



2019

74th Annual Meeting

North Central Weed Science Society

www.ncwss.org

December 10 - 13, 2019

Hyatt Regency Columbus, OH

President's Welcome

2019 North Central Weed Science Society Meeting

Welcome to the 74th annual meeting of the North Central Weed Science Society (NCWSS) at the Hyatt Regency in Columbus, Ohio. I thank the NCWSS membership for the opportunity to serve as President in 2019. I recall the first NCWSS meeting I attended while still an undergraduate student at Southern Illinois University; to now serve as President almost 30 years later is a humbling honor. Our annual meeting remains a vital and vibrant opportunity for members to share their information while learning from others, to make new acquaintances while renewing old friendships, and for our students to experience a meaningful learning environment. I hope you will take all available opportunities to engage with others, and realize a sense of purposeful contentment upon the meeting's conclusion.

Dr. Mark Loux chairs the Local Arrangements Committee for this year's meeting. He and his committee have done an outstanding job with preparations to make our annual meeting a tremendous success. This committee largely functions behind the scenes but their efforts are absolutely essential for a successful meeting. When you see anyone from this year's Local Arrangements Committee, please take a moment to thank them for their dedicated service.

Stott Howard is your Program Chair for the 2019 annual meeting and I'm delighted with the excellent program he has assembled. In addition to an impressive listing of paper and poster presentations, Stott also has organized five symposia for members to attend, including: "Using R Studio for Visualization and Analysis of Weed Science Experiments," "The What, How, and Why of Dicamba Tank Clean-Out," "Improving the Relevance of the NCWSS in Industry," "Cover Crops: an Ecological Tool for Weed Management," and "Invasive Plant," a special addition to the meeting organized by MIPN and Ohio Invasive Plant Council that will begin following the conclusion of the regularly scheduled NCWSS program. Symposia are great learning opportunities that require a tremendous amount of time and effort to organize and I encourage the membership to attend one or more of these as your schedule allows.

Several committee meetings are scheduled throughout the conference, and I welcome your participation and input. These meetings are open to all NCWSS members and your help and ideas are very important in helping to guide the future of our society. Please see the program for committee times and meeting rooms.

Also, I take the opportunity to thank the Sustaining Members of our Society. The generous support of our Sustaining Members helps defray the costs of our annual meeting and other activities throughout the year.

The NCWSS is an organization that functions with volunteers. I always have been impressed by the willingness of the membership to voluntarily serve in numerous capacities for the benefit of this Society. I urge all who volunteer their time and talents to take a measure of pride in your accomplishments, and likewise encourage all members to become even more involved with our Society. Our membership is diverse in many ways, yet we remain united in our efforts to advance the discipline of weed science.

Again, I thank the NCWSS for the opportunity to serve as President and I wish everyone a safe and productive meeting experience.

Aaron Hager, President

Conference Headquarters

All sessions of the conference and the meeting events will be held at the Hyatt Regency Columbus, 350 North High Street, Columbus, OH 43215; Phone 614-463-1234.

Registration Hours

The registration desk is at the **County Foyer**, and will be open Tuesday 4 to 6:30 pm, Wednesday 7:30 am to 4 pm, Thursday 8 to 11 am and 2 to 4 pm, Friday 8 to noon.

Meeting Rooms

All sessions and meetings will be in the Greater Columbus Convention Center attached to the hotel. Additional meetings may be arranged any time during the conference by contacting Mark Loux, Local Arrangements Chair.

Proceedings

2019 NCWSS Proceedings will be available following the meeting online at the NCWSS website. Hard copies of the Proceedings may be ordered from Curran Associates (<http://www.proceedings.com/>).

Sustaining Members

Sustaining members that have made prior arrangements with the Industry Chair may put up a display in the Franklin Foyer. No other displays are allowed.

Health and Safety

Smoking is allowed in designated areas only.

Please contribute to conference environment in which diverse attendees may learn, network and enjoy the company of colleagues in a professional and harassment-free atmosphere.

Please keep your personal belongings with you at all times.

No photographs or videos

Do not take pictures or videos of any presentations without prior permission from the presenter. Many presentations will be available online after the conference, by those that agreed to upload pdf versions of their presentations.

NCWSS Mobile Meeting App – Crowd Compass

The 74th Annual Meeting Program has its own mobile app. Get started by downloading the **Attendee Hub** App in your mobile app store.

1. Open the invitation in your inbox. Tap **Verify Account**.
2. Tap **Open App**. to complete the verification via your brand new mobile app.

If you're signing up for an account:

1. From the event homescreen, tap the hamburger icon at the top left of the screen.
2. Tap **Log in for more features!**
3. Enter your first and last name and tap **Next**.
4. Enter your email.
5. We'll send you an email to verify your account. We just want to make sure it's you.
6. Open your email to find your verification code.
7. Return to the app and enter the four-digit code to finish logging in.

Meetings of the Society 2019

Board of Directors

Tuesday, 1:00 pm

Morrow

Friday, 10:30 am

Morrow

Local Arrangements

Tuesday, 12:00 pm

Clark

Poster Session Setup

Tuesday, 1:00 pm

Union Ballroom

Meal Functions

Breaks

Wednesday, 9:15 – 10:00 am

Union Ballroom

Wednesday, 3:00 – 3:30 pm

Union Ballroom

Thursday, 10:00 – 10:30 am

Union Ballroom

Thursday, 3:00 pm – 3:30 pm

Union Ballroom

Student Mixer and Quiz Bowl

Sponsored by BASF Corporation – Open to all attendees

Tuesday, 6:30 – 9:30 pm

Franklin

Student Luncheon/Business Meeting

Sponsored by Corteva Agriscience – Open to all students

Wednesday, 12:00 – 1:15 pm

Fairfield

Women in Weed Science Networking Breakfast

Open to all women

Thursday, 6:30 – 8:00 am

Delaware AB

Society Awards Luncheon

Thursday, 12:00 – 1:15 pm

Delaware

Society Social and Contest Awards

Sponsored by Sustaining Members – Open to all

Thursday, 5:30 – 7:00 pm

Delaware

Industry Breakfast (Cost \$45)

Friday, 7:00 – 8:15 am

Union Ballroom

Meetings of the Society 2019

The following meetings will take place for conducting the business of each respective committee and to elect a new Vice Chair to serve as Chair in 2022. Most meetings are open to members. Please see the committee chair or attend the committee meeting if you are interested in serving the society by being a committee member.

NCWSS Committee Meetings

Program

Tuesday, 7:30 pm (*section moderators*) Fayette

Communications Working Group

Tuesday, 5:00 pm Knox

Strategic Planning

Tuesday, 5:30 pm Morrow

Distinguished Achievement Award

Wednesday, 12:00 pm Madison

Paper Judges

Wednesday, 7:15 am Madison

Thursday, 11:30 am Madison

Poster Judges

Wednesday, 7:15 am Marion

Thursday, 11:30 am Marion

Finance, Steering & Policy

Wednesday, 5:15 pm Fayette

Future Site Selection

Wednesday, 5:15 pm Marion

Nominating

Wednesday, 5:15 pm Madison

Resident Education, Summer Contest and

Contest Rules Joint meeting

Wednesday, 5:15 pm Morrow

Extension

Thursday, 5:00 pm Morrow

NCWSS Fellow

Thursday, 5:00 pm Knox

Resolutions & Necrology

Thursday, 5:00 pm Fayette

Industry

Friday, 10:15 am Franklin AB

Meetings of the Society 2019

Program Section Business Meetings

Poster Session I

Wednesday, 8:00 am Union Ballroom

Equipment and Application Methods

Wednesday, 4:30 pm Franklin AB

Agronomic Crops I (Corn)

Wednesday, 5:00 pm Delaware AB

Poster Session II

Wednesday, 5:30 pm Union Ballroom

Herbicide Physiology

Wednesday, 5:30 pm Franklin CD

Agronomic and Specialty Crops

Thursday, 11:15 am Franklin D

Invasive Weeds, Rangeland and Vegetation Management

Thursday, 2:30 pm Franklin D

Weed Biology, Ecology & Management

Thursday, 3:00 pm Franklin C

Agronomic Crops II (Soybeans)

Thursday, 5:30 pm Franklin AB

Extension

Thursday, 5:00 pm Morrow

Symposia

Using RStudio for Visualization and Analysis of Weed Science Experiments

Wednesday, 1:15 – 5:30 pm Delaware CD

Cover Crops: An Ecological Tool for Weed Management

Thursday, 8:00 – 11:45 am Fairfield

The What, How, and Why of Dicamba Tank Clean Out

Thursday, 1:30 – 3:15 pm Fairfield

Improving the Relevance of the NCWSS to Industry

Thursday, 3:00 – 5:00 pm Franklin D

What's New in Industry?

Friday, 8:30 – 10:15 am Franklin AB

Invasive Plants

Friday, 9:00 – 3:00 pm Franklin CD

Condensed Program – NCWSS 2019

Tuesday, December 10

1:00 – 5:00	Board of Directors	Morrow
1:00 – 9:00	Poster Setup	Union Ballroom
6:30 – 9:30	Student Mixer and Quiz Bowl	Franklin

Wednesday, December 11

8:00 – 9:45	Poster Session I	Union Ballroom
10:00 – 12:00	NCWSS General Session	Delaware
12:00 – 1:15	Student Lunch	Fairfield
1:15 – 4:30	Equipment & Application Methods	Franklin AB
1:15 – 5:30	Using RStudio for Visualization and Analysis of Weed Science Experiments	Delaware CD
1:15 – 5:15	Agronomic Crops I - Corn	Delaware AB
1:15 – 5:45	Herbicide Physiology	Franklin CD
5:30 – 6:30	Poster Session II	Union Ballroom

Thursday, December 12

6:30 – 8:00	Women in Weed Science Networking Breakfast	Delaware AB
7:00 – 5:00	Poster Viewing	Union Ballroom
8:00 – 11:30	Cover Crops: An Ecological Tool for Weed Management	Fairfield
8:00 – 11:30	Agronomic & Specialty Crops	Franklin D
8:00 – 11:45	Agronomic Crops II - Soybean	Franklin AB
8:00 – 11:45	Weed Biology, Ecology, Mgmt.	Franklin C
12:00 – 1:15	NCWSS Awards Luncheon	Delaware
1:30 – 2:45	Invasive Weeds, Rangeland and Vegetation Management	Franklin D
1:30 – 3:15	The What, How, and Why of Dicamba Tank Clean-Out	Fairfield
1:30 – 3:15	Weed Biology, Ecology, Mgmt.	Franklin C
1:30 – 5:15	Agronomic Crops II – Soybean	Franklin AB
3:00 – 5:00	Improving the Relevance of the NCWSS to Industry	Franklin D
5:30 – 7:00	Society Social & Contest Awards (<i>open to all attendees</i>)	Delaware

Friday, December 13

7:00 – 8:15	Industry Breakfast	Fairfield
8:30 – 10:15	What's New in Industry?	Franklin AB
9:00 – 3:10	Invasive Plants	Franklin CD
10:30 – 1:00	Board of Directors	Morrow

Poster Sessions

Room: Union Ballroom

Chairperson and Moderator: Kristin Rosenbaum

Poster Setup

Posters can be set up between 1:00 and 9:00 pm on Tuesday, December 10. All NCWSS posters will be on display on Wednesday, December 11 from 7:00 am until 6:30 pm and on Thursday, December 12 from 7:00 am until 5:00 pm. Posters must be removed by 5:00 pm on Thursday, December 12.

Students in the Poster Contest must be with their posters during the two Poster Sessions (I and II) on Wednesday for judging. Students in the poster contest are required to bring letter-sized copies of your posters to hand out.

Wednesday, December 11

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|----------------|--|
| 8:00 – 9:45 am | Poster Session I (non-contest authors present at odd numbered posters) |
| 5:30 – 6:30 pm | Poster Session II (non-contest authors present at even numbered posters) |

Poster Removal

All posters must be removed by 5:00 pm on Thursday, December 12.

NCWSS Sustaining Member Exhibitors

Wednesday & Thursday	Union Ballroom
Set up Tuesday afternoon.	

Program Symbols

- * Presenting Author
- † Paper or poster in the graduate and/or undergraduate student contest

Agronomic and Specialty Crops - Poster

†Determining Critical Period for Weed-Pumpkin

Competition. Lindsey M. Orphan*, S. Alan Walters, Karla L. Gage; Southern Illinois University-Carbondale, Carbondale, IL (1)

Control of Johnsongrass and Foxtails with Post-Emergence Herbicides in Yellow and White Popcorn Hybrids. Samantha D. Isaacson*; University of Nebraska-Lincoln, Lincoln, NE (2)

†Pollen Viability and Fruit Set in Tomato Exposed to Sublethal Rates of Dicamba and 2,4-D. Sarah E. Dixon*, Reid J. Smeda; University of Missouri, Columbia, MO (3)

Bicyclopyrone- Crop Safety and Weed Control in Minor Crops. Timothy L. Trower*¹, Larissa L. Smith², Eric Rawls³, Tom Beckett⁴, Gordon Vail⁴; ¹Syngenta, Baraboo, WI, ²Syngenta, King Ferry, NY, ³Syngenta, Vero Beach, FL, ⁴Syngenta, Greensboro, NC (4)

†Impact of Adjuvants on Rainfastness in Sugar Beets. Vinicius Velho*¹, David Mettler², Jeffrey A. Golus¹, Barbara Vukoja¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²Southern Minnesota Beet Sugar Cooperative, Renville, MN (5)

Integrating Cereal Rye for the Management of Glyphosate-Resistant Horseweed in Sugarbeet. Brian J. Stiles II*, Christy Sprague; Michigan State University, East Lansing, MI (6)

†Identification and Characterization of Chlorsulfuron-Tolerant Grain Sorghum (*Sorghum bicolor*). Balaji Aravindhan Pandian*, Sathishraj Rajendran, Vara Prasad P.V., Mithila Jugulam; Kansas State University, Manhattan, KS (7)

Inzen™ Sorghum Weed Control Programs with Zest™ WDG Herbicide. Joe Armstrong*¹, Jeffrey Krumm², Michael Lovelace³, David Saunders⁴; ¹Corteva Agriscience, Indianapolis, IN, ²Corteva Agriscience, Hastings, NE, ³Corteva Agriscience, Lubbock, TX, ⁴Corteva Agriscience, Johnston, IA (8)

†Screening of Industrial Hemp (*Cannabis sativa*) Tolerance to Corn and Soybean Herbicides. Haleigh J. Ortmeier-Clarke*, Maxwell C. Oliveira, Nicholas J. Arneson, Shawn Conley, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (9)

Agronomic Crops I - Corn

†Response of Corn to Low Doses of Paraquat and Fomesafen Using Different Carrier Volumes. Raquel B. Moreira*¹, Bruno C. Vieira¹, Benjamin P. Sperry², Dan Reynolds³, Jeffrey A. Golus¹, Ana Clara Gomes¹, J. Connor Ferguson³, Ulisses R. Antuniassi⁴, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²University of Florida, Gainesville, FL, ³Mississippi State University, Starkville, MS, ⁴UNESP, Sao Paulo, Brazil (10)

Systems Approach to Weed Control in Wisconsin Corn Production. Ryan DeWerff*, Sarah V. Striegel, Maxwell C. Oliveira, Nicholas J. Arneson, Daniel H. Smith, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (11)

Controlled Environment Bioefficacy Studies of Dicamba Herbicide in Dicamba-Tolerant Maize: Developing a Rating Scale to Quantify Herbicide Injury. Laura D. Barberis, Glennon J. Rogan, Daljit Singh*; Bayer Crop Science, Chesterfield, MO (12)

†Comparison of Herbicide Programs Applied PRE and/or POST for Weed Control in Corn. Adam Leise*¹, Carl Coburn², Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Bayer Crop Science, Gothenburg, NE (13)

Development of a Soilless Assay to Investigate Resistance to Preemergence Herbicides in Waterhemp (*Amaranthus tuberculatus*). Dylan R. Kerr*, Seth Strom, Aaron G. Hager, Dean E. Riechers; University of Illinois, Urbana, IL (14)

†Interactions of Clethodim and Dicamba on Glyphosate-Resistant Volunteer Corn Control. Daniel de Araujo Doretto*¹, Gabrielle de Castro Macedo¹, Pedro H. Alves Correa¹, Karina Beneton¹, Vitor M. Anunciato², Jeffrey A. Golus¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²FCA/UNESP, Botucatu, Brazil (15)

Control of Multiple Herbicide-Resistant Palmer Amaranth in Enlist E3™ Corn. Vipin Kumar*¹, Rui Liu¹, Isaac N. Effertz², Natalie K. Aquilina¹, Taylor Lambert¹, Phillip W. Stahlman¹; ¹Kansas State University, Hays, KS, ²Kansas State University, Manhattan, KS (16)

Control of Annual Ryegrass with Spring-Applied Herbicides Prior to Seeding Corn. Nader Soltani*, Christy Shropshire, Peter Sikkema; University of Guelph, Ridgetown, ON (17)

Agronomic Crops II – Soybeans

Use of Low Tunnels to Identify Chemical Factors Influencing Dicamba Movement. Timothy C. Rice*, Shaun M. Billman; University of Missouri, Columbia, MO (18)

†The Influence of Simulated Dew on Dicamba Volatility and Soybean Sensitivity. Matthew J. Osterholt*, Bryan G. Young; Purdue University, West Lafayette, IN (19)

Large-Scale Evaluation of Off-Target Movement of Dicamba in North America. Nader Soltani*¹, Maxwell C. Oliveira², Guilherme S. Alves³, Rodrigo Werle², Greg Kruger³, Jason K. Norsworthy⁴, Christy Sprague⁵, Bryan G. Young⁶, Dan Reynolds⁷, Peter Sikkema¹; ¹University of Guelph, Ridgetown, ON, ²University of Wisconsin-Madison, Madison, WI, ³University of Nebraska-Lincoln, North Platte, NE, ⁴University of Arkansas, Fayetteville, AR, ⁵Michigan State University, East Lansing, MI, ⁶Purdue University, West Lafayette, IN, ⁷Mississippi State University, Starkville, MS (20)

†Effects of Sublethal Doses of Dicamba in Combination with ACCase-Inhibiting Herbicides in Roundup Ready Soybean. Milos Zaric*, Guilherme S. Alves, Kasey P. Schroeder, Jeffrey A. Golus, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (21)

Growth and Sensitivity of Dicamba-Tolerant Soybean to Micro-Rates of 2,4-D. Stevan Z. Knezevic*, Jon Scott, Darko Jovanovic, Ivan B. Cuvaca; University of Nebraska-Lincoln, Lincoln, NE (22)

†Dicamba-Tolerant Soybean Dose-Response to Isoxaflutole Exposure. Karina Beneton*, Guilherme S. Alves, Daniel de Araujo Doretto, Arthur F. Teodoro Duarte, Ana Clara Gomes, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (23)

Yield of Dicamba-Tolerant Soybean as Influenced by Micro-Rates of 2,4-D. Stevan Z. Knezevic*, Jon Scott, Darko Jovanovic, Ivan B. Cuvaca; University of Nebraska-Lincoln, Lincoln, NE (24)

†Interactions of Tank-Mix Combinations Utilized in XtendFlex Herbicide Systems. Adam L. Constine*, Christy Sprague; Michigan State University, East Lansing, MI (25)

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Soybean Yields as Influenced by Ultra-Micro Rates of Dicamba: Hormesis or Not? Stevan Z. Knezevic*, Jon Scott, Darko Jovanovic, Ivan B. Cuvaca; University of Nebraska-Lincoln, Lincoln, NE (26)

†Extending Critical Time of Weed Removal in Dicamba-Tolerant Soybean with Residual Herbicides. Darko Jovanovic*, Stevan Z. Knezevic, Jon Scott, Ivan B. Cuvaca, Pavle Pavlovic, O. Adewale Osipitan; University of Nebraska-Lincoln, Lincoln, NE (27)

†Effect of Row Spacing and Herbicide Programs for Control of Glyphosate-Resistant Palmer Amaranth in Dicamba-Resistant Soybean in Nebraska. Shawn T. McDonald*¹, Parminder S. Chahal¹, Carl Coburn², Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Bayer Crop Science, Gothenburg, NE (28)

Control of Glyphosate-Resistant Palmer Amaranth in Isoxaflutole/Glufosinate/Glyphosate-Resistant Soybean. Jasmine M. Mausbach*¹, Amit J. Jhala¹, Suat Irmak¹, John Lindquist¹, Debalin Sarangi²; ¹University of Nebraska-Lincoln, Lincoln, NE, ²University of Wyoming, Laramie, WY (29)

†Effect of Application Timing of a Premix of Dicamba and Pyroxasulfone for Weed Control in Dicamba-Resistant Soybean. Ethann R. Barnes¹, Will Neels*¹, Kapler Brady², Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²BASF, Eagle, NE (30)

Yield and Yield Loss of Conventional Soybean as Influenced by 2,4-D. Ivan B. Cuvaca*, Jon Scott, Darko Jovanovic, Stevan Z. Knezevic; University of Nebraska-Lincoln, Lincoln, NE (31)

†Integrated Weed Management in No-Till Dryland Soybeans with Row Spacing, Seeding Rates and Herbicides. Natalie K. Aquilina*¹, Vipin Kumar¹, Andrew Tucker², Rui Liu¹, Taylor Lambert¹; ¹Kansas State University, Hays, KS, ²Fort Hays State University, Hays, KS (32)

Conventional Soybean Growth and Sensitivity as Influenced by 2,4-D. Ivan B. Cuvaca*, Stevan Z. Knezevic, Darko Jovanovic, Jon Scott; University of Nebraska-Lincoln, Lincoln, NE (33)

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†Weed Management in Organic Soybeans Across Diverse Field Topographies. Kaleb A. Ortner*, Karen Renner, Dean Baas; Michigan State University, East Lansing, MI (34)

Effect of Growth Stage on Glyphosate-Tolerant Soybean Sensitivity to Micro-Rates of 2,4-D. Ivan B. Cuvaca*, Jon Scott, Darko Jovanovic, Stevan Z. Knezevic; University of Nebraska-Lincoln, Lincoln, NE (35)

†Soil Residual Activity of PRE-Emergence Soybean Herbicides in Wisconsin. Victor Hugo Vidal Ribeiro*¹, Maxwell C. Oliveira¹, Daniel H. Smith¹, Jose Barbosa dos Santos², Rodrigo Werle¹; ¹University of Wisconsin-Madison, Madison, WI, ²Federal University of Jequetinhonha and Mucuri, Diamantina, Brazil (36)

Glyphosate-Tolerant Soybean Yield Loss and Yield Response to Micro-Rates of 2,4-D as Influenced by Growth Stage. Ivan B. Cuvaca*, Stevan Z. Knezevic, Darko Jovanovic, Jon Scott; University of Nebraska-Lincoln, Lincoln, NE (37)

†Utilizing Cover Crops as a Form of Weed Suppression in Auxin-Resistant Soybeans. William G. Johnson, Connor L. Hodgskiss*; Purdue University, West Lafayette, IN (38)

Sensitivity of Glufosinate-Tolerant Soybean to Micro-Rates of 2,4-D. Jon Scott*, Stevan Z. Knezevic, Darko Jovanovic, Ivan B. Cuvaca; University of Nebraska-Lincoln, Lincoln, NE (39)

†Impact of Tank Mix Partner on Solution pH and Secondary Movement of Dicamba and 2,4-D. Sarah V. Striegel*¹, Nikola Arsenijevic², Maxwell C. Oliveira¹, Ryan DeWerff¹, Nicholas J. Arneson¹, Shawn Conley¹, David Stoltenberg¹, Rodrigo Werle¹; ¹University of Wisconsin-Madison, Madison, WI, ²University of Nebraska-Lincoln, North Platte, NE (40)

Yield and Yield Loss of Glufosinate-Tolerant Soybean as Influenced by 2,4-D. Jon Scott*, Stevan Z. Knezevic, Darko Jovanovic, Ivan B. Cuvaca; University of Nebraska-Lincoln, Lincoln, NE (41)

†Efficacy of Glyphosate and Glufosinate Applied Sequentially and in Combination. Reannen A. Kiley*¹, Mark Loux¹, Christy Sprague², Anthony F. Dobbels¹; ¹The Ohio State University, Columbus, OH, ²Michigan State University, East Lansing, MI (42)

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Comparison of Glufosinate and Glyphosate Sequential and Tank Mix Strategies for Weed Control in Soybeans Tolerant to Glufosinate and Glyphosate. Lisa M. Behnken*, Ryan P. Miller, Fritz R. Breitenbach; University of Minnesota Extension, Rochester, MN (43)

†Management of Glyphosate-Resistant Palmer Amaranth (*Amaranthus palmeri*) in 2,4-D

Choline/Glufosinate/Glyphosate-Resistant

Soybean. Chandrima Shyam*¹, Parminder S. Chahal², Mithila Jugulam¹, Amit J. Jhala²; ¹Kansas State University, Manhattan, KS, ²University of Nebraska-Lincoln, Lincoln, NE (44)

Does the Addition of Group 15 Herbicides Affect Soybean Response to Preplant Applications of Trifludimoxazin Plus Saflufenacil? Nicholas R. Steppig*¹, Derek M. Whalen², Bryan G. Young¹; ¹Purdue University, West Lafayette, IN, ²BASF Corporation, Seymour, IL (45)

†Comparison of Residual Waterhemp Control Using Group 15 Herbicides. Claudia R. Bland*¹, Cristin Weber², Brent S. Heaton¹, Mark L. Bernards¹; ¹Western Illinois University, Macomb, IL, ²Syngenta, Normal, IL (46)

Residual Horseweed Control in Soybean with Isoxaflutole and Clomazone. Anthony F. Dobbels*, Mark Loux; The Ohio State University, Columbus, OH (47)

†Control of Protoporphyrinogen Oxidase (PPO)-Inhibitor-Resistant Waterhemp in Dicamba-Resistant Soybean. Adam Striegel*¹, Neha Rana², Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Bayer Crop Science, St. Louis, MO (48)

Combining Cereal Rye and Herbicides for Horseweed Control. Dwight Lingenfelter*, John Wallace; Penn State, University Park, PA (49)

†Preemergence Applications of Mesotrione for Control of ALS-Resistant Giant Ragweed in Liberty-Link GT27 Soybean. Benjamin C. Westrich*, Bryan G. Young; Purdue University, West Lafayette, IN (50)

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Impact of Termination Timing of Cereal Rye Cover Crop on PRE-emergence Herbicide Residual Activity and Grain Yield in Food Grade Soybeans. Nicholas J. Arneson*, Nikola Arsenijevic, Shawn Conley, Brian Mueller, Damon Smith, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (51)

†Effect of Late Season Herbicide Applications on Seed Production of Glyphosate-Resistant Palmer Amaranth. Jose H. Scarparo de Sanctis*¹, Parminder S. Chahal¹, Vipin Kumar², Stevan Z. Knezevic¹, Amit J. Jhala²; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Kansas State University, Hays, KS (52)

Status of Herbicide-Resistant Tall Waterhemp in Iowa Corn and Soybean. Prashant Jha*, Ramawatar Yadav, Avery J. Bennett, Edward S. Dearden Jr., Ryan C. Hamberg, Iththiphonh A. Macvilay, James M. Lee, Damian D. Franzenburg; Iowa State University, Ames, IA (53)

†Evaluation of Spectral Response and Yield of Soybean Following Herbicide Injury. Eric G. Oseland*, Mandy Bish, Kevin Bradley; University of Missouri, Columbia, MO (54)

Equipment and Application Methods

Spray Solution Component Property Effects on Deposition Modeling with AgDisp. Jeffrey A. Golus*, Barbara Vukoja, Bruno C. Vieira, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (55)

Spray Drift Measurements from Various Applications in a Controlled Wind Speed Environment: Pseudo-Field Study Testing. Josh Arnold, Timothy E. Lane*, Frederick Salzman; Battelle, Columbus, OH (56)

†Potential Nozzles and Herbicides for a UAV Pesticide Application. Trenton Houston*¹, W. C. Hoffmann², Jeffrey A. Golus¹, Guilherme S. Alves¹, Barbara Vukoja¹, Bruno C. Vieira¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²Prology Consulting, College Station, TX (57)

Effect of Adjuvant Rates on Dicamba Physicochemical Properties and its Correlation with Droplet Size. Gabrielle de Castro Macedo*¹, Jesaelen G. Moraes¹, Vitor M. Anunciato², Glenn Obear³, Frank Sexton³, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²FCA/UNESP, Botucatu, Brazil, ³Exacto, Inc, Sharon, WI (58)

Posters 2019

†Influence of Adjuvants Associated with Glufosinate and Glyphosate Tank-Mixtures on Weed Control. Ely Anderson*¹, Jeffrey A. Golus¹, Bruno C. Vieira¹, Susan Sun², Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²Croda, Inc., Edison, NJ (59)

Extraction Procedures for Polyurethane Foam (PUF) Samples for Dicamba Analysis. John A. Williams*, Tom Mueller; University of Tennessee, Knoxville, TN (60)

†Weed Wiper Utility in Dicamba Tolerant Soybean. Madison D. Kramer*¹, Travis R. Legleiter²; ¹University of Kentucky, Lynn, IN, ²University of Kentucky, Princeton, KY (61)

Extension

Getting Rid of Weeds Through Integrated Weed Management. Claudio G. Rubione*, Mark J. VanGessel; University of Delaware, Georgetown, DE (62)

The Habits of Private Applicators in Laundering Pesticide-Contaminated Clothing. Lizabeth A. Stahl*¹, Tana M. Haugen-Brown², Lisa M. Behnken³, Ryan P. Miller³, David A. Nicolai⁴, Angie J. Peltier⁵, Jared J. Goplen⁶; ¹University of Minnesota, Worthington, MN, ²University of Minnesota Extension, Andover, MN, ³University of Minnesota Extension, Rochester, MN, ⁴University of Minnesota Extension, Farmington, MN, ⁵University of Minnesota Extension, Crookston, MN, ⁶University of Minnesota, Morris, MN (63)

†Comparison of Spray Drift Models Predicted by AgDisp with Field Applications Using Air Inclusion Nozzles. Barbara Vukoja*, Guilherme S. Alves, Jeffrey A. Golus, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (64)

Evaluation of Preemergence Herbicides and Mechanical Incorporation on Cover Crop Establishment in V5 Corn. Ryan P. Miller*¹, Lizabeth A. Stahl², Jared J. Goplen³, Lisa M. Behnken¹; ¹University of Minnesota Extension, Rochester, MN, ²University of Minnesota, Worthington, MN, ³University of Minnesota, Morris, MN (65)

Wisconsin Waterhemp Management Challenge: Showcasing the Value and Efficacy of Several Preemergence Soybean Herbicides. Daniel H. Smith*, Ryan DeWerff, Maxwell C. Oliveira, Nicholas J. Arneson, Richard Proost, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (66)

†Distribution of Glyphosate, ALS-Inhibitor and PSII-Inhibitor-Resistant Waterhemp Populations in Wisconsin. Felipe de Andrade Faleco*, David Stoltenberg, Mark Renz, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (67)

Herbicide Physiology & Molecular Biology

Limited Absorption and Translocation of ¹⁴C-glyphosate in Glyphosate-Resistant *Conyza sumatrensis*. Amanda dos Santos Souza*¹, Jéssica Ferreira Lourenço Leal¹, Ana Claudia Langaro¹, Vanessa Takeshita², Valdemar Luiz Tornisielo², Leonardo Oliveira Medici¹, Todd A. Gaines³, Camila Ferreira de Pinho¹; ¹Federal Rural University of Rio de Janeiro, Rio de Janeiro, Brazil, ²University of Sao Paulo, Sao Paulo, Brazil, ³Colorado State University, Fort Collins, CO (68)

†Recurrent Selection with Isoxadifen Decreases Control of *Echinochloa crus-galli* with Fenoxaprop-p-ethyl. Carlos Alberto G. Rigon*¹, Luan Cutti², Christian Menegaz², Aldo Merotto Jr², Todd Gaines¹; ¹Colorado State University, Fort Collins, CO, ²Federal University of Rio Grande do Sul, Porto Alegre, Brazil (69)

A Trio-Binning Approach to Genome Assembly: Obtaining Haploid Waterhemp and Smooth Pigweed Genomes. Darci Giacomini*¹, Jacob S. Montgomery¹, Bridgit Waithaka², Christa Lanz², Detlef Weigel², Patrick J. Tranel¹; ¹University of Illinois, Urbana, IL, ³Max Planck Institute of Developmental Biology, Tuebingen, Germany (70)

†Antioxidant Enzyme Activity in Rapid-Response 2,4-D-Resistant *Conyza sumatrensis*. Jéssica Ferreira Lourenço Leal*¹, Amanda dos Santos Souza¹, Junior Borella¹, Ana Claudia Langaro¹, Todd A. Gaines², Aroldo Ferreira Lopes Machado¹, Camila Ferreira de Pinho¹; ¹Federal Rural University of Rio de Janeiro, Rio de Janeiro, Brazil, ²Colorado State University, Fort Collins, CO (71)

Invasive Weeds, Rangeland, Pasture, and Vegetation Management

Comparison of Saflufenacil to Synthetic Auxins for Common Cocklebur and Common Ragweed Control in Cool-Season Grass Pastures. J.D. Green*, Eduardo Lago, Kendal Bowman; University of Kentucky, Lexington, KY (72)

Posters 2019

†Use of Acetic Acid for Spring Burndown of Select Annual Weeds. Emma L. Gaither*¹, H Vlieger², Shaun M. Billman¹, Timothy C. Rice¹, Reid J. Smeda¹; ¹University of Missouri, Columbia, MO, ²Vlieger Farm Supply, Inc., Maurice, IA (73)

Effects of GF-3731 on Weed Control, Productivity and Clover Cover in Rotationally Grazed Grass-Clover Swards. Jose Luiz Carvalho de Souza Dias*¹, Mark Renz¹, Scott Flynn²; ¹University of Wisconsin-Madison, Madison, WI, ²Corteva AgriScience, Lees Summit, MO (74)

Effect of Application Timing of Residual Herbicides on Waterhemp Control in Established Alfalfa. Jose Luiz Carvalho de Souza Dias*¹, Mark Renz¹, Roger Becker², Erin Burns³, John Wallace⁴; ¹University of Wisconsin-Madison, Madison, WI, ²University of Minnesota, Minneapolis, MN, ³Michigan State University, East Lansing, MI, ⁴Penn State, University Park, PA (75)

Evaluation of Options for Dormant Stem Brush Control. Joseph Omielan*; University of Kentucky, Lexington, KY (76)

Weed Biology, Ecology, Management

†Determining Single or Multiple Origins of Glyphosate Resistant *Kochia scoparia* by Comparison of EPSPS Sequence Duplication Across Populations. Todd A. Gaines¹, Eric L. Patterson², Andrea Dixon³, Crystal D. Sparks*¹, Karl Ravet¹, Philip Westra¹, Joel Felix⁴, Don W. Morishita⁵, Prashant Jha⁶, Andrew Kniss⁷; ¹Colorado State University, Fort Collins, CO, ²Michigan State University, East Lansing, MI, ³Rothamsted Research, Harpenden, England, ⁴Oregon State University, Ontario, OR, ⁵University of Idaho, Kimberly, ID, ⁶Iowa State University, Ames, IA, ⁷University of Wyoming, Laramie, WY (77)

†Regional Differences in Kochia Germination from the US Great Plains: Effect of Water Potential and Temperature. Ramawatar Yadav*¹, Prashant Jha², Andrew Kniss³, Nevin C. Lawrence⁴, Gustavo Sbatella⁵; ¹Iowa State University, Ames, IA, ²Iowa State University, Ames, IA, ³University of Wyoming, Laramie, WY, ⁴University of Nebraska-Lincoln, Lincoln, NE, ⁵University of Wyoming, Powell, WY (78)

Posters 2019

Influence of Soil and Residue Management on Herbicide Carryover and Subsequent Crop Development. Kolby R. Grint*¹, Rodrigo Werle¹, Christopher Proctor², Nicholas J. Arneson¹, Maxwell C. Oliveira¹, Daniel H. Smith¹; ¹University of Wisconsin-Madison, Madison, WI, ²University of Nebraska-Lincoln, Lincoln, NE (79)

†Management of Troublesome Weeds in XtendFlex® Soybean. Jesaelen G. Moraes*, Guilherme S. Alves, Jeffrey A. Golus, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (80)

†Effective Herbicide Programs for Controlling 2,4-D-Resistant Palmer Amaranth in Enlist E3™ Soybeans. Isaac N. Effertz*¹, Vipin Kumar², J. Anita Dille¹; ¹Kansas State University, Manhattan, KS, ²Kansas State University, Hays, KS (81)

Effect of Intercropping Winter Wheat with Soybean on Soybean Growth and Weed Control. Madison R. Decker*, Karla L. Gage, Ronald F. Krausz; Southern Illinois University-Carbondale, Carbondale, IL (82)

†Tolerance of Two Horseweed Growth Types to Glyphosate. John A. Schramski*, Christy Sprague, Eric L. Patterson; Michigan State University, East Lansing, MI (83)

†Response of Waterhemp Populations Collected from Five States to Dicamba and Glufosinate. Joe W. Ege*, Brian Dintelmann, William A. Tubbs, Eric G. Oseland, Mandy Bish, Kevin Bradley; University of Missouri, Columbia, MO (84)

Genetics of Dioecy in Waterhemp and Palmer Amaranth: An Update. Jacob S. Montgomery*, Darci Giacomini, Patrick J. Tranel; University of Illinois, Urbana, IL (85)

†Weed Control with Glufosinate Using Oil-Based Adjuvants. Estefania G. Polli*, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (86)

†Optimizing Respray Interval Using Only Glufosinate or Dicamba or 2,4-D for Control of Large Maretail or Waterhemp. Alexis L. Meadows*, Brent S. Heaton, Mark L. Bernards; Western Illinois University, Macomb, IL (87)

Posters 2019

Palmer Amaranth Adaptation to the Upper

Midwest. Madison Melms*¹, Maxwell C. Oliveira², Mark L. Bernards³, Amit J. Jhala⁴, Chris Proctor⁴, Strahinja Stepanovic⁵, Rodrigo Werle²; ¹University of Wisconsin-Platteville, Platteville, WI, ²University of Wisconsin-Madison, Madison, WI, ³Western Illinois University, Macomb, IL, ⁴University of Nebraska-Lincoln, Lincoln, NE, ⁵University of Nebraska-Lincoln, Grant, NE (88)

†Influence of Grain Sorghum Planting Dates and Palmer Amaranth Emergence Timings on Competitive

Outcomes. Lindsey Gastler*, J. Anita Dille; Kansas State University, Manhattan, KS (89)

†The Impacts of a Cereal Rye Cover Crop Planting Date, Seeding Rate and Herbicide Program on Management of Glyphosate-Resistant Horseweed in No-Till Soybeans. Alyssa Lamb*, Mark Loux, Alexander Lindsey, Anthony Dobbels; The Ohio State University, Columbus, OH (90)

Plant Community Response to Pasture Nutrient

Management Strategies. Sarah Lancaster*, Phillip Lancaster; Missouri State University, Springfield, MO (91)

†Use of Glufosinate, Glyphosate and 2,4-D Combinations for Weed Management. Ana Clara Gomes*, Gabrielle de Castro Macedo, Bruno C. Vieira, Jeffrey A. Golus, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (92)

†Predicting *Amaranthus palmeri* Emergence with Thermal Time Models. Theresa A. Reinhardt Piskackova*, S. Chris Reberg-Horton, Robert J. Richardson, Katherine M. Jennings, Ramon G. Leon; North Carolina State University, Raleigh, NC (93)

Horseweed Rosette Survival Over the Winter. Erin Haramoto*¹, Ryan J. Collins¹, J. Anita Dille², Karla L. Gage³, Reid J. Smeda⁴, Brent Sunderlage³; ¹University of Kentucky, Lexington, KY, ²Kansas State University, Manhattan, KS, ³Southern Illinois University-Carbondale, Carbondale, IL, ⁴University of Missouri, Columbia, MO (94)

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†Waterhemp Seed Production from Plants Damaged by Dicamba in a Soybean Field. Faith M. Duke*, Brent S. Heaton, Mark L. Bernards; Western Illinois University, Macomb, IL (95)

†Impact of Cover Crops on Early Season Weed Control and Nitrogen Availability in Corn. Malynda M. O'Day*, J. Anita Dille; Kansas State University, Manhattan, KS (96)

†Weed Control from Dicamba plus Glufosinate as Affected by Drift-reducing Adjuvants and Carrier Volume. Arthur F. Teodoro Duarte*, Guilherme S. Alves, Bruno C. Vieira, Kasey P. Schroeder, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (97)

Weed Species Diversity in Railroad Right-of-Ways. Andrew Osburn*, Mark Loux, Kent Harrison, Emilie Regnier; The Ohio State University, Columbus, OH (98)

†Cocklebur Emergence Under Cereal Rye Residue Before and After Residual Herbicide Application. Wyatt S. Petersen*, William G. Johnson; Purdue University, West Lafayette, IN (99)

†Comparative Emergence and Growth of *Amaranthus rudis* and *A. palmeri* in Iowa. Rebecca S. Baker*, Bob Hartzler; Iowa State University, Ames, IA (100)

If You Were a Waterhemp Plant, Where Would You Rather Be? Crop Canopy as an Effective SOA. Nikola Arsenijevic*, Ryan DeWerff, Nicholas J. Arneson, Maxwell C. Oliveira, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (101)

†Sequential Application of Dimethenamid-p for Control of *Amaranthus palmeri* in Dry Bean. Joshua W. Miranda*¹, Nevin C. Lawrence²; ¹University of Nebraska-Lincoln, Guatemala, Guatemala, ²University of Nebraska-Lincoln, Lincoln, NE (102)

†Physical and Allelopathic Weed Suppression by Cover Crops. Darian Decker*; Missouri State University, Springfield, MO (103)

Germination Characteristics of 2,4-D-Resistant and – Susceptible Palmer Amaranth Under Varying Temperature Conditions. Rui Liu*, Vipin Kumar, Phillip W. Stahlman; Kansas State University, Hays, KS (104)

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†Hybridization Between *Amaranthus tuberculatus* and *A. arenicola*. Brent P. Murphy*, Patrick J. Tranel; University of Illinois, Urbana, IL (105)

†Influence of Glufosinate and Dicamba in Tank-Mixtures on Weed Control. Pedro H. Alves Correa*¹, Gabrielle de Castro Macedo¹, Jesaelen G. Moraes¹, Vitor M. Anunciato², Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²FCA/UNESP, Botucatu, Brazil (106)

Wednesday, December 11, 2019

General Session

LOCATION: Delaware
TIME: 10:00 AM - 12:00 PM
CHAIR: Stott Howard

- 10:00 Graduate Student Video Contest Winners.** Travis R. Legleiter*; University of Kentucky, Princeton, KY (107)
- 10:20 POTUS and SCOTUS on WOTUS: Is Your Water Navigable?** Lee Van Wychen*; National and Regional Weed Science Societies, Alexandria, VA (108)
- 10:50 Keeping the Weed Management Toolbox Full: The Importance of Public-Private Partnerships.** Ed Anderson*; Iowa Soybean Association, Ames, IA (109)
- 11:20 Presidential Address.** Aaron G. Hager*; University of Illinois, Urbana, IL (110)
- 11:50 Remembering NCWSS Members and Friends.** Devin Hammer*; Bayer Crop Science, Clinton, WI (111)
- 11:55 Program Announcements**

Student Luncheon – Business Meeting

Sponsored by Corteva Agriscience – Open to all students
12:00 – 1:15 pm Fairfield

Equipment and Application Methods

LOCATION: Franklin AB
TIME: 1:15 PM - 4:30 PM
CHAIR: Marshall Hay

- 1:15 High Voltage Electricity for Weed Control.** Thomas J. Peters*, Richard Zollinger; North Dakota State University, Fargo, ND (112)
- 1:30 †Use of Pulse Width Modulation to Compare Carrier Volume and Dose Response on Soybean.** Raquel B. Moreira*¹, Bruno C. Vieira¹, Benjamin P. Sperry², Dan Reynolds³, Jeffrey A. Golus¹, Karina Beneton¹, Ulisses R. Antuniassi⁴, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²University of Florida, Gainesville, FL, ³Mississippi State University, Starkville, MS, ⁴UNESP, Sao Paulo, Brazil (113)
- 1:45 Evaluation of Air Induction Spray Nozzle Compatibility with Pulse-Width Modulation Nozzle Control Systems.** Nick J. Fleitz*¹, Brian Finstrom²; ¹Pentair Hypro, New Brighton, MN, ²Capstan, Topeka, KS (114)
- 2:00 †Herbicide Efficacy as Influenced by Nozzle for UAV Applications.** Trenton Houston*¹, W. C. Hoffmann², Jeffrey A. Golus¹, Bruno C. Vieira¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²Prology Consulting, College Station, TX (115)
- 2:15 †Herbicide Deposition and Coverage on Waterhemp (*Amaranthus rudis*) as Influenced by Spray Nozzle Design and Weed Density.** Madison D. Kramer*¹, Travis R. Legleiter²; ¹University of Kentucky, Lynn, IN, ²University of Kentucky, Princeton, KY (116)
- 2:30 Buffer Zone Width Effect on Spray Drift from Applications on Soybean and Corn Using an Air Induction Nozzle.** Guilherme S. Alves*, Bruno C. Vieira, Milos Zaric, Barbara Vukoja, Arthur F. Teodoro Duarte, Pedro H. Alves Correa, Kasey P. Schroeder, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (117)

Equipment and Application Methods
(continued)

- 2:45 Effect of Crosswind Shear in Production of Driftable Fine Droplets.** Steven A. Fredericks*, Andrea C. Clark, Lillian C. Magidow, Daniel C. Bissel, Lee A. Boles, Gregory K. Dahl, Elizabeth R. Alonzi, Joe V. Gednalske; Winfield United, River Falls, WI (118)
- 3:00 Coffee Break**
- 3:15 Assessment of Commercial Scale Dicamba and 2,4-D Drift Using Drift Reducing Adjuvants.** Ryan J. Edwards*, Steven A. Fredericks, Lillian C. Magidow, Gregory K. Dahl, Joe V. Gednalske, Mark A. Risley; Winfield United, River Falls, WI (119)
- 3:30 Adjuvants and Tank-Mix Products Influence the Performance of the New Dicamba and 2,4-D Herbicides.** Gregory K. Dahl*, Ryan J. Edwards, Joe V. Gednalske, Lillian C. Magidow; Winfield United, River Falls, WI (120)
- 3:45 †Optimal Herbicide and Timing for Control of Weeds Surviving Auxin Herbicides.** Tomas F. Delucchi*, Bryan G. Young, William G. Johnson; Purdue University, West Lafayette, IN (121)
- 4:00 †Importance of Sprayer Tank Clean-Out Following Dicamba Application.** Jerri Lynn Henry*¹, Reid J. Smeda¹, Jason W. Weirich²; ¹University of Missouri, Columbia, MO, ²MFA-Inc, Columbia, MO (122)
- 4:15 †Effect of Adjuvants Associated with Herbicide Tank-Mixtures on Weed Control.** Ely Anderson*, Jeffrey A. Golus, Bruno C. Vieira, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (123)
- 4:30 Business Meeting**

Agronomic Crops I - Corn

LOCATION: Delaware A/B
TIME: 1:15 AM - 5:15 PM
CHAIR: Debalin Sarangi

- 1:15 †Control of Glyphosate/Glufosinate-Resistant Volunteer Corn in Corn Resistant to Aryloxyphenoxypropionate.** Adam Striegel*¹, Nevin C. Lawrence¹, Stevan Z. Knezevic¹, Jeffrey Krumm², Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Corteva, Hastings, NE (124)
- 1:30 Control of Multiple-Herbicide-Resistant Waterhemp (*Amaranthus tuberculatus*) in Corn with Single- and Two-Pass Weed Control Programs.** Christian A. Willemse*; University of Guelph, Ridgetown Campus, Parkhill, ON (125)
- 1:45 †Investigating the Potential of Novel Synergistic Postemergence Tank Mixtures to Manage HPPD- and Atrazine-Resistant *Amaranthus tuberculatus* Populations.** Kip E. Jacobs*, Carrie J. Butts-Wilmsmeyer, Chance W. Riggins, Dean E. Riechers; University of Illinois, Urbana, IL (126)
- 2:00 Response of a Five-Way-Resistant Palmer Amaranth Population to Preemergence Applied Mesotrione and Atrazine.** Rui Liu*, Vipin Kumar, Taylor Lambert, Phillip W. Stahlman; Kansas State University, Hays, KS (127)
- 2:15 Influence of Adjuvants on the Control of Glyphosate-Resistant Canada Fleabane (*Conyza canadensis*) and Waterhemp (*Amaranthus tuberculatus*) in Corn with Tolpyralate.** Nicole M. Langdon*¹, Darren Robinson¹, Dave Hooker¹, Alan J. Raeder², Peter Sikkema¹; ¹University of Guelph, Ridgetown, ON, ²ISK Biosciences Inc., Concord, OH (128)
- 2:30 †Modelling Effectiveness of Preemergence Herbicides Used on Corn Across Varied Weather Conditions.** Christopher Landau*¹, Adam Davis¹, Aaron G. Hager¹, Nicholas F. Martin¹, Martin Williams²; ¹University of Illinois, Urbana, IL, ²USDA, Urbana, IL (129)

Agronomic Crops I – Corn (continued)

- 2:45 †Evaluating the Impact of Weed Competition and Water Stress on Corn Hybrids with Differing Drought Tolerance.** Allyson M. Rumler*, Erin Burns; Michigan State University, East Lansing, MI (130)
- 3:00 Coffee Break**
- 3:15 †Does Corn Silage Leaf Angle Modify the Critical Period of Weed Control in Alfalfa Interseeded with Corn?** Sarah A. Drumm*, Erin Burns; Michigan State University, East Lansing, MI (131)
- 3:30 †Interactions Between Cereal Rye and Residual Herbicides on Giant Ragweed and Grass Control in Corn.** Wyatt S. Petersen*, William G. Johnson; Purdue University, West Lafayette, IN (132)
- 3:45 †Impact of Cereal Rye Termination on Acetochlor Efficacy on Weed Control.** Lucas Oliveira Ribeiro Maia*, Wyatt Petersen, William G. Johnson; Purdue University, West Lafayette, IN (133)
- 4:00 The Bicyclopyrone Weed Control Advantage in a New Premix Product Concept for Corn.** Ryan Lins*¹, Scott Cully², Tom Beckett³, Gordon Vail³; ¹Syngenta Crop Protection, Rochester, MN, ²Syngenta, Marion, IL, ³Syngenta, Greensboro, NC (134)
- 4:15 BCS-720: A New Residual Herbicide Combination for Weed Management in Corn.** Mike Weber*¹, Mark Waddington², Eric Riley²; ¹Bayer CropScience, Indianola, IA, ²Bayer CropScience, St. Louis, MO (135)
- 4:30 Resicore® for PRE and POST Weed Control in Corn.** Kevin Johnson*¹, Kevin Hahn², Joe Armstrong³, David Saunders⁴; ¹Corteva Agriscience, Lafayette, IN, ²Corteva Agriscience, Bloomington, IL, ³Corteva Agriscience, Indianapolis, IN, ⁴Corteva Agriscience, Johnston, IA (136)
- 4:45 Introduction and Overview of MON 301107: A New Glyphosate Formulation.** Ross A. Recker*¹, Christopher M. Mayo², David J. Mayonado³, Robert F. Montgomery⁴, Gustavo G. Camargo¹; ¹Bayer, St. Louis, MO, ²Bayer, Gardner, KS, ³Bayer, Hebron, MD, ⁴Bayer, Union City, TN (137)
- 5:00 Business Meeting**

Herbicide Physiology & Molecular Biology

LOCATION: Franklin CD
TIME: 1:15 PM - 5:45 PM
CHAIR: Vipin Kumar

- 1:15 The Complexities of Glyphosate-Resistant Kochia at a Field Level Including Abiotic Stress**
Tolerance. Philip Westra*, Todd Gaines, Franck Dayan, Andrew Effertz, Crystal D. Sparks; Colorado State University, Fort Collins, CO (138)
- 1:30 New Insights into Target-Site and Non-Target-Site Resistance to Synthetic Auxin Herbicides.** Todd A. Gaines*¹, Marcelo Figueiredo¹, Olivia E. Todd¹, Neeta Soni¹, Eric L. Patterson², Anita Kuepper³, Chris Preston⁴, Cris Argueso¹, Anireddy Reddy¹, Philip Westra¹, Franck Dayan¹; ¹Colorado State University, Fort Collins, CO, ²Michigan State University, East Lansing, MI, ³Bayer CropScience, Hoechst, Germany, ⁴University of Adelaide, Glen Osmond, Australia (139)
- 1:45 †A Novel TIPT Double Mutation in EPSPS Conferring Glyphosate Resistance in Tetraploid *Bidens subalternans*.** Hudson K. Takano*, Philip Westra, Todd Gaines, Franck Dayan; Colorado State University, Fort Collins, CO (140)
- 2:00 †Investigation of Novel Mechanism of Resistance to Lactofen in Palmer Amaranth.** Jacob S. Montgomery*, Darci Giacomini, Patrick J. Tranel; University of Illinois, Urbana, IL (141)
- 2:15 †Genetic Mapping of HPPD-Inhibitor Resistance in *Amaranthus tuberculatus*.** Brent P. Murphy*, Patrick J. Tranel; University of Illinois, Urbana, IL (142)
- 2:30 †Resistance to PPO-Inhibiting Herbicides in Palmer Amaranth: Are TSR and NTSR Mechanisms Co-Existing?** Edinaldo A. Borgato*, Dallas E. Peterson, J. Anita Dille, Mithila Jugulam; Kansas State University, Manhattan, KS (143)

Herbicide Physiology & Molecular Biology **(continued)**

- 2:45 †Utilizing Multiple, Effective Herbicide Modes of Action Can Strongly Influence Selection Pressure for ALS-Resistance in Giant Ragweed.** Benjamin C. Westrich*, Bryan G. Young; Purdue University, West Lafayette, IN (144)
- 3:00 Coffee Break**
- 3:15 †Multiple Herbicide-Resistant Palmer Amaranth from Long-Term Conservation Tillage Plot in Kansas- What Options are Left?** Chandrima Shyam*, Ednaldo A. Borgato, Dallas E. Peterson, Mithila Jugulam; Kansas State University, Manhattan, KS (145)
- 3:30 †Reduced Glyphosate Translocation as a Novel Resistance Mechanism in *Bassia scoparia*.** Neeta Soni*, Sarah Morran, Margaret Fleming, Franck Dayan, Todd Gaines; Colorado State University, Fort Collins, CO (146)
- 3:45 †Amplification of Multiple Genes Along with EPSPS in Glyphosate-Resistant Common Waterhemp (*Amaranthus tuberculatus*).** Balaji Aravindhan Pandian*, Sathishraj Rajendran, Sanzhen Liu, Venkatesh P. Ranganath, Vara Prasad P.V., Mithila Jugulam; Kansas State University, Manhattan, KS (147)
- 4:00 Trifluralin Resistance and a Helical Growth Phenotype in Annual Ryegrass.** Jinyi Chen*¹, Stephen Powles², Heping Han², Danica Goggin², Geoffrey Wasteneys³, Eric L. Patterson¹, Qin Yu²; ¹Michigan State University, East Lansing, MI, ²University of Western Australia, Perth, Australia, ³University of British Columbia, Vancouver, BC (148)
- 4:15 †Continuous Use of Herbicide Mixture Decreases *Echinochloa crus-galli* Control.** Carlos Alberto G. Rigon*¹, Luan Cutti², Mateus Gallon², Walker Schaidhauer², Todd Gaines¹, Aldo Merotto Jr²; ¹Colorado State University, Fort Collins, CO, ²Federal University of Rio Grande do Sul, Porto Alegre, Brazil (149)

Herbicide Physiology & Molecular Biology
(continued)

- 4:30 The Mechanism of Glyphosate Resistance via Transposon-Mediated *EPSPS* Tandem Gene Duplication in *K. scoparia*.** Eric L. Patterson*¹, Todd Gaines², Chris A. Saski³, Daniel B. Sloan², Patrick J. Tranel⁴, Philip Westra²; ¹Michigan State University, East Lansing, MI, ²Colorado State University, Fort Collins, CO, ³Clemson University, Clemson, SC, ⁴University of Illinois, Urbana, IL (150)
- 4:45 Enhanced Metabolism Confers Resistance to S-Metolachlor in Two Illinois Waterhemp (*Amaranthus tuberculatus*) Populations.** Seth Strom*, Nicholas J. Seiter, Adam Davis, Aaron G. Hager, Dean E. Riechers; University of Illinois, Urbana, IL (151)
- 5:00 †Identification of *Triticum aestivum* Chromosomes Possessing Genes that Confer Natural Tolerance to Halauxifen-Methyl.** Olivia A. Obenland*, Frederic L. Kolb, German A. Bollero, Dean E. Riechers; University of Illinois, Urbana, IL (152)
- 5:15 Transcriptome Analysis of Fluroxypyr-Resistant *Bassia scoparia*.** Olivia E. Todd*, Todd Gaines, Eric P. Westra, Philip Westra; Colorado State University, Fort Collins, CO (153)
- 5:30 Business Meeting**

**Symposium. Using RStudio for
Visualization and Analysis of Weed Science
Experiments**

LOCATION: Delaware CD
TIME: 1:15 PM - 5:30 PM
CHAIR: Ethann Barnes

- 1:15 Basics of R and RStudio.** Ethann R. Barnes*¹, Erin Burns², Maxwell C. Oliveira³, John A. Schramski²; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Michigan State University, East Lansing, MI, ³University of Wisconsin-Madison, Madison, WI (154)
- 1:45 Data Wrangling with Dplyr.** Maxwell C. Oliveira*; University of Wisconsin-Madison, Madison, WI (155)
- 2:15 An Introduction to Using R for Weed Population Dynamics Modeling.** Erin Burns*; Michigan State University, East Lansing, MI (156)
- 2:45 Coffee Break**
- 3:00 Using Drc Package for Dose Response and Critical Period Analysis.** Stevan Z. Knezevic*¹, Ethann R. Barnes¹, Maxwell C. Oliveira²; ¹University of Nebraska-Lincoln, Lincoln, NE, ²University of Wisconsin-Madison, Madison, WI (157)
- 3:50 Using Ggplot2 for Plotting Drc Models and Dose Response Data.** Ethann R. Barnes*; University of Nebraska-Lincoln, Lincoln, NE (158)
- 4:20 Creating Reproducible Reports Using R Markdown.** Maxwell C. Oliveira*; University of Wisconsin-Madison, Madison, WI (159)
- 4:50 R Help Session - Bring Your Questions and Coding Troubles.** Ethann R. Barnes*¹, Erin Burns², Stevan Z. Knezevic¹, Maxwell C. Oliveira³, John A. Schramski²; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Michigan State University, East Lansing, MI, ³University of Wisconsin-Madison, Madison, WI (160)

Women in Weed Science Networking Breakfast

Open to all women.

6:30 – 8:00 am

Delaware AB

Symposium. Cover Crops: An Ecological Tool for Weed Management

LOCATION: Fairfield

TIME: 8:00 AM - 11:30 AM

CHAIR: O. Adewale Osipitan

8:00 Welcome

8:10 Growers' Feedback on the Use of Cover Crops for Weed Management in Nebraska. Maxwell C. Oliveira*; University of Wisconsin-Madison, Madison, WI (161)

8:40 Cover Crop Management and Influences on Winter and Summer Weed Suppression. Erin Haramoto*; University of Kentucky, Lexington, KY (162)

9:10 Integrating Cover Crops and Herbicide Programs: Challenges and Opportunities in the Northeast. John Wallace*; Penn State, University Park, PA (163)

9:40 Quantitative Summary of Weed Suppression Benefits of Cover Crops Using A Meta-Analysis. O. Adewale Osipitan*; University of California-Davis, Davis, CA (164)

10:10 Coffee Break

10:25 Panel Discussion. Cover Crops: An Ecological Tool for Weed Management. J. Anita Dille*¹, John Wallace², Erin Haramoto³, Maxwell C. Oliveira⁴, O. Adewale Osipitan⁵; ¹Kansas State University, Manhattan, KS, ²Penn State, University Park, PA, ³University of Kentucky, Lexington, KY, ⁴University of Wisconsin-Madison, Madison, WI, ⁵University of California-Davis, Davis, CA (165)

11:10 Wrap Up/Evaluation

Agronomic Crops II – Soybeans

LOCATION: Franklin AB
TIME: 8:00 AM - 11:45 AM
CHAIR: Nick Harre

- 8:00 †Fall-Seeded Cereal Cover Crops Suppress Horseweed in No-Tillage Soybean.** John A. Schramski*, Christy Sprague, Karen Renner; Michigan State University, East Lansing, MI (166)
- 8:15 †Glyphosate Alternatives for Cereal Rye Termination with Different Application Timings in Soybean.** Jose H. Scarparo de Sanctis*¹, Vipin Kumar², Stevan Z. Knezevic¹, Amit J. Jhala¹; ¹University of Nebraska-Lincoln, Lincoln, NE, ²Kansas State University, Hays, KS (167)
- 8:30 †Does Ammonium Thiosulfate (ATS) Antagonize Glyphosate for Spring Burndown Applications?** Marcelo Zimmer*, Julie M. Young, Bryan G. Young, William G. Johnson; Purdue University, West Lafayette, IN (168)
- 8:45 †Influence of PRE-Emergence Herbicides on Soybean Nodulation and Nitrogen Fixation.** Victor Hugo Vidal Ribeiro*¹, Lucas Silva Gontijo Maia¹, Nicholas J. Arneson¹, Jean-Michel Ané¹, Jose Barbosa dos Santos², Rodrigo Werle¹; ¹University of Wisconsin-Madison, Madison, WI, ²Federal University of Jequetinhonha and Mucuri, Diamantina, Brazil (169)
- 9:00 †Weed Management Systems in XtendFlex Soybean.** Adam L. Constine*, Christy Sprague; Michigan State University, East Lansing, MI (170)
- 9:15 †Systems Approach for Weed Control in Dicamba-Resistant Soybeans in Wisconsin.** Sarah V. Striegel*, Maxwell C. Oliveira, Ryan DeWerff, Shawn Conley, David Stoltenberg, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI, (171)
- 9:30 †Role of Other Foliar Herbicide Applications on the Expression of Dicamba Injury.** Matthew J. Osterholt*, Bryan G. Young; Purdue University, West Lafayette, IN (172)

Agronomic Crops II – Soybeans (continued)

- 9:45 †Response of Insect Pest and Beneficial Species to the Timing and Severity of Dicamba Injury in Soybean.** William A. Tubbs*, Kevin Rice, Mandy Bish, Kevin Bradley; University of Missouri, Columbia, MO (173)
- 10:00 Coffee Break**
- 10:15 †Response of Non Dicamba-Tolerant Soybean Varieties and Traits to Dicamba.** Tyler P. Meyeres*¹, Dallas E. Peterson¹, Vipin Kumar²; ¹Kansas State University, Manhattan, KS, ²Kansas State University, Hays, KS (174)
- 10:30 †Soybean Symptomology and Yield Response to Sub-Labeled Doses of Dicamba and 2,4-D.** Jesaelen G. Moraes*¹, Vitor M. Anunciato², Jeffrey A. Golus¹, Kasey P. Schroeder¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²FCA/UNESP, Botucatu, Brazil (175)
- 10:45 †The Effects of Adjuvants and Carrier Water Characteristics on Dicamba Volatilization in a Controlled Environment.** Nicholas C. Hayden*, Julie M. Young, Manoj S. Ghaste, William G. Johnson, Joshua R. Widhalm, Bryan G. Young; Purdue University, West Lafayette, IN (176)
- 11:00 †Dicamba Simulated Tank-Contamination in Common Postemergence Non-Dicamba-Tolerant Soybean Herbicide Programs.** Milos Zaric*, Guilherme S. Alves, Bruno C. Vieira, Jeffrey A. Golus, Greg R. Kruger; University of Nebraska-Lincoln, North Platte, NE (177)
- 11:15 Management of Volunteer Corn with Fusilade DX Plus Dicamba Tank Mixes.** Marshall M. Hay*¹, Ethan T. Parker¹, Peter M. Eure²; ¹Syngenta Crop Protection, Vero Beach, FL, ²Syngenta Crop Protection, Greensboro, NC (178)

Agronomic Crops II – Soybeans (continued)

- 11:30 Pre-Emergence Followed by Post-Emergence Residual Herbicide Programs with XtendiMax® Herbicide with VaporGrip® Technology in Roundup Ready 2 Xtend® Soybeans.** Neha Rana*¹, Rod Stevenson², Ryan Rapp³, Blake Barlow⁴; ¹Bayer CropScience, St Louis, MO, ²Bayer CropScience, Lansing, MI, ³Bayer CropScience, Mitchell, SD, ⁴Bayer CropScience, Columbia, MO (179)

Agronomic and Specialty Crops

LOCATION: Franklin D
TIME: 8:00 AM - 11:30 AM
CHAIR: Jonathon Kohrt

- 8:00 Response of Popcorn and Sweet Corn Hybrids to Acuron and Acuron Flexi Applied Preemergence and Postemergence.** Debalin Sarangi*¹, Martin Williams², Amit J. Jhala³; ¹University of Wyoming, Laramie, WY, ²USDA, Urbana, IL, ³University of Nebraska-Lincoln, Lincoln, NE (180)
- 8:15 †Assessment of HPPD-Inhibitor Damage Using Unmanned Aerial Vehicles and High-Resolution Multispectral Imagery in Grain Sorghum (*Sorghum bicolor*).** Isaac H. Barnhart*, Sushila Chaudhari, Balaji A. Pandian, Ignacio A. Ciampitti, Mithila Jugulam; Kansas State University, Manhattan, KS (181)
- 8:30 GF-4030, A New Broadleaf Herbicide for Cereals from Corteva Agriscience.** Dave Johnson*¹, Joe Yenish², Patti Prasifka³, Michael Moechnig⁴; ¹Corteva Agriscience, Eagan, MN, ²Corteva Agriscience, Billings, MT, ³Corteva Agriscience, West Fargo, ND, ⁴Corteva, Toronto, SD (182)
- 8:45 Control of Emerging Weed Threats in the Northern Plains with Pixxaro EC Herbicide.** Jeffrey Krumm*¹, Bruce Steward², Joseph Yenish³, David Johnson⁴, Patricia Prasifka⁵, Michael Moechnig⁶; ¹Corteva, Hastings, NE, ²Corteva, Oklahoma City, OK, ³Corteva, Billings, MT, ⁴Corteva, Eagan, MN, ⁵Corteva, Fargo, ND, ⁶Corteva, Toronto, SD (183)

Agronomic and Specialty Crops (continued)

- 9:00 †Glyphosate-Resistant Canada Fleabane (*Conyza canadensis*) and Giant Ragweed (*Ambrosia trifida*) Control in Winter Wheat with Halauxifen-Methyl Applied POST.** Jessica Quinn*¹, Jamshid Ashigh², Dave Hooker¹, Darren Robinson¹, Peter Sikkema¹; ¹University of Guelph, Ridgetown, ON, ²Corteva Agriscience, London, ON (184)
- 9:15 Sugarbeet Tolerance and Weed Control from Postemergence Ethofumesate 4SC.** Alexa L. Lystad*, Thomas J. Peters; North Dakota State University, Fargo, ND (185)
- 9:30 †Sugarbeet Tolerance and Weed Efficacy with Acifluorfen.** Emma L. Larson*¹, Thomas J. Peters²; ¹North Dakota State University, Wahpeton, ND, ²North Dakota State University, Fargo, ND (186)
- 9:45 Three Chipping Potato Cultivar Responses to Simulated Dicamba and Glyphosate Drift.** Matthew Brooke, Harlene M. Hatterman-Valenti*, Collin W. Auwarter; North Dakota State University, Fargo, ND (187)
- 10:00 Coffee Break**
- 10:15 Pyroxasulfone Use on Dryland and Irrigated Faba Beans.** Harlene M. Hatterman-Valenti*, Burton Johnson, Collin W. Auwarter, Kutay Yilmaz; North Dakota State University, Fargo, ND (188)
- 10:30 Seeding and Nitrogen Rate Influence Canopy Closure and Weed Suppression in Industrial Hemp (*Cannabis sativa*).** Haleigh J. Ortmeier-Clarke*¹, Nicholas J. Arneson¹, Maxwell C. Oliveira¹, Jerome Clark², Carrie Laboski¹, Shawn Conley¹, Rodrigo Werle¹; ¹University of Wisconsin-Madison, Madison, WI, ²University of Wisconsin-Madison, Chippewa Falls, WI (189)
- 10:45 Aminopyralid + 2,4-D (NativeKlean): A New Herbicide for Native Grass Roughs on Golf Courses.** David Hillger*¹, Amy Agi², Brad Hopkins³; ¹Corteva AgriScience, Thorntown, IN, ²Corteva AgriScience, Brooks, GA, ³Corteva AgriScience, College Station, TX (190)

Agronomic and Specialty Crops (continued)

11:00 Arylex, 2,4-D Choline + Fluroxypyr (GameOn): A New Herbicide for Broad-Spectrum Weed Control in Turf. David Hillger*¹, Amy Agi², Brad Hopkins³; ¹Corteva AgriScience, Thorntown, IN, ²Corteva AgriScience, Brooks, GA, ³Corteva AgriScience, College Station, TX (191)

11:15 Business Meeting

Weed Biology, Ecology, Management

LOCATION: Franklin C

TIME: 8:00 AM - 11:45 AM

CHAIR: Mark Bernards

8:00 †Evaluating the Effect of Mowing Timing and Frequency, Planting Timing and Cover Crop Use on the Establishment of Planted Pollinator Species (forbs). Mark Renz, Jasmine Wyant*, Niels Jorgensen; University of Wisconsin-Madison, Madison, WI (192)

8:15 †Function of Cover Cropping and Herbicide Use When Managing Marestalk. Ryan J. Collins*; University of Kentucky, Lexington, KY (193)

8:30 Effect of Cover Crop Termination Timing on Weed Suppression. Kaity J. Wilmes*, Christopher Proctor; University of Nebraska-Lincoln, Lincoln, NE (194)

8:45 Impact of Cover Crop Termination Timing on Weed Suppression and Soybean Yields. Luke I. Chism*¹, J. Anita Dille¹, Gretchen Sassenrath², Kraig Roozeboom¹; ¹Kansas State University, Manhattan, KS, ²Kansas State University, Parsons, KS (195)

9:00 †Impact of Cover Crop, Irrigation, and Tillage on Kochia Emergence Patterns Across the US Great Plains. Ramawatar Yadav*¹, Prashant Jha¹, Andrew Kniss², Nevin C. Lawrence³, Gustavo Sbatella⁴; ¹Iowa State University, Ames, IA, ²University of Wyoming, Laramie, WY, ³University of Nebraska-Lincoln, Lincoln, NE, ⁴University of Wyoming, Powell, WY (196)

Thursday Papers 2019

- 9:15 †Managing Weeds Utilizing an Integrated Cover Crop and Herbicide Management Program.** Joshua S. Wehrbein*, Christopher Proctor; University of Nebraska-Lincoln, Lincoln, NE (197)
- 9:30 †Agronomic Practices Influence Soybean Canopy Closure and Waterhemp Suppression.** Nikola Arsenijevic*, Nicholas J. Arneson, Maxwell C. Oliveira, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (198)
- 9:45 †Influence of Soil Management Practices on Weed Control, Herbicide Fate and Crop Productivity.** Kolby R. Grint*, Rodrigo Werle, Daniel H. Smith, Ryan DeWerff, Maxwell C. Oliveira; University of Wisconsin-Madison, Madison, WI (199)
- 10:00 Coffee Break**
- 10:15 †Late Season Control of Horseweed by Glufosinate and Oil-Based Adjuvants.** Estefania G. Polli*¹, Frank Sexton², Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²Exacto, Inc, Sharon, WI (200)
- 10:30 Weed Community Response to Varying Levels of 2,4-D Selection Pressure in 2,4-D-Resistant Soybeans Rotated with Corn.** William G. Johnson¹, Travis R. Legleiter², Connor L. Hodgskiss*¹; ¹Purdue University, West Lafayette, IN, ²University of Kentucky, Princeton, KY (201)
- 10:45 †The Challenge Associated with Novel Palmer Amaranth Infestations in the Upper Midwest.** Felipe de Andrade Faleco*, Maxwell C. Oliveira, David Stoltenberg, Rodrigo Werle; University of Wisconsin-Madison, Madison, WI (202)
- 11:00 †Herbicide Drift Exposure Leads to Reduced Herbicide Sensitivity in *Amaranthus* spp.** Bruno C. Vieira*¹, Keenan L. Amundsen², Rodrigo Werle³, Joe D. Luck², Todd Gaines⁴, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²University of Nebraska-Lincoln, Lincoln, NE, ³University of Wisconsin-Madison, Madison, WI, ⁴Colorado State University, Fort Collins, CO (203)

**Weed Biology, Ecology, Management
(continued)**

- 11:15 †Is Waterhemp More Difficult to Control Following
a Sublethal Glufosinate Application?** Jesse A.
Haarmann*, Bryan G. Young, William G. Johnson;
Purdue University, West Lafayette, IN (204)
- 11:30 †Overwinter Survival of Johnsongrass Rhizomes in
Nebraska and Kansas.** Samantha D. Isaacson*;
University of Nebraska Lincoln, Lincoln, NE (205)

NCWSS Awards Luncheon

Distinguished Achievement and Fellow Awards

12:00 – 1:15 pm

Delaware

Symposium. The What, How, and Why of Dicamba Tank Clean-Out

LOCATION: Fairfield
TIME: 1:30 PM - 3:15 PM
CHAIR: Marshall Hay

- 1:30 Sprayer Hygiene and Dicamba – Season Tickets Versus Single Game.** Matt Faletti*, Jim Reiss; Precision Labs, Waukegan, IL (206)
- 1:45 Considerations for Sprayer System Cleanout.** Chris Bursiek*; John Deere, Des Moines, IA (207)
- 2:00 Potential Impact of Dicamba Tank Contamination on Non-Dicamba Tolerant Soybean.** Greg Kruger*, Jeffrey A. Golus, Milos Zaric; University of Nebraska-Lincoln, North Platte, NE (208)
- 2:15 Mississippi State Weed Science Dicamba Tank Clean-Out Research.** Dan Reynolds*; Mississippi State University, Starkville, MS (209)
- 2:30 Tank Cleaners Minimize Dicamba Contamination of Spray Equipment.** Reid J. Smeda*, Jerri Lynn Henry; University of Missouri, Columbia, MO (210)
- 2:45 Tank Cleaner Research to Remove Auxin Herbicide Residues from Sprayers.** Tom Mueller*; University of Tennessee, Knoxville, TN (211)
- 3:00 Out of Sight Out of Mind: Improving Spray Boom Hygiene in the Dicamba Age.** Nick J. Fleitz*; Pentair Hypro, New Brighton, MN (212)

Agronomic Crops II - Soybeans

LOCATION: Franklin A/B
TIME: 1:30 PM - 5:15 PM
CHAIR: Nick Harre

- 1:30 Do pH Modifiers Affect the Efficacy of Glyphosate + Dicamba Tank-Mixes?** Nicholas R. Steppig¹, Bryan G. Young¹, Nathan H. Haugrud², Michael H. Ostlie³, Joseph T. Ikley*²; ¹Purdue University, West Lafayette, IN, ²North Dakota State University, Fargo, ND, ³North Dakota State University, Carrington, ND (213)
- 1:45 Understanding the Role of Weather in Off-Target Dicamba Movement to Improve Application Practices.** Mandy Bish*, Kevin Bradley; University of Missouri, Columbia, MO (214)
- 2:00 Dicamba Volatilization from Soybean Leaves and Bare Soil.** Donald Penner*, Christine Vandervoort, Jan Michael; Michigan State University, East Lansing, MI (215)
- 2:15 Lessons from Two Years of Dicamba Off-Target Movement Research in Wisconsin.** Rodrigo Werle*¹, Maxwell C. Oliveira¹, Ryan Rector²; ¹University of Wisconsin-Madison, Madison, WI, ²Bayer Crop Science, Saint Louis, MO (216)
- 2:30 Dimetric Charged: A New Option for Burndown and Residual Weed Control.** Ryan J. Edwards*¹, Greg K. Dahl¹, Eric P. Spandl¹, Mark A. Risley¹, Annie D. Makepeace²; ¹Winfield United, River Falls, WI, ²Winfield United, Arden Hills, MN (217)
- 2:45 Preplant Burndown Weed Control with Elevore Herbicide with Arylex Active.** Kristin Rosenbaum*¹, Larry Walton², Joe Armstrong³; ¹Corteva Agriscience, Coffey, MO, ²Corteva Agriscience, Tupelo, MS, ³Corteva Agriscience, Indianapolis, IN (218)
- 3:00 Coffee Break**

Agronomic Crops II – Soybeans (continued)

- 3:15 Investigating the Influence of Soybean Variety, Herbicide Rate, and Preplant Timing, on Soybean Response to Soil Applications of Trifludimoxazin and Trifludimoxazin Plus Saflufenacil.** Nicholas R. Steppig*¹, Derek M. Whalen², Bryan G. Young¹; ¹Purdue University, West Lafayette, IN, ²BASF Corporation, Seymour, IL (219)
- 3:30 Enlist E3 Soybean Tolerance and Weed Control Programs.** David Simpson*; Corteva Agrisciences, Indianapolis, IN (220)
- 3:45 Weed Control and Crop Tolerance with Glu-L™, a Resolved Isomer of Glufosinate, in Glufosinate Resistant Cotton and Soybean.** Thomas A. Hayden*¹, Brian Green²; ¹AgriMetis, LLC, Owensboro, KY, ²AgriMetis, LLC, Lutherville, MD (221)
- 4:00 Herbicide-Resistant Palmer Amaranth and Common Waterhemp in Kansas.** Vipin Kumar*, Rui Liu, Natalie K. Aquilina, Taylor Lambert, Phillip W. Stahlman; Kansas State University, Hays, KS (222)
- 4:15 Herbicide Program and Row Spacing Effect on PPO-Resistant Palmer Amaranth and Waterhemp.** Drake Copeland*¹, Nick Hustedde², Matthew Wiggins³; ¹FMC Corporation, Dayton, OH, ²FMC Corporation, Celestine, IN, ³FMC Corporation, Humboldt, TN (223)
- 4:30 Control of Multiple-Resistant Waterhemp in HT3 Soybean.** Peter Sikkema*, Nader Soltani; University of Guelph, Ridgetown, ON (224)
- 4:45 The Influence of Utilizing Multiple Herbicide Sites of Action on Soil Seed Bank Dynamics.** Nick Hustedde*¹, Matthew Wiggins², Brent Neuberger³; ¹FMC Corporation, Celestine, IN, ²FMC Corporation, Humboldt, TN, ³FMC, Des Moines, IA (225)
- 5:00 Business Meeting**

Invasive Weeds, Rangeland, Pasture, and Vegetation Management

LOCATION: Franklin D
TIME: 1:30 PM - 2:45 PM
CHAIR: Roger Becker

- 1:30 Comparison of Glyphosate and Imazapyr for Caucasian Bluestem Control.** Walter H. Fick*; Kansas State University, Manhattan, KS (226)
- 1:45 Can I Keep My Clover? Rinskor Active – A New Herbicide Enabling Selective Broadleaf Weed Control in White Clover-Grass Pastures.** David Hillger*¹, Scott Flynn², Chad Cummings³, Will Hatler⁴, Byron Sleugh⁵; ¹Corteva AgriScience, Thorntown, IN, ²Corteva AgriScience, Lees Summit, MO, ³Corteva AgriScience, Bonham, TX, ⁴Corteva AgriScience, Meridian, ID, ⁵Corteva AgriScience, Indianapolis, IN (227)
- 2:00 Rinskor + Aminopyralid (Duracor): A New Herbicide for Control of Weeds in Rangeland and Pastures.** David Hillger*¹, Scott Flynn², Chad Cummings³, Will Hatler⁴, Byron Sleugh⁵; ¹Corteva AgriScience, Thorntown, IN, ²Corteva AgriScience, Lees Summit, MO, ³Corteva AgriScience, Bonham, TX, ⁴Corteva AgriScience, Meridian, ID, ⁵Corteva AgriScience, Indianapolis, IN (228)
- 2:15 Rinskor + Aminopyralid (TerraVue): A New Herbicide for Non-Crop Land Management.** David Hillger*¹, Scott Flynn², Chad Cummings³, Will Hatler⁴, Byron Sleugh⁵; ¹Corteva AgriScience, Thorntown, IN, ²Corteva AgriScience, Lees Summit, MO, ³Corteva AgriScience, Bonham, TX, ⁴Corteva AgriScience, Meridian, ID, ⁵Corteva AgriScience, Indianapolis, IN (229)
- 2:30 Business Meeting**

Weed Biology, Ecology, Management

LOCATION: Franklin C
TIME: 1:30 PM - 3:15 PM
CHAIR: Mark Bernards

- 1:30 Influence of Dicamba, Glufosinate and Glyphosate Tank-Mixtures on Weed Control as Affected by Herbicide Rates.** Gabrielle de Castro Macedo*¹, Jesaelen G. Moraes¹, Vitor M. Anunciato², Jeffrey A. Golus¹, Greg R. Kruger¹; ¹University of Nebraska-Lincoln, North Platte, NE, ²FCA/UNESP, Botucatu, Brazil (230)
- 1:45 A Kochia Population with Possible Field Resistance to Dicamba, Fluroxypyr and Glyphosate.** Randall Currie*¹, Patrick Geier¹, Mithila Jugulam², Chandrima Shyam², Balaji A. Pandian²; ¹Kansas State University, Garden City, KS, ²Kansas State University, Manhattan, KS (231)
- 2:00 Exploiting the Natural Reproduction System to Block Weed Resistance.** Efrat Lidor Nili¹, Ido Shwartz¹, Herve Huet¹, Miriam Aminia¹, Micheal D. Owen², Orly Noivirt-Brik*³; ¹WeedOUT Ltd., Ness Ziona, Israel, ²Iowa State University, Ames, IA, ³WeedOUT Ltd., Ness-Ziona, Israel (232)
- 2:15 Using Emergence and Phenology Models to Determine Minimum Number of Control Actions.** Theresa A. Reinhardt Piskackova*, S. Chris Reberg-Horton, Robert J. Richardson, Katherine M. Jennings, Ramon G. Leon; North Carolina State University, Raleigh, NC (233)
- 2:30 Gender-Specific Gene Expression in Dioecious *Amaranthus* Species.** Yousoon Baek*, Patrick J. Tranel; University of Illinois, Urbana, IL (234)
- 2:45 Risk Assessment of Pollen-Mediated Gene Flow from Field Corn to Popcorn.** Ethann R. Barnes*, Stevan Z. Knezevic, Nevin C. Lawrence, Amit J. Jhala; University of Nebraska-Lincoln, Lincoln, NE (235)
- 3:00 Business Meeting**

Symposium. Improving the Relevance of the NCWSS to Industry

LOCATION: Franklin D
TIME: 3:00 PM - 5:00 PM
CHAIR: Andy Kendig

- 3:00 Challenges to Participation at the NCWSS.** Andy Kendig*; ADAMA, Chesterfield, MO (236)
- 3:12 What is the Business Relevance of the NCWSS to 'Management' in Industry?** Greg Elmore*; Bayer, Chesterfield, MO (237)
- 3:24 What is the Business Relevance of the NCWSS to Individuals?** Greg K. Dahl*; Winfield United, River Falls, WI (238)
- 3:36 'Methods' to Attend the NCWSS.** R. Joseph Wuerffel*; Syngenta, Sebastian, FL (239)
- 3:48 Summary/Review**
- 4:00 Panel Discussion: What Can the Society do to Increase its Relevance to Industry?** Andy Kendig*; ADAMA, Chesterfield, MO (240)

NCWSS Society Social

Sponsored by Sustaining Members – Open to all attendees
Graduate and Undergraduate Paper and Poster Awards
5:30 – 7:00 pm Delaware

Friday 2019

Industry Breakfast (Tickets required)

LOCATION: Fairfield
TIME: 7:00 AM - 8:15 AM
CHAIR: Andy Kendig

7:00 The Write Stuff - How to Work with the News in a New Era. Pam Smith*; DTN Progressive Farmer, Decatur, IL (241)

Symposium. What is New in Industry?

LOCATION: Franklin A/B
TIME: 8:30 AM - 10:15 AM
CHAIR: Andy Kendig

10:15 Business Meeting

Friday 2019

Symposium. Invasive Plants

LOCATION: Franklin C/D

TIME: 9:00 AM - 3:10 PM

CHAIR: Clair Ryan

9:00 Registration and Coffee

9:30 Welcome

- 9:45 Seeing the Forest *and* the Trees: Regional Collaboration to Address Woody Invasives in the Great Lakes Basin and Beyond.** Clair Ryan*; Midwest Invasive Plant Network, Lisle, IL (242)
- 10:25 Stopping the Spread: The Role of Public Gardens as Sentinels Against Invasive Plants.** Theresa Culley*; Ohio Invasive Plant Council, Cincinnati, OH (243)
- 11:05 What do we Know About the Invasiveness of Horticultural Forms of Japanese Barberry (*Berberis thunbergii*) and Winged Burning Brush (*Euonymus alatus*)?** Mark Brand*; University of Connecticut, Storrs, CT (244)
- 11:45 Lunch Break**
- 1:00 Data Collection, Sharing, and Re-Use Through the Early Detection and Distribution Mapping System.** Rebekah Wallace*; University of Georgia, Tifton, GA (245)
- 1:40 Suppression of Reed Canary Grass (*Phalaris arundinaceae*) by Assisted Succession: a 15-Year Restoration Experiment.** Steve Hovick*; The Ohio State University, Columbus, OH (246)
- 2:20 What Can We Learn About the Rules of Nature from Plants that Break them All?** Ryan McEwan*; University of Dayton, Dayton, OH (247)
- 3:00 Wrap Up/Evaluation**

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North Central Weed Science Society Information

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Resident Education-Contest Rules Subcommittee

Rodrigo Werle, Chair 402-937-2887
Garrison Gundy, 1stVice-Chair 316-303-7316
Devin Hammer, 2ndVice-Chair 217-821-3426
Dawn Refsell (2019 Contest) 816-206-3919

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Bruce Ackley (OH), 740-225-2014
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Mark Bernards (IL) 309-298-1569
Dave Ruen (MN) 507-259-7095
Erin Burns (MI) 517-353-0223
Nader Soltani (ON) 859-218-0745
Erin Haramoto (KY) 402-432-1469
Brady Kappler(NE) (Director)
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Summer Contest Subcommittee of Resident Education

Dawn Refsell, 2019 Host 816-206-3919
Rodrigo Werle, Chair 402-937-2887
Garrison Gundy, 1stVice-Chair 316-303-7316
Devin Hammer, 2ndVice-Chair 217-821-3426

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NCWSS Standing Committees

Distinguished Achievement Award

Christy Sprague, Chair 517-353-0224
Aaron Hager, Vice Chair 217-333-9646
Greg Dahl, Past Chair 651-261-1817
Anita Dille 785-532-7240
John Hinz 515-733-9250
Mithila Jugulam 785-532-5501
Doug Doohan 330-202-3593
Steve Bowe 919-547-2559
Peter Sikkema 519-674-1500
Doug Nord 620-285-3380
Larry Hageman 815-562-7570
Julie Young 765-494-0891
Vipan Kumar 785-625-3425

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Distinguished Achievement Awards, Graduate Student subcommittee

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Meaghan Anderson 319-331-0058
Pat Tranel 217 333-1531
Eric Miller 618-559-9459
Travis Legleiter 270-365-7541x218

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Fellow Committee

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Finance Steering and Policy Committee

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Christy Sprague 517-353-0224
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Future Site Selection Committee

Mark Loux, Chair 614-292-9081
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North Central Weed Science Society Information

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Reid Smeda, Past Chair	573-882-1329
Mark Renz	608-263-7437
Kevin Gibson	765-496-2161
Walt Fick	785-532-7223
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Alyssa Lamb	740-207-5096
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North Central Weed Science Society Information

Section Program Chairs

General Program

Stott Howard	Chair	15-321-7469 stott.howard@syngenta.com
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Poster Session

Kristin Rosenbaum	Chair	660-425-6215 kristin.rosenbaum@corteva.com
Scott Payne	Vice Chair	515-418-3929 scott.payne@syngenta.com

Graduate Student Paper Awards

Garrison Gundy	Chair	316-303-7316 garrison.gundy@valent.com
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Graduate Student Poster Awards

Devin Hammer	Chair	217-821-3426 devin.hammer@bayer.com
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Undergraduate Student Poster Awards

Rodrigo Werle	Chair	402-937-2887 rwerle@wisc.edu
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Agronomic Crops I (Corn)

Debalin Sarangi	Chair	402-416-6647 dsarangi@uwyo.edu
Mike Weber	Vice Chair	515-962-9214 michael.weber3@bayer.com
Helen Flanigan	Past Chair	317-459-9650

Agronomic Crops II (Soybeans)

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Agronomic and Specialty Crops

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Tate Castillo	Past Chair	785-213-8979 tate.castillo@bayer.com

Equipment and Application Methods

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Invasive Weeds, Rangeland, Pasture & Vegetation Management

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Reid Smeda	Past Chair	573-882-1329 smedar@missouri.edu

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Chris Proctor	Past Chair	402-472-5411 caproctor@unl.edu

North Central Weed Science Society Information

Honorary Members/Fellows

Honorary Members

1948	L.W. Dephart *
1949	A.H. Larson *
1950	J.W. Zahnley *
1951	R.W. Fuelleman *
	(posthumous citation)
	Ted F. Yost *
	(posthumous citation)
1952	Henry E. Wood *
1953	George Briggs *
	Walter C. Dutton *
1954	A.L. Bakke *
1955	Charles J. Willard *
1956	R.S. Dunham *
1957	P.J. Olson *
1958	L.W. Melander *
	T.K. Pavlychenko *
	(posthumous citation)
1959	E.A. Helgeson *
1960	Oliver C. Lee *
1962	Sig Bjerken *
1964	K.P. Buchholtz *
	E.P. Sylwester *
1966	Robert C. Beatty *
	Clare Buskirk *
1967	J.K. Freeman *
1968	E.K. Alban *
	H.A. Friesen *
1969	Lawrence Southwick *
	David W. Staniforth *
1970	Delbert D. Hemphill *
	George Frederick Warren *
1971	Fred W. Slife *
1972	Thomas Victor Beck *
	O. Hale Fletchall *
1973	Richard Behrens
	Lawrence H. Hannah *
1974	William Lobay *
1975	John D. Furrer *
1976	Lyle A. Derscheid *
	LeRoy G. Holm *
1977	James W. Divall
	James L. Williams, Jr. *
1978	Melwin K. McCarty *
	Robert E. Nylund
1979	Ellery L. Knake *
	Kenneth W. Bradfield *
1980	John D. Nalewaja *
	O.C. Burnside *
1981	Rodney J. Fink
	Juett C. Hogancamp *
	Larry W. Mitich *
1982	W.D. Carpenter
	James W. Herron *
	William F. Meggitt
1983	Robert N. Andersen

	Dale E. Bush *
	Ronald E. Doersch
1984	Edward W. Stroube *
	Oliver E. Strand *
	Gail A. Wicks *
1985	Robert Hiltibrant *
1986	Elroy J. Peters *
	Deane W. Finnerty *
	Oliver G. Russ *
1987	Ralph Althaus *
	William M. Phillips *
	Gerald R. Miller
1988	Robert Benson
	Calvin Messersmith
	Edward Stoller
1989	Loyd M. Wax
	Alan R. Putman
1990	Alan G. Dexter
	Russell L. Nash *
1991	George Kapusta *
	Marshall McGlamery *
	Russell Moomaw *
	Don Penner
1992	R. Gordon Harvey, Jr. *
	Larry K. Binning
	Alex R. Martin
	Don Taylor
1993	Merrill A. Ross, Jr. *
	Robert G. Wilson
	Jerry D. Doll
1994	Ted R. Warfield
	William W. Witt

Fellows¹

1995	Charles R. Fenster
	Leon J. Wrage
1996	Thomas T. Bauman *
	Earl W. Chamberlain
	Richard S. Fawcett
	William E. Lueschen
1997	Stephen D. Miller
	M.D.K. Owen
	Fred W. Roeth
1998	Paul J. Ogg *
	James P. Worthington
1999	Michael Barrett
	Norman J. Probst
2000	Douglas D. Buhler
	Bill Miller
	Philip L. Orwick
	Stephen C. Weller
2001	LeRoy R. Cobia
2002	James J. Kells
2003	Karen Ann Renner
	Charles Slack
	Phillip Stahlman

North Central Weed Science Society Information

Honorary Members/Fellows (continued)

2004	Duane Rathman		Gordon K. Roskamp
	David Regehr	2012	Peter H. Sikkema
2005	Dallas E. Peterson		Bob Hartzler
2006	James R. Martin		Roger Becker
	Bernard H. Zandstra	2013	Bryan Young
2007	Chris M. Boerboom	2014	Adrian Moses
	Michael J. Horak		David Stoltenberg
2008	Thomas J. Peters	2015	Dave Johnson
	Jeffrey Gunsolus		Mark Wrucke
	Kassim Al-Khatib	2016	David Simpson
2009	J.D. Green		Curtis Thompson
	Thomas B. Threewitt	2017	John Hinz
	Robert N. Klein		Patrick J. Tranel
2010	No nominations	2018	Anita Dille
2011	Bill Johnson		Mark Peterson
	Harlene Hatterman-Valenti		

* Deceased

¹Society members being honored were originally referred to as Honorary Members. Beginning in 1995, the award was changed to Fellow.

North Central Weed Science Society Information

North Central Weed Science Society Presidents

1944	No President	2001	Rathmann, Duane P.
1945	Yost, Ted F. *	2002	Peterson, Dallas E.
1946	Yost, Ted F. *	2003	Horak, Michael J.
1947	Hanson, Noel S. *	2004	Doll, Jerry D.
1948	Willard, Charles J. *	2005	Peters, Tom
1949	Dunham, R. S. *	2006	Miller, Stephen D.
1950	Worzella, W. W. *	2007	Moses, Adrian
1951	Sylwester, Erhardt P. *	2008	Johnson, William G.
1952	Buchholtz, Kenneth P. *	2009	Holm, Mick
1953	Gilbert, C. J. *	2010	Boerboom, Chris
1954	Lee, Oliver C. *	2011	Wrucke, Mark
1955	Grigsby, Buford H. *	2012	Young, Bryan
1956	Helgeson, Earl A. *	2013	Johnson, Dave
1957	Slife, Fred W. *	2014	Green, J.D.
1958	Derscheid, Lyle A. *	2015	Hinz, John
1959	Foster, J. Roe *	2016	Dille, Anita
1960	Holm, Leroy G. *	2017	Dahl, Gregory
1961	Alban, E. K. *	2018	Sprague, Christy L.
1962	Bjerken Sig. *	2019	Hager, Aaron
1963	Hemphill, Delbert D. *		
1964	Hemphill, Delbert D. *		
1965	Furrer, John D. *	* Deceased	
1966	Furrer, John D. *		
1967	Warden, Robert L. *		
1968	Fletchall, O. Hale *		
1969	Beck, Thomas V. *		
1970	Hannah, Lawrence H. *		
1971	Knake, Ellery *		
1972	Williams, Jr., James L. *		
1973	Meggitt, William		
1974	Bradfield, Kenneth W. *		
1975	Burnside, Orvin C. *		
1976	Fink, Rodney J.		
1977	Carpenter, Will D.		
1978	Doersch, Ronald E.		
1979	Nalewaja, John D. *		
1980	Stroube, Edward W. *		
1980	Stroube, Edward W. *		
1981	Herron, James W. *		
1982	Benson, Robert L.		
1983	DiVall, James W.		
1984	Miller, Gerald R.		
1985	Messersmith, Calvin G.		
1986	Wax, Loyd M.		
1987	Chamberlain, Earl *		
1988	Harvey, R. Gordon *		
1989	Worthington, James P.		
1990	Martin, Alex R.		
1991	Taylor, T. Don		
1992	Stoller, Edward W.		
1993	Warfield, Ted R.		
1994	Bauman, Thomas T. *		
1995	Cobia, LeRoy R.		
1996	Dexter, Alan G.		
1997	Miller, Bill		
1998	Buhler, Douglas D.		
1999	Orwick, Philip L.		
2000	Kells, James J.		

Distinguished Achievement Awards

1990	Gerald W. Gogan – Education Gail A. Wicks - Service Robert G. Wilson - Research Jeffrey L. Gunsolus - Young Scientist
1991	F. Strizke - Education Paul G. Mayland - Industry Patrick J. Shea - Research
1992	William W. Witt - Education James P. Worthington - Education Rex A. Liebl - Research Jerry D. Doll - Service
1993	Robert G. Hartzler - Education Douglas D. Buhler - Research Karen A. Renner - Young Scientist
1994	David L. Regehr - Education Deane W. Finnerty - Industry Robert N. Andersen - Service David A. Mortensen - Young Scientist
1995	Will D. Carpenter - Industry Phillip W. Stahlman - Research M.D.K. Owen - Service
1996	Beverly R. Durgan - Education Charles L. Kern - Industry E. James Retzinger - Industry Michael J. Horak - Young Scientist
1997	Roger Becker - Education Joseph G. Vollmer - Industry Charles H. Slack - Research Richard Zollinger - Service David E. Stoltenberg - Young Scientist
1998	Randy W. Lloyd - Industry Ronald F. Krausz - Research James R. Martin - Service
1999	Thomas R. Hoverstad - Professional Staff Robert J. Kremer - Research J. D. Green - Service Chris M. Boerboom - Young Scientist Reid J. Smeda - Young Scientist
2000	Harlan P. Palm - Industry James F. Lux - Professional Staff Gary E. Powell - Professional Staff David A. Vox - Professional Staff William G. Johnson - Young Scientist
2001	John B. Masiunas - Education Bernard H. Zandstra - Education Patrick W. Geier - Professional Staff Douglas J. Maxwell - Professional Staff Kassim Al-Khatib - Research
2002	Paul L. Sprankle - Industry Thomas B. Threewitt - Industry Monica Elmes - Professional Staff John L. Luecke -Professional Staff Bryan Young - Young Scientist
2003	Mark Loux - Education Kenneth Carlson - Industry Daniel E. Schroeder - Industry Andrew Chomas - Professional Staff Jeffrey Stachler - Professional Staff

Distinguished Achievement Awards (continued)

2004	Gordon Roskamp - Education
	Robert N. Klein - Education
	David Stoltenberg - Research
	Robert E. Wolf - Service
	Patrick J. Tranel - Young Scientist
2005	Chris Boerboom - Education
	Dennis Belcher - Industry
	Anthony F. Dobbels - Professional Staff
	Curtis R. Thompson - Service
	Christy Sprague - Young Scientist
2006	Richard K. Zollinger - Education
	John R. Hinz - Industry
	Christy Shropshire - Professional Staff
	Glenn Nice - Service
	Dean E. Riechers - Young Scientist
2007	Douglas Doohan - Education
	Kevin Gibson - Young Scientist
	Martin M. Williams II - Young Scientist
2008	Frank Forcella - Research
	Anita Dille - Young Scientist
	Damian Franzenburg - Professional Staff
	Joseph Matthews - Professional Staff
2009	Kevin W. Bradley – Young Scientist
	Adam S. Davis – Young Scientist
	Reid J. Smeda – Education
	Adrian J. Moses – Industry
	James L. Moody – Professional Staff
2010	Darren Robinson – Young Scientist
	Aaron Hager – Education
	Jon Scott – Professional Staff
	Peter Sikkema - Research
2011	Anita Dille - Education
	Walter Fick - Education
	Terry Wright - Industry
	Greg Dahl - Industry
	Nader Soltani - Professional Staff
	Chad Brabham - Graduate Student
2012	Dain Bruns - Industry
	Fritz Breitenbach - Professional Staff
	Timothy Trower - Professional Staff
	Erin Taylor-Hill - Professional Staff
	Paul Marquardt-Graduate Student
	Kirk Howatt – Education
2013	Mark Renz – Education
	Patrick Tranel – Research
	Stevan Knezevic – Research
	Christy Sprague - Service
	Rodrigo Werle – Graduate Student
	Greg Kruger – Young Scientist
2014	Ryan Lins – Young Scientist
	Dawn Refsell – Industry
	Jeff Golus – Professional Staff
	Collin Auwarter – Professional Staff
	Jessica Bugg – Graduate Student
	Brian Jenks – Service
2015	Doug Nord – Service
	Marvin Schultz – Industry
	Bruce Ackley – Professional Staff

Distinguished Achievement Awards (continued)

2015	Darren Robinson – Research
	Cody F. Creech – Graduate Student
2016	Richard Cole- Industry
	Mark Peterson- Industry
	Larry Hageman- Industry
	Stott Howard- Service
	Amit Jhala- Young Scientist
2017	Scott Cully – Industry
	Helen Flanigan – Industry
	Lowell Sandell – Industry
	Steven Knezevic – Education
	Julie Young – Professional Staff
2018	Parminder Chahal – Graduate
	Carla Yerkes – Industry
	Kevin Bradley – Education
	Peter Sikkema – Education
	Richard Proost – Professional Staff
	Phil Westra – Research
	Marshall Hay – Graduate Student

North Central Weed Science Contest Locations

YEAR	Company	Location
1981	Agri-Growth	Hollandale, MN
1982	Agri-Growth	Hollandale, MN
1983	Lilly Research Lab	Leshara, NE
1984	Dow Chemical Research	Geneseo, IL
1985	Bayer (Mobay)	Stilwell, KS
1986	Union Carbide	Newton, IA
1987	Monsanto	Monmouth, IL
1988	Agri-Growth	Hollandale, MN
1989	FMC	Champaign, IL
1990	DowElanco	Greenfield, IN
1991	CibaGeigy	Champaign, IL
1992	Cenex Land o Lakes	Iowa
1993	Zeneca	Champaign, IL
1994	Bayer (Miles)	Stilwell, KS
1995	Amcy	Seymour, IL
1996	Monsanto	Monmouth, IL
1997	Land o Lakes	Webster City, IA
1998	Valent	Champaign, IL
1999	Agri-Growth	Hollandale, MN
2000	Bayer	West Lafayette, IN
2001	Monsanto	Monmouth, IL
2002	Dow AgroSciences	Fowler, IN
2003	Syngenta	Champaign, IL
2004	University of Minnesota- Southern Research & Outreach Ctr.	Waseca, MN
2005	Kansas State University	Manhattan, KS
2006	Midwest Research Inc.	York, NE
2007	Bennett Ag. Research Corp	Richland, IA
2008	SGS Alvey Ag Research	Carlyle, IL
2009	joint NC/NE – ABG Ag Services	Indianapolis, IN
2010	no contest	
2011	Weed Olympics, University of Tennessee	Knoxville, TN
2012	Diamond Ag Research Inc.	Larned, KS
2013	joint NC/NE - Monsanto	Monmouth, IL
2014	DuPont Pioneer	Johnston, IA
2015	Weed Olympics, The Ohio State University	Columbus, OH
2016	Purdue University	West Lafayette, IN
2017	Iowa State University FEEL	Ames, IA
2018	Monsanto Water Utilization Learning Center	Gothenburg, NE
2019	Weed Olympics BASF, Bayer, Corteva, Valent Klein Family Farm	Seymour, IL

Author Index

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Notes

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Time Schedule

Mark papers and meetings in the appropriate space.

Time	Wednesday	Thursday	Friday	
8:00	Poster Session I			
8:15				
8:30			What's New In Industry	Invasive Plants
8:45				
9:00				
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9:30				
9:45				
10:00	General Session			
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Future NCWSS Annual Meeting Sites

2020 – November 30 – December 2,
Minneapolis, MN

2021 – December 13 – 16, Grand Rapids, MI

Meeting Space - Hyatt Regency, Columbus, Ohio

Second Floor

