

TEXTURE APPLICATION NOTE SPONGE CAKE

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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 \varnothing 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)

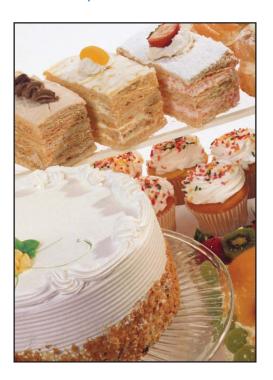


TABLE 1 LFRA Settings

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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