

SOLUTIONS MANUAL



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Understanding Food
Principles & Preparation

Fourth Edition



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Instructor's Manual¹ for Chapter 2 – Food Evaluation

Objectives

The food industry uses an array of testing methods to measure the sensory factors related to food selection and to evaluate quality. These tests are conducted for research and development, product improvement, sales and marketing, quality assurance, nutrient content analysis for labeling requirements (Nutrition Facts), and detection of contamination or adulteration. The purpose of the chapter is to identify the specific types of tests and tools that the food industry uses to evaluate the palatability of food among consumers.

Recommendations

Food evaluation is accomplished using both sensory (subjective) and objective tests. The depth of the lecture is dependent on the students and the majors represented in the class. If the curriculum does not require a second course in foods or experimental foods, the section on evaluation may be essentially deleted or shortened. It should, however, include the definitions of subjective and objective testing and the explanation of why food manufacturing companies perform specific tests.

Lecture Outline

- I. Introduction
- II. Sensory (Subjective) Evaluation
 - A. Sensory criteria
 1. Sight
 2. Taste
 3. Touch
 4. Smell
 5. Hearing
 - B. Two types of sensory testing
 1. Analytical tests (effective tests)
 - a. Discriminative tests
 1. Difference tests
 - a. Triangle
 - b. Duo-trio
 - c. Paired comparison
 - d. Ranking
 - e. Ordinal
 2. Sensitivity
 - a. Threshold
 - b. Dilution
 - b. Descriptive tests
 1. Flavor profile
 2. Texture profile
 - c. Trained taste panel
 2. Affective tests (consumer)
 - a. Hedonic
 1. Nine-point scale
 2. “Smily” or “frowny” faces for children

¹ Objectives, recommendations, and lecture outlines by Dr. Joan Aronson of New York University. Learning activities by Cheryl Houston of Fontbonne University.

- b. Personal preference
 - 1. Paired preference
 - 2. Ranking test
 - c. Untrained consumer taste panel
 - C. Taste panels
 - 1. Skilled/trained or random
 - 2. Characteristics of general taste panels
 - D. Sample preparation
 - 1. Environment for testing
 - 2. Sampling procedure
- III. Objective Evaluation
 - A. Physical tests – measure size, shape, weight, volume, density, moisture, texture, and viscosity
 - 1. Visual evaluation
 - a. Microscope
 - b. Spectrophotometer
 - 2. Weight/volume measurements
 - 3. Texture measurements
 - a. Penetrometer
 - b. Warner-Bratzler shear
 - c. Shortometer
 - 4. Viscosity measurements
 - a. Line-spread test
 - b. Viscometer
 - 5. Concentration measurements
 - a. Polarimeter
 - b. Atomic absorption
 - B. Chemical tests
 - 1. Examples
 - a. Benedict and Fehling tests – reducing sugars
 - b. Chromatography – flavor compounds
 - c. Electrophoresis – proteins
 - d. Enzyme tests – inactivity
 - e. Fuchsin test – aldehydes in fats and oils
 - f. Iodine value test – unsaturation in fats
 - g. Peroxide value test – fat oxidation
 - h. pH meter – acidity or alkalinity
 - i. Proximate analysis – macronutrient content
 - 2. Testing in commercial laboratories
 - a. Microbial evaluation
 - 1. Bacteria, yeast and/ or molds
 - b. Nutrition Facts labels
 - c. Contamination and adulteration
 - d. Pesticides, herbicides, and industrial residues
 - e. Melamine
 - 3. Chemical test examples conducted by a food testing company
 - a. Allergens
 - b. Ammonia
 - c. Ash
 - d. Calcium
 - e. Calories (by calculation)
 - f. Collagen
 - g. Crude fiber
 - h. Fat (Soxhlet)
 - i. Fatty acid content (saturated, unsaturated, trans)

- j. Iron
- k. Heavy metals
- l. Hydroxyproline
- m. Moisture (water)
- n. Maximum internal temperature
- o. Moisture/protein ratio
- p. Nitrate
- q. Nutritional analysis and labeling
- r. Percent bone
- s. pH
- t. Phosphate
- u. Protein
- v. Salt
- w. Sodium nitrite
- x. Soy protein concentrate
- y. Thiobarbituric acid reactive substances (TBA)
- z. Unknown compound identification

Learning Activities

Activity 2-1: Subjective Tests for Food Evaluation

Chapter Reference: Food evaluation – subjective tests of difference

Materials Needed: Handout 2-1 (provided in this document)

Key Concepts:

- Food evaluation
- Subjective tests
- Analytical tests
- Difference tests

Instructions:

1. Place students in teams of 2-3 members.
2. Distribute the handout and review the directions.
3. Lead a large group discussion of the results.

Answer Key for Handout 2-2

Part A

- | | |
|---------------------------------|-------------------------|
| 1. Sensory (subjective) tests | i. Hedonic tests |
| a. Analytical (effective) tests | ii. Personal preference |
| i. Discriminative tests | 2. Objective tests |
| ii. Descriptive tests | a. Physical tests |
| b. Affective tests | b. Chemical tests |

Part B

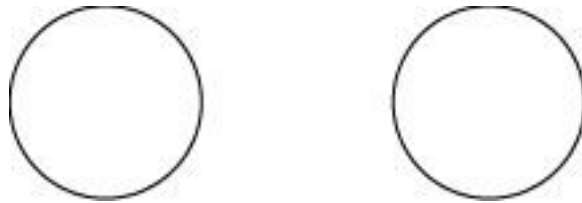
- | | |
|--|--|
| 1. Objective: physical test: viscosity test | 5. Sensory: affective test: hedonic test |
| 2. Sensory: discriminative test: difference test | 6. Sensory: descriptive test: flavor profile |
| 3. Objective: chemical test: analysis | 7. Objective: physical test: density test |
| 4. Sensory: affective test: personal preference | |

Handout 2-1

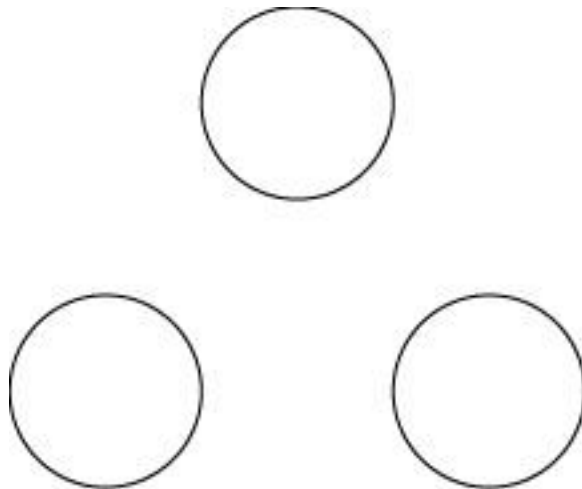
Team Name: _____

Directions: A food manufacturer asked you to design three experiments (paired comparison, triangle test, duo-trio test) to see if consumers can detect the difference between regular Ruffles® potato chips (control) and reduced-fat Ruffles® potato chips. Illustrate your three experiments using the three templates below; be sure to label the circles as appropriate.

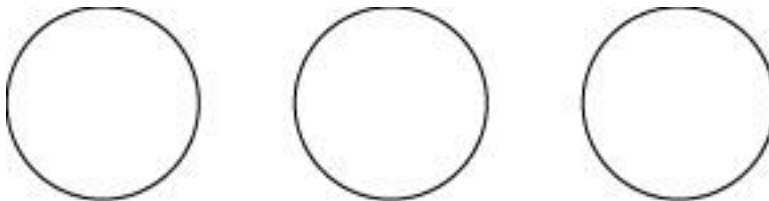
Experiment #1: _____ (name of test)



Experiment #2: _____ (name of test)



Experiment #3: _____ (name of test)



Handout 2-2: Chapter 2 Student Review Worksheet

Part A: Outline the major types of food evaluation methods.

Major Test Types

Subcategories

- | | | |
|------------|----------------------------|-----------------------------|
| 1. _____ = | a. _____ =
or | i. _____
or
ii. _____ |
| | b. _____ = | i. _____
or
ii. _____ |
| 2. _____ = | a. _____
or
b. _____ | |

Part B: Imagine you are responsible for planning some evaluation tests for Super Tasty brand marinara (tomato) sauce. Name the type of test that is most appropriate for each question you need to answer.

- How easily will Super Tasty pour out of the jar and over a plate of pasta?
- Can a trained taster tell the difference between Super Tasty sauce and another brand?
- How much dietary fiber and fat are provided by 1 cup of Super Tasty sauce?
- Out of 100 consumers, how many would prefer Super Tasty sauce over another brand?
- What aspects (e.g., odor, color, texture) of Super Tasty Sauce do consumers like best, and which do they like least?
- What specific herbs and spices used in Super Tasty sauce can be detected by a trained taster?
- What is the mass per each ounce of Super Tasty sauce?