# TEXTURE APPLICATION NOTE

## SPONGE CAKE



### APPLICATION

Evaluation of soft sponge cake (Madeira cake)

### TEST OBJECTIVE

Quantify the textural properties of the cake as an indicator of baking conditions imposed using Texture profile analysis (TPA)

### METHOD

Two commercially available Madeira cakes were assessed using the LFRA texture analyser at three different levels of deformation: 25%, 50%, and 75%. True compression was imposed using a 50.8mm Ø Perspex cylinder probe to samples standardised by cutting cubes of 26 mm x 26 mm x 45 mm from the base of the cake.

### PARAMETERS:

| | |
|---|---|
| HARDNESS: | Peak force in first compression cycle (N) |
| SPRINGINESS: | Height the food recovers between the end of the of the first and the start of the second.(m) |
| ADHESIVENESS: | The negative area for the first bite, representing work required to pull the compressing plunger away from the sample. (Joules) |
| COHESIVENESS: | The ratio of the positive area during the second to that of the first compression cycle |
| FRACTUBILITY: | The first significant break in the compression cycle (N) |
| GUMMINESS: | Calculated parameter Hardness x cohesiveness (N) energy required to disintegrate a semi solid food for swallowing. |
| CHEWINESS: | Calculated parameter Gumminess x springiness (joules) energy required to chew a solid for swallowing (Joules) |

**TABLE 1**
**LFRA Settings**

| | |
|---|---|
| MODE: | TPA |
| TOTAL CYCLES: | 2 |
| TRIGGER: | 5g |
| TEST SPEED: | 1mm/s |
| TARGET UNIT: | % Deformation |
| TARGET VALUE: | 25%; 50% and 75% |
| LOAD CELL: | 4.5 kg |

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### RESULTS

| SELECTED CALCULATIONS | PRE MAD 75% TPA_3.qdf | PRE MAD 75% TPA_1.qdf | PRE MAD 75% TPA_2.qdf | PRE MAD TPA 50%_1.qdf | PRE MAD TPA 50%_2.qdf | PRE MAD TPA 50%_3.qdf | mad pre TPA 25%_1.qdf | mad pre TPA 25%_2.qdf | mad pre TPA 25%_3.qdf |
|---|---|---|---|---|---|---|---|---|---|
| Hardness | 2484 | 2431 | 1957 | 645 | 766 | 723 | 328 | 343 | 291 |
| Cohesiveness | 0.226083 | 0.237671 | 0.216806 | 0.410783 | 0.421709 | 0.423246 | 0.598091 | 0.598088 | 0.629802 |
| Gumminess | 561.59 | 577.7777 | 424.2892 | 264.9554 | 323.0291 | 306.0066 | 196.1737 | 205.144 | 183.2724 |
| Apparent modulus | 23.24211 | 25.67393 | 29.82095 | 22.93333 | 25.52464 | 26.5931 | 29.15555 | 33.2606 | 38.8 |
| Adhesive force | 0 | -6 | -7 | -1 | -1 | -3 | -1 | 0 | -2 |
| Adhesiveness | 0 | -1.875 | -3.7875 | -0.45 | -0.1875 | -4.425 | -0.7875 | 0 | -2.5125 |
| Springiness | 6.869999 | 7.029999 | 8.030001 | 12.11 | 12.93 | 12.65 | 8.4 | 8.43 | 8.33 |
| Springiness Index | 0.202059 | 0.206765 | 0.236176 | 0.550455 | 0.587727 | 0.575 | 0.763636 | 0.766364 | 0.757273 |
| Area cycle 1 | 22587.79 | 23719.57 | 19811.32 | 6868.125 | 8876.737 | 7600.462 | 2686.8 | 2749.2 | 2117.212 |
| Area cycle 2 | 5106.712 | 5637.45 | 4295.212 | 2821.313 | 3743.4 | 3216.863 | 1606.95 | 1644.262 | 1333.425 |
| Quantity fractures | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hardness 1 work done | 21402.71 | 22434.22 | 18812.4 | 6084.413 | 7837.5 | 6746.025 | 2133.337 | 2146.425 | 1657.238 |
| Hardness 2 work done | 4304.138 | 4795.35 | 3593.475 | 2268.675 | 2991.3 | 2584.387 | 1158.525 | 1175.025 | 961.2375 |
| Recoverable work done 1 | 1185.075 | 1285.35 | 998.925 | 783.7125 | 1039.238 | 854.4375 | 553.4625 | 602.775 | 459.975 |
| Recoverable work done 2 | 802.575 | 842.1 | 701.7375 | 552.6375 | 752.1 | 632.475 | 448.425 | 469.2375 | 372.1875 |
| Sample length | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Deformation @ peak load | 34 | 34 | 34 | 22 | 22 | 22 | 11 | 11 | 11 |
| Deformation @ final load | 34.01 | 34.01 | 34.02 | 22.01 | 22 | 22 | 11 | 11 | 11 |

### OBSERVATION:

The loads increase linearly between the 25% and 50% deformation cycles, while a steep increase and change in characteristics is observed at the higher 75% deformation. 50% gives greatest correlation due to elimination of base effects. While base effect is clearly evident at the higher 75% deformation.

### CONCLUSION

The method follow traditional principle recognized throughout the food industry as indicators of product texture as a means of sensorial correlation and process control. The method is therefore an invaluable tool for both the product developer and the QC departments as a means of consistent quality production and efficient effective product development.



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