Overview

The use of plants to assess environmental risk is a budding science that has only recently gained the attention of scientists. Although terrestrial plant studies have been used for decades to evaluate the efficacy of potential herbicides, it was not until 1982 that the Office of Pesticide Programs, U.S. Environmental Protection Agency (EPA) published a guideline to evaluate the hazard of pesticides on nontarget plants as part of a Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulation. After nearly a decade of use, these guidelines are still being refined, and steps to conduct studies under field conditions have been initiated. In 1987 the U.S. Federal Drug Administration (FDA) published guidelines to assess environmental risk including two plant bioassay guidelines. In 1985 the U.S. EPA Toxic Substance Control Act (TSCA) seedling test guidelines were published in the *Federal Register*, and in 1984 the current Organization for Economic Cooperation and Development (OECD) terrestrial plant guidelines were published. As can be seen from these recently published guidelines for testing plants, there are numerous differences, often requiring a laboratory to repeat studies to satisfy two or more agencies. This symposium, the Second Symposium on Use of Plants for Toxicity Assessment, focused on some of these issues, in addition to many others relative to the value of using plants to assess environmental risk.

As did the first symposium (Atlanta, Georgia, 1989), the second symposium provided a forum to promote (1) the gathering and dissemination of information, (2) the development of standard practices to assess the impact of chemicals and other xenobiotics upon the plant communities, and (3) the use of plants for toxicity assessment.

The Second Symposium on Use of Plants for Toxicity Assessment was sponsored by ASTM Committee E-47 on Biological Effects and Environmental Fate and its Subcommittee E-47.11 on Plant Toxicology and was held in San Francisco, California, on 23–24 April 1990. The symposium attracted more than 100 researchers from Canada, Denmark, France, Germany, India, the United Kingdom, and the United States. Scientists from academia, industry, consulting laboratories, and governments were represented. The attendees' backgrounds included ecotoxicology, biochemistry, statistics, ecology, plant physiology, and genetics, to name only a few. The platform and poster sessions included a wide range of topics on the use of higher and lower plants for assessing pollution in freshwater, marine environments, air, soil, and water. Themes covered many aspects of ecotoxicology as well as genotoxicology. The plant miniworkshop held toward the end of the second symposium focused on the FDA and OECD seedling test guidelines and some of the associated difficulties in performing these studies and interpreting the results.

The papers indicated the need to eliminate differences and to focus on standardizing bioassays to evaluate the impact of new and existing chemicals, and to evaluate the impact of fugitive emissions (e.g., cadmium and Halone 1211) on forests and trees.

This ASTM special technical publication is an outgrowth of the symposium. It contains 35 refereed papers divided into six groups: Regulatory Perspectives, Applications of Plant Bioassays/Photosynthesis, Xenobiotic Uptake by Plants, General Phytotoxicology, Biochemical and Genetic Applications, and New Approaches. John Fletcher of the University of Oklahoma presented the keynote speech, describing the need for more plant testing in an effort to curtail and avoid the further decline of plant life in threatened habitats such as the forests of central Europe. He also noted the need to review the current test guidelines to determine if they are economically and scientifically sound, and if the test results are

being interpreted accurately for the purpose of environmental protection.

The use of plants to assess the potential toxicity of chemicals in the air, water, and soil ecosystems has a promising future. In late November 1990, Environmental Research Laboratory (Corvallis, Oregon) of the EPA sponsored a three-day workshop to evaluate the current test guidelines. Several of the recommendations and priority research were concluded, including (1) designing and implementing field experiments and (2) improving the efficiency and validity of test protocols. Scientists are convinced that plants are an important component of our ecosystem and must be protected. Therefore, standardization of methods and participation by scientists worldwide are necessary to accomplish this task. As summed up in the EPA workshop, "One important observation was the need to eliminate differences in the test procedures between different regulatory authorities (e.g., OECD, FIFRA, TSCA, FDA, and CERCLA)." ASTM members certainly have a critical challenge to assist in this process of eliminating differences in guidelines. Another challenge facing many of the ASTM members is learning about and implementing the good laboratory practice standards (GLPs) that are required by these various government agencies. In addition, plant toxicology is evolving and new discoveries are continuously being made. Researchers in plant toxicology are strongly encouraged to continue their work in order to reach new heights.

The symposium committee thanks Tom Doane, Chairman of Committee E-47, for his support of this project; the authors, who contributed and shared their findings with the attendees; and the reviewers, whose time-consuming efforts and constructive comments resulted in much-improved papers. ASTM staff members are acknowledged for their assistance in organizing this symposium as well as their efforts in producing this publication. They include Dorothy Savini, Kathy Greene, Monica Siperko, and Rita Hippensteel.

The symposium committee would also like to acknowledge the efforts of Kenneth R. St. John, who acted as the representative from the ASTM Committee on Publications.

Joseph W. Gorsuch
Symposium Chairman and Editor
Eastman Kodak Company
Rochester, NY 14652-3617

William R. Lower
Symposium Co-Chairman and Editor
University of Missouri
Columbia, MO 65203

Michael A. Lewis
Symposium Co-Chairman
Battelle-Columbus Division
Columbus, Ohio 43201-2693

Shahbeg Sandhu
Symposium Co-Chairman
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Wuncheng (Woodrow) Wang
Symposium Co-Chairman
Illinois State Water Survey
Peoria, IL 61652