

VEE KVALITEET. JUHISED FÜTOPLANKTONI BIOMAHU MÄÄRAMISEKS

Water quality - Guidance on the estimation of
phytoplankton biovolume

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16695:2015 sisaldab Euroopa standardi EN 16695:2015 ingliskeelset teksti.	This Estonian standard EVS-EN 16695:2015 consists of the English text of the European standard EN 16695:2015.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 02.09.2015.	Date of Availability of the European standard is 02.09.2015.
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ICS 13.060.70

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English Version

Water quality - Guidance on the estimation of phytoplankton biovolume

Qualité de l'eau - Lignes directrices pour l'estimation
du biovolume des microalgues

Wasserbeschaffenheit - Anleitung zur Abschätzung des
Phytoplankton-Biovolumens

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European foreword

This document (EN 16695:2015) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2016 and conflicting national standards shall be withdrawn at the latest by March 2016.

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Introduction

The abundance or number of counting units of individual phytoplankton taxa does not necessarily reflect the real ratio of single taxa to the complete biomass of a phytoplankton community. Few big cells/counting units can contribute far more biomass to the system than many small ones. Hence, abundance data alone is often not an ideal measurement of population size. Biomass estimations give very important information for ecological studies, classification schemes and ecosystem modelling. Therefore, it is necessary to determine the biomass of phytoplankton taxa, particularly because phytoplankton delivers energy in the form of carbon, to other trophic levels of food webs. It is not possible to directly analyse the carbon content on the taxonomic level in natural phytoplankton samples, therefore the biovolume of the phytoplankton taxa is a suitable measure to determine the biomass of an ecosystem according to the taxonomic composition. Neither particle size analysis using laser analysis, nor flow cytometry, nor Coulter Counters, nor chemical analyses of chlorophyll-a concentration as well as total carbon allow statements on the taxon level. An estimation of the carbon content is possible using conversion factors (see Annex C).

Further, the biovolume is a quantitative basis for assessing hazards from those algae and cyanobacteria, which (can) contain noxious or toxic metabolites, and is used in combination with cell numbers or chlorophyll-a concentration within WHO guidelines and national regulations for risk assessments.

Up to now, various guidelines for estimating the biovolume of microalgae have been used in different national and international monitoring programs (e.g. [1], [2], [3], [4]). The main objective of this document is the standardization of the procedure for determining the phytoplankton biovolume in order to achieve comparability of data. For this reason, the estimation of the biovolume in phytoplankton samples in sedimentation chambers (according to Utermöhl) using an inverted microscope will be described in detail.

This European Standard is also applicable for image analysis of pictures derived from microscope and flow cytometry cameras. The use of a standard catalogue containing basic and some composed geometrical shapes is recommended. Of course, such a standard list will not reflect the variety of all naturally existing shapes and will not match the exact biovolume values of each taxon. It will always be a compromise between accuracy and efficiency. However, the usage of agreed geometrical shapes and the application of the relevant formulae will improve the comparability of phytoplankton data and will be an important step forward for the implementation of quality assurance measures in phytoplankton analysis.

1 Scope

This European Standard specifies a procedure for the estimation of biovolume of marine and freshwater phytoplankton taxa using inverted microscopy (Utermöhl technique according to EN 15204), in consideration of some heterotrophic protists ($< 100 \mu\text{m}$) that are not considered in routine zooplankton analysis and benthic microalgae, which can be found in pelagic water samples.

This European Standard describes the necessary methods for measuring cell dimensions and for the calculation of cell or counting unit volumes to estimate the biovolume in phytoplankton samples. This shall be done using harmonized assignments of geometrical shapes to avoid errors.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15204, *Water quality - Guidance standard on the enumeration of phytoplankton using inverted microscopy (Utermöhl technique)*

EN 15972, *Water quality - Guidance on quantitative and qualitative investigations of marine phytoplankton*

EN 16698, *Water quality - Guidance on quantitative and qualitative sampling of phytoplankton from inland waters*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

biomass

total mass of living organic matter within a system or taxon

3.2

biovolume

total volume of (living) organisms within a system or taxon

Note 1 to entry: The biovolume is usually expressed in cubic millimetres per litre (mm^3/l).

3.3

cell volume

counting unit volume

total volume of a single cell or one counting unit

Note 1 to entry: The cell volume or counting unit volume includes the cell wall (if existing) but excludes lorica and/or mucilaginous envelopes and cell surface structures such as spines, bristles and scales.

Note 2 to entry: The cell volume or counting unit volume is usually expressed in cubic micrometres (μm^3).

4 Principle

Generally, the estimation of the total or taxon specific biovolume in phytoplankton samples of natural communities or cultures is based on measurements of a representative number of individuals. By