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Sensory analysis helps make good cheese matches

By Rena Archwamety

MADISON, Wis. — In between the process of making cheese and selling the finished product, sensory analysis is a helpful research and development tool that can fine tune the cheese to best match its end use.

Sensory analysis covers a broad range of attributes, from simple observations of

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how a cheese looks and tastes compared to other products to detailed descriptions of how it melts on a pizza or breaks down in the mouth.

The Wisconsin Center for Dairy Research (CDR) at the University of Wisconsin-Madison helps cheesemakers and food companies by creating descriptions and analyzing various profiles of cheeses, beverages, ice cream and finished foods with dairy ingredients.

"It's not unusual for them to send cheese to the center, and we profile it for them," says Carol Chen, researcher and coordinator of CDR's sensory program.

For example, she says, when describing a Cheddar, researchers at CDR begin with a few things about the body, how firm it is, and how it breaks down in the mouth. For flavor, they start out describing overall intensity — mild, aged, sharp or extra sharp — and basic flavors such as acid, sour, sweet or bitter, before moving on to other flavors from milky or buttery notes for young cheeses to possible sulfury notes as it ages.

"We describe flavors that contribute toward the Cheddar flavor, anything that pops up," she says. "We don't attach positive or negative terms."

• Making the grade

USDA grading and American Dairy Science Association (ADSA) scorecard judging are among the most well-known and traditional sensory tests. In a 2007 review for ADSA, "Sensory Analysis of Dairy Foods," MaryAnne Drake, professor of sensory analysis and flavor chemistry at North Carolina State University, writes that in these techniques, a product is assigned an

overall quality score or grade based on a designated list of defects. These methods are fast and practical in a large manufacturing facility or quality control environment.

Robert Bradley, University of Wisconsin retired professor of food science and cheese judge trainer, describes cheese grading as a point scale based on what might be considered a "perfect cheese." Flavor is given the most weight, body and texture next, and color and appearance third. Special categories exist for certain cheeses, such as eye formation in Swiss.

The first thing a cheese grader does is look at the surface, Bradley says. It has to be smooth, otherwise mold could grow underneath the wrapper. Color discrepancies might indicate discrepancies in flavor.

Next, the grader or judge will use a cheese trier to pull a plug to sample, smelling the fresh-cut surface.

"Since it's a fresh-cut surface, you check for odor. It gives the first indication," Bradley says. "Examine the surface of the plug. Are there openings? Gas holes? Those are discrepancies. Is the color uniform from top to bottom?"

The grader then will bend the cheese plug to see where it breaks. If a Cheddar breaks before a 90-degree bend, it's marked as "short" and may have an acid flavor. If it breaks beyond 90 degrees or not at all, the cheese is weak and too soft.

"From there, you make notations on an evaluation sheet and put down a score," Bradley says, adding that USDA has fixed deductions for each discrepancy in flavor, body and texture, color and appearance.

"They all go by 'slight,' 'definite' or 'pronounced.' It's a judgment call," he says. "It takes a lot of training to get someone to the point where they can judge correctly or evaluate correctly."

• A science of sense

Sensory profiles may seem subjective depending on a person's taste, preference and experience, but the aim of sensory analysis is to produce repeatable results.

"We are not looking for the perfect cheese. The goal is to 1: learn how to describe the cheese, 2: identify off flavors that are present and find the causes, and 3: describe the main descriptors that define the product," says Montserrat Almena-Aliste, a food science professor who specializes in sensory evaluation at the University of Vermont and Vermont Institute for Artisan Cheese. "At the end you have a good objective picture of the product and a good tool to evaluate the sensory quality of your cheese."

Sensory researchers go into more depth than the average consumer would to describe and analyze properties of a cheese or other product. One example of this is differentiating between bitterness and acidity, Almena-Aliste says.

"Some people are not able to differentiate between these two basic tastes, but in terms of troubleshooting, the

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steps are very different if it is one or the other, so it is very important to be sure that as a cheesemaker you know the difference," she says.

When training students to evaluate sensory profiles, Almena-Aliste says she focuses especially on descriptive analysis, which brings a more comprehensive approach than other methods.

In her "Sensory Analysis of Dairy Foods" review, Drake writes that descriptive analysis consists of training a group of individuals (generally 6-12) to identify and quantify specific sensory attributes or all of the sensory attributes of a food. This sensory tool requires training of the panelists to operate in unison as an instrument.

"A trained sensory panel should produce results analogous to instrumental data," Drake says in the 2007 review. "As such, the sensory instrument (panel) should be as precise and

reproducible as possible."

Drake also says in the report, "Sensory analysis is an invaluable set of methods for research and marketing. Knowledge of product variability, stability, comparison to competitor products, relationships to instrumental analyses and consumer understanding are all requirements for a successful product."

• **Examining applications**

Examining the sensory profiles of cheese through basic tasting panels, grading evaluation or descriptive analysis can help companies determine if their cheese is a good match with consumers and for various applications. It also can help pinpoint flaws and how to adjust the process or ingredients to improve the cheese.

Almena-Aliste says many cheesemakers are concerned with finding the right level of salt for their cheese, so salt level is one of the most important players in examining sensory profiles.

"Salt enhances and balances cheese flavor, but it also helps from

a technical point because, along with pH and moisture content, it controls bacteria and enzymatic activity shaping the sensory profile and shelf life of the cheese," she says.

"Exploring how different salt levels affect the quality of your cheese is always helpful," she adds. "Salt is a critical factor in the quality of cheese, and salt preference levels are quite different among consumers. So you need to do your homework!"

Sensory research also involves determining what is preferred by the end user, and those preferences can vary by demographic.

"The variety in what people are looking at as acceptable is very different," Chen explains. "On the East Coast they don't mind oiling off and they expect the melted cheese to brown. The West Coast wants their pizza pie to have minimal oiling off of the cheese."

Chen says panels representing the end users should have specific targets in mind to evaluate how a product performs.

"It's another case of why it's really important to us to accurately describe a product," she says. "Whether a performance is acceptable or not, the end user really has to decide that."

While sensory research in cheese used to deal primarily with evaluating the cheese by itself, the field now has shifted to include cheese that will be used as an ingredient. Research might include how the cheese needs to perform in a sauce, on a pizza or as an ingredient in a cracker.

Chen gives the example of someone who approached the researchers at CDR looking for the right Mozzarella for a deep-dish pizza.

"All the ingredients were going next to the crust, covered with sauce, and they wanted to know how Mozzarella would perform there," she says. "We assessed how it was performing and helped them change specifications of the cheese so it performed better in that part of the application."

Sensory researchers at CDR work with different types of pizza ovens to

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determine how a cheese's attributes will change given different conditions.

"There are several different kinds of ovens pizza is cooked in — home, restaurant, stone-on-bottom, forced-air ovens," Chen says. "Cheese performs differently in all ovens. It's all very empirical. Cook pizza in one type of oven, it has a nice level of browning. Change one thing, you may not have acceptable browning."

• **Higher standards**

As people become interested in a broader range of foods and develop new tastes, and as the quality and technology in cheesemaking improves, the science of sensory evaluation also grows.

"The analytical techniques that support sensory science are growing. They are finding more and more about the chemistry of cheese," Chen says. "Detection and measurement of things going on in cheese is improving, and we can correlate those along with sensory. They can support each other."

Bradley adds that the quality of cheese has improved because of higher quality milk, and because automation has helped decrease human error. However, he says, that alone won't create a perfect score.

"The occasional human error is eliminated," he says. "But it does take the master cheesemaker's touch to create the top-quality cheese you see going for \$10-\$15 a pound. It's almost artful." **CMN**