

Langhans, R.W., Tibbitts, T.W. (ed.): **Plant Growth Chamber Handbook**. - Iowa State University, Ames 1997. ISBN 0361-199X. 240 pp., USD 15.00 plus 3.00 shipping.

This book presents report of the project NCR-101 "Controlled Environment Technology and Uses". It is published by the Iowa Agriculture and Home Economics Experimental Station as Special Report 99 (North Central Regional Research Publication 340). Copies are available from Agriculture Information Services, 304 Curtiss Hall, Iowa State University, Ames, Iowa 50011-1050.

The handbook has been developed to pull together the known information for effective use of growth chambers for plant research. It should be a helpful guide for both operations and maintenance and for the purchase of new chambers. The book contains 15 chapters (plus Appendix) written by 27 scientists from the U.S.A. and Canada who have been involved in growth chamber research for many years and have met annually to discuss new technologies and problems in growth chamber research.

All chapters present more or less detailed summary of plant responses to conditions in the growth chambers, measurement methods and apparatuses, definitions and units, and bibliography. The first six chapters deal with environmental factors controlled in the growth chambers: radiation, temperature, humidity, carbon dioxide, air contaminants, and air movement. Chapter 1 dealing with radiation is the most extensive. The introductory summary of plant responses is devoted to photosynthesis (photosynthetically active radiation,  $C_3$  and  $C_4$  plants, chloroplast pigments, quantum efficiency) and photomorphogenesis (germination, flowering, photonastic movements, stem elongation, chloroplast development, *etc.*). Then, available sources of radiation with their spectrum, duration, and irradiance are presented together with conversion values (incandescent and fluorescent lamps, HID, LPS, mercury and xenon lamps, LEDs and microwave lamps). Chapter 2 deals with thermal environment (energy exchange, conduction, convection, latent heat transfer), temperature control (heating, cooling, sensing systems, programming temperatures, low-temperature chambers), and measurement of temperature (instruments, sensor location, leaf temperature measurement, data acquisition and storage). Humidity and  $CO_2$  concentration in growth chambers, mainly their fluctuations, and sources and sinks, are treated in Chapters 3 and 4. Special attention is paid to measurements of the two factors, including calibration of analysers, and analysis of measurement errors. Occurrence of air contaminants in the growth chambers, rarely reported in the literature, is discussed in Chapter 5. Different more or less toxic compounds were identified (cyclohexylamines, dibutylphthalate, mercury, xylene, ethylene, ethylene glycol), originating from caulking compounds and sealants, paints, tubings, ballasts, cooling systems, different plastics, containers, *etc.* Different symptoms found on plants are then reviewed (leaf bleaching and chlorosis, stunting of plants, cotyledon necrosis, downward curling and abscission of leaves, galls, or oedema). Chapter 6 is devoted to air movement, its effects on plants (temperature, gas exchange, mechanical stress), and its control within growth chambers. Chapters 7 and 8 deal with plant culture in solid media, and in hydroponics (media, containers, watering and water purification, nutrition, oxygen supply, algae and microbial controls, *etc.*). Plant physiological disorders, and pests and diseases occurring in the growth chambers are summarized in Chapters 9 and 10. Chapters 11 to 15 are mainly devoted to more technical problems of chamber design and construction (special use chambers, chamber maintenance, experimental design, *etc.*), and to guidelines for users of these facilities (writing chamber specifications, reporting experimental conditions). In the Appendix, growth requirements are summarized for different crops in extensive tables.

This useful book was focused toward researchers with little knowledge of growth chambers, but it is surely of value as a handbook of reference information for all growth chamber users. It is excellently edited, well produced, and is accompanied with a fairly detailed subject index.

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