National Institute of Standards and Technology
U.S. Department of Commerce

Date of Issue:
16 December 2020

Reference Material 8403
Cocoa Flavanol Extract
REFERENCE MATERIAL INFORMATION SHEET

Purpose: This reference material (RM) is intended for harmonizing methods for the determination of cocoa flavanols and their oligomers up to a degree of polymerization (DP) of seven units.

Description: RM 8403 is a free-flowing powder containing cocoa flavanols sealed in aluminized mylar sachets. A unit of RM 8403 consists of five sachets each containing approximately 2 g of the material.

Non-Certified Values: National Institute of Standards and Technology (NIST) non-certified values are best estimates based on currently available information. However, they do not meet NIST's criteria for certification. Non-certified values should not be used to establish metrological traceability to the International System of Units (SI) or other higher-order reference system [1].

Mass fraction values for cocoa flavanols and their oligomers up to DP of seven units, reported on an as-received basis are provided below. These non-certified values are metrologically traceable to the materials and procedures used in their determination.

Degree of Polymerization	Mass Fraction[(a)] (mg/g)
DP1	114.9 ± 1.7
DP2	82.6 ± 1.4
DP3	87.4 ± 1.9
DP4	74.0 ± 1.5
DP5	62.7 ± 1.3
DP6	48.4 ± 1.1
DP7	36.7 ± 1.0

[(a)] These values are expressed as $x \pm 2u(x)$, where x is the value and $u(x)$ is the standard uncertainty of x. The standard uncertainty combines material heterogeneity, instrumental repeatability, and between-laboratory sources of bias and imprecision. While the best estimate value lies within the interval $x \pm 2u(x)$, this interval may not include the true value. For guidance in using and propagating this uncertainty, see reference 2.

Period of Validity: The non-certified values are valid within the measurement uncertainty specified until **01 December 2030**. The value assignments are nullified if the material is stored or used improperly, damaged, contaminated, or otherwise modified.

Maintenance of Non-Certified Value: NIST will monitor this material to the end of its period of validity. If substantive technical changes occur that affect the non-certified values during this period, NIST will update this Reference Material Information Sheet. Before making use of any of the values delivered by this material, users should obtain the most recent version of this documentation, available free of charge through the https://www.nist.gov/srm website.

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Steven J. Choquette, Director
Office of Reference Materials

Safety: RM 8403 is intended for research use; not for human consumption.

Storage: Unopened sachets should be stored at –20 °C until use. The stability of the cocoa flavanols has been assessed, an opened and resealed sachet may be stored at –20 °C and reused for six months.

Use: Gently mix contents prior to opening sachet. A minimum sample size of 100 mg should be used.

Analysis: RM 8403 was prepared and evaluated by Mars EDGE (Germantown, MD). The non-certified values were determined using liquid chromatography with fluorescence detection [3] at the Germantown facility and by participants in an interlaboratory comparison study.

Additional Information: Full details on the production, analysis, and value assignment of RM 8403 are provided in reference 4.

REFERENCES

[1] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sharpless, K.E.; Sieber, J.R.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication 260-136; U.S. Government Printing Office: Washington, DC (2020); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2020.pdf (accessed Dec 2020).

[2] Possolo, A; *Evaluating, Expressing, and Propagating Measurement Uncertainty for NIST Reference Materials*; NIST Special Publication 260-202; U.S. Government Printing Office: Washington, DC (2020); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-202.pdf (accessed Dec 2020).

[3] Bussy, U; May, B.R.; Olanrewaju, Y.; Hewitt, G.; Anderson, N.; Crozier, A.; Ottaviani, J.I.; Kwik-Uribe, C.; *Reliable, Accessible and Transferable Method for the Quantification of Flavanols and Procyanidins in Foodstuffs and Dietary Supplements;* Food Funct. Vol. 11; pp. 131–138 (2020).

[4] Rimmer, C.A.; Lippa, K.A.; Yen, J.; Bussy, U.; Hewitt, G.; Anderson, N.P.; Kwik-Uribe, C.; *Production and Analysis of RM 8403 Cocoa Flavanol Extract;* NIST Special Publication 260-207; U.S. Government Printing Office: Washington, DC (2020); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-207.pdf (accessed Dec 2020).

If you use this RM in published work, please reference:

Rimmer CA, Lippa KA, Yen J, Bussy U, Hewitt G, Anderson NP, Kwik-Uribe C (2020) Production and Analysis of RM 8403 Cocoa Flavanol Extract. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-207. https://doi.org/10.6028/NIST.SP.260-207

Certain commercial organizations, services, equipment, or materials may be identified in this Reference Material Information Sheet to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the organizations, services, materials, or equipment identified are necessarily the best available for the purpose.

Users of this RM should ensure that the Reference Material Information Sheet in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, Maryland 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at https://www.nist.gov/srm.

* * * * * * * * * * End of Reference Material Information Sheet * * * * * * * * * *