THE SENSORY EVALUATION OF THE MEAL ON THE GO^{tm} FOOD BAR SUPPLEMENTED WITH VITAMINS AND MINERALS OR CORN BRAN

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GLOSSARY

15%VM	15% vitamin/mineral bar
20%VM	20% vitamin/mineral bar
25%VM	25% vitamin/mineral bar
ACCEPT	Acceptance
Adsorption:	"Adherence of atoms, ions, or molecules of a gas or liquid to the surface of another substance, called adsorbent." (Hawley, 1981).
Aerobic Degradation:	A decomposition process which needs air or oxygen (Hawley, 1981).
Amylase:	An enzyme that breaks down starch to sugars (Hawley, 1981).
Arabinose:	A saccharide known as gum sugar contained in vegetable gums (Hawley, 1981).
Bile Acids:	Excreted by the liver, they are steroids found bond to other molecules whose detergent action assists in the absorption of fats (Hawley, 1981).
CB	Corn Bran Bar
Cholesterol:	A sterol which is a precursor to bile acids, steroid hormones, and provitamin D_3 (Hawley, 1981).
Chymotrypsin:	Enzyme that breaks down protein (Hawley, 1981).
CTEXT	Easy to chew texture
Dietary Fiber:	Components of plants, commonly found in the cell wall, which are indigestible in the presence of mammalian digestive enzymes (Kay, 1982).
DRY	Dryness

Enrichment:	The nutrient supplementation of foods with the selection and amount of nutrients legally regulated by a standard of identity (Bender, 1982).
Fatty Acids:	Carboxlic acids classified among lipids containing 4 - 22 carbon atoms produced by animals or vegetables and found in animal or vegetable fats or oils (Hawley, 1981).
Fortification:	Addition of nutrients above the indigenous level to foods without reference to a legal standard (Bender, 1982).
Fucose:	A monosaccharide contained in several mucopolysaccharides, mucoproteins, and blood group polysaccharides (Dorland's, 1974).
Galactose:	One of the monosaccharides in lactose, milk sugar (Hawley, 1981).
HTEXT	Hard/gummy texture
Lipase:	Enzymes that breaks down fats into glycerol and fatty acids (Hawley, 1981).
Minerals:	Inorganic homogeneous substances commonly a component of the earth's crust (Dorland's, 1974).
MOGB	Meal On The Go^{tm} food bar
Monoolein:	A glycerol molecule with one fatty acid (Hawley, 1981).
Nutrification:	The enrichment of low nutrient dense foods to a level at which they can substitute for meal or a food (Freeman-Graves & Peckham, 1987).
Provesteen-T:	A dried torula yeast grown on a sucrose substrate produced by the Provesta Corporation (Provesta, 1986).
Racemic:	Conversion of an optically active compound into as optically inactive form, in which half of the optically active substance becomes its mirror-image (Hawley, 1981).

Restoration:	Replenishing nutrients destroyed or lost during processing (Freeman-Graves & Peckham, 1987).
Rhamnose:	A monosaccharide contained in many plants (Hawley, 1981).
Sequestration:	"The formation of a coordination complex by certain phosphate with metallic ions in solution so that the usual precipitation reactions of the latter are prevented. The term sequestration may be used for any instance in which an ion is prevented from exhibiting its usual properties due to close combination with an added material." (Hawley, 1981)
Steroids:	Classified as lipids, steroids include cholesterol, some hormones, some vitamin precursors, bile acids, sterols, and some drugs and poisons (Hawley, 1981).
SWEET	Sweetness
Trypsin:	An enzyme that breaks down protein(Hawley, 1981).
VM BAR	Vitamin/mineral bar
Vitamins:	Organic substances occurring naturally in foods, essential to the metabolic activities of the human body (Dorland's, 1974).
VMFLAV	Vitamin/mineral flavor
VMODOR	Vitamin/mineral odor
Xylose:	Wood sugar (Hawley, 1981).
Yellow Dent Corn:	Dent corn is one of the six classifications of corn. It is descriptively named due to the dent on the top of the kernel which occurs when the starches of the kernel shrink unevenly during drying (Ensminger, Ensminger, Konlande, & Robson, 1983).

CHAPTER I

THE SENSORY EVALUATION OF THE MEAL ON THE GO^{tm} FOOD BAR SUPPLEMENTED WITH VITAMINS AND MINERALS OR CORN BRAN

Introduction

The main conclusion of the Surgeon General's Report on Nutrition and Health is "over consumption of certain dietary components is now a major concern for Americans (U.S. Department of Health and Human Services [DHHS], 1988). Heart diseases, cancers, strokes, diabetes mellitus, and atherosclerosis ranked first, second, third, seventh, and tenth, respectively, among the leading causes of mortality in the United States during 1987 (National Center for Health Statistics [NCHS], 1988). Risk factors for these diseases include "dietary excesses or imbalance" (DHHS, 1988).

Many of the snacks available to the general public are high in fat and simple carbohydrates, but low in fiber and vitamins. Examples from the Pendleton and Church (1985) nutrient data base include fried chips, doughnuts, cookies, and candy bars. Nutritious snack selections as well as healthy meal choices are among the vital components to promotion of health and prevention of disease (Thomas &

Call, 1973).

The Meal On The Go^{tm} food bar is a nutritious, high-fiber bar developed as a light meal or a nutritious snack alternative (Provesta, 1989). It was formulated by researchers in the Department of Food, Nutrition and Institution Administration, College of Home Economics, Oklahoma State University, Stillwater, Oklahoma.

In consumer preference studies among 347 independently living elderly, the bar was highly acceptable as a meal substitution (Knight, 1986). During development of this bar, emphasis was placed on the protein quantity and quality and varying the fiber sources and amounts, but the vitamin and mineral contents were limited to those naturally present in the ingredients (Provesta, 1989). Therefore, as a light meal replacement, it falls short of 1/3 of the recommended levels of most nutrients, including fiber. The American Dietetic Association [ADA] (1988), in its position paper on dietary fiber, recommended that the American diet include 20 to 35gm of fiber daily. Manufactures are increasing the fiber content of many foods to help people reach this amount. Although, the Meal On The Go^{tm} food bar furnishes a respectable 7.0gm of mixed dietary fiber, it still only has 20% of the amount recommended for daily consumption (Provesta, 1989).

Purpose and Objectives

The purpose of this study was to:

(1) Increase the minimum vitamin and mineral content of the Meal On The Go^{tm} food bar to three levels 15%, 20%, 25% of the U.S.RDA for vitamins: ascorbic acid (vitamin C), niacin (vitamin B2), pyridoxine (vitamin B6), riboflavin (vitamin B3), thiamine (vitamin B1), vitamin B12, vitamin A, folic acid, vitamin D, pantothenic acid, and biotin; and for minerals: copper, iron, iodine, and zinc; and to conduct sensory evaluations of the fortified bars.

(2) Increase the dietary fiber content of the food bar to 9gm., and to conduct sensory evaluations of the fiber-increased bar.

(3) To test for differences between the sensory evaluation rating of the male and female panelists.

(4) To test the effect of vitamin and mineral self-dosing on the sensory evaluation ratings.

(5) To test the effect of bar age (two to six days after production) on the sensory evaluation ratings.

Assumptions

The author assumes the following:

(1) That the panelists will use their sensory evaluation skills developed during training to assess the sensory attributes of the products and the data generated will reflect the perceptions, attributes, and experiences of the panelists.

(2) Sensory evaluation generates data that helps determine the attributes and acceptability of improved food products.

Limitations

Any vitamin and mineral losses due to preparation were not accounted for.

Only one source of added fiber (coarse grain corn bran) was added.

The test sample was limited to 26 panelists.

Hypotheses

The following hypotheses were postulated for this research:

H_1: There will be no difference between the control bar and the vitamin and mineral fortified bars at any of the fortification levels (15%, 20%, 25% of the U.S.RDA) for any of these characteristics: flavor, odor, taste, texture, moisture, and acceptability.

H_2: There will be no difference between the control and the corn bran bar for any of these selected characteristics: flavor, odor, taste, texture, moisture, and acceptability.

H_3: There will be no difference between the sensory ratings of the male panelists and the female panelists.

H_4: There will be no differences among the sensory evaluation scores due to bar age (two to six days after

H_4: There will be no differences among the sensory evaluation scores due to bar age (two to six days after production).

H_5: There will be no difference between panelists identified as taking vitamin and mineral supplements and those not taking vitamin and mineral supplements.

Format of Thesis

The study discussed in Chapter III was outlined and written for publication according to the Publication Manual of the American Psychological Association. The literature citations referenced in Chapter III will also be cited in the Selected Bibliography.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to determine the sensory characteristics and acceptance of the Meal On The Go^{tm} food bar fortified with vitamins and minerals at three levels or supplemented with corn bran. This literature review contains information on dietary fibers, and specifically corn bran: its processing, digestion, and sensory qualities. Since the samples are analyzed by sensory evaluation, its use as a research tool is discussed. In addition, vitamin and mineral supplementation in the United States, stability of vitamin supplements, and bioavailability of synthetic vitamins are reviewed.

Dietary Fiber

Fiber, once neglected in the Western diet, is now of great concern due to possible links with the etiology of several diseases (Burkitt 1973). Diabetes, hyperproteinemia, hemorrhoids, diverticulosis, and colon cancer (Burkitt, 1973) may, in-part, be brought about by a lack of dietary fiber. Also, constipation is associated with inadequate intakes of dietary fiber (Graham, Moser & Estes, 1982).

A typical American diet contains approximately 20gm or less of dietary fiber; this figure is generally greater among vegetarians who may daily eat 40gm or more. However, the diets of most Americans sharply contrast with the nutriment of many African peoples who consume an estimated 150gm of dietary fiber every 24 hours. They have significantly reduced occurrences of those diseases related to poor dietary fiber intake (Eastwood & Passmore, 1983; Spiller, 1986). As a disease prevention measure, several American health-related professional groups recommend increased dietary fiber consumption (Table I) (Kellogg Company, 1986). Dietary fiber, also known as roughage, is defined as components of plants, commonly found in the cell wall, which are indigestible in the presence of mammalian digestive enzymes (Kay, 1982).

Classification of Dietary Fibers

Dietary fibers, based on their cellular functions, are generally subdivided into three categories: structural polysaccharides, structural non-polysaccharides, and non-structural polysaccharides. Structural polysaccharides include hemicellulose, cellulose, and pectins. Structural non-polysaccharides are primarily lignins (Schneeman, 1986); only traces of lignins are found in the immature plant cell wall but it is close to 17% of the mature plant cell wall (Siegal, 1968). Non-structural polysaccharides are gums and mucilages (Schneeman, 1986) such as carrageenan and agar

TABLE I

DIETARY FIBER RECOMMENDATIONS BY HEALTH AND PROFESSIONAL GROUPS

American Diabetes Association/American Dietetic Association: 1979	An increase in carbohydrate intake is recommended, preferably a complex carbohydrate (starch associated with fiber)
National Academy of Sciences: 1982	Eat whole-grain cereal products, fruits and vegetables daily
American Institute of Cancer Research: 1983	Increase the consumption of whole-grain cereals, fruits and vegetables
American Cancer Society: 1984	Eat more high-fiber foods such as fruits, vegetables and whole grain cereals
National Cancer Institute: 1984	Recommends foods which provide 25-35 grams of fiber daily
United States Department of Agriculture/Department of Health and Human Services: 1985	Eat foods with adequate starch and fiber

Kellogg, 1986

(Hawley, 1981) Dietary fibers are also subdivided into classifications which emphasize their solubility: insoluble (lignin, cellulose, and hemicellulose); and soluble (pectin and gums) (Anderson, Medley & Wedman, 1979).

Structural Fibers

Cereals and vegetables are major food sources of hemicellulose; whole wheat grains and mature vegetables are our primary food sources of cellulose and lignin (Anderson, 1985). Hemicellulose is composed of glucose, galactose, mannose, and xylose molecules within its main chain; and arabinose, galactose, and glucoronic acid molecules form its side chains (Schneeman, 1986). Characteristics of hemicellulose include its ability to absorb water leading to increased stool weight (McConnell, Eastwood & Mitchell, 1974) and the physiological effect of reduced intestinal transit time (Cummings, Southgate, Branch, Houston, Jenkins & James, 1978; Anderson, 1985).

Cellulose, of which cereals and vegetables are food sources (Anderson, 1985), is composed of glucose molecules with beta 1,4 linkages (Schneeman, 1986). It is relatively insoluble (Schneeman, 1986); however, it absorbs water and thus increases fecal weight (Kelsay, 1978) and increases stool volume (Eastwood, Kirkpatrick, Mitchell, Bone & Hamilton, 1973). Cellulose is associated with depressed pancreatic enzyme activity (in vitro) (Dunaif & Schneeman, 1981) and with negative calcium and magnesium balances (Ismail-Beigi, Reinhold, Faradji & Adabi, 1977; Slavin & Marlett, 1980). Also, it increases fecal bile acid excretion (Shurpalekar, Doraiswamy, Sundaravalli & Narayana Rao, 1971).

Pectins, food sources of which are primarily fruits and vegetables, are composed of galacturonic acid molecules in the main chain, and rhamnose, arabinose, xylose, fucose, and galactose molecules in the side chains. Pectins are degraded by bacteria, and have water-holding/gel forming capabilities. They sequester bile acids thus effecting the excretion of fecal bile acid and steroid (Schneeman, 1986), which is associated with the pectins' hypocholesterolemia capabilities (Hill, 1982). The gel system formed by pectins, possibly by entrapment, limits the intestinal absorption of steroids, fats, and amino acids (Hill, 1982). Pectins are also associated with: slow gastric emptying (Schneeman, 1986; Holt, Heading, Carter, Prescott & Tothill, 1979; Leeds, 1982); enhancement of human pancreatic enzyme activity (Dunaif & Schneeman, 1981); and lowering effects on postprandial glycemia (Schneeman, 1986); Jenkins, Leeds, Gassull, Wolever, Goff, Alberti & Hockaday, 1976).

Lignin is a structural fiber, but not a polysaccharide. Food sources of lignin include mature wheat and mature vegetables. It is composed of sinapyl, coniferyl, and p-coumary alcohols (Schneeman, 1986). The physical characteristics of lignin include insolubility (Anderson, 1985), aerobic degradation, and limiting effects on cell wall fermentation (Cummings, 1982), absorption of bile salts (Schneeman, 1986), and anion binding properties (in vitro) (Hill, 1982). Lignin sequesters bile salts, lecithin, cholesterol, monoolein, and fatty acids (Vahouny, Tombes,

Cassidy, Kritchevsky & Gallo, 1980).

Non-structural polysaccharides

These include gums and mucilages and are contained in cell wall secretions (Schneeman, 1986). Food sources of gums include legumes, oats, and barley (Anderson, 1985). The main chains of gums are composed of galactose, glucuronic acid-mannose, and galacturonic acid-rhamnose molecules; side chains contain zylose, fucose, and galactose. The characteristics of gums include reduction of serum cholesterol levels (Anderson, 1985; Jenkins, Reynolds, Slavin, Leeds, Jenkins & Jepson, 1980), slowed glucose absorption (Anderson, 1985; Jenkins, Reynolds, Slavin, Leeds, Jenkins & Jepson, 1980) thickening of duodenal fluid (Schneeman, 1982), and slowed gastric emptying (Anderson, 1985; Holt, Heading, Carter, Prescott & Tothill, 1979). Gums increase fecal excretion rates of some steroids, fats, and amino acids possibly by entrapping nutrients effecting greater fecal losses (Hill, 1982). Guar gum is capable of sequestering bile salts, lecithin, cholesterol, monoolien, and fatty acids (Vahouny, Tombes, Cassidy, Kritchevsky & Gallo, 1980).

Food sources of mucilages include the sea weeds, carrageenan and agar (Hawley, 1981). They are constructed with galactose-mannose, glucose-mannose, arabinose-xylose, and galacturonic acid-rhamnose in the main chains, and galactose in the side chains. Physical properties include

bacterial degradation and water-holding capability (Schneeman, 1986).

Corn Bran

Corn bran looks like light brown granules with a corn odor and mild corn flavor. In food products, corn bran contributes to texture, flavor, water absorption, fat absorption, and dietary fiber content (Vetter, 1984). It also contributes to the functional properties of increased fiber with minimal increases in caloric content, and a water-holding capacity of, generally, 2.4 : 1 (Burge & Duensing, 1989). This portion of the literature review will cover dry milling processing of corn bran, its sensory characteristics, the effects of digestion on corn bran, and the effects of corn bran on the plasma components.

Dry Milling Process of Corn Bran

The corn bran for this study is produced by the Lauhoff Grain Company using a dry milling process. Commonly, the production starts with shelled U. S. No. 2 yellow dent corn. First, the corn is cleaned; second, it is tempered until the moisture content is greater than 20%; and third, the corn is placed into a degerminator to separate it into bran, germ, and endosperm. Further milling is required to produce grits, meal, flour, and bran. Additional processing (i.e. direct pressure or hexane extraction) is needed to recover crude corn oil. The corn bran isolated by this process is

low in moisture, protein, oil, and ash content; it is over 80% total dietary fiber and is primarily cellulose and hemicellulose (Table II) (Burge & Duensing, 1989).

TABLE II

ANALYSIS OF CORN BRAN

Composition	%
Cellulose	18
Hemicellulose	67
Lignin	<2
Pectins	<1
Gums	<1
Total dietary fiber	88

Burge & Duensing, 1989

Effects of Digestion on Corn Bran

Several workers have investigated the effects of the digestive process on corn bran. Dintzis, Watson, and Sandstead's (1985) results indicate that corn bran may associate with important nutrients. Significantly higher levels of copper, zinc, iron, and calcium are retrievable from corn bran after digestion than before ingestion. Over ten times the quantity of calcium associated with the corn bran prior to ingestion is retrievable from fecal matter.

Further, corn bran is largely unaffected by digestive

enzymes. Dintzis, Legg, Deathrage, Baker, Iglett, Jacob, Reck, Munoz, Klevay, Sandstead, and Shuey (1979) find that at least 90% of corn bran is recovered from the small intestines and the colon; the integrity of the corn bran is maintained to a large extent. Fleming, Marthinsen, and Kuhnlein (1983) report that corn bran increases fecal output, fecal water output, and frequency compared to the basal diet and the fiber-free diet. They also report increases in excretion of volatile fatty acids with the corn bran, primarily acetic acid. Inversely, flatus quantity of hydrogen, carbon dioxide, and methane is negligible for corn bran; accordingly, Fleming et al. (1983) also state that gas production by means of fermentation is not an outcome of consuming corn bran. Hanson and Winterfelt (1985) measured breath hydrogen concentration as a measure of colonic fermentation. They report a low breath hydrogen level with the corn bran diet which confirms Flemings et al.'s (1983) findings that corn bran is not fermented in the colon. Hanson and Winterfelt further report that corn bran speeds intestinal transit time. Since the main fiber fractions of corn bran are insoluble, it has limited effects on glucose or plasma lipids. Mahalko, Sandstead, Johnson, Inman, Milne, Warner, and Haunz (1984) find that corn bran has no effect on plasma and urinary glucose, glycosylated hemoglobin, or plasma lipid values at a level of 25gm per day in the diet.

Sensory Evaluation of Corn Bran Products

Several researchers have investigated the sensory attributes of products supplemented with corn bran. Polizzoto, Tinsley, Weber, and Berry (1983) report that muffins made with corn bran are significantly more acceptable than muffins made with alpha-cellulose, soy bran, rice bran, and oat hulls; however, they are significantly less acceptable than muffins made with wheat bran. This order of acceptability, though not always significant, is repeated for the other characteristics studied: flavor, mouth feel, texture, appearance, aroma, and color. Shafer and Zabik (1978) report that cakes made with a 30% corn bran substitution for flour had the greatest volume when compared to with various fiber sources: wheat brans, soy brans, and oat brans. Though the flavor, primarily due to the corn taste, of the corn bran cake was rated less acceptable than those cakes made with wheat products, sensory scores increased as the panelists became familiar with the corn bran.

Sensory Evaluation as a Research Tool

The art of sensory discrimination is as old as man, but the science of sensory evaluation is relatively new. During the 1940's and mid-1950's, U.S. Army Quartermaster Food and Container Institute research projects stimulated interest in sensory evaluation while investigating food acceptance

within the armed forces. Initially, the food industry employed experts (e.g. brewers and flavorist) to evaluate the sensory qualities of products (Stone & Sidel, 1985). Now, sensory evaluationists assist the food industry in product development as well as evaluation.

Sensory evaluation is defined as "a scientific discipline used to evoke, measure, analyze, and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of sight, smell, taste, touch, and hearing" (Institute of Food Technologists [IFT], 1981). Its broad application base makes sensory evaluation a useful tool for new product development, product matching, product improvement, process change, cost reduction, selection of new sources of supply, storage stability, product grading or rating, consumer acceptance, consumer opinions, consumer preference, panelist selection and training, and correlation of sensory with chemical and physical measurements. These research objectives direct the selection of sensory evaluation tests (IFT, 1981).

Sensory Evaluation Tests

Sensory evaluation tests are subdivided into analytical tests and affective tests. Analytical tests are used to identify and describe differences among sensory attributes and to study detectable levels of variance among samples. Affective tests are preference tests and acceptance tests (IFT 1981). Amerine, Pangborn, and Roessler (1965) define

preference as " ... (1) expression of higher degree of liking; (2) choice of one object over other; and/or (3) psychological continuum of affectivity (pleasantness-unpleasantness) upon which such choices are based. This continuum is also referred to as the degree of liking or disliking." They define acceptance as " ... (1) an experience, or feature of experience, characterized by a position attribute; and/or (2) actual utilization (e.g. purchase or eating). [Acceptance] may be measured by preference or liking for a specific food item. The two definitions are often highly correlated, but they are not necessarily the same."

Discrimination-difference tests can be either analytical or affective in nature and include paired-comparisons, duo-trio, triangle, ranking, and rating difference/scalar difference from control tests. Sensitivity tests and threshold tests are also included in this category. In a paired-comparison test, the panelist determines if there is a sensory difference or preference between two, coded samples, which may or may not be identical. The duo-trio test starts with two, coded samples and a reference sample identical to one of the coded samples. The panelist selects the odd sample by comparing the reference to the two, coded samples. Unlike the duo-trio test, the triangle test contains three, coded samples from which the judge selects the odd sample. Therefore, the probability of selecting the odd sample in the duo-trio test

is 50% and in the triangle test is 33% (Larmond, 1977). In a ranking test, several samples are ordered according to the intensity of a particular characteristic (with optional use of a standard). Rating difference/scalar difference from control tests are used to quantify the degree of difference between experimental samples and control samples. Sensitivity tests (thresholds and dilutions) tests are employed to identify and quantify minimum detection levels of a substance (IFT, 1981).

Analytical-descriptive tests are subdivided into two main categories: attribute rating (category scaling, and ratio scaling) and descriptive analysis (flavor profile analysis, texture profile analysis, and quantitative descriptive analysis.) In category scaling, coded samples are described on mono-directional or bi-directional scales with adverbial or adjective modifiers as the scalar anchors emphasizing the presence or absence of sensory characteristics (IFT, 1981). Ratio scaling is used to estimate the relationship between the quantity of a substance(s) generating a physical characteristic and the sensory perception of the stimulus(i). Flavor profile analysis codifies a product's aroma, flavors, mouth feel, and after-tastes. A texture profile analysis test describes the sensory components related to texture, such as mechanics, geometry, fat, and moisture. These characteristics are ordered according to occurrence, and the magnitude quantified. Quantitative descriptive analysis is

employed to calculate and to compare the intensity of the differences among samples (IFT, 1981).

Preference and acceptance tests include: paired-preference, ranking test, hedonic rating scale, and food action rating scale. The purpose of the paired-preference test is to facilitate the selection of the most acceptable food product based on a stated attribute. (Multiple-paired comparisons may also be evaluated.) Ranking tests, based on the principles of the paired-preference test, compare and order three or more samples according to preference. A group's pleasure from and preference for a food product is measured by a hedonic rating scale, while a group's attitudes and anticipated actions toward a food product are scored by a food action rating scale (IFT, 1981).

Panelist Selection and Training

Panelist selection criteria are determined by the objectives of the sensory evaluation and the types of tests used by the researcher. Highly trained or experienced panelists perform analytical tests. For affective tests, untrained panelists are selected as a representative sample of the target population. Panelists who can perceive slight differences among products and verbalize product characteristics are employed for analytical-descriptive tests. Highly trained panelists are essential to profiles and quantitative descriptive studies. Untrained consumer panels are adequate to complete food action rating scales

(IFT, 1981). Other basic considerations when selecting a panelist include reproducible judgements, motivation, interest, health and emotional status, absenteeism, and habits which interfere with sensory perceptions (Jellinek, 1985). When evaluating panelists for selection and training, gender is not a limiting factor. Both men and women are equally capable of being effective sensory evaluation panelists (Jellinek, 1985), though women are considered, by some researchers, to be more sensitive to odorants, especially when estrogen levels peak during ovulation (Maruniak & Mackey-Sim, 1984).

Vitamin and Mineral Supplementation

> It is one thing to discover scientific truths through research; it is another thing to translate them into services to the human population, and particularity without disturbing routines or adding to the cost of living ... C.H. Bailey (1956).

One of the earliest examples of successful nutrient supplementation in the United States was the iodization of table salt to eradicate endemic goiter. Iodization of table salt was first proposed by Boussingault, a French chemist, in 1833. But it was not produced in the United States prior to the 1920's when Dr. David Murray Cowie and colleagues confronted iodine deficiency (Markel, 1987).

Basically, Dr. Cowie's objectives were to generate the demand for iodized salt among members of the medical community and the public, and to meet the technological

needs of the salt industry in order to implement iodization. He formed a committee to review the feasibility of fortifying salt with iodine; enlisted the medical professionals to educate the public and peers about the need for iodized salt; persuaded the salt industry that iodized salt was profitable and had acceptable sensory qualities; and compared the incidences of endemic goiter before and after the debut of iodized salt (Markel, 1987). On May 1, 1924, approximately three years after his initial interest in the iodization of salt, Dr. Cowie witnessed the introduction of salt containing sodium iodide into America's grocery stores. Thirty years after the introduction of iodized salt in the State of Michigan, the incidence of endemic goiter had been almost eliminated (Brush & Altand, 1952).

There are other triumphs in the arena of nutrient supplementation. Laws mandating the enrichment of grain products with iron, thiamin, niacin, and riboflavin led to dramatic reductions in of iron-deficiency anemia, beri-beri, pellagra, and ariboflavinosis. Rickets was virtually eliminated with the addition of vitamin D to milk; and xerophthalamia, still a problem in developing countries but almost unknown in the United States, was addressed with the addition of vitamin A to margarine (National Research Council, 1989).

Food supplementation is subdivided into four categories: restoration, nutrification, fortification, and

enrichment. The addition of vitamin C to canned citrus fruits is restoration, because an indigenous nutrient destroyed during processing is replenished. Nutrification is the supplementation of a food product to a comparable level with other foods or with a complete meal. Enrichment is the addition of specified nutrient(s) to meet a legal standard. The primary difference between enriched foods and fortified foods is that the legal standards must be met with enrichment. Enrichment levels are based on Standards of Identification regulating the minimum and maximum supplementation with the intent of replacing nutrients destroyed during storage, handling, or processing. Fortification, however, is unregulated and allows the addition of non-indigenous nutrients to food products (Freeland-Graves & Peckham, 1987).

The enrichment of grain products was accomplished through several methods; however, now, millers generally add a vitamin premix to baking flour. Prior to this time, flour was supplemented with a variety of nutrient sources such as high-vitamin fractions of the wheat or baker's yeast. Corn grits are supplemented with a rinse-resistant premix, as is also done with many rice products. Rice may also be supplemented by granule impregnation. When supplementing cold cereals, heat-labile vitamins (e.g thiamine) may be sprayed on the surface after toasting; heat-stable nutrients can be added during the mixing process (Brooke, 1968).

Stability of Vitamin Supplement

The stability of vitamin supplements in a food system can be enhanced when a number of variables are manipulated. It is necessary to control temperature, moisture, pH, and limit exposure to incompatible metals and light. Further considerations include use of antioxidants, and proper handling, processing, and storage procedures. These steps are required so that labile nutrients, such as Vitamins A, C, cyanocobalamin (B_{12}), pantothenic acid, and folic acid, can be partially protected against degradation. For example, antioxidants or chelating agents are often needed for stability of Vitamin A. Due to heat lability, thiamin (B_1) is sprayed on the finished product of some foods after thermal processing. Since some losses due to instability are inevitable, overages are necessary to compensate for vitamin destruction as well as assaying errors; calculations for overages are food system dependent (Borenstein, 1972, 1975).

Bioavailability of Synthetic Vitamins

Most synthetic vitamins are chemically identical to those naturally occurring in foods. An exception is synthetic vitamin E, "a racemic mixture of eight isomers", which differs from the naturally occurring tocopherol and has reduced bioavailability. The problems that plague the bioavailability of indigenous vitamins are also problems

with synthetic vitamins: solubility, destruction or preservation, bound vitamin forms, and food digestibility (Borenstein, Bendich & Waysek, 1988). Borenstein, Bendich, Waysek (1988) stated that "the bioavailability issues of vitamins in fortification are ... issues of absorption from the GI tract rather than of the bio-activity of the compound per se."

In the digestive fluids, the fat soluble vitamins and riboflavin have reduced solubilities, which decrease their rate of absorption. Destruction of ascorbic acid, retinyl palmitate, carotenes, and tocopherol in the gastrointestinal tract is contingent upon food pH and meal components, such as iron salts which may catalyze some nutrients. However, lipid-phase antioxidants may stabilize various nutrients. Vitamins in food are often in a bound form and have reduced bioavailability. Niacytin, a form of niacin in wheat bran, in a peptide in corn has reduced bioavailability. (However, the lime-water used in processing corn for tortillas increases the bioavailability of niacin in corn.) pyridoxine is bound by dietary fiber thus reducing its biological value. Researchers have found that the pyridoxine in whole wheat bread is less available than that in white bread (Leklem, Miller, Perera, Peffers, 1980).

Fibrous foods are degraded and digested slowly (while at the same time speeding transit time), thus reducing the bioavailability of some nutrients. Reduced absorption of the vitamin B_6 in wheat bran and the beta-carotene in corn

and in carrots may be due to inadequate digestion (Borenstein, Bendich & Waysek, 1988). Brown, Micozzi, Craft, Bieri, Beecher, Edwards, Rose, Taylor, and Smith (1989) report that subjects fed 30gm of synthetic beta-carotene, with no associated fibrous materials, for 42 days showed clinical signs of carotenodermia, while the control group fed foods with naturally occurring plant fiber was asymptomatic.

CHAPTER III

THE SENSORY EVALUATION OF A FOOD BAR SUPPLEMENTED WITH VITAMINS AND MINERALS OR CORN BRAN

Introduction

The fortification and enrichment of the American food supply has addressed rickets, pellagra, scurvy, beriberi, and xerophtalmia through supplementation of vitamin D, niacin, vitamin C, thiamin, and vitamin A, respectively (National Research Council, 1989). These efforts have greatly diminished the incidence of vitamin and mineral deficiency in the U.S. diet. However, there is growing concern for over consumption of other nutrients. The Surgeon General, in the first report on Nutrition and Health, concludes "... over consumption of certain dietary components is now a major concern for Americans." (U. S. Department of Health and Human Services, 1988).

Snack foods may contribute to over consumption of dietary components, or they may enhance the quality of daily nutrient intake. A review of a nutrient data base (Pendleton & Church, 1985) shows that many of the snack foods available to consumers are high in fat and simple carbohydrates and low in fiber and vitamin and mineral

content. Examples include fried chips, doughnuts, cookies, and candy bars.

Crocetti, and Guthrie (1986) report that snacking among the elderly correlates with poor nutrient intake. On the other hand, Khan and Lipke (1982) report that snacking enhances college students' intake of energy, iron, calcium, vitamin A, and thiamin to levels above the U.S.RDA. Thomas & Call (1973) recommend nutrition education on wise snacking habits to help make healthy and nutritious between meal food selections. The food bar* used in this study was developed by researchers in the Department of Food, Nutrition and Institution Administration in the College of Home Economics of Oklahoma State University at Stillwater, Oklahoma as a light-meal alternative or substitution for less nutritious snacks.

In consumer preference studies among 347 independently living elderly, the food bar was highly acceptable as a meal substitute (Knight, 1986). During its development, emphasis was placed on increasing protein quantity and quality and varying the fiber sources and amounts, and the vitamin and mineral content was limited to those naturally present in the ingredients. Therefore, as a light-meal replacement, it falls short of 1/3 of the recommended levels of most nutrients, including fiber.

The American Dietetic Association, in its position paper in dietary fiber, recommends that the American diet

*Research funded by the Provesta Corp., Bartlesville, OK

include 20-35gm per day dietary fiber (American Dietetic Association [ADA], 1988). Manufacturers are increasing the fiber content of many foods (e.g. breakfast cereals and breads) to help consumers reach this amount. Although, the food bar furnishes a respectable 7gm of mixed dietary fiber, it is still only about 20% of the amount recommended for daily consumption. The purpose of this study was to determine the sensory characteristics and acceptance of variations of a food bar fortified with a vitamin and mineral premix, and supplemented with corn bran.

Materials and Methods

Sample Preparation

Four variations of a food bar were compared to the original formula. These variations were three levels of vitamin and mineral fortification (15%, 20%, and 25% of the U.S.RDA) and one level of corn bran substitution.

Vitamin and Mineral Bars. Precision Premix, a Hoffman-La Roche product (Table III), was the vitamin and mineral supplement added to the food bars. This product was selected as a nutrient supplement primarily due to its formulation of the U.S.RDA for vitamins and minerals; it allowed for fortification ease of several vitamins and minerals. The vitamin and mineral fortification levels represented nutrient supplementation to indigenous vitamins and minerals in this food bar.

TABLE III

PRECISION PREMIX DATA SHEET

Premix Name: U.S.RDA Label Claim/Use Rate: 330.00 MG
TSD Number: 010781 Packaging: 100 LB. Drum

Description	Label Claim
Ascorbic Acid F.P.	78.000 MG
Niacinamide	22.000 MG
Pyridoxine Hydrochloride	2.780 MG
Riboflavin, Type S	1.960 MG
Thiamine Mononitrate	1.730 MG
Vit. B12 1.0% SD (Spray Dried)	0.700 MG
Vit. A 250 SD (Spray Dried)	24.000 MG
Folic Acid	0.480 MG
Vit. D3 100 SD (Spray Dried)	4.800 MG
D-Calcium Pantothenate SD (Spray Dried)	12.54 MG
Biotin	0.36 MG
Copper Gluconate	15.70 MG
Iron Electrolytic	19.10 MG
Potassium Iodide	0.243 MG
Zinc Oxide	20.0 MG

The formulation suggested herein are based on information, methods and practices believed to be reliable, however, results obtained may vary with manufacturing conditions and techniques utilized. Accordingly, Hoffman-La Roche Inc., can make no guarantees or warranties or assume any responsibility as to the results to a obtained. the aforesaid as a service to you, subject to your judgement and decision to manufacture and/or use the same.

Corn Bran Bar. Coarse corn bran, a Lauhoff Grain Company product, was substituted in the corn bran bar. Corn bran was selected as a fiber supplement due to several product qualities. First, corn bran's high percentage of dietary fiber, 88%, makes it easy to incorporate in products. Less gram per gram ingredient substitution was

required to achieve the targeted dietary fiber content. Second, corn bran's bland yet familiar taste was considered compatible with the bar during preliminary tests. Third, corn bran enhanced the dietary fiber source profile of this food bar which contains dietary fiber from fruits, wheat bran, and oatmeal.

The corn bran food bar required two formula changes. One, to hydrate the corn bran, additional fluid was needed. Two, coarse corn bran was substituted for an equal weight of flours in the food bar formula.

The food bar is a combination of these ingredients: pineapple, currants, enriched wheat flour, oats, brown sugar, partially hydrogenated vegetable oil, high fructose corn syrup, corn syrup solids, dried yeast, whole wheat flour, sucrose, wheat bran, vegetable margarine, modified corn starch, nonfat dry milk, natural and artificial vanilla flavors, baking soda, and cinnamon. The preparation procedures were standardized during the development of the food bar and were adapted from the conventional mixing method (cake method)(Freeland-Graves and Peckham, 1987). When called for by the research design, the vitamin and mineral fortification, or the corn bran substitution was added with the dry ingredients.

Sensory Evaluation

Sensory evaluation is an integral part of product reformulation experiments The sensory evaluation process

for this study was comprised of panelist selection, panelist training, and data collection.

Panelists. The panelists were 26 healthy volunteers from the Oklahoma State University community. The age of the subjects ranged from 19 to 58 years. Six panelists reported vitamin and mineral supplement use, while twelve panelists reported no vitamin and mineral use, and eight panelists did not respond. Ten of them were male and sixteen female.

Training. In advance of the testing period, all the panelists attended sensory evaluation training sessions. During these sessions, the panelists received training on: basic tastes and odor identification, texture, viscosity, and basic taste intensity rankings.

Data Collection. At a single session the panelists evaluated a control and the four variations of the food bar. For each evaluation, the panelists received a score sheet with seven bipolar-anchored scales. Figure 1 is a copy of the data score sheet.

The sensory evaluation tests were completed in partitioned booths with ambient temperature and lighting, while environmental sounds and odors were minimized. Objectivity was encouraged among the panelists. Distilled water was offered for mouth rinsing between samples. Samples were coded and randomly distributed according to the American Society of Testing Material, STP 433 (Klemmer, 1968).

FOOD BAR EVALUATION SHEET

Here is a variation of a food bar. We would like to know your observations. Please mark the line where it best describes your opinion of this food product.

Was the bar:

0 DRY 100
|_____|
Too Dry Too Wet

0 SWEET 100
|_____|
Not Sweet Too Sweet

0 CTEXT 100
|_____|
Hard, Crumbly Gummy, Sticks to Teeth or Mouth

0 HTEXT 100
|_____|
Easy to Chew Hard to Chew

100 ACCEPT 0
|_____|
Very Acceptable Unacceptable

0 VMFLAV 100
|_____|
No Vitamin/Mineral Flavor Strong Vitamin/ Mineral Flavor

0 VMODOR 100
|_____|
No Vitamin/Mineral Odor Strong Vitamin/ Mineral Odor

We appreciate having your opinions. Thank you.

Figure 1. Food Bar Score Sheet with Optimum Scores Marked.

Experimental Design and Statistical Analysis

The data were analyzed as two separate studies in randomized complete block designs where the levels of vitamin and mineral fortification and corn bran supplementation were the treatments and the individual panelists were the blocks. This study generated data about the variations of the food bar which were compared with the control. The data were analyzed using Analysis of Variance with F-tests procedures (Steel and Torrie, 1980). Scoring differences were tested between the control and the variations, and among the panelists and days where significant differences were indicated with the level of significance at $p \leq 0.05$. Dunnett's t-tests were used to identify differences between the treatment bars and the control bar.

Nutrient Information

The nutrient content of the control bar and the experimental food bars were calculated using the Food Processor II (1987) computerized nutrient data base system. Nutrient information from Hoffman-La Roche (Table III), Lauhoff Grain (Table IV) (Lauhoff, 1987), and Provesta (1989) were added to the nutrient base to analyzed the unbaked food bars (Tables V and VI, and Figures 2 and 3).

TABLE IV

DIETFIBER CORN BRAN SPECIALLY PROCESSED
CORN BRAN, COARSE NC 04085

Product Characteristics	Analysis (Dry Basis)
% Moisture	10.0 Maximum
% Protein	6.0 Maximum
% Oil	1.2 Maximum
% Total Dietary Fiber	85.0 Minimum 90.0 Typical

Lauhoff Grain Company, 1987.

TABLE V

NUTRIENT ANALYSIS OF THE UNBAKED CONTROL BAR AND THE VITAMIN/MINERAL BARS FOR SELECT NUTRIENTS

Nutrients	Control	%USRDA*	15%VM	%USRDA	20%VM	%USRDA	25%VM	%USRDA
Vitamin A (RE)	34.1	3	220	22	281	28	341	34
Vitamin C (mg)	2.4	4	13.5	23	17.2	29	20.8	35
Thiamin (mg)	0.28	19	0.56	37	.65	43	.74	49
Riboflavin (mg)	0.35	21	0.67	39	.77	45	.87	51
Niacin (mg)	4.2	21	8.0	40	9.2	46	10.4	52
Vitamin B6 (mg)	0.37	19	0.74	37	0.86	43	0.99	49
Vitamin B12 (mcg)	0.08	1	1.19	20	1.6	26	1.9	32
Iron (mg)	2.2	12	5.6	31	6.7	37	7.7	43
Zinc (mg)	1.1	7	3.9	26	4.8	32	5.7	38

*U.S.RDA for labeling.

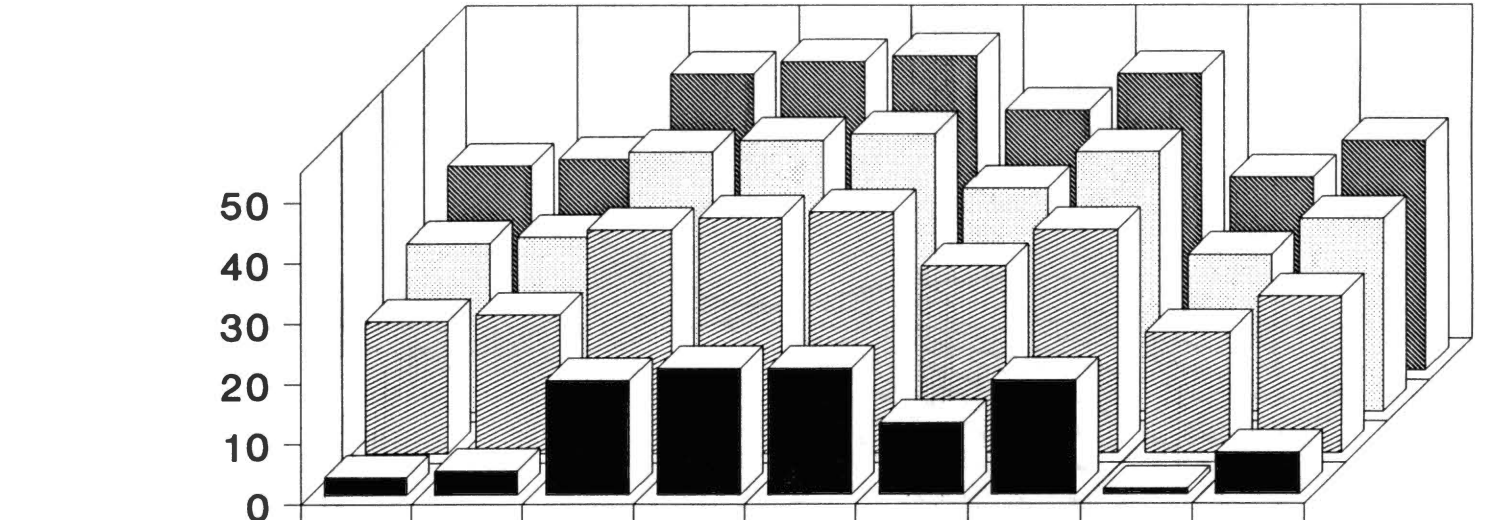
TABLE VI

NUTRIENT ANALYSIS OF THE UNBAKED CONTROL BAR AND THE CORN BRAN BAR FOR SELECT NUTRIENTS

Nutrient	Control	%USRDA*	Corn Bran Bar	%USRDA
Dietary Fiber (gm)	7.0+	-	9.5	-
Vitamin A (RE)	34.1	3	34.1	3
Vitamin C (mg)	2.4	4	2.4	4
Thiamin (mg)	0.28	19	0.26	18
Riboflavin (mg)	0.35	21	0.35	21
Niacin (mg)	4.2	21	4.2	21
Vitamin B6	0.37	19	0.38	19
Vitamin B12 (mcg)	0.08	1	0.08	1
Iron (mg)	2.2	12	2.1	12
Zinc (mg)	1.1	7	1.1	7

+Provesta Corp., 1989 *U.S.RDA for labeling.

NUTRIENT ANALYSIS COMPARISON
UNBAKED CONTROL BAR
vs VM BAR



	A	C	B1	B2	B3	Iron	B6	B12	Zinc
25% VM	34	35	49	51	52	43	49	32	38
20% VM	28	29	43	45	46	37	43	26	32
15% VM	22	23	37	39	40	31	37	20	26
Control	3	4	19	21	21	12	19	1	7

Figure 2. Nutrient Comparisons of the Unbaked Control Bar and the Vitamin/Mineral Bar

NUTRIENT COMPARISONS OF THE UNBAKED CONTROL BAR AND THE CORN BRAN BAR

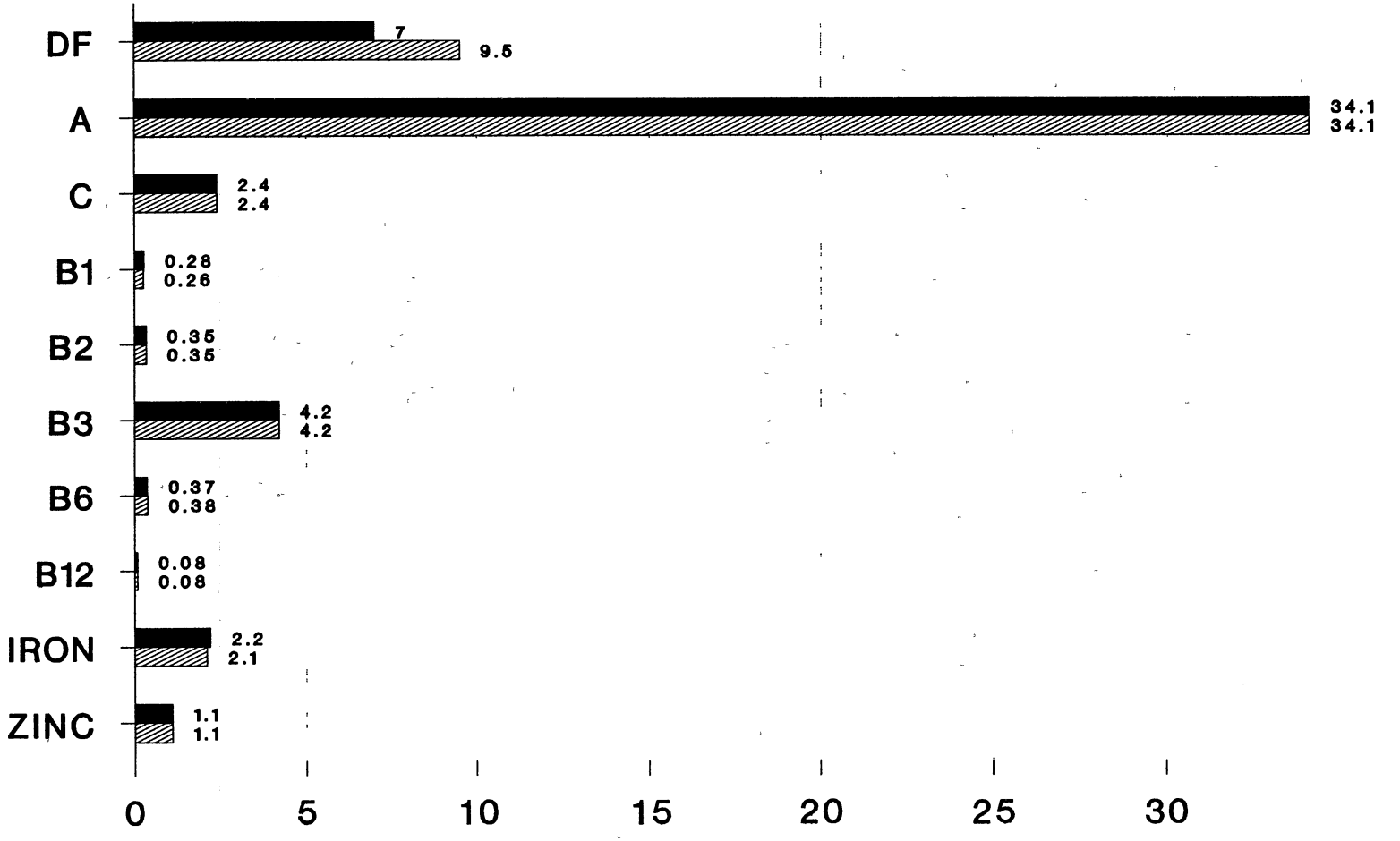


Figure 3. Nutrient Comparisons of the Unbaked Control Bar and the Corn Bran Bar

Results and Discussions

Vitamin and Mineral Bars

The Analysis of Variance indicated significant differences among panelist rating means for dry texture (P=.0149), and vitamin/mineral odor (P=.0074) and flavor (P=.0043). The Dunnett's test showed that there were no significant differences between the control bar and the means of the 15%VM bar for all attributes tested (Table VII and Figure 4). The Dunnett's t-test showed that only the 25%VM bar was significantly different from the control for vitamin/mineral odor, while both the 20%VM and 25%VM bars were significantly different from the control for vitamin/mineral flavor. There were no differences between any of the other characteristics tested.

Corn Bran Bar

The odor and the flavor of the CB bar were rated significantly different than the control (Table VIII and Figure 5). The panelists attributed these differences to a vitamin and mineral odorant and flavor, though this bar was not supplemented with vitamins and minerals. Even with these differences, the CB bar's acceptance is rated virtually the same as the control, 54.2 and 53.9, respectively.

TABLE VII

SIGNIFICANT DIFFERENCES BETWEEN THE CONTROL BAR AND THE VITAMIN/MINERAL BARS

Attributes	Means				
	Control	15%VM	20%VM	25%VM	Pr>F
DRY	53.6	61.9	60.8	50.0	.01
SWEET	41.9	43.8	45.0	44.5	.88
HTEXT	64.2	71.2	74.0	67.2	.08
CTEXT	30.0	29.0	32.2	32.4	.85
ACCEPT	53.9	51.5	51.6	51.0	.98
VMODOR	19.1	28.3	26.9	33.7	.01*
VMFLAV	24.2	33.3	42.2*	41.3*	.00*

*Significant differences

TABLE VIII

SIGNIFICANT DIFFERENCES BETWEEN THE CONTROL BAR AND THE CORN BRAN BAR

Attributes	Means		
	Control	CB	Pr>F
DRY	53.6	53.9	.92
SWEET	41.9	44.1	.64
HTEXT	64.2	66.6	.43
CTEXT	30.0	32.8	.47
ACCEPT	53.9	54.2	.95
VMODOR	19.1	27.4*	.05*
VMFLAV	24.2	34.0*	.04*

*Significant differences

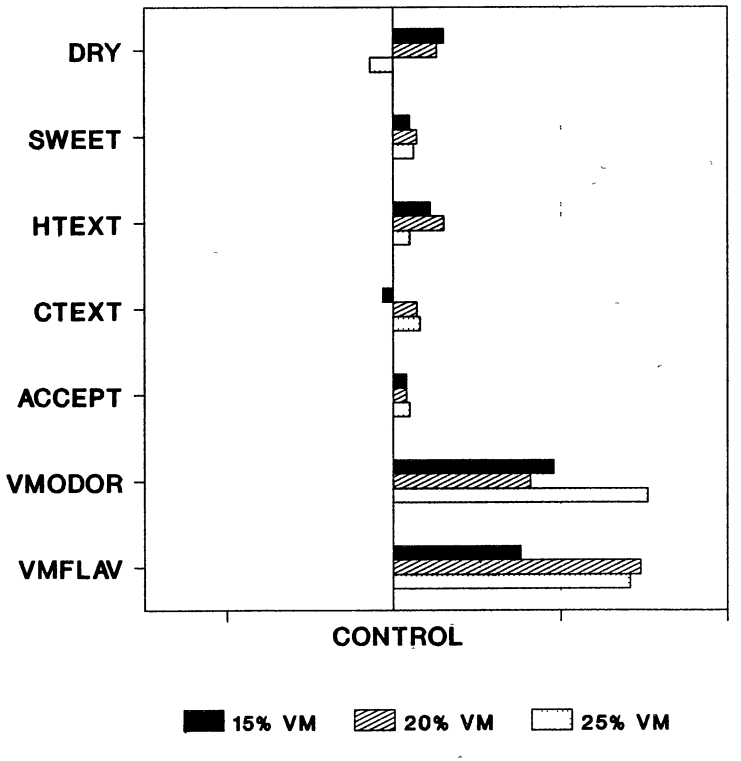


Figure 4. Comparison of the Means of the Control Bar and the Vitamin/Mineral Bar

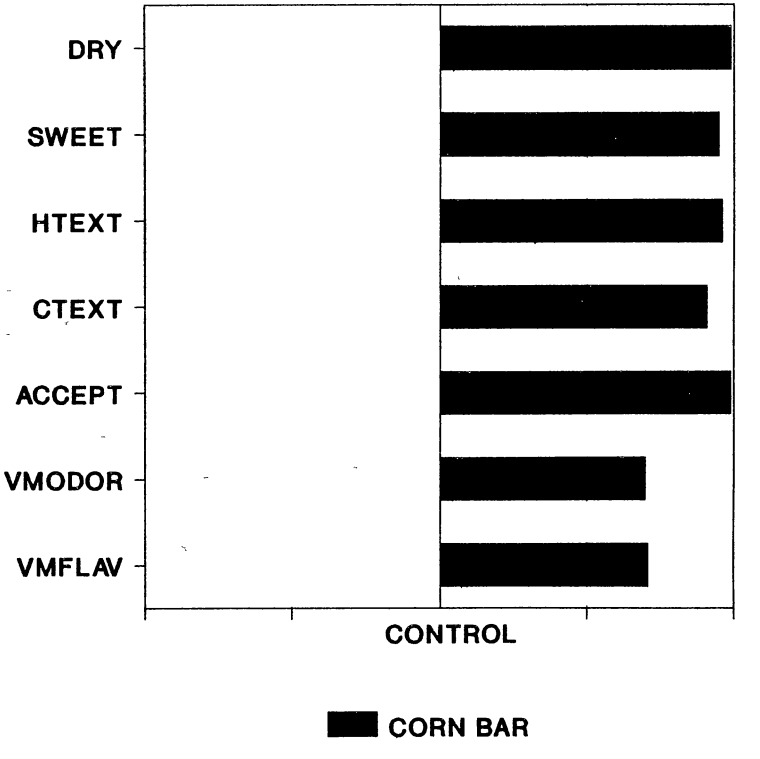


Figure 5. Comparison of the Means of the Control Bar and the Corn Bran Bar

Sex, Age of food bars, and Vitamin/Mineral Use as Treatments Conditions

The data were analyzed for the affect of sex (Table IX), age of food bars (Table X), and vitamin/mineral self-dosing as treatment conditions (Table XI). There was not significant difference between the ratings of male panelists and female panelists. Date as a treatment condition was no significant, and vitamin/mineral supplement use was insignificant.

TABLE IX

SEX AS A TREATMENT CONDITION

Sex	Product	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMODOR	VMFLAV
F	Control	16	55.9	36.7	65.2	30.2	49.4	18.7	24.0
M	Control	10	49.9	50.0	62.4	29.6	61.2	19.8	24.4
F	15%VM	16	64.1	43.9	76.2	25.0	52.4	30.3	35.2
M	15%VM	10	58.2	43.8	63.1	35.4	50.1	25.1	30.2
F	20%VM	16	60.0	41.1	73.2	34.3	52.6	28.1	41.1
M	20%VM	10	62.1	51.2	75.2	28.9	50.1	24.9	44.1
F	25%VM	16	50.6	42.6	68.2	31.5	53.4	34.9	42.7
M	25%VM	10	48.9	47.5	65.5	33.9	47.2	31.6	39.0
F	CB	16	52.8	40.6	68.4	34.7	46.1	26.5	37.8
M	CB	10	55.6	49.7	63.6	29.3	67.3	28.8	27.8

TABLE X

AGE (IN DAYS) OF FOOD BARS AS TREATMENT CONDITIONS

Control Bar Means

Age	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
2	8	56.4	48.9	67.3	26.9	54.0	27.0	17.0
3	8	46.3	37.4	63.6	35.3	54.0	23.3	23.5
4	3	53.3	34.0	64.0	49.0	37.0	25.7	13.0
5	2	57.5	48.5	61.5	19.5	51.5	16.5	18.0
6	5	59.4	39.8	61.2	17.8	64.8	23.2	19.6

15%VM Bar Means

Age	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
2	8	63.1	48.6	73.1	30.5	52.8	28.6	21.9
3	8	62.4	40.3	72.0	29.9	51.0	33.4	34.4
4	3	57.3	52.3	70.3	21.3	61.3	40.7	40.0
5	2	65.5	44.5	69.0	43.0	64.5	40.0	38.5
6	5	60.2	36.6	68.0	24.2	39.2	33.4	17.8

20%VM Bar Means

Age	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
2	8	63.5	52.8	81.1	25.5	51.3**	44.9	21.4
3	8	55.9	38.3	70.4	27.1	49.0	37.0	28.9
4	3	65.7	49.0	77.7	51.0	50.7	63.0	47.7
5	2	76.5	29.0	72.5	32.5	56.0	28.5	27.0
6	5	55.0	47.2	66.8	41.3*	55.0	39.4	20.0

25%VM Bar Means

Age	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
2	8	39.9	40.3	66.6	33.9	47.5	46.9	40.5
3	8	59.0	45.8	69.3	25.5	67.5	39.1	28.9
4	3	68.0	60.3	82.7	34.7	22.0	53.0	39.3
5	2	43.5	37.5	67.5	50.5	45.0	38.5	37.5
6	5	43.5	42.6	55.4	32.6	50.2	29.8	25.4

Corn Bar Means

Age	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
2	8	50.5	48.8	70.4	31.9	61.3	26.8	21.5
3	8	54.1	40.0	68.5	30.1	49.9	36.0	35.5
4	3	57.0	46.7	70.7	31.3	52.3	34.0	27.0
5	2	61.0	26.0	73.5	35.0	42.0	41.5	38.5
6	5	54.2	48.8	52.2	40.0*	56.0	39.2	19.6

*N = 4; **N = 7; N's not equal due to missing data.

TABLE XI

VITAMIN AND MINERAL SELF-DOSING AS A TREATMENT CONDITION

Panelist's Response	Product	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR	CTEXT	ACCEPT
No	15%VM	12	57.75	42.42	64.33	26.33	22.25	38.42	53.67
Yes	15%VM	6	67.17	45.33	74.00	40.67	28.33	19.00	51.83
No	20%VM	12	59.25	43.50	71.83	35.83	15.83	28.73	49.42
Yes	20%VM	6	65.17	50.33	75.33	46.67	23.67	33.67	64.83
No	25%VM	12	39.50	41.25	65.42	28.58	23.75	39.00	55.67
Yes	25%VM	6	55.17	44.50	64.50	51.17	35.17	32.33	38.00

Conclusions

The objectives of this research were to supplement the food bar with vitamin and mineral supplement or corn bran and to evaluate the acceptability of the supplemented bars and their sensory attributes. All the experimental bars were acceptable. The panelists detected significant differences from the control bar for odor and/or flavor for three of the experimental bars, but not the 15%VM bar. None of the attributes of the 15%VM bar were significantly different from the control which indicates that it may be perceived as the same as the control bar by most in the target market.

Acknowledgements

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CHAPTER IV

HYPOTHESES TESTING AND RECOMMENDATIONS

The purpose of this study was to determine the sensory characteristics and acceptance of the Meal On The Go^{tm} food bar fortified with vitamins and minerals at three different levels or supplemented with corn bran.

Hypotheses Testing

Established statistical procedures were employed to test the hypotheses formulated for this study. An alpha level of $p \leq 0.05$ was chosen for determining differences among means.

The first hypothesis (H_1) stated that there would be no difference between the control bar and the vitamin and mineral fortified bars for any of these selected characteristics: flavor, odor, taste, texture, moisture, and acceptability. The results showed no significant difference between any of the three levels of vitamin and mineral fortification and the control for sweetness, acceptance, chewiness, and dryness. So, for these characteristics H_1 cannot be rejected. However, there were significant differences between the variations and the control for

vitamin and mineral flavor, and vitamin and mineral odor. Specifically, the significant differences for flavor were between the 20%VM bar and the control and the 25%VM bar and the control. For odor, a significant difference was located between the 25%VM bar and the control. Based on these results, the researcher rejected H_1.

The second hypothesis (H_2) stated that there would be no difference between the control and the CB bar for any of the selected characteristics. The results showed that the only significant difference between the CB bar and the control was the vitamin and mineral flavor. (Since this bar had no vitamin and mineral fortification, the panelists have attributed vitamin and mineral flavor to the added corn bran.) Based on these results, the researcher rejected H_2 for vitamin and mineral flavor, but could not reject H_2 for the other characteristics.

The third hypothesis (H_3) stated that there would be no difference between the acceptability ratings of the male panelists and the female panelists. The results showed that there was no significant difference in rating due to the sex of the panelists, therefore, the researcher failed to reject hypothesis H_3.

The fourth hypothesis (H_4) stated that there would be no difference among the sensory evaluation scores generated due to age of the bars. The results disclosed no significant difference in ratings due to bar age; therefore, the researcher failed to reject H_4.

The fifth hypothesis (H_5) stated that there would be no difference between panelists identified as taking vitamin and mineral supplements and those not taking vitamin and mineral supplements. The results revealed no significant difference; thus the researcher failed to reject hypothesis H_5.

Recommendations

This study shows that the Meal On The Go^{tm} food bar can be successfully supplemented with vitamin and mineral supplement or corn bran with no significant differences in acceptability. The following recommendations are for additional research with supplementation of this food bar:

1. Analyze the nutrient content of the Meal On The Go^{tm} food bar supplemented with vitamin and minerals to the 15% level of the USDA or supplemented with corn bran after baking.
2. Study the market's purchasing behavior toward the Meal On The Go^{tm} food bar supplemented with vitamin and minerals or corn bran.
3. Estimate the nutritional impact of the Meal On The Go^{tm} food bar supplemented to the 15% level of the USRDA or with corn bran on the diets of a target population.
4. Research the compatibility of supplementing the Meal On The Go^{tm} food bar with both the vitamin/mineral supplement and with the corn bran.
5. Examin the industry production procedures of Meal On The Go^{tm} food bar to determine the appropriate step at which to add a vitamin and mineral supplement or corn bran.

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APPENDIX

APPENDIX A

TASTE PANEL DATA

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925
PRODUCT	5	CORN MOG 15%VM 20%VM 25%VM

NUMBER OF OBSERVATIONS IN DATA SET = 130

GROUP	OBS	DEPENDENT VARIABLES
1	130	DRY SWEET HTEXT VMFLAV VMODOR
2	128	CTEXT
3	129	ACCEPT

NOTE VARIABLES IN EACH GROUP ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	27944 48564103	620 98856980	3 12	0 0001	0 625618	25 1920
ERROR	84	16722 50666667	199 07746032		ROOT MSE		DRY MEAN
CORRECTED TOTAL	129	44666 99230769			14 10948122		56 00769231

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	643 54897436	0 81	0 5234	4	643 54897436	0 81	0 5234
CODE(DATE)	21	20488 24333333	4 90	0 0001	21	20488 24333333	4 90	0 0001
PRODUCT	4	2697 03076923	3 39	0 0128	4	2131 51865801	2 68	0 0373
DATE*PRODUCT	16	4115 66256410	1 29	0 2216	16	4115 66256410	1 29	0 2216

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	643 54897436	0 16	0 9538

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	22887 10641026	508 60236467	2 49	O 0001	O 572021	32 5634
ERROR	84	17123 81666667	203 85496032		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	129	40010 92307692			14 27777855		43 84615385

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1930 41474359	2 37	O 0592	4	1930 41474359	2 37	O 0592
CODE(DATE)	21	17576 10833333	4 11	O 0001	21	17576 10833333	4 11	O 0001
PRODUCT	4	148 84615385	O 18	O 9469	4	183 03008658	O 22	O 9240
DATE*PRODUCT	16	3231 73717949	O 99	O 4744	16	3231 73717949	O 99	O 4744

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1930 41474359	O 58	O 6827

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	17565 32589744	390 34057550	1 81	0 0093	0 492954	21 3741
ERROR	84	18067 44333333	215 08861111		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	129	35632 76923077			14 66589960		68 61538462

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	2237 29589744	2 60	0 0418	4	2237 29589744	2 60	0 0418
CODE(DATE)	21	12141 07333333	2 69	0 0007	21	12141 07333333	2 69	0 0007
PRODUCT	4	1599 61538462	1 86	0 1252	4	1127 57549784	1 31	0 2727
DATE*PRODUCT	16	1587 34128205	0 46	0 9586	16	1587 34128205	0 46	0 9586

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	2237 29589744	0 97	0 4460

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	52491 63076923	1166 48068376	2 90	0 0001	0 608211	57 3618
ERROR	84	33813 30000000	402 53928571		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	129	86304 93076923			20 06338171		34 97692308

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1228 72243590	0 76	0 5522	4	1228 72243590	0 76	0 5522
CODE(DATE)	21	42258 20833333	5 00	0 0001	21	42258 20833333	5 00	0 0001
PRODUCT	4	5545 73846154	3 44	0 0117	4	4646 79415584	2 89	0 0272
DATE*PRODUCT	16	3458 96153846	0 54	0 9196	16	3458 96153846	0 54	0 9196

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1228 72243590	0 15	0 9597

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	51457 18358974	1143 49296866	5 34	0 0001	0 741048	54 0498
ERROR	84	17981 19333333	214 06182540		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	129	69438 37692308			14 63085183		27 06923077

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	2592 76192308	3 03	0 0220	4	2592 76192308	3 03	0 0220
CODE(DATE)	21	42354 41500000	9 42	0 0001	21	42354 41500000	9 42	0 0001
PRODUCT	4	2815 49230769	3 29	0 0149	4	2785 98523810	3 25	0 0156
DATE*PRODUCT	16	3694 51435897	1 08	0 3880	16	3694 51435897	1 08	0 3880

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	2592 76192308	0 32	0 8604

GENERAL LINEAR MODELS PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
880718	40	54 6750000	47 8500000	71 7000000	34 8250000	24 4500000
880719	40	55 5250000	40 3250000	68 7500000	33 7500000	30 2250000
880720	15	60 2666667	48 4666667	73 0666667	43 2666667	33 4000000
880721	10	60 8000000	37 1000000	68 8000000	33 0000000	31 9000000
880722	25	54 4400000	43 0000000	60 7200000	33 0000000	20 4800000

PRODUCT	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
CORN	26	53 8846154	44 0769231	66 5769231	33 9615385	27 3846154
MOG	26	53 5769231	41 8461538	64 1538462	24 1538462	19 1153846
15%VM	26	61 8461538	43 8461538	71 1538462	33 2692308	28 3076923
20%VM	26	60 7692308	44 9615385	74 0000000	42 2307692	26 8846154
25%VM	26	49 9615385	44 5000000	67 1923077	41 2692308	33 6538462

DATE	PRODUCT	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
880718	CORN	8	50 5000000	48 7500000	70 3750000	26 7500000	21 5000000
880718	MOG	8	56 3750000	48 8750000	67 2500000	27 0000000	17 0000000
880718	15%VM	8	63 1250000	48 6250000	73 1250000	28 6250000	21 8750000
880718	20%VM	8	63 5000000	52 7500000	81 1250000	44 8750000	21 3750000
880718	25%VM	8	39 8750000	40 2500000	66 6250000	46 8750000	40 5000000
880719	CORN	8	54 1250000	40 0000000	68 5000000	36 0000000	35 5000000
880719	MOG	8	46 2500000	37 3750000	63 6250000	23 2500000	23 5000000
880719	15%VM	8	62 3750000	40 2500000	72 0000000	33 3750000	34 3750000
880719	20%VM	8	55 8750000	38 2500000	70 3750000	37 0000000	28 8750000
880719	25%VM	8	59 0000000	45 7500000	69 2500000	39 1250000	28 8750000
880720	CORN	3	57 0000000	46 6666667	70 6666667	34 0000000	27 0000000
880720	MOG	3	53 3333333	34 0000000	64 0000000	25 6666667	13 0000000
880720	15%VM	3	57 3333333	52 3333333	70 3333333	40 6666667	40 0000000
880720	20%VM	3	65 6666667	49 0000000	77 6666667	63 0000000	47 6666667
880720	25%VM	3	68 0000000	60 3333333	82 6666667	53 0000000	39 3333333
880721	CORN	2	61 0000000	26 0000000	73 5000000	41 5000000	38 5000000
880721	MOG	2	57 5000000	48 5000000	61 5000000	16 5000000	18 0000000
880721	15%VM	2	65 5000000	44 5000000	69 0000000	40 0000000	38 5000000
880721	20%VM	2	76 5000000	29 0000000	72 5000000	28 5000000	27 0000000
880721	25%VM	2	43 5000000	37 5000000	67 5000000	38 5000000	37 5000000
880722	CORN	5	54 2000000	48 8000000	52 2000000	39 2000000	19 6000000
880722	MOG	5	59 4000000	39 8000000	61 2000000	23 2000000	19 6000000
880722	15%VM	5	60 2000000	36 6000000	68 0000000	33 4000000	17 8000000
880722	20%VM	5	55 0000000	47 2000000	66 8000000	39 4000000	20 0000000
880722	25%VM	5	43 4000000	42 6000000	55 4000000	29 8000000	25 4000000

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	36276 90003064	806 15333401	3 51	0 0001	0 658210	48 4894
ERROR	82	18837 59215686	229 72673362		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	127	55114 49218750			15 15673888		31 25781250

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1013 69146286	1 10	0 3607	4	1036 20453735	1 13	0 3493
CODE(DATE)	21	30021 05072464	6 22	0 0001	21	29532 20784314	6 12	0 0001
PRODUCT	4	235 32761161	0 26	0 9052	4	531 79274303	0 58	0 6789
DATE*PRODUCT	16	5006 83023153	1 36	0 1817	16	5006 83023153	1 36	0 1817

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1036 20453735	0 18	0 9440

GENERAL LINEAR MODELS PROCEDURE

MEANS

DATE	N	CTEXT
880718	40	29 7250000
880719	40	29 7750000
880720	15	37 4666667
880721	10	36 1000000
880722	23	30 3478261

PRODUCT	N	CTEXT
CORN	25	32 8000000
MOG	26	30 0000000
15%VM	26	29 0000000
20%VM	25	32 1600000
25%VM	26	32 4230769

DATE	PRODUCT	N	CTEXT
880718	CORN	8	31 8750000
880718	MOG	8	26 8750000
880718	15%VM	8	30 5000000
880718	20%VM	8	25 5000000
880718	25%VM	8	33 8750000
880719	CORN	8	30 1250000
880719	MOG	8	36 2500000
880719	15%VM	8	29 8750000
880719	20%VM	8	27 1250000
880719	25%VM	8	25 5000000
880720	CORN	3	31 3333333
880720	MOG	3	49 0000000
880720	15%VM	3	21 3333333
880720	20%VM	3	51 0000000
880720	25%VM	3	34 6666667
880721	CORN	2	35 0000000
880721	MOG	2	19 5000000
880721	15%VM	2	43 0000000
880721	20%VM	2	32 5000000
880721	25%VM	2	50 5000000
880722	CORN	4	40 0000000
880722	MOG	5	17 8000000
880722	15%VM	5	24 2000000
880722	20%VM	4	41 2500000
880722	25%VM	5	32 6000000

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	45	23405 84349945	520 12985554	0 84	0 7326	0 313524	47 3620
ERROR	83	51248 24952381	617 44878944		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	128	74654 09302326			24 84851685		52 46511628

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1090 78879249	0 44	0 7782	4	1058 68532427	0 43	0 7875
CODE(DATE)	21	14308 95423077	1 10	0 3612	21	14412 45404762	1 11	0 3533
PRODUCT	4	267 44353846	0 11	0 9793	4	621 64624082	0 25	0 9079
DATE*PRODUCT	16	7738 65693773	0 78	0 6997	16	7738 65693773	0 78	0 6997

TESTS OF HYPOTHESES USING THE TYPE III MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	TYPE III SS	F VALUE	PR > F
DATE	4	1058 6853242,	0 39	0 8164

GENERAL LINEAR MODELS PROCEDURE

MEANS

DATE	N	ACCEPT
880718	39	53 4102564
880719	40	54 2750000
880720	15	44 6666667
880721	10	51 8000000
880722	25	53 0400000

PRODUCT	N	ACCEPT
CORN	26	54 2307692
MOG	26	53 9230769
15%VM	26	51 5000000
20%VM	25	51 6000000
25%VM	26	51 0384615

DATE	PRODUCT	N	ACCEPT
880718	CORN	8	61 2500000
880718	MOG	8	54 0000000
880718	15%VM	8	52 7500000
880718	20%VM	7	51 2857143
880718	25%VM	8	47 5000000
880719	CORN	8	49 8750000
880719	MOG	8	54 0000000
880719	15%VM	8	51 0000000
880719	20%VM	8	49 0000000
880719	25%VM	8	67 5000000
880720	CORN	3	52 3333333
880720	MOG	3	37 0000000
880720	15%VM	3	61 3333333
880720	20%VM	3	50 6666667
880720	25%VM	3	22 0000000
880721	CORN	2	42 0000000
880721	MOG	2	51 5000000
880721	15%VM	2	64 5000000
880721	20%VM	2	56 0000000
880721	25%VM	2	45 0000000
880722	CORN	5	56 0000000
880722	MOG	5	64 8000000
880722	15%VM	5	39 2000000
880722	20%VM	5	55 0000000
880722	25%VM	5	50 2000000

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925

NUMBER OF OBSERVATIONS IN BY GROUP = 26

GROUP	OBS	DEPENDENT VARIABLES
1	26	DRY SWEET HTEXT ACCEPT VMFLAV VMODOR
2	25	CTEXT

NOTE VARIABLES IN EACH GROUP ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	9234 65384615	369 38615385			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		DRY MEAN
CORRECTED TOTAL	25	9234 65384615			0 00000000		53 88461538

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	222 97884615		
CODE(DATE)	21	9011 67500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	222 97884615	0 13	0 9698

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8645 84615385	345 83384615			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	25	8645 84615385			0 00000000		44 07692308

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1092 87948718		
CODE(DATE)	21	7552 96666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1092 87948718	0 76	0 5631

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8546 34615385	341 85384615			1.000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	25	8546 34615385			0 00000000		66 57692308

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1324 50448718		
CODE(DATE)	21	7221 84166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1324 50448718	0 96	0 4483

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	14402 61538462	576 10461538			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	25	14402 61538462			0 00000000		54 23076923

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	871 57371795		
CODE(DATE)	21	13531 04166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	871 57371795	0 34	0 8491

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	17962 96153846	718 51846154			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	25	17962 96153846			0 00000000		33 96153846

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	700 16153846		
CODE(DATE)	21	17262 80000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	700 16153846	0 21	0 9283

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	12368 15384615	494 72615385			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	25	12368 15384615			0 00000000		27 38461538

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1354 45384615		
CODE(DATE)	21	11013 70000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1354 45384615	0 65	0 6361

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	ACCEPT	VMFLAV	VMODOR
880718	8	50 5000000	48 7500000	70 3750000	61 2500000	26 7500000	21 5000000
880719	8	54 1250000	40 0000000	68 5000000	49 8750000	36 0000000	35 5000000
880720	3	57 0000000	46 6666667	70 6666667	52 3333333	34 0000000	27 0000000
880721	2	61 0000000	26 0000000	73 5000000	42 0000000	41 5000000	38 5000000
880722	5	54 2000000	48 8000000	52 2000000	56 0000000	39 2000000	19 6000000

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	24	10156 00000000	423 16666667			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	24	10156 00000000			0 00000000		32 80000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	287 58333333		
CODE(DATE)	20	9868 41666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	287 58333333	0 15	0 9628

PRODUCT=CORN

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	CTEXT
880718	8	31 8750000
880719	8	30 1250000
880720	3	31 3333333
880721	2	35 0000000
880722	4	40 0000000

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925

NUMBER OF OBSERVATIONS IN BY GROUP = 26

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8632 34615385	345 29384615			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		DRY MEAN
CORRECTED TOTAL	25	8632 34615385			0 00000000		53 57692308

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	692 60448718		
CODE(DATE)	21	7939 74166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	692 60448718	0 46	0 7656

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8145 38461538	325 81538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	25	8145 38461538			0 00000000		41 84615385

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	849 33461538		
CODE(DATE)	21	7296 05000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	849 33461538	0 61	0 6592

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	4975 38461538	199 01538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	25	4975 38461538			0 00000000		64 15384615

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	136 70961538		
CODE(DATE)	21	4838 67500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	136 70961538	0 15	0 9617

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	13344 00000000	533 76000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	25	13344 00000000			0 00000000		30 00000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	2438 32500000		
CODE(DATE)	21	10905 67500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	2438 32500000	1 17	0 3508

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	14685 84615385	587 43384615			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	25	14685 84615385			0 00000000		53 92307692

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1462 54615385		
CODE(DATE)	21	13223 30000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1462 54615385	0 58	0 6799

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8327 38461538	333 08538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	25	8327 38461538			0 00000000		24 15384615

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	199 91794872		
CODE(DATE)	21	8127 46666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	199 91794872	0 13	0 9701

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	10254 65384615	410 18615385			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	25	10254 65384615			0 00000000		19 11538462

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	305 45384615		
CODE(DATE)	21	9949 20000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	305 45384615	0 16	0 9556

PRODUCT=MOG

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
880718	8	56 3750000	48 8750000	67 2500000	26 8750000	54 0000000	27 0000000	17 0000000
880719	8	46 2500000	37 3750000	63 6250000	36 2500000	54 0000000	23 2500000	23 5000000
880720	3	53 3333333	34 0000000	64 0000000	49 0000000	37 0000000	25 6666667	13 0000000
880721	2	57 5000000	48 5000000	61 5000000	19 5000000	51 5000000	16 5000000	18 0000000
880722	5	59 4000000	39 8000000	61 2000000	17 8000000	64 8000000	23 2000000	19 6000000

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925

NUMBER OF OBSERVATIONS IN BY GROUP = 26

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	7553 38461538	302 13538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		DRY MEAN
CORRECTED TOTAL	25	7553 38461538			0 00000000		61 84615385

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	116 66794872		
CODE(DATE)	21	7436 71666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	116 66794872	0 08	0 9869

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	5485 38461538	219 41538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	25	5485 38461538			0 00000000		43 84615385

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	765 64294872		
CODE(DATE)	21	4719 74166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	765 64294872	0 85	0 5086

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	7801 38461538	312 05538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	25	7801 38461538			0 00000000		71 15384615

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	97 84294872		
CODE(DATE)	21	7703 54166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	97 84294872	0 07	0 9912

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	9212 00000000	368 48000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	25	9212 00000000			0 00000000		29 00000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	707 65833333		
CODE(DATE)	21	8504 34166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	707 65833333	0 44	0 7805

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	10654 50000000	426 18000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	25	10654 50000000			0 00000000		51 50000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1399 03333333		
CODE(DATE)	21	9255 46666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1399 03333333	0 79	0 5425

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	15463 11538462	618 52461538			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	25	15463 11538462			0 00000000		33 26923077

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	427 49871795		
CODE(DATE)	21	15035 61666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	427 49871795	0 15	0 9613

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	13425 53846154	537 02153846			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	25	13425 53846154			0 00000000		28 30769231

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1795 48846154		
CODE(DATE)	21	11630 05000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1795 48846154	0 81	0 5325

PRODUCT=15%VM

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
880718	8	63 1250000	48 6250000	73 1250000	30 5000000	52 7500000	28 6250000	21 8750000
880719	8	62 3750000	40 2500000	72 0000000	29 8750000	51 0000000	33 3750000	34 3750000
880720	3	57 3333333	52 3333333	70 3333333	21 3333333	61 3333333	40 6666667	40 0000000
880721	2	65 5000000	44 5000000	69 0000000	43 0000000	64 5000000	40 0000000	38 5000000
880722	5	60 2000000	36 6000000	68 0000000	24 2000000	39 2000000	33 4000000	17 8000000

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925

NUMBER OF OBSERVATIONS IN BY GROUP = 26

GROUP	OBS	DEPENDENT VARIABLES
1	26	DRY SWEET HTEXT VMFLAV VMODOR
2	25	CTEXT
3	25	ACCEPT

NOTE VARIABLES IN EACH GROUP ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	10168 61538462	406 74461538			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		DRY MEAN
CORRECTED TOTAL	25	10168 61538462			0 00000000		60 76923077

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	984 57371795		
CODE(DATE)	21	9184 04166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	984 57371795	0 56	0 6922

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	6444 96153846	257 79846154			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	25	6444 96153846			0 00000000		44 96153846

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1429 16153846		
CODE(DATE)	21	5015 80000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1429 16153846	1 50	0 2393

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	4588 00000000	183 52000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	25	4588 00000000			0 00000000		74 00000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	815 28333333		
CODE(DATE)	21	3772 71666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	815 28333333	1 13	0 3673

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	16218 61538462	648 74461538			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	25	16218 61538462			0 00000000		42 23076923

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1986 04038462		
CODE(DATE)	21	14232 57500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1986 04038462	0 73	0 5799

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	13142 65384615	525 70615385			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	25	13142 65384615			Q 00000000		26 88461538

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1807 23717949		
CODE(DATE)	21	11335 41666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1807 23717949	0 84	0 5170

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
880718	8	63 5000000	52 7500000	81 1250000	44 8750000	21 3750000
880719	8	55 8750000	38 2500000	70 3750000	37 0000000	28 8750000
880720	3	65 6666667	49 0000000	77 6666667	63 0000000	47 6666667
880721	2	76 5000000	29 0000000	72 5000000	28 5000000	27 0000000
880722	5	55 0000000	47 2000000	66 8000000	39 4000000	20 0000000

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	24	10425 36000000	434 39000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	24	10425 36000000			0 00000000		32 16000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1953 23500000		
CODE(DATE)	20	8472 12500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1953 23500000	1 15	0 3609

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	CTEXT
880718	8	25 5000000
880719	8	27 1250000
880720	3	51 0000000
880721	2	32 5000000
880722	4	41 2500000

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	24	15296 00000000	637 33333333			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	24	15296 00000000			0 00000000		51 60000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	153 90476190		
CODE(DATE)	20	15142 09523810		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	153 90476190	0 05	0 9948

PRODUCT=20%VM

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	ACCEPT
880718	7	51 2857143
880719	8	49 0000000
880720	3	50 6666667
880721	2	56 0000000
880722	5	55 0000000

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
DATE	5	880718 880719 880720 880721 880722
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925

NUMBER OF OBSERVATIONS IN BY GROUP = 26

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	6380 96153846	255 23846154			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		DRY MEAN
CORRECTED TOTAL	25	6380 96153846			0 00000000		49 96153846

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	2742 38653846		
CODE(DATE)	21	3638 57500000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	2742 38653846	3 96	0 0151

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	11140 50000000	445 62000000			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	25	11140 50000000			0 00000000		44.50000000

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1025 13333333		
CODE(DATE)	21	10115 36666667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1025 13333333	0 53	0 7136

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	8122 03846154	324 88153846			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	25	8122 03846154			0 00000000		67 19230769

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1450 29679487		
CODE(DATE)	21	6671 74166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1450 29679487	1 14	0 3645

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	11688 34615385	467 53384615			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	25	11688 34615385			0 00000000		32 42307692

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1069 10448718		
CODE(DATE)	21	10619 24166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1069 10448718	0 53	0 7160

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	19382 96153846	775 31846154			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	25	19382 96153846			0 00000000		51 03846154

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	4874 16153846		
CODE(DATE)	21	14508 80000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	4874 16153846	1 76	0 1739

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	22787 11538462	911 48461538			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	25	22787 11538462			0 00000000		41 26923077

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1374 06538462		
CODE(DATE)	21	21413 05000000		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1374 06538462	0 34	0 8500

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	17431 88461538	697 27538462			1 000000	0 0000
ERROR	0	0 00000000	0 00000000		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	25	17431 88461538			0 00000000		33 65384615

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1024 64294872		
CODE(DATE)	21	16407 24166667		

TESTS OF HYPOTHESES USING THE ANOVA MS FOR CODE(DATE) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
DATE	4	1024 64294872	0 33	0 8561

PRODUCT=25%VM

ANALYSIS OF VARIANCE PROCEDURE

MEANS

DATE	N	DRY	SWEET	HTEXT	CTEXT	ACCEPT	VMFLAV	VMODOR
880718	8	39 8750000	40 2500000	66 6250000	33 8750000	47 5000000	46 8750000	40 5000000
880719	8	59 0000000	45 7500000	69 2500000	25 5000000	67 5000000	39 1250000	28 8750000
880720	3	68 0000000	60 3333333	82 6666667	34 6666667	22 0000000	53 0000000	39 3333333
880721	2	43 5000000	37 5000000	67 5000000	50 5000000	45 0000000	38 5000000	37 5000000
880722	5	43 4000000	42 6000000	55 4000000	32 6000000	50 2000000	29 8000000	25 4000000

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
SUPP	2	N Y
CODE	18	901 902 903 904 905 906 907 908 909 910 911 914 918 921 922 923 924 925
PRODUCT	5	CORN MOG 15%VM 20%VM 25%VM

NUMBER OF OBSERVATIONS IN DATA SET = 130

GROUP	OBS	DEPENDENT VARIABLES
1	90	DRY SWEET HTEXT ACCEPT VMFLAV VMODOR
2	88	CTEXT

NOTE VARIABLES IN EACH GROUP ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	16146 85555556	645 87422222	4 08	0 0001	0 614464	22 8665
ERROR	64	10131 10000000	158 29843750		ROOT MSE		DRY MEAN
CORRECTED TOTAL	89	26277 95555556			12 58167070		55 02222222

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	875 60555556	5 53	0 0218	1	875 60555556	5 53	0 0218
CODE(SUPP)	16	11251 15000000	4 44	0 0001	16	11251 15000000	4 44	0 0001
PRODUCT	4	3305 40000000	5 22	0 0011	4	2589 05555556	4 09	0 0052
SUPP*PRODUCT	4	714 70000000	1 13	0 3509	4	714 70000000	1 13	0 3509

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	875 60555556	1 25	0 2810

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	12576 42222222	503.05688889	3 56	0 0001	0 581978	26 8857
ERROR	64	9033 36666667	141 14635417		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	89	21609 78888889			11 88050311		44 18888889

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	34 67222222	0 25	0 6219	1	34 67222222	0 25	0 6219
CODE(SUPP)	16	11614 71666667	5 14	0 0001	16	11614 71666667	5 14	0 0001
PRODUCT	4	210 17777778	0 37	0 8276	4	147 52222222	0 26	0 9017
SUPP*PRODUCT	4	716 85555556	1 27	0 2912	4	716 85555556	1 27	0 2912

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	34 67222222	0 05	0 8298

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	13299 02222222	531 96088889	2 68	0 0008	0 511639	21 0166
ERROR	64	12693 96666667	198 34322917		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	89	25992 98888889			14 08343812		67 01111111

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	8 02222222	0 04	0 8412	1	8 02222222	0 04	0 8412
CODE(SUPP)	16	11753 36666667	3 70	0 0001	16	11753 36666667	3 70	0 0001
PRODUCT	4	939 37777778	1 18	0 3263	4	1149 41111111	1 45	0 2283
SUPP*PRODUCT	4	598 25555556	0 75	0 5590	4	598 25555556	0 75	0 5590

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	8 02222222	0 01	0 9181

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	10702 08888889	428 08355556	0 78	0 7529	0 233151	43 2075
ERROR	64	35199 96666667	549 99947917		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	89	45902 05555556			23 45206769		54 27777778

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	102 75555556	0 19	0 6670	1	102 75555556	0 19	0 6670
CODE(SUPP)	16	7371 70000000	0 84	0 6395	16	7371 70000000	0 84	0 6395
PRODUCT	4	795 66666667	0 36	0 8350	4	1439 03333333	0 65	0 6261
SUPP*PRODUCT	4	2431 96666667	1 11	0 3617	4	2431 96666667	1 11	0 3617

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	102 75555556	0 22	0 6431

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE VMFLAV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	29706 28888889	1188 25155556	2 67	0 0008	0 510774	65 0997
ERROR	64	28453 10000000	444 57968750		ROOT MSE		VMFLAV MEAN
CORRECTED TOTAL	89	58159 38888889			21 08505839		32 38888889

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	3388 67222222	7 62	0 0075	1	3388 67222222	7 62	0 0075
CODE(SUPP)	16	21674 31666667	3 05	0 0008	16	21674 31666667	3 05	0 0008
PRODUCT	4	3850 44444444	2 17	0 0829	4	4258 36666667	2 39	0 0595
SUPP*PRODUCT	4	792 85555556	0 45	0 7750	4	792 85555556	0 45	0 7750

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	3388 67222222	2 50	0 1333

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE VMODOR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	24657 22222222	986 28888889	4 50	0 0001	0 637528	68 3441
ERROR	64	14019 10000000	219 04843750		ROOT MSE		VMODOR MEAN
CORRECTED TOTAL	89	38676 32222222			14 80028505		21 65555556

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	1175 55555556	5 37	0 0237	1	1175 55555556	5 37	0 0237
CODE(SUPP)	16	21125 56666667	6 03	0 0001	16	21125 56666667	6 03	0 0001
PRODUCT	4	2278 82222222	2 60	0 0442	4	2160 25555556	2 47	0 0537
SUPP*PRODUCT	4	77 27777778	0 09	0 9858	4	77 27777778	0 09	0 9858

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	1175 55555556	0 89	0 3594

GENERAL LINEAR MODELS PROCEDURE

MEANS

SUPP	N	DRY	SWEET	HTEXT	ACCEPT	VMFLAV	VMODOR
N	60	52 8166667	43 7500000	66 8000000	55 0333333	28 0500000	19 1000000
Y	30	59 4333333	45 0666667	67 4333333	52 7666667	41 0666667	26 7666667

PRODUCT	N	DRY	SWEET	HTEXT	ACCEPT	VMFLAV	VMODOR
CORN	18	52 8888889	43 2222222	63 7777778	55 0555556	34 8333333	24 5000000
MOG	18	55 3888889	46 2222222	65 6111111	58 9444444	20 4444444	13 5000000
15%VM	18	60 8888889	43 3888889	67 5555556	53 0555556	31 1111111	24 2777778
20%VM	18	61 2222222	45 7777778	73 0000000	54 5555556	39 4444444	18 4444444
25%VM	18	44 7222222	42 3333333	65 1111111	49 7777778	36 1111111	27 5555556

SUPP	PRODUCT	N	DRY	SWEET	HTEXT	ACCEPT	VMFLAV	VMODOR
N	CORN	12	51 3333333	41 9166667	64 8333333	58 0000000	30 0833333	22 3333333
N	MOG	12	56 2500000	49 6666667	67 5833333	58 4166667	19 4166667	11 3333333
N	15%VM	12	57 7500000	42 4166667	64 3333333	53 6666667	26 3333333	22 2500000
N	20%VM	12	59 2500000	43 5000000	71 8333333	49 4166667	35 8333333	15 8333333
N	25%VM	12	39 5000000	41 2500000	65 4166667	55 6666667	28 5833333	23 7500000
Y	CORN	6	56 0000000	45 8333333	61 6666667	49 1666667	44 3333333	28 8333333
Y	MOG	6	53 6666667	39 3333333	61 6666667	60 0000000	22 5000000	17 8333333
Y	15%VM	6	67 1666667	45 3333333	74 0000000	51 8333333	40 6666667	28 3333333
Y	20%VM	6	65 1666667	50 3333333	75 3333333	64 8333333	46 6666667	23 6666667
Y	25%VM	6	55 1666667	44 5000000	64 5000000	38 0000000	51 1666667	35 1666667

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	25	29260 24204545	1170 40968182	5 29	0 0001	0 680764	46 0962
ERROR	62	13721 21250000	221 30987903		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	87	42981 45454545			14 87648746		32 27272727

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SUPP	1	370 80112640	1 68	0 2003	1	260 08548641	1 18	0 2825
CODE(SUPP)	16	26003 70341905	7 34	0 0001	16	26169 88598485	7 39	0 0001
PRODUCT	4	1063 40079434	1 20	0 3193	4	1128 23720317	1 27	0 2897
SUPP*PRODUCT	4	1822 33670566	2 06	0 0971	4	1822 33670566	2 06	0 0971

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SUPP) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SUPP	1	370 80112640	0 23	0 6394

GENERAL LINEAR MODELS PROCEDURE

MEANS

SUPP	N	CTEXT
N	59	33 7118644
Y	29	29 3448276

PRODUCT	N	CTEXT
CORN	17	35 0000000
MOG	18	27 2222222
15%VM	18	31 9444444
20%VM	17	30 4705882
25%VM	18	36 7777778

SUPP	PRODUCT	N	CTEXT
N	CORN	12	32 9166667
N	MOG	12	29 0833333
N	15%VM	12	38 4166667
N	20%VM	11	28 7272727
N	25%VM	12	39 0000000
Y	CORN	5	40 0000000
Y	MOG	6	23 5000000
Y	15%VM	6	19 0000000
Y	20%VM	6	33 6666667
Y	25%VM	6	32 3333333

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
SEX	2	F M
CODE	26	899 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925
PRODUCT	5	CORN MOG 15%VM 20%VM 25%VM

NUMBER OF OBSERVATIONS IN DATA SET = 130

GROUP	OBS	DEPENDENT VARIABLES
1	130	DRY SWEET HTEXT VMFLAV VMODOR
2	128	CTEXT
3	129	ACCEPT

NOTE VARIABLES IN EACH GROUP ARE CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE DRY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	33	24266 83730769	735 35870629	3 46	0 0001	0 543283	26 0276
ERROR	96	20400 15500000	212 50161458		ROOT MSE		DRY MEAN
CORRECTED TOTAL	129	44666 99230769			14 57743512		56 00769231

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SEX	1	92 62230769	0 44	0 5107	1	92 62230769	0 44	0 5107
CODE(SEX)	24	21039 17000000	4 13	0 0001	24	21039 17000000	4 13	0 0001
PRODUCT	4	2697 03076923	3 17	0 0170	4	2546 84500000	3 00	0 0223
SEX*PRODUCT	4	438 01423077	0 52	0 7246	4	438 01423077	0 52	0 7246

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SEX) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SEX	1	92 62230769	0 11	0 7480

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE SWEET

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	33	20313 61807692	615 56418415	3 00	0 0001	0 507702	32 6690
ERROR	96	19697 30500000	205 18026042		ROOT MSE		SWEET MEAN
CORRECTED TOTAL	129	40010 92307692			14 32411465		43 84615385

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SEX	1	1714 65307692	8 36	0 0048	1	1714 65307692	8 36	0 0048
CODE(SEX)	24	17791 87000000	3 61	0 0001	24	17791 87000000	3 61	0 0001
PRODUCT	4	148 84615385	0 18	0 9476	4	119 75653846	0 15	0 9644
SEX*PRODUCT	4	658 24884615	0 80	0 5268	4	658 24884615	0 80	0 5268

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SEX) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SEX	1	1714 65307692	2 31	0 1414

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE HTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	33	16723 06423077	506 75952214	2 57	0 0002	0 469317	20 4543
ERROR	96	18909 70500000	196 97609375		ROOT MSE		HTEXT MEAN
CORRECTED TOTAL	129	35632 76923077			14 03481720		68 61538462

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SEX	1	572 89923077	2 91	0 0913	1	572 89923077	2 91	0 0913
CODE(SEX)	24	13805 47000000	2 92	0 0001	24	13805 47000000	2 92	0 0001
PRODUCT	4	1599 61538462	2 03	0 0962	4	1575 51038462	2 00	0 1007
SEX*PRODUCT	4	745 07961538	0 95	0 4411	4	745 07961538	0 95	0 4411

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SEX) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SEX	1	572 89923077	1 00	0 3282

GENERAL LINEAR MODELS PROCEDURE

MEANS

SEX	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
F	80	56 6750000	40 9750000	70 2750000	36 1500000	27 7125000
M	50	54 9400000	48 4400000	65 9600000	33 1000000	26 0400000

PRODUCT	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
CORN	26	53 8846154	44 0769231	66 5769231	33 9615385	27 3846154
MOG	26	53 5769231	41 8461538	64 1538462	24 1538462	19 1153846
15%VM	26	61 8461538	43 8461538	71 1538462	33 2692308	28 3076923
20%VM	26	60 7692308	44 9615385	74 0000000	42 2307692	26 8846154
25%VM	26	49 9615385	44 5000000	67 1923077	41 2692308	33 6538462

SEX	PRODUCT	N	DRY	SWEET	HTEXT	VMFLAV	VMODOR
F	CORN	16	52 8125000	40 5625000	68 4375000	37 8125000	26 5000000
F	MOG	16	55 8750000	36 7500000	65 2500000	24 0000000	18 6875000
F	15%VM	16	64 1250000	43 8750000	76 1875000	35 1875000	30 3125000
F	20%VM	16	59 9375000	41 0625000	73 2500000	41 0625000	28 1250000
F	25%VM	16	50 6250000	42 6250000	68 2500000	42 6875000	34 9375000
M	CORN	10	55 6000000	49 7000000	63 6000000	27 8000000	28 8000000
M	MOG	10	49 9000000	50 0000000	62 4000000	24 4000000	19 8000000
M	15%VM	10	58 2000000	43 8000000	63 1000000	30 2000000	25 1000000
M	20%VM	10	62 1000000	51 2000000	75 2000000	44 1000000	24 9000000
M	25%VM	10	48 9000000	47 5000000	65 5000000	39 0000000	31 6000000

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE CTEXT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	33	32307 80107639	979 02427504	4 04	0 0001	0 586194	49 8320
ERROR	94	22806 69111111	242 62437352		ROOT MSE		CTEXT MEAN
CORRECTED TOTAL	127	55114 49218750			15 57640438		31 25781250

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SEX	1	3 55392865	0 01	0 9039	1	3 00404547	0 01	0 9116
CODE(SEX)	24	31031 18825885	5 33	0 0001	24	30969 24222222	5 32	0 0001
PRODUCT	4	235 32761161	0 24	0 9135	4	120 30739951	0 12	0 9735
SEX*PRODUCT	4	1037 73127728	1 07	0 3762	4	1037 73127728	1 07	0 3762

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SEX) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SEX	1	3 55392865	0 00	0 9586

GENERAL LINEAR MODELS PROCEDURE

MEANS

SEX	N	CTEXT
F	79	31 1265823
M	49	31 4693878

PRODUCT	N	CTEXT
CORN	25	32 8000000
MOG	26	30 0000000
15%VM	26	29 0000000
20%VM	25	32 1600000
25%VM	26	32 4230769

SEX	PRODUCT	N	CTEXT
F	CORN	16	34 7500000
F	MOG	16	30 2500000
F	15%VM	16	25 0000000
F	20%VM	15	34 3333333
F	25%VM	16	31 5000000
M	CORN	9	29 3333333
M	MOG	10	29 6000000
M	15%VM	10	35 4000000
M	20%VM	10	28 9000000
M	25%VM	10	33 9000000

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE ACCEPT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C V
MODEL	33	18934 36135659	573.76852596	0 98	0 5120	0 253628	46 1607
ERROR	95	55719 73166667	586 52349123		ROOT MSE		ACCEPT MEAN
CORRECTED TOTAL	128	74654 09302326			24 21824707		52 46511628

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
SEX	1	601 77631440	1 03	0 3137	1	644 35416136	1 10	0 2972
CODE(SEX)	24	14797 96670886	1 05	0 4133	24	14757 34333333	1 05	0 4166
PRODUCT	4	267 44353846	0 11	0 9773	4	819 90341026	0 35	0 8438
SEX*PRODUCT	4	3267 17479487	1 39	0 2424	4	3267 17479487	1 39	0 2424

TESTS OF HYPOTHESES USING THE TYPE I MS FOR CODE(SEX) AS AN ERROR TERM

SOURCE	DF	TYPE I SS	F VALUE	PR > F
SEX	1	601 77631440	0 98	0 3330

GENERAL LINEAR MODELS PROCEDURE

MEANS

SEX	N	ACCEPT
F	79	50 7468354
M	50	55 1800000

PRODUCT	N	ACCEPT
CORN	26	54 2307692
MOG	26	53 9230769
15%VM	26	51 5000000
20%VM	25	51 6000000
25%VM	26	51 0384615

SEX	PRODUCT	N	ACCEPT
F	CORN	16	46 0625000
F	MOG	16	49 3750000
F	15%VM	16	52 3750000
F	20%VM	15	52 6000000
F	25%VM	16	53 4375000
M	CORN	10	67 3000000
M	MOG	10	61 2000000
M	15%VM	10	50 1000000
M	20%VM	10	50 1000000
M	25%VM	10	47 2000000

VITA

Terra Lisa Smith

Candidate for the Degree of

Master of Science

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Personal data: Born in Elizabeth City, North Carolina, September 3, 1962, the daughter of Theon and Ida Smith; two brothers, Theon Cails and Beau-Micah; married Loveday E. Nwobilor on August 9, 1986; one son, Chidozie Daniel Amadi Nwobilor.

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