Texas Plant Protection Association

32nd Annual

Texas Plant Protection Conference

"Resilent Agriculture: Healthy Farms for a Healthy Future"

December 8, 9, &10, 2020

Virtual Conference

2020 Texas Plant Protection Conference
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1989- Dave Weaver

1990- Ray Smith

1991- Glenn Whitney

1992- Bart Drees

1993- Pamela Younts

1994- M.O. Way

1995- Jerral Johnson

1996- Jack LeClair

1997- Frank Hons

1998- Cloyce Coffman

1999- Bill Odle

2000- Scott Senseman

2001- Chip Lee

2002- John Braun

2003- Al Nelson

2004- Monty Dozier

2005- Doug Jost

2006- James Grichar

2007- Doug Pustejovsky

2008- Gaylon Morgan

2009- Brad Minton

2010 Amir Ibrahim

2011- Danny Fromme

2012- Vernon Langston

2013- Seth Murray

2014- Dale Mott

2015- Eric Castner

2016-Elizabeth Pierson

2017-Gary Schwarzlose

2018- Kranthi Mandadi

2019- Clark Neely

2020- Adam Hixson

TPPA Awards

TPPA Awards will be announce during the Virtual Conference Program for 2020

Norman Borlaug Lifetime Achievement Award

This is the Texas Plant Protection Association's highest award for members that over the years have made a special contribution to the association, the conference and to Texas agriculture. It is named in honor of Dr. Norman Borlaug an agronomist, humanitarian and Nobel laureate who has been called "the Father of the Green Revolution", "Agriculture's Greatest Spokesperson" and "The Man Who Saved A Billion Lives". He completed his career as a member of the Texas A&M University Staff, serving as a Distinguished Professor of International Agriculture.

Previous Winners

2004 – H. Ray Smith, 2005- Charles Stichler, 2006- Barron Rector, 2007- Travis Miller, 2008- James Grichar, 2009- Paul Baumann, 2010- Jack LeClair, 2011- Ron Lacewell, 2012- Brad Minton, 2013- Roy Parker, 2014 - Tom Cothren, 2015 – Randy Rivera, 2016 - David Baltensperger, 2017 Ron Smith, 2018 Ken Smith, 2019 Juan Landivar

TPPA AWARDS

TPPA each year has honored some of the outstanding Texas Plant Protection Association members that have made special contributions to the association, to the conference, to their profession and to Texas agriculture with the TPPA Award.

Past Award Winners are:

	Graduate Student	Consultant	Industry	Academic/Agency
2003	Greg Steele	Dan Bradshaw	Bill Odle	Ron Lacewell
2004	Josh Bynum	Webb Wallace	Doug Jost	Robert Lemon
2005	Brad Hopkins	Sid Hopkins Mark Nemec	Brad Minton	Paul Baumann
2006	Robert Puckett	David Wilde	Drew Wenner	Tom Cothren
2007	Sam Willingham	Paul Pilsner	Jack LeClair	Randy Rivera
2008	Nyland Falkenberg Travis Janak	Gary Kennedy	Alan Dalrymple	M.O. Way
2009	Scott Stanislav	Neal Pratt	Doug Pustejovsky	Ed Gage
2010	Edinalvo Camargo	Gary Bradshaw	Vernon Langston	Roy Parker
2011	Ben McKnight	Cliff Mock	Mark Spilman	Tom Isakeit
2012	Zach Eder	Glenn Crane	Greg Steele	Mike Chandler
2013	Trevor Jones	Brandon Ripple	Gary Schwarzlose	Gaylon Morgan
2014	Josh McGinty Silvano Assanga	Larry McAnally	Eric Castner	Joe Masabni
2015		Darrin Biediger	Adam Hixson	Charles Adam
2016	Kevin Cox	Lee Hutchins	Luke Etheredge	Ronnie Schnell
2017	Brady Arthur – MS John Gordy - PhD	Ronnie Phillips	Tony Driver	Betsy Pierson
2018	Colby Ratcliff – MS Luke Pruter - PhD	Peter Bruno	Jimmy Schulz	Sandy Pierson
2019	James Griffin, PhD Cynthia Sias- MS	Justin Chopelas	Steve Carlson	David Kerns

Ag Communications Award

Special Award for Outstanding Communications for Texas Agriculture & for TPPA.

2012 Blair Fannin

2013 Ron Smith

Ray Smith Leadership Award

Special Award for Outstanding Leadership in Texas Agriculture & in TPPA.

2013 Ray Smith

2014 Donnie Dippel

2017 Travis Miller & Ron Lacewell

2019 Gary Schwarzlose

2020 TPPA Conference Sponsors

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- Texas A & M - Commerce
- Texas Agricultural Irrigation Association
- Texas Farm Bureau
- Texas Wheat Producers Association
- Texas Peanut Producers Board
- UPL
- Valent USA
- Wilbur-Ellis

32TH ANNUAL
TEXAS PLANT PROTECTION CONFERENCE

"Resilient Agriculture: Healthy Farms for a Healthy Future"

Tuesday, December 8, 2020

9:30 am – 12:00 noon-- **General Session #1**

Moderator: **Adam Hixson, TPPA President**

9:30 - 9:45 am **Welcome & Conference Introduction –** ***Adam Hixson, TPPA President***

9:45 – 10:00 am "**Welcome"-** ***Dr. Jeff Hyde, Texas A & M AgriLife Extension Service, Director***

10:00 – 10:30 am **1 Rural Broadband Status and its Impact on Precision Ag** – *Dr. Alex Thomasson, Department Head, Agricultural and Biological Engineering, Mississippi State University*

10:30 – 11:00 am **2 Soil Health -***Dr. Kelsey L.H. Greub, Project Scientist, Soil Health Institute.*

11:00 – 11:30 am **3 Update on Hemp in Texas** - *Dr. Calvin Trostle, Texas A & M AgriLife Extension Service, Statewide Hemp Specialist*

11:30 – 12:00 noon **4 Upcoming Ag Issues Impacting Texas Agriculture** *(***Farm Bill, Ag Policy, & Regulations) –** *Dr Bart Fischer, Texas A & M University, Food Policy Center Co-Director*

12:00 noon – 1:30 pm---**Lunch**
(on your own)

1: 30 pm – 2:45 pm --**Consultants Sponsored General Session**
Moderator: **Mark Nemec,** ***MJN Consulting Service***

This section will cover the upcoming changes in weed control in cotton due to resistance concerns.

1:30 – 1:45 pm **5 Weed Management in Xtend and Enlist Crops: Resistance Management More Important Than Ever** - *Dr. Larry Steckel, Professor Row Crop Weed Management,* *University of Tennessee*

1:45 – 1:50 pm ---New Technology & Chemistry -1

6 Two New Corn Herbicide Brands from AMVAC – *Dr***.** Scott *Ludwig AMVAC*

1:50 - 2:05 pm **7 A Program Approach to Delaying the Onset of Resistant Weeds –** *Dr. Scott A. Nolte, State Weed Specialist, Texas A & M AgriLife Extension Service*

2:05 – 2:10 pm ---New Technology & Chemistry -2

8 What's New with BASF for 2021 – *Dr***.** *Adam Hixson, BASF*

2:10 - 2:25 pm **9 Weed Resistance Management with the Xtendflex system in Texas** - *Dr. Greg Steele, Crop Protection TDR, Bayer CropScience*

2:25 – 2:30 pm---New Technology & Chemistry -3

10 Gowan Co: A Look at our New Technology – *Mondo DeLeon, Gowan USA*

2:30 -2:45 pm **11 Ag Consultant's Perspective "Out with the New and in with the Old Weed Control Programs" –** *Mark Nemec, MJN Consulting Service*

2:45 – 3:00pm--**Break**

Pest ID Contest

***Chairman*: Barron Rector, Texas A & M AgriLife Extension Service**

3:00 - 3:30 pm--General Session

3:30pm Adjourn for the Day

Day 2

Wednesday, December 9, 2020

Laws & Regulations

Moderator: **Perry Cervantes**, **Texas Department of Agriculture**

8:00 -9:00 am **Auxin Applicator Training Session,** Dr. Scott A. Nolte, State Weed Specialist, Texas A & M AgriLife Extension Service

Cotton Session--
Moderator: **David Kerns, Texas A & M AgriLife Extension Service**

9:00 – 9:15 am **12 Update on Aphid Vectors and Management of Cotton Leafroll Dwarf Virus** – *Dr. Alana Jacobson, Department of Entomology and Plant Pathology, Auburn University, Auburn, AL*

9:15 - 9:20 am --New Technology & Chemistry -4
13 Tavium Update and New Formulation of Acuron Herbicide for 2021 - *Dr. Caroline Land, Syngenta Crop Protection*

9:20 – 9:35 am **14 Plastic Contamination Mitigation Research** – *Dr. John Wanjura, USDA-ARS Cotton Production and Processing Research Unit, Lubbock, TX*

9:35 – 9:40 am---New Technology & Chemistry -5
15 Using Virus for Control of Cotton Bollworm/ Corn Earworm - *Remi Wright, Certis USA*

9:40 - 9:55 am **16 Harvest Aid Programs in Texas Cotton Production Systems**– *Dr. Ben McKnight, Department of Soil and Crop Science, Texas A&M AgriLife Extension, College Station, TX*

9:55 – 10:00 am---New Technology & Chemistry -6
17 Crop Protection Product Updates from Bayer CropScience – *Dr.* *Greg Steele, Crop Protection TDR, Bayer CropScience*

10:00 – 10:15 am **18 Understanding Bt Resistance in Bollworm** – *Dr. David Kerns, Department of Entomology Texas A&M AgriLife Extension, College Station, TX*

10:15 – 10:30 am---Break

Fertility Management Session--

Moderator: **Greg Mock, Simplot Growers Solutions**

10:30 – 10:45 am **19 Fertilizer Trends in Texas -** *Ben Jones, Office of the State Chemist*

10:45 – 10:50 am --New Technology & Chemistry -7

20 New Product Updates from Valent USA, LLC - *Dr. Chris Meador, Valent USA, LLC*

10:50 – 11:05 am **21 Interpreting Texas A&M Soil Analysis: Concerns with Phosphorus and Potassium Critical Levels -** *Larry Unruh, American Plant Food Corp*

11:05 - 11:10 am --New Technology & Chemistry -8

22 New Product Updates from FMC – *Eric Castner, FMC Corporation*

11:10 – 11:25 am **23 World Fertilizer Production and Demand effects on US Farmers -** *Robert Mullen, Nutrien*

11:25 – 11:30 am--New Technology & Chemistry -9

24 Innovations with Duplosan and dichlorprop-p for Managing Herbicide Resistant Plants - *Dr. Dan Beran, Nufarm Americas, LLC*

11:30 -11:45 am **25 Nutrient Dynamics Under Regenerative Agriculture -***Lance Gunderson, Regen Ag Lab*

11:45 am Adjourn for the day

Day 3

Thursday, December 10, 2020

Grain Session--

Moderator: **Ronnie Schnell, Texas A & M AgriLife Extension Service**

8:00 – 8:15 am **26 New Sorghum Herbicide Technologies for 2021**. – *Dr. Brent Bean, Director of Agronomy, United Sorghum Checkoff Program*

8:15 – 8:20 am--New Technology & Chemistry 10

27 Product Update from Nichino America – *Milo Lewis, Nichino America*

8:20 – 8:35 am **28 The Small Grains Extension Program at TAMU Agrilife – An Overview**. - *Dr. Fernando Guillen Portal, Assistant Professor and State Small Grains Specialist, Soil and Crop Science Dept., Texas A&M AgriLife Extension*

8:35 – 8:40 am--New Technology & Chemistry 11

29 Pioneer® brand Grain Sorghum with the Inzen™ Herbicide-Tolerant Trait

- *Dr. Spencer Samuelson, Corteva AgriScience*

8:40 – 8:45 am **30** **Mexican Corn Rootworm Management –** *Dr David Kerns, Professor, Extension Specialist, Statewide IPM Coordinator & Associate Department Head*

8:45 – 9:00 am **31** **General Management Practices and Key Agronomics for Sunflower Production in Texas -** *John Murray, Field Agronomist, Pioneer Seeds*

9:00 – 9:05 am **Break**

Horticulture / Turf Session---
Moderator: **Betsy Pierson, Texas A & M University**

9:05 -9:20 am: **32** **Rose Breeding and Genetics Program** – *Dr. Oscar Riera-Lizarazu, Department of Horticultural Sciences, Texas A&M University, College Station, Texas*

9:20- 9:35 am: **33** **Hibiscus Breeding Program** – *Dr. Dariusz Malinowski, Texas A&M AgriLife Research and Extension, Vernon, Texas*

9:35 – 9:50 am: **34** **Turfgrass Breeding and Genetics Program** – *Dr. Ambika Chandra, Texas A&M AgriLife Research and Extension, Dallas, Texas*

9:50 - 10:05 am: **35** **Indoor Vertical Farms** – *Dr. Shuyang Zhen, Department of Horticultural Science, Texas A&M University, College Station, Texas*

10:05 – 10:10 **am** **Break**

Water & Irrigation Management ---------------------Sponsored by Texas Agricultural Irrigation Association

Moderator**: Dana Porter, Texas A & M AgriLife Extension Service**

10:10 – 10:25 am **36** **Irrigation Education Programs in the Rio Grande Valley** - *Lucas Gregory, Ph.D., Senior Research Scientist, Texas Water Resources Institute, Texas A&M University System, College Station, Texas*

10:25 -10:40 am **37** **Irrigation Management for Corn in the Texas High Plains: Implications of Variety, Planting Date, and Irrigation Management**.- *Jourdan Bell, Ph.D., Associate Professor and Extension Specialist, Texas A&M AgriLife Extension Service Department of Soil and Crop Sciences, Amarillo/Bushland, Texas*

10:40 -10:55 am **38** **Soil Water Sensors: Performance and Calibration -** *Gary Marek, Ph.D., Research Agricultural Engineer, USDA-ARS Conservation and Production Systems Laboratory, Bushland, Texas*

10:55 – 11:10 am **39** **Sensor Based Variable Rate Irrigation -** *Susan O'Shaughnessy, Ph.D., Research Agricultural Engineer, USDA-ARS Conservation and Production Systems Laboratory, Bushland, Texas*

11:10 – 11:15 am **Break**

Pasture & Rangeland Session--
***Moderator:* Case Medlin, Bayer Crop Science**

11:15– 11:30 am **40** **Items Sometime Overlooked on Pesticide Labels** - *Don Renchie, Texas A&M AgriLife Extension, College Station*

11:30 - 11:45 am **41** **Invora® Herbicide; Update and Summary of Training Requirement -** *Megan Clayton, Texas A&M AgriLife Extension, Corpus Christi*

11:45 – 12:00 am **42** **Biosecurity Matters for Livestock Producers -** *Bryan Davis, Texas A&M AgriLife Extension, Guadalupe County*

12:00 – 12:15 pm **43** **DuraCor® Herbicide; Experiences in Southwest Pastures from 2020 -** *D. Chad Cummings, E. Scott Flynn, Daniel Mielke, Rachel Hinton, and Samuel Eads, Corteva AgriScience*

12:20 – TPPA Awards announced

Conference Program Abstracts

1

Rural Broadband Status and its Impact on Precision Agriculture

Dr. Alex Thomasson, Professor, Department Head, and Berry Endowed Chairholder, Department of Agricultural and Biological Engineering, Mississippi State University

This talk will shed some light on seven questions about rural wireless broadband connectivity (RWBC) in America. (1) How is precision agriculture (PA) advancing? Some aspects include new sensing technologies, connectivity, artificial intelligence, and automation and robotics. (2) How has PA brought about the need for connectivity in rural areas and remote farm fields? The advances in PA have opened opportunities for enhanced decision making and automation in agricultural operations. (3) What is the status of RWBC? It is generally lacking across America, particularly in remote farm fields. (4) What are various government entities doing about RWBC? Agencies at multiple levels, most notably USDA and FCC are investing significant effort and funds into expansion of RWBC. (5) What are corporations doing about RWBC in America and worldwide? Numerous companies are involved, and Microsoft in particular has multiple efforts underway. (6) What does the future of RWBC look like? Rural cities and towns are likely to see rapid expansion of RWBC over the next five years, but remote farm fields will typically not have connectivity for the foreseeable future. (7) How will RWBC affect PA and the grower's bottom line in the future? PA with RWBC will enhance growers' ability to mitigate risk, make profitable decisions at a finer level of detail, and respond more quickly to changing conditions.

2

Evaluating Soil Health Measurements Across North America

Dr. Kelsey Greub, Project Scientist, Soil Health Institute

Research on soil health is becoming increasingly important as the need to conserve soil and other natural resources increases. However, there is a growing need to establish as standard set of soil health indicators to monitor soil health that are cost effective and meaningful for producers and other stakeholders. The North American Project to Evaluate Soil Health Measurements was designed to investigate soil health indicators across a wide range of soils and management systems across Canada, the United States, and Mexico. For this project, over 2000 soil samples were collected from approximately 124 long-term research sites and evaluated for more than 31 indicators of soil health, such as aggregate stability, saturated hydraulic conductivity, carbon measurements, nitrogen measurements, and microbial diversity. Select indicators were also evaluated for their sensitivity to changes in management based on the historical management data provided by each site's principle scientist. Results from this study show that reduced tillage and cover cropping improved some soil health indicators, such as soil organic carbon, aggregate stability, and water-holding capacity.

3

First-Year Texas Hemp: What We Have Learned So Far

Dr. Calvin Trostle, Statewide Hemp Specialist, Department of Soil and Crop Sciences, Texas A&M AgriLife Extension Service

Legal industrial hemp (Cannabis sativa L.) production was introduced to Texas in 2020. Regulated by Texas Department of Agriculture, most Texas hemp was planted about two months later than what is expected in future years. Commercially, Texas growers focused mostly on cannabinoid hemp (CBD) with limited acreage for fiber and grain. In part due to the photoperiod sensitivity of most hemp varieties and southerly Texas latitudes, much of the

first-year hemp crop entered floral structure development much too soon, especially among fiber and grain varieties. Seed germination and establishment was difficult for most growers as well as in AgriLife variety trials. Late planting, hot temperatures, and soil crusting were responsible. Variety trials for CBD identified initial varieties that performed well, but with CBD prices paid to growers remaining about 80% below 2019 prices there is no margin for profit in traditional hand-oriented small-acreage farming. Operations that focus on mechanical harvest show promise of reducing per-acre production costs to 40% or less of typical farming. AgriLife testing will consider research to identify varieties that do not prematurely flower prior to the 2021 cropping season. An outline of 2021 research for AgriLife will be discussed.

4

Upcoming Ag Issues Impacting Texas Agriculture

Dr. Bart Fischer, Food Policy Center Co-Director, Texas A&M University

Dr. Bart Fischer will provide an update on policy issues impacting Texas agriculture. He will address the recent election results and discuss implications for agriculture in the coming year. He will also provide a status update on a number of important topics including the status of additional COVID relief and fiscal year 2021 appropriations. Finally, he will address 2018 Farm Bill implementation and highlight a number of issues on the horizon that will likely inform the development of the next farm bill.

5

Weed Management in Xtend and Enlist Crops: Resistance Management More Important Than Ever

Dr. Larry Steckel, Professor Row Crop Weed Management, University of Tennessee

Concerns about poor Palmer amaranth control after a dicamba applications were more prevalent in Tennessee in 2020. More than a few have reported that Palmer amaranth has survived multiple dicamba + glyphosate applications. What appears to be ongoing is a segregating population of Palmer amaranth with the more auxin-herbicide tolerant biotypes becoming more numerous in a number of locations.

Several of our research studies this spring have also seen poor Palmer control with dicamba. In one recent study Palmer amaranth that was 2 to 5" at the time of a 0.5 lb/A dicamba + 32 oz/A glyphosate application resulted in control less than 60% by 21 days after application. Higher rates of dicamba were only marginally better.

In a separate study Palmer amaranth that was sprayed with glyphosate + dicamba when it was in the 4 to 8" range at time of first application resulted in 53% control. A follow-up application of dicamba + glyphosate applied 7 days after the initial application did not substantially improve control. So what should we do? Utilizing a Liberty application applied within 7 days of the failed dicamba application is proving to better control than another dicamba application on Palmer escapes.

The importance of using residual products and to start clean for best pigweed control. This has been the best year in recent memory for the performance of residual herbicides on Palmer. We will need to rely on them even more in 2021.

6

Two New Corn Herbicide Brands from AMVAC

Dr. Scott Ludwig, Product Development Manager - Southern Region, AMVAC

AMVAC® has two new corn herbicide brands, Sinate™ Herbicide and Impact Core™ Herbicide, for use in 2021. Sinate, a soluble liquid (SL) containing topramezone and glufosinate (1:24 ratio), is labeled for use on glufosinate tolerant (LibertyLink®) field corn (grain and silage) and sweet corn. These two active ingredients provide complementary control of key broadleaf and grass weeds. Sinate provides a solid weed resistance management strategy by combining two effective modes of action on an overlapping weed spectrum. Sinate can be broadcast applied to LibertyLink field corn from emergence through 24 inches tall orV7 stage of growth. Drop nozzles are required for corn applications from 24 to 36 inches tall. In LibertyLink sweet corn, Sinate can be applied from emergence up to v6 stage of growth. Impact Core, an emulsifiable concentrate (EC) containing topramezone and unsafened acetochlor (1:100 ratio), is labeled for postemergence applications on field corn (grain, silage, seed) and popcorn up to 11 inches tall. Impact Core tank mixtures with atrazine and/or glyphosate provide postemergence and residual control of many key weeds in corn. Important: Always read and follow label instructions.

7

A Program Approach to Delaying the Onset of Resistance Weeds

Scott Nolte, State Weeds Specialist, Texas A & M AgriLife Extension Service

Weed management in Texas cotton has been challenge for years and the increased presence of palmer amaranth, waterhemp and other difficult to control species continues to narrow the already thin profit margin. However, with the introduction of herbicide-resistance traits in cotton varieties, weed management decisions became less complicated and for a time, herbicide selection has been tied more to cotton HT traits than to weed species. These herbicide use patterns, if not rotated, result in rapid selection for herbicide resistant weed populations. Producers may feel relief that dicamba will be available for the next five years, but other weed management tools are still available and must be used in a program approach to delay the selection for and spread of resistant populations. Including the use of a residual herbicide can drastically reduce the weed pressure on a postemergence application. Regardless of the choice of postemergence herbicide, selecting an additional herbicide with another mode of action is critical for reducing selection pressure on any single herbicide.

8

What's New with BASF for 2021

Dr. Adam Hixson, Technical Service Representative, BASF Corporation

Sefina® insecticide is novel mode of action (IRAC group 9D) tool for the control of targeted piercing sucking insects (aphids, psyllids, and whiteflies). Recently, federal registration was granted for Sefina use on grain/forage sorghum, alfalfa, and pecans. In numerous research trials across Texas, Oklahoma, and New Mexico, Sefina has demonstrated excellent efficacy on sugarcane aphid in forage/grain sorghum, cowpea aphid in alfalfa, and black-margined aphid in pecans.

Revysol® fungicide is a new fungicide registered for use in corn, grain sorghum, soybean, peanut, and many other crops. Revysol has an increased binding affinity to fungi, outstanding efficacy, and excellent crop safety. It is the first isopropanol-azole, setting a new standard for broad spectrum disease control by delivering fast-acting preventative and post-infection residual disease control for a broad range of crops and diseases. Solo and pre-mix formulations will provide high performing fungicide solutions for many yield-robbing diseases in various crops. Veltyma® fungicide (Revysol + F500® fungicide) is for corn and grain sorghum, Revytek® fungicide (Revysol + Xemium® fungicide + F500) is for soybean, Provysol® fungicide (Revysol) is for citrus, and Cevya® fungicide (Revysol) is for grapes and pecans.

Engenia® herbicide recently received a new, updated federal registration for dicamba-tolerant soybeans and cotton. Engenia will continue to provide excellent control of more than 100 annual broadleaf weeds, including many herbicide-resistant weed species. In addition to excellent weed control, Engenia in combination with SentrisTM buffering technology or other approved buffering adjuvants will continue to offer excellent crop safety and low-volatility characteristics for improved on-target application.

9
Weed Resistance Management with the XtendFlex System in Texas
Dr. Greg Steele, Crop Protection TDR, Bayer CropScience

The Roundup Ready® Xtend Crop System for cotton utilizes herbicide-tolerant trait technologies to help maximize yield potential, weed control, and cotton quality. Both Bollgard II® XtendFlex® and Bollgard® 3 XtendFlex® cotton technologies include tolerance to the herbicides dicamba, glyphosate, and glufosinate. Cotton tolerance to these three herbicides, each with a different site of action, provides for a weed management system with flexibility in herbicide selection and tank-mixing. This technology provides the opportunity for implementing a comprehensive weed management program utilizing multiple herbicides with different sites of action pre- and post-plant in cotton. This presentation will include details on XtendFlex cotton technology, updates on Xtendimax herbicide, and recommendations for weed management programs in Texas cotton.

10
Gowan Co.: A Look at Our New Technology!
Mondo DeLeon, Gowan USA

I have a short introduction of myself and who's and where's of Gowan USA. This introduction will be followed by a short introduction of each product/chemistry that is new to Gowan. These are old chemistries that have been purchased by Gowan, but are new to Gowan USA. These chemistries also carry the same name as first introduced into the markets by previous marketers, but need to be reintroduced because in some cases the industry thinks these products no longer exist and not available for purchase and use.

11
Ag Consultant Perspective "Out with the New and in with the Old Weed Control Programs"
Mark J. Nemec, MJN Consulting Services

With the ever changing world of weed control and weed resistance, Consultants have to try and keep up with all of it. We also can't forget what we did in the past. It seems like a lot of farmers have gotten too used to over the top programs and not using enough residuals. There are numerous over the top residuals, but some of the older lay-by products are still around and should be incorporated back in to our weed control programs. Some of the old methods also include the one thing no weed is resistant to…"Cold Hard Steel". Yes, I'm talking about using a cultivator to help control hard to get rid of problem weeds.

12
Update on Aphid Vectors and Management of Cotton Leafroll Dwarf Virus
A.L. Jacobson, Department of Entomology and Plant Pathology, Auburn University, Auburn, AL

Cotton leafroll dwarf disease (CLRDD), caused by Cotton leafroll dwarf virus (CLRDV), is an emerging aphid-transmitted virus in the U.S. Symptoms of this new disease include crinkling, cupping, thickening of leaves, reddening of leaf veins and petioles, dwarfing of the plant, reduced boll set, swollen and brittle stems, accentuated verticality and decreased yields. Results of research conducted in 2019-2020 will be presented to highlight what has been learned about virus spread by aphids, and the effectiveness of management strategies on reducing virus incidence and yield loss associated with this virus.

13

Tavium Update and New Formulation of Acuron Herbicide for 2021

Caroline Land, R&D Scientist, Syngenta Crop Protection, Katy, Texas
John Gordy, R&D Scientist, Syngenta Crop Protection, Pearland, Texas
Monti Vandiver, R&D Scientist, Syngenta Crop Protection, Lubbock, Texas
Tony Driver, Agronomic Service Representative, Syngenta Crop Protection, Crawford, Texas
Brent Besler, Agronomic Service Representative, Syngenta Crop Protection, Lubbock, Texas

Tavium® Plus VaporGrip® Technology is a herbicide premix developed by Syngenta Crop Protection for use in dicamba-tolerant cotton and soybean and was registered with the EPA on April 5, 2019. It contains three key components: dicamba, a Group 4 herbicide, S-metolachlor, a Group 15 herbicide, Plus VaporGrip Technology. Tavium Plus VaporGrip Technology provides postemergence control of over 50 broadleaf weeds as well as extended residual control of key broadleaf species such as waterhemp and Palmer amaranth as well as troublesome grasses. In addition to Tavium® Plus VaporGrip® Technology new Acuron XR, Acuron Flexi XR, and Acuron GT are new selective herbicides under development by Syngenta with anticipated registration allowing first sales in the 2021 growing season. New Acuron formulations contains four active ingredients with three modes of action and is formulated with liquid capsule suspension (ZC) technology. Acuron XR, and Acuron Flexi XR, will have a wide window of application including pre-plant, pre-emergence and post-emergence and will provide broad-spectrum residual control of annual grass and broadleaf weeds in field corn, sweet corn, seed corn, and yellow popcorn. Acuron GT will have a window of application for post-emergence use and will provide broad-spectrum residual control of annual grass and broadleaf weeds in glyphosate resistant field corn.

14

Plastic Contamination Mitigation Research

Dr. John D. Wanjura
Dr. Mathew G. Pelletier
Dr. Greg A. Holt
USDA-ARS Cotton Production and Processing Research Unit, Lubbock, TX

Lint bale contamination is estimated to cost US producers about $750 million annually. In recent years, plastic contamination has increased in large part because of the rapid adoption of cotton harvesters that wrap seed cotton in plastic. The plastic material is used to hold seed cotton in cylindrical form and protect it from losses in quantity and quality due to wind, rain, and other environmental effects. However, improper handling of cylindrical or round modules in the field or at the gin can damage the wrap and increase the risk of contamination. This presentation discusses new technologies for use in the ginning industry that help to identify and remove contaminants from seed cotton before it is ginned. Inspection systems used at the module feeder have proven useful in identifying module wrap damage prior to unwrapping and help to identify gin handling practices that reduce the risk of contamination. A newly commercialized system, known as VIPR, is used on the gin stand feeder apron to identify and eject contaminants from seed cotton flowing into the gin stand. Commercial testing of the VIPR system indicated detection and rejection efficiency of 90% for module wrap plastic.

15

Using Baculovirus Insecticide for Controlling *Helicoverpa* spp. (corn earworm/cotton bollworm) on Row Crops

Remi Wright, Certis USA

The use of baculovirus insecticides for row crops such as corn, cotton, and hemp. Baculovirus insecticides can be an important part of an IPM program in conventional and organic crops. This presentation will provide an overview of how baculovirus controls Helicoverpa spp. It will also provide some key tips regarding timing and application. For more information on Certis USA's baculorvirus, GEMSTAR®, please visit www.certisusa.com.

16

Harvest Aid Programs in Texas Cotton Production Systems

Benjamin McKnight, State Extension Cotton Specialist, Department of Soil and Crop Sciences, Texas A&M AgriLife Extension, College Station, TX

Chemical harvest aid programs are essential for the preparation of cotton for harvesting in the majority of U.S. acres. The effective utilization of harvest aid programs can increase mechanical harvesting efficiency, harvesting windows, and lint turnout, often resulting in a positive impact on yield and fiber quality. The growth stage of cotton, temperature, precipitation, humidity, and the type of harvesting equipment used are factors that are considered when developing a harvest aid program.

In the 2020 growing season, two field trials were conducted in the Blackland Prairie growing region evaluating harvest aid programs. A trial was conducted at the Stiles Farm Foundation near Thrall, TX and a second trial was conducted at a grower location in Hill County near Abbott, TX. Treatments in both trials consisted of commonly utilized defoliants, desiccants, and boll openers applied alone or in mixture. Single application and sequential applications were also evaluated, and treatments were replicated three times at both locations. Treatments were applied over five rows with a self-propelled sprayer calibrated to deliver 11 gallons per acre with Teejet 8002 Flat Fan nozzles. At 7 and 14 days after treatment plots were evaluated for percent defoliation, desiccation, and regrowth.

Increased leaf drop was observed at both study locations following treatment with a mixture of thiadazuron and Folex, compared with other treatments. The addition of Sharpen herbicide in a sequential application reduced plant regrowth compared with other treatments.

17

Crop Protection Updates from Bayer CropScience

Dr. Greg Steele, Crop Protection TDR, Bayer CropScience

Bayer CropScience has a diverse portfolio of Crop Protection, Seed Growth, and Seeds & Traits products that are constantly being updated. The focus of this short presentation will be the recently announced 5-year registration of XtendiMax® herbicide with VaporGrip® Technology, including requirements in the new label. Updates to other new and existing crop protection products will be reviewed as time permits.

18

Understanding Bt Resistance in Bollworm

Dr. David L. Kerns, Professor, Statewide IPM Coordinator, and Associate Department Head, Department of Entomology, Texas A&M AgriLife Extension Service

Currently we have essentially four Bt proteins utilized in cotton, Cry1As, Cry2As, Cry1F and Vip3Aa. Bollworm resistance to the Bt Cry proteins is wide-spread throughout much of Texas and the U.S. Cotton Belt. Cry1F has always been a weak protein on bollworm and resistance has not been characterized. Cry1A resistance has not been fully characterized but appears to involve multiple genes. There is some evidence that a single gene may be driving much of the resistance issue. Cry1A resistance appears to be incompletely to nearly completely dominant. Cry2 resistance involves multiple genes, is incompletely dominant to incompletely recessive depending on the Cry2 dosage. There may be several types of Vip3A resistance. The form we see in the field appears to be a low level of resistance or may be natural variation in susceptibility. However, we have detected a form of Vip3A resistance that renders the bollworm immune to Vip3A. This resistance is controlled by a single recessive gene.

19
Fertilizer Trends in Texas
Ben Jones, Associate Director, Office of the Texas State Chemist

20
New Products Update from Valent USA, LLC.
Dr. Christopher B. Meador, Field Market Development Specialist, Valent USA LLC.

Valent USA, LLC. is excited to announce the registration of EXCALIA™ Fungicide. EXCALIA™ exhibits high efficacy against a broad range of plant diseases on various crops, such as Rhizoctonia pod rot and Southern Blight of peanut, Asian soybean rust and cereal rusts. We are also excited to announce Senstar™ Insecticide which brings two effective modes of action for fast, long lasting control of soft-bodied insects in citrus and vegetables. Senstar™ utilizes dual systemic activity with fast translaminar activity for your IPM program. Finally, the new Zeltera™ Rice System combines multiple fungicide modes of action and a powerful insecticide for above and below ground rice seed protection as our latest seed treatment offering. With new technology for advanced protection from Rhizoctonia in combination with an enhanced rate of metalaxyl, Zeltera Rice System shields plant roots to deliver strong early and late season stand establishment and plant vigor, protecting your yield.

21
Interpreting Texas A&M Soil Analysis: Concerns with Phosphorus and Potassium Critical Levels
Dr. Larry Unruh, Technical Director, American Plant Food Corporation

Background: Late in 1989 I was hired by the Texas A&M Soil and Crop Science Department to help improve the turn-around-time, analytical accuracy and computerized fertilizer recommendations at the Texas A&M Extension Soil, Water and Forage Testing Laboratory. We were successful in improving lab accuracy and turn-around-time, but improving the computerized soil fertility recommendations proved to be challenging, considering the size and diversity of Texas agriculture. The Texas A&M program was written in the early 1980s by a brilliant programmer at Texas Tech. Dr. Dale Pennington worked countless hours with him along with his A&M colleagues on the Texas A&M program. It was written in Fortran and compiled on a computer at Texas Tech, making future modifications difficult. The original A&M program had 300 crop codes. This is why still to this day, growers can receive multiple recommendations on every soil sample, causing confusion with growers, farm stores and fertilizer dealers.

During my tenure at A&M, I had extensive conversations with the A&M soil fertility researchers trying to determine where the recommendations and critical levels came from: Drs., Welch, Gray, Onken, Matocha, Haby, Bade, Dorsett, Roquette, etc. At this same time, I was very fortunate to have multiple conversations with Dr. Glen Burton concerning the "fertilizer philosophy" used in the warm season grasses part of the A&M program. He was very critical, especially in the fact all of the P and K for the whole season was recommended to be applied in the spring application, followed by nitrogen only. This led to the rise in bermudagrass decline/take all root rot caused by the soil fungus Ggg. Later on the program was modified to split K applications if over 75 lbs/acre, but customers do not see this statement. I asked Drs. Gray and Welch where this philosophy came from and I was told "we just thought it was a good idea, we thought the P and K would move down with rainfall over the summer". Dr. Burton said this led to luxury consumption in the first hay cutting and his extensive research indicated that a N, P, K, S blend be put down with EVERY fertilizer application for warm season grasses.

Phosphorus Critical Level: During the spring of 1990 "Lab Comparison Studies" were initiated in the Texas Blacklands growing sorghum and corn. The A&M program recommended only nitrogen and the private labs recommended every nutrient imaginable. The private lab's plots looked fantastic, but the economics were not favorable. The A&M plots had small stalks, small heads and lodged, but if you were able to slow down and lower the header to harvest the fallen heads, the economics barely favored nitrogen only. I had observed this before in

Kansas and wondered if phosphorus was a limiting factor. Bobby Bird did his Master's Thesis on Phosphorus fertilization on sorghum, corn and cotton in the Texas Blacklands. The Olsen P test worked extremely well in predicting a P response. The A&M P test and the Bray I drastically overestimated P availability on these soils. These methods would result in 40-80 PPM extractable P, where the critical level was 22 PPM, same as all labs around the country. "It was decided" to double the critical level of P to 44 PPM. This was the only (global) change we were able to make in the old program. This change helped with row crops growing on the high pH soils of Texas, but drastically over recommended P in the more acid soils, where warm season grasses predominate. Remembering the P recommended by the A&M program for warm season grasses is for the whole season. This is why I have received so many A&M lab recommendations from Texas growers asking me what is going on?…"they" are recommending more P than K on a East Texas sand!

Potassium Critical Level: Originally established at 125 PPM extractable K. I asked Dr. Pennington how this was arrived at and he indicated the only hard data was from Dr. Onken planting haygrazer on old peanut fields in the Panhandle. He said a response from "incorporated" K in his research using the Cate-Nelson approach was about 125 PPM K. Dr. Pennington consulted Dr. Matocha at the A&M Overton station and he agreed that this was a good number based on his research with surface applied K on permanent pastures. Looking back this number was based on old data when the fields still had some K deeper in the profile, so 125 PPM K in central-west Texas was much more sufficient than 125 PPM K in East Texas. At the time if you were in East Texas and you had 126 PPM K, the K recommendation went to zero! Because of low K recommendations from A&M, the critical level for K has been increased to 180 PPM, which helps, but the K recommended is still for the whole season. When I am sent A&M soil sample recommendations with soil pHs less than 7.5, I normally cut the P recommendation in half and recommend the potassium rate be split and applied at 80-100% of the nitrogen rate (100 lbs N/Acre max-Hay) or rarely 120 lbs N/Acre for very good Tifton 85. For Grazing, I use the same blend as for hay and reduce the fertilizer rate by 40%. I also recommend small amounts of K on High K soils for a Chloride application. (disease, drought tolerance etc.)

22

New Technology Update from FMC

Eric Castner, Technical Service Manager, FMC Agricultural Solutions

Research has demonstrated that Xyway™ brand fungicides from FMC deliver season-long disease corn foliar disease protection from at-plant applications on key corn diseases including gray leaf spot, Northern corn leaf blight and common rust. Over 380 research trials, replicated over four years by FMC, universities, and growers have shown that an at-plant application of Xyway brand fungicides consistently results in equivalent disease protection and yields as a foliar fungicide application at the R1 growth stage. Outstanding stalk health and standability were also observed with Xyway brand fungicides compared to untreated acres. Xyway brand fungicides will include Xyway 3D fungicide and (pending registration) Xyway LFR® fungicide.

Elevest™ Insect Control is an optimized ratio of Rynaxypyr® active with bifenthrin. Elevest insect control combintes full rates of both Rynaxypyr and bifenthrin to provide enhance activity on select lepidopteran pests and a broad spectrum of more than 40 insects including sting bugs and plant bugs. Elevest is labeled on a broad range of crops including cotton, soybeans, peanuts, potatoes and pecans.

Vantacor t™ Insect Control is a new, advanced, low-use-rate formulation of Rynaxypyr® active which combines highly effective low use rates with fast-acting, systemic, long residual control for reliable results that optimize crop quality and yields. Vantacor insect control delivers convenient, targeted and long-lasting residual control of worm pests in a range of row crops including soybeans, corn, cotton, peanuts, potatoes, sweet corn, sugarcane and onions.

23

World Fertilizer Production and Demand Effects on U.S. Farmers

Dr. Robert Mullen, Director of Agronomy, Nutrien

This presentation will provide a discussion on how global fertilizer dynamics impact U.S. farmers. The presentation will discuss global supply and demand balances and trends.

24
Innovations with Duplosan^{TM} and Dichlorprop-p for Managing Herbicide Resistant Plants

Dr. Daniel D. Beran, Technical Service Director, Nufarm Americas

Nufarm has been conducting research to further evaluate the use of dichlorprop-p for the management of herbicide resistant plants. Duplosan, an ester formulation containing 4 lbs ae/gal of dichlorprop-p, has been used under a special local need label in Texas for post-harvest crop destruction of cotton including 2,4-D tolerant varieties. The recommended rates of Duplosan have been 32 oz. per acre of Duplosan alone or 24 oz per acre of Duplosan in combination with 3.2 oz. of FreefallTM (thidiazuron). The unique activity and spectrum of control of dichlorprop-p relative to 2,4-D has presented several research scenarios. Duplosan applied in the spring to control volunteer cotton has been most effective when the cotton is in the cotyledon to 2-leaf stage and when tank mixed with 2 oz. per acre of Panther® SC (flumioxazin). Evaluation of the efficacy of Duplosan on 2,4-D tolerant weeds has identified promising levels of control of kochia (Bassia scoparia), including biotypes resistant to dicamba and fluroxypyr. ScorchTM EXT, a combination of Duplosan, dicamba and 2,4-D is currently awaiting registration for noncropland and industrial vegetation management. Further work is being conducted to refine product concepts for use in small grains, fallow and preplant control of key broadleaf weeds including herbicide resistant kochia.

25
Nutrient Dynamics Under Regenerative Agriculture

Lance Gunderson, President, Regen Ag Lab

Much of the focus in conventional agriculture surrounds optimizing soil chemistry for nutrient uptake and maximizing yields. While this approach has certainly been successful in various aspects, the rising costs of production, negative environmental impacts, increased regulation, and stagnant commodity prices have more producers looking at ways to save on input costs. Under the Regenerative Ag model, producers focus more on biomimicry, carbon capture through photosynthesis, biological diversity, and minimizing disturbance to build a soil's biological capacity and function. While the crops in both systems require the same nutrients in the same relative amounts, the shift from a seemingly dead soil to a thriving, living ecosystem has a drastic effect on how plants interact with their environment to obtain the nutrition they require. Nutrient uptake is seldomly a direct transfer from the soil into the plant roots as most of us have been taught. Rather, a majority of crop nutrient uptake is facilitated by the direct and indirect interactions of various microorganisms, the plants, and the environment they both help create and share. In other words, nutrients found as part of a living ecosystem are not static in their chemical forms or their immediate availability. This dynamic nature creates challenges for producers, agronomists and soil scientists alike, but there are many desired outcomes derived from this give and take biological landscape, if we can learn to work with it rather than dictate it with an iron disc…or is it fist?

26
New Sorghum Herbicide Technologies for 2021

Dr. Brent Bean, Director of Agronomy, United Sorghum Checkoff Program

Three new and unique herbicide tolerant sorghum technologies for over-the-top grass control are expected to be introduced, at least on a limited scale, to grower fields in 2021. These include Inzen sorghum from Corteva, Igrowth sorghum from Advanta, and Double Team sorghum from S&W (Sorghum Partners.) Each technology was developed using conventional breeding techniques and is non-GMO. In addition, each will have its own strengths and weaknesses. Nicosulfuron from Corteva is the herbicide labeled for use in Inzen sorghum. Historically used in corn, nicosulfuron is an excellent herbicide for over-the-top control of a number of grass species. Grass with ALS resistance is a concern. Imazamox, from UPL, is the herbicide that will be utilized in Igrowth sorghum. Some growers will be familiar with this herbicide that has been used in soybeans and wheat. Its advantage is that it has both pre- and post-emergence activity, as well as the ability to control some broadleaf weeds. Although in a different subclass of herbicides than nicosulfuron, it is also an ALS herbicide. Double Team sorghum hybrids are tolerant to the ‘fop’ ACCase herbicides. Quizalofop, from ADAMA, will be the herbicide labeled for use in Double Team sorghum. This herbicide does not provide any broadleaf weed control activity, but has an excellent track record in controlling many grass species.

27
Product update from Nichino America, Inc.

Milo Lewis, Product Development Representative, Nichino America, Inc.

PQZ (pyrifluquinizon, IRAC group 9B) is a contact and translaminar insecticide that is efficacious against piercing/sucking insects including whitefly, aphid, and cotton fleahopper in a variety of crops including cucurbits and cotton. Portal (fenpyroximate, IRAC group 21A) is a contact insecticide/miticide with efficacy against several arthropods including potato psyllid in potato and mites in cotton, corn, and peanuts. Torac (Tolfenpyrad, IRAC group 21A) is an insecticide with excellent contact efficacy against thrips in onions and potato psyllid in potatoes. Torac is also active against most downy mildews. Gatten (Flutianil) offers a new and unique mode of action (FRAC group U13) against powdery mildew in grapes and cucurbits that shows no cross resistance to other modes of action.

28
The Small Grains Extension Program at TAMU AgriLife – An Overview

Dr. Fernando Guillen-Portal, Small Grains and Oil Seed Crops Extension Specialist, Department of Soil and Crop Sciences, Texas A&M AgriLife Extension Service

Implementation of effective transfer of research-based information on topics of practical relevance in small grain production in Texas to producers, extensions educators, and agricultural communities, along with the conduction of research oriented to finding practical solutions to current challenges in small grains production in Texas constitute the primary goals of the Small Grains Extension Program at Texas A&M AgriLife Extension. Consistent with that, annually the program coordinates and implements uniform variety trials in winter and spring wheat, winter and spring barley, and winter oats, and small grain forage variety trials in Texas. This is a collaborative effort among agronomists from the TAMU Research and Extension Centers and extension agents across the state. The information gathered allows to make solid variety recommendations for the different small grain growing regions in Texas. The 2020-harvest season included 30 locations where 63 HRWW, 73 SRWW, and 18 HRSW cultivars and experimental lines from 5 Universities and 10 Private seed companies were evaluated for agronomic performance in Texas. Agenda for the upcoming season include the implementation of an educational strategy oriented to the adoption of use of certified seed in wheat production in Texas, which will contribute to the betterment of the whole wheat industry in the state. It also contemplates the conduction of field research on the use of micronutrients to enhance the end-use value of winter wheat, and on genotype by environment by management (G x E x M) interactions to understand major causal factors underlying the observed yield gap in winter wheat.

29
Pioneer® brand Grain Sorghum with the Inzen™ Herbicide-Tolerant Trait

Dr. Spencer Samuelson, Corteva Agriscience

With the use of traditional breeding technology, Corteva Agriscience and Pioneer® announces the continued progress of Grain Sorghum with the InzenTM herbicide-tolerant trait. The non-transgenic Inzen trait was built on Pioneer’s elite genetics and agronomic traits and has been extensively field tested by local Pioneer field teams to ensure it protects yield potential. When partnered with Corteva’s ZestTM WDG herbicide, which has exceptional crop safety, the combination forms the most effective system for over-the-top foliar applications, specifically to manage annual grasses in grain sorghum. Zest WDG includes a proven herbicide active ingredient – a proprietary formulation of nicosulfuron – that is new for sorghum. This system was specifically designed for grain sorghum with a low fluid ounce rate, and a wide application window from V3-V7 sorghum, offering exceptional crop safety at all stages of growth. Zest WDG herbicide postemergence is part of a program approach to control weeds in Inzen grain sorghum. This program approach with Inzen includes a preemergence application of FulTime® NXT or Cinch® ATZ herbicides followed by Zest WDG postemergence.

30

Mexican Corn Rootworm Management

Dr. David L. Kerns, Professor, Statewide IPM Coordinator, and Associate Department Head, Department of Entomology, Texas A&M AgriLife Extension Service

Mexican Corn Rootworm (MCRW) can be a major pest of corn primarily along the Texas Gulf Coast and Blacklands. The larvae feed on the corn roots resulting in low vigor, lodging and yield loss. The adults feed on corn silks which can disrupt proper pollination. MCRW has only one generation per year and overwinters in the egg stage. Thus, the infestation is present at planting. Bt traits (Cry3Bb1, mCry3A, Cry34/35Ab1, and eCry3.1Ab) have been widely utilized to manage MCRW. Corn hybrids with single Bt proteins are considered low dose, not highly durable, and subject to the development of resistance. Thus, the EPA has mandated that we transition to hybrids with multiple rootworm Bt traits. However, there are still reports of unacceptable injury by MCRW to hybrids with multiple rootworm Bt traits. Since MCRW can only complete development on corn and a few grass species, rotating a heavily infested field out of corn is an excellent control tactic. If rotation is not a good option then the producer should: 1) utilize hybrids with multiple rootworm Bt traits, 2) use high rates of insecticide seed treatment, 3) supplement with in-furrow insecticides, and 4) manage adult beetle to reduce egg lay.

31

General Management and Key Agronomics for Sunflower Production

John Murray, Field Agronomist, Pioneer Seeds

Sunflowers can be a great crop to include in your crop rotation. In order to have a successful sunflower crop it is important to understand best management practices for sunflower production. Understanding what pests to scout for and having the right population, weed control strategy, and fertility is paramount.

32

Towards Genomics-Assisted Rose Breeding in Texas

Dr. Oscar Riera-Lizarazu, Associate Professor
Dr. Patricia Klein, Professor
Dr. David H. Byrne, Professor, Department of Horticultural Sciences, Texas A&M University

The focus of the rose breeding program at Texas A&M University is to develop sustainable garden varieties that combine high ornamental value with good adaptation. The major challenge is bringing together resistance against fungal diseases (black spot and cercospora leaf spot), the rose rosette virus (RRV), heat tolerance, and high ornamental quality. To this end, we have research efforts to better understand the genetic basis of traits of interest and to use marker/genomics-based tools in variety development. These activities include the construction of high-density linkage maps of diploid and tetraploid roses and identification of genetic factors, or quantitative trait loci (QTL), that underlie these traits using quantitative trait mapping approaches. A major effort has been undertaken to identifying QTL for resistance to black spot and cercospora leaf spot as well as flower productivity. These efforts have allowed the detection of stable QTL for these traits. Similar efforts are underway to identify genetic factors that underlie components of rose rosette virus resistance/tolerance, plant architecture, and flower pigmentation patterns. Better understanding of the genetic basis of traits from our mapping activities is now being coupled with other genomic approaches to enhance our ability to manipulate these traits and increase breeding efficiency.

33

Breeding for Novel Flower Colors in Winter-Hardy and Tropical Hibiscus

Dr. Dariusz P. Malinowski, Professor, Department of Soil and Crop Sciences, Texas A&M AgriLife Research

Winter-hardy and tropical hibiscus cultivars are highly sought ornamental plants that can be cultivated in containers or as landscape plants, depending on the climatic zone. Our winter-hardy hibiscus breeding program is 10 years old and focuses on developing cultivars with novel flower and foliage colors. The breakthrough achievements are development of winter-hardy hibiscus cultivars with bluish and salmon-orange flower colors, petal shapes resembling multi-petal flowers, and multicolored flowers. There are over 12,000 tropical hibiscus cultivars registered with the International Hibiscus Society, yet our breeding lines developed in the past 6 years have caught an immediate attention of major commercial partners. Our goals are to develop tropical hibiscus cultivars with novel flower color combinations, extended flower life, and for various uses. The breeding philosophy and examples of the outstanding hibiscus hybrids developed in our program are discussed in this presentation.

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Turfgrass Breeding Program at Texas A&M AgriLife Research

Dr. Ambika Chandra, Professor, Department of Soil and Crop Sciences, Texas A&M AgriLife Research

As an agricultural commodity, turfgrass impacts the lives of millions of people in many different ways including their physical and mental health, and social well-being. However, recurrent drought and increased demand on fresh water resources for human consumption means less potable water will be available for landscape irrigation while extreme weather patterns and temperature fluctuations are resulting in turfgrass winter-kill or heat-stress, especially in the transition zone. The turfgrass breeding program at the Texas AgriLife Research - Dallas focuses on developing climate resilient and stress tolerant cultivars of turfgrass species requiring lower inputs of water, pesticides, and fertilizer. We use conventional plant breeding approaches, sensor-based high throughput phenotyping technologies along with molecular biology tools for the genetic improvement of major warm-season turfgrass species for sustainable turfgrass production. The history of breeding, performance, and use of St. Augustinegrass and zoysiagrass will be presented with emphasis on research initiatives to improve drought tolerance, cold-hardiness and disease tolerance. Attendees will receive an overview of a warm-season grass breeding program working towards solving long-term problems challenging the economic and environmental viability of the turfgrass industry.

35

Indoor Vertical Farms

Dr. Shuyang Zhen, Assistant Professor - Controlled Environment Horticulture, Department of Horticultural Science, Texas A&M University

Indoor production of food and specialty crops in/near urban areas offers new opportunities to meet the increasing demand for local year-round production of high quality, safe, fresh, nutritious produce with improved yield per unit growing area. This technology-based, innovative approach to crop production can increase resource use efficiency and reduce environmental impact. However, high capital investments and production costs, especially high energy consumption, restrict production in controlled environment facilities to high value crops. Shuyang Zhen will discuss the opportunities and challenges in developing economically viable urban farms in Texas. She will also discuss her research in developing cost-effective lighting approaches and how the growing environment can be manipulated to improve crop yield, quality and nutritive values.

36

Irrigation Education Programs in the Rio Grande Valley

Dr. Lucas Gregory, Assistant Director, Texas Water Resources Institute, Texas A&M University

Agriculture in the Lower Rio Grande Valley would not exist as it currently does without irrigation. Water from the Rio Grande transformed land along the river into one of the most productive agricultural regions in the US. Today is

no different with the Rio Grande remaining the primary source of water for agriculture, industry, municipalities, and the environment. Demand for this limited water supply both in Mexico and the U.S. has rapidly increased. In times of shortage, agriculture is typically the first to deal with lower water availability. Making the most of resources you have is a must for growers. Many technologies and tools exist that can help save water or increase its use efficiency, but they come at a cost that is often economically impractical.
'The Lower Rio Grande Valley Irrigation Education and Outreach Program' funded by the Texas Water Development Board through an Ag Water Conservation Grant recently provided information resources and field-based learning to irrigation districts and growers regarding new technologies and techniques that can optimize and conserve water in the district's canal system and in the grower's field. Programs provided discussion forums regarding challenges faced, local needs and the dynamics of irrigation in the valley that make it very different from other irrigated areas. This presentation will highlight the variety of education programs delivered, technologies discussed, and local challenges and needs that make irrigation in the Valley very different from other parts of the world.

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Irrigation Management for Corn in the Texas High Plains: Implications of Hybrid, Planting Date, and Irrigation Management

Dr. Jourdan M. Bell, Associate Professor and Extension Agronomist, Department of Soil and Crop Sciences, Texas A&M AgriLife Extension Service

Corn is the primary irrigated crop in the Texas High Plains (THP), but the declining Ogallala Aquifer and irrigation pumping restrictions constrain corn production within the region. Variable weather patterns further compound crop stress and restrict corn production. Regional corn has historically been irrigated at 100% evapotranspiration (ET), but producers are reevaluating irrigation strategies and planted corn acres. Sustainable and efficient irrigation strategies are a priority for producers. Research was conducted in 2019 and 2020 at the Texas A&M AgriLife Research Farm in Bushland, Texas under center pivot irrigation. Planting date (normal ~ May 15 vs. delayed planting ~ June 20), hybrid relative maturity class and drought tolerance (long season vs. short season; with or without drought tolerance trait), and irrigation levels (100%, 75% and 50% ET requirements) were evaluated to optimize grain yield, grain quality, and water use efficiency (WUE). Delaying planting date minimized crop ET and improved grain yields and WUE for all hybrids and irrigation levels evaluated by accelerating crop development. In 2019, plant susceptibility to disease increased in the late planting under water stress (50% ET) and higher relative humidity (100% ET). There was no significant difference in grain yields between delayed planting at 75% ET and a normal planting dates at 100% ET, and there was no advantage to drought tolerant hybrids. 2020 samples are being processed and data will be presented. First-year data demonstrates that as irrigation becomes increasingly limited, delaying planting may provide a strategy to increase grain yields with limited irrigation capacities.

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Soil Water Sensors: Performance and Calibration

Dr. Gary Marek, Research Agricultural Engineer, USDA-ARS Conservation and Production Systems Laboratory

A myriad of commercial sensors is available for monitoring soil water in agricultural fields. Sensors vary in design, complexity, and cost. Measurement values also vary among sensors, including volumetric water content (VWC), soil matric potential, and other metrics. Field calibrations are useful for meaningful interpretation of data and performance evaluation. Additionally, all sensors are subject to potential issues with bulk density and preferential flow associated with installation methods. Irrespective of design, data from both VWC and relative difference sensors can be effective for irrigation scheduling purposes, provided users understand the caveats of each. We present calibration and performance data for several commercially available soil water sensors (including resistance, capacitance, and reflectometry-based sensors) using multiple installation orientations for a clay loam soil at Bushland, TX. Comparisons included a newly available, downhole time domain reflectometry (TDR) based sensor. All point and integrated soil profile water measurements were compared to corresponding data from neutron moisture meters.

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Sensor Based Variable Rate Irrigation

Dr. Susan O'Shaughnessy, Research Agricultural Engineer, USDA-ARS Conservation and Productions Systems Laboratory

Crop water productivity (CWP) can be improved at the field level by using variable rate irrigation (VRI) sprinklers to meet changing crop water needs over time and location within a field. However, sensor feedback is needed to detect variable crop water status and determine how much water to apply. The Agricultural Research Service developed an automated irrigation scheduling (AIS) system that uses a software program to integrate wireless sensor networks of canopy temperature, soil water sensing and local weather variables to build dynamic prescription maps and control VRI sprinklers. These systems were used for irrigation management of corn, soybean, cotton, and sorghum in humid and semi-arid regions. In Missouri, this system resulted in water savings of 1 to 2 acre-inches and greater levels of CWP (300 lbs/acre-inch) for cotton as compared with the Arkansas Irrigation Scheduling method, which resulted in 88.2 lbs/acre-inch. For soybeans grown in Mississippi, the AIS system resulted in CWP of 30 bu/acre-inch with a water savings of 3 to 4 acre-inches as compared with irrigation scheduling using soil water sensors to trigger irrigations using management allowable depletion, which resulted in only 15.1 bu/acre-inch. When the AIS system was used to manage corn in the semi-arid region of Bushland, Texas, and the humid region of South Carolina, CWP was on average 10 bu/acre-inch and similar to best management practices for each region. Sensor feedback for decision support could benefit producers through greater CWP without significantly lowering yields and could save producers time when making irrigation scheduling decisions.

40

Items Sometimes Overlooked on Pesticide Labels

Dr. Mark A. Matocha, Associate Professor and Extension Specialist, Agricultural and Environmental Safety Unit, Texas A&M AgriLife Extension Service

Pesticide labels are often lengthy documents that contain large amounts of information. The directions on labels are there primarily to help the applicator achieve maximum benefits with minimum risk. Because labels are legal documents, the use of any pesticide in a manner that does not comply with label directions is illegal. Most pasture and rangeland labels include specific directions for topics such as adjuvants, drift reduction, tank mix partners, timing, and buffer restrictions that may be overlooked by applicators.

41

Invora Herbicide: Update and Summary of Training Requirements

Dr. Megan Clayton, Associate Professor and Extension Range Specialist, Department of Rangeland, Wildlife, and Fisheries Management, Texas A&M AgriLife Extension Service

The much anticipated Invora® herbicide from Bayer CropScience LP was approved for application on privately-owned grazing lands and rangelands managed for wildlife in early 2020. This new chemistry (aminocyclopyrachlor + tricloyr amine) provides broadcast control with longevity on honey mesquite (Prosopis glandulosa) and huisache (Vachellia farnesiana), while also controlling many species of brush through foliar individual plant treatment applications that previously did not have a reliable control option, such as yaupon (Ilex vomitoria), whitebrush (Aloysia gratissima), Texas persimmon (Diospyros texana), lotebush (Ziziphus obtusifolia), and coyotillo (Karwinskia humboldtiana).

The EPA has stressed the importance of environmental stewardship by requiring a Picolinic Acid Chemistry Training prior to applying the herbicide. This 1-hour training provides information on use site (excludes public and hayed lands), buffer requirements, vegetation, brush, and manure management.

42

Biosecurity Matters for Livestock Producers

Bryan Davis, County Extension Agent - Emergency Management, Guadalupe County, Texas A&M AgriLife Extension Service

Biosecurity involves a system of management practices that prevent diseases from infecting a herd. Although biosecurity is often associated with foreign animal diseases, the term also applies to common diseases that affect herds, such as blackleg and bovine viral diarrhea. Vaccines can help prevent disease, but other management practices can be even more important. By developing biosecurity protocols that protect cattle from the common diseases, producers are establishing a safety net against a possible outbreak of a foreign animal disease.

43

DuraCor Herbicide for Range and Pasture Management - Key Learnings from the 2020 Field Season

Chad Cummings
E. Scott Flynn, Corteva AgriScience

DuraCor™ herbicide (Rinksor™ + Aminopyralid) is a new Range and Pasture herbicide labeled for control of annual and perennial broadleaf weeds and enhanced control of certain woody brush species. A key component of DuraCor is Rinskor™ active, a novel new active ingredient never used rangeland and pastures and is an EPA Reduced Risk Pesticide just like Milestone. DuraCor provides excellent control of many broadleaf weeds in range and pasture, including aerial broadcast, ground broadcast and treated dry fertilizer applications. DuraCor will be a useful tool in the management of weeds and some enhanced brush control in various sites. This presentation will discuss key learnings, best recommendations, and some new research on brush control with DuraCor tank mixes.

Poster Abstracts

1

Effects different legume and cereal cover crops on greenhouse gas emissions and soil moisture, temperature dynamics in organic cotton.

Sk Musfiq Us Salehin, Texas A&M University

Dr. Nithya Rajan, Texas A&M AgriLife Research

Reducing greenhouse gas emissions and increasing C sequestration in agricultural systems are some of the major concerns in modern day agricultural practices to fight the challenges of climate change. With increasing interest in organic cotton practice among the cotton producers of southeast Texas, we need to investigate the associated environmental footprints of the cropping system. A study was conducted at Texas A&M University farm at College Station, Texas to investigate the effects of different legume and cereal cover crops i.e. winter pea, mustard, oats, winter mix and one weed free check treatment on CO2, N2O and CH4 emissions using the static chamber technique. Soil moisture and temperature dynamics at 5-17 cm soil depth under the influence of four cover crops and weed free treatments were also monitored using CS655 soil moisture sensors. First year data of the study indicates relative high CO2 emissions from oats and winter mix treatments. Higher N2O emissions were observed from weed free and winter mix treatments. CH4 flux was highest in winter mix treatment compared to others. Cereal cover crop oats were very effective in conserving the soil moisture and keeping the surface soil cool compared to others. Continuation of the study for two more years would be a great help in understanding the effects more thoroughly and help in making right decisions for the management practices.

2

Corn and Grain Sorghum Performance Trials in Texas

Katrina Horn, Crop Testing Program Coordinator, Texas A&M AgriLife Research, Soil and Crop Science Department; Ronnie Schnell, Associate Professor and Extension Specialist; Ethan Biar, Research Associate; Texas A&M AgriLife Research, Soil and Crop Science Department

The Crop Testing Program conducts corn and grain sorghum performance tests each year to provide growers in Texas with accurate and unbiased information on hybrid performance at locations across the state. Selection of superior hybrids that are well adapted for a given region is essential for maximizing yield and profit. Tests are planted using a randomized complete block design with four replications of

each hybrid. Seed is planted using a SRES Advanced research air planter with Monosem units. Plant populations are determined for each location based on appropriate seeding rates for that region. Field data such as plant stands, plant height, flower dates, and lodging are recorded at the appropriate time. Tests are harvested with a John Deere 3300 plot combine equipped with a HarvestMaster GrainGage that measures plot weight, test weight, and grain moisture. Field and harvest notes are compiled for each location and results analyzed. Data from each location is analyzed statistically using SAS 9.4. Results are presented in tables with yield ranking from highest to lowest. Yields and hybrid performance vary based on geographic location and year-specific weather and rainfall conditions. These results prove helpful in giving producers and seedsmen valuable hybrid performance and comparison data.

3

Comparative genomics of Fov (Fusarium oxysporum f. sp. vasinfectum) in US cotton provides insights into Race-specific regions related to pathogenicity and evolution

Catherine Danmaigona Clement, Texas A & M Univeristy, Lin Zhang1, Zunyong Liu1, Steve Hague1, Terry Wheeler2, Jane K Dever3, Ping He1 and Libo Shan1, (1)Texas A&M University, College Station, TX, (2)Texas A&M AgriLife Research, Lubbock, TX, (3)Texas A&M AgriLife Research and Extension Center, Lubbock, TX

Fusarium wilt of cotton, caused by soil-borne fungal pathogen Fusarium oxysporum f. sp. vasinfectum (Fov), is a continuing problem causing up to 80% yield loss in cotton. The upland U.S. cotton industry is currently facing a strategic threat by reason of the expansion of Fov Race 4 (Fov4) from California in 2003 into Texas & New Mexico in 2017. There is an incumbent need to understand the extent of genetic diversity and pathogenicity of different Fov isolates in the field. While Race1 requires root knot nematode to effectively cause infection in cotton, Race4 is independent of root knot nematode. The differences in behavior of between these two races is unknown. Lineage-specific chromosomes have been reported to determine host specific pathogenicity in Fusarium oxysporum species but there is no report of lineage specific chromosomes in Fov and its function. We deployed long read whole genome sequencing and captured Race-specific (RS) regions unique to Race1 and Race4 Fov genomes. These RS regions were more enriched in GC, repetitive sequences, transposons & effectors compared to the core regions of all four genomes sequenced. It is well known that fungal avirulence genes encode virulence factors called effectors which play major role in virulence. RS regions amassed more secreted effectors with transmembrane domain and extracellular localization in contrast with the core chromosome regions. Genes and transposon elements enriched in these Race-specific regions might have strong correlation with pathogenicity and explain the different behavior of Race 1 isolates compared to Race 4 isolates. We also show several gene duplication events only observed in the Race-specific regions of the Fov genomes which plays an important role in the evolution of Fov. This is the first report of compartmentalization and identification of Race-specific regions with several events of gene duplication in the Fov genome.

4

Weed Suppression in Cotton through Phosphite Fertilization

Shilpa Singh, Soil & Crop Sciences/ Texas A & M University, Devendra Pandeya, Texas A & M University/ Keerti Rathore, Texas A & M University/ Kater Hake, Cotton Incorporated, Cary, NC/ Muthu Bagavathiannan, Texas A & M University

Herbicide-resistant in weeds is a major problem in US cotton production system. Novel strategies are crucial for effective weed management. Phosphorus (P) is an essential macronutrient required for the normal growth and development of plants. Plants can only metabolize P in the orthophosphate (Pi) form, but unable to utilize the phosphite (Phi) form. A transgenic variety of cotton with the bacterial phosphite dehydrogenase (ptxD) gene has the ability to convert Phi into Pi, whereas weeds lack this ability and thus can be negatively impacted by Phi application in a P deficient soil. In 2020, a series of studies were conducted to understand the effects of Phi application on cotton (ptxD and non-ptxD varieties) and weeds [Palmer amaranth (Amaranthus palmeri) and johnsongrass (Sorghum halepense)] in four soil types: very low P [10 parts per million (ppm)], low P (15 ppm), moderate P (25 ppm), and normal P (50 ppm). To compare preemergence as well as postemergence effects of Phi, the experiments were conducted in a randomized complete block design with three replications. Results indicated that Phi application negatively affected weed growth, but the level of impact varied in different soil P level. Greater effect was observed in low P soil (10 to 15 ppm) and Palmer amaranth. In an experiment with glufosinate and Phi tank-mix combinations, an improvement in weed control was observed. Further investigations are required to standardize the utilization of Phi as a weed suppression tool in cotton.

5

Quantifying Biological Nitrogen Fixation of Cool-Season Legumes in Three Systems in the U.S. Southern Great Plains

Jennifer MacMillan, Dr. Curtis Adams, Texas A&M University

Biological nitrogen fixation (BNF) is one of the most important ecosystem services rendered by legumes in cropping systems and a large motivation for producers to grow them. However, little quantitative information is known about legume BNF in the U.S. Southern Great Plains. The objective of this study was to quantify BNF and productivity in four winter legume species (Austrian winter pea, crimson clover, hairy vetch, and lentil) grown as cash or cover crops in three distinct dryland cropping systems in the region. Aboveground BNF is the product of biomass production, N content, and the percentage N derived from the atmosphere (%Ndfa) and each species had distinguishing component traits. Austrian winter pea was among the best producers and seemed to have an advantage as a N-fixer in monoculture plantings due to its high %Ndfa (57.2 to 72.6%). The rate of BNF was greater in pea (66.7 to 73.9 kg ha-1) than vetch (45.8 to 51.3 kg ha-1), depending on the site, and greater than all other legumes tested. Moderate

biomass production and high %Ndfa at one site made BNF in lentil (48.6 kg N ha-1) comparable to vetch. Clover performed poorly. When peas were intercropped with wheat as an organic hay crop, the mix was productive and legume %Ndfa was exceptionally high (92.7%), making BNF comparable to legume monocultures in the other systems (54.6 kg N ha-1). The evaluated legumes can be incorporated into regional cropping systems to fix N, reducing the need for chemical fertilizer, while providing other ecosystem services.

6

Effects of gibberellic acid and cold stratification on sparkleberry (Vaccinium arboreum) germination under different collecting times

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Sparkleberry (V. arboretum), a native blueberry species, has the potential to use as a blueberry rootstock due to its broader adaptation to the environment and less yield loss during mechanical harvesting. However, propagating sparkleberry on a large scale is difficult and little information about its seed germination can be found. To improve sparkleberry germination rate, a greenhouse study was carried out with seeds collected in November and December. Seeds were treated with gibberellic acid (GA3) at three levels (0, 500, and 1,000 mg L-1) and cold stratification at four levels (0, 3, 6, and 9 weeks). Emergence percentage and number of days needed for germination were recorded. Results showed that seeds collected from November treated with 500 mg L-1 GA3 and stratification for 9 weeks could reach a germination rate at 70.4% with 12.6 days needed for germination. Seeds collected from December treated with 1,000 mg L-1 GA3 and stratification for 3 weeks could reach a germination rate at 61.2% with 19 days needed for germination. In conclusion, combining GA3 at 500 mg L-1 and a period of cold stratification can be used for promoting sparkleberry seed germination.

7

Assessment of Phenotypic Variation in Root Nodulation and Growth Parameters in 50 Guar (Cyamopsis tetragonoloba L.) Accessions

Rajan Shrestha, Texas A&M University, Curtis Adams/Texas Agrilife Research and Extension Centre, Vernon, TX

Guar (Cyamopsis tetragonoloba L.) is a legume crop grown in semi-arid regions of the world mostly for galactomannan gum derived from the seed endosperm, which has diverse applications as binder,

thickener, and lubricant in several industries. Besides seed production goal, guar producers parallelly hope to maximize biological nitrogen fixation (BNF), though little is known about rates of BNF or the factors that limit BNF in guar. Therefore, we tested 50 guar accessions characterize phenotypic variation in root nodulation (nodule number and size), and crop growth parameters (plant height, biomass, biomass components, specific leaf area, leaf area index, number of reproductive and total nodes). The pot study was fully replicated in a greenhouse near Vernon, TX in summer 2020. The 50 guar accessions, obtained from the Plant Genetic Resources Conservation Unit (Griffin, GA), were grown for 50 days, followed by sample processing and data collection. Biometrics on nodulation characteristics showed large variations on nodule mass (0 -887 mg plant-1) compared to the nodule numbers (6-18 plant-1). Similarly, genotypes varied greatly with morphological traits like nodes, height, branches, stem basal diameter, and biomass productivity. The components of biomass/biomass production were co-related to nodule mass, suggesting a greater N-fixation relationship with more productive genotypes. Results suggest the existence of a diverse genotypic pool for the guar plant, enabling varietal selection/improvement for biological-nitrogen-fixation and/or yield productivity.

8

Evaluation of Seasonal Application Options for Smutgrass (Sporobolus indicus var. indicus)

Zachary Howard / Extension Program Specialist, Texas A&M AgriLife Extension, Mason House, Scott Nolte

Smutgrass (Sporobolus indicus) is a non-native perennial weed that is problematic due to its poor palatability to cattle and its difficulty to control once established. The objective of this research conducted in 2019 in Grimes and Austin County, Texas, was to evaluate the most effective options for smutgrass control at three seasonal application timings. Treatments of hexazinone, nicosulfuron + metsulfuron methyl, glyphosate, and imazapic were each applied in spring (A), summer (B), and fall (C) applications. Smutgrass control and common bermudagrass injury at both locations, and bahiagrass injury at the Austin County location, were evaluated following spring green up in 2020. Summer applications of hexazinone resulted in the highest level of efficacy, though did not provide total smutgrass control. In general, treatments of glyphosate and imazapic applied in the spring resulted in the greatest amount of bermudagrass injury, while spring applications of nicosulfuron + metsulfuron, and summer applications of glyphosate caused the greatest bahiagrass injury. However, all bermudagrass and bahiagrass forage recovered by the spring evaluation.

9

Evaluating of Spanish Peanut (Arachis hypogaea L.) breeding lines for Organic Peanut Production

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AgriLife Research, Corpus Chrisiti/M.D. Burow, Texas A&M AgriLife Research and Texas Tech University

Organic peanut production is centered in West Texas with some estimates indicating that as much as 98% of all organic peanuts in the U.S. are being produced in the region. Organic producers face limited options for control of several key production issues. The lack of the ability to apply fungicides and herbicides both at planting and during the season is a major factor in how organic peanuts are managed. The lack of the ability to use commercial seed treatments in organic production systems often results in poor germination and stand establishment which is also a factor in weed control throughout the season. The Texas A&M AgriLife Research Peanut Breeding Program initiated an evaluation of current germplasm in 2020 in an on-farm trial in Terry Co. Texas. Twenty breeding lines and cultivars were evaluated. Each entry was replicated 3 times without the commercially available seed treatment. Plots were arranged in a randomized complete block and stand counts were taken by hand at 7, 14, 21 and 28 days. In addition, plot data was collected and evaluated for plant height, visual greenness, pod rot, yield and grade. Differences were observed based on date of stand counts, plant height and yield and quality characteristics. Data will be presented. This project will be repeated in 2021 and expanded on in order to develop breeding lines specifically suited for the unique needs of organic peanut producers.

10

Using Unmanned Aircraft Systems for evaluation of Peanut (Arachis hypogaea L.).

J. M. Cason/ Assistant Professor, Texas A&M AgriLIfe Research Stephenville, B.D. Bennett /Texas A&M AgriLife Research Stephenville/Anjin Chang, Mahendra Bhandari, Texas A&M AgriLIfe Research Corpus Christi/ M.D. Burow Texas A&M AgriLIfe Research Lubbock and Texas Tech University

In the past, the collection of crop data was performed by expensive, labor-intensive and in some cases destructive hand sampling techniques. With the introduction of Unmanned Aircraft Systems (UAS), some of these hurdles can be overcome. The 2019 crop season was the first-time data was collected on peanut by the Texas A&M AgriLife Research peanut breeding program located in Stephenville, Tx. In 2020 the program was continued. A total of 17 flights were collected at a location in Erath Co. Texas. and were processed and analyzed where applicable. The location was flown weekly from 14 DAP until harvest to collect data for analysis. The location was planted on May 6, 2020 and dug on October 5, 2020. UAS data collection (i.e. flights) were conducted beginning in May and ending in September. One drawback to UAS data collection is the single antenna Global Positioning System (GPS) on the UAV is only accurate to 3-5 m. To improve the quality of the data collected Ground Control Points (GCPs) were used to survey plots using a post-processed kinematic GPS (PPK-GPS) device which improves overall accuracy to < 2-3 cm. Results on plant height and other traits will be presented.

11

The Impact of Nozzle Selection on Herbicide Efficacy for Controlling Smutgrass (Sporobolus indicus)

Mason House/ Graduate Assistant, Texas A&M Univerity, 1) Zachary Howard/Texas A&M AgriLife Extension 2) Scott Nolte/Texas A&M AgriLife Extension

The broad range of variables involved in herbicide applications can make achieving effective weed control very challenging. These variables include application timing, methodology, weather and many other factors. The impacts of some variables have been researched extensively in several weed species; however, no research has been published evaluating application nozzle type and the methodology required to significantly improve smutgrass control. In 2019, a trial was conducted in Brazos County, TX comparing flat-fan air-induction nozzles to bi-directional nozzles spraying labeled smutgrass control programs through both nozzles; in order to determine relative fitness of each nozzle to the herbicide program. Results of this study show that glyphosate at 1.375 lb ai A-1 followed by hexazinone at 1.12 lb ai A-1 resulted in 100% control approximately one year after application and resulted in no significant injury to the bermudagrass (Cynodon dactylon) within the plots, as compared to the untreated check. However, both nozzles resulted in 100% control with this herbicide treatment, which means there was no difference in control that could be contributed to the nozzles. Also, of the four herbicide treatments tested in 2019, the nozzles did not create significant difference in any of the herbicide programs' efficacy 365 days after treatment. This trial was applied again in October 2020 at a second location, using the same treatments and nozzles and will be rated at 30-day intervals until 365 days after treatment.

12

Association analyses for yield components and end-use quality in synthetic derived and adapted winter wheat lines and model selections for genomic prediction.

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Primary synthetics have been used in spring wheat breeding worldwide. Synthetic derived lines (SDLs) from hard red winter wheat backcrossing has been reported to have a higher yield potential than adapted cultivars, which is important for ensuring global food security through the development of improved varieties. To understand the genetics of marker-trait associations underlying yield components and bread-making quality traits in SDLs, field data from twelve environments were collected from 2015 to 2017 in both dryland and irrigated conditions. Yield, yield components, and end-use quality traits were measured on a panel of 298 diverse SDLs derived from crosses of 21 primary synthetic hexaploid spring wheat lines crossed with TAM 111 and/or TAM 112. We employed genotyping-by-sequencing (GBS) to identify the genetic loci for yield traits though genome-wide association study (GWAS) using TASSEL and GAPIT. rrBLUP is used to build a training model to calculate genomic estimated breeding values (GEBV) of a set of different 165 SDLs in the yield trials of 2019 and 2020. Association analyses will also be conducted in a set of 191 adapted advanced lines for yield and end-use quality and their GEBVs will be estimated using a model from a TAMU historical set of 230 lines from elite yield trials during 2009 to 2018. Significant SNP alleles associated with improved yield and end-use quality traits will be compared between adapted and synthetic-derived lines to find superior alleles beneficial to breeding and the release of new cultivars."

13

The Effects of Plant Nutrients on Biological Parameters of Crapemyrtle Bark Scale

(Acanthococcuslagerstromiae)

Mr. Runshi Xie, Texas A&M University, Mr. Bin Wu (Texas A&M University), Dr. Mengmeng Gu (Texas A&M AgriLife Extension Service), and Dr. Hongmin Qin (Texas A&M University)

Crapemyrtle Bark Scale (Acanthococcus lagerstromiae; CMBS) is a non-native pest species that feeds on the phloem of several plant hosts including crapemyrtles (Lagerstroemia spp.), pomegranates (Punica spp.), and American beautyberry (Callicarpa spp.). Better understanding of plant-insect interaction may provide alternative pest management strategy, thus increase the effectiveness in controlling this pest insect. Previously, plant malnutrition was known to disturb plant metabolism. However, little was known about the relationship between plant metabolic state and the population dynamics of CMBS. In this study, the effects of plant metabolic state on the performance of CMBS were evaluated. Insect rearing experiments were conducted in growth chamber at 25°C and 12-photophase. Nymphs were reared on crapemyrtle grew in nutrient deficient agar medium and agar medium with supplementation of 0.1 MS salt. Biological parameters of CMBS including duration of each nymphal instar, survival and mortality of instars, longevity, and fecundity were recorded. At day 105, the mortality of CMBS reached 100% and 71.43% for the nymphs reared on plants in MS and nutrient deficient medium, respectively. No second generation CMBS progeny was reproduced on plants grew in the MS medium despite that the plants grown in the MS medium were much healthier than the ones raised on nutrient deficient medium. The results indicated that the metabolic state of the host plant plays an important role in its acceptance of CMBS, which suggest that an optimized plant nutrient supplement regime may be in aid of current pest control strategies for CMBS.

14

HPPD Tolerant Cotton Response and Weed Management Systems Using Isoxaflutole

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Over half of the nation's cotton (Gossypium hirsutum L.) is planted in Texas with 4 million acres residing in the High Plains region. Since 2011, glyphosate resistant Palmer amaranth (Amaranthus palmeri S. Watson) has threatened Texas cotton production and profitability and alternatives to glyphosate-based weed management systems are needed. Integrating soil residual herbicides such as isoxaflutole, an Herbicide Resistance Action Committee Group F2 herbicide, is an effective weed management strategy to control glyphosate resistant weeds before emergence. BASF Corporation is developing hydroxyphenylpyruvate dioxygenase (HPPD) tolerant cotton, which may allow growers to use isoxaflutole, an HPPD inhibiting herbicide, in future weed management programs. In 2019 and 2020, field experiments were conducted to examine crop response and weed control when incorporating isoxaflutole into local season-long weed management programs. There were two locations examining cotton response (Lubbock and New Deal, TX) and one location examining season-long weed control (Halfway, TX) each year. Cotton response to isoxaflutole was minimal (<15%) throughout the season and cotton lint yields were similar to the nontreated weed-free control. Season-long weed control when incorporating isoxaflutole into local weed management programs was equal to or better than the current local standard herbicide program that did not include isoxaflutole. Isoxaflutole provided excellent Palmer amaranth control when applied before weed emergence but had little effect on emerged weeds. The opportunity to use isoxaflutole in cotton will improve season-long Palmer amaranth control and add a novel mode of action in weed management systems when integrated as part of an overall weed management program.

15

Using an UAS derived vegetation index to monitor sugarcane aphid stress in sorghum in Texas

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Unmanned aircraft systems (UASs) and sensors are able to collect multi-temporal remote sensing data over the cropping season for detecting plant stress. In order to apply this technology for management of the sugarcane aphid on sorghum, pest severity was estimated by linking a normalized difference

vegetation index (NDVI), a common measure of plant health, to ground measurements of insect abundance and yield. We introduce several UAS advancements in collecting imagery and processing designed to show the fine-scale of plant response to low aphid population levels needed for management purposes. We monitored structured low aphid populations on sorghum using UAS equipped with RGB and multispectral cameras. Analysis of post infestation aphid densities was able to detect significant effects of aphid manipulation on cumulative aphid days. However, the relationships between NDVI, sugarcane aphid abundance, and yield were variable for the aphid densities seen in this study. These results suggest the limitations on the effectiveness of NDVI to monitor aphid populations in sorghum may be more related to the form and severity of aphid feeding and plant response, as opposed to technological problems with UAS derived data.

16

Fall Cover Cropping Systems in Texas

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Fall cover crops may provide a way to suppress herbicide resistant weeds, improve soil health, and reduce nitrate leaching. Questions remain however, about the benefits and risks for Texas cropping systems. Our objective is to measure change in soil properties, weed management, and crop yields when contrasting fall cover crops are used in conventionally managed corn (Zea maize) and grain sorghum (Sorghum bicolor (L.) Moench). The experiment was arranged in a strip-plot design with three replications for corn and sorghum production in Burleson County, TX on the Texas A&M University farm. Herbicide treatments (post application timing) were established as whole plots and cover crop as strip plots with cash crops established as independent studies. Cover crop's impact on weed pressure, herbicide efficacy, and grain yield were measured. While herbicide application timing influenced weed biomass, no significant impact ($p>0.05$) on grain yield was observed. Cover crops significantly impacted cash crop grain yield. In the first year of the study, sorghum following winter wheat had significantly lower grain yields than fallow while the other cover crops did not differ. In the second year of the study only sorghum following spring wheat did not differ from fallow whereas the others yielded significantly lower. In corn both spring and winter wheat seemed to have a significant yield penalty in the first year of the study. However, in the second year of the study plots following winter wheat actually had significantly higher yields than fallow. This study will be repeated for a third year.

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Soil Health Management Systems for Resilient Farms

Jodie McVane Reisner , Texas A&M University, Muthukumar Bagavathiannan

Conservation management systems on farms can address many existing environmental issues facing agriculture. Soil health refers to the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. It is of utmost importance to manage soils so they are productive for current and future generations. Soils contain living organisms that provide many ecosystem services, that ultimately benefit crop growth and yield. Many soils in Texas and beyond have been degraded due to erosion and management factors. Cover crops are a tool to use that offers several ecosystem services and protects soil resources.

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Influence of Palmer amaranth size on recurrent sublethal dose selection of Dicamba

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Palmer amaranth escapes are becoming increasingly common in Dicamba cotton systems in Texas. It is known that Palmer amaranth (Amaranthus palmeri S. Watson), when sprayed with sub lethal doses of Dicamba, can evolve 3-fold resistance by the end of the third generation (Tehranchian, Parsa et al. 2017). However, all the seedlings in this experiment were sprayed at 4-5 leaf stages (4 inch). And in the field, it's not uncommon to see Palmer of different sizes between two application timings because of its prolonged germination period and its habit to germinate in cohorts. In cotton systems, with no residuals in the herbicide program and continuous application of Dicamba as POST applications, waiting until a substantial population of palmer germinates to spray could cause serious resistance issues in the long run. Therefore, to simulate field conditions more closely and evaluate if size of palmer influences the rate of selection similarly to that of applying sub-lethal doses of dicamba, three different sizes of palmer between 0-4 inch, 5-8 inch and >8 inch were sprayed with 0.075X and 0.125X, 0.15X and 0.25X, 0.25X and 0.45X respectively. Visual differences were observed in the above ground biomass between treated and untreated plants at 7 DAT. Plants treated with higher dose on each size showed greater decline in biomass compared to lower doses. Dry weight of above ground biomass, percent seedling survival at 21 DAT and dose response curves will be included at the time of conference.

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EPG application in feeding behavior study helps rapidly confirm potential hosts of crapemyrtle bark scale (Acanthococcus lagerstroemiae)

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Crapemyrtle bark scale (CMBS, Acanthococcus lagerstroemiae), an invasive and polyphagous sap feeder, has spread across 14 states. The infestation of CMBS negatively impacted the flowering of ornamental plants and even the fruiting of some crops. CMBS host identification is critical to determine potential risks to ecosystems and industries and helps develop strategic management. To establish a reliable and fast method for screening potential hosts, we used the electrical penetration graph (EPG) technology to investigate the CMBS's feeding behavior on different plant species, such as Buxus microphylla var. japonica 'Gregem', Callicarpa acuminata, Callicarpa longissima, Ficus pumila, Ficus tikoua, Lagerstroemia limii, L. speciosa, and Malus domestica 'Red Delicious'. Compared with other Hemipteran feeding waveforms, which have been correlated with insect penetration activities, we uncovered typical waveforms associated with the CMBS's feeding behavior. All waveforms including waveform A (start probing), C (intercellular), potential drops (cell membrane), E (phloem), and G (xylem), were detected on C. longissima, F. tikoua, L. limii, and L. speciosa. This result verified these species as the hosts for CMBS. Except for waveform E, all other waveforms were detected on C. acuminata, F. pumila, and M. domestica 'Red Delicious', demonstrating that CMBS took xylem sap but did not drink from phloem tissue. Thus, C. acuminata, F. pumila, and M. domestica have the potential of being the hosts. No feeding activity has been detected on this boxwood yet, suggesting that this Buxus might not be the potential host. Therefore, the EPG-based approach would shorten the process of confirming CMBS's potential hosts.

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Detecting Low Rates of 2,4-D Injury in Cotton using an Unmanned Aerial System

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The release of auxinic herbicide resistant cotton varieties in 2017 provides growers additional options for successful season-long weed management. The use of auxin herbicides, like 2,4-dichlorophenoxyacetic acid (2,4-D), allows growers to use multiple modes of action to control glyphosate resistant weeds such as the Amaranthus species. Although this herbicide has been effective at managing weeds, off-target movement of 2,4-D can be problematic to susceptible vegetation including non-tolerant cotton varieties. Cotton is highly sensitive to 2,4-D at very low rates and plants exhibit visible injury within a few hours after exposure. In this study, an Unmanned Aerial System (UAS) was used to detect low rates of 2,4-D injury in cotton. The study was conducted at the Texas Tech New Deal Research Farm near Lubbock, TX. Several different low rates of 2,4-D were sprayed mid-season to cotton at four stages of growth using a CO2-pressurized backpack sprayer. Weekly flights at an altitude of 100 feet were conducted after application. Reflectance maps were generated and various vegetation indices were applied to assess differences between treatments. Several vegetation indices were able to distinguish between the low rates of 2,4-D and the non-treated control. As the cotton continued to grow after 2,4-D exposure, reflectance values across all treatments increased as well as injury in the treated plots, resulting in greater

detectability later in the season. Removal of the soil background resulted in slightly better results as compared to its inclusion.

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Effect of Biological Nitrification Inhibition (BNI) of sorghum on Weswood silt loam soil

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Nitrification is an essential component of soil nitrogen (N) cycling, catalyzed by several soil nitrifiers. The highly mobile NO3- can easily leach from the root zone resulting decrease in the nutrient use efficiency along with adulterating the environment. Several studies revealed the presence of Biological Nitrogen Inhibitor (BNI) compounds in sorghum that can suppress soil nitrification. All these previous studies were conducted in soil-less systems. A greenhouse pot experiment was conducted in a randomized block design with three replications at Texas A&M University (TAMU). Four sorghum genotypes from the Texas A&M sorghum breeding program were selected based on BNI screening conducted at the Japan International Research Center for Agricultural Sciences (JIRCAS). A high BNI genotype and bare soil were used as positive and negative controls. Nearly eight weeks after seed sowing, rhizosphere soil samples were collected to test the effect of BNI activity on ammonia-oxidizing bacteria (AOB) population. A potential nitrification study was conducted with rhizosphere soil samples in a controlled environment with two treatments receiving nitrification inhibitor (2-Cyanoguanidine) application totaling eight treatments. The samples were extracted daily to analyze NH_4^+, NO2-, and NO3- contents in the incubated soil. The preliminary result showed high BNI producing lines can attenuate the AOB population. The incubation study resulted in a similar nitrification pattern in all the sorghum lines potentially due to compromised root growth observed in our study. However, the application of DCD changed the nitrification dynamic of the soil.

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Exploiting Genetic Variation for Heat Stress Tolerance in Tomato

Samikshya Bhattarai, Texas A&M University, Daniel I. Leskovar

Texas tomato production is vulnerable to extreme heat in the spring-summer cropping period. This limitation is exacerbated by the lack of available superior heat stress tolerant tomato genotypes. There is a dire need for superior varieties that can adapt to the Texas environments and exhibit high yield stability

under such temperature extremes. Two open-field experiments were conducted at the Texas A&M AgriLife Research and Extension Center - Uvalde to select heat-tolerant tomato varieties under natural heat-stress conditions. Forty-three commercial and TAMU heirloom and hybrid tomato varieties were screened based on yield responses in 2019. Twenty-four varieties selected from the first study were then examined in 2020 based on leaf gas exchange and temperature, chlorophyll fluorescence, SPAD value, electrolyte leakage (EL), heat injury index (HII), and yield. The tomato varieties with low EL (a measure of cell membrane stability) and HII (a visual rating) exhibited higher marketable yields. This study suggests that electrolyte leakage and heat injury index were the prime determinants that best distinguished the heat-stress tolerant tomato varieties in open-field conditions. Those were: ‘Heat Master,’ ‘New Girl,’ ‘HM-1823’, ‘Rally,’ ‘Valley Girl,’ ‘Celebrity,’ and ‘Tribeca.’ Adopting these varieties for southwest Texas production systems is highly recommended to enhance tomato yield during the spring-summer season. This study also contributes to tomato breeding by better understanding the genetic bases underlying tomato heat stress tolerance.

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Herbicidal Management of The Invasive King Ranch (Bothriochloa ischemum) and Kleberg Bluestems (Dichanthium annulatum) in South Texas

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King Ranch bluestem (Bothriochloa ischemum) and Kleberg bluestem (Dichanthium annulatum) are two invasive grass species used originally in pastures for grazing and erosion control. Due to their competitive behavior the two bluestem species have moved and overtaken unintended areas. This study was designed determine to efficacy of fifteen different herbicide treatments, rates, and timings for long term management. The treatments were arranged in a randomized complete block design (RCBD) with 3 by 6 meter plots consisting of three replications of each treatment and one untreated control (UTC). Bluestem density counts were conducted using a 0.3x0.3 meter square 3 times in each plot bi-weekly from spring to fall. At 49 days after application A (DAA) there was a decrease in bluestem density compared to the UTC of 80.42-41.20% from the treatments with glyphosate (3.05 kg ae ha-1), imazapyr (0.34 kg ae ha-1) + glyphosate (1.26 kg ae ha-1), pendimethalin (2.77 kg ai ha-1) + glyphosate (1.26 kg ae ha-1), glyphosate (1.26 kg ae ha-1) followed by glufosinate-ammonium (0.66 kg ae ha-1; 5-7 days later), and indaziflam (43.87 and 73.12 g ai ha-1) + glyphosate (1.26 kg ae ha-1). At 47 days after application B (DAB) there was a 55.32-42.91% decrease from treatments with pendimethalin (2.77 kg ai ha-1) + glyphosate (1.26 kg ae ha-1) and indaziflam (43.87 and 73.12 g ai ha-1) + glyphosate (1.26 kg ae ha-1). Further analysis will be conducted, and a second year of data will be analyzed to further corroborate these results.

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QTL mapping of yield component in adapted wheat cultivars TAM 113 and Gallagher

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Understanding the genetic structure of yield and yield components of dryland and irrigated wheat (Triticum arestivum L.) is pivotal to developing enhances germplasm and cultivars. The aim of this study is to construct a genetic map and detect major quantitative trait loci (QTL) linked to enhanced yield components using the biparental population developed from ‘TAM 113’/’Gallagher’. Plant height (PH), heading date (HD), total biomass, thousand kernel weight (TKW), seeds spike-1, spikes m-2 and yield were recorded from 191 recombinant inbred lines (RIL) at McGregor, College Station and two environments at Bushland, TX during the two growing seasons in 2019 and 2020. A set of 8261 single nucleotide polymorphisms (SNPs) markers were used to construct a high-density genetic map for all 21 chromosomes using JoinMap 4.0. The QTL have been analyzed and reported using IciMapping 4.2. A major QTL for hessian fly resistance was identified on chromosome 1A and 5A. Twenty-nine QTL associated with traits of grain yield, HD, PH, biomass weight and spikes m-2. Additionally, one QTL has a pleotropic effect on HD and grain yield and was identified on 2D at 32 Mb.

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Application of X-Ray Computed Tomography to Analyze Sorghum Grain Quality

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The structural characteristics of whole sorghum kernels are to affect end-use quality. Improvements in structural characteristics are reliant upon accurate and efficient phenotyping methods which are currently limited. X-ray computed tomography, CT imaging, presents opportunities to nondestructively extract three-dimensional quantitative data from sorghum caryopsis for multiple traits related to end use quality. Presented herein is a phenotyping pipeline developed using a machine learning based classifier to characterize sorghum caryopsis for structural characteristics. Validation of this methodology was conducted on a panel of sorghum lines to access precision and accuracy in measuring embryo volume, endosperm hardness, endosperm texture, endosperm volume, pericarp volume, and kernel volume. Applications of this research could lead to improved testing metrics for grain quality and subsequent

improvements that would follow through traditional breeding practices not just in sorghum, but other small-seeded crops as well.

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Timing is everything: root-feeding herbivore overcomes biological control by reducing recruitment of entomopathogenic nematodes with sustained herbivory.

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Root-feeding herbivores are among the most devastating crop pests because their belowground infestations are challenging to detect and control. Conventional management strategies often rely on prophylactic pesticide applications, which can be expensive and environmentally damaging, highlighting a need for more sustainable control options. Biological control with entomopathogenic nematodes (EPNs) is a promising strategy for managing root-feeding insects, like striped cucumber beetles (Acalymma vittatum), which are devastating pests of cucurbit crops. Here, we examined the potential for EPN biological control of cucumber beetles by comparing recruitment of EPNs (Heterorhabditis bacteriophora) to roots of cucumber plants (Cucumis sativus) with or without A. vittatum herbivory. We also characterized the EPN-attracting volatile cues produced by C. sativus roots and investigated how EPN attraction changes over the course of herbivory. We found that feeding damage by striped cucumber beetle larvae induced a characteristic blend of volatiles, including three key compounds, camphene, alpha pinene and sabinene, which successfully recruited EPNs. However, after 7 days of continuous herbivory, beetle larvae suppressed production of these volatiles and EPNs were no longer attracted to larvae feeding on roots. This study revealed a potential challenge of using EPNs to control cucumber beetles, as larvae could avoid attracting EPNs during later infestations. However, we also identified volatile chemical attractants for EPNs that could potentially be introduced as synthetic lures to enhance EPN biological control. Overall, our findings suggest that timing of introduction could be important for successful recruitment of EPNs and effective biological control of striped cucumber beetles.

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Genetic Resistance is a Consistent Management Tool Against Reniform Nematodes in Cotton

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Reniform nematode, Rotylenchulus reniformis, is an increasingly detrimental pest in cotton throughout the United States cotton belt. Field research was conducted at Damon, College Station, and Wall, TX in 2019 and 2020, and at Lubbock, TX in 2020, to assess efficacy of genetic resistance and nematicides to

reduce negative impacts of reniform nematodes on cotton production. One study compared genetic resistance among root-knot resistant (RKN), reniform resistant (REN), and nematode-susceptible varieties with and without an in-furrow nematicide (fluopyram + prothioconazole). The second study compared nematicides: in-furrow aldicarb (15G), in-furrow fluopyram + prothioconazole, and foliar-applied oxamyl. In the genetics study in 2020, all three REN varieties were among the highest yielding ($p < 0.002$), and two of the REN varieties yielded greater (mean = 1191 kg ha-1) than all RKN and susceptible varieties (mean = 884 kg ha-1) at Damon and College Station combined. Variety effects on reniform nematode populations were inconsistent; however, application of fluopyram + prothioconazole reduced nematode populations in the variety trial at College Station by 32.6% ($p < 0.009$). In the nematicide study at Damon, aldicarb and aldicarb + oxamyl increased yield (mean = 1019 kg ha-1) compared to oxamyl alone (779 kg ha-1). Nematicide treatments did not affect yield at College Station ($p > 0.05$), nor nematode populations at either site. Results from Wall and Lubbock 2020, as well as 2019 results, will be compared and added into the final analysis.

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Evaluation of Gametocides for Suppressing Palmer amaranth Reproduction and Seedbank Contributions in Cotton Production SystemsBlaire Brorman/Evaluation of Gametocides for Suppressing Palmer amaranth Reproduction and Seedbank Contributions in Cotton Production Systems

Blaire Brorman/Undergraduate Researcher, Sarah Kezar/Texas A&M Weed Science

Management of Palmer amaranth in the has proven more challenging as the weed has genetic potential for multiple resistances to commonly used herbicides in cotton production. There is a critical need to evaluate solutions, apart from chemical formulations, with gametocides presenting viable options. Physiologically, gametocides can stunt vegetative growth and inhibit reproduction, which could play a crucial role in reducing late-season contributions to the seedbank. At the same time, the seeds of the next generation that enter the seedbank may express lower vigor and altered dormancy dynamics. Here, a gametocide with dual benefits as a defoliant would provide a double benefit for utilization at time of cotton desiccation. At the same time, tank-mix options with herbicides during a layby application could coincide with the ideal growth stage for optimal gametocide application. The evaluated gametocides exhibit response as: synthetic auxins, ALS inhibitors, growth inhibitors, chemical hybridizing agents, sex hormones, and halogenated aliphatic acids. Twenty-one gametocide treatments along with one non-treated check were applied to Palmer amaranth at different stages of development. These gametocides were applied in a spray chamber and conducted as a RCBD design in a greenhouse setting at vegetative, seedhead development, and reproductive stages, respectively. Gametocides have the potential to play a beneficial role in controlling Palmer amaranth by preventing reproduction through male sterility along with the added benefit of an altered dormancy in the next generation of seeds and these compounding effects should be explored to benefit the sustainability cotton production systems.

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Integrated Italian Ryegrass Management using Herbicides and Harvest Weed Seed Control (HWSC) in South-Central US

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Italian ryegrass is a major weed problem in wheat and other winter crops in the south-central United States (US). In addition to the high genetic diversity leading to wide adaptability, multiple herbicide-resistance, high fecundity, and extreme shattering tendency of Italian ryegrass make its management difficult under field conditions. Recent intervention through harvest weed seed control (HWSC) tactics developed in Australia, where rigid ryegrass is the major weed problem in wheat production, promises a great potential to reduce ryegrass seedbank inputs and subsequent field infestations. A four-year study (2016-2019) was conducted in College Station, TX and Newport, AR in split-plot design, comprising of three main-plot treatments, (1) no narrow-windrow burning (HWSC) + disk immediately after harvest, (2) HWSC + disk immediately after harvest, and (3) HWSC + disk one month after harvest; and two sub-plot treatments, (1) Pendimethalin (Prowl H2O® @2242 g/ha) DPRE after wheat spiking, approximately 5 days after planting and (2) Flufenacet + Metribuzin (Axiom® DF @560 g/ha) + Pyroxasulfone (Zidua® WG @105 g/ha) EPOST at 1-2 leaf stage fb Pinoxaden (Axial PRO @1121 g/ha) in spring. At the end of the experiment, HWSC alone was significantly better than no HWSC, and a combination of HWSC and the herbicide program #2 was the most effective treatment in controlling ryegrass infestations. In these plots, final ryegrass densities during wheat harvest were close to 0 plants/m2. The combination of a standard practice (no HWSC) and herbicide program #1 led to an increase in ryegrass infestation in the field (58 plants/m2). Further, similar trends were also observed with seedling emergence, with 58.4 seedlings/m2 in plots with no HWSC and herbicide program #1, and 0.8 seedlings/m2 with HWSC and herbicide program #2. Findings will be useful for developing an improved ryegrass management strategy in the south-central US.

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A Beltwide experiment to evaluate multi-tactic weed management strategies for Palmer amaranth in cotton.

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As crop productivity and profitability are directly impacted by resistant weed pressures, exploring multi-tactic solutions outside of a jug is increasingly important. Despite the best efforts to control weeds in crop fields, they do manage to persist long-term, due primarily to seed production and seedbank replenishment by uncontrolled weed escapes prior to crop harvest. Moreover, weeds that emerge after crop harvest, especially in more southern areas with adequate heat units, can produce seed prior to frost or planting the subsequent crop in spring, further adding to soil seedbank. The practice of relying on a few herbicide sites of action allowed Palmer amaranth to evolve resistance to herbicides, with multiple resistance being an emerging concern. With this critical truth in mind, seedbank management is a key aspect of herbicide-resistant weed management. Thus, it is critical that seed production and seedbank addition from these late-season weed escapes and post-harvest recruits are minimized to achieve effective long-term control and sustain the utility of existing herbicides. Addressing this weed problem is a critical need for cotton producers and this research aims to lead to the development of integrated strategies for minimizing seedbank addition from Palmer amaranth escapes by evaluating including cereal rye as a cover crop, desiccant application prior to cotton harvest, tillage systems, and a combination of these tactics. Overall, the outcomes of this project are expected to help suppress long-term population growth of Palmer amaranth, reduce weed control costs, and improve economic and environmental sustainability of cotton production in the United States.

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Winter Cover Crops Influence Weed Infestation, Soil Moisture, and Yield in Cotton

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Cover cropping has witnessed limited adoption in South Texas, despite long growing seasons and continued accumulation of heat units after cash crop harvest. Some of the major limitations for cover crop adoption include a general lack of knowledge to facilitate cover crop selection, insufficient biomass production of covers prior to cash crop planting in spring, and perceived soil moisture depletion caused by cover crop growth, which may impact subsequent cash crop yield. The objectives of this study were to determine the effect of four winter cover crop species (triticale, oat, shield mustard, and Austrian winter pea) and termination timing (6-weeks, 4-weeks, and 2-weeks prior to cotton establishment) on cover crop biomass production, weed suppression, soil moisture dynamics, and cotton performance. The study was conducted from fall 2018 to fall 2019 at two locations: The Texas A&M University Research Farm, College Station, TX and the Stiles Foundation Farm, Thrall, TX. Cover crop termination timing had significant impact on biomass production, cotton stand establishment, and lint yield. Terminating cover crops 2-weeks prior to cash crop planting had a positive long-term effect on soil moisture. Triticale and oat provided substantial suppression of early summer annual weeds through live biomass and provided additional weed suppression through residue cover after termination. The knowledge generated from this study will support informed decision making on cover crop species selection and termination timing based on production goals.

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Mapping herbicide drift injury and predicting yield loss in cotton using remote sensing techniques

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Off-target movement of herbicides onto sensitive crop cultivars is a serious issue in agricultural landscapes. An ability to map herbicide drift injury and predict their impact on crop yield using aerial images can allow for rapid and informed management decision making by growers. In this study, both multispectral and thermal responses of cotton plants subjected to simulated drifts using tembotrione (Laudis®) and dicamba (Xtendimax®) were recorded with DJI Matrice 600 drones mounted with a multispectral camera (Micasense RedEdge) and a thermal camera (Infrared Camera Inc.), respectively. The responses were recorded at 7, 14, and 21 days after herbicide application (DAA) at two different growth stages (match-head square and early-bloom) in cotton. Machine learning algorithms and univariate regression techniques were used for mapping herbicide injury and predicting yield loss, respectively. Analysis of the imagery collected at 14 DAA for match-head square stage showed that herbicide injury can be mapped with fair accuracy (73% and 68% respectively for tembotrione and dicamba) using aerial imagery. Results also showed that imagery-derived variables have great potential for yield loss prediction (highest R2 values of 0.79 and 0.88 for tembotrione and dicamba, respectively). Image analysis for other observation timings is currently ongoing. Overall, this study demonstrates that aerial imagery can be used reliably to map herbicide injury and predict yield loss in cotton, though additional research is required to improve mapping and prediction accuracies.

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Effect of sub-lethal dose of dicamba on the reproductive characteristics in Palmer amaranth (Amaranthus palmeri)

Hayden Taylor // Effect of sub-lethal dose of dicamba on the reproductive characteristics in Palmer amaranth (Amaranthus palmeri), TAMU Weed Science Research, Gisselle Padilla-Ramirez, Muthukumar Bagavathiannan, Nithya Subramanian

Palmer amaranth (Amaranthus palmeri), a dioecious weed species, is currently one of the most troublesome weeds in agronomic crop production systems in the United States, exhibiting multiple herbicide resistance. Changes to sex ratios can impact seed production and evolutionary dynamics of dioecious weed populations. Two Palmer amaranth populations originating from the Texas High Plains (HP) and Nebraska (NE) were sprayed with a sub-lethal dose (0.1x; 2.2 oz/A) of dicamba, an auxin analog, under greenhouse conditions. The influence of the treatment on seed germination and viability were tested. Additionally, potential changes to the sex of the plants in response to herbicide stress was examined. Preliminary results on sex-ratio, seed germination, and viability will be presented. Results of this experiment have implications for understanding and managing this troublesome species.