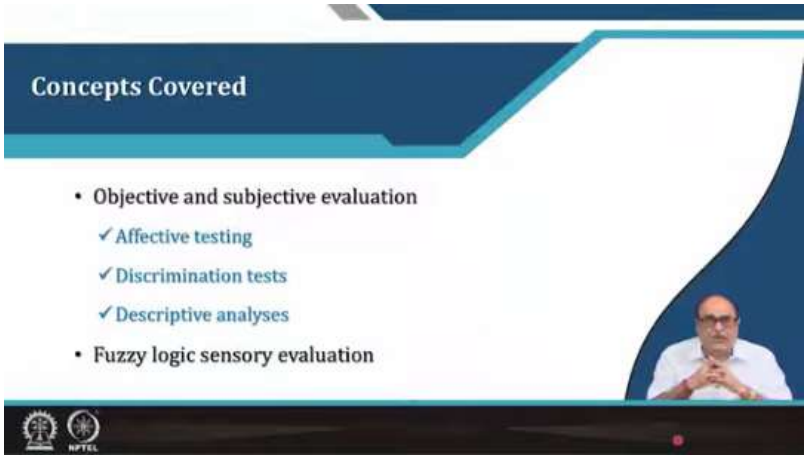
FOOD SCIENCE AND TECHNOLOGY

Lecture18

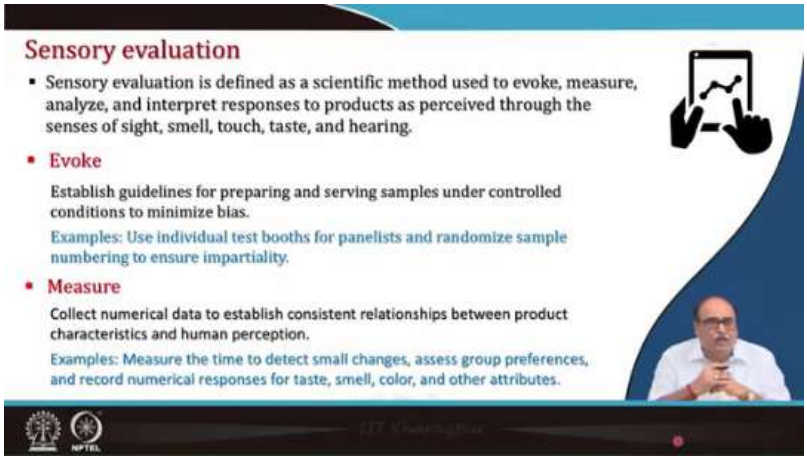
Lecture 18: Sensory Evaluation Methods

Hello everyone, Namaskar.

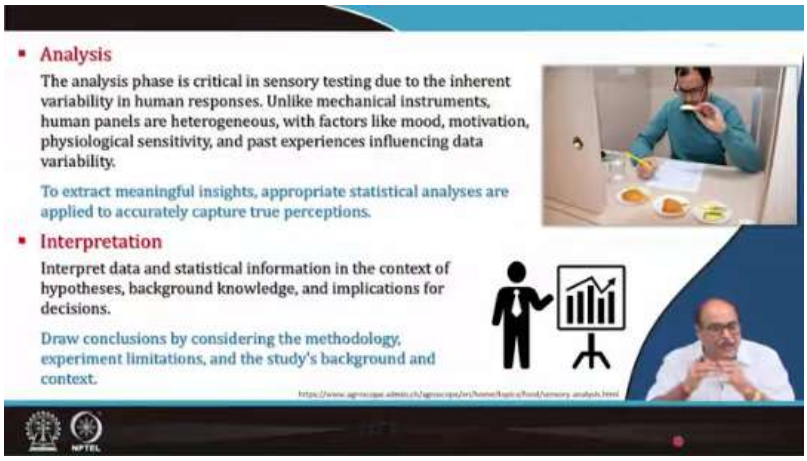
In this 18th lecture, now let us talk about sensory evaluation methods, which are very important aspects of any food industry. For the food before sending it to the market, even for our research purposes, etc., we evaluate the food, and sensory evaluation is considered to be the most important and valid evaluation.



So, we will talk about objective and subjective evaluation methods, that is, what is the effective testing, discrimination test, or descriptive analysis. We will also, towards the end, talk about fuzzy logic sensory evaluation.

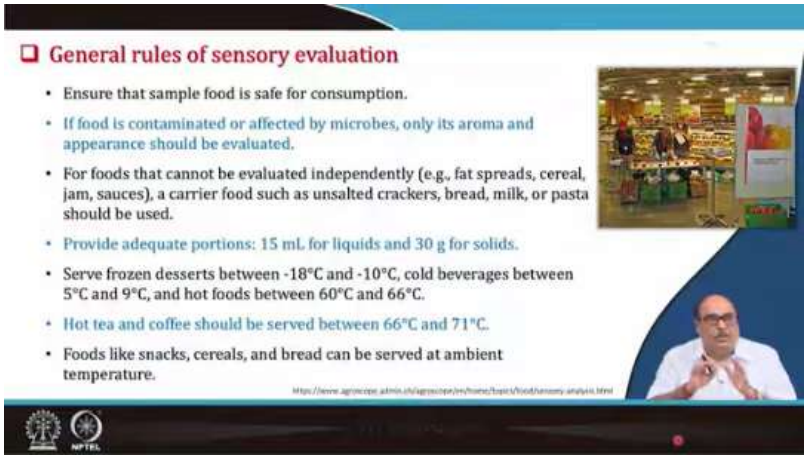


So, let us see sensory evaluation is defined as a scientific method used to evoke, measure, analyze, and interpret responses to the product as perceived through the senses of sight, smell, touch, taste, and hearing. So, these five organoleptic or sensory organs of the human are involved and are used in evaluating the food. So, evoke means establishing a guideline for preparing and serving samples under controlled conditions to minimize bias. For example, use individual test booths for panelists and randomize the sample numbering to ensure impartiality. Then comes the measure, which means collecting numerical data to establish a consistent relationship between product characteristics and human perception. Like measuring the time to detect small changes, accessing group preferences, and recording numerical responses for taste, smell, color, and other attributes.



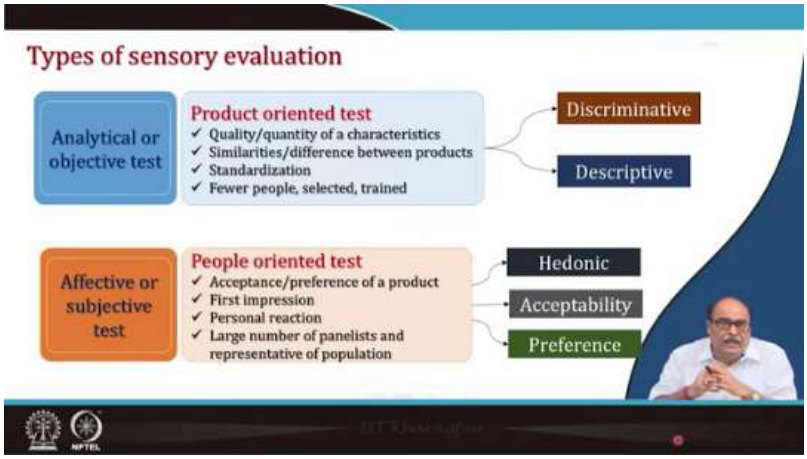
Then, whatever numerical responses or numerical data are obtained are analyzed in the analysis phase. That is, it is very critical in sensory testing because of the inherent variability in human responses. There are different humans; they might respond differently to the various tests that is, even smell, all those things, various attributes of the organoleptic, because it is the individual human response. So, unlike in mechanical

instruments, human panels are heterogeneous, with factors like mood, motivation, physiological sensitivity, and past experiences influencing data variability, etc. So, to extract meaningful insights, the appropriate statistical data, etc. They are analyzed, and various, maybe sometimes software, and there are statistical procedures, etc. They are applied to accurately capture the true perception, that is, to get the real thing out of that numerical data. Finally, another important aspect is the interpretation, that is, interpreting the data and statistical information in the context of the hypothesis, background knowledge, and implications for decisions. Draw conclusions by considering the methodology, experimental limitations, and the study's background and context.

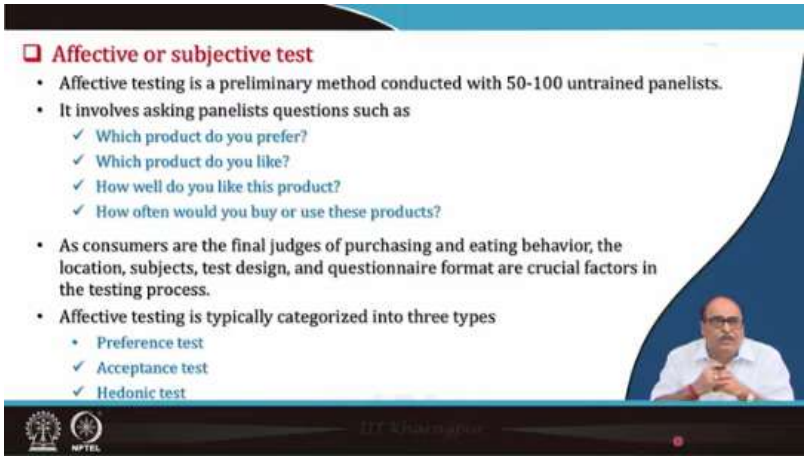


So, there are general rules, certain rules for sensory evaluation, and that should be used and applied in order to get good data and a good response. For example, ensure that the sample food is safe for consumption. Because you are giving it directly for human consumption, it should be safe. Also, if the food is contaminated or affected by microbes, only its aroma and appearance should be evaluated, not its taste. Definitely not; the taste should not be used for these foods. For foods that cannot be evaluated independently, like, for example, fat spread, cereals, jam, sauces, etc., like the foods which are eaten with certain adjuncts together, like chapati, it is always eaten with curry or vegetables. So all these things that are carrier foods, such as unsalted crackers, bread, milk, or pasta, etc. These should be evaluated in the actual condition in which they are normally eaten. Then adequate portions, like a sufficient quantity of the sample, should be provided like a minimum of 15 mL for liquids and about 30 grams for solid foods and the food should be served to the panellist. In the actual condition in which it is to be consumed, or likely to be consumed, like, for example, frozen desserts, they should be served at a temperature between minus 18 degrees to minus 10 degrees Celsius. Cold beverages should be served at around 5 to 9 degrees Celsius and hot foods and beverages should be served at about 60 or 66 degrees Celsius,

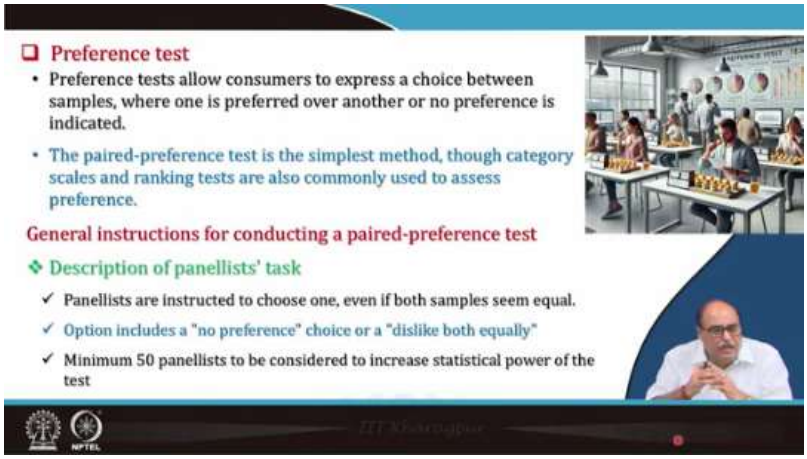
like chapati, etc. If you are taking hot. So, this should be served at this temperature. Similarly, hot tea and coffee should be served between 66 to 71 degrees Celsius. So foods like snacks, cereals, breads, etc., can be served at ambient temperature. So that is very important that it should be served under those conditions in which it is liked by the consumer at least to be used by the persons.



Then there are two types of sensory evaluation. One is the analytical or objective evaluation. The other is the affective or subjective evaluation. So, analytical or objective evaluation here are the product-oriented tests. They may be discriminative or descriptive and normally the quantity or quality of characteristics, similarities or differences between products. These are like standardization of the products used in these tests, and here, normally fewer people are used; that is, normally, a trained panel of judges is used to evaluate or to find these types of tests, to conduct these types of tests, etc. Whereas effective or subjective tests are people-oriented tests. It may be hedonic scale testing; it may be an acceptability test or a preference test. Normally, here, the acceptance or preference of the product is our first impression, a personal reaction. Generally, these types of tests require a large number of panellists and representatives of the population, like the consumer analysis test, etc., which is done this way.

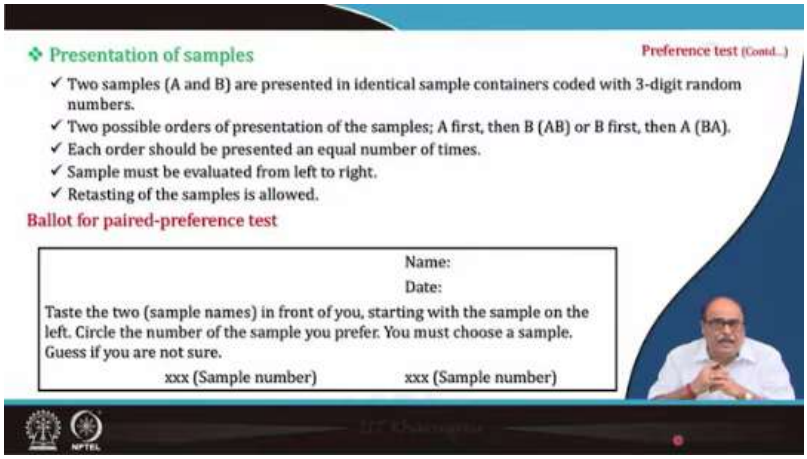


Then let us talk about one by one briefly about all these types of tests. first is the effective or subjective test. This test is a preliminary method conducted with 50 to 100 untrained panellists. It involves asking panellists questions such as, which product do you prefer? Which product do you like? How will you do if you like this product? How often would you like to buy or use these products, etc., etc. As consumers are the final judges of purchasing and eating behaviour, the location, subjects, test designs, questionnaire, etc., format is crucial in the testing process. Effective testing is typically categorized into Three types like preference test, acceptance test, or hedonic test.

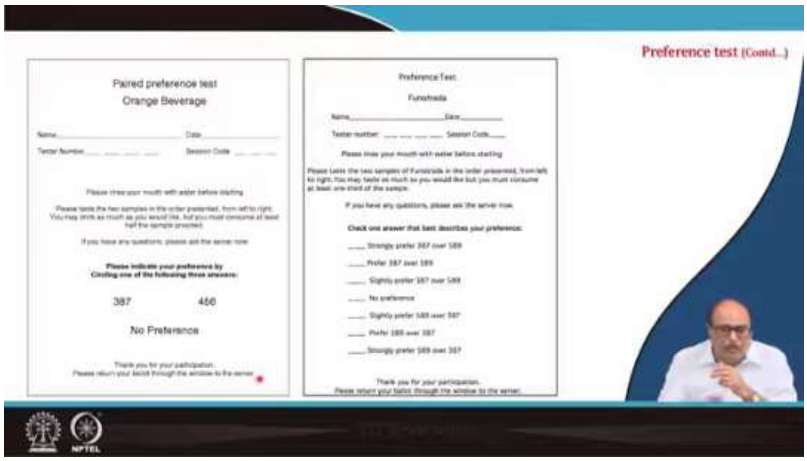


Preference test allows consumers to express a choice between samples where one is preferred over another or no preference is indicated. The paired preference test is the simplest method, though category scales and ranking tests are also commonly used to assess preferences. So, general instructions for conducting a paired preference test are number one, that is the description of panelist tasks. These panelists are suitably instructed to choose one even if both the samples are equal, unequal, or options include like they have to give no preference choice or dislike both equally, etc. and a minimum of 50 panelists

are to be considered to increase the statistical power of the test to have a good observation result.

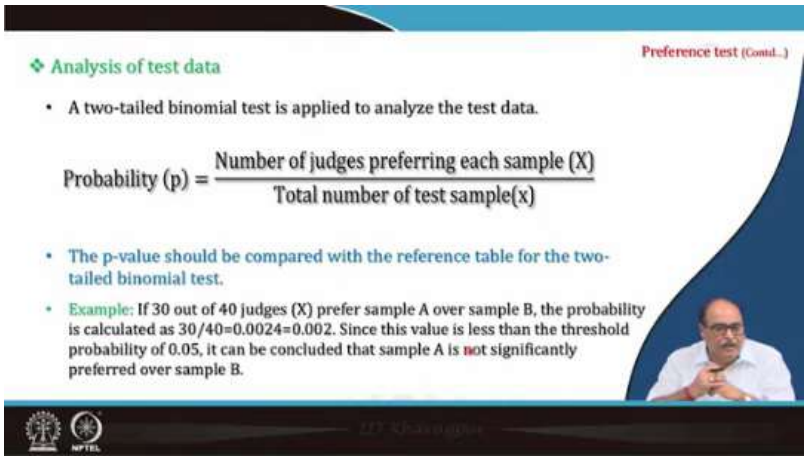


Then presentation of the sample. Like for example, there are two samples A and B. They are presented in identical sample containers which should be coded with three-digit random numbers. Two possible orders of presentation of the sample may be A first, then B like A B or B first, then A like B A, and so on. Each order should be presented an equal number of times. Samples must be evaluated from left to right, and repeating the retesting of the sample is allowed to keep the evaluator assured of the results. So, this is a sample ballot. For this type of descriptive test, like the name of the product or the date, the test two samples in front of you in that data record sheet, the ballot, you have to give the information like the two samples are in front of you, starting with the sample on the left, circle the number in which it is prepared, and you choose a sample, guess if you are not sure, etc.



For this, information is printed there, and then the number of the samples, etc. There, sample A, sample B, like this. They are three-digit number samples. Also, there are

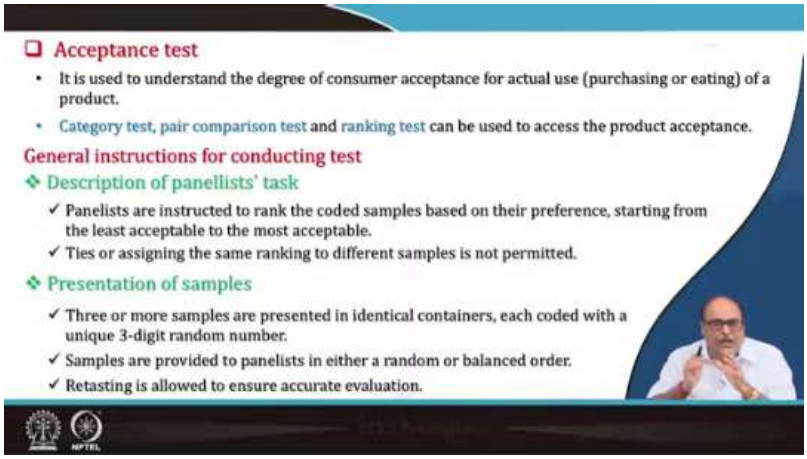
sometimes these samples you give, and you ask them the sample number, like here 3, 8, 7, 4, 5, 6, and no preference. So, they have to tick, they write their name, etc. Similarly, there are other types of things like strongly prefer this, prefer 387 over 589, no preference, slightly prefer, prefer 589 over 387, or strongly prefer 589 over 387. That you can give various choices that are called preference tests or paired preference tests. So, accordingly, you have to, for all these types of tests, it is again very important that you prepare a suitable ballot or suitable record sheet where these panelists give their opinions.



Then, after you have got these numbers, you analyze the data like a two-tailed binomial test is applied to analyze the data where $probability\ (p) = \frac{Number\ of\ judges\ preferring\ each\ sample(X)}{the\ total\ number\ of\ test\ samples\ (x)}$,

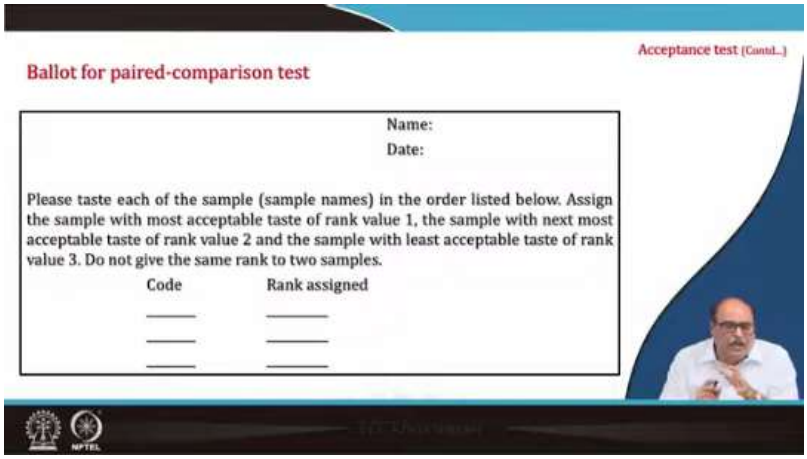
the p-value should be compared with the reference table for the two-tailed binomial T testing. These statistical tables are available in the literature, in any statistical book you will find. For example, you can take, suppose 30 out of 40 judges prefer sample A over sample B; the probability is calculated as 30 by 40, which means 0.0024, like 0.002, you can say in 3 digits. Since this value is less than the threshold probability of 0.05 like we say that p is equal to less than 0.05, 5 per cent probability, then it can be concluded that sample A is not significantly preferred over sample B; that is, both samples have no significant difference.

This is the Table T test. The table is available in early literature, and this becomes important. By this, it is this side is the confidence level 0 per cent, 50 per cent to 99.9 per cent. There is a cumulative proof 112. Trials that is degree of freedom is given and then t 0.5, t 0.75, t. So, all these things are the t value tabulated value. So, you have to compare your calculated value with the tabulated value.



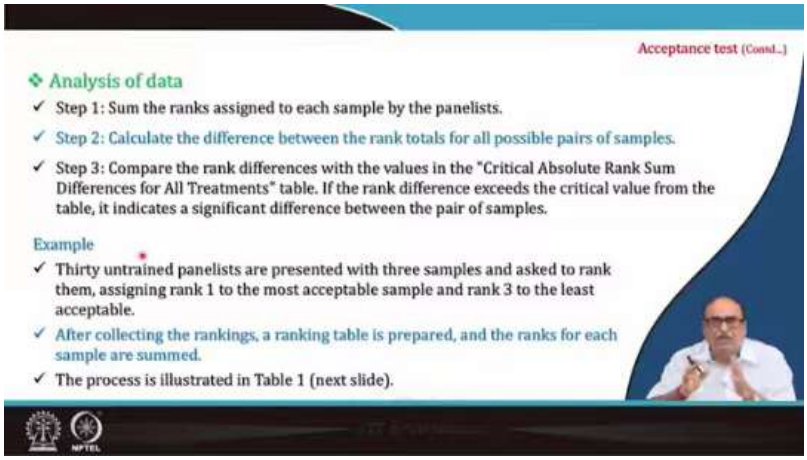
Then comes the acceptance test. It is used to understand the degree of consumer acceptance for actual use. Like purchasing or eating, like consumer acceptability test normally we do of a product. This category test, pair comparison test, and ranking test can be used to assess product acceptance. So, here, general instructions for conducting this type of test include a description of panellist tasks like panellists are instructed to rank the coded sample. Based on their preference, starting from the least acceptable to the most acceptable, ties are assigned. The same ranking to different samples is normally not permitted here. They have to give just a number or two in the sample in order of their preference. It may be 1 to 10 or other things 10 to 100 whatever they decide. Then the presentation of sample that is the 3 or more samples are presented in identical containers. It is coded with a 3-digit random

number, and samples are provided to panellists in either a random or balanced order and retesting here is allowed to ensure accurate evaluation.

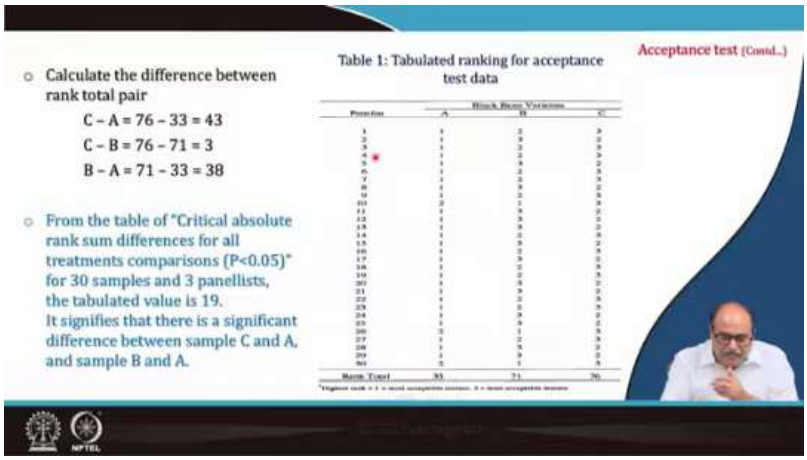


Again, a ballot for paired comparison test like code number there assigned, you can give. Please test each sample. So, you write the general instructions which we discussed earlier in the alert. So, the panelist should be advised to read all these instructions before testing the samples.

Here again, a ballot for paired comparison tests like assessor name and number. You are provided with two strawberry flavors. Please assess each product. Please indicate which sample has the most strawberry flavor and all those things, and then you can go.

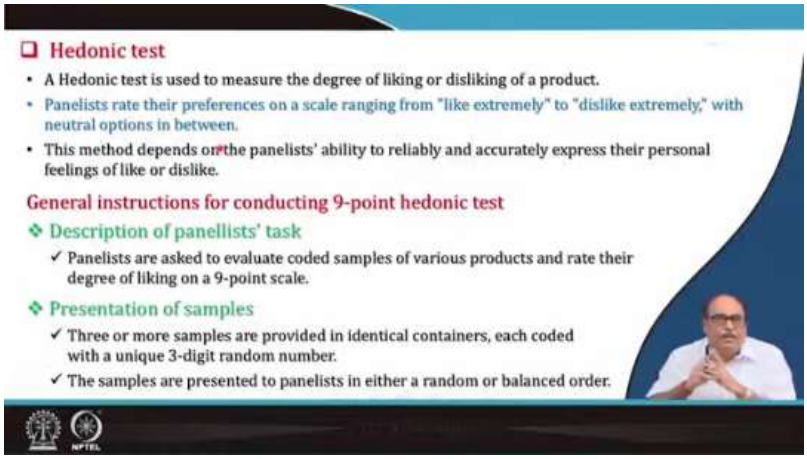


Then, after that, you analyze the data that in the data analysis first sum of the rank assigned to each sample by the panellist, then calculate the different sample rank totals for all possible pairs of samples. Then compare the rank differences in the values in the critical absolute rank sum difference for all treatments table. There is a standard table provided for this purpose, and the rank difference exceeds the critical value from the table. It indicates a significant difference within the pair of these samples.

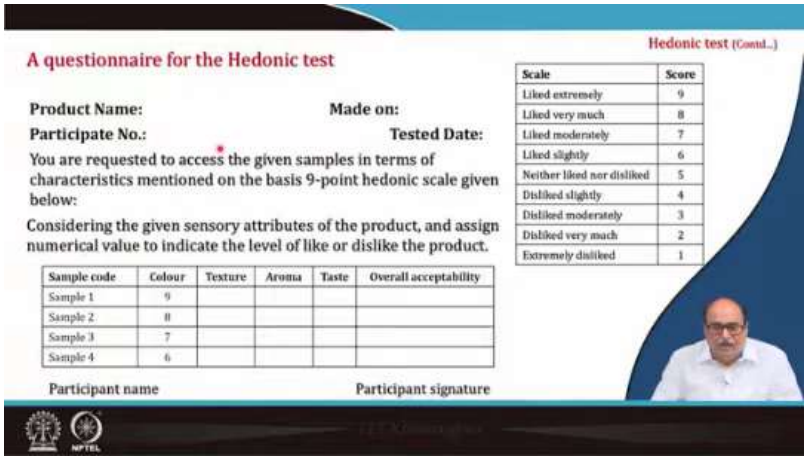


For example, let us say that 30 untrained panellists or consumers are presented with three samples, and are asked to rank them, assigning rank one to the most acceptable sample and rank three to the least acceptable sample. So, after collecting the rankings, a ranking table is prepared, and the ranks of each sample are summed up, as you see here in this table it is shown. There are 30 panelists and there are 3 samples A, B, C. So, some panelists, that is, they give rank 1, rank 2, and rank 3, like some panelists 1 gave rank 1 to A, 2 to B and 3 to C, whereas the 20th panelist gave rank 1 to A, rank 3 to B and rank 2 to C like that. So, what is done? Calculate the difference between their total ranks. You total the ranks for all 30 participants. There is a 33 for A, 71 for B, and let us say 76 for C sample, and the highest

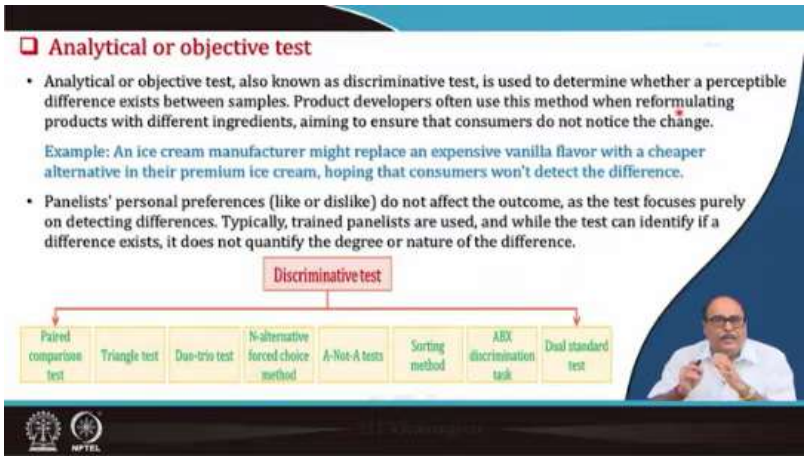
rank is 1, the most acceptable, and 3 the least acceptable. So, in this case, you would find the difference like $C - A = 43, C - B = 76 - 71 = 3$ *and* $B - A = 38$. So, now you compare these data. 43, 3, or 38 from the table of critical absolute rank sum difference for all treatment comparisons at the p less than 0.05. That is a 5 per cent probability for 30 samples and 3 panellists. 30 samples and 3 panelists. And this value in the table is 19. So now you can see that the C minus A, which is 43, is more than 19. Also, 38, B and A is more than 38. So, these two samples are significantly different. Whereas in samples B and C, this value is less. So, these are not significantly different. There is no significant difference between C and B. But C and A, and A and B are significantly different.



Then comes hedonic testing. A hedonic test is used to measure the degree of liking or disliking of a product. Here, panellists are asked to rate their preferences on a scale ranging from like extremely to dislike extremely, with neutral options in between. It is normally 1 to 9, where 9 is like stimuli, 1 is dislike stimuli, and there may be 5, which is neither like nor dislike, and in between 6, 7, 8, and 9. So, 5 is neither like nor dislike; above that is like, more like, very much like, like stimuli, and so on. So, the general instruction for conducting a 9-point hedonic test is the description of the panelist task. Panellists are asked to evaluate coded samples of various products and rate their degree of liking on a 9-point hedonic scale. Then comes the presentation of samples to the panellists. That is, three or more samples are provided in identical containers. Each is coded with a three-digit random number but identical so that the panellists cannot guess the product, and the samples are presented to panellists in either random or balanced order.

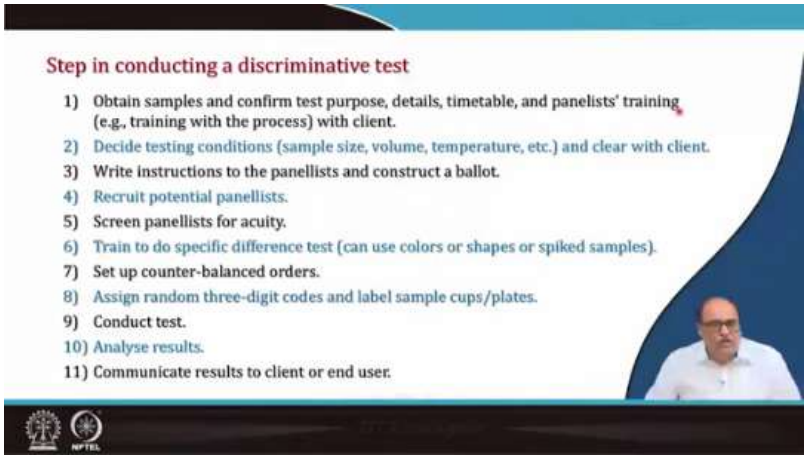


The questionnaire here, you can say, includes the product name, participant name, the sample made on or the tested date, etc. and you just give your instructions to the panelist that you are requested to assess the given sample on a 9-point hedonic scale and consider the given sensory data of the product. Assign numerical values, and the numerical values, like for example, there are 4 samples: sample 1, 2, 3, 4. Like one can give 9, and another can give 8, 6, or So, this is the hedonic scale from 1 to 9, as I told you. 5 is neither like nor dislike, 4 is dislike slightly, moderately dislike 3, dislike very much 2, and extremely dislike 1. If you go above 5, 6 is like slightly, like moderately 7, like very much 8, and like extremely. So, in this manner, again, you get the number of this, and then we take the average of the panelists and analyze the data.



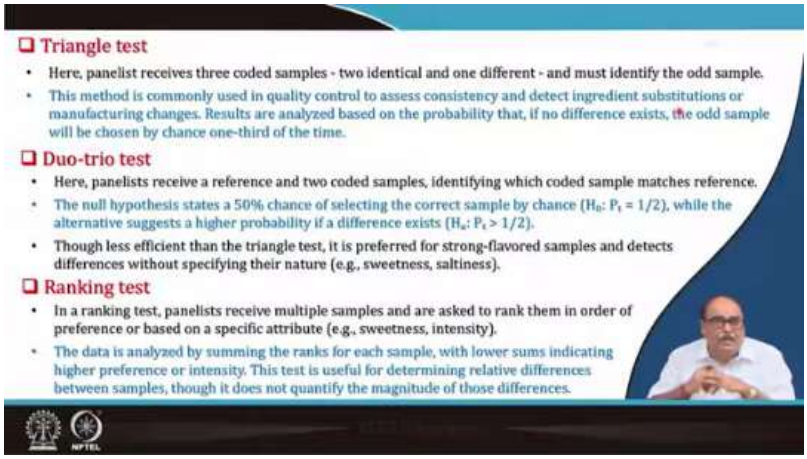
Then analytical or objective testing. These analytical or objective tests, also known as discriminative tests, are used to determine whether a perceptible difference exists between samples or not. Product development developers often use this method when pre-formulating products with different ingredients, aiming to ensure that consumers do not notice the change. For example, an ice cream manufacturer might replace an expensive

vanilla flavor with a cheaper alternative in their premium ice cream. Hoping that consumers won't be able to detect the difference. So, here the analytical or objective test is then the descriptive test, which is then for panelists. Personal preferences, like or dislike, do not affect the outcome. The test focuses purely on detecting the differences. Typically, trained panellists are used here. And while the test can identify if a difference exists, it does not quantify the degree or nature of the difference. This is called a discriminative test. Maybe here, pair comparison test, triangle test, duo-trio test, then alternative forced choices, A not A test, sorting methods, ABX discriminative test, dual standard test, and different types of discriminative tests are there. And in all these tests, almost always there is a difference in the Ballot papers, etcetera, which are provided to panellists, are normally given similar instructions and here also they record the data sometimes by just ticking, sometimes by circling, sometimes by giving some numbers, etcetera and then this data is analyzed statistically and observations are drawn.



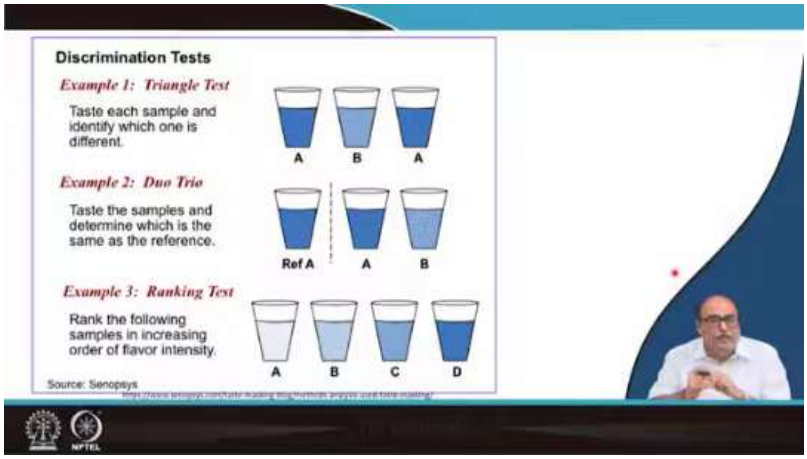
So, steps in conducting a discriminative test often include obtaining the sample and confirming the test purpose, details, timetable, and panelist training, like we have put training with the purpose with the client, like the With whom you are giving that, they should be in a position to really clearly understand the taste of that particular product Like, suppose you are giving any fermented food, idli, or chapati, so the person should be used to eating that type of food so that they understand that yes, what a good chapati means, what good idli means Then decide testing conditions like sample size, volume, temperature, etc., and clear with client and tell them all these things, details about the clients Write instructions to the panelists and construct a suitable ballot paper, like the data record sheet Recruit potential panelists, then screen the panellists for accuracy and Even sometimes these panellists are properly trained, that is They should be given that product for some time to eat that so that they have a suitable, good appreciation about the real organoleptic

characteristics of that particular product that is trained to do a specific difference test. You can also use color or shapes or spike samples, etc. Then set up the counters for balanced order. Normally, separate boxes are given to all the panelists. Assign random three-digit codes and label the sample cups and pellets, then conduct the test. And even there, the panellists should be advised there should be either a salt solution or something before each test. Different samples, particularly before testing, should rinse their mouth with water or with some other salt solution, etcetera. So, that they regain the original taste. So, after testing, conduct the test, then analyze the result and then communicate the results to the client or the end user.

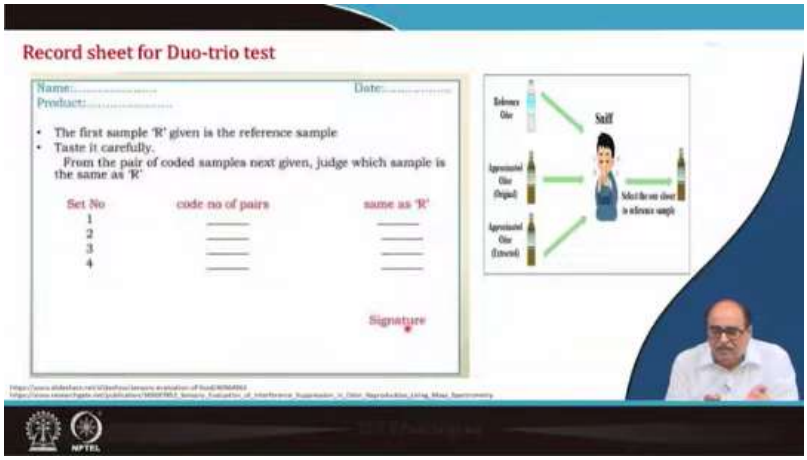


So, here there are triangle tests, duo-trio tests, or ranking tests. In the triangle test, panelists receive three coded samples, two identical and one sample will be different, and one must identify the odd sample. This is one triangle test. This method is commonly used in quality control to assess consistency and detect ingredients or substitutions or manufacturing changes, etcetera. and the results are analyzed based on the probability that if no difference exists, the odd sample will be chosen by chance, that is, one-third of the time. So, that is here. It gives that if there are two samples, two identical ones. So, you can find out that just to see that yes, in the different in the factory, there are different sessions, etc. So, you see that the different lots which are manufactured are identical or not. So, similarly, the duo-trio test. Here, panellists receive a preference for the two coded samples identified with coded samples matching references. The null hypothesis here states that there is a 50% chance of selecting the correct sample by chance, that is, the null hypothesis Pt is equal to 1 by 2, while the alternative suggests a higher probability if a difference exists, like Ha, Pt is equal to more than 1 by 2. So, though less efficient than the triangle test, it is preferred for strong flavor samples and detects the differences without specifying their nature, whether it is salt, sweet, or sour, but if there are two samples, it will not be able to say that

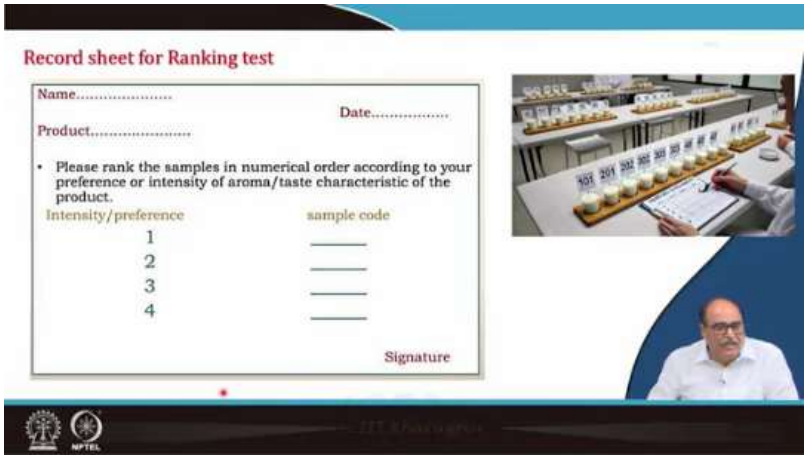
this sample is sweet, this sample is sour, but obviously, it will say that these two samples are different. Then, in the ranking test panelists receive multiple samples and are asked to rank them. In order of preference or based on specific attributes like sweetness, intensity, etc. The data is analyzed by summing the ranks of each sample, with lower sums indicating higher preference or added intensity. This test is used for detecting relative differences between samples, though it does not quantify the magnitude of those differences.



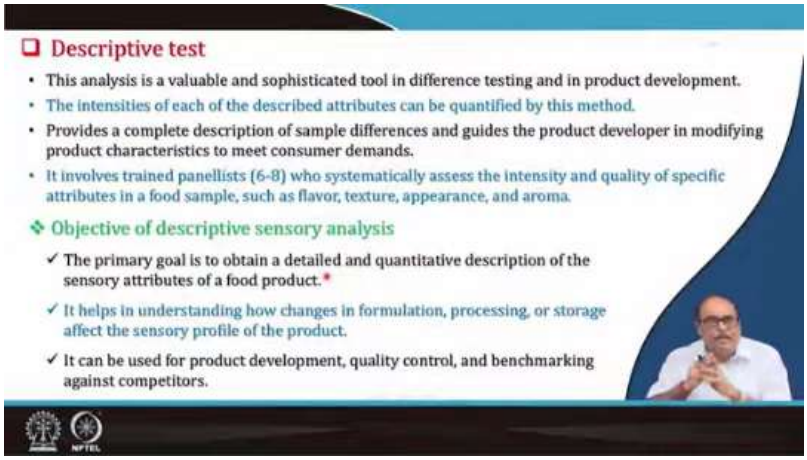
These are the discrimination test examples. One is the triangle test, which tests each sample to identify which one is different. Simply, the duo-trio test is where the reference is given A, and then A and B, that is in a there is T cell and determine which one is the same as that here in the duo-trio test. You are given one sample there and then two other different samples. These samples are to be analyzed in comparison, that is taking a standard as a reference sample whether it is similar to the reference sample or different from the reference sample. Then, the ranking test here ranks the following samples in increasing order of flavor intensity of A, B, C, D that is your flavor intensity, color intensity, taste, etcetera, and the increasing order or decreasing order as you can, this is called the ranking test. Triangle test, duo-trio test or ranking test, and obviously, a record sheet for all these things is there.



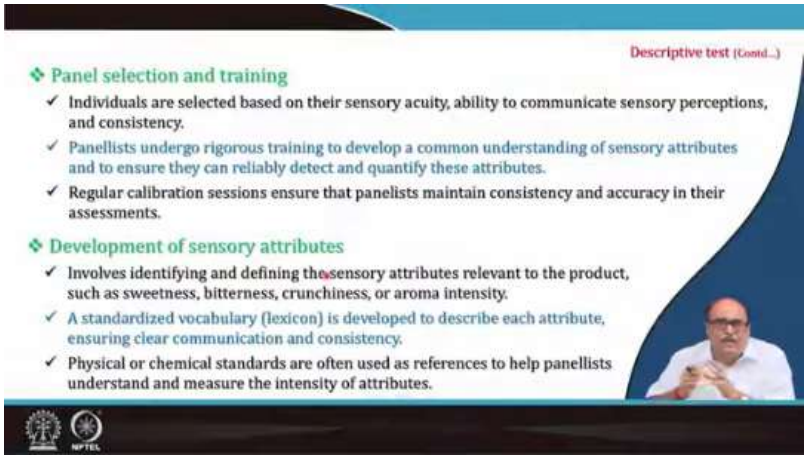
That, like the sample, is given to the reference sample tested carefully, and the code number of pairs is the same as are like that you can give a record sheet, and judges evaluate and give their readings on this test and then this is finally, similarly, this is the record sheet for the triangle test where you give the code and check the odd sample out of this, which put the tick through a difference between the multiple duplicate samples and the odd samples. Then the acceptability, like the odd sample, is more acceptable, and duplicates are more acceptable, like this and if they write any comments, etc. So, in this way, data is collected, and that data is finally analyzed.



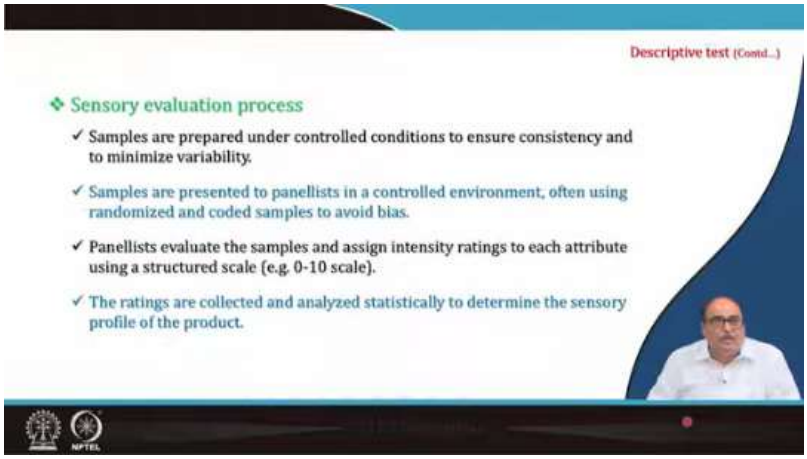
This is the record sheet for the ranking test. That is, here there are 4 samples, and you have to give a code; the sample code is there, and then they have to write or this, you give 1, 2, 3, 4, and they have to write the sample code here, which one they rank first, which one they rank second or last, like that, in this way, you can get it done.



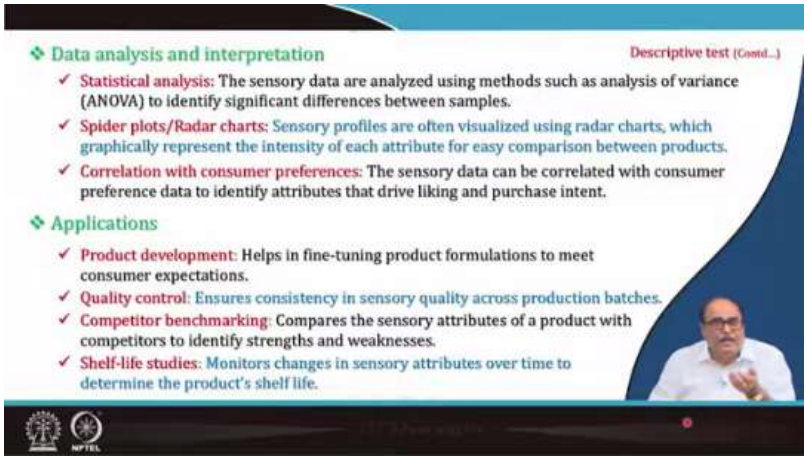
Then the descriptive test, this analysis is a variable and sophisticated tool in difference testing in product development. The intensities of each of the described attributes can be quantified by this method. It provides a complete description of the sample differences. and guides the product developer in modifying product characteristics to meet consumer demands. It involves trained panellists, again a small number of panellists like 6 to 8, maximum of 10 panellists, who systematically assess the intensity and quality of specific attributes in a food sample, such as flavour, colour, etc. These are mostly used in research laboratories where we are conducting research evaluation methods to get a clear-cut idea about this product. So, there will be objectives of descriptive sensory analysis like that. What is the objective of this descriptive sensory analysis? The primary goal is to obtain a detailed and quantitative description of the sensory attributes of the product. It helps in understanding how changes in formulation, processing, or storage affect the sensory profile of the product, and it can be used for product development, quality control, benchmarking against competitors, etc., and it is normally done in the R&D units of the industry or research laboratories.



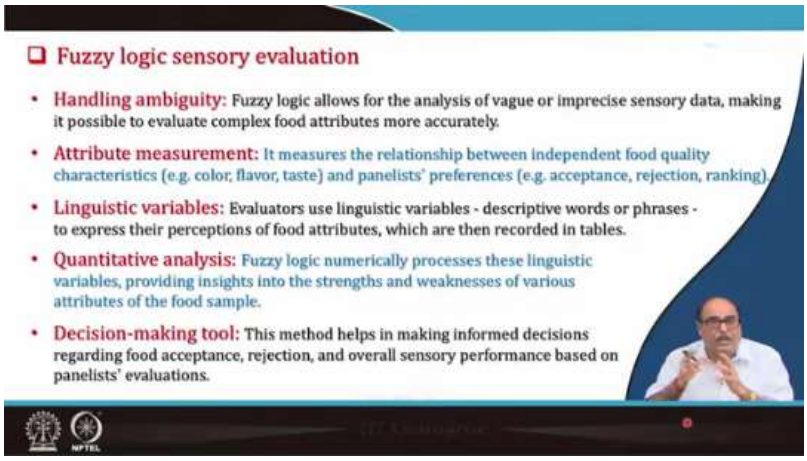
Then panel selection and training, like individuals, are selected based on their sensory acuity. That is the acuteness, acumen, or ability to communicate sensory perceptions and consistency. Panelists undergo rigorous training to develop a common understanding of the sensory attributes and to ensure that they really detect and quantify these attributes. Their regular calibration sessions ensure the panellists maintain consistency and accuracy in their assessments. Highly trained panellists are used to evaluate this in industries like In the tea industry and all those industries; you see that there are highly trained persons who evaluate the different samples in the flavour industry or other industries. So, the development of sensory attributes involves identifying and defining the sensory attributes relevant to the product. Such as sweetness, bitterness, crunchiness, and aroma intensity and a standardized vocabulary is developed to describe each attribute ensuring clear communication and consistency. Physical or chemical standards are often used as a reference to help panelists understand and measure the intensity of attributes.



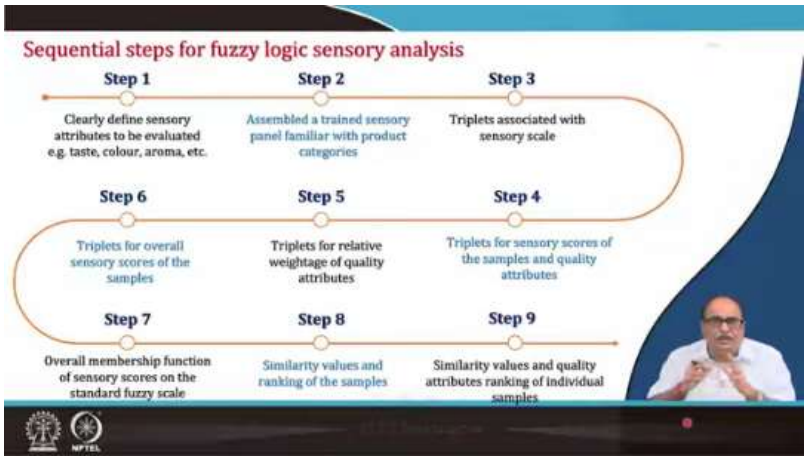
Then, in this evaluation, samples are prepared under controlled conditions to ensure consistency to minimize variability. Samples are presented to the panelists in a controlled environment often using randomized and coded samples to avoid bias. Panelists evaluate the samples and assign intensity. Ranking of each attribute using a structured score may be on a 0 to 10 scale, and the rankings are then collected. They are analyzed statistically to determine the sensory profile of the products.



Then, data analysis and interpretation involve statistical analysis. Sensory data are analyzed using methods such as analysis of variance. Now, analysis is very popular. It is used to identify whether there are significant differences between the samples or not. Sometimes, we prepare spider plots or radar charts, etc. Sensory profiles are often visualized. These charts are used. Radar charts graphically represent the intensity of each attribute for easy comparison between products. Correlation with consumer preferences is also evaluated. Sensory data can be correlated with consumer preference data to identify attributes that drive liking and purchase intent. So, this type of test is used by the industry in product development, which helps in fine-tuning product formulations to meet consumer demands or in quality control, which ensures consistency in sensory quality across production. Then, even competitor benchmarking is used to compare the sensory attributes of a product with the competitors. To identify strengths and weaknesses, and it is also used to evaluate the shelf life. In the case of the product or in shelf life, we study to monitor the changes. Sensory attributes over time determine the product quality and all those things.



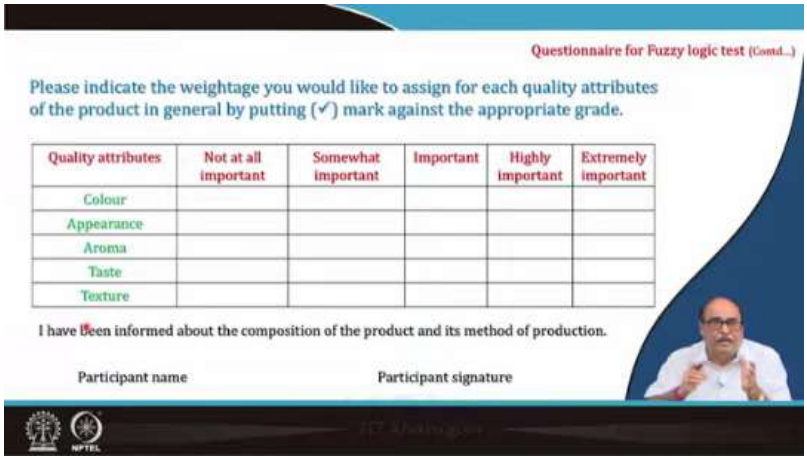
Then, finally, now let us also talk about sensory fuzzy logic sensory evaluation and here also, there are things like what happens then, as you discussed earlier. When you give this sample to the human, there may be some variations in the human subjects, there may be. That is, sometimes you may get some ambiguous results or bias, etc. And that is obvious; you cannot undo it. So, these things are now overall, that is, the fuzzy logic allows for the analysis of vague or imprecise sensory data, making it possible to evaluate complex food attributes more accurately. So, ambiguity or vagueness in the data generated by human means. They can be removed or addressed by using fuzzy logic evaluation. Also, it helps in attribute measurement, like it measures the relationship. Between the independent food quality characteristics and panellists' preferences. Evaluators generally use linguistic variables like descriptive words or phrases to express their perceptions of food attributes, which are often recorded in tables. Fuzzy logic numerically processes these linguistic variables, which are provided to assess the strengths and weaknesses of the various attributes of the food samples. Finally, there is a decision-making tool that helps in making informed decisions regarding the food acceptance, ranking of the food sample, their rejection, their overall sensory information, and based on the panelist evaluation one can determine in which product the flavor is most important or the color is most important on what basis the product is accepted. So, all these things allow one to rank the product one above the other.



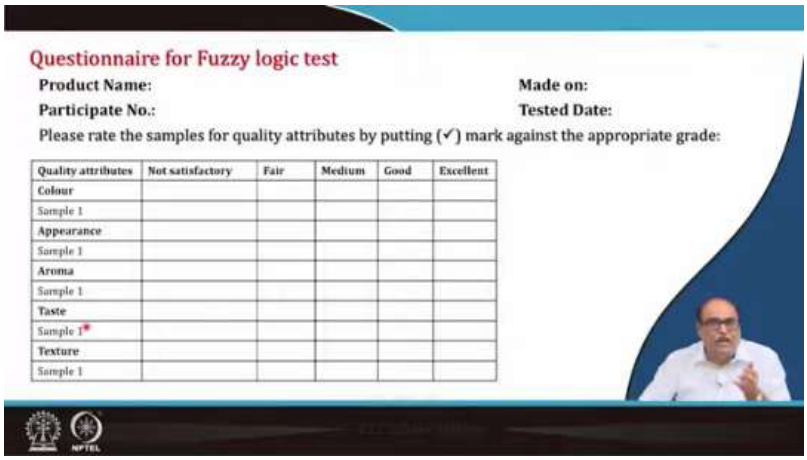
So, these are the sequential steps in the fuzzy logic sensory analysis, like number 1. That clearly defines the sensory attributes to be evaluated, like taste, color, aroma, etcetera. And then, assemble a trained sensory panel familiar with the product categories, which is again important. The first thing is that you have the product sample prepared and the characteristics and attributes you want to evaluate, and then there should be a trained panel of judges. After that, you form different triplets; that is, in the third step, triplets associated

with the sensory scales are formed. Then, triplets are used for sensory scores of the samples and quality attributes, and triplets are used for relative weightage. Of the quality attributes, these are the various details you can go into of the sensory analysis data, etc. You will understand more deeply into that, then there are triplets for overall sensory scores of the samples. In step 7, the overall membership function, you evaluate these triplets to find out what is the overall membership function of the sensory scores on the standard fuzzy logic scale or fuzzy scale. Then, find out the similarity values and quality attributes at step 8 and finally ranking of the sample based on similarity values and quality attributes at step 9 and you will find out which of the sample is better.

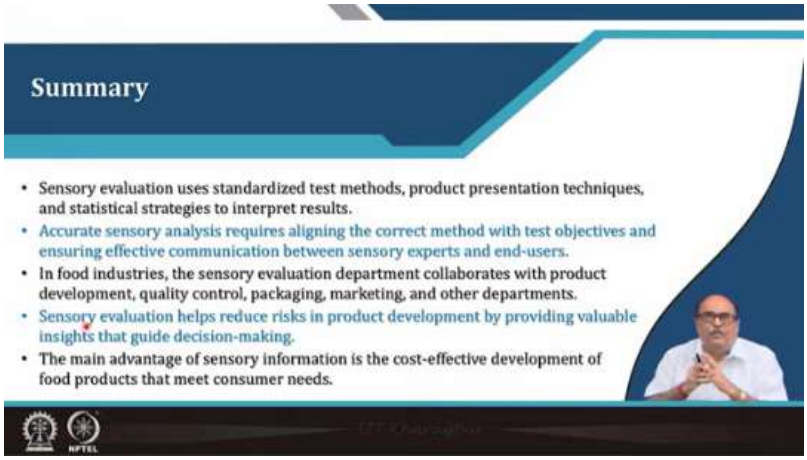
Like here, the ballot questionnaire for the fuzzy logic test, like you can give here. Please rate the samples for quality attributes by putting a mark against the sample. Like there are colour, appearance, aroma, taste, texture, and there are different samples. Sample 1, sample 2, sample 3. So, they have to give their like, not satisfactory, fair, medium, good, excellent, etc. They are telling their sample 1, its color is fair, aroma is excellent, but it is not excellent. So, once this data is generated, then on the basis of this data, various triplets are analyzed, and various triplets are made.



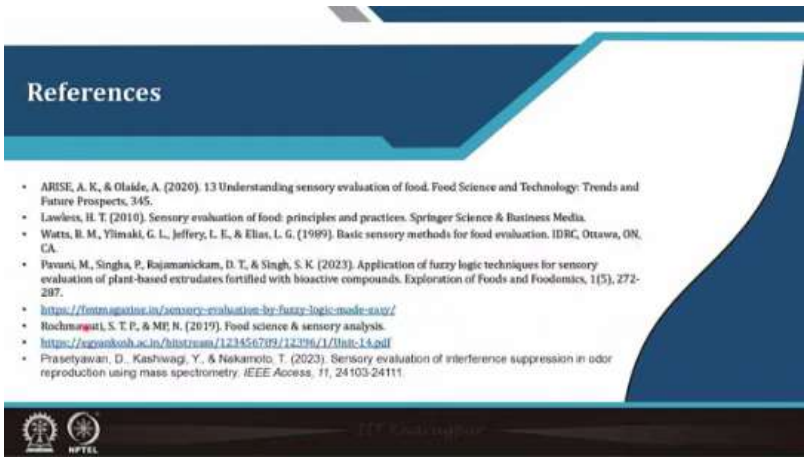
Then, there is another way, which is to please indicate the weightage you would like to assign for each quality attribute of the product in general by putting a tick mark against the appropriate like color, aroma, flavor, etc. Not at all important, somewhat important, important, highly important, or extremely important, etc. I have been informed about the composition of the product and its methods of production, etc. So, the participant's name and signature.



So, these two sets of data are generated by the panellists, and on the basis of this data, we go and have these various triplets formed, use the necessary calculations, etc. various triplets, and then find out what the similarity values are, what the membership function is, etc. On the basis of that, finally, the results are recorded.



So, now I would like to summarize this finally, that this lecture that sensory evaluation uses standardized test methods and product presentation techniques and statistical strategies to interpret results. So, accurate sensory analysis requires selecting the correct method with test objectives and ensuring effective communication between the sensory experts and end users. In the food industry, the sensory evaluation department collaborates with the product development, quality control, packaging, and marketing and other departments properly and sensory evaluation helps reduce risk in product development by providing valuable insights that guide decision making. The main advantage of sensory information is the cost-effective development of food products that meet consumer needs.



These are the references used in this lecture.

Thank you very much for your patience here. Thank you.