2	2	2	5	2	2	2	2	5	4	2	3	2	1
139	4	5	1	4	3	5	1	10	1	1	5	2	3	3	2	1
140	4	3	1	2	4	5	1	7	2	2	5	2	3	2	2	1

B. CONSUMER EVALUATIONS

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
1	1	5	8	7	7	7	2	7	1	1	1	2
2	1	7	7	7	6	7	2	7	1	1	1	2
3	1	5	8	8	4	2	2	7	1	2	2	2
4	1	7	8	8	8	8	2	8	1	1	1	2
5	1	8	4	7	3	4	1	7	1	2	1	2
6	1	3	3	4	4	4	1	3	2	2	2	1
7	1	8	4	7	7	3	2	5	1	2	1	2
8	1	6	6	6	6	2	2	4	2	2	1	2
9	1	8	7	8	8	6	2	7	1	1	1	2
10	1	8	8	8	8	8	2	8	1	1	1	2
11	1	8	5	6	6	4	2	5	2	2	2	3
12	1	4	7	7	5	2	2	4	2	2	2	2
13	1	7	8	6	5	7	2	7	1	2	1	3
14	1	9	7	8	8	8	2	8	1	1	1	2
15	1	8	8	8	6	5	1	8	1	1	1	2
16	1	5	4	6	6	5	2	5	1	1	1	2
17	1	8	7	7	9	7	2	8	1	2	1	2
18	1	7	3	3	5	4	2	4	2	2	2	1
19	1	8	8	7	8	8	2	8	1	1	1	1
20	1	4	3	6	5	2	2	4	2	2	2	1
21	1	8	7	8	7	6	2	7	1	2	2	1
22	1	8	6	8	8	2	2	4	2	2	2	2
23	1	8	4	3	5	2	2	3	2	2	2	1
24	1	5	7	7	7	8	2	7	1	1	1	2
25	1	7	2	3	3	4	1	2	2	2	2	1
26	1	5	2	4	5	1	2	3	2	2	2	1
27	1	5	2	4	2	1	1	2	2	2	2	1

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
28	1	6	7	6	4	3	2	6	2	2	2	3
29	1	7	3	4	6	3	2	4	2	2	2	1
30	1	7	8	9	8	4	2	7	1	1	1	2
31	1	6	1	1	1	4	1	1	2	2	2	1
32	1	3	4	6	3	3	.	3	2	2	2	2
33	1	6	7	7	7	7	2	7	1	1	1	2
34	1	7	6	8	5	8	1	7	1	1	1	2
35	1	7	7	8	8	6	2	7	2	2	1	2
36	1	7	8	8	7	3	1	7	2	2	2	2
37	1	8	8	8	6	7	1	8	1	1	1	2
38	1	5	6	7	6	4	1	5	1	2	2	2
39	1	4	5	6	5	6	2	5	2	2	2	1
40	1	8	4	8	8	2	2	4	1	2	2	2
41	1	6	7	7	7	4	1	6	1	2	1	2
42	1	5	7	8	7	3	2	6	2	2	2	2
43	1	7	8	8	8	3	2	6	2	2	2	2
44	1	6	6	4	6	4	2	6	1	2	2	1
45	1	5	4	4	5	1	2	2	2	2	2	2
46	1	5	7	8	5	7	2	7	1	1	1	2
47	1	5	7	7	6	4	1	6	1	1	1	2
48	1	4	6	6	5	2	2	3	2	2	2	2
49	1	6	3	3	5	2	1	2	2	2	2	1
50	1	8	7	7	7	6	2	8	1	1	1	2
51	1	8	6	7	6	3	1	6	1	2	2	2
52	1	9	7	5	4	2	1	5	2	2	2	1
53	1	8	4	7	4	1	2	2	2	2	2	2
54	1	5	4	4	6	3	2	4	2	2	2	1
55	1	8	8	8	5	7	1	8	1	1	1	2
56	1	9	9	9	9	3	2	6	2	2	2	2
57	1	6	7	8	7	6	2	7	1	1	1	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
58	1	4	7	8	8	6	2	6	1	2	2	2
59	1	8	6	2	2	3	2	4	2	2	2	1
60	1	8	8	8	5	7	2	8	1	1	1	2
61	1	7	7	5	7	8	2	7	1	1	1	2
62	1	5	6	6	6	6	2	6	1	2	2	2
63	1	7	7	7	6	6	2	7	1	1	1	2
64	1	6	7	7	7	6	2	7	1	1	1	2
65	1	8	7	7	5	9	1	7	1	2	1	1
66	1	4	5	3	5	8	1	4	2	2	2	1
67	1	7	7	8	5	6	2	7	1	1	1	2
68	1	6	4	6	7	8	1	6	1	2	2	1
69	1	7	6	6	4	4	1	6	1	1	1	1
70	1	6	6	7	6	3	2	6	2	2	2	2
71	1	4	1	3	3	1	1	1	2	2	2	1
72	1	8	7	6	5	2	2	6	1	2	1	2
73	1	8	4	6	5	3	1	3	2	2	2	2
74	1	8	6	8	3	6	2	6	2	2	1	2
75	1	8	7	8	7	7	2	7	1	1	1	2
76	1	7	6	8	7	6	2	7	1	2	1	2
77	1	8	7	6	4	4	2	7	1	1	1	2
78	1	8	6	8	6	4	2	7	1	1	1	2
79	1	4	4	4	3	3	2	5	1	2	1	3
80	1	7	3	6	5	2	1	4	2	2	2	1
81	1	7	4	5	5	1	1	3	2	2	2	2
82	1	8	7	7	7	7	2	7	1	1	1	2
83	1	7	3	3	3	5	1	4	2	2	2	1
84	1	7	5	7	7	4	1	5	2	2	2	2
85	1	8	4	6	8	2	2	3	2	2	2	2
86	1	8	4	8	8	4	1	4	2	2	2	2
87	1	5	3	1	5	3	2	2	2	2	2	1

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
88	1	7	7	7	8	8	2	7	1	2	2	2
89	1	8	6	2	4	7	1	5	2	2	2	1
90	1	5	4	6	6	4	1	4	.	2	2	2
91	1	8	4	6	2	3	1	4	1	2	2	2
92	1	4	4	6	8	3	2	4	2	2	1	1
93	1	8	8	9	8	8	2	8	1	1	1	2
94	1	5	4	6	5	3	2	5	1	2	2	3
95	1	4	4	6	6	2	2	4	2	2	2	1
96	1	6	3	6	2	4	2	4	2	2	2	1
97	1	7	7	8	5	6	2	7	1	2	2	2
98	1	5	7	8	4	7	1	7	1	1	1	2
99	1	8	7	6	6	7	2	7	1	2	2	1
100	1	6	7	7	7	3	2	6	1	2	2	2
101	1	8	7	8	8	8	2	8	1	1	1	2
102	1	9	8	8	5	4	2	8	1	1	1	2
103	1	8	8	8	8	7	2	8	1	1	1	2
104	1	3	3	4	4	8	2	3	2	2	1	1
105	1	4	4	4	5	3	1	4	2	2	2	1
106	1	6	7	7	5	4	1	6	1	2	1	2
107	1	7	4	8	7	4	2	5	2	2	1	2
108	1	9	8	8	8	7	2	9	1	1	1	2
109	1	8	4	6	6	7	2	7	1	1	1	1
110	1	5	5	7	7	2	2	3	2	2	2	2
111	1	3	.	4	3	2	1	2	2	2	2	3
112	1	5	6	3	6	1	2	4	2	2	2	1
113	1	8	6	4	4	3	2	6	1	1	1	1
114	1	8	7	8	8	8	2	8	1	1	1	2
115	1	3	2	2	3	3	1	3	2	2	2	1
116	1	7	6	7	5	6	2	6	1	1	1	2
117	1	4	3	2	5	6	1	4	2	2	2	1

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
118	1	8	8	8	6	7	1	7	1	1	1	2
119	1	7	4	6	5	4	1	4	1	2	1	3
120	1	5	3	6	3	2	1	3	2	2	2	2
121	1	7	6	4	4	4	2	3	2	2	2	1
122	1	8	8	7	6	7	1	8	1	1	1	1
123	1	7	7	7	5	4	2	6	1	2	1	2
124	1	8	8	8	8	8	2	8	1	1	1	2
125	1	8	7	7	7	4	2	6	1	2	2	2
126	1	8	7	5	5	4	2	6	1	1	1	1
127	1	5	7	7	7	3	2	7	1	2	1	2
128	1	8	7	7	7	7	2	8	1	1	1	2
129	1	4	4	7	7	2	2	6	2	2	1	2
130	1	9	9	9	8	4	2	9	1	1	1	2
131	1	6	6	8	7	7	2	6	1	1	1	2
132	1	8	9	8	9	9	2	9	1	1	1	2
133	1	7	8	7	8	7	2	8	1	1	1	2
134	1	7	7	7	7	4	2	6	1	1	1	2
135	1	4	6	6	8	4	1	6	2	2	2	1
136	1	7	5	5	6	4	2	5	1	2	2	1
137	1	8	4	4	4	8	1	4	2	2	2	1
138	1	8	7	7	7	4	2	6	1	2	1	2
139	1	6	3	6	6	3	2	4	2	2	2	2
140	1	8	7	8	8	8	2	8	1	1	1	2
1	2	5	3	4	4	2	2	4	2	2	1	1
2	2	7	6	6	5	4	2	5	2	2	2	3
3	2	5	5	6	5	4	2	4	1	2	2	3
4	2	7	7	7	7	4	2	6	2	2	2	2
5	2	8	3	5	4	7	1	4	1	2	2	3
6	2	5	7	6	6	7	2	7	1	1	1	2
7	2	8	4	4	4	3	2	4	2	2	2	3

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
8	2	5	6	7	7	4	1	7	1	2	1	2
9	2	8	6	6	5	4	2	4	2	2	2	1
10	2	8	8	8	8	8	2	8	1	1	1	2
11	2	7	3	4	5	3	1	3	2	2	2	3
12	2	4	6	7	5	6	2	6	1	2	2	2
13	2	4	8	8	8	8	2	8	1	1	1	2
14	2	7	6	8	6	4	2	7	1	1	1	2
15	2	7	7	7	6	7	1	8	1	1	1	2
16	2	6	6	6	6	6	2	6	1	1	1	2
17	2	6	6	6	5	4	2	5	2	2	2	2
18	2	7	4	5	3	3	1	4	2	2	2	1
19	2	8	8	8	8	7	2	7	1	1	1	1
20	2	3	7	6	6	3	1	3	2	2	2	1
21	2	7	6	6	7	6	2	6	2	2	2	1
22	2	8	4	5	5	2	2	2	2	2	2	2
23	2	4	3	4	5	3	2	3	2	2	2	1
24	2	8	7	6	6	6	2	6	1	1	1	1
25	2	7	2	4	3	4	1	2	2	2	2	1
26	2	5	2	5	5	2	2	5	2	2	2	1
27	2	5	2	4	2	2	1	2	2	2	2	1
28	2	6	6	7	6	3	2	4	2	2	2	2
29	2	7	7	6	6	6	2	7	1	1	1	2
30	2	7	6	6	8	2	1	3	2	2	2	1
31	2	6	1	1	1	4	1	1	2	2	2	1
32	2	2	2	3	2	2	2	2	2	2	2	1
33	2	4	7	6	6	5	1	6	1	1	1	2
34	2	5	4	4	5	8	1	4	2	2	2	1
35	2	7	7	8	7	4	2	6	2	2	1	2
36	2	6	6	7	6	3	2	4	2	2	2	2
37	2	7	7	8	7	6	1	6	2	2	2	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
38	2	5	5	6	6	4	1	5	2	2	2	1
39	2	4	6	7	6	3	2	6	2	2	2	2
40	2	4	3	4	5	2	2	3	2	2	2	3
41	2	5	4	5	5	3	2	5	2	2	2	1
42	2	5	8	8	8	3	2	.	2	2	2	2
43	2	6	6	5	5	2	2	3	2	2	2	1
44	2	7	7	7	7	7	2	7	1	1	1	2
45	2	5	4	5	5	3	2	3	2	2	2	2
46	2	7	4	4	5	4	2	4	2	2	2	1
47	2	6	7	7	7	5	2	7	1	1	1	2
48	2	4	5	6	5	1	2	2	2	2	2	3
49	2	7	6	7	6	2	2	3	2	2	2	2
50	2	3	5	5	5	6	2	4	2	2	2	2
51	2	8	8	8	8	6	1	8	1	2	2	2
52	2	9	4	4	4	3	1	3	2	2	2	1
53	2	7	4	4	3	2	2	2	2	2	2	1
54	2	4	2	3	3	2	2	2	2	2	2	1
55	2	8	8	8	5	8	1	8	1	1	1	2
56	2	9	8	8	8	2	2	2	2	2	2	2
57	2	6	5	5	4	5	2	4	2	2	2	1
58	2	5	3	5	5	3	2	3	2	2	2	1
59	2	6	4	2	2	7	2	5	2	2	1	1
60	2	8	7	4	4	9	2	7	1	1	1	3
61	2	5	4	5	3	5	2	4	1	2	2	1
62	2	5	7	7	6	7	2	7	1	2	2	2
63	2	6	6	6	6	6	2	6	2	2	1	1
64	2	5	6	8	8	5	1	6	1	1	1	2
65	2	8	2	2	2	8	1	2	2	2	1	1
66	2	9	7	6	6	8	2	7	1	1	1	2
67	2	6	6	6	6	4	2	5	2	2	2	3

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
68	2	6	5	6	4	3	1	3	2	2	2	1
69	2	7	4	3	3	3	1	3	2	2	2	1
70	2	7	5	5	4	4	1	4	2	2	2	2
71	2	3	4	4	3	1	1	1	2	2	2	3
72	2	4	3	3	5	2	2	3	2	2	2	1
73	2	5	3	4	5	3	2	3	2	2	2	1
74	2	7	7	4	5	4	1	6	2	2	1	1
75	2	8	6	7	6	5	2	6	2	2	1	2
76	2	4	3	4	3	2	1	4	2	2	1	1
77	2	7	7	6	5	7	2	7	1	1	1	2
78	2	8	7	8	6	4	2	7	1	2	1	2
79	2	5	6	6	4	4	2	6	1	1	1	2
80	2	7	6	6	5	4	1	5	2	2	2	1
81	2	7	3	6	5	3	1	3	2	2	2	2
82	2	8	8	8	8	8	2	8	1	1	1	2
83	2	5	6	5	4	6	1	6	1	2	2	1
84	2	7	7	8	7	7	1	7	1	1	1	2
85	2	4	4	6	4	2	2	3	2	2	2	1
86	2	4	3	7	6	3	2	3	2	2	2	2
87	2	6	4	5	5	6	2	3	2	2	2	1
88	2	5	4	7	4	4	2	4	2	2	2	2
89	2	8	7	7	5	5	1	7	1	1	1	2
90	2	6	6	5	4	5	2	6	2	2	2	2
91	2	7	7	7	6	7	1	7	1	2	2	2
92	2	5	8	7	8	6	2	7	1	1	1	2
93	2	8	7	8	8	8	1	7	1	1	1	2
94	2	7	6	6	7	7	2	6	1	2	2	3
95	2	4	4	7	6	2	2	6	2	2	2	1
96	2	7	4	7	2	4	1	3	2	2	2	2
97	2	7	4	4	5	6	2	5	1	2	2	3

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
98	2	5	7	6	5	7	2	6	1	1	1	2
99	2	8	2	3	3	2	2	2	2	2	2	1
100	2	5	4	4	4	3	2	4	2	2	2	1
101	2	7	7	7	7	8	2	7	1	1	1	1
102	2	8	9	9	7	7	2	9	1	1	1	2
103	2	8	7	8	7	7	2	8	1	1	1	2
104	2	7	6	7	6	7	2	7	1	1	1	2
105	2	5	5	6	4	6	2	5	2	2	1	1
106	2	7	7	7	5	7	1	7	1	1	1	2
107	2	5	7	7	7	6	2	6	1	1	1	2
108	2	8	9	8	8	6	2	8	1	1	1	2
109	2	6	5	5	7	5	2	4	2	1	1	1
110	2	5	4	6	6	2	2	2	2	2	2	2
111	2	6	7	7	7	2	2	7	2	2	2	2
112	2	6	1	5	5	1	2	2	2	2	2	1
113	2	8	7	7	4	4	1	6	1	2	2	2
114	2	6	7	4	6	6	1	4	2	2	2	.
115	2	4	3	3	2	1	1	3	2	2	2	1
116	2	6	3	5	5	6	1	3	2	2	2	2
117	2	6	3	3	3	4	1	3	2	2	2	1
118	2	8	8	8	8	8	1	8	1	1	1	2
119	2	6	4	6	5	4	1	4	1	2	1	2
120	2	4	6	6	5	2	1	4	2	2	2	1
121	2	6	6	8	4	4	2	6	1	2	2	2
122	2	8	7	7	7	6	2	7	1	1	1	1
123	2	7	7	7	5	4	2	5	1	2	2	2
124	2	8	8	8	7	8	1	7	1	1	1	2
125	2	8	8	8	7	4	2	7	1	1	1	2
126	2	8	6	5	5	3	1	4	2	2	2	1
127	2	5	7	7	7	4	2	7	1	2	1	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
128	2	8	7	7	4	7	2	4	2	2	2	2
129	2	5	3	3	3	3	1	3	2	2	2	1
130	2	9	1	1	1	1	2	1	2	2	2	1
131	2	8	7	8	7	6	2	7	1	2	1	2
132	2	8	6	4	4	4	2	4	2	2	2	1
133	2	8	7	6	4	6	1	6	1	2	2	1
134	2	8	6	6	4	4	1	4	2	2	2	1
135	2	4	3	3	4	4	2	4	2	2	2	1
136	2	8	4	3	5	2	1	3	2	2	2	3
137	2	5	8	7	7	8	2	8	2	1	1	2
138	2	7	6	7	6	7	2	6	1	2	1	2
139	2	5	4	5	4	3	2	4	2	2	2	1
140	2	8	4	8	8	6	1	5	1	2	2	2
1	3	5	6	6	6	4	2	6	1	1	1	2
2	3	6	5	5	6	3	2	3	2	2	2	3
3	3	5	5	7	5	3	2	7	1	1	1	2
4	3	7	8	8	8	7	2	8	1	1	1	2
5	3	9	8	8	5	9	2	8	1	1	1	2
6	3	6	7	8	7	9	2	9	1	1	1	2
7	3	8	4	5	6	3	2	5	1	2	1	2
8	3	7	8	7	6	4	2	7	1	2	1	2
9	3	8	7	7	7	6	2	6	1	2	2	2
10	3	8	8	8	8	8	2	8	1	1	1	2
11	3	6	6	6	6	5	2	6	1	1	1	2
12	3	4	6	6	5	4	2	4	2	2	2	2
13	3	6	7	4	5	8	1	6	1	2	2	3
14	3	8	8	9	8	8	2	8	1	1	1	2
15	3	5	6	7	5	8	1	7	1	1	1	2
16	3	5	5	5	5	5	1	5	1	1	1	2
17	3	5	6	6	5	4	2	5	2	2	2	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
18	3	6	6	5	6	6	2	4	2	2	2	2
19	3	8	8	8	8	8	2	8	1	1	1	1
20	3	7	7	6	7	6	1	6	1	2	2	1
21	3	7	8	8	7	8	2	8	1	2	1	2
22	3	8	5	6	4	2	2	3	2	2	2	2
23	3	6	4	4	5	4	2	4	2	2	2	1
24	3	7	7	7	7	8	2	8	1	1	1	2
25	3	7	6	6	4	4	1	6	1	2	2	1
26	3	5	6	6	6	7	2	7	1	2	1	2
27	3	5	6	6	5	5	2	6	1	2	2	2
28	3	6	4	4	4	3	2	4	2	2	2	3
29	3	7	6	6	6	7	2	7	1	1	1	2
30	3	9	5	3	7	1	.	2	2	2	2	1
31	3	6	4	4	4	1	1	4	2	2	2	1
32	3	4	4	6	6	3	2	4	2	2	2	2
33	3	4	6	7	4	4	1	5	1	1	1	2
34	3	6	6	5	5	7	1	5	1	2	2	1
35	3	8	7	8	8	8	2	8	1	1	1	2
36	3	6	6	6	7	3	1	4	2	2	2	2
37	3	8	9	8	7	9	2	9	1	1	1	2
38	3	5	7	7	6	5	2	6	1	2	2	2
39	3	4	3	3	2	3	1	3	2	2	2	1
40	3	6	8	8	8	4	2	7	1	1	1	2
41	3	5	6	6	6	6	2	6	1	2	1	2
42	3	5	6	6	5	3	2	4	2	2	2	2
43	3	6	7	6	6	5	2	6	2	2	2	2
44	3	7	7	7	6	7	2	7	1	1	1	2
45	3	5	6	6	6	4	2	6	1	1	1	2
46	3	5	7	7	5	8	2	8	1	1	1	2
47	3	5	7	7	6	4	1	6	1	1	1	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
48	3	4	6	5	5	3	2	4	2	2	2	2
49	3	6	2	4	3	2	1	2	2	2	2	3
50	3	6	8	7	7	6	2	7	1	1	1	2
51	3	8	3	3	2	3	1	2	2	2	2	3
52	3	9	1	1	1	1	1	1	2	2	2	3
53	3	7	6	6	5	4	2	4	1	2	2	2
54	3	5	4	5	4	3	2	4	2	2	2	2
55	3	8	8	8	5	6	1	7	2	2	2	2
56	3	9	6	6	4	1	2	1	2	2	2	2
57	3	7	6	6	4	5	1	4	2	2	2	1
58	3	6	5	6	7	3	1	5	2	2	2	2
59	3	8	6	4	7	6	1	7	1	1	1	2
60	3	8	8	8	6	8	1	8	1	1	1	2
61	3	5	6	6	5	7	2	6	1	1	1	2
62	3	5	7	7	6	7	2	7	1	2	2	2
63	3	7	7	7	7	7	2	7	1	1	1	2
64	3	6	7	5	5	6	2	5	1	1	1	3
65	3	9	7	7	5	6	1	6	1	2	1	2
66	3	7	4	4	6	6	1	5	2	2	2	1
67	3	6	7	8	7	8	2	7	1	1	1	2
68	3	4	7	7	7	8	1	7	1	1	1	2
69	3	7	7	7	6	6	2	7	1	1	1	2
70	3	7	6	6	6	5	2	5	1	2	1	2
71	3	4	4	4	3	1	1	1	2	2	2	1
72	3	7	5	7	5	4	2	5	2	2	2	2
73	3	7	6	6	6	4	1	4	2	2	2	2
74	3	8	7	7	7	7	1	7	1	1	1	2
75	3	7	6	7	7	5	2	5	2	2	1	2
76	3	6	5	6	4	5	2	4	.	2	1	1
77	3	7	4	5	4	5	1	4	2	2	2	1

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
78	3	8	8	8	7	8	2	8	1	1	1	2
79	3	8	8	8	8	5	2	8	1	1	1	2
80	3	6	7	6	6	4	2	6	1	1	1	1
81	3	7	3	5	5	3	1	3	2	2	2	3
82	3	8	8	8	8	7	2	8	1	1	1	2
83	3	5	7	7	5	8	2	7	1	2	2	1
84	3	7	7	8	6	6	1	7	1	1	1	2
85	3	8	3	7	7	1	1	2	2	2	2	2
86	3	4	4	6	4	4	1	4	2	2	2	2
87	3	6	7	7	5	7	2	5	1	2	2	1
88	3	5	6	7	7	6	2	7	1	2	1	2
89	3	4	3	6	4	6	1	6	2	2	2	1
90	3	7	7	7	7	7	2	7	1	1	1	2
91	3	4	3	3	4	2	1	2	2	2	2	3
92	3	4	6	7	6	4	1	6	2	2	1	2
93	3	8	7	7	7	2	1	6	2	2	1	2
94	3	7	4	6	6	6	2	5	1	2	2	2
95	3	6	6	6	6	3	2	4	2	2	2	2
96	3	7	7	7	5	7	1	6	1	2	1	2
97	3	6	7	7	6	6	2	7	1	1	1	2
98	3	8	8	7	6	7	2	8	1	1	1	2
99	3	7	3	3	3	3	2	3	2	2	2	1
100	3	4	4	6	4	4	2	4	2	2	2	2
101	3	8	7	6	6	7	2	7	2	2	2	3
102	3	9	7	4	6	4	1	4	2	2	2	1
103	3	7	8	8	8	8	2	8	1	1	1	2
104	3	4	4	4	4	6	1	4	2	2	1	1
105	3	6	6	4	4	3	2	4	2	2	1	1
106	3	7	7	7	5	7	1	7	1	1	1	2
107	3	5	6	4	6	4	2	6	1	1	1	3

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
108	3	9	8	9	9	9	2	9	1	1	1	2
109	3	6	6	4	5	6	2	5	1	1	1	1
110	3	5	4	5	5	1	2	1	2	2	2	2
111	3	7	7	8	6	2	1	3	2	2	1	2
112	3	6	4	4	3	1	2	3	2	2	2	1
113	3	8	6	6	5	4	1	4	1	2	2	2
114	3	7	7	7	7	7	2	7	1	2	1	3
115	3	3	3	3	3	1	1	2	2	2	2	1
116	3	6	7	7	6	7	2	7	1	1	1	2
117	3	5	7	6	5	6	1	6	1	1	1	2
118	3	8	8	8	8	8	1	8	1	1	1	2
119	3	7	8	8	6	7	2	8	1	1	1	2
120	3	6	6	5	6	4	1	6	1	2	2	1
121	3	6	6	5	4	4	2	5	2	2	2	2
122	3	8	8	6	8	8	2	8	1	1	1	2
123	3	7	7	7	5	5	2	6	1	2	2	2
124	3	8	3	2	2	2	1	3	2	2	2	3
125	3	8	4	6	4	3	1	3	2	2	2	1
126	3	8	5	4	5	4	2	4	2	2	2	1
127	3	5	6	7	6	2	2	4	1	2	2	1
128	3	8	7	7	6	7	2	7	1	1	1	2
129	3	6	6	3	3	3	1	3	2	2	2	1
130	3	9	6	8	3	9	2	7	2	2	2	2
131	3	7	8	8	4	6	1	6	2	2	2	2
132	3	8	7	7	6	6	2	6	1	2	1	3
133	3	7	7	7	5	7	2	7	1	2	1	1
134	3	6	7	7	7	3	1	4	2	2	2	2
135	3	4	7	3	4	7	2	4	2	2	2	1
136	3	7	6	8	5	3	1	6	1	2	2	2
137	3	8	3	3	2	7	1	4	2	2	2	.

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
138	3	7	7	7	6	7	2	6	1	2	1	2
139	3	5	5	6	7	4	2	4	2	2	2	2
140	3	8	8	8	8	8	2	8	1	1	1	2
1	4	5	5	6	4	4	2	5	1	2	1	2
2	4	6	6	5	6	6	2	6	1	2	1	2
3	4	8	7	4	7	3	2	2	1	2	2	3
4	4	7	7	7	7	5	2	6	1	2	2	2
5	4	8	7	4	5	6	2	7	1	2	1	3
6	4	6	7	7	7	7	2	7	1	1	1	2
7	4	8	4	5	5	3	2	5	1	2	1	2
8	4	4	4	3	4	6	1	3	2	2	1	3
9	4	8	8	8	7	6	2	5	2	2	2	2
10	4	8	8	8	8	8	2	8	1	1	1	2
11	4	6	6	6	6	5	2	6	1	1	1	2
12	4	3	5	5	5	3	2	4	2	2	2	2
13	4	4	4	3	5	4	1	4	1	2	2	3
14	4	8	8	8	8	8	2	9	1	1	1	2
15	4	8	7	7	6	7	1	7	1	1	1	2
16	4	5	4	4	4	3	1	4	2	2	1	1
17	4	6	6	6	5	4	2	5	2	2	2	2
18	4	6	6	6	6	6	2	6	1	2	2	2
19	4	8	7	7	7	7	2	7	1	1	1	1
20	4	6	7	4	3	3	1	6	2	2	2	1
21	4	8	8	8	8	8	2	9	1	1	1	2
22	4	8	5	4	3	2	1	3	2	2	2	1
23	4	6	3	3	3	3	1	3	2	2	2	1
24	4	8	7	7	7	7	2	7	1	1	1	2
25	4	7	3	6	4	2	1	3	2	2	2	2
26	4	5	7	6	5	6	2	6	1	2	1	2
27	4	7	5	6	5	5	2	5	1	2	2	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
28	4	6	6	6	6	4	2	4	2	2	2	2
29	4	7	5	4	4	7	2	5	2	2	2	3
30	4	8	8	8	8	6	2	8	1	1	1	2
31	4	6	4	4	4	1	1	4	2	2	2	1
32	4	4	6	7	7	3	2	4	2	2	2	2
33	4	7	5	6	4	4	1	4	2	2	1	2
34	4	7	7	8	6	8	2	7	1	1	1	2
35	4	8	7	8	8	2	2	3	2	2	2	2
36	4	6	5	7	8	3	1	6	2	2	2	2
37	4	7	8	8	7	6	1	7	1	2	1	2
38	4	5	7	7	7	5	2	6	1	2	2	2
39	4	4	3	4	3	4	1	3	2	2	2	1
40	4	8	7	5	5	1	1	3	2	2	2	1
41	4	6	5	6	6	4	2	6	1	2	1	2
42	4	5	7	7	7	4	1	4	2	2	2	2
43	4	8	8	8	8	8	2	8	1	1	1	2
44	4	8	8	8	8	8	2	8	1	1	1	2
45	4	5	6	5	5	4	2	5	1	2	2	2
46	4	8	7	7	5	4	2	5	1	1	1	2
47	4	6	7	7	7	5	2	7	1	1	1	2
48	4	3	6	6	4	3	2	5	2	2	2	2
49	4	5	3	4	4	3	1	3	2	2	2	3
50	4	5	5	6	5	4	2	5	1	2	2	2
51	4	8	3	3	2	2	1	2	2	2	2	3
52	4	9	3	3	4	2	1	4	2	2	1	2
53	4	6	4	5	4	4	2	4	1	2	2	2
54	4	4	3	4	5	2	2	3	2	2	2	1
55	4	8	4	7	5	4	1	4	2	2	2	2
56	4	9	6	4	2	1	2	1	2	2	2	1
57	4	7	7	6	5	6	2	6	1	2	2	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
58	4	5	6	6	6	5	1	5	1	2	2	2
59	4	6	6	7	4	4	2	4	1	1	2	2
60	4	8	7	7	4	7	1	7	1	1	1	1
61	4	5	8	7	5	7	2	7	1	1	1	2
62	4	5	6	6	6	6	2	6	1	2	2	2
63	4	7	7	7	6	7	2	7	1	1	1	2
64	4	5	5	4	5	7	1	5	1	1	1	3
65	4	9	7	7	5	.	1	6	1	2	1	1
66	4	8	6	6	6	5	2	6	1	1	1	2
67	4	8	8	7	7	6	1	7	2	2	1	2
68	4	6	7	8	7	8	2	8	1	1	1	2
69	4	7	6	3	6	6	2	7	1	1	1	1
70	4	7	6	7	5	6	2	6	1	2	1	2
71	4	4	1	4	3	1	1	1	2	2	2	1
72	4	7	5	5	5	5	2	5	2	2	2	1
73	4	4	4	6	5	2	1	4	2	2	2	2
74	4	8	8	8	6	7	2	8	1	1	1	2
75	4	7	7	7	6	6	2	7	1	2	1	2
76	4	8	8	7	6	7	2	8	1	1	1	2
77	4	6	6	8	6	5	2	7	1	2	1	2
78	4	8	7	8	4	8	2	7	1	2	1	2
79	4	5	7	7	5	5	2	7	1	1	1	2
80	4	6	6	6	5	4	2	6	1	1	1	1
81	4	7	2	4	5	3	1	3	2	2	2	3
82	4	8	7	7	8	7	2	7	1	1	1	2
83	4	6	7	7	5	6	2	7	1	1	1	2
84	4	8	8	8	7	7	1	8	1	1	1	2
85	4	6	3	7	7	2	1	2	2	2	2	2
86	4	4	4	4	4	4	1	4	2	2	2	3
87	4	7	4	6	5	7	2	4	2	2	2	1

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
88	4	7	7	7	7	8	2	7	1	2	1	2
89	4	8	7	4	4	5	1	7	2	2	2	1
90	4	8	8	7	7	8	2	8	1	1	1	2
91	4	4	6	7	7	5	2	7	1	2	2	2
92	4	8	7	7	8	4	1	6	1	2	1	2
93	4	6	6	6	2	1	1	3	2	2	2	1
94	4	5	3	6	5	3	1	4	1	2	2	2
95	4	6	6	7	6	3	2	4	1	2	2	2
96	4	8	8	7	6	8	1	8	1	1	1	2
97	4	7	7	7	7	7	2	7	1	1	1	2
98	4	8	8	7	7	8	2	9	1	1	1	2
99	4	8	7	7	7	7	2	7	2	2	2	1
100	4	6	6	6	6	4	2	6	1	2	2	2
101	4	8	7	8	8	8	2	8	1	1	1	2
102	4	9	9	9	6	9	2	9	1	1	1	2
103	4	8	8	7	8	8	2	8	1	1	1	3
104	4	6	5	4	4	7	2	6	1	2	1	1
105	4	6	3	6	4	4	2	6	1	1	1	2
106	4	6	6	6	5	5	1	6	1	2	1	2
107	4	3	4	5	5	5	1	5	2	2	1	3
108	4	9	7	.	6	7	2	7	1	2	1	2
109	4	6	5	8	8	4	2	6	1	1	1	2
110	4	5	6	6	6	2	2	3	2	2	2	2
111	4	4	1	1	1	1	1	1	2	2	2	.
112	4	6	1	2	2	1	1	1	2	2	2	1
113	4	8	5	6	6	4	2	6	1	2	1	2
114	4	8	8	8	7	8	2	8	1	1	1	2
115	4	5	2	3	3	1	1	2	2	2	2	1
116	4	6	6	7	6	6	1	6	2	2	2	2
117	4	7	7	8	5	4	2	8	1	1	1	2

Panelist	Form	Appear	Flavor	Sweet	Sour	Texture	Bitter	Liking	Accept	Buy	BuySoy	Sweet2
118	4	8	8	8	9	7	1	8	1	1	1	2
119	4	8	8	8	8	7	2	8	1	1	1	2
120	4	6	6	6	6	4	2	6	1	2	2	2
121	4	7	8	7	7	7	2	7	1	1	2	2
122	4	8	8	8	8	8	2	8	1	1	1	2
123	4	7	6	6	5	3	2	6	1	2	2	2
124	4	8	9	9	9	9	2	9	1	1	1	2
125	4	8	8	8	8	6	2	8	1	1	1	2
126	4	8	5	4	4	3	1	3	2	2	2	1
127	4	5	7	7	7	3	2	7	1	2	1	2
128	4	8	7	7	7	7	2	7	1	1	1	2
129	4	4	7	7	7	4	2	7	1	1	1	2
130	4	9	9	6	5	3	2	7	1	1	1	2
131	4	4	6	7	4	4	2	4	2	2	1	2
132	4	8	8	6	7	7	2	7	1	1	1	3
133	4	9	7	7	4	7	2	7	1	1	1	2
134	4	7	5	5	4	3	1	3	2	2	2	1
135	4	6	6	6	4	6	2	6	2	2	2	1
136	4	8	7	8	7	4	2	7	1	2	1	2
137	4	6	4	4	3	7	1	4	2	2	2	1
138	4	7	7	7	7	7	2	7	1	1	1	2
139	4	5	4	4	4	4	2	3	2	2	2	1
140	4	8	8	8	8	6	2	6	1	2	1	2

VITA

Jonathan Walker was born on August 13, 1974 in Fayetteville, North Carolina. He moved to Clinton, Louisiana, in 1977. In May 2000 he graduated from Louisiana State University and Agricultural and Mechanical College with a Bachelor of Science degree in dietetics. Upon receiving his bachelor's degree he joined the graduate school at Louisiana State University and Agricultural and Mechanical College in the Department of food science in fall of 2000. He is a candidate for the degree of Master of Science in Food Science in December 2002. After receiving his degree he is moving to Tampa, Florida, to seek employment.