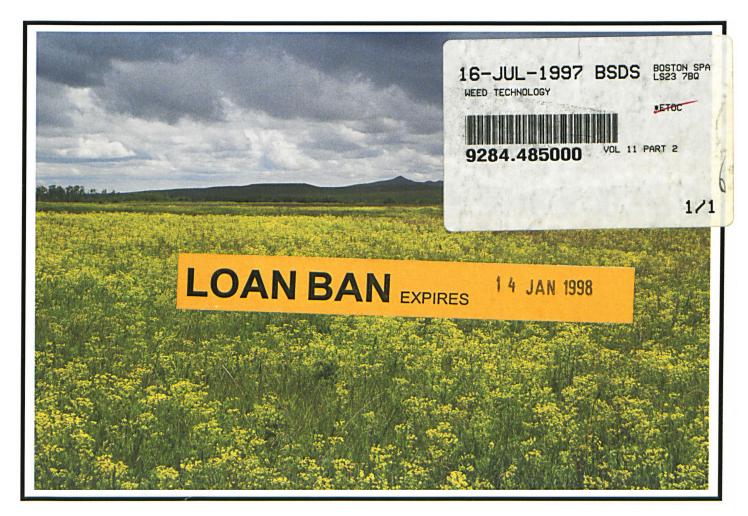




A Journal of the Weed Science Society of America

**VOLUME 11 APRIL-JUNE 1997 NUMBER 2** 



ISSN 0890-037X

WETEE9 11(2) 207-402 (1997)

# WEED TECHNOLOGY

#### A Journal of the Weed Science Society of America

Weed Technology, published quarterly beginning each January–March issue, is included along with Weed Science and WSSA Newsletter to Weed Science Society of America (WSSA) members. Annual membership costs \$75 with \$30 student affiliate memberships on a calendar year basis only.

Weed Technology subscriptions are \$75 per year (four issues per volume). New subscriptions begin with the January–March issue. Subscribers, including libraries and institutions, can obtain both Weed Science (volume of six issues per year) and Weed Technology for \$125 annually.

Changes of mailing address, inquiries about copies lost in the mail, and requests for back issues and for information about placing advertisements and about receiving journals, membership and subscriptions should be sent to WSSA, 810 East 10th Street, P.O. Box 1897, Lawrence, KS 66044-8897. Send dues by December 1 each year. Claims for copies lost in the mail must be received within 30 days (90 days foreign) of the issue date to insure replacement at no charge.

Send three copies of the manuscript to Sheila M. Rake, Managing Editor, Allen Press, Inc., 810 East 10th Street, Lawrence, KS 66044-8897 and one copy to Chester L. Foy, Editor, Weed Technology, Dept. of Piant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute and State Univ., 503 Price Hall, Blacksburg, VA 24061-0331. Directions for Contributors are published in each October-December Issue of *Weed Technology*. Authors are charged \$50 per page to cover a portion of publication costs. The Editor can exempt page charges in advance when justified.

Weed Technology (ISSN 0890-037X) is published by the Weed Science Society of America, 810 East 10th St., Lawrence, KS 66044-8897. Periodical postage paid at Lawrence, KS and at additional mailing offices. Copyright 1997 by the Weed Science Society of America. Printed in U.S.A. All rights reserved. Reproduction in part or whole is prohibited. POSTMASTER: Send address changes to WSSA, 810 East 10th Street, Lawrence, KS 66044-8897.

The Weed Science Society of America fully subscribes to the belief that progress in science depends upon the sharing of ideas, information, and materials among qualified investigators. Authors of papers published in *Weed Technology* are therefore encouraged, whenever practicable and when state and federal laws permit, to share genotypically unique propagative materials they might possess with other workers in that area who request such materials for the purpose of scientific research.

#### **WSSA OFFICERS**

Calvin G. Messersmith, President
F. Dan Hess, President Elect
James M. Chandler, Vice President
Stephen O. Duke, Past President
Jodie S. Holt, Secretary
Joan Dusky, Treasurer
Anne Légère, Editor-in-Chief
Horace D. Skipper, Chair,
Constitution and Operating Procedures



## Sustaining Members February 28, 1997

#### **PATRON**

American Cyanamid Company DuPon And Biral Products Griffe Sucception ISK Bioscience Company Monsanto Agricultural Company

#### CONTRIBUTING

AgrEvo USA Company
Bayer Corporation
Cenex/Land O'Lakes
Ciba-Geigy Corporation
Compliance Service Int'l., Inc.
FMC Corporation Ag Chem Group
Mycogen Corporation
Terra Chemical Int'l. Inc.

#### **ASSOCIATE**

**ABC Laboratories** Agri Business Group Agri-Growth Research Inc. Agvise Laboratories Allen Machine Works **ALMACO Company** American Agricultural Services The Andersons **Burch Company** CIRTA Concord Environmental Equipment Conviron Decagon Devices, Inc. Deere & Company Tech. Center **EPL Bio-Analytical Services** Farmland Industries **Gandy Corporation** Growmark Inc. Gylling Data Management Inc. HarvestMaster Inc. Heartland Technologies Inc. Kincaid Equipment Manufacture Corp. LI-COR Inc. MARATHON Ag/Environmental Nissan Chemical America Group PBI/Gordon Corporation R & D Sprayers, Inc. Research Options Inc. The Scotts Company Springborn Laboratories Inc. Stewart Agric. Research Services Stone Environmental Inc. Uniroyal Chemical Company United Agri Products Weed Systems Equipment, Inc. Wintersteiger Inc.

April-June, 1997



Volume 11 Number 2

A Journal of the Weed Science Society of America

#### **Table of Contents**

## • Research ===

- Application Timing Affects Weed Control with Metolachlor Plus Atrazine in No-Till Corn (Zea mays). William G. Johnson, Michael S. Defelice, and Cheryl S. Holman
- 212 An Evaluation of Hydrophilic Polymers for Formulating the Bioherbicide Agents *Alternaria cassiae* and *A. eichhorniae*. Yasser M. Shabana, R. Charudattan, James T. Devalerio, and Mohamed A. Elwakil
- Weed Management in Cotton (Gossypium hirsutum) with Soil-Applied and Post-Directed Herbicides.

  John W. Wilcut, David L. Jordan, William K. Vencill, and John S. Richburg, III
- 227 Sicklepod (Senna obtusifolia) and Entireleaf Morningglory (Ipomoea hederacea var. integriuscula)
  Management in Soybean (Glycine max) with Flumetsulam. Katherine M. Jennings, Alan C. York,
  Roger B. Batts, and A. Stanley Culpepper
- Carrot (*Daucus carota*) and Weed Response to Linuron and Metribuzin Applied at Different Crop Stages. Robin R. Bellinder, Jonathan J. Kirkwyland, and Russell W. Wallace
- 241 Common Cocklebur (*Xanthium strumarium*) Resistance to Selected ALS-Inhibiting Herbicides. Christy L. Sprague, Edward W. Stoller, and Loyd M. Wax
- The Effect of Phenological Stage on Detectability of Yellow Hawkweed (*Hieracium pratense*) and Oxeye Daisy (*Chrysanthemum leucanthemum*) with Remote Multispectral Digital Imagery. Lawrence W. Lass and Robert H. Callihan
- 257 Efficacy and Economics of Cultivation for Weed Control in Potato (Solanum tuberosum). Charlotte V. Eberlein, Paul E. Patterson, Mary J. Guttieri, and Jeffrey C. Stark
- 265 Leafy Spurge (Euphorbia esula) Control with Quinclorac. Brian D. Kuehl and Rodney G. Lym
- 270 Control of Sulfonylurea-Resistant Kochia (Kochia scoparia). Dennis J. Tonks and Philip Westra
- 277 Downy Brome (Bromus tectorum) Control in Established Alfalfa (Medicago sativa). Robert G. Wilson
- 283 Influence of Application Timing on the Efficacy of Reduced Rate Postemergence Herbicides for Wild Oat (Avena fatua) Control in Spring Barley (Hordeum vulgare). Robert N. Stougaard, Bruce D. Maxwell, and Jerry D. Harris
- Influence of Emulsifiable Oils and Emulsifier on the Performance of Phenmedipham, Metoxuron, Sethoxydim, and Quizalofop. Hans de Ruiter, Andre J. M. Uffing, and Esther Meinen

#### Cover

Leafy spurge (Euphorbia esula L.) infesting grassland on The Nature Conservancy's Pine Butte Swamp Preserve along the eastern front of the Rocky Mountains west of Choteau, MT. Leafy spurge is an extremely aggressive invader of native grassland and is especially severe from the eastern Plains in Minnesota and Iowa west. This photo was submitted by John M. Randall, The Nature Conservancy, Wildland Weed Management and Research, Section of Plant Biology, University of California, Davis, CA 95616.

<sup>•</sup> Peer reviewed papers.

- 298 Varying Surfactant Type Changes Quizalofop-P Herbicidal Activity. Jerry M. Green
- 303 Response of BAR-Transformed Rice (Oryza sativa) and Red Rice (Oryza sativa) to Glufosinate Application Timing. Sujatha Sankula, Michael P. Braverman, and Steven D. Linscombe
- 308 Changes in the Weed Species Composition of the Southern United States: 1974 to 1995. Theodore M. Webster and Harold D. Coble
- 318 Application of Sand for Inhibition of Swamp Dodder (Cuscuta gronovii) Seedling Emergence and Survival on Cranberry (Vaccinium macrocarpon) Bogs. Hilary A. Sandler, Mary Jane Else, and Michael Sutherland
- 324 Rimsulfuron and Metribuzin Efficacy in Transplanted Tomato (Lycopersicon esculentum). John A. Ackley, Henry P. Wilson, and Thomas E. Hines
- 329 Economics and Efficacy of Postemergence Spurred Anoda (Anoda cristata) Control in Pinto Beans (Phaseolus vulgaris). Mark J. VanGessel and Phil Westra
- Weed Management in No-Tillage Bromoxynil-Tolerant Cotton (Gossypium hirsutum). A. Stanley Culpepper and Alan C. York
- 346 Imazethapyr, Alone or with Other Herbicides for Weed Control During Alfalfa (Medicago sativa) Establishment. A. Lloyd Darwent, Dan Cole, and Najib Malik
- Influence of Application Variables on Efficacy of Glyphosate. David L. Jordan, Alan C. York, James L. Griffin, Patrick A. Clay, P. Roy Vidrine, and Daniel B. Reynolds
- 363 "Acceptable" Levels of Spotted Knapweed (Centaurea maculosa) Control. Roger L. Sheley and James S. Jacobs
- 369 The Persistence of Trifluralin Resistance in Green Foxtail (Setaria viridis) Populations. Todd S. Andrews and Ian N. Morrison
- 373 Quackgrass (*Elytrigia repens*) Control in Corn (*Zea mays*) with Nicosulfuron and Primisulfuron. Joseph A. Bruce and James J. Kells
- 379 Rice (Oryza sativa) Response to Soil Residues of Selected Herbicides. David L. Jordan, Daniel B. Reynolds, and Stephen H. Crawford

#### 

384 Classification of Herbicides by Site of Action for Weed Resistance Management Strategies. E. James Retzinger, Jr. and Carol Mallory-Smith

## • Intriguing World of Weeds \_\_\_\_\_

394 Common Purslane (Portulaca oleracea). Larry W. Mitich

## • Technology Notes

- 398 News Notes of General Weed Science Interest
- 401 Schedule of Dates and Events

EDITOR
Chester L. Foy

TECHNICAL EDITOR Leanne D. Mitchell

MANAGING EDITOR Sheila M. Rake

ASSOCIATE EDITORS

Randy L. Anderson
Philip A. Banks
Prasanta C. Bhowmik
Douglas Buhler
Robert H. Callihan
William W. Donald
Jerry M. Green

John Masiunas
Robert Masters
Patrick McMullan
Robert F. Norris
Thomas F. Peeper
William H. Vanden-Born

K. Neil Harker Leslie Weston
George Kapusta Gail Wicks
Mary L. Ketchersid John Wilcut

Malcolm D. Devine, Ex Officio Chair, Reviews of Weed Science Committee

#### Accessing Your New WSSA Business Office

Memberships, subscriptions, address changes, missing journal issues, single journal issue and back issue orders, reprints, color plates and page charge payments, ordering special publications: WSSA Business Office, 810 East 10th St., P.O. Box 1897, Lawrence, KS 66044-8897 [phone: 1-800-627-0629 (U.S. and Canada), 913-843-1235; fax: 913-843-1274; e-mail: wssa@allenpress.com]. Executive Secretary: John Breithaupt (jbreith@allenpress.com); Business Manager: Gina Black (gblack@allenpress.com).

#### Directions for Contributors to Weed Science

Send two copies of the manuscript and all illustrations to Sheila M. Rake, Managing Editor, Allen Press, 810 East 10th St., P.O. Box 1897, Lawrence, KS 66044-8897 and one copy to R. L. Zimdahl, Editor, Weed Science, Weed Research Laboratory, Colorado State University, Fort Collins, CO 80523. In the accompanying cover letter to R. L. Zimdahl provide: 1) the corresponding author's name and telephone number, b) three stick-on labels showing the name and address of the corresponding author, c) the category that best describes the paper's content: Weed Management; Physiology, Chemistry, and Biochemistry; Weed Biology and Ecology; Soil, Air, and Water; or Special Topic, and d) a brief list of names, addresses, phone numbers, fax numbers, and e-mail addresses of suggested reviewers.

#### Directions for Contributors to Weed Technology

Send three copies of the manuscript and all illustrations to Sheila M. Rake, Managing Editor, Allen Press, Inc., 810 East 10th St., P.O. Box 1897, Lawrence, KS 66044-8897 and one copy to Chester L. Foy, Editor, Weed Technology, Dept. of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute and State Univ., 502 Price Hall, Blacksburg, VA 24061-0331. Please include the names, addresses, phone numbers, fax numbers, and e-mail addresses of suggested reviewers.



## Weed Science Society of America Membership Application

Name	
Employer	
Department	
Address	
City	
State/Zip/Country	
Phone (Office)	(Fax) (EMail)
% of Time devoted to Weed Science related activated	vities
Mark all of the appropriate areas of involvement:	
b) Administration/Management	g) Registration
a) Contract Research	h) Regulatory/Legal
c) Extension	i) Research
d) Graduate Student	j) Sales/Technical Services
e) Private Practice	k) Teaching
f) Products Development/R&D	l) Other
If appropriate, indicate areas of specialization:	
1) Agent	11) Non-cropland
2) Aquatic Weeds	12) Physiology
3) Application Technology	13) Plant Biotechnology/Genetics
4) Biological Control of Weeds	14) Residue Chemistry
5) Field Crops	15) Soil
6) Forage Crops	16) Specialists
7) Forestry	17) Sustainable Agriculture
8) Fruit and Vegetables	18) Toxicology
9) Integrated Pest Management	19) Turf/Ornamental
10) Modeling	20) Weed Biology/Ecology
Type of membership: Regular (\$75)	Student (\$30) (Advisor must sign)
	Advisor's Signature

#### Remit in U.S. funds to:

Weed Science Society of America

P.O. Box 1897, 810 East 10th St., Lawrence, KS 66044-8897. Ph: (800)627-0629 (U.S. and Canada), (913)843-1235; Fax: (913)843-1274; E-mail: wssa@allenpress.com