

The Authors

James B. Sinclair is a professor of plant pathology in the Department of Crop Sciences, College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana—Champaign, Urbana (UIUC). Professor Sinclair received his B.Sc. degree from Lawrence University, Appleton, Wisconsin in 1951 and his Ph.D. in plant pathology from the University of Wisconsin, Madison in 1955. He held a postdoctoral appointment until 1956, when he accepted a position in the Department of Plant Pathology, Louisiana State University, Baton Rouge (LSU). At LSU he served as an Assistant Professor, Associate Professor, and then Professor until 1968. Also, he was Administrative Assistant to the Chancellor from 1966 to 1968. He joined the Department of Plant Pathology, UIUC, in 1968 as a professor of international plant pathology. He served as campus, and the all—University coordinator for the Illinois—Tehran Research Unit, 1974—78. Professor Sinclair has been a member of the UIUC International Soybean Program (INTSOY) team and consultant for soybean disease assessment and control for USAID and UN—FAO. He is co—author of *Basic Plant Pathology Methods and Principles of Seed Pathology*, both in their second edition; and the three editions of the *Compendium of Soybean Diseases*. He was named Interim Director, National Soybean Research Laboratory, UIUC, 1993-96.

Marcos Kogan is the Director of the Integrated Plant Protection Center (IPPC), Oregon State University, Corvallis. Professor Kogan received his B.Sc. degree from the Universidade Rural do Rio de Janeiro, Brazil in 1961, and his Ph.D. in entomology from the University of California, Riverside in 1969. He remained at UC—Riverside as a Research Associate for six months, then accepted a position as associate entomologist, Illinois Natural History Survey; Professor of entomology, Department of Entomology, School of Life Sciences and Professor of Agricultural Entomology, College of Agricultural, Consumer and Environmental Sciences, University of Illinois at Urbana—Champaign from 1969—1990. Dr. Kogan became Director, IPPC and Professor of Entomology, College of Agricultural Sciences, Oregon State University in 1991. His research interests include the theory and practice of IPM, particularly of grain legume insect pests, plant resistance to insects, plant/insect interactions, and the chemical ecology and nutrition of phytophagous insects. He has worked extensively in international cooperation on IPM.

Marshal D. McGlamery is a professor of weed science in the Department of Crop Sciences, College of Agricultural, Consumer, and Environmental Sciences, University of Illinois at Urbana—Champaign (UIUC). Professor McGlamery received his B.S. in 1956 and M.S. in 1958 from Oklahoma State University. He taught soils at Panhandle A&M College at Goodwell, Oklahoma from 1958 to 1960, and worked one year for Agri—Bizz Liquid Fertilizer in Lawrence, Kansas. He received his Ph.D. in weed science under F. W. Slife at UJUC in 1965. Since 1965, he has been extension agronomist and weed scientist at UIUC, serving as assistant professor, associate professor, and professor. He was Visiting Professor of Agronomy at the University of Minnesota in 1971—72, North Carolina State University in 1981, and the University of Arkansas in 1992. Professor McGlamery has taught the beginning weed science course at the University of Illinois since 1968. He received the UIUC Alpha Zeta Outstanding Teacher Award in 1985, and the UIUC Excellence in Off—Campus Teaching Award in 1988. Professor McGlamery has been a consultant to the UIUC International Soybean Program (INTSOY) on soybean weed control in India and Jamaica, and to the Consortium for Integrated Pest Control (CIPC) on integrated pest management in Barbados and Grenada. He served from 1975 to 1987 on the USDA—ES ECOP Pesticide Education Committee, working with US—EPA to establish and evaluate the National Pesticide Training and Certification Program.

Acknowledgements

The authors wish to thank Kelly Lock, Susan Mittlesteadt, and Carol Mathews (UIUC), who prepared the hard and disk copies of the manuscript, and to A. G. Hager, G. L. Hartman, H. W. Kirby, L. M. Wax, and R. J. Wynstra for reviewing the manuscript before publication.

Table of Contents

I. Introduction	1
A. Soybean in the world	1
B. World production of soybean	1
C. Soybean growth and development	1
D. Computer programs related to soybean pests	2
II. Principles of integrated pest management	5
A. Pest Identification	5
1. Diseases	5
2. Arthropods	6
3. Weeds	7
B. Principles of sampling	7
1. Diseases and nematode monitoring	7
2. Arthropod monitoring	7
3. Weed monitoring	8
C. Decision making	9
1. Economic injury level	10
2. Economic threshold	10
3. Pest status	10
D. Economic injury levels	11
1. EILs for diseases	11
2. EILs for arthropods	11
3. EILs for weeds	12
4. Practical uses of EILs	14
III. Major soybean pests of the world	15
A. Diseases	15
B. Arthropods	15
1. Injury affecting stand establishment	15
2. Injury during vegetative growth	15
3. Injury affecting flowers and pods	17
4. Injury to seeds in storage	18
C. Weeds	19
IV. Management tactics — implication of IPM programs	25
A. Introduction	25
B. Preventive tactics	26
1. Pest exclusion	26
2. Soybean resistance	26
a. Resistance to pathogens	26
b. Resistance to arthropods	26
c. Resistance to herbicides	28
3. Biological control tactics	28
a. Biological control of pathogens	28
b. Biological control of arthropods	28
c. Biological control of weeds	29
4. Cultural control tactics	29
V. Preemptive management tactics	31
A. Introduction	31
B. Pathogen management and fungicides	32
C. Bradyrhizobium inoculant and fungicides	33
D. Pathogen management and nematicides	34
E. Pathogen management and insecticides	34
F. Pathogen management and herbicides	34
G. Weed management and herbicides	34
VI. Remedial management tactics	37
A. Arthropod management and insecticides	37
B. Weed control	37
1. Cultural methods	37
2. Preemergence herbicides	37
3. Postemergence herbicides	38
4. Weed resistance to herbicides	38
5. Conservation tillage and weed control	38

VII.	Selected references	41
VIII.	Appendix 1	47