The Weed Science Society of America publishes original research and scholarship in the form of peer-reviewed articles in three international journals. *Weed Science* is focused on understanding "why" phenomena occur in agricultural crops. As such, it focuses on fundamental research directly related to all aspects of weed science in agricultural systems. *Weed Technology* focuses on understanding "how" weeds are managed. As such, it focuses on more applied aspects concerning the management of weeds in agricultural systems. *Invasive Plant Science and Management* is a broad-based journal that focuses not only on fundamental and applied research on invasive plant biology, ecology, management, and restoration of invaded non-crop areas, but also on the many other aspects relevant to invasive species, including educational activities, policy issues, and case study reports. Topics for *Weed Science* include the biology and ecology of weeds in agricultural, forestry, aquatic, turf, recreational, rights-of-ways, and other settings; genetics of weeds and herbicide resistance; chemistry, biochemistry, physiology and molecular action of herbicides and plant growth regulators used to manage undesirable vegetation, and the biology and ecology of weeds in agricultural, forestry, aquatic, turf, recreational, rights-of-ways, and other settings; genetics of weeds and herbicide resistance; ecology of cropping and non-cropping systems as it relates to weed management; biological and ecological aspects of weed control tools including biological agents, herbicide resistant crops, etc.; effects of weed management on soil, air, and water. Symposia papers and reviews are accepted. Consult the editor for additional information.

**Associate Editors (Assignment Year)**

Muthukumar V Bagavathiannan, Texas A&M, College Station, TX 77843 (2015)

Carlene Chase, Horticultural Sciences Department, University of Florida, Gainesville, FL 32611 (2016)

Bhagirath Singh Chauhan, Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Queensland, Australia (2014)

Sharon Clay, South Dakota State University Plant Science Department, Brookings, SD 57007 (2002)

Franc E. Dayan, USDA-ARS-NPURU, National Center for Natural Products Research, University, MS 38677 (2003)

Anita Dille, Kansas State University, Department of Agronomy, Manhattan, KS 66506 (2013)

Timothy Grey, Department of Crop and Soil Science, University of Georgia, Tifton, GA 31793 (2009)

Marie Jasieniuk, Department of Plant Sciences, University of California, Davis, CA 95616 (2016)

Prashant Jha, Montana State University, Bozeman, MT 59717 (2017)

Ramon Leon, Department of Crop and Soil Sciences, North Carolina State University, Raleigh, NC 27695 (2016)

Sara Martin, Ag Canada, Ottawa, Canada (2018)

Vijay Nandula, Mississippi State University, Delta Research & Extension Center, Stoneville, MS 38776 (2008)

Chris Preston, Australian Weed Management, University of Adelaide, PMB1, Glen Osmond, SA 5064, Australia (2003)

Neha Rana, Monsanto, Chesterfield, MO 63005 (2017)

Dean Riechers, Department of Crop Sciences, University of Illinois, Urbana, IL 61801 (2011)

Hilary Sandler, University of Massachusetts–Amherst Cranberry Station, East Wareham, MA 02538 (2008)

Steven Seefeldt, USDA-ARS, University of Alaska, Fairbanks, AK 99775 (2011)

Patrick J. Tranle, Department of Crop Sciences, University of Illinois, 360 ERML, Urbana, IL 61801 (2002)

Martin M. Williams II, USDA-ARS Global Change and Photosynthesis Research, Urbana, IL 61801 (2008)

Tracy Candelaria, Managing Editor

**Officers of the Weed Science Society of America**

http://wssa.net/society/bod/

*Weed Science* (ISSN 0043-1745) is an official publication of the Weed Science Society of America, 12011 Tejon Street, Suite 700, Westminster, CO 80234 (720-977-7940). It contains refereed papers describing the results of research that elucidates the nature of phenomena relating to all aspects of weeds and their control. It is published bimonthly, one volume per year, six issues per year beginning in January.

Membership includes online access to *Weed Science, Weed Technology, Invasive Plant Science and Management*, and the online *WSSA Newsletter*. Dues should be sent to WSSA, 12011 Tejon Street, Suite 700, Westminster, CO 80234 no later than December 1 of each year. Membership in the society is on a calendar-year basis only.

New subscriptions and renewals begin with the first issue of the current volume. Please visit the *Weed Science* subscription page at https://www.cambridge.org/core/journals/weed-science/subscribe; Email: subscriptions_newyork@cambridge.org in USA, journals@cambridge.org outside USA.

*Weed Science* publishes six times a year in January, March, May, July, September, and November. Annual institutional electronic subscription rates: US $453.00; UK £315.00. Please use Editorial Manager to access manuscript submissions (http://www.editorialmanager.com/ws). Authors are asked to pay $65 per page as a portion of the cost of publication, plus an additional processing charge of $55 per manuscript if none of the authors are WSSA members. The Editor can make exceptions in advance when justified.

The Weed Science Society of America fully endorses the belief that progress in science depends upon the sharing of ideas, information, and materials among qualified investigators. Authors of papers published in *Weed Science* 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 the area who request such materials for the purpose of scientific research.

*Weed Science* published by the Weed Science Society of America.

Copyright 2019 by the Weed Science Society of America.

All rights reserved. Reproduction in part or whole prohibited.

---

**On the Cover:**

Cover photo from cover crop experiment on horseweed (*Erigeron canadensis*) control. Inset on left shows *E. canadensis* in rye-radish plots and the one on the right shows *E. canadensis* in control plot. Photos by John Wallace.

https://doi.org/10.1017/wsc.2019.11 Published online by Cambridge University Press
Research to very-long-chain fatty-acid (VLCFA)-inhibiting herbicides in multiple field-selected rigid ryegrass (*Lolium rigidum*) populations. *David J. Brunton, Peter Boutsalis, Gurjeet Gill and Christopher Preston* .............................................................................................................................................................. 267


Target site–based penoxsulam resistance in barnyardgrass (*Echinochloa crus-galli*) from China. *Jiapeng Fang, Tingting Liu, Yuhua Zhang, Jun Li and Liyao Dong* .................................................................................................................................................................................................................. 281

Variation in tolerance mechanisms to fluazifop-P-butyl among selected zoysiagrass lines. *Wenwen Liu, Gregory E. MacDonald, J. Bryan Unruh, Kevin E. Kenworthy, Laurie E. Trembol and Ramon G. Leon* .......................................................................................................................................................................................................................... 288

Survey of glyphosate-, atrazine- and lactofen-resistance mechanisms in Ohio water hemp (*Amaranthus tuberculatus*) populations. *Brent P. Murphy, Alvaro S. Larran, Bruce Ackley, Mark M. Loux and Patrick J. Tran* .................................................................................................................................................................................................................. 296

Response of weedy rice (*Oryza* spp.) germplasm from Arkansas to glyphosate, glufosinate, and flumioxazin. *Swati Shrestha, Gourav Sharma, Nilda Roma Burgos and Te-Ming Tseng* .......................................................................................................................................................................................................................... 303

Shade avoidance cues reduce *Beta vulgaris* growth. *Thomas J. Schambow, Albert T. Adjesiwor, Louise Lorent and Andrew R. Kniss* .......................................................................................................................................................................................................................... 311

Composted manure and straw amendments in wheat of a rice–wheat rotation system alter weed richness and abundance. *Haiyan Zhang, Yicheng Sun, Yong Li, Guojun Sun, Fang Yuan, Min Han, Yunhui Duan, Zhong Ji, Rongsong Zhu, Jiahe Shen and Wei Ran* .......................................................................................................................................................................................................................... 318

Cover crop effects on horseweed (*Erigeron canadensis*) density and size inequality at the time of herbicide exposure. *John M. Wallace, William S. Curran and David A. Mortensen* .......................................................................................................................................................................................................................... 327

Divergent responses of leaf N:P:K stoichiometry to nitrogen fertilization in rice and weeds. *Xiao Sun, Jiuxin Guo, Shiwei Guo, Hui Guo and Shuijin Hu* .......................................................................................................................................................................................................................... 339

Nitrogen application after plant growth regulator herbicide drift reduces soybean growth and yield. *Brian Van de Stroet, Craig Reicks, Deepak Joshi, Sen Subramanian, David Clay and Sharon A. Clay* .......................................................................................................................................................................................................................... 346

Soybean response to dicamba in irrigation water under controlled environmental conditions. *Cammy D. Willett, Erin M. Grantz, Jung Ae Lee, Matthew N. Thompson and Jason K. Norsworthy* .......................................................................................................................................................................................................................... 354