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Standard Guide for Conducting Terrestrial Plant Toxicity Tests[1]

This standard is issued under the fixed designation E 1963; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers practices for conducting plant toxicity tests using terrestrial plant species to determine effects of test substances on plant growth and development. Specific test procedures are presented in accompanying annexes.

1.2 Terrestrial plants are vital components of ecological landscapes. The populations and communities of plants influence the distribution and abundance of wildlife. Obviously, plants are the central focus of agriculture, forestry, and rangelands. Toxicity tests conducted under the guidelines and annexes presented herein can provide critical information regarding the effects of chemicals on the establishment and maintenance of terrestrial plant communities.

1.3 Toxic substances that prevent or reduce seed germination can have immediate and large impacts to crops. In natural systems, many desired species may be sensitive, while other species are tolerant. Such selective pressure can result in changes in species diversity, population dynamics, and community structure that may be considered undesirable. Similarly, toxic substances may impair the growth and development of seedlings resulting in decreased plant populations, decreased competitive abilities, reduced reproductive capacity, and lowered crop yield. For the purposes of this guide, test substances include pesticides, industrial chemicals, sludges, metals or metalloids, and hazardous wastes that could be added to soil. It also includes environmental samples that may have had any of these test substances incorporated into soil.

1.4 Terrestrial plants range from annuals, capable of completing a life-cycle in as little as a few weeks, to long-lived perennials that grow and reproduce for several hundreds of years. Procedures to evaluate chemical effects on plants range from short-term measures of physiological responses (for example, chlorophyll fluorescence) to field studies of trees over several years. Research and development of standardized plant tests have emphasized three categories of tests: (*1*) short-term, physiological endpoints (that is, biomarkers); (*2*) short-term tests conducted during the early stages of plant growth with several endpoints related to survival, growth, and development; and (*3*) life-cycle toxicity tests that emphasize reproductive success.

1.5 This guide is arranged by sections as follows:

Section	Title
1	Scope
2	Referenced Documents
3	Terminology
4	Summary of Phytotoxicity Tests
5	Significance and Use
6	Apparatus
7	Test Material
8	Hazards
9	Test Organisms
10	Sample Handling and Storage
11	Calibration and Standardization
12	Test Conditions
13	Interference and Limitations
14	Quality Assurance and Quality Control
15	Calculations and Interpretation of Results
16	Precision and Bias

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1193 Specification for Reagent Water[2]

D 4547 Practice for Sampling Waste and Soils for Volatile Organics[3]

D 5633 Practice for Sampling with a Scoop[3]

E 1598 Practice for Conducting Early Seedling Growth Tests[4]

E 1733 Guide for Use of Lighting in Laboratory Testing[3]

2.2 *Code of Federal Regulations Standard:*

CFR 49 [5]

[1] This guide is under the jurisdiction of ASTM Committee E47 on Biological Effects and Environmental Fate and is the direct responsibility of Subcommittee E47.02 on Terrestrial Assessment and Toxicology.

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[2] *Annual Book of ASTM Standards*, Vol 11.01.

[3] *Annual Book of ASTM Standards*, Vol 11.04.

[4] *Annual Book of ASTM Standards*, Vol 11.05.

[5] Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111–5094, Attn: NPODS.

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