



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.

Follow NCWSS on Twitter

Keep up to date with the latest NCWSS news by following @NCWeedScience and the annual meeting tag #NCWSS2019.

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

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)

Posters 2019

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)

Posters 2019

†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)

Posters 2019

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)

Posters 2019

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 Adjuvants. Estefania G. Polli*, Gabrielle Macedo, Bruno C. Vieira, Greg 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)

Posters 2019

†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)

Posters 2019

†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 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's 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**

North Central Weed Science Society Information

2019 Officers/Executive Committee

President

Aaron Hager
University of Illinois
217-333-4424
hager@illinois.edu

President-Elect

Stott Howard
Syngenta
515-321-7469
stott.howard@syngenta.com

Vice-President

Harlene Hatterman-Valenti
North Dakota State University
701-353-8536
h.hatterman.Valenti@ndsu.edu

Past President

Christy Sprague
Michigan State University
517-353-0224
sprague1@msu.edu

Secretary/Treasurer

David Simpson
Corteva Agriscience
317-337-3959
david.simpson@corteva.com

Editor, NCWSS Proceedings

Joe Wuerffel
Syngenta
618-363-6231
Joe.wuerffel@syngenta.com

Editor, NCWSS Communications

Vacant

WSSA Representative

Greg Elmore
Bayer
314-694-1744
greg.elmore@bayer.com

CAST Representative

Reid Smeda
University of Missouri
573-882-1329
smedar@missouri.edu

Executive Secretary

Kelley Mazur
Interactive Management, Inc.
303-327-8016
kelley@imigroup.org
info@ncwss.org

North Central Weed Science Society Information

Directors at Large

Travis Legleiter	Extension 573-808-2357 travis.legeiter@uky.edu
Ethann Barnes	Graduate Students 308-672-4464 ethann.barnes@unl.edu
Andy Kendig	Industry 314-580-8202 andy.kendig@adama.com
Rodrigo Werle	Resident Education 402-937-2887 rwerle@wisc.edu
Bruce Ackley	Strategic Planning Eastern (2019) 740-225-2014 ackley.19@osu.edu
Tim Trower	Central (2017) 217-762-9030 tim.trower@syngenta.com
Brady Kappler	Western (2017) 402-432-1469 brady.kappler@basf.com

NCWSS Interest Group Committees

Extension

Travis Legleiter, Chair	270-365-7541x218	travis.legeiter@uky.edu
Parminder Chahal, Vice Chair	402-580-2319	parminder.chahal@huskers.unl.edu
Debalin Sarangi, Past Chair	402-416-6647	debalin.sarangi@huskers.unl.edu

Graduate Student Committee

Ethann Barnes, Chair	308-672-4464	ethann.barnes@unl.edu
John Schramski, Vice Chair	989-225-6005	schrams9@msu.edu
Marcelo Zimmer, Past Chair	765-476-3860	zimmer6@purdue.edu

Industry

Andy Kendig, Chair	314-580-8202	andy.kendig@adama.com
Lowell Sandell, Vice Chair	402-432-2683	lowell.sandell@valent.com
Joe Wuerffel, Past Chair	618-363-6231	joe.wuerffel@syngenta.com

Resident Education

Rodrigo Werle, Chair	402-937-2887	rwerle@wisc.edu
Garrison Gundy, 1stVice-Chair	316-303-7316	garrison.gundy@valent.com
Devin Hammer, 2ndVice-Chair	217-821-3426	devin.hammer@bayer.com
Neha Rana, Past Chair	636-288-2609	neha.rana@bayer.com
Mayank Malik	662-402-9030	mayank.malik@bayer.com
Mark Reiman	605-690-0522	mark.reiman@bayer.com
Carl Coburn	513-257-4120	carl.coburn@bayer.com
Jeff Golus	308-520-2410	jeff.golus@unl.edu
Kasey Schroeder	308-520-2535	kasey.schroeder@unl.edu
Daljit Singh	662-402-7232	daljit.singh@bayer.com
Mark Bernards	309-313-5917	ml-bernards@wiu.edu
Tate Castillo	785-213-8979	tate.castillo@bayer.com
Bruce Ackley	740-225-2014	ackley.19@osu.edu
Fritz Koppatschek	317-431-3295	fkoppatschek@abgagservices.com
Cheryl Dunne	772-563-7288	cheryl.dunne@syngenta.com
Anita Dille	785-532-7240	dieleman@ksu.edu
John Hinz	515-733-9250	john.hinz@bayer.com
Doug Nord	620-285-3380	dwnord@gbta.net
Helen Flanigan	317-459-9650	
Dawn Refsell (2019 Contest)	816-206-3919	Dawn.refsell@valent.com
Andy Kendig	314-580-8202	andy.kendig@adama.com
Troy Klingaman	217-778-2929	Troy.Klingaman@basf.com

North Central Weed Science Society Information

Jess Spotanski 402-366-9230
Chris Proctor 402-472-5411
Sandeep Rana 479-871-4309
Dave Johnson 515-535-7234
Vince Davis 608-262-1392

jess@midwestresearchinc.com
caproctor@unl.edu
sandeep.rana@bayer.com
david.h.johnson@corteva.com
vince.davis@basf.com

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

rwerle@wisc.edu
garrison.gundy@valent.com
devin.hammer@bayer.com
Dawn.refsell@valent.com

Strategic Planning

Bruce Ackley (OH), 740-225-2014
Tim Trower (WI)(Director) 608-393-9371
Mike Weber (IA) 515-962-9214
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)
Phil Westra (CO/WY) 602-212-2399
Doug Shoup (KS) 701-231-8131
Tom Peters (ND) 605-679-0297
Trevor Israel (SD)

ackley.19@osu.edu
Tim.Trower@syngenta.com
Michael.weber3@bayer.com
ML-Bernards@wiu.edu

burnser5@msu.edu
soltanin@uoguelph.ca
erin.haramoto@uky.edu
brady.kappler@basf.com
Philip.Westra@colostate.edu
dshoup@ksu.edu
thomas.j.peters@ndsu.edu
trevor.israel@valent.com

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

Dawn.refsell@valent.com
rwerle@wisc.edu
garrison.gundy@valent.com
devin.hammer@bayer.com

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

sprague1@msu.edu
hager@illinois.edu
gkdahl@landolakes.com
dieleman@ksu.edu
john.hinz@bayer.com
mithila@ksu.edu
doohan.1@osu.edu
steven.bowe@basf.com
psikkema@uoguelph.ca
dwnord@gbta.net
larry.hageman@fmc.com
young294@purdue.edu
vkumar@ksu.edu

Distinguished Achievement Awards, Graduate Student subcommittee

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

sprague1@msu.edu
hager@illinois.edu
gkdahl@landolakes.com
dieleman@ksu.edu
john.hinz@bayer.com
mjanders@iastate.edu
tranel@illinois.edu
ericmiller1@siu.edu
travis.legleiter@uky.ed

Fellow Committee

Dave Johnson, Chair 515-423-3810
JD Green, Vice Chair 859-257-4898
Duane Rathmann 507-835-2580
Amit Jhala 402-840-2259
John Hinz 515-733-9250

david.h.johnson@corteva.com
jdgreen@uky.edu
duane.rathmann@basf.com
amit.jhala@unl.edu
john.hinz@bayer.com

Finance Steering and Policy Committee

David Simpson, Chair 317-337-3959
Harlene Hatterman-Valenti 701-231-8536
Kelly Nelson 660-739-4410
Christy Sprague 517-353-0224
Greg Kruger 308-696-6715
Eric Spandl 651-375-4292
Phil Banks 575-527-1888

david.simpson@corteva.com
h.hatterman.valenti@ndsu.edu
nelsonke@missouri.edu
sprague1@msu.edu
gkruger2@unl.edu
epspandl@landolakes.com
marathonag@zianet.com

Future Site Selection Committee

Mark Loux, Chair 614-292-9081
Charles Slack, Vice Chair 859-227-3355
Christy Sprague 517-353-0224

loux.1@osu.edu
cslack@uky.edu
sprague1@msu.edu

North Central Weed Science Society Information

Invasive Plants Committee

Roger Becker, Chair	612-625-5753
Joe Omielan, Vice Chair	859-231-0662
Reid Smeda, Past Chair	573-882-1329
Mark Renz	608-263-7437
Kevin Gibson	765-496-2161
Walt Fick	785-532-7223
Joe Omielan	859-967-6205

becke003@umn.edu
joe.omielan@uky.edu
smedar@missouri.edu
mrenz@wisc.edu
kgibson@purdue.edu
whfick@ksu.edu
joe.omielan@uky.edu

Local Arrangements: 2019 Columbus, OH

Mark Loux, Chair	614-292-9081
Richard Proost, Past Chair	608-262-7845
Tim Trower, Past Chair	608-393-9371
Anthony Dobbels	614-403-3237
Bruce Ackley	740-225-2014
Alyssa Lamb	740-207-5096
Dave Lamore	419-236-4407
Jessica Bugg	419-706-3978

loux.1@osu.edu
rproost@wisc.edu
Tim.Trower@syngenta.com
dobbels.1@osu.edu
ackley.19@osu.edu
lamb.223@osu.edu
dave.lamore@bayer.com
jessica.r.bugg@corteva.com

Nominating Committee

Tom Peters, Chair	701-231-8131
Reid Smeda, Past Chair	573-882-1329
Bert Schou	319-277-6661
Peter Sikkema	519-674-1500
Stott Howard	515-222-4809
Karen Renner	517-355-0271

thomas.j.peters@nds.edu
smedar@missouri.edu
BertSchou@gmail.com
psikkema@uoguelph.ca
stott.howard@syngenta.com
renner@msu.edu

Program Committee 2019

Stott Howard	515-321-7469
HarleneHatterman-Valenti	701-231-8536
Mark Loux	614-292-9081
David Simpson	317-337-3959
Joe Wuerffel	618-363-6231
Rodrigo Werle	402-937-2887
Travis Legleiter	573-808-2357
Andy Kendig	314-580-8202
Ethann Barnes	308-672-4464
Aaron Hager	217-333-9646

stott.howard@syngenta.com
h.hatterman.valenti@nds.edu
loux.1@osu.edu
david.simpson@corteva.com
joe.wuerffel@syngenta.com
rwerle@wisc.edu
travis.legeiter@uky.edu
andy.kendig@adama.com
ethann.barnes@unl.edu
hager@illinois.edu

Resolutions and Necrology Committee

Devin Hammer, Chair	217-821-3426
Nathan Drewitz, Vice Chair	608-515-4414
Cody Evans, Past Chair	217-371-9777
Chris Kamienski	309-532-4405
Pat Tranel	217-333-1531

devin.hammer@bayer.com
ndrewitz@umn.edu
cody.evans@bayer.com
christopher.kamienski@channel.com
tranel@illinois.edu

North Central Weed Science Society Information

Section Program Chairs

General Program

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

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
----------------	-------	--

Graduate Student Poster Awards

Devin Hammer	Chair	217-821-3426 devin.hammer@bayer.com
--------------	-------	-------------------------------------

Undergraduate Student Poster Awards

Rodrigo Werle	Chair	402-937-2887 rwerle@wisc.edu
---------------	-------	------------------------------

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)

Nick Harre	Chair	618-314-0581 nharre@purdue.edu
Cody Evans	Vice Chair	217-371-9777 cody.evans@bayer.com
Eric Riley	Past Chair	573-795-9084 eric.riley@bayer.com

Agronomic and Specialty Crops

Jon Kohrt	Chair	515-802-1294 jkohr@valent.com
Debalin Sarangi	Vice Chair	402-416-6647 dsarangi@uwyo.edu
Tate Castillo	Past Chair	785-213-8979 tate.castillo@bayer.com

Equipment and Application Methods

Marshall Hay	Chair	641-891-3017 MMHay@ksu.edu
Matthew Nelson	Vice Chair	712-540-8419 matthew.nelson@bayer.com
Thomas Butts	Past Chair	608-214-4215 tbutts@uaex.edu

Extension

Travis Legleiter	Chair	573-808-2357 travis.legeiter@uky.edu
Parminder Chahal	Vice Chair	402-580-2319 parminder.chahal@huskers.unl.edu
Debalin Sarangi	Past Chair	402-416-6647 dsarangi@uwyo.edu

Herbicide Physiology

Vipan Kumar	Chair	786-625-3425 vkumar@ksu.edu
Nick Harre	Vice Chair	618-314-0581 nharre@purdue.edu
Daniela Ribeiro	Past Chair	662-347-5060

Invasive Weeds, Rangeland, Pasture & Vegetation Management

Roger Becker	Chair	612-625-5753 becke003@umn.edu
Joe Omielan	Vice Chair	859-231-0662 joe.omielan@uky.edu
Reid Smeda	Past Chair	573-882-1329 smedar@missouri.edu

Weed Biology, Ecology and Management

Mark Bernards	Chair	309-313-5917 ml-bernards@wiu.edu
Adewale Osipitan	Vice Chair	785-236-9027 waleos@unl.edu
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

Agi, Amy	190, 191
Alonzi, Elizabeth R.	118
Alves, Guilherme S.	20, 21, 23, 57, 64, 80, 97, 117, 177
Alves Correa, Pedro H.	15, 106, 117
Aminia, Miriam	232
Amundsen, Keenan L.	203
Anderson, Ed	109
Anderson, Ely	59, 123
An�, Jean-Michel	169
Antuniassi, Ulisses R.	10, 113
Anunciato, Vitor M.	15, 58, 106, 175, 230
Aquilina, Natalie K.	16, 32, 222
Argueso, Cris	139
Armstrong, Joe	8, 136, 218
Arneson, Nicholas J.	9, 11, 40, 51, 66, 79, 101, 169, 189, 198
Arnold, Josh	56
Arsenijevic, Nikola	40, 51, 101, 198
Ashigh, Jamshid	184
Auwarter, Collin W.	187, 188
Baas, Dean	34
Baek, Yousoon	234
Baker, Rebecca S.	100
Barberis, Laura D.	12
Barlow, Blake	179
Barnes, Ethann R.	30, 154, 157, 158, 160, 235
Barnhart, Isaac H.	181
Becker, Roger	75
Beckett, Tom	4, 134
Behnken, Lisa M.	43, 63, 65
Beneton, Karina	15, 23, 113
Bennett, Avery J.	53
Bernards, Mark L.	46, 87, 88, 95
Billman, Shaun M.	18, 73
Bish, Mandy	54, 84, 173, 214
Bissel, Daniel C.	118
Bland, Claudia R.	46
Boles, Lee A.	118
Bollero, German A.	152
Borella, Junior	71
Borgato, Ednaldo A.	143, 145
Bowman, Kendal	72
Bradley, Kevin	54, 84, 173, 214
Brady, Kapler	30

Brand, Mark	244
Breitenbach, Fritz R.	43
Brooke, Matthew	187
Burns, Erin	75, 130, 131, 154, 156, 160
Bursiek, Chris	207
Butts-Wilmsmeyer, Carrie J.	126
Camargo, Gustavo G.	137
Carvalho de Souza Dias, Jose Luiz	74, 75
Chahal, Parminder S.	28, 44, 52
Chaudhari, Sushila	181
Chen, Jinyi	148
Chism, Luke I.	195
Ciampitti, Ignacio A.	181
Clark, Andrea C.	118
Clark, Jerome	189
Coburn, Carl	13, 28
Collins, Ryan J.	94, 193
Conley, Shawn	9, 40, 51, 171, 189
Constine, Adam L.	25, 170
Copeland, Drake	223
Culley, Theresa	243
Cully, Scott	134
Cummings, Chad	227, 228, 229
Currie, Randall	231
Cutti, Luan	69, 149
Cuvaca, Ivan B.	22, 24, 26, 27, 31, 33, 35, 37, 39, 41
Dahl, Greg K.	118, 119, 120, 217, 238
Davis, Adam	129, 151
Dayan, Franck	138, 139, 140, 146
de Andrade Faleco, Felipe	67, 202
de Araujo Doretto, Daniel	15, 23
de Castro Macedo, Gabrielle	15, 58, 92, 106, 230
Dearden Jr., Edward S.	53
Decker, Darian	103
Decker, Madison R.	82
Delucchi, Tomas F.	121
DeWerff, Ryan	11, 40, 66, 101, 171, 199
Dille, J. Anita	81, 89, 94, 96, 143, 165, 195
Dintelmann, Brian	84
Dixon, Andrea	77
Dixon, Sarah E.	3
Dobbels, Anthony	42, 47, 90
dos Santos, Jose Barbosa	36, 169
dos Santos Souza, Amanda	68, 71
Drumm, Sarah A.	131
Duke, Faith M.	95

Edwards, Ryan J.	119, 120, 217
Effertz, Andrew	138
Effertz, Isaac N.	16, 81
Ege, Joe W.	84
Elmore, Greg	237
Eure, Peter M.	178
Faletti, Matt	206
Felix, Joel	77
Ferguson, J. Connor	10
Ferreira de Pinho, Camila	68, 71
Ferreira Lopes Machado, Aroldo	71
Ferreira Lourenço Leal, Jéssica	68, 71
Fick, Walter H.	226
Figueiredo, Marcelo	139
Finstrom, Brian	114
Fleitz, Nick J.	114, 212
Fleming, Margaret	146
Flynn, Scott	74, 227, 228, 229
Franzenburg, Damian D.	53
Fredericks, Steven A.	118, 119
Gage, Karla L.	1, 82, 94
Gaines, Todd	68, 69, 71, 77, 138, 139, 140, 146, 149, 150, 153, 203
Gaither, Emma L.	73
Gallon, Mateus	149
Gastler, Lindsey	89
Gednalske, Joe V.	118, 119, 120
Geier, Patrick	231
Ghaste, Manoj S.	176
Giacomini, Darci	70, 85, 141
Goggin, Danica	148
Golus, Jeffrey A.	5, 10, 15, 21, 55, 57, 59, 64, 80, 92, 113, 115, 123, 175, 177, 208, 230
Gomes, Ana Clara	10, 23, 92
Gontijo Maia, Lucas Silva	169
Goplen, Jared J.	63, 65
Green, Brian	221
Green, J.D.	72
Grint, Kolby R.	79, 199
Haarmann, Jesse A.	204
Hager, Aaron G.	14, 110, 129, 151
Hahn, Kevin	136
Hamberg, Ryan C.	53
Hammer, Devin	111
Han, Heping	148
Haramoto, Erin	94, 162, 165

Harrison, Kent	98
Hartzler, Bob	100
Hatler, Will	227, 228, 229
Hatterman-Valenti, Harlene M.	187, 188
Haugen-Brown, Tana M.	63
Haugrud, Nathan H.	213
Hay, Marshall M.	178
Hayden, Nicholas C.	176
Hayden, Thomas A.	221
Heaton, Brent S.	46, 87, 95
Henry, Jerri Lynn	122, 210
Hillger, David	190, 191, 227, 228, 229
Hodgskiss, Connor L.	38, 201
Hoffmann, W. C.	57, 115
Hooker, Dave	128, 184
Hopkins, Brad	190, 191
Houston, Trenton	57, 115
Hovick, Steve	246
Huet, Herve	232
Hustedde, Nick	223, 225
Ikley, Joseph T.	213
Irmak, Suat	29
Isaacson, Samantha D.	2, 205
Jacobs, Kip E.	126
Jennings, Katherine M.	93, 233
Jha, Prashant	53, 77, 78, 196
Jhala, Amit J.	13, 28, 29, 30, 44, 48, 52, 88, 124, 167, 180, 235
Johnson, Burton	188
Johnson, Dave	182
Johnson, David	183
Johnson, Kevin	136
Johnson, William G.	38, 99, 121, 132, 133, 168, 176, 201, 204
Jorgensen, Niels	192
Jovanovic, Darko	22, 24, 26, 27, 31, 33, 35, 37, 39, 41
Jugulam, Mithila	7, 44, 143, 145, 147, 181, 231
Kendig, Andy	236, 240
Kerr, Dylan R.	14
Kiley, Reannen A.	42
Knezevic, Stevan Z.	22, 24, 26, 27, 31, 33, 35, 37, 39, 41, 52, 124, 157, 160, 167, 235
Kniss, Andrew	77, 78, 196
Kolb, Frederic L.	152
Kramer, Madison D.	61, 116
Krausz, Ronald F.	82

Kruger, Greg R.	5, 10, 15, 20, 21, 23, 55, 57, 58, 59, 64, 80, 86, 92, 97, 106, 113, 115, 117, 123, 175, 177, 200, 203, 208, 230
Krumm, Jeffrey	8, 124, 183
Kuepper, Anita	139
Kumar, Vipan	16, 32, 52, 81, 104, 127, 167, 174, 222
Laboski, Carrie	189
Lago, Eduardo	72
Lamb, Alyssa	90
Lambert, Taylor	16, 32, 127, 222
Lancaster, Phillip	91
Lancaster, Sarah	91
Landau, Christopher	129
Lane, Timothy E.	56
Langaro, Ana Claudia	68, 71
Langdon, Nicole M.	128
Lanz, Christa	70
Larson, Emma L.	186
Lawrence, Nevin C.	78, 102, 124, 196, 235
Lee, James M.	53
Legleiter, Travis R.	61, 107, 116, 201
Leise, Adam	13
Leon, Ramon G.	93, 233
Lidor Nili, Efrat	232
Lindquist, John	29
Lindsey, Alexander	90
Lingenfelter, Dwight	49
Lins, Ryan	134
Liu, Rui	16, 32, 104, 127, 222
Liu, Sanzhen	147
Loux, Mark	42, 47, 90, 98
Lovelace, Michael	8
Luck, Joe D.	203
Luiz Tornisielo, Valdemar	68
Lystad, Alexa L.	185
Macvilay, Iththiphonh A.	53
Magidow, Lillian C.	118, 119, 120
Makepeace, Annie D.	217
Martin, Nicholas F.	129
Mausbach, Jasmine M.	29
Mayo, Christopher M.	137
Mayonado, David J.	137
McDonald, Shawn T.	28
McEwan, Ryan	247
Meadows, Alexis L.	87
Melms, Madison	88

Menegaz, Christian	69
Merotto Jr, Aldo	69, 149
Mettler, David	5
Meyeres, Tyler P.	174
Michael, Jan	215
Miller, Ryan P.	43, 63, 65
Miranda, Joshua W.	102
Moechnig, Michael	182, 183
Montgomery, Jacob S.	70, 85, 141
Montgomery, Robert F.	137
Moraes, Jesaelen G.	58, 80, 106, 175, 230
Moreira, Raquel B.	10, 113
Morishita, Don W.	77
Morran, Sarah	146
Mueller, Brian	51
Mueller, Tom	60, 211
Murphy, Brent P.	105, 142
Neels, Will	30
Neuberger, Brent	225
Nicolai, David A.	63
Noivirt-Brik, Orly	232
Norsworthy, Jason K.	20
Obear, Glenn	58
Obenland, Olivia A.	152
ODay, Malynda M.	96
Oliveira, Maxwel C.	9, 11, 20, 36, 40, 66, 79, 88, 101, 154, 155, 157, 159, 160, 161, 165, 171, 189, 198, 199, 202, 216
Oliveira Medici, Leonardo	68
Oliveira Ribeiro Maia, Lucas	133
Omielan, Joseph	76
Orphan, Lindsey M.	1
Ortmeier-Clarke, Haleigh J.	9, 189
Ortner, Kaleb A.	34
Osburn, Andrew	98
Oseland, Eric G.	54, 84
Osipitan, O. Adewale	27, 164, 165
Osterholt, Matthew J.	19, 172
Ostlie, Michael H.	213
Owen, Micheal D.	232
P. Ranganath, Venkatesh	147
P.V., Vara Prasad	7, 147
Pandian, Balaji Aravindhan	7, 147, 181, 231
Parker, Ethan T.	178
Patterson, Eric L.	77, 83, 139, 148, 150
Pavlovic, Pavle	27

Peltier, Angie J.	63
Penner, Donald	215
Peters, Thomas J.	112, 185, 186
Petersen, Wyatt S.	99, 132, 133
Peterson, Dallas E.	143, 145, 174
Polli, Estefania G.	86, 200
Powles, Stephen	148
Prasifka, Patricia	182, 183
Preston, Chris	139
Proctor, Christopher	79, 88, 194, 197
Proost, Richard	66
Quinn, Jessica	184
Raeder, Alan J.	128
Rajendran, Sathishraj	7, 147
Rana, Neha	48, 179
Rapp, Ryan	179
Ravet, Karl	77
Rawls, Eric	4
Reberg-Horton, S. Chris	93, 233
Recker, Ross A.	137
Rector, Ryan	216
Reddy, Anireddy	139
Regnier, Emilie	98
Reinhardt Piskackova, Theresa A.	93, 233
Reiss, Jim ..	206
Renner, Karen	34, 166
Renz, Mark	67, 74, 75, 192
Reynolds, Dan	10, 20, 113, 209
Rice, Kevin	173
Rice, Timothy C.	18, 73
Richardson, Robert J.	93, 233
Riechers, Dean E.	14, 126, 151, 152
Riggins, Chance W.	126
Rigon, Carlos Alberto G.	69, 149
Riley, Eric	135
Risley, Mark A.	119, 217
Robinson, Darren	128, 184
Rogan, Glennon J.	12
Roozeboom, Kraig	195
Rosenbaum, Kristin	218
Rubione, Claudio G.	62
Rumler, Allyson M.	130
Ryan, Clair	242
Salzman, Frederick	56
Sarangi, Debalin	29, 180
Saski, Chris A.	150

Sassenrath, Gretchen	195
Saunders, David	8, 136
Sbatella, Gustavo	78, 196
Scarpato de Sanctis, Jose H.	52, 167
Schaidhauer, Walker	149
Schramski, John A.	83, 154, 160, 166
Schroeder, Kasey P.	21, 97, 117, 175
Scott, Jon	22, 24, 26, 27, 31, 33, 35, 37, 39, 41
Seiter, Nicholas J.	151
Sexton, Frank	58, 200
Shropshire, Christy	17
Shwartz, Ido	232
Shyam, Chandrima	44, 145, 231
Sikkema, Peter	17, 20, 128, 184, 224
Simpson, David	220
Singh, Daljit	12
Sleugh, Byron	227, 228, 229
Sloan, Daniel B.	150
Smeda, Reid J.	3, 73, 94, 122, 210
Smith, Damon	51
Smith, Daniel H.	11, 36, 66, 79, 199
Smith, Larissa L.	4
Smith, Pam	241
Soltani, Nader	17, 20, 224
Soni, Neeta	139, 146
Spandl, Eric P.	217
Sparks, Crystal D.	77, 138
Sperry, Benjamin P.	10, 113
Sprague, Christy	6, 20, 25, 42, 83, 166, 170
Stahl, Elizabeth A.	63, 65
Stahlman, Phillip W.	16, 104, 127, 222
Stepanovic, Strahinja	88
Steppig, Nicholas R.	45, 213, 219
Stevenson, Rod	179
Steward, Bruce	183
Stiles II, Brian J.	6
Stoltenberg, David	40, 67, 171, 202
Striegel, Adam	48, 124
Striegel, Sarah V.	11, 40, 171
Strom, Seth	14, 151
Sun, Susan	59
Sunderlage, Brent	94
Takano, Hudson K.	140
Takeshita, Vanessa	68
Teodoro Duarte, Arthur F.	23, 97, 117
Todd, Olivia E.	139, 153

Tranel, Patrick J.	70, 85, 105, 141, 142, 150, 234
Trower, Timothy L.	4
Tubbs, William A.	84, 173
Tucker, Andrew	32
Vail, Gordon	4, 134
Van Wychen, Lee	108
Vandervoort, Christine	215
VanGessel, Mark J.	62
Velho, Vinicius	5
Vidal Ribeiro, Victor Hugo	36, 169
Vieira, Bruno C.	10, 55, 57, 59, 92, 97, 113, 115, 117, 123, 177, 203
Vlieger, H.	73
Vukoja, Barbara	5, 55, 57, 64, 117
Waddington, Mark	135
Waithaka, Bridgit	70
Wallace, John	49, 75, 163, 165
Wallace, Rebekah	245
Walters, S. Alan	1
Walton, Larry	218
Wasteneys, Geoffrey	148
Weber, Cristin	46
Weber, Mike	135
Wehrbein, Joshua S.	197
Weigel, Detlef	70
Weirich, Jason W.	122
Werle, Rodrigo	9, 11, 20, 36, 40, 51, 66, 67, 79, 88, 101, 169, 171, 189, 198, 199, 202, 203, 216
Westra, Eric P.	153
Westra, Philip	77, 138, 139, 140, 150, 153
Westrich, Benjamin C.	50, 144
Whalen, Derek M.	45, 219
Widhalm, Joshua R.	176
Wiggins, Matthew	223, 225
Willemse, Christian A.	125
Williams, John A.	60
Williams, Martin	129, 180
Wilmes, Kaity J.	194
Wuerffel, R. Joseph	239
Wyant, Jasmine	192
Yadav, Ramawatar	53, 78, 196
Yenish, Joe	182, 183
Yilmaz, Kutay	188
Young, Bryan G.	19, 20, 45, 50, 121, 144, 168, 172, 176, 204, 213, 219
Young, Julie M.	168, 176

Yu, Qin	148
Zaric, Milos	21, 117, 177, 208
Zimmer, Marcelo	168
Zollinger, Richard	112

NCWSS Sustaining Members

We are grateful for the support of the following
Sustaining Members:

Gold

**BASF Corporation
Bayer CropScience
Corteva Agriscience
Syngenta Crop Protection
Winfield United**

Silver

**FMC Corporation
Helena
Valent**

Bronze

**ABG Ag Services
ADAMA
Aker
Belchim
Blue River Technology
Chemorse
Clariant Chemical Corporation
Flotek Industries
Growmark
KayJay Ag Services Inc.
K-I Chemical
Oxford Lasers
Pentair Hypro
TeeJet Technologies
United Phosphorous, Inc.
Wilmar Fabrications, LLC.**

Notes

This image shows a blank sheet of white paper designed for writing. It features a series of horizontal ruling lines spaced evenly down the page. A solid gray rectangular bar is positioned at the very top, serving as a header. On the left side, there is a thin vertical line that creates a margin. The rest of the page is open space for text.

Notes

[illegible]

[illegible]

Notes



A series of horizontal lines for taking notes. The first line is a solid grey bar. The subsequent lines are thin, light grey horizontal lines, providing a structured space for writing.

Notes

Notes

[illegible]

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				
9:15				
9:30				
9:45				
10:00	General Session			
10:15				
10:30				
10:45				
11:00				
11:15				
11:30				
11:45				
12:00	Student Luncheon	NCWSS Awards Luncheon		
12:15				
12:30				
12:45				
1:00				
1:15				
1:30				
1:45				
2:00				
2:15				
2:30				
2:45				
3:00				
3:15				
3:30				
3:45				
4:00				
4:15				
4:30				
4:45				
5:00				
5:15				
5:30	Poster Session II	Society Social		
5:45				
6:00				
6:30				

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

