



It has been complied
with the requirements of ISO Guide 34

Control Material CS-M-4

As, Cd, Cr, Cu, Hg, Pb, Se and Zn in Dried Mushroom Powder (*Leccinum scabrum*)

General Information

Intended use: Checking the performance of analytical laboratories engaged in the determination of As, Cd, Cr, Cu, Hg, Pb, Se and Zn in food and other biological samples

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Description of material

Wild mushrooms (*Leccinum scabrum*) were collected in the forest in north-west Poland, cleaned, i.e. dust, soil and attached mosses were removed. The end part of stalks was cut off using stainless steel knife. Mushrooms were cut to smaller parts, which were then air dried at a temperature 25 – 60°C according to standard procedure used by food concentrate producers. Dried mushrooms (caps and stalks) were milled in a centrifugal mill made of stainless steel and sieved by stainless sieves. The fraction of particles with diameter ≤ 0.3 mm was collected.

The obtained material was further homogenized by mixing in a plastic drum rotated in three directions, distributed into PET bottles in portion of ca. 20 g and firmly covered. Care was taken to avoid contamination. The material was then sterilized by electron beam radiation from linear accelerator with dose of 28 kGy. Homogeneity was examined for the sample size of 250 mg for each of element certified i.e. As, Cr, Cd, Cu, Hg, Pb, Se and Zn. Statistical evaluation has been performed following ISO 13528:2005 standard [1] recommendations confirming good homogeneity of the material for sample masses ≥ 250 mg.

Determination of moisture content

In order to express the concentration of elements on a dry-weight basis, moisture content should be determined on a separate subsample by drying in an oven at 70°C for 24 hours.

Assigning of reference values

Reference values were assigned on the basis of the results provided by several reference laboratories. The elements have to be determined by at least two methods in order to assign reference value. The results were obtained AAS, ICP-MS and NAA. A reference value was

calculated as the robust mean value [1] of the laboratory means, an uncertainty was evaluated according to ISO 13528:2005 [1], ISO GUM [2] and IUPAC harmonized protocol [3].

Reference values for Mushroom Powder

Element	Reference value + expanded uncertainty (k=2)
	$X_{\text{ref}} \pm U$ [mg · kg ⁻¹ dry mass]
As	0.375 ± 0.051
Cd	1.33 ± 0.09
Cr	1.09 ± 0.21
Cu	26.37 ± 1.74
Hg	0.463 ± 0.024
Pb	0.998 ± 0.072
Se	1.29 ± 0.08
Zn	120.7 ± 5.9

Long-time stability is monitored during storage. The shelf life of the control mushroom powder material has been established to be **31 December 2025**.

References

1. ISO 13528:2005 Statistical methods for the use in proficiency testing by interlaboratory comparison. Geneva. 2005
2. International Organization for Standardization (ISO). Guide to the Expression of Uncertainty in Measurement. ISO. Geneva. 1993 (corrected and reprinted 1995)
3. M. Thompson. S.L.R. Ellison. R. Wood. The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories (IUPAC Technical Report). Pure Appl. Chem. 78 (2006) 145

Reference laboratories:

Institute of Agricultural and Food Biotechnology. Warsaw

Institute of Nuclear Chemistry and Technology. Warsaw