Certificate of the Reference Material

Name of the Material : Elements in Hazelnut Certified Reference Material

Material Code : UME CRM 1202

Issue Date : 31.08.2016

Revision Date : 08.09.2023 (Revision history can be found on the last page)

Validity Period of the Certificate : 18 months from the sales date

Certified Values :

Element	Certified Value[1], mg/kg	Uncertainty[1, 2], mg/kg	Element	Certified Value[1], µg/kg	Uncertainty[1,2], µg/kg
B[3]	16.8	2.2	Cd[6]	6.4	0.9
Ca[4]	1550	110	Co[5]	278	28
Cu[3]	16.4	1.0			
Fe[3]	36.1	2.9			
Mg[4]	1540	150			
Mn[5]	95.3	6.3			
Ni[5]	1.60	0.17			
Sr[5]	6.68	0.46			
Zn[3]	20.4	1.8			

[1] The certified values and the uncertainties are traceable to the International System of Units (SI).
[2] The expanded uncertainty of certified value includes characterization, homogeneity, stability components and is stated as the standard uncertainty of measurement multiplied by the coverage factor *k* = *2*, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with GUM "Guide to the Expression of Uncertainty in Measurement".
[3] Certified value has been assigned based on the results produced by using totally independent HR-ICP-MS and ID-ICP-MS methods applied by a single laboratory.
[4] Certified value has been assigned based on the results produced by using totally independent HR-ICP-MS and FAAS methods applied by a single laboratory.
[5] Certified value has been assigned based on the results produced by using totally independent HR-ICP-MS and GF-AAS methods applied by a single laboratory.
[6] Certified value has been assigned by using ID-ICP-MS method.

TÜBİTAK UME, as a reference material producer, has been accredited by TÜRKAK according to TS EN ISO 17034 with the accreditation number AB-0001-RM.

Sales Date

Dr. Mustafa ÇETİNTAŞ
Acting Director

TÜBİTAK Gebze Yerleşkesi PK 54 41470 Gebze-Kocaeli /TÜRKİYE T +90 262 679 50 00 F +90 262 679 50 01 www.ume.tubitak.gov.tr

Certified Values (Continued):

Parameter	Certified Value[1], w/w (%)	Uncertainty[2], w/w (%)
*Total Fat Content[3]	69.0	3.2

[1] Unweighted mean value is calculated by using the means of 10 accepted sets of data produced by different laboratories applying TS EN ISO 659, AOAC 948.22, AOAC 963.15 and Soxhlet Extraction methods.
[2] The expanded uncertainty of certified value includes characterization, homogeneity, stability components and is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with GUM "Guide to the Expression of Uncertainty in Measurement".
[3] Value for total fat content is corrected for dry mass. Moisture content was determined by drying at (103 ± 2) °C until constant weight.

*** Out of accreditation scope.**

Informative Values:

Element	Value[1] and Uncertainty[2], mg/kg
Ba	5.8 ± 0.3
P	3240 ± 890

[1] Value has been assigned by using HR-ICP-MS method.
[2] The expanded uncertainty of the informative value has contribution from characterisation, homogeneity, stability and is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with GUM "Guide to the Expression of Uncertainty in Measurement".

Description

The material is in amber glass containing about 45 g hazelnut. Additional information is presented in the certification report.

Intended Use

This material is intended to be used for method validation of the determination of element mass fractions and total fat content in hazelnut and quality control purposes.

Instructions for Use

The bottle must be shaken gently for one minute before opening for assurance of homogeneity. All precautions must be taken in order to prevent degradation or contamination with air intact.

Minimum sample intake is 1 g for all elements and 5 g for fat content analysis.

For moisture determination, (5 ± 0.5) g sample must be dried in a conventional oven with normal ventilation (prevention of increasing air flow rate) under atmospheric pressure at (103 ± 2) °C until constant mass is attained (the difference between 2 consecutive measurements is less than 0.005 g). The material can be safely dispatched at ambient temperature where the temperature does not exceed 60 °C and the transportation period of 4 weeks.

Storage Conditions

The material must be stored at (18 ± 2) °C under dark conditions. It is recommended to store the material at 4 °C once the bottle is opened. TÜBİTAK UME cannot be held responsible for changes that might happen to the material at customer's premises due to noncompliance with the instructions for use, and the storage conditions given in the certificate.

Safety Information

Material is produced for laboratory use only. Usual laboratory precautions apply. It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable.

Participants

Information about the laboratory participated in the characterization of elements study is given in the following table.

Laboratory	Address
TÜBİTAK UME	TÜBİTAK Gebze Yerleşkesi, Barış Mah. Dr. Zeki Acar Cad. No.1, 41470 Gebze – Kocaeli / Türkiye

Information about the laboratories participated in the characterization of total fat content study is given in the following table:

Laboratory	Address
İNTERTEK	Merkez Mahallesi Sanayi Cad. No.23 Altındağ Plaza 34197 Yenibosna, İstanbul / Türkiye
Gözlem Gıda Kontrol ve Araştırma Laboratuvarı	Kozyatağı, Bayar Cad. No:78, 34736 Kadıköy - İstanbul / Türkiye
TÜBİTAK MAM / Gıda Enstitüsü	TÜBİTAK Gebze Yerleşkesi, Barış Mah. Dr. Zeki Acar Cad. No.1, 41470 Gebze - Kocaeli / Türkiye
TÜBİTAK BUTAL	Gaziakdemir Mah. Merinos Cad. No: 11 16190 Osmangazi - Bursa / Türkiye
BİLİM Sağlık ve Lab. Hiz. Tic.	Şehremini Mh. Kızılelma Cd. No: 6 Kat: 1-6 Fındıkzade, 34104 Fatih - İstanbul / Türkiye
DEPPO Özel Kontrol Laboratuvarı	Gıda Laboratuarı Üniversite Cad. No:71/B Ağaçlıyol, 35100 Bornova - İzmir / Türkiye
Çevre Gıda Analiz Laboratuvarı	Merkez Mah. Tatlıpınar Sok. Mart Plaza No:13 K:1-2, 34400 Kağıthane - İstanbul / Türkiye
Bursa Gıda ve Yem Kontrol Merkez Araştırma Enstitüsü Müdürlüğü	Hürriyet Caddesi, No: 126, 16036, Osmangazi - Bursa / Türkiye
Gıda,Tarım ve Hayvancılık Bakanlığı Ordu Gıda Kontrol Laboratuvar Müdürlüğü	Akyazı Mahallesi Kanuni Sultan Süleyman Cad. No:24/1, 52200 Altınordu - Ordu / Türkiye
TÜBİTAK UME	TÜBİTAK Gebze Yerleşkesi, Barış Mah. Dr. Zeki Acar Cad. No.1, 41470 Gebze - Kocaeli / Türkiye

Methods and/or Techniques Used for the Determination of the Certified Values

Techniques used in the characterization studies are given in the table below:

Method/Technique	Parameter
Graphite Furnance Atomic Absorption Spectrometry (GF-AAS)	Co, Mn, Ni, Sr
Flame Atomic Absorption Spectrometry (FAAS)	Ca, Mg
High Resolution Inductively Coupled Plasma Mass Spectrometry (HR-ICP-MS)	B, Ca, Co, Cu, Fe, Mg, Mn, Ni, Sr, Zn
Isotope Dilution Inductively Coupled Plasma Mass Spectrometry (ID-ICP-MS)	B, Cd, Cu, Fe, Zn
Solvent Extraction	Fat content

Revision History

Date	Remarks
31.08.2016	First publication.
26.09.2016	Mg is added to HR-ICP-MS method which was used in characterisation.
08.10.2018	Certificate is updated due to format change of the document. Total fat content is added to the certified parameters.
18.09.2019	Information about shipping conditions is added. Certificate is updated due to changes in the format of certificate for reference materials.
08.09.2023	Potassium is removed from the list of informative values.

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