TECHNOLOGY PAPER

Maillard Index To Measure Food Flavor

Maillard Index

FLAVOR MEASUREMENT WHITE PAPER

Contact: Robert Janda
Hunterlab Atlantic Region Sales
Annapolis, MD 21403
Telephone 410-263-2223
Email: JandaB@Hunterlab.com

MAILLARD REACTION

When foods are cooked they go through a chemical process called the Maillard reaction. This is a chemical reaction between the amino acids in the food and a reducing sugar that produces the flavor of the food. In the cooking process, flavor compounds are created by the reaction and each food has a distinctive set of flavor compounds. Most foods such as baked goods, cereals, coffee, sauces, soups, meats and vegetables, develop flavor by the Mallard reaction. By measuring the Maillard reaction one can follow flavor development and identify the flavor peak.

FLAVOR DISCOVERY

We have measured food during cooking and discovered a set of wavelengths that correlate to the Maillard reaction. The eyes are unable to discriminate the wavelengths and only are detectable using instruments. Based upon our testing, a new algorithm and index has been created. The algorithm is a multiple term equation with term coefficients selected based upon the food being measured. Coefficients are different for foods with hydrogenated oil compared to foods with non-hydrogenated oil. Blind taste tests have been performed to correlate the algorithm with food flavor and the algorithm followed food flavor. The algorithm has been successfully applied to all Maillard reacting foods. The set of wavelengths and the algorithms used to detect the Maillard reaction are proprietary and a disclosure document has been filed with the US Patent Office.

TEST METHODOLOGY

Our testing was oriented to cover many food groups to evaluate the gamut of the Maillard Index rather than concentrating on a particular individual food. The same basic method was used to test the algorithm for all foods. The following test method for peanuts represents the methodology used.

Virginia # 1 grade raw whole skinless peanuts were inspected; defective peanuts removed and the batch air roasted. Five pounds were placed in a clear bottom Pyrex pan. The peanuts were air roasted in a 350-degree F oven. Oven temperature was monitored using a digital thermometer. Nut surface temperature was read using a handheld IR thermometer. Color measurements were made through the bottom of the clear pan. Color readings were taken at ten-minute intervals, the nuts were stirred and 0-oz sample sets were aside for blind taste testing.

After roasting, blind taste tests were conducted by arranging three one-ounce cups of samples and three sequences of taste tests. The samples were arranged in a cross checking method where a reference sample would appear in the first taste test and again in the second taste test then again in the third.

The taste test was designed to produce an internal cross-reference. Panel size ranged from four to eight people with eight being best. Statistical analysis recommends a population of 33 people = 92% probability of certainty. However, we found the sensory curve became smooth with a population of 8 people.

Samples were judged using the following ratings

Best	(Strongly Acceptable)
Good	(Flavorful)
OK	(Acceptable)
Not OK	(Not Acceptable)
Worst	(Raw-or-Burnt)

In the initial blind taste tests it was found that the panel was influenced by the "crunchiness" or bite of the product. Therefore in products that were "crunchy" such as peanuts, cashews and cookies, the product were chopped to a uniform 1 mm size in a food chopper to eliminate the crunch effect on the taste judgment. Thus enabling the food to be judged solely on flavor.

FOODS TESTED

Many foods were tested; the following curves are shown for peanuts, sugar cookies, piecrust and thick potato chips. Thick potato chips were used since they laid flat and could be easily measured compared to thin potato chips that would curl.

CONCLUSION

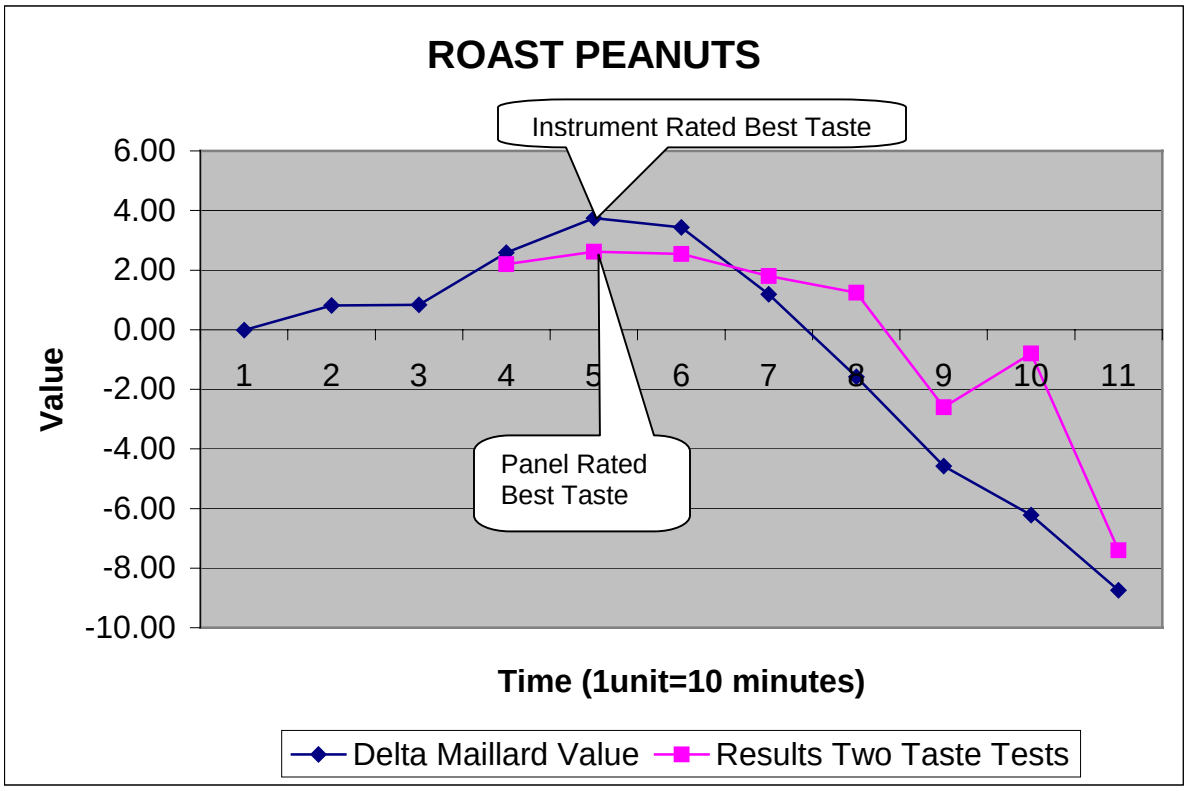
This new technology assigns a numerical value to flavor and identifies the flavor peak. This technology can be used to monitor flavor development on-line and adjust the line to produce foods at their flavor peak. It will correct for seasonal variations in the foods amino acid and sugar composition. Food developers can also use this technology to reduce the number of blind taste tests required to bring a new food to market. This technology can be used to track flavor shelf life.

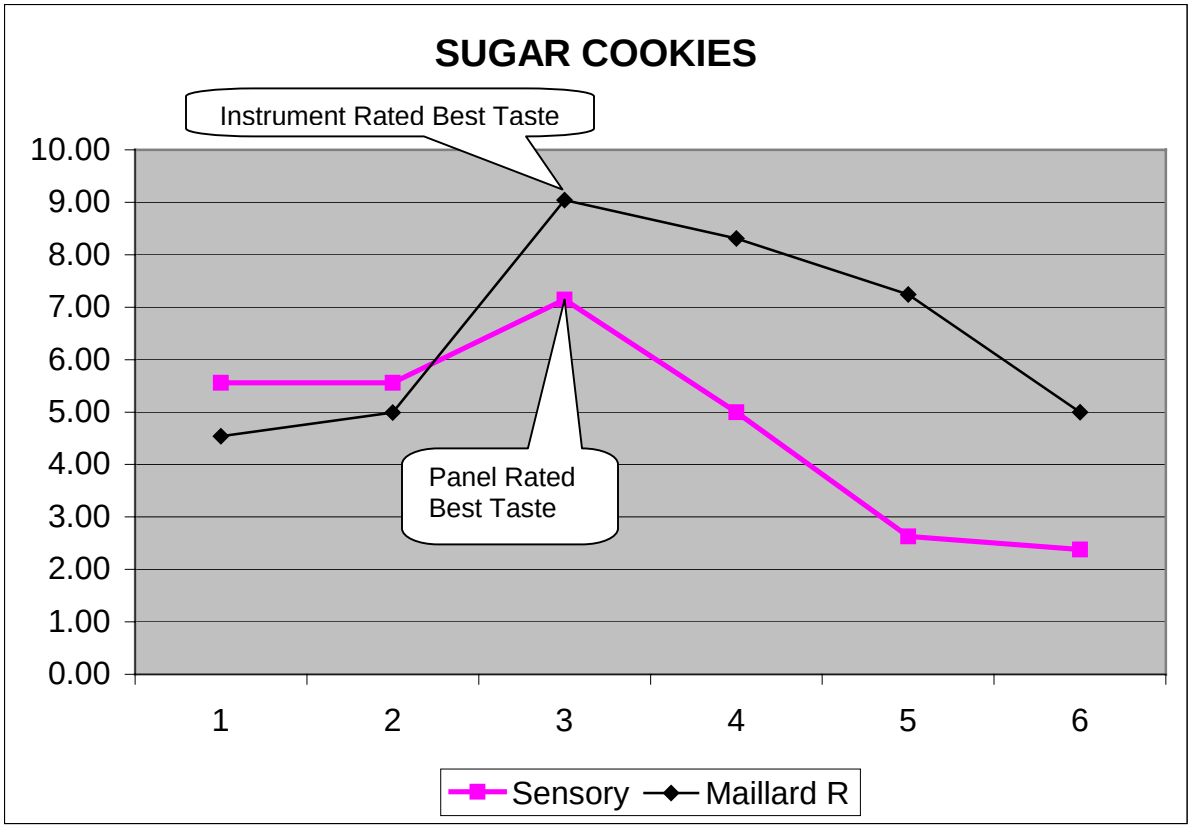
We can provide instruments to:

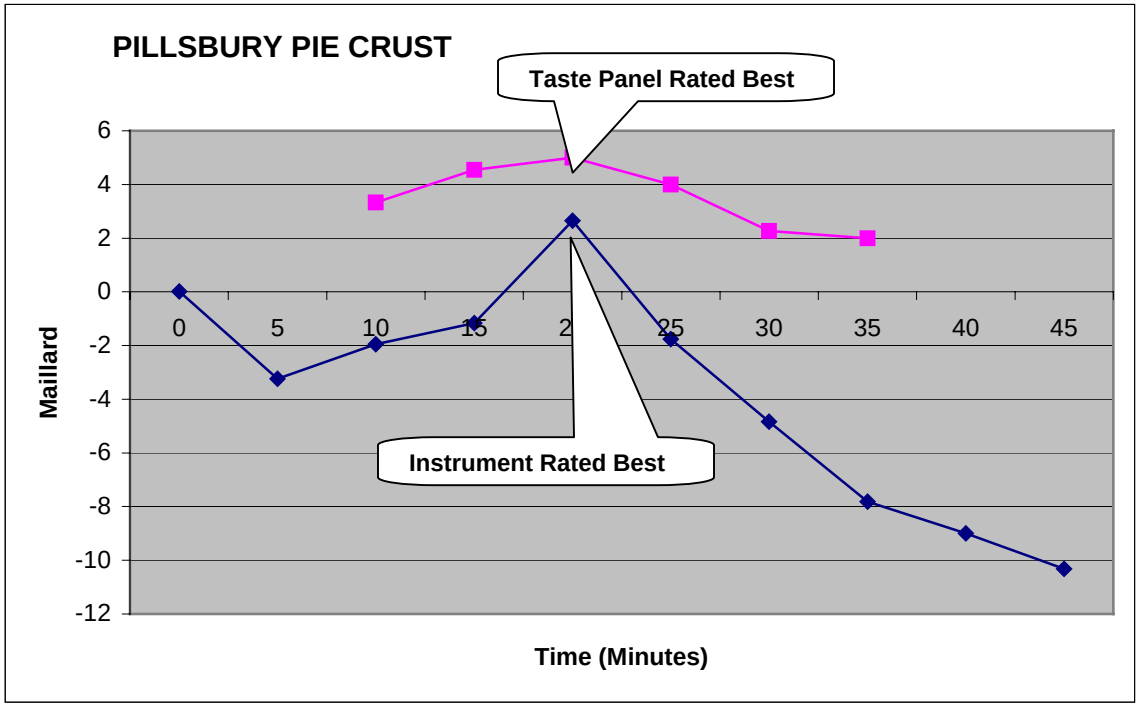
- Analyze foods for peak flavor.
- Providing flavor measurement the QC laboratory and online.
- Measure and recommend how to improve flavor for a food line.
- Measure flavor shelf life.

JANDA CORPORATION
Hunterlab Atlantic Sales
Annapolis, MD 21403 Email:JandaB@Hunterlab.com Telephone 410-263-2223

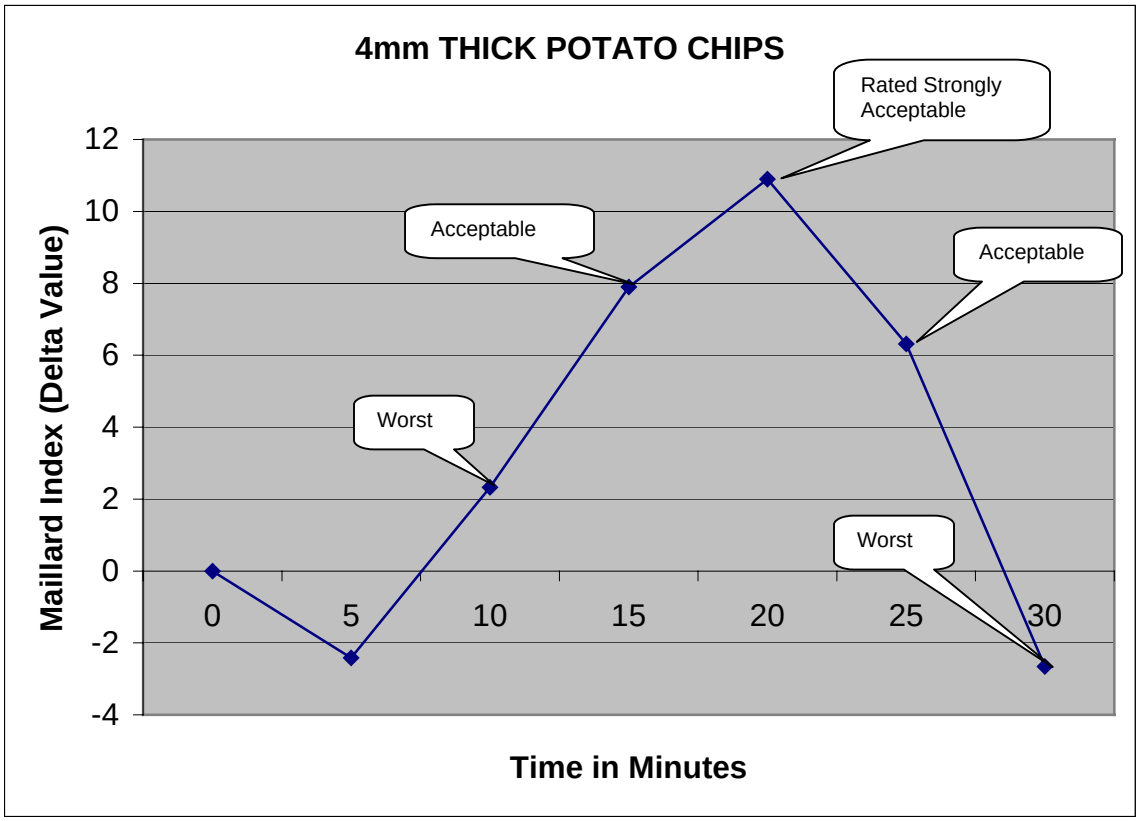
FOODS CURVES







Taste Test Panel Rating



Taste Test Panel Ratings