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Soil quality — Method to directly extract DNA from soil samples

Qualité du sol — Méthode pour extraire directement l'ADN d'échantillons de sol

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Introduction

DNA (deoxyribonucleic acid) is an essential component of any living organism coding for enzymes responsible for any biological activities. The study of DNA sequences from DNA sources extracted from different matrixes, by means of numerous molecular approaches, provides molecular markers that can be used to sharply distinguish and identify different organisms (bacteria, archaea and eucaryotes).

Up to now, most of the studies aiming to develop microbial soil quality indicators applicable to complex environments, such as soil, were biased by the unculturability of many microorganisms and the lack of sensitivity of traditional microbiological methods [16]. The recent development of numerous molecular biology methods based primarily on amplification of soil-extracted nucleic acids have provided a pertinent alternative to classical culture-based microbiological methods, providing unique insight into the composition, richness, and structure of microbial communities [15], [18], [26], [27], [36]. DNA-based approaches are now well-established in soil ecology and serve as genotypic (= molecular genetic) markers for determining microbial diversity.

The results of molecular analyses of soil microbial communities and/or populations rely on two main parameters:

a) the extraction of DNA representative of the indigenous bacterial community composition;

b) PCR bias, such as the choice of primers, the concentration of amplified DNA, errors in the PCR, or even the method chosen for analysis [23], [26], [38], [40]. Recently, numerous studies have investigated new methods to improve extraction, purification, amplification, and quantification of DNA from soils [20].

The aim of this International Standard is to describe the procedure used to extract DNA directly from soil samples. The reproducibility of this soil DNA extraction procedure was assessed in an international ring-test study (Annex A). The reproducibility of this soil DNA extraction procedure was successfully evaluated on both quantitative (q-PCR) and qualitative (A-RISA) approaches.