

## FOOD PRODUCT DEVELOPMENT TOOL

### Introduction

Food product development. Development new food and drink product is a complex process requiring knowledge of ingredients, processing techniques, packaging materials, legislation and consumer demands and preferences.

### Definition of Organoleptic testing panels:

Evaluation of food products by a combination of taste (by mouth) and smell (by nose) by taste panels.

### Organoleptic testing:

- When formulating oral medicines, scientists face the challenges of masking the bitter taste of active principles or off-<sup>v</sup>odor of some ingredients.
- Indeed, odor<sup>v</sup> and taste are key parameters in pharmaceutical oral forms since they determine palatability, patient acceptability and success on the market.
- Alpha MOS instrumental solutions for measuring and evaluating the odor<sup>v</sup> and taste of medicines are designed to give rapid answer to organoleptic issues in pharmaceutical formulation and pharmaceutical product development:
  - i. Taste masking efficiency tasting.
  - ii. Unpleasant odor<sup>v</sup> masking evaluation.
  - iii. Bitterness measurement of active principles and new chemical entities.
  - iv. Taste matching placebo assessment.

**Advantages of instrumental sensory analysis in the pharmaceutical industry:**

- i. Fast and reliable results produced from instrumental measurement that can be correlated with sensory panel evaluation.
- ii. Global multi-sensory approach (odor, taste) by combined use of electronic nose and electronic tongue.
- iii. Avoiding unpleasant tasting of bitter substances for sensory panel assessors.
- iv. No more safety issues linked to human tasting.

### **Examples of application in sensory analysis of medicines:**

Using Alpha MOS chemical and sensory analysis instruments, a wide variety of application on oral medicines and have been successfully achieved such as:

- Quantitative evaluation of the masking efficiency of various taste masking techniques such as addition of flavor or sweeteners, coating, encapsulation, polymer extrusion.
- Determination of the bitterness intensity of active ingredients.
- Comparison of the taste and bitters level of brand and generic orally disintegrating tablets.
- Quantification of the odor masking power of various coating on tablets containing an active principle with a strong odor.
- Optimization of taste matching placebo development for double blind clinical trials.

- Assessment of odor quality and intensity of Omega-3 using the same scoring scale as a sensory panel.
- Investigation of various food vehicles for masking the bitterness of a pediatric syrup.
- Selection of the packing type (plastic versus glass) that will best assure active ingredients stability over time.

**Definition of export profile panels:**

Food processing sector is one of the largest sectors in India in terms of production, growth, consumption, and export.

India's food processing sector covers fruit and vegetables, spices, meat and poultry, milk and milk products, alcoholic beverages, fisheries, plantation, grain processing and other consumer product groups like confectionery, chocolate and cocoa products soya based products, mineral water, high protein foods etc.

The Indian food processing industry is primarily export orient.

India's geographical situation gives it the unique advantage of connectivity to Europe, the middle East, Japan, Singapore, Thailand, Malaysia and Korea.

**Specific Requirements and Conditions:**

The applicant shall ensure compliance of the following specific requirements relevant to the sub-components under Development of Export Infrastructure:

**I. Integrated Pack house:**

a. The proposals for Pack houses / cold storages / pre-cooling shall minimally be based on National Council for Cold Chain Development (NCCD) cold chain technical standards as available at the link <http://nccd.gov.in/>. Further, the requirement of importing

countries have to be complied with, as per directions from APEDA from time to time.

b. The exporter shall be responsible to get the Pack house registered with APEDA under the Pack house recognition scheme within 6 months of completion of project.

c. 75% of the assistance shall be released after submission of final claim documents complete in all respects as mentioned at point no. 7 of the document and fulfilling compliance of all the requirements.

d. The balance 25% of the total eligible assistance shall be released after registration of the Pack House as per APEDA Pack House registration scheme.

## **II. Insulated / Reefer transport / Mobile pre-cooling units:**

a. The quotation should be on letter head of OEM or their authorized distributor/dealer of the equipment, duly signed or digitally signed with validity and other terms and conditions for the following:

- Chassis with make and model
- Container with make and model
- Refrigeration system with make and model

## **III. Processing Facilities:**

- a. The unit must have the food processing line already established.
- b. The unit must be HACCP / ISO 22000 certified

#### **IV. Development of Organic Products**

a. Assistance is available for creation of capital assets; integrated pack house, purchase of insulated refrigerated transport vehicles / mobile pre-cooling unit, single or multiple products processing facilities, cold store / warehouses, carbon dioxide generators, fumigated stores and Silos etc. The products covered under Tracenet traceability system for organic products are eligible under the scheme.

b. The assistance would be limited to the 40% of the total cost subject to the ceiling of RS. 100 lakhs.

#### **Specific Requirements and Conditions:**

The applicant shall ensure compliance of the following specific requirements relevant to the sub-components under Quality Development:

#### **I Certification of quality and Food Safety Management Systems:**

a. Assistance for implementation and certification of Food Safety Management System such as HACCP, India HACCP, ISO-22000/FSSC-22000, BRC, ISO-14001, GAP, India GAP, GHP, India GHP, ISO-9001 etc., in house quality control lab equipments, etc. would be admissible to manufacturer exporters only.

b. Eligible assistance for HACCP, ISO-22000/FSSC-22000, BRC, ISO-9001 etc. shall be reimbursed to the exporters in two phases (50% on submission of claim and 50% on completion of first periodic surveillance).

- c. The certification should be from APEDA recognized agencies.
- d. The detailed component wise fee structure from Implementation and Certification agency must be provided as per **Annexure 2**. The details would be hosted on the website of APEDA.
- e. Application shall be submitted for each of the above systems separately since assistance is applicable individually for each system.

## **II Training in India and abroad to be implemented by APEDA.**

- a. Assistance shall be given only for APEDA related activities.
- b. Assistance shall be given for short term executive courses (up to 1 month) relevant to agro industry, quality, marketing and management offered by institutes illustrated in the Annexure 8. The cost of participation fee/ course fee shall only be considered.

**III Testing of water, soil, residues of agrochemicals/pesticide, veterinary drugs, hormones, toxins, heavy metals, microbial count etc. in agricultural produce / products where monitoring activity is implemented by APEDA.**

A) In-principle approval (IPA) is not required for this component. However, the reimbursement is subject to availability of funds.

B) Assistance to exporters shall be available for sampling and analysis carried out by APEDA recognized laboratories.

C)The application should be filed through Laboratory Testing software.

D)The application should be accompanied by a Linkage sheet asplaced at Annexure 3,selfcertified copy of bank statement showing debit entries of payment released to the laboratory.

E)Financial assistance will be computed on the basis of entries on the Laboratory Testing software geo-tagging of samples etc.

#### **IV Laboratory for export testing and in-house lab equipments:**

a. Indicative list of testing equipments is placed at Annexure 1.

b. Assistance is applicable exclusively for lab scale testing equipmentand not for in process quality control equipments, consumables,glassware, computers, general refrigerators, Air Conditioners orlaboratory furniture and civil work etc.

Laboratory recognition in accordance with the procedure laid downby APEDA available at the link <http://apeda.gov.in/apedawebpage/menupages/Recognitionschemes.htm>

d.The assistance should exclude building, renovation and interiors etc.

e.The laboratories assisted and recognized by APEDA shall providerebate to APEDA registered exporters at least 10% on the testingcharges fixed by APEDA



**VI. Introduction of new plant / seed / germplasm varieties for export oriented / varieties suitable for processing for identified produce for Grapes, Gherkins Pineapple, White Onion, Groundnuts, Potato, Tomato, Onion.**

A) The applicant has to submit a detailed business plan to avail assistance under this scheme.

B) The financial assistance shall be limited to 60% of the cost of the imported plant material subject to a ceiling of Rs.10.00 lakhs per beneficiary/exporter. Cost of royalty etc., shall be borne by beneficiary/exporter.

C) The farm and subsequent area brought after grafting etc., has to be registered under the HortiNet/GrapeNet/Traceability system of APEDA and details of production and exported quantity has to be reported at the end of the season to APEDA.

D) Applicant shall take approval of the Competent Authority in India, as the case may be for import of such planting material.

E) The payment shall be released in three instalments: 60% of the cost on planting and registration of farm, 30% after one year of planting and balance 10% in the first year of the commencement of export.

F) FPOs are also eligible under the scheme.

G) In case, import is done by ICAR institutions/State Govt. Institutions. APEDA may extend financial assistance upto 100% of the cost

of the imported plant material. The installments would be paid based on the business plan of institutions on mutually agreeable terms & condition. The cost of royalty in such cases will be paid by APEDA

### **Post-Harvest Processing of Fruits:**

The post-harvest processing of fruits at the pack house facility is carried out at the postharvest processing area (# 3) that is clearly segregated from that of unprocessed fruit storage area and entry to the post-harvest processing area is regulated and controlled. All the workers before entering the processing area undergo washing and wear clean disposable aprons/gowns, caps and gloves.

The process of cleaning, washing, hot-water treatment and grading at the pack house facility is carried out through a highly sophisticated automated system fitted with roller conveyor with adjustable speed and hot water treatment unit with thermostatic controls under the supervision of process supervisor.

### **Desapping of fruits.**

Desapping of fruits is carried out in processing area by trained workers under the supervision of processing supervisor.

Desapping is done by holding the mango fruits upside down while cutting the stalk of fruits.

The stalks of mango fruits are cut very carefully to 0.5 to 1.0 cm by trained workers by using a scissor with sharp long nose to avoid causing skin injury.

### **Cleaning & Washing of Fruits.**

The cleaning & washing of fruits is done at the pack house facility through automated washing system fitted with overhead sprayers and smooth rotating brushes to clean and wash the fruits.

At the beginning the workers gently place the desapped fruits in the trays fitted onto the conveyor, which conveys the fruits to the automated water spraying platform, wherein the fruits get washing with a clean water of potable quality mixed with a neutral detergent such as Teapol, Sandovit or Indtron at 0.1% (1 ml of detergent per litre of water). The process of cleaning and washing will take 3-5 minutes. The temperature of water is maintained at 270 C.

Hot-Water treatment with fungicidal dipping.

Hot water treatment of fruits is carried out in hot water treatment tanks fitted with

Theremostatic controls to maintain a constant desired temperature of 520 C.

The hot water is treated with fungicide such as Sodium hypo chloride at 200 ppm concentration for 2-3 minutes.

After the treatment the fruits are passed through a drying table till the moisture on the surface of fruits gets evaporated and thereafter wiped with a soft muslin cloth. The fruits are then transferred to a grading and sorting table.

### **Sorting/Grading of fruits.**

At the sorting table, the trained workers wearing gloves sort out the oversized and undersized fruits, immature/scarred/blemished fruits, diseased/insect damaged fruits and as well as fruits with sap injury under the supervision of quality supervisor. The segregated fruits kept in plastic crates are removed at the end each working shift from the process area and are distinctly labeled for disposal.

At this stage, the mangoes are separated according to size by weight into following groups for packing by count. Trained workers, under the close supervision of quality supervisor, do grading manually, after wearing gloves.

The graded mangoes are classified into three classes Viz.,

- (i) Extra Class
- (ii) Class-1 and
- (iii) Class-2 as per the quality parameters specified and the tolerances described in "Post Harvest Manual for Mangoes" published by APEDA.

### **Packaging & Labeling/Marking:**

Each graded mango is placed into soft, white expandable polystyrene, netted sleeves to prevent bruising before placing it in compressed fiberboard cartons.

The sleeved mangoes are packed in a single layer in compressed fiberboard cartons of interlocking type preferably having a water-proof coating to prevent damage due to high humidity during cold storage. All the holes (ventilator openings of the cartons (packages) are covered with insect- proof screen of a minimum of 30 meshes per linear inch. Only packing material of food grade is used for packing mangoes at the pack house facility and the following standard size of packages are used for packing mangoes for export viz., 370 X 275 X 90 mm.

All the sides of each package are then sealed with adhesive tape to prevent entry of target or non-target quarantine pests.

All the packages are affixed with labels as indicated in Addendum-5 approved by the USDA-APHIS. The labels are appropriately marked/stamped on left-half indicating Production Unit Code Number (PUC), Packinghouse Code Number (PHC), Date of Packing, and Lot Number.

The processing supervisor at the end of packaging will make complete inventory of processing in the product logbook detailing the information on the quantity of fruits/number of fruit crates received for processing; date/time of processing;

Quantity/No of cartons packed & rejected quantity of fruits for packing.

**Loading, Sealing, Transportation & shipment by air:**

The insect-proof packages of processed mango, are immediately loaded into a closed conveyance at the loading area (#7) of the pack house facility and transported to the irradiation facility for treatment to meet the specific phyto sanitary requirements of USA. The loading area is provided with secured docking facility to prevent insect gaining entry into the facility.

Before loading the packages, the conveyance is carefully inspected to ensure it is thoroughly clean and free from hitchhiking pests. At the completion of loading at the pack house facility, the doors of the vehicle is closed and locked and suitable seal is affixed to ensure the integrity of processed consignment.

The consignment is then transported to irradiation treatment facility accompanied by a post-harvest process information sheet (Adendum-6).

## Primary Sensory Panel

- ❖ A sensory panel may be described as a group of testers who have exceptional **sensory faculties** and can describe products on the basis of taste, smell or feel.
- ❖ The sensory panelists are trained to **describe** their **sensory experiences** using words they generate in previous training sessions. These words are more detailed than those used by consumers, and more **useful for R&D** departments.

The parameters they can measure:

- ✓ **Smell:** Perfumes and Aromas etc.
- ✓ **Taste:** Flavor, Texture etc
- **Touch:** Viscosity for cosmetics, roughness/smoothness for a leather steering wheels, for instance
- **Other sensations** like vibration of a drill, smoothness of a car ride etc.
- ❖ Linking data from a Sensory Panel and Consumer Tests for a common set of products is a very **powerful development tool**.
- ❖ By statistically linking, i.e., mapping the expert descriptions and consumer liking, the key elements that actually drive preference can be optimized to meet consumer needs.
- ❖ This technique can be used to great effect by identifying "taste segmentation groups".

## When to use Sensory Panels?

Sensory Panels may be used as part of market understanding to:

- Describe current products in the market (mapping a market)
- Tracking competitive product changes over time

They can be used as part of **product development program** to :

- Develop a new product from gaps in existing market maps
- Determine if it is possible for consumers to notice changes
- Understand the magnitude of changes that will get a particular consumer reaction
- Determine which products and concepts in a range of new ones are the most promising
- Substantiate advertising propositions and label claims

Sensory panels can also be utilized in the **Quality management process** for:

- Determining product changes over time for shelf life evaluation
- Determining the effect of in-house ingredients and process changes (Quality Improvement and Cost Reduction)
- Understanding tolerances for a QA program

A sensory panel is more appropriate for repeated assessments.

## Objective of Sensory Panels

- ❖ Any decision related to **sensory evaluation** begins with identifying what the researcher wants to accomplish. The most common objectives pertain to *product development and quality*.
- ❖ Specific functions could include product matching, enhancement of ingredient specifications, shelf-life determinations and **cost optimization**. When detection, not identification, of differences is the goal, it involves less time and training.
- ❖ However, situations that require attribute-specific quantifiable data, such as target matching, demand a trained panel of product specialists. Every panelist must be competent in using



the **sensory method**, terminology, rating scales, and evaluation ballots or programs.

- ❖ "Descriptive stats reveal background flavors and textures, as well as intensities that explain consumer choices." Combined analysis of **consumer and descriptive data** reveals key drivers of consumer liking and how to make a product that meets acceptance standards.
- ❖ Many companies use trained sensory panels to gather **objective analysis**. The sensory panels are different than a consumer tasting panel. "Sensory panels guide product development while consumers help with market acceptability."
- ❖ Sensory panels use descriptive analysis, to allow the flavor group to understand the attributes of the functional ingredients or formulations, and to create flavors that allow the final product to have enhanced palatability. They can identify flavor, aromatic and texture characteristics and rate those characteristics on an intensity scale."
- ❖ Members of such panels undergo training to be able to provide specific, objective details on scent and flavor attributes. Trained sensory panel judges are not determining drinkability or acceptability. They help determine whether a flavor characteristic is perceptible and to what degree.
- ❖ Sensory panelists are given an intensive 3-week training, using a barrage of samples and studying **sensory techniques** such as profiling, scaling and references. They also learn the difference between flavor facts (quantitative attribute measurement that is based on training) and opinions (qualitative judgment).
- ❖ A highly trained sensory panel does not generate fuzzy directions. There's no subjectivity in a **professional descriptive food panel.**"
- ❖ In addition to assisting in formulation work, sensory panels can also assist in the characterization of raw materials.

- ❖ This lends insight, into what a company or flavor house might expect, in a formulation combining several functional ingredients.

Industry Vertical where the Sensory Panel method is used:

- Food and Beverage
- Pharmaceutical
- Agriculture
- Flavor
- Consumer Products, etc.

Sensory panels are primarily employed by organizations when a product's standard of quality needs to be established, controlled or assured. This method essentially helps manufacturers determine if their product meets the **consumers' preferences** and helps in marketing the product successfully. This method however has certain advantages and disadvantages that can be enlisted as:

### Advantages

- Sensory panels help manufacturers, scientists, food technologists etc. **gain** a clear **perception** of what ordinary consumers may experience
- Sensory panel testing can be much **more rapid** than most non-sensory methods
- Sensory panelists use more than one sense, making them more **flexible** instruments
- Sensory panelists can be very **sensitive** and good at detecting minute differences in product characteristics
- Sensory panels are **acceptable** for writing into specifications for quality

- Laboratory facilities are not required to conduct the descriptive analysis of a product. This makes sensory panels a **feasible** proposition to study products

## Disadvantages

- Sensory panelists can become **fatigued** with the entire process of testing and assessing descriptive data
- Assessors may be subject to **biases** e.g. from loss of interest or from distractions
- To ensure precision in the analysis and interpretation of the descriptive data, several assessors may be required, making it an **expensive** proposition
- The entire process of recruiting and training sensory panelists can be a **time-consuming** and costly process
- It may **not be easy** to replace assessors quickly, as the incoming assessor will have to be given intensive training to develop requisite expertise of the job
- The sensory panel method can be more expensive than some **non-sensory** methods
- The panelists may **not be good at quantifying** perceptions
- Interpretation of results may get problematic and be **open to dispute**

## PANEL ORGANIZATION:

### INTRODUCTION:

The sensory quality of food product has been considered an important factor since the beginning of the food industrialization process due to its influence on the overall quality of the product. For the consumers, the eating quality attributes—aroma, taste, aftertaste, tactual properties, and appearance are the deciding factors in food acceptance. The quality that “Which the consumer likes best” and the grades of quality are understood more by the degree of desirable attributes and absence of undesirable characteristics.

Sensory Analysis is the description and scientific measurement of the attributes of a product perceived by the senses: sight, sound, smell, taste, and touch. By understanding sensory data, one can offer food-product development guidelines as to which property should be emphasized when making product-development decision. This decision process includes processing ingredient and economic considerations.

Not merely food “tasting” it can involve describing food color as well as texture, flavor, aftertaste, aroma, tactile response, and even auditory response.

### METHODOLOGIES:

Developing a panel for sensory evaluation was done by screening test and give them a proper training for sensory about the attributes of flavor and texture characteristic and their intensities of the product.

The experiment was conducted in Britannia Industries Limited, Bengaluru. The testing material was also procured from the local area of the Bengaluru.

### RECRUITING PANEL:

A key element in the descriptive test was finding panelists who are capable of using objective terms and expressions to describe food products. Using a trained panelist does not give any identification of consumer liking, simply a descriptive profile of sensory characteristics of products. To obtain a good understanding of the consumer, minimum 10 members of panelist were required for the sensory of the product.

## SCREENING TEST:

When developing a sensory panel, there were several areas that need to be addressed and which include:

- The need for a panel in the organization (R&D, QA/QC)
- Organization and management support and commitment
- Resources required a:
  - A. Sensory staff
  - B. Interest and availability of a potential panelist
  - C. Sample and reference for screening and training
  - D. Facility for data collection and statistical analysis

❖ The screening test consist of 3 stages which include:

- Basic test and flavor identification
- Threshold test and color intensity
- Discriminative test

### Stage 1:

To determine the abilities to identify difference using dilute solution that may represent the basic tastes I .e. sour, bitter, salty, sweet and umami.

The odor was also commonly used for the screening test. In order to evaluate the ability of the panelist to describe the sensory response, a series of products can be presented and potential panelist was asked to describe the sensory impression.

### Stage 2:

After basic and odor test out of 24 participants, the 20 participants were selected for the next round of test that was a threshold, color identification, and texture characterization.

After the threshold and color test, 20 panelist got selected for the next round of test that was Texture Characterization. In this test, all range of products having typical texture was given to the participants.

They had to arrange this product according to the and level of textural properties, such as hard, elastic(spongy), adhesive(sticky/pastry), brittle, gummy, cohesive, chewy, firmness, softness etc.

### Stage 3:

After the 2<sup>nd</sup> stage, 15 participants got selected for the 3<sup>rd</sup> stage. In this stage, it includes a discriminative test in which a series of a triangle or due-trio test may be completed to assess the ability of the potential panelist to detect small difference between stimuli at supra- threshold levels.

For the selection of panelist, 10% and 50% of sucrose were diluted in water where to samples o 10% diluted sucrose and one sample of 50% diluted sucrose had given to the participants where they had found out the odd one out of it.

### TRAINING:

After analyzing my screening result I invited 10 selected panelist to participate in sensory training.

Training was involved as a group meeting to taste and describe of taste and flavors of various products. I worked with the panelist to create descriptor to define the food products being tested and define each descriptor. Then the panelist was provided with the examples of each descriptor and given the opportunity to evaluate various products for those descriptors.

Five different brands products for yogurt were give to the panelist to analyze the flavor and texture properly.

- Epigamia
- Britannia
- Mother dairy
- Nestle
- Milky mist

### RESULT AND DISCUSSION:

The result is based on the pilot-study using the PCA method on semi-trained, characterizing the different brands of the yogurt product by the descriptive test.

The purpose of this analysis step was to get a quick and general overview over how the data was structured and to identify panels that were differ greatly in regard to how they perceived differences between the tested samples.

This was done by applying PCA on the merged data set. The analysis of this PCA chart shows that the overall attributes show around 10-30 attributes of the product which could easily differentiate each brand and which could explain the overall degree of liking by the panel for the product.

### **CONCLUSION:**

The results show that in yogurt samples, panel mostly preferred Epigamia brand among all other product as it had a good texture and flavor profiling. These results can help other brand to improve their product according to the preference of the panel and specification of the sensory properties of the product, and characterization to allow recognition in the food market. FOR development and marketing of the product, perceptual mapping in the consent of QDA and PCA could contribute to product positioning with correct approach or strategy.