
**Soil quality — Inhibition of
reproduction of the soil mite
(*Hypoaspis aculeifer*) by soil
contaminants**

*Qualité du sol — Inhibition de la reproduction de l'acarien prédateur
(*Hypoaspis aculeifer*) par des contaminants du sol*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Ecotoxicological test systems are applied to obtain information about the effects of contaminants in soil and are proposed to complement conventional chemical analysis (see ISO 15799 and ISO 17616). ISO 15799 includes a list and short characterization of recommended and standardized test systems and ISO 17616 gives guidance on the choice and evaluation of the bioassays. Aquatic test systems with soil eluate are applied to obtain information about the fraction of contaminants potentially reaching the groundwater by the water path (retention function of soils), whereas terrestrial test systems are used to assess the habitat function of soils.

Mites (Acari) are a world-wide and diverse group of arthropods belonging to the class Arachnida with over 40 000 species recorded, divided into two super-orders (Acariformes and Parasitiformes). Due to their relative small size (a few μm to a few cm), they occupy specific ecological niches on plants as well as in soils (see Reference [13]).

Among soil-inhabiting mites, the role of predation is ensured by, for example, *Hypoaspis* sp. (Laelapidae). Because they are exposed to chemical contamination, mites are already considered in the environmental risk assessment of pesticides, as non-target organisms (see Reference [10]). Indeed, among the data required for active substances of pesticides, effects on predatory mites are assessed, i.e. for the plant-inhabitant *Typhlodromus pyri* (Phytoseiidae) and the soil-inhabitant *Hypoaspis aculeifer* (Laelapidae) (see Reference [6]).

The first authors introducing *H. aculeifer* as a test organism in ecotoxicological studies [23][17] were later proposed a two-species test system in the European project SECOFASE (Sublethal Effects of Chemicals on Fauna in the Soil Ecosystem), including the collembolan *Folsomia fimetaria* as prey. In the context of the development of an ecotoxicological test for the assessment of plant protection products on non-target arthropods (see References [5][6]), a protocol on soil predatory mites using *H. aculeifer* was further proposed. More recently, a standard test protocol for the assessment of chemicals was developed for this species by OECD in 2008 and revised in 2016. The results of the associated international ring-test were published in Reference [25].

Among mites, the predator *Hypoaspis aculeifer* is the most studied species in laboratory. The reproduction end point was found in general to be more sensitive than mortality and avoidance. Compared to other soil meso-fauna invertebrates, mites were found in general less sensitive than or as sensitive as other test species, depending on the end points and chemicals studied. Considering semi-field studies, *H. aculeifer* was used as a top predator whereas other soil invertebrates, mainly springtails, were ranked in the grazer group. In these studies, mites showed to be quite tolerant towards anthropogenic contamination. This statement was also corroborated by field surveys. However, the applicability of laboratory test methods for the assessment of environmental samples (contaminated soils, wastes etc.) with mites is emphasized, as to date a limited number of studies are available.

This document describes a method that is based on the determination of lethal and sublethal effects of contaminated soils to adult predatory mites of the species *Hypoaspis aculeifer*. This species is considered to be representative of predatory soil arthropods. Background information on the ecology of these mites and their use in ecotoxicological testing is available in Reference [14].

Soil quality — Inhibition of reproduction of the soil mite (*Hypoaspis aculeifer*) by soil contaminants

1 Scope

This document specifies a chronic test method for evaluating the habitat function of soils and determining effects of soil contaminants and substances on the reproduction of *Hypoaspis aculeifer* by – mainly – alimentary uptake. This method is applicable to soils and soil materials of unknown quality, e.g. from contaminated sites, amended soils, soils after remediation, industrial, agricultural or other sites under concern and waste materials (e.g. dredged material, municipal sludge from a wastewater treatment plant, composed material, or manure, especially those for possible land disposal). The reproduction (= number of juveniles) is the measured parameter of the test. The test reflects the bioavailability of a mixture of contaminants in natural soils (contaminated site soils) to a species which represents a trophic level which is not covered by other ISO standards. This test is not intended to replace the earthworm (see ISO 11268-2) or Collembola (see ISO 11267) reproduction tests since this species belongs not only to a different trophic group but also a different taxonomic group (= mites; i.e. arachnids) than those used usually.

Effects of substances are assessed using a standard soil, preferably a defined artificial soil substrate. For contaminated soils, the effects are determined in the soil to be tested and in a control soil. Depending on the objective of the study, the control and dilution substrate (dilution series of contaminated soil) are either an uncontaminated soil comparable to the soil to be tested (reference soil) or a standard soil (e.g. artificial soil).

This document provides information on how to use this method for testing samples (soils or substances) under temperate conditions.

This document is not applicable to substances for which the air/soil partition coefficient is greater than one, or to substances with vapour pressure exceeding 300 Pa at 25 °C.

NOTE The stability of the test substance cannot be ensured over the test period. No provision is made in the test method for monitoring the persistence of the substance under test.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10390, *Soil quality — Determination of pH*

ISO 10694, *Soil quality — Determination of organic and total carbon after dry combustion (elementary analysis)*

ISO 11260, *Soil quality — Determination of effective cation exchange capacity and base saturation level using barium chloride solution*

ISO 11277, *Soil quality — Determination of particle size distribution in mineral soil material — Method by sieving and sedimentation*

ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

ISO 18400-206, *Soil quality — Sampling — Part 206: Collection, handling and storage of soil under aerobic conditions for the assessment of microbiological processes, biomass and diversity in the laboratory*