Establishment of Quality Assurance Sensory Panel and Descriptive Sensory Panel for Soup Mixtures

By

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02/AS/039

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DECLARATION

I certify that this dissertation, implemented by me at Unilever Sri Lanka Ltd and Faculty of Applied Sciences under the supervision of Mr. Chrishantha Perera, Miss Dilani Hettiarachchi and Mrs. Rasangi Sabaragamuwa, does not incorporate with out acknowledgment of any material previously submitted for a degree or diploma in any other university and to the best of my knowledge and belief this does not contain any material previously published in writing or orally communicated by another person where due reference is made in the text.

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AFFECTIONATELY DEDICATED

TO MY PARENTS

AND TEACHERS

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ABSTRACT

Any food product has to be analysed and accepted by a quality control sensory panel prior to be released to the market. The panel used for this purpose should be well trained using standards, in order to make them familiar with the standard sensory characteristics of the product. Establishment of a training procedure and trained sensory panel and for the quality assurance of a soup mixture was one of the major objectives of this research. Descriptive sensory panel must be able to provide a quantitative specification of all the sensory attributes of a food product for development activities. So the panel used for this purpose should be highly trained and standardized with the usage of references. Establishment of a training procedure and trained sensory panel for the descriptive sensory analysis of the above soup mixture was the other major objective of this research.

For the accomplishment of this objective first the major sensory attributes of the soup mixture were identified and formulations of the samples that can be used for the training were determined with the assistance of a sensory expert. Panel consisted three members who were selected through a pre screening procedure. At the out set of the training program the panel was given the basic knowledge about importance and general rules of sensory analysis and the basic test procedures. In order to make the panel familiar with the standard sensory characteristics of the soup, they were trained using the standard sample along with number of samples having deviated sensory characteristics.

To further expertise the panel they were trained using soup samples having different intensities of sensory characteristics of the product i.e. saltiness, umami taste, sweetness, chicken flavour, colour and viscosity. Further they were made familiarised about the effect of major flavouring ingredients on the overall flavour profile of the soup, using samples having different compositions of flavouring ingredients in water base and corn flour gravy.

Performance evaluation was done on the following day of each of the training sessions and at the end of the whole training program in which all the members were able to identify the standard sample and were able to arrange the samples with different intensities of sensory characteristics in their increasing order. The performance evaluation results revealed that the training procedure is effective so that the trainees can be appointed in the quality assurance sensory panel. And also this procedure can be further improved by including training on scaling and profiling methods and can be used to train a descriptive sensory panel.

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LIST OF ABBREVATIONS

edt : Edition

et al. : And others

g : gram

ml : mili litre

MSG : Mono Sodium Glutamate

YEP : Yeast extract powder

CHAPTER 01

INTRODUCTION AND OBJECTIVES

1.1 Introduction

Soup is usually a liquid food that is made by combining ingredients, such as meat and vegetables in stock or hot water, until the flavour is extracted, forming a broth. With the complication of the life styles of people the traditional concept of soup was replaced with instant soup mixtures in order to provide convenience added to its superior nutritional properties and delicacy.

Soup mixes of various recipes are available in market in order to match the unique interests of consumer segments and different needs of them. Major common ingredients in soup mixes are dehydrated inclusions like vegetables, grains and meats, starches like corn flour, natural, nature identical and artificial flavouring substances, flavour enhancers, edible fats, spices and condiments, natural colours and several other ingredients which give off unique properties to different formulations of soup mixes.

Most of those properties imparted by the ingredients are readily perceived by human senses during consumption, as the various physico-chemical characteristics of those ingredients are able to stimulate those senses to a certain extend. Consumer preference for any kind of a food unexceptionally for soup is initially dictated by its sensory quality.

Therefore one major obligation of the manufacturer is to maintain the sensory quality of the product in such a way it is accepted and more over it is able to delight the consumer through it's sensory properties.

Physical properties are widely used to define standards for acceptable process and product quality. In the same way, sensory results can be used as a basis for specifying tolerance limits on a number of sensory characteristics, in conjunction with marketing, in order to deliver consistently good product quality to the consumer (Carpenter, *et al.*, 2000). Consequently sensory analysis becomes an essential step in quality assurance of soup mixtures and thus they have to be analysed and accepted by a quality assurance sensory panel prior to the release to the market.

The panel which is involved in quality assurance sensory evaluation must be highly familiar with the standard sensory characteristics of the product and later they should decide the tolerance limit for each of such sensory attributes so that they can aid to take the management decision of acceptance or rejection of a batch of product through a quality assurance sensory evaluation.

Descriptive analysis techniques attempt to provide a quantitative specification of all the sensory attributes of a food or product. The results are useful for specifying sensory changes in product development as a function of ingredient, packaging or processing variables and for shelf life and quality control questions. The data are also used for correlation with consumer judgment for purpose of building predictive or explanatory model of factors driving likes and dislikes. Since they are quantitative and analytic in nature, the sensory specifications are also sometimes examined for correlation with instrumental measures of food properties (Lawless Harry T., 2001).

The panel used for descriptive sensory analysis should be highly trained and standardized with usage of references. The methodology of training depends on the product and in case of soup mixes the panel should be thoroughly familiarized with the different level of intensities of the sensory attributes of soup mixes and possible defects in them.

1.2 Overall Objective

- To establish a quality assurance sensory panel for soup mixtures.
- To establish a trained panel for the descriptive sensory analysis of soup mixtures.

1.3 Specific Objectives

- To determine the formulations of the samples that can be used to train a panel for the quality assurance of soup mixtures.
- To determine the formulations of the samples that can be used to train a panel for the descriptive sensory analysis of soup mixtures.
- To establish a procedure to train the panel members on basic tastes.
- To establish a procedure to train a quality assurance panel for soup mixtures.
- To establish a procedure to train a panel for the descriptive sensory analysis of soup mixes.
- To train a quality assurance sensory panel using above established procedure.
- To train a descriptive sensory panel using above established procedure.

CHAPTER 02

LITERATURE REVIEW

2.1 Introduction for Sensory Analysis

Sensory analysis is the identification, scientific measurement, analysis and interpretation of the properties (attributes) of a product, as they are perceived through the five senses of sight, smell, taste, touch and hearing (Carpenter, *et al.*, 2000).

2.1.1 Human Senses

There are five human senses which are able perceive the sensory attributes of the food items that are consumed by us.

1. Gustatory (Sense of taste): Sensation of the taste is a result of the effect of water soluble molecules interacting with receptors on the tongue and oral cavity.
2. Olfactory sense (Sense of smell): The olfactory epithelium of the human nose is responsible for the detection of odours
3. Visual sense (Vision): Human eye is the organ responsible for the visual senses.
4. Audition (Sense of hearing): Human ear is the organ responsible for the visual senses.
5. Somesthetic & kinesthetic sense (Sense of touch): Through this variation in physical pressure is sensed through skin and nerve fibres in muscles tendons and joints.

2.1.2 Applications of Sensory Analysis

(I) Providing Answers to Practical Problems

Sensory analysis is used to answer questions about product quality, questions relating to discrimination, description, or preference. Discrimination plays an important role in product quality control, in shelf life studies, and in investigation of possible taints. Discrimination applications depend on the assessor's ability to detect and recognise differences. Descriptive tests are applied in product development context where there is a desire to develop a product that matches known target quality; or to reformulate an existing product using different ingredients or processes; or to investigate the differences among a range of experimental and/or commercial products. Preference and acceptability tests are aimed at establishing whether product differences are recognised by the consumer and are seen to be improving liking or acceptability.

(II) Specification and Quality Control

The use of product specifications in the manufacture and supply of food items is essential in normal commercial practice. A widely used definition of quality is in this context is "the collection of features and characteristics of a product or service that confer its ability to satisfy stated or implied needs" (ISO, 1992). When applied to a food product, this definition can be seen to comprise two "sensory" elements-the first part includes the objective sensory properties of the product ("the collection of features"), while the second part refers to the subjective perceptions of the end user or consumer of the goods ("to satisfy stated or implied needs"). A product sensory quality specification would be: A document that clearly identifies the important sensory characteristics of a product and that can act as a basis of agreement between the buyer and the seller of that product.

(III) Shelf Life Studies

The purpose of a shelf life study is to find out how long a food product may be stored before there is an unacceptable deterioration in its sensory quality. During the entire shelf life of a product factors like temperature, high packaging, atmosphere, storage, distribution and retail procedures are likely to affect its sensory quality, and ultimately, its acceptability to the consumer.

(IV) Taint Potential

Taints are odours or flavours that are essentially foreign to the food product, but have been inadvertently introduce by contact or exposure. Sensory analysis is an essential tool for investigating taint potential. It can establish whether a taint problem is likely to develop, it can provide the first indication of taint problem, or it can provide evidence to identify the nature of the taint component, and consequently determine the associated hazard, if any, it may require specialists procedures, as people vary in their sensitivity to different taints.

(V) Product Matching

Sensory analysis can be used in product matching to evaluate the sensory characteristic of one product and track product development changes that aim to bring it in line with the sensory characteristics of another, similar products. Usually in product matching the target product has already been identified. An objective or analytical approach to sensory analysis along with the use of techniques of descriptive profiling is most appropriate for this purpose.

(VI) Product Formulation

Whenever it is necessary to alter some element of the manufacturing process, there is a need to check the impact on the final product quality. Sensory analysis provides objective tools for this purpose. Descriptive sensory profiling provides an objective measure of any quality changes caused by ingredient or process substitutions. In order to assess the commercial impact of these changes, additional information may be required, such as product knowledge from experts, knowledge about production variation, and information from consumers on trends and fashions that may influence acceptability.

(VII) Product Mapping

There is a stage in the life of most food products when it becomes necessary to compare and contrast the sensory quality of a whole range of related products. The sensory analysis technique of descriptive profiling is a favoured method for gathering the raw data on each product, but there is an additional need to represent and communicate large amount of sensory data in a simple summary form. This is where product mapping comes into its own, though it can also be used in simpler product matching and reformulation studies.

(VIII) Product Acceptability

The question that is asked is no longer an analytical one; instead it has to do with consumer judgment. So it is no longer appropriate to recruit and train special assessors for the task-in fact any such training is likely to induce bias and be counterproductive. What is required is a group of respondents that is representative of target population of product users.

2.1.3 Control of Test Room, Product & Panel

2.1.3.1 Test room control

(A) Test Controls

The physical settings must be designed so as to minimize the subject's biases, maximize their sensitivity, and eliminate variables, which do not come from the product them selves. The test area should be centrally located, easy to reach and free of crowding and confusion, as well as comfortable, quiet, temperature controlled, and above all, free from odours and noise.

(B) Location

The panel test area should be readily accessible to all. A good location is one, which most panel members pass on their way to lunch or morning break. If panel members are drawn from the outside, the area should be near the building entrance. The rooms should be

separated by a suitable distance from congested areas because of noise and the opportunity this would provide for unwanted socializing. Test rooms should be away from other noise and from sources of odour such as machine shops, loading docks, production lines, and cafeteria kitchens.

(C) Test room Designing

- **The Booth** - The materials of construction in the booths and surrounding area should be odour-free and easy to clean. Sample trays may be carried to each booth if they consist of non-odorous items that will keep their condition for 10 to 20 minutes.
- **Descriptive Evaluation and Training Area** - If descriptive analysis is a common requirement or if needs for training and testing are large.
- **Preparation Area**- The preparation area is a laboratory which must permit preparation of all of these possible and foreseeable combinations of test samples at the maximum rate at which they are required. Each booth area and descriptive analysis area should have a separate preparation laboratory as so to maximize the technician's ability to prepare, present and clean up each study.
- **Entrance and Exit area**- Preventing unwanted exchange of information is important.

(D) General Design factors

The colour and lighting in the booth should be planned to permit adequate viewing of samples while minimizing distractions, walls should be off white, the absence of hues of any colour will prevent unwanted difference in appearance. Booths should be even, shadow free.

(E) Construction Materials

- **Non-odorous**- Construction materials must be smooth, easy to clean, and non-absorbing, so that they don't retain odour from previous sessions. (Stainless steel, Teflon and Formica) Non-odours vinyl laminate is suitable for ceilings, walls and floors.
- **Colour**- A neutral, unobtrusive colour scheme using off-white colours and few patterns provides a background, which is non-distracting to panellists. Especially for countertops it is important to choose a colour that doesn't confound or bias evaluations (Meilgaard, *et al.*, 1999).

2.1.3.2 Product Control

(A) Sample Preparation

- **Supplies & Equipments:** In addition to the necessary major appliances, the controlled preparation of products requires adequate supplies & equipment such as
  - Scales, for weighing products and ingredient.
  - Glassware, for measurement & storage of products.
  - Timers, for monitoring of preparation procedures.
  - Stainless steel equipment, for mixing & storing products.
- **Materials:** Sampling of the materials should be done according to the international standards.
- **Preparation Procedure:** The controlled preparation of products requires careful regulation & monitoring of procedures used, with attention given to;
- Amount of product to be used, measured by weight or volume using precise equipment
- Amount of each added ingredient
- The process of preparation, regulation of time, temperature, rates of agitation, size and type of preparation equipment.
- Holding time defined as the minimum and maximum time after preparation that a product could be used for a sensory test (Meilgaard, *et al.*, 1999).

(B) Sample Presentation

- **Serving Containers:** Again these are preferably glass or glazed China, not plastic unless tested.
- **Serving Size:** Extreme care must be given to regulating the precise, amount of product to be given to each equipment may be advantageous for measuring precise amounts of a product for sensory testing (Meilgaard, *et al.*, 1999). Technicians should be carefully trained to deliver the correct amount of product with the least amount of handling. Special

2.1.3.3 Panellist Control

(A) Panel Training or Orientation

As a minimum, panellists must be prepared to participate in a laboratory sensory test with no instruction from the sensory analysts once the test has started. They should be thoroughly familiar with

- The test procedures, such as the amount of sample to be tasted, at one time, delivery system (Spoon, cup, sip, slurry) the length of time of contact with the product and the disposition of the product (swallow, expectorate, leave in contact with skin or remove from skin) must be predetermined and adhered to by all panellists.
- The score sheet design, which includes instructions for evaluation and questions, terminology and scales for expressing judgment, must be understood and familiar to all panellists.
- The type of judgment/evaluation required (difference, description, preference, acceptance) should be understood by the panellists as part of their test orientation.

(B) Product /Time of day

With panellists who are not highly trained it is wise to schedule the evaluation of certain product types at the time of day when the product is normally used or consumed. The tasting of highly flavoured or alcoholic products in the early morning is not recommended. Product testing just after meals or coffee breaks also may introduce bias and should be avoided. Some preconditioning of the panellists skin or mouth may be necessary in order to improve the consistency of verdicts.

(C) Panellists / Environment

The test environment, as seen by the panellist must be controlled if biases are to be avoided. Note, however, that certain controls, such as coloured lights, high humidity, or enclosed testing area, may cause anxiety or distraction, unless panellists are given ample opportunity to become used to such "different" surroundings. Again it is necessary to prepare panellists for what they are to expect in the actual test situation, to give them the orientation and time to feel comfortable with the test protocols, and to provide them with enough information to respond properly to the variables under study.

2.1.4 Factors Influencing Sensory Verdicts

Good sensory measurements require that we look at the tasters as measuring instruments, somewhat variable over time and among them selves, and prone to bias. In order to minimize variability and bias, the experimenter must understand the basic physiological psychological factors, which may influence sensory perception.

Observers must be put in a frame of mind to understand the characteristics we want him to measure. This is done through training and by avoiding a number of pitfalls, inherent in the presentation of samples, the text of the questionnaire, and the handling of the participants (Meilgaard, *et al.*, 1999).

2.1.4.1 Physiological Factors

(A) Adaptation

Adaptation is a decrease in or change in sensitivity to a given stimulus as a result of continued exposure to that stimulus or a similar one. In sensory testing this effect is an important unwanted source of variability of thresholds and intensity ratings.

(B) Enhancement or Suppression

Enhancement or suppression involves the interaction of stimuli presented simultaneously as mixtures.

- **Enhancement-** The effect of presence of one substance increasing the perceived intensity of a second substance.
- **Synergy-** The effect of the presence of one substance increasing the perceived combined intensity of two substances, such that the perceived intensity of the mixture is greater than the sum of the intensities of the components.
- **Suppression-** The effect of the presence of one substance decreasing the perceived intensity of a mixture of two or more substances.

2.1.4.2 Psychological Factors

(A) Expectation Error

Information given with the sample may trigger preconceived ideas. Expectation errors can destroy the validity of a test and must be avoided by keeping the source of samples a secret and by not giving panellists any detailed information in advance of the test. Samples should be coded and the order of presentation should be random among the participants.

(B) Error of Habituation

Human beings have been described as creatures of habit. This description holds true in the sensory world and leads to an error, the error of habituation. This error results from a tendency to continue to give the same response when a series of solely increasing or decreasing stimuli are presented, for example, in quality control from day to day. Habituation is common and must be counteracted by varying the types of product or presenting doctored samples.

(C) Stimulus Error

This error is caused when irrelevant criteria, such as the style or colour of the container, influence the observer. If the criteria suggest differences, the panellist will find them even when they do not exist. The remedies in these cases are obvious, avoid leaving irrelevant (as well as relevant) cues, schedule panel sessions regularly, and make frequent and irregular departures from any usual order or manner of presentation.

(D) Logical Error

Logical errors occur when two or more characteristics of the samples are associated in the minds of the assessors. Logical errors must be minimized by keeping the samples uniform and by masking differences with the aid of coloured glasses, coloured lights, etc. Certain logical errors cannot be masked but may be avoided in other ways.

(E) Halo effect

When more than one attribute of a sample is evaluated, the ratings will tend to influence each other. Simultaneously scoring of various flavour aspects along with overall acceptability can produce different results rather than if each characteristic is evaluated separately. The remedy, when any particular variable is important, is to present separate sets of samples for evaluation of that characteristic.

(F) Order of presentation of samples

At least five types of bias may be caused by the order of presentation.

(1) **Contrast effect**-Presentation of a sample of good quality just before one of poor quality may cause the second sample to receive a lower rating than if it had been rated monadically.

(2) **Group effect**- one good sample presented in a group of poor samples will tend to be rated lower than if presented on its own. This effect is the opposite of the contrast effect.

(3) **Error of central tendency**- Sample placed near the centre of a set tends to be preferred over those placed at the ends.

(4) **Pattern effect**-Panellists will use all available clues and are quick to detect any pattern in the order of presentation.

(5) **Time error/position bias**-One's attitude undergoes subtle changes over a series of tests, from anticipation or even hunger for the first sample, to fatigue or indifference with the last.

All of these five effects must be minimized by the use of a balanced, randomized order of presentation. "Balanced" means that each of the possible combinations is presented an equal number of times. "Randomised" means that the order in which the selected combinations appear was chosen according to the laws of chance.

(G) Mutual Suggestions

The response of the panellists can be influenced by the other panellists. The testing area also should be free from noise and distraction and separate from the preparation area.

(H) Lack of Motivation

An interested panellist is always more efficient. Motivation is best in a well-understood, well-defined test situation. The interest of test panellists can be maintained by giving them reports of their results. Panellists should be made to feel that the panels are an important activity. This can be subtly accomplished by running the tests in a controlled, efficient manner.

(I) Capriciousness vs. Timidity

Some people tend to use the extremes of any scale, thereby exerting more than their share of influence over the panel's results. Others tend to stick to the central part of the scale and to minimize differences between samples.

2.1.4.3 Poor Physical Condition

Panellist should be excused from sessions:

- If they suffer from fever or the common cold, in the case of tasters, and if they suffer from skin or nervous system disorders in the case of a tactile panel.
- If they suffer from poor dental hygiene or gingivitis.
- In the case of emotional upset or heavy pressure of work which prevents them from concentrating.

2.1.5 Establishment of a Sensory Panel

A preliminary selection of candidates has to be undertaken at the recruitment stage, in order to eliminate those who would be unsuited for sensory analysis. However, the final selection can only be made after training and the completion of the envisaged tasks.

The recommended procedure involves.

a) Recruitment and preliminary screening of naïve assessors.
b) Training of naïve assessors who will become initiated assessors
c) Selection of initiated assessors according to ability to perform particular tests, they will then become selected assessors.
d) Selection following the performance of an actual sensory assessment (usual in the case of descriptive analyses).
e) Possible training of selected assessors to become expert assessors.

The performance of selected assessors should be monitored regularly to ensure that the criteria by which they were initially selected continue to be met (ISO 8586-1).

The flow diagram of the process of training assessors

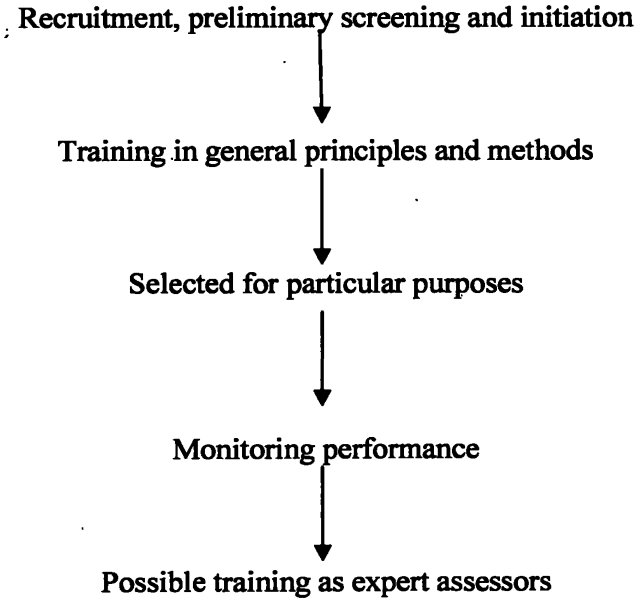

Figure 2.1 Process of training assessors
(Source ISO 8586-1)

2.1.6 Recruitment, Preliminary Screening and Initiation

2.1.6.1 Recruitment

Recruitment is an important starting point in forming a panel of selected assessors. Different recruitment methods and criteria are available and there are various tests that can be used for screening candidates for suitability for further training.

The following three questions arise when recruiting persons to form a sensory analysis panel.

-where should one look for the people who will constitute the group?

-How many people shall be selected?

-How shall the people be selected?

Types of Recruitment

2 types of recruitment are available to organizations.

-Recruit through the personal department of the organization (Internal recruitment)

-Recruit people from outside the organization (External recruitment)

Internal recruitment

The candidates are recruited from amongst the office, plant or laboratory staff. It is advisable to avoid those persons who are too personally involved with the products being examined, in particular those involved at the technical or commercial level, because they may cause the results to be biased. In this type of recruitment, it is vital that the organization's general management and hierarchy provide their support and make it known that sensory analysis is considered as forming part of everyone's work. This can be made known at the hiring stage of the personal.

External recruitment

The recruitment is conducted outside the organization.

A mixed panel may be formed using internal and external recruitment, in variable proportions.

Advantages of Internal Recruitment

The advantages are that

-the people are on the spot

-it is not necessary to make provisions for any payment

-a better confidentiality vis-à-vis the results is ensured, which is particular important if it is a question of research work

-there is better stability of the panel with time.

Internal Recruitment - Disadvantages

The disadvantages are that

-Candidates are influenced in their judgments (by knowing of the products)

-it is difficult to allow for the evolution of the organizations products

-replacement of candidates is more difficult (limited number of persons in small organizations)

-lack of availability (ISO 8586-1).

2.1.6.2 Background Information

Background information on the candidates may be obtained by submitting them to a combination of clearly understood questionnaires coupled with interviews by persons experienced in sensory analysis.

a. Interest and Motivation

Candidates who are interested in sensory analysis and the product or products to be investigated are likely to be more motivated and hence are likely to become better assessors than those without such interest and motivation.

b. Attitudes to foods

Strong dislikes for certain foods and beverages should be determined.

c. Knowledge and aptitude

If the candidate is then required to evaluate only one type of product, knowledge of all aspects of that product may be beneficial. It is then possible to choose expert assessors from amongst those candidates who have shown an aptitude for sensory analysis of this product.

d. Health

The candidates shall be in good general health. They shall not suffer from any disabilities which may affect their senses, or from any allergies or illnesses, and shall not take medication which might impair their sensory capacities and thus affect the reliability of their judgments. It may be useful to know whether the candidates have dental prosthesis, since they can have an influence in certain types of evaluation involving texture and flavour. Colds or temporary conditions should not be a reason for eliminating a candidate.

2.1.6.3 Selection of candidates

a) Ability to communicate

The ability of candidates to communicate and describe the sensation they perceive when assessing is particularly important when considering candidates for descriptive analyses. This ability can be determined at the interview and again during screening tests.

b) Availability

Candidates shall be available to attend both training and subsequent assessments. Personal who travel frequently or have continual heavy work loads are often unsuited for sensory work.

c) Personal characteristic

Candidates shall be punctual in attending sessions and shall be reliable and honest in their approach.

d) Other factors

Other information which may be recorded during recruitment are name, age group, sex, nationality, educational background, current occupation and experience in sensory analysis. Information on smoking habits may also be recorded, but candidates who smoke shall not be excluded on these groups.

2.1.7 Screening

2.2.7.1 Types of screening tests

All the tests described have the dual function of familiarizing the candidates with both the methods and the materials used in sensory analysis. They are divided into 3 types as follows.

a) Those aimed at determining impairment

b) Those aimed at determining sensory acuity

c) Those aimed at evaluating a candidate's potential for describing and communicating sensory perceptions.

Candidates with high success rates are to be expected to be more useful than others, but those showing improving results with repetition are likely to respond well to training (ISO 8586-1).

2.1.7.2 Acuity and Discriminating ability

The two following tests are recommended.

a. Test for detection of a stimulus

These tests are based on the triangular test. One material at a time is tested. Two samples of the test material and sample of water or other neutral medium, or 1 sample of the test material and two of water or other neutral medium, are presented to each candidate. The concentration of the test material shall be at the supra-threshold level.

Preferable candidates should have 100% current responses.

b. Tests for discrimination between level of intensity of a stimulus

These tests are based on the ranking tests.

For each test 4 samples having different intensities of the property are presented in a random order to the candidates, who are required to put them in order of increasing intensity. This random order shall be the same foe all candidates, to ensure that comparisons of their performance are not influenced by the effects of different orders of presentation. A satisfactory level of success in this task can be specified in relation to the particular intensities used.

2.1.8 Training of the panellists

2.2.8.1 Assessment Procedure

At the start of any training programme assessors shall be taught the correct way to assess samples. The temperature of samples shall be specified.

- With liquid sample, the assessors shall be told in advance the size of the sample (for mouth assessment) the proximate time for which the sample is to be held in the mouth and whether it is to be swallowed or not.
- The problem of adaptation and the advantage of raising the mouth and of standard time intervals between samples shall also be discussed.
- Any procedure finally agreed upon shall be stated clearly so that all assessors assess products in the same way.
- The interval between samples shall be sufficient to permit recovery but not so long that assessors lose their ability to discriminate.

a. Training in detection and recognition of tastes and odours

Matching, Recognition, Paired comparison, triangular and duo-trio tests shall be used to demonstrate tastes at high and low concentrations and to train assessors to recognize and describe them correctly. Identical tests shall be used to develop assessors' acuity for odour stimuli.

b. Training in the use of scales

Assessors shall be introduced to the concepts of rating, classification, interval and ratio scale by initially ranking series of single odour, single tastes and single texture stimuli will respect to the intensity of a particular characteristic. The various rating procedures are then used to attach meaningful magnitudes to the samples.

Training in the development and use of descriptors (profiles) panellists shall be introduced to the idea of profiling by being presented with a series of sample products and asked to develop vocabularies for describing their sensory characteristics, in particular terms which allow samples to be differentiated. Terms shall be developed individually and then discussed and an agreed list of at least ten devised.

To provide assessors will rudimentary knowledge of procedures used in sensory analysis and to develop their ability to detect, recognize and describe sensory stimuli.

2.1.8.2 Specific product training

After basic training, assessors may undergo a panel of product training the exact nature of this depending on whether it is intended to use the panel for difference or descriptive testing (visual, odour, texture and flavour evaluation)

a. Different assessment

Samples similar to those that will eventually be assessed are presented to the assessors who evaluate them using one of the difference assessment procedures.

b. Descriptive assessment

For assessors who are to assess one specific product type, 3 samples of this type of product shall be presented in each session, approximately 15 samples being assessed in total.

2.1.8.3 Final choice of panels for particular methods

Choice of those assessors most appropriate for a given method to make up pools from which panels of assessors for particular tests are taken. If the number of candidates exceeds only slightly the number required for the panel, it may be necessary to select the best assessors available rather than those meeting predefined criteria.

a. Different assessment

Final panel selection is based on repeat examination of actual samples. If the panel is to be used for the detection of a particular characteristic, the ability to detect adulterated samples at decreasing concentrations can also be used as a criterion for selection. Assessors selected shall perform consistently and be able to differentiate correctly the samples presented. Those who perform this task less well than others shall be rejected.

b. Ranking assessment

Final panel selection is based on repeat examination of actual samples. Assessors selected shall perform consistently and be able to rank correctly the samples presented. Those who perform this task less well than others shall be rejected.

c. Rating and scoring

Significant variation among assessors indicates the presents of bias, one or more assessors gives scores consistently higher or lower than the others. Significant variation among assessors indicates that the assessors as a panel are successfully differentiating among the samples. A significant assessors/samples interaction indicates that two or more of the assessors have a different perception of the dissimilarities between two or more samples. In some cases, an assessors/samples interaction may even reflect a disagreement about the ranking of the samples.

d. Qualitative descriptive analysis

No additional specific selection procedure is advocated amongst those already outlined.

e. Quantitative descriptive analysis

It controls or reference samples have been provided candidates shall be tested for their ability to recognize and describe them. Assessors who cannot recognize or adequately describe correctly 70% of control samples shall be considered unsuitable for this type of test (ISO 8586-1).

2.1.9 Monitoring of selected assessors

It is necessary to check periodically the effectiveness and performance of selected assessors. The aim of check is to examine which individuals' performance to determine whether the selected assessor is able to achieve appropriate and reproducible results. The check may be carried out at the same times as the experiment itself in many cases. The results of this examination will indicate whether re-training is necessary.

2.1.10 Threshold level

Threshold Levels

Thresholds are the limits of sensory capacities. The threshold is not a fixed point but rather a value on a stimulus continuum. It is convenient to distinguish between the absolute threshold, the recognition threshold, the difference threshold, and the terminal threshold.

- The absolute threshold (detection threshold) is the lowest stimulus capable of producing a sensation-the dimmest light, the softest sound, the lightest weight, the weakest taste.
- The recognition threshold is the level of stimulus at which the specific stimulus can be recognizes and identified. The recognition threshold is higher than the absolute threshold.
- The difference threshold is the extend of charge in the stimulus necessary to produce a noticeable difference. It is usually determined by presenting a standard stimulus, which is then compared to a variable stimulus. The term just noticeable different (JND) is used when the different threshold is determined by changing the variable stimulus by small amounts above and below the standard until the subject notices a difference.
- The terminal threshold is that magnitude of a stimulus above, which there is no increase in the perceived intensity of the appropriate quality for that stimulus. Above this level, pain often occurs (Meilgaard M. *et al.*, 1999).

The threshold value for any stimulus for a group of panellists may require revision as the sensitivity is known to improve with training and lower the value of threshold concentration (Pruthi, 1999).

2.2 Introduction to Soups

Soup is usually a liquid food that is made by combining ingredients, such as meat and vegetables in stock or hot water, until the flavor is extracted, forming a broth. Boiling was not a common cooking technique until the invention of waterproof containers about 5,000 years ago.

The terms gruel and potage have become separated from broth and stock. Modern definitions of soup and stew were established in the 18th century: soups usually are more liquid; stews are thicker, containing more solid ingredients. Stews are cooked in covered containers for longer periods of time, at a gentle boil with less water and at a lower heat.

2.2.1 Classification of Soups

Traditionally, soups are classified into two broad groups:

(1) Clear soups

French classifications of clear soups:

(a) Bouillon

(b) Consomme

(2) Thick soups

Thick soups are classified depending upon the type of thickening agent used.

(a) Purees are vegetable soups thickened with starch

(b) Bisques are made from puréed shellfish thickened with cream

(c) Cream soups are thickened with béchamel sauce

(d) Veloutes are thickened with eggs, butter and cream

Other ingredients commonly used to thicken soups and broths include rice, flour, and grain.

CHAPTER 03

MATERIALS AND METHODOLOGY

3.1 Materials

3.1.1 Materials Required for the Preparation of Samples

- Soup Mixture
- Tap water at ambient temperature
- Raw corn flour
- Table salt
- Sugar
- White pepper powder
- Mono Sodium Glutamate (MSG)
- Yeast extract powder (YEP)
- Chicken flavour IFF
- Anhydrous Citric acid
- Analytical balance
- Hot plate
- Water bath
- Sauce pan
- Table Spoon
- Measuring Cylinder (100ml)
- Pipette (10ml)
- Beaker (500ml)

3.1.2 Materials Required for the Sensory Training

- Neutral water (odourless and tasteless)
- Paper napkins
- Glasses (10ml)
- Soup bowls (100ml)
- Trays
- Tea spoons
- Pens
- Labels for sample containers
- Evaluation forms
- A room for group discussions with a large table discussion area
- Isolated test room with booths or tables
- Chairs
- Splitting devices
- Apparatus to give a signal
- Note books

3.2 Methodology

3.2.1 Preliminary Study

3.2.1.1 Preparation of the standard soup sample

- Content in the pack (54g of soup powder) was put in to a sauce pan having a capacity of around1L and 700ml water was added to that.
- The mixture was stirred well until all the lumps are dissolved.
- Pan containing the mixture was placed on a stove and brought to boil while stirring it continuously.
- Then it was simmered for three minutes under controlled flame.

3.2.1.2 Attribute generation for the standard soup sample

- Prepared soup sample was observed and examined for its appearance, taste, odour and texture by means of tasting, sniffing, visual observation, touching and stirring.
- Dominating tastes, odours, appearance and textural attributes of the soup was identified.

3.2.1.3 Determination of the formulations of the training samples

- Around sixty samples with different formulations were prepared incorporating a range of concentrations of fifteen different ingredients which are mention below, to obtain the expected sensory characteristics.

Table 3.1 List of Ingredients Used for the Sample Preparation Trails

Sensory Attributes	**Ingredients Tested**
Overall acceptability	White pepper powder Caramel powder Raw corn flour Water
Colour	Caramel powder Turmeric powder Iodocol Tartarazine colourant
Viscosity	Water Raw corn flour Precooked corn flour gravy
Saltiness	Salt
Sweetness	Sugar
Chicken flavour	Chicken fat Chicken extract, Chicken flavour IFF YEP
Umami taste	MSG YEP

- Those prepared samples were tested by the sensory expert and out of those sixty samples around twenty five samples were selected as suitable to be used for the training of the sensory panel.

3.2.2 Selection of the panellists through screening

The members in the panel were already screened through screening tests which are mentioned below.

Pre screening

Pre screening of members for the sensory panel had been already carried out by means of a pre screening questionnaire (Appendix: 03.01).

Basic taste test

The members had been already subjected for the basic taste test by offering them with 10 coded samples of five basic tastes and 2 samples of water which is neutral in taste (Appendix: 03.02).

Basic taste ranking test

This had been done by offering the participants with a salt concentration gradient and asking them to rank them in the increasing order of their intensity of saltiness (Appendix: 03.03).

Odour identification test

This had been done by offering the participants with twenty well known odours to the participants and asking them to identify those odours (Appendix: 03.04).

Odour recall test

This had been done by offering participants with 18 labelled samples of odours and asking them to identify the same odours after 1 hour (Appendix: 03.05).

Difference test

This had been done by offering the participants two samples of same product one sample from a different product asking them to describe the differences between the two different products (Appendix: 03.06).

Texture test

This had been done by offering the participants with three products with higher textural differences and asking them to find the most different sample out of them and described the perceivable differences in them (Appendix: 03.07).

Candidates who had possessed the qualifications as required by the selection criteria during pre screening and those who scored more than the cut off points during screening tests had been selected for further training.

3.2.3 Training of the panellists

3.2.3.1 Day One

3.2.3.1.1 Providing basic knowledge on sensory evaluation

- The members of the panel were given basic knowledge about general rules for tasting sessions, basic test procedures and other necessary information by means of a round table discussions and a leaflet.

3.2.3.1.2 Attribute generation for the sensory evaluation of soup mixes

- 100ml of the standard soup sample prepared in the procedure specified in method 3.2.1.1 was put in to a soup bowl and all three panellists were offered with one bowl of soup, few spoons and a glass of water each.
- First they were asked to smell the soup sample and give comments on the readily perceivable odours of the soup.
- Then the panellists were asked to decide a method to analyse the texture of the soup sample. Then they were asked to analyse the texture of the soup sample using that method and give their comments on the textural attributes of the soup.
- They were asked to taste the soup sample and give their comments on the readily perceivable tastes of the soup.
- Then the panellists were asked to visually observe the soup sample and give their comments on the appearance of the soup sample.
- Comments given by each of the panellists were discussed and finally they were asked to come to an agreement about what has to be considered as the major sensory attributes of the soup sample.

3.2.3.1.3 Comparing standard soup sample vs. a soup sample which has a deviated overall impression.

3.2.3.1.3.1 Preparation of a sample with a deviated overall impression

- 2ml water and 2g of white pepper powder was added to 98ml of soup that is prepared using method 3.2.1.1.
- They were mixed and stirred properly until it gets a uniform consistency

3.2.3.1.3.2 Familiarization of the panellists

- Panellists were offered with a bowl of standard soup sample along with a soup sample prepared in the method 3.2.3.1.3.1.
- They were asked to observe and discuss the major differences in their sensory properties.

3.2.3.2 Day Two

3.2.3.2.1 Performance evaluation

(Identification of a standard soup sample against a soup sample with a deviated overall impression in a paired test)

- Soup samples were prepared in the procedure specified in method 3.2.1.1and 3.2.3.1.3.1.
- Panellists were offered with a bowl of each soup sample both of which are coded with three digit random numbers.
- Then they were asked to compare them as given in the questionnaire (Appendix: 03.08).

3.2.3.2.2 Performance evaluation

(Identification of a standard soup sample in monadic tests)

3.2.3.2.2.1 Preparation of a soup sample with higher viscosity

3.2.3.2.2.1.1 Preparation of a corn flour mix:

- 200ml water and 10g of corn flour were mixed together and it was brought to boil while stirring.
- Then the mixture was simmered for 2 minutes.

3.2.3.2.2.1.2 Preparation of the high viscous soup sample

- 50ml of soup that is prepared using method 3.2.1.1 and 50ml of corn flour mixture were mixed together and it was stirred it until the mix get the uniform consistency.

3.2.3.2.2.1.3 Preparation of a sample with higher saltiness

- 0.02g of salt was added to 100ml of soup and mixed thoroughly.

3.2.3.2.2.1.4Preparation of a sample with higher chicken flavour

- 0.30g of chicken flavour IFF was added to 100ml of soup and mixed thoroughly.

3.2.3.2.2.2 Sensory evaluation

- Standard soup sample and the samples prepared in the methods 3.2.3.2.2.1, 3.2.3.2.2.2, and 3.2.3.2.2.3 were coded with three digit random numbers.
- Panellists were offered with one sample at a time along with the appropriate questionnaire for monadic tests (Appendix: 03.09).
- They were asked to analyse the samples as given in the questionnaire.

3.2.3.3 Day Three

3.2.3.3.1 Identification and arranging of a series of soup samples with a gradient of salt concentrations

3.2.3.3.1.1 Preparation of soup samples with gradient of salt concentrations

- 98ml soup + 2ml water
- 99ml soup + 1ml water
- 100ml soup + 0.02g salt
- 100ml soup + 0.04g salt
- Ingredients were mixed as in the way given in above formulations and stirred thoroughly to get a uniform consistency.

3.2.3.3.1.2 Sensory evaluation

- Samples prepared in the method 3.2.3.3.1.1 were coded with three digit random number as given below.
    - 325: 98ml soup + 2ml water
    - 492: 99ml soup + 1ml water
    - 605: Standard soup sample
    - 234: 100ml soup + 0.02g salt
    - 145: 100ml soup + 0.04g salt
- Panellists were offered with each of the above samples along with the questionnaire and they were asked to do as given in the questionnaire. (Appendix: 03.10)

3.2.3.4 Day Four

3.2.3.4.1 Familiarization with the effect of major flavouring ingredients on the flavour profile of the soup (In water base)

3.2.3.4.1.1 Preparation of samples with individual flavouring ingredients.

- MSG 0.348g
- Salt 1.1g
- Sugar 0.311g
- Yeast Extract Powder 0.102g

- Each of above ingredients was dissolved in 100ml of water individually.

3.2.3.4.1.2 Preparation of samples to demonstrate the effect of each flavouring ingredient on overall flavour profile of soup

Standard Mixture

- MSG 0.348g
- Salt 1.1g
- Sugar 0.311g
- Yeast Extract Powder 0.102g

Mixture 01

- Salt 1.1g
- Sugar 0.311
- Yeast Extract Powder 0.102g

Mixture 02

- MSG 0.348g
- Sugar 0.311g
- Yeast Extract Powder 0.102g

Mixture 03

- MSG 0.348g
- Salt 1.1g
- Yeast Extract Powder 0.102g

Mixture 04

- MSG 0.348g
- Salt 1.1g
- Sugar 0.311g

- Each of above ingredient mixture was dissolved in 100ml water in order to obtain the samples having different flavour profiles in water base.

3.2.3.4.1.3 Familiarization of the panellists

- Samples prepared in method 3.2.3.4.1.1 and 3.2.3.4.1.3 was offered to the panellists and they were asked to taste them individually, comparing the tastes of each sample.
- This was done as a round table discussion and each of the panellists were given knowledge about the composition of each sample.

3.2.3.5 Day Five

3.2.3.5.1 Familiarization with the effect of major flavouring ingredients on the flavour profile of the soup (In corn flour gravy)

3.2.3.5.1.1 Preparation of flavour mixtures in corn flour base

- The samples were prepared by dissolving the formulations mentioned in methodology 3.2.3.4.1.1 and 3.2.3.4.1.2 in 100ml of corn flour base prepared in method specified in 3.4.2.2.1.1.

3.2.3.5.1.2 Familiarization of the panellists

- Samples prepared in method 3.2.3.5.1.2 were offered to the panellists and they were asked to taste them individually while comparing the tastes of each sample.
- This was done as a round table discussion and each of the panellists were given knowledge about the composition of each sample.

3.2.3.6 Day Six

3.2.3.6.1 Performance evaluation (Session one for flavour mixtures)

(Effect of flavouring ingredients on the overall flavour profile- In corn flour gravy)

- Samples were prepared in the procedure indicated in method 3.2.3.5.1.2.
- They were coded with three digits random numbers.
- Panellists were offered with those samples in random order.
- Then they were asked to identify what ingredient is deficient in each of the sample record their answer in a blank paper.

3.2.3.7 Day Seven

3.2.3.7.1 Performance evaluation (Session two for flavour mixtures)

(Effect of flavouring ingredients on the overall flavour profile- In corn flour gravy)

3.2.3.7.1.1 Preparation of flavour mixturees with all four flavouring ingredients with one of their concentration is doubled than their standard concentration.

Mixture 01

- MSG 0.696g
- Salt 1.1g
- Sugar 0.311g
- Yeast Extract Powder 0.102g

Mixture 02

- MSG 0.348g
- Salt 1.1g
- Sugar 0.311g
- Yeast Extract Powder 0.204g

- Each of the above formulations was dissolved in 100ml of corn flour base prepared using method specified in 3.2.3.2.2.1.1.

3.4.7.1.2 Sensory evaluation

- Samples were prepared in the procedure indicated in methodology 3.2.3.5.1.1 and 3.2.3.7.1.1.
- They were coded with three digits random numbers.
- The panellists were offered with each of those samples in random order.
- Then they were asked to identify what ingredient is deficient or doubled in their concentration in each of the sample and record their answer in a blank paper.

3.2.3.8 Day Eight

3.2.3.8.1 Performance evaluation (Session three for flavour mixtures)

(Effect of flavouring ingredients on the overall flavour profile- In corn flour gravy)

- Samples were prepared in the procedure indicated in methodology 3.2.3.5.1.1 and 3.2.3.7.1.1.
- They were coded with three digits random numbers.
- The panellists were offered with each of those samples in random order.
- Then they were asked to identify what ingredient is deficient or doubled in their concentration in each of the sample and record their answer in a blank paper.

3.2.3.9 Day Nine

3.2.3.9.1 Familiarization of the panel with a salt gradient, MSG gradient and Citric acid gradient in water base and MSG gradient in salt solution

3.2.3.9.1.1 Preparation of salt, MSG and Citric acid gradient in water base

- Salt 0.70g 0.75g 0.80g 0.85g 0.90g
- MSG 0.21g 0.24g 0.27g 0.30g 0.33g
- Salt (0.80) + MSG 0.24g 0.27g 0.30g
- Citric Acid 0.01g 0.015g 0.022g 0.034g

- Each of the above concentration of the given ingredients was dissolved in 100ml water individually.

3.2.3.9.1.2 Familiarization of the panellists

- Samples prepared in the methodology 3.2.3.9.1.1 were offered to the panel one series at once.
- They were asked to taste them individually while comparing the intensity of those tastes in each of the sample.
- This was done as a round table discussion and each of the panellists were asked to identify and arrange the samples in the increasing order of the intensity of those tastes.

3.2.3.10 Day Ten

3.2.3.10.1 Performance evaluation

(Identification of the salt gradient, MSG gradient and Citric acid gradient in water base and MSG gradient in salt solution)

- Samples were prepared in the procedure indicated in method 3.2.3.9.1.1.
- Samples in each of the series were coded with three digits random numbers as indicated in the table below.

Table 3.2 Codes given to the samples used for the performance evaluation

Salt		MSG		Citric Acid	
0.70g	650	0.21g	662	0.01	425
0.75g	430	0.24g	870	0.015	264
0.80g	802	0.27g	125	0.022	932
0.85g	171	0.30g	567	0.034	785
0.90g	325	0.33g	301		

- Then the samples of each of above concentration gradients were offered to the panellists in random order one series at once.
- Then they were asked to taste them and arrange them in the increasing order of their taste intensities and not them down in a blank paper.

3.2.3.11 Day Eleven

3.2.3.11.1 Familiarization of the panel with a viscosity gradient

3.2.3.11.1.1 Preparation of a viscosity gradient

3.2.3.11.1.1.1 Preparation of stock corn flour mix

- 100g of raw corn starch was dissolved in 1000ml of water and it was brought to boil and simmered for 2 minutes.

3.2.3.11.1.1.2 Preparation of dilution series

- 100ml of corn flour mix
- 100ml of corn flour mix + 20ml water
- 100ml of corn flour mix + 30ml water
- 100ml of corn flour mix + 40ml water
- 100ml of corn flour mix + 50ml water

- Ingredients were combined as given in the above list and each of the above combination was mixed and stirred thoroughly until the samples get a uniform consistency.

3.2.3.11.1.2 Familiarization of the panellists

- 100ml of each of the prepared samples were put in to soup bowls and they were offered to the panellists along with the standard teaspoon which was priory agreed to be used for the viscosity evaluation.
- They were asked to check the viscosity of the given samples individually in the method agreed by them at the out set of the training programme, while comparing the viscosities of each of the sample.
- This was done as a round table discussion and each of the panellists were asked to identify and arrange the samples in the increasing order of the viscosity.

3.2.3.11.2 Familiarization of the panel with a colour intensity gradient

3.2.3.11.2.1 Preparation of colour intensity gradient in corn flour base.

3.2.3.11.2.1.1 Preparation of stock colour solution

- 0.02g of Idacol Tartrazine colourant was dissolved in 500ml of water and stirred to obtain a uniform colour solution.

3.2.3.11.2.1.2 Preparation of dilution series.

- 1ml of colour solution + 4ml water
- 2ml of colour solution + 3ml water
- 3ml of colour solution + 2ml water
- 4ml of colour solution + 1ml water
- 5ml of colour solution

- The above mixtures were each mixed with 30ml of corn flour mix and stirred until the mixture gets a uniform colour.

Figure 03.01 Colour intensity gradient in corn flour base

3.2.3.11.1.2 Familiarization of the panellists

- 50 ml of samples were put in to saucers and they were made available at the sensory evaluation booths where the day lights were switched on.
- Then the panellists were asked to compare the colours of the available samples by visual observation and try to arrange those samples in the increasing order of their colour intensity.

3.2.3.12 Day Twelve

3.2.3.12.1 Familiarization of the panel with a salt concentration gradient in soup base

3.2.3.12.1.1 Preparation gradient of salt concentrations in soup base

- 100ml of standard soup sample + 0.0054g salt
- 100ml of standard soup sample + 0.0128g salt
- 100ml of standard soup sample
- 99.95ml of standard soup sample + 0.05ml water
- 99.90ml of standard soup sample + 0.10ml water

- Standard soup sample was prepared using the method specified in 3.2.1.1.
- Gradient of salt concentrations was prepared by mixing the ingredients in as given in above formulations.

3.2.3.12.1.2 Familiarization of the panellists

- 100ml of prepared samples were offered to the panellists in soup bowls whole series at once.
- They were asked to taste them individually while comparing the intensity of the saltiness in each of the sample.
- This was done as a round table discussion and each of the panellists were asked to identify and arrange the samples in the increasing order of the intensity of those tastes.

3.2.3.13 Day Thirteen

3.2.3.13.1 Performance evaluation

(Identification of the standard soup sample in monadic tests)

3.2.3.13.1.1 Preparation of soup samples deviated in taste from the standard

- 98ml of standard soup sample + 2ml Water
- 100ml of standard soup sample + 0.0100g MSG
- 100ml of standard soup sample + 0.0100g Chicken Flavour IFF
- 100ml of standard soup sample + 0.0100g Yeast extract powder

- Standard soup sample was prepared using the method specified in 3.2.1.1.
- The tastes of the samples were changed by mixing the ingredients as indicated in the above formulations

3.2.3.13.1.2 Sensory evaluation

- Samples prepared in method 3.2.3.13.1.1 and standard soup samples were coded with three digit random numbers.
- Panellists were offered with one sample at a time randomly along with the appropriate questionnaire for monadic tests (Appendix: 03.08).
- They were asked to analyse the samples as given in the questionnaire.

3.2.3.14 Day Fourteen

3.2.3.14.1 Performance evaluation

(Identification of the standard soup sample in monadic tests)

3.2.3.14.1.1 Preparation of soup samples deviated in taste from the standard

- 100ml of standard soup sample + 0.0060g salt
- 100ml of standard soup sample + 0.0040g MSG
- 100ml of standard soup sample + 0.0040g Chicken flavour IFF
- 100ml of standard soup sample + 0.0050g Yeast extract powder

- Soup was prepared using the method specified in 3.2.1.1
- The tastes of the samples were changed by mixing the ingredients as indicated in the above formulations

3.2.3.14.1.2 Sensory evaluation

- Samples prepared in method 3.2.3.14.1.1 and standard soup samples were coded with three digit random numbers.
- Panellists were offered with one sample at a time randomly along with the appropriate questionnaire for monadic tests (Appendix: 03.08).
- They were asked to analyse the samples as given in the questionnaire.

3.2.3.15 Day Fifteen

3.2.3.15.1 Performance evaluation

(Identification of the standard soup sample in monadic tests)

3.2.3.15.1.1 Preparation of soup samples deviated in taste from the standard

- 100ml of standard soup sample + 0.0250g MSG
- 100ml of standard soup sample + 0.0500g MSG
- 100ml of standard soup sample + 0.0200g Chicken Flavour IFF
- 100ml of standard soup sample + 0.0400g Chicken Flavour IFF

- Standard soup sample was prepared using the method specified in 3.2.1.1.
- The tastes of the samples were changed by mixing the ingredients as indicated in the above formulations.

3.2.3.15.1.2 Sensory evaluation

- Samples prepared in method 3.2.3.15.1.1 and standard soup samples were coded with three digit random numbers.
- Panellists were offered with one sample at a time randomly along with the appropriate questionnaire for monadic tests (Appendix: 03.08).
- They were asked to analyse the samples as given in the questionnaire.

3.2.3.15.2 Familiarization with a MSG and chicken flavour concentration gradient

- Samples were prepared in the procedure indicated in method 3.2.3.15.1.1.

3.2.3.15.2.1 Familiarization of the panel with a MSG gradient

- First the panellists were offered with samples having following formulations.
    - 100ml of standard soup sample + 0.0250g MSG
    - 100ml of standard soup sample
    - 100ml of standard soup sample + 0.0500g MSG
- They were asked to taste the samples while comparing the intensity of the umami taste in each of those samples.
- Then they were asked to arrange those samples in the increasing order of their umami taste.

3.2.3.15.2.1 Familiarization of the panel with a chicken flavour gradient

- First the panellists were offered with samples having following formulations.
    - 100ml of standard soup sample + 0.0200g Chicken Flavour IFF
    - 100ml of standard soup sample
    - 100ml of standard soup sample + 0.0400g Chicken Flavour IFF
- They were asked to taste the samples while comparing the intensity of the chicken flavour in each of those samples.
- Then they were asked to arrange those samples in the increasing order of their chicken flavour.

3.2.3.16 Day Sixteen

3.2.3.16.1 Performance evaluation

(Identification of the standard soup sample in monadic tests)

3.2.3.16.1.1 Preparation of soup samples deviated in taste from the standard

- 100ml of standard soup sample + 0.0300g Sugar
- 100ml of standard soup sample + 0.0200g MSG
- 100ml of standard soup sample + 0.0300g Yeast Extract Powder
- 100ml of standard soup sample + 0.0200g Chicken Flavour IFF

- Standard soup sample was prepared using the method specified in 3.2.1.1.
- The tastes of the samples were changed by mixing the ingredients as indicated in the above formulations.

3.2.3.16.1.2 Sensory evaluation

- Samples prepared in method 3.2.3.16.1.1 and standard soup samples were coded with three digit random numbers.
- Panellists were offered with one sample at a time randomly along with the appropriate questionnaire for monadic tests (Appendix: 03.08).
- They were asked to analyse the samples as given in the questionnaire.

3.2.3.17 Day Seventeen

3.2.3.17.1 Performance validation session

3.2.3.17.1.1 Preparation of soup samples deviated from the standard

- 100ml of standard soup sample + 1ml water + 0.2g white pepper powder
- 100ml of standard soup sample + 4g of corn starch
- 100ml of standard soup sample + 0.30g Chicken Flavour IFF
- 100ml of standard soup sample + 0.22g YEP
- 100ml of standard soup sample + 1g Sugar

- Standard soup sample was prepared using the method specified in 3.2.1.1.
- The tastes of the samples were changed by mixing the ingredients as indicated in the above formulations.

3.2.3.17.1.2 Sensory evaluation

Five deviated samples were prepared in the procedure specified in methodology 3.2.3.17.1.1.

Five standard samples were prepared in the procedure indicated in the methodology 3.2.1.1.

All ten samples were coded with three digits random numbers.

Panellists were offered with each of the deviated sample along with a standard sample and appropriate questionnaire for the paired test (Appendix: 03.09).

Then they were asked to analyse the samples as indicated in the questionnaire and indicate their responses.

CHAPTER 04

RESULTS AND DISCUSSION

4.1 Preliminary Study

4.1.1 Attribute Generation

The preliminary study was carried out as an pilot study for the determination of formulations of the samples that can be used for the training program. First a standard soup sample was prepared using the standard procedure montioned in the primary package of the soup mixture and offered to the sensory proffessionals in the development department. They were asked to taste and analyse the given soup samples and identify the major sensory attributes of it.
On their view;

1. Chicken flavour
2. Saltiness
3. Sweetness
4. Pungency
5. Aroma
6. Viscosity
7. Appearance factors:
    a. Colour of the soup
    b. Size and the concentration of Inclusions (small pieces of carrot, corn seeds, small pieces of spring onions, small pieces of chicken)

were identified as the major sensory attributes of the given soup sample.

Next step was to decide which of above sensory attributes are of a major importance when deciding the quality of the final product, which of above can be varied significantly during manufacturing activities and which of above attributes can be possibly regulated in laboratory scale to facilitate the training activites. This decision was taken with the assistance of development manager of the soup mixture along with the advices given by the production department and sensory expert. Although the soup possesses number of sensory attributes, because of their inability to be regulated in laboratory scale and their less importance in deciding the quality of the final product, few of those sensory attributes were not taken in to the consideration during the training of quality assurance sensory panel. Therefore by taking all of the above in to consideration ultimately it was decided to train the pannelists to identify the differences of the following sensory attributes of the given soup samples.

- Overall acceptability
- Colour
- Viscosity
- Saltiness
- Sweetness
- Chicken flavour
- Umami taste

4.1.2 Determination of the Formulations of the Training Samples

Training samples are the samples which are good examples to demonstrate certain attributes. It is important to have an example of each attribute, atleast one example for one type of attribute (Munoz, et al., 1074). So next step was to determine the formulations of the samples which are able to demonstrate the standards and the varations of above sensory attributes. This too was done by with the advices given by the sensory expert and the development manager of the soup mixture. For this purpose first, about sixty samples were prepared by adding different ingredients which has a potential to give off above sensory attributes and then they were tested by the sensory expert and few more individuals blindly. Then they were able to identify the samples which are having closely related sensroy attributes to the standard soup sample. With the help of these observations it was decided to add following ingredients to obtain the required sensory characteristics.

- To regualate the overall acceptability : White pepper powder, Raw corn flour, Water
- To regulate colour : Iodocol Tartarazine colourant
- To regulate viscosity : Water, Precooked corn flour gravy
- To regulate saltiness : Salt
- To regulate sweetness : Sugar
- To regulate chicken flavour : Chicken flavour IFF, YEP
- To regulate umami taste : MSG, YEP

Next important task was to determine the concentrations of the those ingreadients which are able to impart the changes in the sensory attributes as required for training pragram. Series of samples with varying concentrations of above ingredients were prepared and they were subjected to be tested by the sensory expert and few more normal individuals. By testing all those samples the sensory expert with the help of the product development team, decided the samples having the appropriate intensities of the sensory attributes those have be used for the training program. The formulations of those samples are mentioned in chapter three under materials and methodology.

4.2 Selection of the panellists through screening

Major objective of the sreening of the judges is to identify the individuals with normal sensory acuity, interested in sensory evaluation and those with ability to discriminate and reproduce results and appropriate behaviour. Screening had been done by using appropriate questionnaires in a prior stage by a sensory expert and following basic screening tests had been carried out for the screening of new assessors.

Pre-screening: By subjecting the applicants for pre-screening tests individuals who were having following characteristics were eleminated from the sensory panel.
Applicants were rejected when they:

- had food allergies
- were vegetarians
- had or were working for othet food companies or other sensory panels
- were fussy with regards
- were colour blind
- were having dentures

Through this it was made sure that the selected individuals were healthy, could try most foods, were not on a diet, were available when ever needed for sensory analysis and were flexible enough to be able to be trained to follow procedures needed. And also through this it was made sure that the selected individuals had a good descriptive ability so that they are able to answer to the sensory questionnaires up to a satisfactotry level. Although the minimum number of panellists that should be in a quality assurance sensory panel is five, because of the practical constraints in organizational scenario only three individuals could be selected for further training.

(C) Basic taste test: Through this participants ability to detect the basic tastes i.e. sweet sour, salt bitter and umami and also ability to detect the neutral sample was checked using the given methodology and appropriate questionnaire. (Appendix: 03.02) Selected three individuals had scored more than 8 out of 12 (should have at least 1 correct answer to the every basic test).

(D) Taste ranking test: The objective of performing this test was to exclude the persons with a lower than average tasting sensitivity to different concentrations of one basic taste. Salt taste was used for this purpose. Selected individuals had scored more than 6 out of 9.

(E) Odour identification test: This test had been done to screen participants for their ability to identify odour. List of odours mentioned in Appendix: 03.04 had been used for this test. The selected individuals had scored more than 12 out of 20.

(F) Odour recall test: Objective of performing this test was to assess the participants' ability to learn odours and recall them after a short period of time. Participants had been given 20 labelled odours mentioned in Appendix: 03.05. After a short time (preferably 1-hour) 18 from the 20 odours had been offered again and they were asked to recall the correct names of these odours on basis of a list with 20 names. Selected individuals had scored more than 12 out of 18.

(G) Difference test: This test had been used to determine whether or not the participants could detect small differences in sensory character. Two test products offered were different only in flavour and the appearance of the products was kept same. Two types of beverages were used for this purpose and they were prepared as for a triangle test. (Two identical samples and one odd sample) Participants were asked to identify the odd sample as in the questionnaire in appendix 03.06. Selected individuals had scored more than 2 for this test.

(H) Texture test: Texture test was used to screen the participants on their ability to describe texture attributes and their intensities.

(I) Texture creativity test: Three products with higher textural differences (Sponge cake, apple, and biscuit) were offered and the individuals were asked to find out the most different sample out of the given three. Then they were asked to describe the other two products. The selected three individuals had scored more than 3 for this test.

(J) Texture rating test: Five products which are different in texture, either five different products (cake, apple, biscuit, cheese, cucumber) or five different types of one product can be used for this purpose. The participants must be able to rank them from soft to hard in a line scale. The selected three individuals had scored more than 2 for this test.

The three individuals who were selected for further training had obtained the grand total more than 41 out of 69 as a whole.

4.3 Training of the panellists

4.3.1 Day One

4.3.1.1 Orientation of the Selected Panellists

Three individuals who were selected through above pre-screening procedure were subjected to training. Training consists of a number of training sessions. In the first sessions candidates are familiarised with a certain quality parameter, by discussion and evaluating the samples, while in later sessions the candidates are requested to identify the standard product in a pair test (Munoz, et al., 1074).

At the out set they were given knowledge about general rules for tasting sessions, basic test procedures and other necessary information by means of a round table discussions and a leaflet. During this they were informed and advised about what they should not do prior to and during tasting sessions. Some of those advice and information were as follows.

They were given knowledge about a basic set up of a sensory evaluation laboratory including sample preparation area and tasting area. This was done by means of demonstration, leaflet and a visit around the sensory evaluation laboratory available in the organization.

Figure 4.1 Sample Preparation Area

Figure 4.2 Sensory Evaluation Booth

Figure 4.3 Training and Discussion Area

Then they were given knowledge about what they should not prior to and during a sensory analysis. Some of those instructions were as follows:

- Avoid drinking of coffee, eating of strong tasting food, smoking, chewing of gums, etc. for at least half an hour before the tasting session.
- Do not speak, discuss during tasting. Keep your comments until everybody has finished tasting all samples.
- Make written notes of your perceptions and comments. (Use the questionnaire provided)
- Take equal portions of samples.
- Make sure everybody understands the vocabulary used
- Separate your analytical and hedonical judgment (subjective liking) and describe objectively before giving your subjective comments.

Then they were given knowledge about how to perform a general sensory evaluation for a given soup sample. Information about methodology of analysing a sample in correct procedure specially ordered sequence of analysing each attribute and how to perform these analyses was demonstrated and discussed. Some of those instructions were as follows.
The first attribute to be evaluated in the sensory analysis of any kind of a product is to analyse the texture of the product since it changes significantly with the changes in the temperature. It was decided to evaluate the viscosity of the soup sample as a textural attribute. The panel came to an agreement about the method to analyse the viscosity by a discussion and the agreed method was to measure the force needed to move a tea spoon through the sample of soup inside the bowl.

Next sensory attribute to be analysed is the aroma of the product. This is because aromatic compounds are volatilised well in considerably higher temperature (around 72^0C) so that they are well perceived around this temperature. It is important to neutralize the nose between two samples during aroma evaluation by interrupting the test, taking a break and getting some fresh air or by smelling on your own skin on the arm (do not use any perfumed cosmetics).

Next sensory attribute to be analysed is the appearance. Appearance attributes considered as important in the given soup was the colour. Colour was observed through naked eye in normal day light conditions. The taste of the sample should be analysed next. Neutralization of taste buds between two samples during taste evaluation either by drinking water and/or by eating neutral bread, apple slices, etc is important during tasting.

4.3.1.2 Attribute generation for the soup sample be the panellists

After giving the panellists the basic knowledge about rules procedures and other necessary information about sensory analysis next important activity carried out on the first day is the attribute generation for the given standard soup sample. This was done as a round table discussion and as the outcome, the panel was able to identify all the important sensory attributes of the soup sample namely; chicken flavour, saltiness, sweetness, pungency, aroma, viscosity and appearance factors like colour of the soup and size and the concentration of inclusions.

Then they were made familiarised with the standard sensory characteristics of the soup sample by allowing them to compare the sensory attributes of a standard soup sample against a deviated soup sample. The deviated soup sample contained added water and white pepper powder in it, which result in changing the overall impression of the sample along with its appearance, texture, odour and taste. This familiarization was done by means of a round table discussion and they were allowed to share their ideas with the fellow panellists and necessary information such as the formulation of the deviated sample and what are the expected deviations, were given whenever necessary.

4.3.2 Day Two

On the second day the success of the previous day training was measured by means of two performance evaluation sessions. In first performance evaluation session the same combination of samples i.e. the standard sample along with the deviated sample was offered once as a paired test and they were asked to identify the standard sample. All the panellists were able to identify the standard sample successfully.

The objective of the next performance evaluation session too was to check whether they are sufficiently familiar with the standard sample. This was done as a series of monadic tests in which the panellists were offered several deviated samples and one standard sample separately (monadically). The deviated samples were added with corn flour gravy which results in an increased viscosity, salt which results in an increased saltiness thereby a deviation of the taste and chicken flavour IFF which result in a deviated taste and aroma. In this particular performance evaluation session too all the panellists were able to identify the standard sample accurately indicating that the familiarisation session held in the first day was successful.

4.3.3 Day Three

On the third day the panellists were given to identify a series of soup samples having a salt concentration gradient. This was done individually by offering each of the panellists with the series of samples placed in a random order and asking them to identify whether there's any difference exists among given samples and if so, they were asked to arrange those samples in the increasing order of that difference. In this session the discussions between the panellists was not allowed.

The responses given by each of the panellists to the given questionnaire was checked and it was observed that all the panellists were able to recognise that there's a difference between the saltiness of the samples but none of them were able to identify the correct order of increasing the saltiness. Some reasons behind this failure may be that prior to this session they were not given a chance to analyse such a salt concentration gradient by means of a discussion so that they are not much familiar with the given task. And also one major defect happened during this was that the offered samples were in different temperatures. This difference in temperatures makes a difference in perceivable saltiness i.e. lower the temperature higher the perceivable saltiness it has. Because of this reason it was decided to store all the samples in a hot water bath where the temperature is maintained around 75^0C until they are offered to the panellists.

4.3.4 Day Four and Day Five

Training session held on the fourth day was mainly focused on giving the panellists a familiarization about the effect of major flavouring ingredients in the soup mixture to the overall flavour profile of the soup sample. For this purpose a standard flavour mixture was prepared by adding MSG, salt, sugar and yeast extract powder. MSG is able to increase the perceivable intensity of saltiness, sweetness and other tastes in the soup sample while giving off umami after taste. Added salt is able to increase the saltiness while sweetness is increased by added sugar. Yeast extract powder contains many tastes and flavours in it basically, it gives off saltiness, umami taste and in addition to this a flavour similar to chicken flavour. This ultimate effect was demonstrated to the panellists by allowing them to compare the standard flavour mixture against the flavour mixtures which are lacking in each individual ingredient.

On the fifth day the panellists were given to familiarise with the above same flavour mixtures in corn flour gravy. The objective of preparing these mixtures in corn flour gravy is that as the base of the soup too is corn flour gravy, by using this it is able to demonstrate the effect of those individual ingredients to the given soup sample.

4.3.5 Day Six, Seven and Eight

Performance evaluation sessions were held on the sixth day, seventh day and eighth day to check whether the panellists are sufficiently familiar with the effect of major flavouring ingredients to the overall flavour profile of the soup sample. On the sixth day the panellists were offered with four samples which are deficient in salt, sugar, yeast extract powder and MSG and they were asked to identify which ingredient is deficient in each of the given samples. The responses given by each of the panellists is summarised in the table below.

Table 4.1 Results of the performance evaluation session – Day Six

Sample	Identified Deficiencies by the panellists		
	Member 1	Member 2	Member 3
Salt Deficient	Salt	MSG	MSG
Sugar Deficient	Sugar	Sugar	Sugar
YEP Deficient	MSG	Salt	Salt
MSG Defiecient	YEP	YEP	YEP

There all the members have correctly identified only the sample deficient in sugar. They were unable to identify the other flavour mixtures accurately. The major reason for this failure is that All the other three ingredients (salt, YEP, MSG) give off saltiness for certain extent and MSG increase the perceivable intensity of so many other flavours and also all these three ingredients give a more or less similar effect to the overall perceivable flavour profile. One major draw back of this performance evaluation session is that the panellists were not given a standard sample to compare each of the other samples.

On the seventh day member one has correctly identified the standard sample, salt deficient sample, and the samples having doubled concentrations of yeast extract powder and MSG. This can be considered as an improvement of member one because unlike on the sixth day he has correctly identified the salt deficient sample. When considering about the member two, he was able to accurately identify salt deficient sample, MSG deficient sample and the samples having doubled concentrations of yeast extract powder and MSG. This performance too can be considered as an improvement when compared to the performance on the sixth day. Member three also has accurately identified the standard sample, sample that is deficient in salt and the samples having doubled concentrations of yeast extract powder and MSG.

All three members possess ability to identify the sample deficient in salt which is an improvement compared to the performance on the sixth day. And also all of them were able to identify the samples which have doubled concentrations of yeast extract powder and MSG. This gives the evident that when a certain ingredient has a higher concentration than the standard concentration it is easily identifiable than when that compound is deficient in that mixture.

Table 4.2 Results of the performance evaluation session – Day Seven

		Deviations identified by the panellists						
		Std.	**No Sugar**	**No MSG**	**No Salt**	**No YEP**	**2*YEP**	**2*MSG**
M 1	Standard	\						
	No Salt				\			
	No sugar			\				
	No MSG					\		
	No YEP		\					
	Doubled YEP						\	
	Doubled MSG							\
M 2	Standard		\					
	No Salt				\			
	No sugar					\		
	No MSG			\				
	No YEP	\						
	Doubled YEP						\	
	Doubled MSG							\
M 3	Standard	\						
	No Salt				\			
	No sugar			\				
	No MSG					\		
	No YEP		\					
	Doubled YEP						\	
	Doubled MSG							\

Key to the table 4.2 and 4.3;

M 1 – Member one

M 2 – Member two

M 3 – Member three

Std. – Standard

2*YEP – Sample having the YEP concentration doubled than the standard

2*MSG – Sample having the MSG concentration doubled than the standard

\ – Given Response

Table 4.3 Results of the performance evaluation session – Day Eight

		Deficiencies identified by the panellists				
		No Salt	**Std.**	**No YEP**	**No Sugar**	**No MSG**
M 1	Original		/			
	No Salt	/				
	No sugar				/	
	No MSG			/		
	No YEP					/
M 2	Original		/			
	No Salt	/				
	No sugar				/	
	No MSG			/		
	No YEP					/
M 3	Original		/			
	No Salt	/				
	No sugar					/
	No MSG			/		
	No YEP				/	

In the performance evaluation session held on the eighth day member one has correctly identified the standard sample, salt deficient sample and the sugar deficient sample. This can be considered as an improvement of member one because unlike on the seventh day he has correctly identified the sugar deficient sample too.

When considering about the member two, he was able to accurately identify the standard sample, salt deficient sample and sugar deficient sample. Although he has accurately identified the MSG deficient sample on the seventh day on the 8th day he was failed to identify it. This may be due to the effect given by the yeast extract powder is more similar to the effect of MSG because both of them have umami taste in varying amounts.

Member three also has accurately identified the standard sample, sample that is deficient in salt and the sample that is deficient in sugar. This also can be considered as an improvement of the performance because unlike on the seventh day he was able to identify the sample deficient in sugar too.

All three members possess ability to identify the sample deficient in sugar which is an improvement compared to the performance on the seventh day. Still the panel is unable to identify the flavour mixtures which are deficient in yeast extract powder and MSG. So it is appropriate to carry out some more training sessions on this aspect in order to improve the descriptive ability of the panellists.

4.3.6 Day Nine and Ten

On the ninth day of the training the panellists were made familiarize with a gradient of salt concentrations, MSG concentrations, and citric acid concentrations. And also they were given to identify a series of samples having a constant concentration of salt along with a gradient of concentrations of MSG.

The gradient of citric acid concentration was prepared as given in the ISO 8596-1 as a test for discrimination between levels of intensity of stimulus of taste. The concentrations of the salt and the MSG in the series of samples were determined in the way that it roughly varies around the actual salt and MSG concentration of the soup sample. They objective of offering the gradient of MSG concentrations in the constant salt concentration was to improve the panellists' ability to discriminate between the saltiness and umami taste along with make them aware about the combined effect of those two ingredients.

To measure the success of the ninth day training a performance evaluation session was held on the tenth day of the training program. As indicated in the table Member one was able to identify the order of salt concentration gradient and citric acid gradient correctly indicating that he is able to discriminate the salt concentrations higher than 0.7g/100ml in 0.05g/100ml variations and citric acid concentrations higher than 0.01g/100ml in 0.005g/100ml variations. All the panellists have this discriminating ability for citric acid in this range but in member two and member three discriminating ability of salt concentration is reduced when the concentration was below 0.8g/100ml. So further training sessions has to be carried out to improve this discrimination ability. When considering about the MSG concentration gradient none of the panellists were able to identify the order of the concentration gradient accurately. But they were all able to identify the sample with minimum MSG concentration (0.21g/100ml) and member one and member three was able to identify the highest MSG concentration (0.33g/100ml) also. To improve the discrimination ability of umami taste all the panellists should be further trained.

Table 4.4 Results of the performance evaluation – Day Ten

		Highest	-> ->	-> ->	-> ->	Lowest
Salt	Correct Order	325	171	802	430	650
	Member 1	325	171	802	430	650
	Member 2	325	171	430	802	650
	Member 3	325	171	430	802	650
MSG	Correct Order	301	633	125	870	662
	Member 1	301	870	633	125	662
	Member 2	633	301	125	870	662
	Member 3	301	125	633	870	662
Citric Acid	Correct Order	785	932	264	425	
	Member 1	785	932	264	425	
	Member 2	785	932	264	425	
	Member 3	785	932	264	425	

4.3.7 Day Eleven and Twelve

On the eleventh day the panellists were made familiarised with a viscosity gradient roughly around the viscosity of the standard soup sample. And also they were made familiar with a colour intensity gradient which is closer to the colour of the standard soup sample. Both of these can be considered as a part of basic training but in this occasion it is specially focused on the product. On the twelfth day the panel is made familiarised with a salt concentration gradient in soup base. The objective of performing such a familiarization session is to improve the ability of the panellists to identify the deviations of saltiness in soup.

4.3.8 Day Thirteen, Fourteen, Fifteen and Sixteen

On the thirteenth, fourteenth, fifteenth and sixteenth day performance evaluation sessions were conducted in order to find out whether the panellists are able to identify the standard sample and to check whether they are able to detect the small differences in taste. On the fourteenth day they were able to detect the deviation occurred by addition of 0.0060g salt to 100ml of soup, 0.0040g MSG to 100ml of soup, 0.0040g Chicken Flavour IFF to 100ml of soup and 0.0050g Yeast Extract powder to 100ml of soup. This deviation can be considered as the minimum level of deviation detected by the panellists during entire training program.

4.3.7 Day Seventeen - Performance Validation Session

Final performance validation session was held on the seventeenth day of the training program. The panellists were offered with all ten samples as pairs having one deviated sample and one standard sample each of which are coded with three digit random numbers. They were provided with the appropriate questionnaire for the paired test (Appendix: 3.9). In that they had to analyse the sample one by one and to check if the sensory attributes of those samples are up to the standard or not.The objective of performing such a validation session is to check whether each of the panellists individually able to identify standard samples in three consecutive times. This result helps to get the decision that the performance of the panellist under consideration is accurate and precise in identifying the standard soup sample in any circumstance.

Deviation expected by adding water and white pepper powder to the standard soup sample is a change in the overall impression. More precisely by adding water the viscosity, appearance (mainly colour), texture, odour and taste of the soup sample is changed. On the other hand added white pepper powder can significantly affect the appearance odour and the taste of the standard soup sample. So both of those added ingredients has collectively changed the overall impression of the sample along with its appearance, texture, odour and taste. Addition of chicken flavour IFF change the odour and taste of the soup sample along with its overall impression. Added corn starch has changed all the sensory attributes of the soup sample namely overall impression, appearance, texture, odour and taste. Yeast extract powder has mainly changed the taste and there by the overall impression too. Added sugar too has changed only the taste along with overall impression.

4.3.7.1 Performance of Member One

Member one had successfully identified the deviations in corn starch added and sugar added samples and samples with both water and white pepper powder added. But he was unable to identify whether the texture of chicken flavour added sample is up to the standard or not. The answer NS (Not Sure) indicates that he was able to perceive a small deviation but it is doubtful whether is considerable or not. Further he is unable to identify whether the odour of the yeast extract powder added sample is up to the standard or not. He has given twenty three correct answers out of twenty five expected answers when identifying the standard sample. There he was able to identify the standard sample correctly in last four consecutive times where the standard sample was offered. So it can be concluded that the member one is accurate and precise in identifying standard soup sample so that he can be appointed in the quality assurance sensory panel of the given soup mixture.

Table 4.5 Performance Validation Results of Member One

Sample		O. I.	App.	Txt.	Od.	Tst	Percentage Correct
White Pepper & Water Added	Expected	No	No	No	No	No	5/5 = 100%
	Given	No	No	No	No	No	
Corn Starch Added	Expected	No	No	No	No	No	5/5 = 100%
	Given	No	No	No	No	No	
Chicken Flavour Added	Expected	No	Yes	Yes	No	No	4/5 = 80%
	Given	No	Yes	NS	No	No	
YEP Added	Expected	No	Yes	Yes	Yes	No	4/5 = 80%
	Given	No	Yes	Yes	NS	No	
Sugar Added	Expected	No	Yes	Yes	Yes	No	5/5 = 100%
	Given	No	Yes	Yes	Yes	No	
Standard	Expected	Yes	Yes	Yes	Yes	Yes	23/25=92%
Standard 1	Given	No	Yes	Yes	Yes	No	
Standard 2	Given	Yes	Yes	Yes	Yes	Yes	
Standard 3	Given	Yes	Yes	Yes	Yes	Yes	
Standard 4	Given	Yes	Yes	Yes	Yes	Yes	
Standard 5	Given	Yes	Yes	Yes	Yes	Yes	

Key to Table 4.5, 4.6 and 4.7;

O. I. – Overall impression

App – Appearance

Txt – Texture

Od – Odour

Tst - Taste

4.3.7.2 Performance of Member Two

Member two had successfully identified the deviations in corn starch added sample. But he was unable to identify whether the texture of water added sample is up to the standard or not. Here he identifies the taste of the samples with added chicken flavour, yeast extract powder and sugar as standard. There he was unable to perceive the increased intensity of tastes due to the addition of higher concentration of flavouring ingredients i.e. he has identified those increased tastes as the standard taste of the soup sample. So it is better to train him further on this aspect. He has given all the answers correctly in identifying the standard soup samples. There he was able to identify the standard sample correctly in all five consecutive times where the standard sample was offered. So it can be concluded that the member two is

accurate and precise in identifying standard soup sample so that he can be appointed in the quality assurance sensory panel of the given soup mixture.

Table 4.6 Performance Validation Results of Member Two

Sample		O. I.	App.	Txt.	Od.	Tst	Percentage Correct
White Pepper & Water Added	Expected	No	No	No	No	No	4/5 = 80%
	Given	No	No	Ns	No	No	
Corn Starch Added	Expected	No	No	No	No	No	5/5 = 100%
	Given	No	No	No	No	No	
Chicken Flavour Added	Expected	No	Yes	Yes	No	No	2/5 = 40%
	Given	Yes	Yes	Yes	Yes	Yes	
YEP Added	Expected	No	Yes	Yes	Yes	No	3/5 = 60%
	Given	Yes	Yes	Yes	Yes	Yes	
Sugar Added	Expected	No	Yes	Yes	Yes	No	3/5 = 60%
	Given	Yes	Yes	Yes	Yes	Yes	
Standard	Expected	Yes	Yes	Yes	Yes	Yes	25/25= 100%
Standard 1	Given	Yes	Yes	Yes	Yes	Yes	
Standard 2	Given	Yes	Yes	Yes	Yes	Yes	
Standard 3	Given	Yes	Yes	Yes	Yes	Yes	
Standard 4	Given	Yes	Yes	Yes	Yes	Yes	
Standard 5	Given	Yes	Yes	Yes	Yes	Yes	

4.3.7.3 Performance of Member Three

Member three has successfully identified the deviations in the sample with both water and white pepper powder added and in the sample with yeast extract powder added. But he has identified the odour of the corn flour added sample and the chicken flavour added sample as standard odour. Further he is unable to identify the deviation of taste that has occurred due to the addition of sugar. And also he has identified the appearance of the chicken flavour added and sugar added samples as deviated. He has given twenty four correct answers out of twenty five expected answers. There he was able to identify the standard sample correctly in last four consecutive times where the standard sample was offered. So it can be concluded that the member three is accurate and precise in identifying standard soup sample so that he can be appointed in the quality assurance sensory panel of the given soup mixture.

Table 4.7 Performance Validation Results of Member Three

Sample		O. I.	App.	Txt.	Od.	Tst	Percentage Correct
White Pepper & Water Added	Expected	No	No	No	No	No	5/5 = 100%
	Given	No	No	No	No	No	
Corn Starch Added	Expected	No	No	No	No	No	4/5 = 80%
	Given	No	No	No	Yes	No	
Chicken Flavour Added	Expected	No	Yes	Yes	No	No	3/5 = 60%
	Given	No	No	Yes	Yes	No	
YEP Added	Expected	No	Yes	Yes	Yes	No	5/5 = 100%
	Given	No	Yes	Yes	Yes	No	
Sugar Added	Expected	No	Yes	Yes	Yes	No	3/5 = 60%
	Given	No	No	Yes	Yes	Yes	
Standard	Expected	Yes	Yes	Yes	Yes	Yes	24/25 = 96%
Standard 1	Given	Yes	Yes	Yes	NS	Yes	
Standard 2	Given	Yes	Yes	Yes	Yes	Yes	
Standard 3	Given	Yes	Yes	Yes	Yes	Yes	
Standard 4	Given	Yes	Yes	Yes	Yes	Yes	
Standard 5	Given	Yes	Yes	Yes	Yes	Yes	

Final performance validation session results reveal that all the three members show the accuracy in identifying the standard sample. But Member two has to be given further training on identifying the increased flavour intensities.

Ultimately all three members can be appointed in a quality assurance sensory panel. As minimum number of panellists that should be in a quality assurance sensory panel is five, two more individuals have to be trained using the above established procedure in order to establish the quality assurance sensory panel.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

- The samples of which the formulations are mentioned in chapter three can be successfully employed for the training of quality assurance sensory panel for the given soup mixture.

- The established procedure can be successfully used for the training of quality assurance sensory panel for the given soup mixture.

- Trained three panellists can be appointed in the quality assurance sensory panel for the given soup mixture.

5.2 Recommendations

- Two more individuals have to be trained using the above established procedure in order to establish the quality assurance sensory panel.

- By further improving the training procedure by including training on scaling and profiling methods this training procedure can be used for the establishment of descriptive sensory panel.

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Appendix: 03.01 - Pre screening questionnaire

Personal details

Name:

Contact numbers:

Date of birth:

Please tick the relevant cage

		Yes	No
Do you smoke			
Do you have dentures/partial dentures?			
Do you wear light sensitive/tinted glasses?			
Are you colour blind?			
Do you suffer from			
	Sinus problems?		
	Asthma		
	Frequent mouth infections		
	Sore throats		
	Bronchitis		
	Diabetes		
	Digestive complaints		
	High blood pressure		
	Frequent nasal infections		
	Migraine		

Do you suffer from any skin irritations?

Yes		No	

If yes, please describe

.....

.....

Are you allergic to any soaps or lotions?

Yes		No	

If yes, please describe

.....

.....

Food habits

Are you currently on a restricted diet?

Yes		No	

Are you a vegetarian?

Yes		No	

What is (are) your favourite food(s)?

.....

.....

What is (are) your least favourite food(s)?

.....

.....

What foods can you not eat or allergic to?

.....

.....

What food would you never eat?

.....

.....

Sensory Questionnaire

Describe some of the noticeable flavours in a sausage

.....
.....

Name 2/3 other foods that taste like yoghurt

.....
.....

Name some commonly used herbs

.....
.....
.....

Describe some of the noticeable smells in a bakery

.....
.....

What type of odours is associated with clean and fresh?

.....
.....

Appendix: 03.02 – Evaluation Form for Basic Taste Test

Name :.....

Date :.....

- In front of you are 12 coded samples.
- Copy the code of the sample and mark which basic taste it is.

CODE		Sweet	Salt	Sour	Bitter	Umami	Neutral
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Appendix: 03.03 – Evaluation Form for Taste Ranking Test

Name: .....

Date:.....

- Taste the products one by one.
- Decide which of the 5 basic tastes it is and mark this basic taste.
- Put the 8 samples in increasing intensity from weak to strong.
- What is the basic taste given to you?

Sweet	
Sour	
Salt	
Bitter	
Umami	

- Fill in the codes of the samples in the squares according to the increasing intensity (weak to strong)

1	2	3	4	5	6	7	8
Weak						**Strong**	

Appendix: 03.04 – Evaluation Form for Odour Identification Test

Name: .....

Date: .....

- You will be given 20 well known odours.
- Below you find a list of these odours.
- Before you start smelling the odours, read these names thoroughly so that you know which odours to expect.
- Open the jar, smell and decide which of the odours on the list you smell. (You can take maximum of 1 minute).
- Write the answer beside the code of the jar. For example if you have jar number 4, write the answer on the line with number 4.

Odour list

Aniseed	Coffee	Nutmeg
Almond	Cumin	Onion
Banana	Fennel	Oregano
Black Pepper	Garlic	Peanut-butter
Camomile	Ginger	Rose
Caramel	Hazelnut	Rosemary
Celery	Honey	Rum
Cinnamon	Lavender	Strawberry
Clove	Lilac	Tomato
Coconut	Mushroom	Vanilla

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

Appendix: 03.05 – Evaluation Form for Odour Recall Test

Name: .....

Date: .....

- You will get 18 of the 20 jars you assessed earlier.
- Open the jar, smell and decide which of the odours on the list you smell. (You can take maximum of 1 minute).
- Write the answer beside the code of the jar. For example if you have jar number 4, write the answer on the line with number 4.

Odour list

Basil	Fennel	Pink grapefruit
Bouillon	Ginger	Rubber
Caramel	Grapefruit	Rum
Cognac	Lapsang souchong tea	Strawberry
Condensed milk	Mandarin	Tarragon
Clove	Orange	Tobacco
Earthy	Piment	

1.	10.
2.	11.
3.	12.
4.	13.
5.	14.
6.	15.
7.	16.
8.	17.
9.	18.

Appendix: 03.06 – Evaluation Form for Difference Test

Name: .....

Date: .....

- In front of you there are 3 products.
- 2 products are the same, one is different.
- In this test you have to determine product is the one that is different.
- Describe the differences between the two different products.

Fill in the codes of the 3 products	**1**	**2**	**3**
Mark the code of the product that contains the different product			
Describe the differences between the product	Differences		

Appendix: 03.07 – Evaluation Form for Texture Test

Name: .....

Date: .....

- In front of you there are 3 different products.
- These products differ in various ways like taste, odour, colour etc.
- In this test you have to focus on the texture of the products. For example the hardness of the product, for one product there is more force required to bite through then for another product.
- The trays of each product are coded.
- To describe as many differences as possible between the products, follow the instructions below;
    - Take a bite of every product and bite on it several times.
    - Decide which of the 3 products is most different
    - Write the code of the product that you find most different
    - Describe the differences in mouth feel between the most different product and the other two products.
    - Then describe the differences in the other two products.

Fill in the code of the product you find most different in texture			CODE	
Describe the differences in texture of the most different product and the other two			Differences	
Fill in the codes of the other 2 products	CODE		CODE	

Describe the differences in texture between these 2 products	Differences	Differences

Part 2

- In front of you there are 5 products. In this part you have to scale 5 products on the attribute hardness. Hardness = the force required to bite through the product
- Take a bite of the product one by one.
- Decide which product is the softest and which product is hardest
- Rank 5 products from soft to hard
- In the line scale given, write the code of hardest product at the right end of the line
- Write the code of the softest product on the left end of the line scale.
- Also have to determine the hardness of the other 3 products. Do this for each of the 3 products.
- Indicate with a mark on the line scale how hard you find the product. Do this by comparing the hardness of the product with the hardness of the softest and the hardest product.
- Important: Place the code of the product above the mark

Write down the Code of the softest	Write down the Code of the hardest

.....

.....

Appendix: 03.08 – Evaluation Form for Paired Comparison Test

Name:

Date:

Time:

Sample Code 1:

Sample Code 2:

- Which sample has the standard quality on the following aspects?

	Sample 1	Sample 2	Remarks (Apparent Differences)
Overall Impression			
Appearance			
Texture			
Odour			
Taste			

Appendix: 03.09 – Evaluation Form for Monadic Test

Name:

Date:

Time:

Sample Code:

- Is this sample up to the standard?

	Yes	No	Not Sure	Remarks
Overall Impression				
Appearance				
Texture				
Odour				
Taste				

Appendix: 03.10 – Evaluation Form for the Identification of Salt Intensity Gradient

Name:

Date:

- Taste the given samples.
- Try to use the sensory vocabulary when ever possible.

1. Do you find any difference between given samples?

YES		NO	

2. Please arrange the samples to the increasing order of that characteristic. Write the code number in the relevant cage.

Lower				**Higher**
1	2	3	4	5

3. Explain the differences you identified in the tasted sample.

Sample Number	Is it up to the standard	Explain the differences
	Yes / No / Not sure	
	Yes / No / Not sure	
	Yes / No / Not sure	
	Yes / No / Not sure	
	Yes / No / Not sure	

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