UNIT 6 TESTING CONDITIONS AND SENSORY PARAMETERS

Structure

6.0 Objectives

6.1 Introduction

6.2 Sensory Evaluation Room

6.3 Preparation of Meat Samples

6.4 Number and Presentation of the Samples

6.5 Time for Sensory Evaluation

6.6 Sensory Attributes/Parameters

- 6.6.1 Flavour
- 6.6.2 Texture and Tenderness
- 6.6.3 Appearance and Colour
- 6.6.4 Juiciness

6.7 Overall Acceptability of a Meat Product

6.8 Conduct of Sensory Panel

6.9 Let Us Sum Up

6.10 Key Words

6.11 Some Useful Books

6.12 Answers to Check Your Progress

6.0 OBJECTIVES

After reading this unit, you will be able to:

- narrate the environment of a sensory evaluation laboratory;
- discuss the testing conditions including temperature, time, preparation and presentation of the food sample;
- describe the sensory evaluation process; and
- state important sensory attributes or parameters of a meat product.

6.1 INTRODUCTION

Sensory evaluation of a food requires exclusive concentration of senses for analyzing certain attributes. It is possible in certain specific testing conditions including the exclusive sensory evaluation laboratory, proper preparation/presentation of sample, use of control or reference sample, adhering to optimal time of evaluation etc. As told to you earlier, each meat product has certain distinguishing quality characteristics. So, it is assessed on the basis of those desirable sensory attributes or traits or parameters. The important sensory attributes of a meat product are colour/appearance, flavour, juiciness, texture etc. These parameters markedly influence the overall acceptability of a product. Sometimes intermediary parameters like saltiness, binding, crispness, mouth coating etc. are also evaluated separately as they markedly influence the ultimate quality of a product. Acknowledge of these sensory parameters is of prime importance. In this unit, you will learn about the ideal sensory testing conditions or environment and sensory parameters of general nature.

6.2 SENSORY EVALUATION ROOM

As we read earlier sensory evaluation is a scientific approach to grade the food products on the basis of their sensory attributes and as we require a laboratory equipped with all necessary instruments and reagents to conduct a scientific experiment so for sensory evaluation we need sensory evaluation room. Sensory evaluation room is a multi-component area which includes a briefing room, an office, testing booths and sample preparation room. Briefing room and office may be common one with facilities of comfortable seating and used for briefing or instruction delivery.

Testing booths/area should be a calm and quite place separate from the cooking room or kitchen. It may be connected with the kitchen by a window, which opens only for passing on the food samples. It should have an exhaust fan to eliminate the external odours. A slight positive pressure may be created in reduce inflow of odorous air. It should have separate booths erected with limited wooden partitions. Panel booth area should have independent doors for entry and exit. Each booth should have a wash basin, water glass for oral rinsing, writing table, stool or chair, water beakers and arrangements for coloured as well as neutral white light. Besides, there should be availability of knife, fork, paper, napkin etc. The relative humidity in the room should be around 70 to 75 per cent and a temperature of 20°C should be maintained inside for conducive working. A sparkling white colour in taste panel room should be avoided as it is uncomfortable to eyes. Lighting should be uniform, shadow free, controllable and of sufficient intensity (110 foot candle light). You will learn more about these conditions in the practical class and see how a good sensory testing environment is maintained.

6.3 PREPARATION OF MEAT SAMPLES

The meat product for sensory evaluation is prepared in specified area/preparation room which is located adjacent to the testing area. The preparation area must be well ventilated with working space, sink, cooking range, oven, refrigerator, deep freeze, blender, scoops, knives, balance, dishes, spoons, cleaning and storage facilities etc.

The sampling for sensory evaluation should be done sincerely in such a way that the sample taken represents the total batch of meat product. However, it should be ensured that all meat samples to be presented for evaluation are safe for human consumption. Panelists should never be asked to taste or eat any meat product that has become stale or mouldy. For the evaluation of stored samples, the safety should be ensured by microbiological tests. For the spoiled samples, only the appearance and odour attributes may be evaluated.

In India, meat products are generally eaten warm. So, these products should be evaluated at that temperature (40°C). It is better to prepare the product just before sensory evaluation unless it is a storage study. Even for stored product if it is warmed it must be presented for evaluation soon. In no case repeated heating and cooling of ready product should be permitted before sensory evaluation, only the standardized method should be followed for preparation of meat product unless it is a subject of test. If it is a comparative study care must be taken that the source of meat as well as processing procedure is same except the subject of test.

As far as the quantity is concerned, it should be enough for the panelists to have atleast two bites in case of solids and 15 ml in case of liquids (soup etc). Meat samples should be prepared as uniformly as possible and presented as quickly as possible to the panelists after warming.

6.4 NUMBER AND PRESENTATION OF THE SAMPLES

The meat samples are presented to each panel member in a random order. Each sample is assigned a number or code which does not give any idea to the panel member about its treatment or processing steps. Generally, four samples are enough for a panel member to evaluate in one session and six samples are considered absolute maximum for trained panelists because their sensory concepts get fatigued. They are required to rinse their mouth after the evaluation of each sample. In the consumer panel, it is customary to evaluate only one sample at a time and the evaluation sheet is also very small e.g., they are required to tick either

very much liked ( ),

liked ( ),

did not like ( ).

They must not be asked to fill up a complex proforma neither they should be questioned hurting them any sense. The samples must be presented in most aesthetic way for sensory evaluation. It is better to use clean, colourless, transparent, well dried glass beaker free of any scratch or brand mark for liquid product such as soup etc. For solid product white dishes of porcelain may be used. For each product a separate container should be used. Each product should be arranged on booth in such a way that all could be visualize at a time for better comparison of sensory attributes like colour or appearance. The number tag should not be in touch of food product and it must be able to code for which it has been kept. There must be separate knife and fork for each sample.

It is better to have a control or reference sample to which all other samples could be compared. If the purpose of sensory evaluation is to produce a meat product which is an improvement over the existing one, then the existing sample can be served as a control.

6.5 TIME FOR SENSORY EVALUATION

The timing for sensory evaluation is very important. It also depends upon the number of tests to be given and the length of time they will take. In general, panel members are very sensitive when slightly hungry. A person who is very hungry tends to like any meat product. On the contrary, a person who is full stomach tends to be indifferent even to the best preparation. So, both the conditions are undesirable. A sensory panel should not be conducted just before or after the lunch time. The ideal time for sensory evaluation is late morning or late afternoon or atleast one and half hours after lunch.

6.6 SENSORY ATTRIBUTES/PARAMETERS

Consumers are the ultimate users of a meat product. So their perception and eating satisfaction is of paramount importance for the success of any meat product. If the product is highly palatable, it makes an excellent eating. Some of the important sensory attributes or parameters are flavour, texture and tenderness, appearance and colour, juiciness etc. Some sensory parameters are product specific e.g., saltiness in cured products, binding in restructured or emulsified products, mouth coating in buffalo meat products, crispness in dehydrated meat products, coating adherence in enrobed meat products. Knowledge of these attributes is of prime importance for their subjective and objective assessment of meat products.

6.6.1 Flavour

Flavour comprises of two components – taste and smell, the later being more important. It is perceived collectively by tongue and nose. Our tongue is capable of perceiving all

the four basic tastes i.e., sweet, salty, sour and bitter. The taste buds for all the four tastes are concentrated on the tongue and palate at different places as shown in the diagram. You will notice that sweet taste is most easily sensed at the tip of the tongue, the salty at the tip and edges, the sour at the edges and bitter at the back of the tongue. The sample is taken in mouth in sips or masticated with teeth and then moved around in such a way that it touches all parts of the tongue including edges of tongue. Samples should not be swallowed to avoid stomach getting full and therefore sickness. The sample must not retested unless we are uncertain of taste. Repeated tasting leads to uncertainty and fatigue.

You might have noted that fresh meat has almost indistinct taste and smell odour. It is during cooking that odour gets pronounced and becomes meaty. Odour is sensed in the deeper part of the nose. For better odour perception, the sample should be smelled first followed by tasting. But in some cases we can not smell the product as some products are having very pungent smell which leads to a pain sensation. Although it is an unusual case and in general taste is preceded by careful smelling. The product must not be smelled more than thrice as it may lead to fatigue or adoption. In the mouth, the product becomes warm making the odour more volatile which reaches to organ of perception easily. Flavour is an important sensory attribute which has a marked effect on the overall acceptability of the product. In fact, flavour of a product is the combined effect of many volatile components which become more pronounced on cooking.

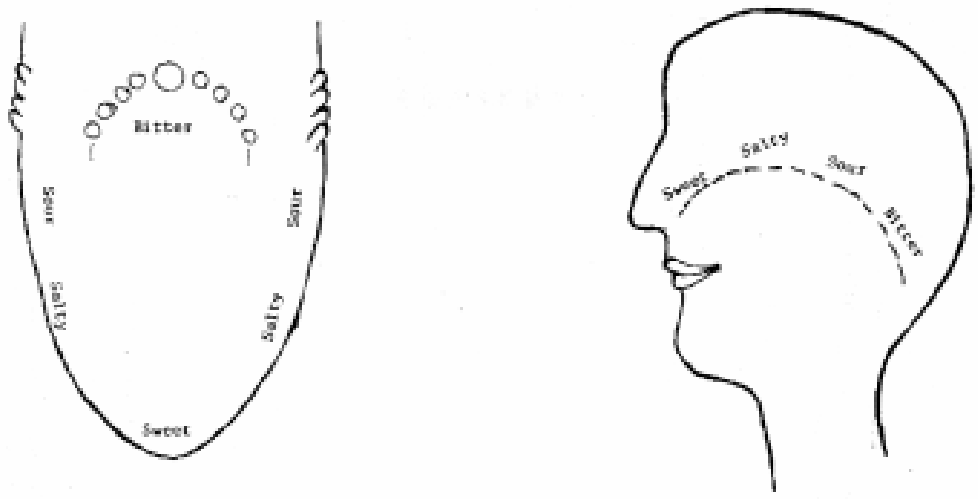

Fig. 6.1 : Sensation of different taste on the tongue and palate

6.6.2 Texture and Tenderness

Texture of a food reflects its physical nature and is perceived by the senses of touch, sight and sometimes hearing. The kinesthetic and tactile senses in the mouth give an idea of physical nature e.g., tenderness, density, granular structure, fragility etc. It is a complete attribute and encompasses so many different characteristics namely (i) mechanical reaction to a meat product to stress such as hardness, gumminess, chewiness, elasticity etc., (ii) geometrical orientation of fibres within meat e.g., coarseness, graininess, fibrosity etc. and (iii) compositional e.g., oiliness, greasiness, watery, dryness etc. As much as 96 texture description and material properties have been reported (Tilnger, 1979).

Meat texture is a function of the size of bundles of fibres into which the perimysial connective tissue divides the muscle longitudinally. The size of the bundle is determined by the number and size of muscle fibres. Texture and tenderness are influenced by many pre-slaughter factors like carcass grade, diet, age, sex etc. and post-slaughter factors like postmortem glycolysis, freezing, conditioning, cooking and processing of meat.

Tenderness decreases with the age of the animal and diameter of muscle fibres in its musculature. Cooking of meat makes connective tissue more tender by converting collagen to gelatin.

Sensory assessment of texture and tenderness in the mouth is done in three stages

(i) Ease of penetration of meat by teeth

(ii) Ease with which the meat breaks into fragments and

(iii) The amount of residue remaining after chewing.

The degree of tenderness may be evaluated as the number of chews required to masticate the sample. The number of chews required for a particular meat sample helps the judges to focus attention on tenderness. The standard size meat samples are generally chewed to the consistency at which meat is normally considered to be ready for swallowing.

An idea about the textural characteristics of meat may be obtained prior to mastication. The visual appearance of the sample may provide some idea about its firmness. When a sample of meat is manipulated in the hand by pressing, bending, squeezing, cutting or penetrating with a fork, it gives an idea about its firmness, toughness, fibrousness or crispness etc. The sound emitted when certain meat products are bitten and chewed gives a reflection of the texture of these products.

Now-a-days texture profile analysis is possible with instruments but the results are not always correlated with sensory results. Shear apparatus, compressometers, penetrometers, cutting devices, consistometers, viscosimeters etc. are the instruments in use for evaluation of textural component.

6.6.3 Appearance and Colour

Appearance is an important parameter which influences the consumer's inclination while buying the fresh as well as processed meats. It is basically the recognition and assessment of properties such as colour, surface structure etc. associated with the product. We all know that colour of an object is the perception of the spatial patterns of different wave lengths of light that emanate from that object. The shape of a meat product also plays an important role in judging the appearance. So, it is advisable to make uniform slices or cubes for the sensory evaluation.

The colour of fresh meat is due to the pigment – myoglobin and it is species specific. The colour of stored meat is due to the relative proportion of myoglobin, oxymyoglobin and metmyoglobin. Consumers relate the appearance characteristics of both raw and cooked meat to safety and healthfulness. Consumers also relate colour to determine doneness in cooked meat products.

The final colour of cooked meat is dependent upon the pigment changes brought about by temperature, time and method of cooking. When meat is cooked, there is gradual change of colour from dark red or pink to a lighter shade and finally at higher temperature to grey or brown colour. Pressure cooked or boiled meat will show gray colour whereas roasted and broiled meat turns brown. The brown colour of thoroughly cooked meat is due to denaturation of heme pigment and polymerization of some proteins and fats. It is advisable to have a colour match during the evaluation because it is difficult for humans to develop a colour memory.

Although colour and appearance are many times used as synonym, appearance is a wider term. The pH of meat influences its colour and appearance. Meat with high pH has better colour retention. However, pH alone can not predict the colour of meat.

Sometimes appearance of a product is judged excluding colour components. In such cases the product for evaluation is presented on sensory booth with red light on and thus masking any colour difference among samples.

6.6.4 Juiciness

Meat juiciness as a sensory parameter has two components. The first one is the impression of wetness during the initial chews as a result of rapid release of meat fluid and the second being the sustained juiciness due to the stimulatory effect of fat on salivation. Some specialists describe juiciness as the perceived amount of moisture released during mastication. Good quality meat is more juicy as compared to poor quality meat. This difference is attributed to some extent to the higher content of intramuscular fat in good quality meat. Meat proteins have a greater ability to bind water at a pH of about 6. So this pH is good from meat juiciness point of view. Juiciness is very much related to the tenderness of meat. Meat juices are quickly released in a tender meat during chewing. Interestingly, addition of 0.5% carageenan alongwith 10% water has been successfully used to decrease fat level without affecting the juiciness of meat products. Cooking temperature has a profound effect on juiciness of meat. Meat products cooked at lower temperature are more juicy than those cooked at higher temperature. Besides, meat products showing lower shrinkage have been shown to be comparatively more juicy.

Presence of salivary stimulant in product may not give a true picture of juiciness. Salivation due to environmental condition is already reported by Pavlov and therefore all these must be kept in mind while assessing the product for juiciness attribute.

6.7 OVERALL ACCEPTABILITY OF A MEAT PRODUCT

It is not an independent sensory attribute but it gives total sensory perception of a meat product. It is the overall acceptability of a product in absolute term which actually matters. You very well know that a product is not eaten attribute-wise, so the cumulative perception which a product leaves on the sensory panelist is evaluated as overall acceptability. However, it should not be taken as a sum average of all the attributes because some sensory attributes have more influence on the overall acceptability of the product as compared to others. Some meat scientists strongly rate texture and tenderness to be the most important eating quality attribute influencing the overall acceptability of a meat product, while others rate flavour to be comparatively more important. Actually it depends on the product nature that which parameter will influence overall acceptability most.

Without entering into this debate, it is emphasized that tenderness and flavour have a marked influence on the overall acceptability and these two attributes generally follow the same trend as overall acceptance.

6.8 CONDUCT OF SENSORY PANEL

The sensory panel leader must be knowledgeable enough about the basic principles of sensory evaluation, testing procedure, statistical design and interpretation of results. He should guide the panelists on the attributes. They should use utmost concentration and mark their opinion in the proforma. Panelists should be given only that information which is necessary for them to satisfactorily perform their task. Expectation error can occur if they are given more information. When the evaluation is in progress, they should be discouraged from discussing their judgement amongst themselves. Panelists should rinse their mouth with the neutral or dematerialized water before and after biting each sample. It helps to overcome taste fatigue or adaptation. Glass distilled water should not be used for rinsing the mouth as it may cause a cardboard like flavour. Similarly, to get rid of odour fatigue panelists use to interrupt odour tests and breathe fresh air. Recovery from odour fatigue is relatively difficult.

Panelists may be directed to fill up the sheets on the spot correctly as per instructions.

Check Your Progress

1) Answer in True or False:

a) A part of cooking area can be converted into a sensory evaluation section.

b) A specialized panel should not be given more than 4 samples for evaluation in one session.

c) Appearance of a product can also give some idea about its texture.

d) Some people use colour and appearance of a product as synonym but it is not proper.

e) Meat products cooked at high temperature are juicier.

f) Tenderness and flavour are the most important sensory attributes of a meat product.

g) Sometimes red light is thrown on the meat product samples to mask the influence of colour.

h) Texture of a food product is the reflection of its physical nature.

i) A hungry consumer is the best judge about the acceptability of a meat product in the market.

j) The bite, chew and swallow are three steps in the sensory evaluation of juiciness attributes.

k) Coloured glass filters or coloured bulbs are used to mask colour differences in samples.

l) The sample should touch only limited parts of the tongue in tasting.

m) Highly perfumed soap should be used to wash hands before participating in taste panel.

2) Fill in the blanks.

a) The relative humidity in the sensory evaluation laboratory should be around…….

b) Sensory evaluation laboratory is maintained at …….°C.

c) In India, meat products should be served for sensory evaluation at a temperature of nearly …….°C.

d) Flavour is a combined effect of …….. and …….

e) Appearance is broader term than …….

f) Consumers relate the colour of fresh meat with ……..

g) Complete information about the treatments given to a meat product during sensory evaluation can lead to ……

h) Texture of a food product is perceived by the senses of ……., …… and……

i) Consumer relate the colour of a cooked meat product to its ……..

j) The food preparation area for sensory analysis should be well …… and ……..

k) A liquid sample of ……ml is sufficient for taste.

3) Write the stages of sensory assessment of tenderness of any food in mouth.

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4) At what time the panelist should be provided with the sample for sensory evaluation?

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6.9 LET US SUM UP

Sensory evaluation becomes necessary during the process of development, alteration or imitation of a meat product. It should be conducted in a separate room or laboratory which is cool, calm and conducive to concentrate on sensory attributes without any disturbance. The test sample should represent the entire batch and it should be served lukewarm for better perception. The samples should not be more than four for specialized panel. Mouth rinsing before and after tasting each sample is very much required. Sensory evaluation should take place in the late forenoon or atleast one and a half hours after lunch. Some of the important sensory attributes or parameters of a meat product are texture, flavour, juiciness, appearance etc. Meat texture/tenderness and flavour have a profound influence on the overall acceptability of a product. Sensory panel leader conducts the evaluation and reminds the panelists about the characteristics of the proposed product and sensory attributes requiring more critical concentration. Sensory panelists record their observations on the proforma or test sheet there itself. The details of various sensory tests will be discussed in next unit and practical classes.

6.10 KEY WORDS

Flavour : It is the sensory impression of a food or other substance, and is determined mainly by the senses of taste and smell. It is sensed collectively by tongue and nose.

Juiciness : It is the sensory impression of wetness during the chews of a food.

Sensory parameters : The characteristics of any food which can be judged by any of our five senses (touch, sight, taste, smell, hearing). These characteristics are flavour, texture, tenderness, appearance, colour, juiciness, saltiness, mouth coating, crispness etc.

Texture : It generally refers to the properties held and sensations caused by the external surface of objects received through the sense of touch. In case of food, it refers to the way food feels in a person's mouth. Texture of a food may be hard, gummy, elastic, coarse, fibrous, oily, greasy, watery, dry etc.

6.11 SOME USEFUL BOOKS

Biswas, S. (2005). Meat and Egg Technology. 1st edition. University Publication, WBUAFS, Kolkata. West Bengal.

Jellinek, G. (1985). Sensory Evaluation of Foods : Theory and Practice. Ellis International Publishers Ltd., Chichester, England.

Lawrie, R.A. (1998). Lawrie's Meat Science, 6th edition. Woodhead Publishing Limited.

Price J.F. and Schweigert, B.S. (1971). The Science of Meat and Meat Products. 2nd Edition, W.H. Freeman and Company, SanFransisco.

Sharma, B.D. (1999). Meat and Meat Products Technology. 1st edition, JAYPEE Brothers, New Delhi.

6.12 ANSWERS TO CHECK YOUR PROGRESS

1) (a) False (b) True (c) True (d) True
(e) False (f) True (g) True (h) True
(i) False (j) False (k) True (l) False (m) False

2) (a) 70-75% (b) 22 (c) 40 (d) taste, odour
(e) colour (f) quality (g) expectation error
(h) touch, sight and hearing (i) doneness (j) ventilated and lighted
(k) 15.

3) Sensory assessment of tenderness of any food in the mouth is done in following three stages:

- Ease of penetration of meat by teeth
- Ease with which the meat breaks into fragments and
- The amount of residue remaining after chewing.

4) The panelist should be provided with the sample for sensory evaluation either in the late morning or late afternoon or atleast one and half hours after lunch. Because a hungry person tends to like any food and a person with full stomach tends to be indifferent even to the best preparation, so it is better not to provide the sample to the panelist just before or after the lunch time.