Fighting Weeds in Louisiana Agriculture for 125 Years

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Human existence depends on the ability to find food or produce food. Because insect, diseases and weeds can all contribute to reduced food production, the control of these pests has been critical to human survival. Early on, controlling weeds was an arduous task consisting primarily of hand removal. The era of chemical weed control is generally recognized as beginning in 1896 in France with the discovery that the Bordeaux mixture of lime, copper and sulfur provided control of certain weeds. In the early 1900s in Europe, emphasis was placed on weed control in cereal crops using copper nitrate, ammonium salts, sulfuric acid, iron sulfate and potassium salts. Weed control with these water-soluble inorganic salts, however, was often inconsistent.

The Louisiana Agricultural Experiment Station, established in 1887, has been directly involved in research to support development of herbicides and weed management technologies since 1926. Faculty contributing to weed management research in Louisiana, along with their area of emphasis, can be found in Table 1. A listing of herbicides and weed management technologies whose development was affected by Louisiana research scientists is provided in Table 2.

Research Emphasis in 1940s

Between 1900 and 1940 a limited number of herbicides were introduced. The arsenicals, chlorates and borates (inorganic herbicides) were highly persistent and nonselective (injured both crops and weeds) and were toxic. The phenols were the first group of organic compounds to be used for weed management.

A breakthrough in weed management occurred with the discovery of 2,4-D (2,4-dichlorophenoxyacetic acid) in the 1940s. Much of the early research with 2,4-D, a phenoxy herbicide, was conducted under wartime regulations and secrecy. Soon after the war the compound was released to universities for research. At that time chemical weed management was in its infancy and formal weed science courses were not offered at universities. Researchers working in weed management were trained as plant physiologists. This was an exciting time in weed management because 2,4-D was active on broadleaf weeds and could be used safely in grass crops.

Much of the early work on 2,4-D at the Louisiana Agricultural Experiment Station was conducted by Clair Brown, a faculty member in the Department of Botany. Brown was employed from 1926 to 1970 and was the first president of what is known today as the Southern Weed Science Society.

Others who followed, St. John P. Chilton and Ernest Stamper, also worked with 2,4-D as well as the second generation phenoxy herbicides – MCPA, 2,4,5-T and 2,4,5-TP. These researchers were responsible for determining herbicide rates and application timings necessary to control broadleaf weeds in sugarcane, rice and corn as well as to control aquatic weeds. Through their research it was determined that tolerance of rice and corn to phenoxy herbicides was dependent on growth stage. Their work was critical to the successful introduction of the herbicide to growers. The widespread adoption of 2,4-D revolutionized weed management in Louisiana and contributed to significant yield increases.

Research Emphasis in 1950s and 1960s

The discovery of 2,4-D herbicide provided stimulus to the agricultural chemical industry and led to commercial development in the 1950s of the herbicides Eptam, Karmex, Atrazine, Simazine, Dacthal and Dinitro. Lowell McCormick worked in soybeans and corn and Ernest Stamper continued the sugarcane work. John Baker and Walter Porter were employed in 1953. Baker was responsible for rice, and Porter worked in cotton weed management. Unlike the phenoxy herbicides, which were applied after emergence of weeds (postemergence), the herbicides developed in the 1950s could be used before weed emergence (preemergence), and others could be used both preemergence and postemergence. These new herbicides allowed growers greater options for weed management. In the 1960s many herbicides were developed and introduced including Treflan, MSMA, DSMA, Cotoran and Zorial for use in cotton; Treflan, Lasso, Lorox and Zorial in soybeans; and Treflan, Sinbar and Dowpon M in sugarcane.

In the 1960s, Leon Standifer evaluated herbicides in cotton, and Larry Rogers and Lowell McCormick worked in soybeans. Research focused on the fit of herbicides in production programs, refinement of rates, application use (preemergence and postemergence) and crop safety. Stam, Ordram and Bolero were introduced in rice. The first work in Louisiana to show the value of Stam for postemergence weed control in rice was conducted by John Baker. His research also addressed preplant application of Ordram and Bolero in dry-seeded and water-seeded rice for red rice control.

Research Emphasis in 1970s

In the 1970s the discovery of Roundup, a nonselective herbicide, offered growers the option to control johnsongrass, other grasses and broadleaf weeds prior to planting (preplant). The introduction of Roundup also led to research by Freddie Martin to evaluate glyphosate as a sugarcane ripener to increase sugar production per acre. The availability of new herbicides encouraged use of sequential applications, preemergence followed by postemergence, as well as herbicide combinations, known as tank mixtures, for use in cotton and soybeans. Research conducted by Larry Rogers and Tom Harger in soybeans concentrated on Roundup applied preplant; Lasso, Dual, Prowl and Sencor preemergence; and combinations of Basagran and Blazer for postemergence control of broadleaf weeds. In cotton, Bill Blackmon and Roy Vidrine evaluated Roundup preplant and Bladex and Dual preemergence. In sugarcane, Ernest Stamper evaluated Sencor and Asulox, which today still serve as primary means of weed control. In rice John Baker and Steve Crawford were actively involved in evaluation of Ordram, Bolero, Modown, Basagran, Blazer, Stam and Arrosolo, a premix combination of Stam and Ordram.

In the late 1970s, preplant weed control was shifted to the use of Paraquat or Roundup as “burndown” herbicides for winter weed control. Steve Crawford and Larry Rogers were responsible for determining herbicide rates needed for various weeds and for evaluating tank mix combinations of Paraquat or Roundup with other herbicides to enhance weed control and provide residual control. The ability to control weeds preplant without negatively affecting crop stand or yield led to the adoption of reduced tillage programs and conservation tillage practices that contributed to reduced soil erosion. Adoption of reduced tillage, “stale seedbed” programs contributed to greater profitability of cotton and soybeans particularly when grown on heavy clay soils.

Research Emphasis in 1980s

The 1980s was historical in the number of herbicides under development and in the continued acceptance of preplant weed control and conservation tillage practices. During this time period weed

control was addressed by Steve Crawford, Tom Harger, Roy Vidrine, Jim Griffin, Dearl Sanders, Jamie Retzinger, Lynn Kitchen, Dan Reynolds and John Baker. This period was marked by the introduction of the imidazolinone herbicides Scepter and Pursuit in soybeans and the sulfonylurea herbicides Canopy and Classic in soybeans, Accent and Beacon in corn, Londax in rice, Glean in wheat, and Oust on roadsides. Of particular significance was the introduction of the overtop grass herbicides Fusilade, Assure, Poast, and Select. These herbicides were effective for postemergence control of annual and perennial grasses such as red rice, itchgrass, barnyardgrass, broadleaf signalgrass and johnsongrass and could be used safely in cotton and soybeans. In addition, in soybeans the herbicides Command, Reflex, and Cobra were introduced. Facet and Whip 360 were introduced in rice and Staple was introduced in cotton. All of these herbicides were welcome additions to weed management programs.

Research Emphasis in 1990s

Although there were many herbicides labeled in crops in the early 1990s, it was common to see fields infested with grass and broadleaf weeds. With commodity prices low and herbicide costs high, it was not economical to control all weeds present in fields. Consequently, weeds thrived and caused significant yield losses. Because of the effectiveness of some herbicides, continuous use over several years resulted in removal of susceptible biotypes and a gradual shift toward populations of weeds less susceptible to the herbicide. Dearl Sanders was able to identify MSMA-resistant common cocklebur in cotton in 1992; propanil (Stam)-resistant barnyardgrass in rice in 1995; fluazifop-P-butyl (Fusilade)-resistant itchgrass in soybean and clethodim (Select) and fluazifop-P-butyl (Fusilade)-resistant johnsongrass in cotton in 1997; and quinclorac (Facet)-resistant barnyardgrass in rice in 1998. Reports of herbicide-resistant weeds was a warning of what could occur in the future when the same crop is grown and the same herbicide is applied year after year. Education programs were initiated to promote crop rotation and use of herbicides that differ in mode of action.

The 1990s were marked by the advancements in weed management technologies through the development of herbicide-resistant crops. Even though developed by private companies, herbicide-resistant crops were evaluated extensively by Louisiana Agricultural Experiment Station weed scientists including Steve Crawford, Roy Vidrine, Jim Griffin, Dearl Sanders, Dan Reynolds, Donnie Miller, Bill Williams and Steve Kelly.

Imi-Corn introduced in 1991 allowed for the use of Lightning herbicide (a premix of the imidazolinone herbicides imazethapyr, the active ingredient in Pursuit and imazapyr, the active ingredient in Arsenal). Weed control technology using the BxN system in cotton was first evaluated in 1990 and was commercially available in 1995. This technology offered cotton growers the flexibility to control broadleaf weeds using Buctril herbicide as a foliar application without fear of crop injury.

The glyphosate-resistant (Roundup Ready) crops were introduced in the United States in soybeans in 1996, cotton in 1997, and corn in 1998. Although the Imi-Corn and BxN technologies were short-lived, the Roundup Ready technology and the use of glyphosate products still serve as a valuable component of weed management programs in Louisiana. Glufosinate-resistance (Liberty Link) was introduced in corn in 1997 and allowed for application of Ignite herbicide postemergence.

All of these technologies contributed significantly to weed management in cotton, corn and soybeans. Other research during the 1990s evaluated several herbicides that would prove useful in both herbicide-resistant and conventional crops and included Broadstrike, Valor, Permit, Authority, FirstRate and Callisto.

In the late 1990s research was conducted by Dearl Sanders, Michael Braverman and Eric Webster to evaluate what would be introduced in 2003 as Clearfield Rice with tolerance to Newpath (imazethapyr herbicide). Their research evaluated rates and application timings to provide growers the option to selectively control red rice and other weeds in dry and water seeded rice. Clearfield Rice was a major breakthrough in the rice weed control and the technology is still in use today.

In the late 1990s, Eric Webster and Bill Williams evaluated Prowl, Command, Grandstand, Permit and Clincher in rice. These herbicides provided a good fit in a Clearfield production system. In sugarcane, Jim Griffin's research evaluated crop safety and weed management with Valor, Authority, Permit, Callisto, and Envoke. The inconsistency in johnsongrass management in sugarcane was greatly improved when Envoke was applied with Asulox.

Research Emphasis in 2000s

In the decade following the turn of the century in 2000, there was a lull in herbicide development in cotton, soybeans and corn – mostly because of the success of the Roundup Ready technology and use of Roundup herbicide. The technology offered economical advantages and, in most cases, growers were able to effectively manage problem weeds that had limited production in the past. Weed scientists, however, began to observe shifts in weed populations in fields where glyphosate had been used over several crop cycles. Although glyphosate was effectively removing certain weeds, others less sensitive to glyphosate were becoming more prevalent. Because herbicide-resistant weeds were reported by Dearl Sanders in the 1990s, researchers began to reemphasize to growers that weed management programs include use of soil-applied herbicides and that other herbicides be applied with glyphosate. Jim Griffin, Donnie Miller and Daniel Stephenson initiated research with Liberty Link soybeans to evaluate rates and application timing of Ignite herbicide. Liberty Link soybeans were introduced in 2009, and information derived from their research was important in promoting the technology. In rice, Eric Webster and Bill Williams continued to evaluate weed management programs in Clearfield rice. The new herbicides Regiment, Beyond, Grasp, and Strada were evaluated for their fit in both Clearfield and conventional rice programs. In 2009, Amazon sprangletop resistant to cyhalofop-butyl (Clincher) and fenoxaprop-P-ethyl (Whip 360) was reported in rice Louisiana. Dearl Sanders was involved in the evaluation of aminopyralid for weed management in pastures and roadsides, and Ron Strahan was developing an active program in turf weed management.

Even though the development of the Roundup Ready technology in cotton, soybeans and corn had greatly benefitted weed management programs in the mid-South, long-term use of glyphosate had selected for glyphosate-resistant weeds. In Tennessee, Mississippi and Arkansas glyphosate-resistant marestail was identified in 2001 and 2003. Glyphosate-resistant Palmer amaranth (pigweed) was reported in 2005 in Georgia, 2006 in Arkansas and Tennessee, and 2008 in Mississippi. Glyphosate-resistant Italian ryegrass was reported in Mississippi in 2005 and in Arkansas in 2007. Johnsongrass resistant to glyphosate was reported in Arkansas in 2007. Herbicide-resistant weeds, however, had not been observed in Louisiana. It was speculated that the delay in development of glyphosate-resistant weeds in Louisiana may be related to cropping systems and weed management programs, which included use of soil-applied herbicides at planting and combinations of glyphosate with other herbicides. At grower meetings weed scientists relayed the findings of glyphosate-resistant weeds in other states and promoted weed management programs to help prevent or delay development of glyphosate-resistant weeds.

Research Emphasis after 2010

The issue finally surfaced in Louisiana, and in 2010, Palmer amaranth resistance to glyphosate was reported by Daniel Stephenson, and johnsongrass resistance to glyphosate was reported by Jim Griffin. The search was on for new herbicides that could be used in programs to manage herbicide-resistant weeds. Herbicides evaluated in soybeans and corn by Jim Griffin, Dearl Sanders, Donnie Miller, Bill Williams and Daniel Stephenson included Sharpen, Zidua, Cadet, Laudis, and Armezon/Impact as well as several pre-mixes including Anthem (pyroxasulfone + fluthiacet), Fierce (pyroxasulfone + flumioxazin), Authority MTZ (sulfentrazone + metribuzin), Authority XL (sulfentrazone + chlorimuron), Authority First (sulfentrazone + chloransulam), Boundary (s-metolachlor + metribuzin), Verdict (saflufenacil + dimethenamid-P), Corvus (thiencarbazone-methyl + isoxaflutole), and Capreno (thiencarbazone-methyl + tembotrione). Co-packs of Gangster V (flumioxazin, the active ingredient in Valor), and Ganger FR (cloransulam-methyl, the active ingredient in Firstrate), were also evaluated. In rice, Webster and Williams evaluated Sharpen and League. Research continues with the goal to develop cost-effective and environmentally-friendly herbicides for use in Louisiana's diverse cropping systems.

Nonherbicide Weed Science Research (1980-present)

Although evaluation of herbicides and weed management technologies has been a major thrust of research programs within the Louisiana Agricultural Experiment Station, considerable fundamental research in weed science has been conducted by graduate students and faculty. Specific areas of research include:

- Weed-crop competition
- Weed biology
- Herbicide persistence
- Weed-pathogen-herbicide and weed-insect interactions
- Herbicide uptake, translocation and metabolism
- Off-target crop response to herbicides
- Herbicide spray application technologies
- Herbicide-resistant weeds
- Rainfastness of foliar-applied herbicides
- Adjuvant chemistry and utility
- Weed seed biology

From 1955 to 2011, 98 graduate students have completed M.S. and Ph.D. degree programs in weed science at LSU. Graduate students past and present along with their faculty advisors are presented in Table 3. Individuals completing degree programs have been or are currently employed by the U.S. Department of Agriculture, universities and agri-chemical companies. Some individuals are consultants, farmers and attorneys, and others have served in an agricultural capacity in other countries.

Future Weed Management Technologies

The changes in agricultural production and weed management technology since 1940 have been phenomenal. Several new and innovative weed management technologies are on the horizon. Some of these are in the early stages of development and as in the past, Louisiana Agricultural Experiment Station scientists are leading the way in evaluating their fit in Louisiana cropping systems. These technologies include:

- Optimum GAT (Glyphosate ALS Technology) in Soybeans (Dupont) – will allow for use of both glyphosate and ALS herbicides

- Optimum GAT and Enlist Technology in Soybeans (Dupont and DowAgrosciences) - Stacked trait options with tolerance to ALS herbicides, glyphosate, and 2,4-D

- ALS Resistant Grain Sorghum (Dupont) - Will allow for use of ALS herbicides

- GT technology in Soybeans (Syngenta) – will allow for use of glyphosate (Touchdown) in Northrup King varieties

- DT (Dicamba Tolerant) Soybeans (Monsanto) - Will allow for use of dicamba and glyphosate

- Glyphosate/Dicamba/Glufosinate Cotton (Monsanto) - Will allow for use of glyphosate, dicamba, and glfosinate (Liberty)

- Enlist Weed Control System with Colex-D™ Technology in Soybeans and Cotton (Dow Agrosciences) – Will allow for use of glyphosate, 2,4-D, and pyridine herbicides (fluroxypyr and triclopyr)

- Glyphosate/HPPD Tolerant Soybeans (Bayer CropScience) - Will allow for use of glyphosate and HPPD inhibiting herbicides

Conclusion

Weeds have been and will continue to be an issue in crop production. Over the 125-year existence of the Louisiana Agricultural Experiment Station, yields in all crops have increased dramatically. No doubt these increases can be directly attributed to improved crop varieties, but the advances made in the understanding of weeds and the development of management practices have also played a large part in yield advances. Weed science was dealt a major blow when herbicide-resistant weeds entered the picture in 2010. Old herbicides may have to be rejuvenated and a step back to old and proven methodology may be needed. Regardless, weed science research will continue to address innovative approaches in weed management, which are critical to sustainability of Louisiana's diverse cropping systems.

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Table 1. Louisiana State University and Louisiana State University Agricultural Center faculty working in the areas of weed biology, weed physiology, and weed management from 1926-2012.

Faculty	Employment time	Research area/Comments
Clair A. Brown	1926-1970	Aquatic weed management; first President, Southern Weed Science Society
St. John P. Chilton	1940-1976	Rice weed management
Ernest R. Stamper	1946-1980	Sugarcane weed management
Lowell L. McCormick	1948-1989	Soybean and corn weed management; extension soybean specialist
Walter K. Porter	1953-1960	Cotton weed management
John B. Baker	1953-1992	Rice weed management; President, Southern Weed Science Society and Fellow, Weed Science Society of America
Leonidas C. Standifer	1961-1990	Cotton weed management (1961-1969); horticulture weed management (1970-1990)
Larry R. Rogers	1967-1974	Soybean weed management; President, Southern Weed Science Society and Fellow, Weed Science Society of America
Stephen H. Crawford	1968-1993	Cotton and rice weed management
Freddie A. Martin	1971-1982	Sugarcane ripeners
William J. Blackmon	1971-1994	Cotton weed management (1971-1988); horticulture (1989-1994)
Thomas R. Harger	1975-1984	Soybean weed management
P. Roy Vidrine	1971-2008	Cotton, soybean, and wheat weed management
Richard T. Dunand	1977-2008	Rice physiology
James L. Griffin	1979-present	Soybean, corn, and sugarcane weed management; Fellow, Weed Science Society of America
Dearl E. Sanders	1979-present	Soybean, cotton, corn, rice, and sugarcane extension weed specialist; aquatic, pasture, forestry, and roadside weed management
E. James Retzinger	1980-1986	Soybean, corn, and wheat weed management
Lynn M. Kitchen	1980-1987	Soybean, sugarcane, and corn weed management
Peter W. Jordan	1985-1992	Weed biology and ecology
Daniel B. Reynolds	1986-1996	Soybean, cotton, and corn weed management
Michael P. Braverman	1991-1997	Rice weed management
Billy J. Williams	1996-2012	Rice, corn, grain sorghum, and wheat weed management
Donnie K. Miller	1996-present	Cotton, soybean, and sweet potato weed management
Eric P. Webster	1997-present	Rice weed management
Steven T. Kelly	1999-2006	Cotton extension weed specialist
Ronald E. Strahan	2002-present	Turf and ornamental weed management; extension weed specialist
Daniel O. Stephenson, IV	2008-present	Cotton, soybean, corn, grain sorghum, and wheat weed management

Table 2. Major herbicides evaluated and weed management technologies developed through research conducted in Louisiana from 1940 to present.

Decade	Herbicide common name (Trade name)
1940s	2,4-D (Several)
1950s	MCPA (Several)
	2,4,5-T (Several)
	2,4,5-TP (Silvex)
	EPTC (Eptam/Eradicane)
	diuron (Karmex)
	atrazine (Atrazine/Aatrex)
	simazine (Simazine/Princep)
	DCPA (Dacthal)
	dinoseb (Dinitro)
1960s	MSMA/DSMA (Several)
	terbacil (Sinbar)
	diquat (Reglone, Reward)
	paraquat (Paraquat, Gramoxone Inteon)
	dalapon (Dowpon M)
	trifluralin (Treflan)
	alachlor (Lasso)
	linuron (Lorox)
	dicamba (Banvel)
	norflurazon (Zorial, Solicam)
	bromoxynil (Buctril)
	fluometuron (Cotoran)
	molinate (Ordram/Arrosolo)
	propanil (Stam)
	thiobencarb (Bolero)
1970s	cyanazine (Bladex)
	metribuzin (Sencor)
	glyphosate (Roundup)
	bentazon (Basagran)
	bifenox (Modown)
	difenzoquat (Avenge)
	metolachlor (Dual)
	pendimethalin (Prowl)
	tebuthiuron (Spike)
	acifluorfen (Blazer)
	clopyralid (Stinger)
	diclofop-methyl (Hoelon)
	oxyflurofen (Goal)
	prodiamine (Barricade, Factor)
	asulam (Asulox)
	triclopyr (Garlon)
	fluridone (Sonar)
	pyridate (Tough)
1980s	acetochlor (Harness)
	chlorsulfuron (Glean)
	sulfometuron (Oust)

	fluazifop-butyl /fluazifop P (Fusilade)
	glufosinate (Ignite)
	chlorimuron (Classic)
	clomazone (Command)
	isoxaben (Gallery)
	bensulfuron (Londax)
	fluroxypyr (Vista)
	fomesafen (Reflex, Flexstar)
	imazapyr (Arsenal)
	imazaquin (Scepter, Image)
	metsulfuron (Ally, Escort)
	quizalofop (Assure)
	sethoxydim (Poast)
	imazethapyr (Pursuit)
	quinclorac (Facet)
	thifensulfuron (Harmony)
	tribenuron (Express)
	clethodim (Select)
	dithiopyr (Dimension)
	lactofen (Cobra)
	nicosulfuron (Accent)
	primisulfuron (Beacon)
	pyrithiobac (Staple)
	fenoxaprop-P (Whip 360)
	flumiclorac (Resource)
	rimsulfuron (Titus, Matrix)
1990s	Imi-Corn (1991)
	flumetsulam (Broadstrike)
	dimethenamid (Frontier, Outlook)
	flumioxazin (Valor)
	halosulfuron (Permit)
	sulfentrazone (Authority)
	imazapic (Cadre, Plateau)
	carfentrazone (Aim)
	cloransulam (FirstRate)
	cyhalofop (Clincher)
	fluthiacet-methyl (Appeal, Blizzard)
	prosulfuron (Peak)
	pyraflufen-ethyl (ET)
	diclosulam (Strongarm)
	BxN cotton (1995)
	isoxaflutole (Balance)
	sulfosulfuron (Monitor, Maverick, Outrider)
	Roundup Ready soybean (1996)
	Roundup Ready cotton (1997)
	Liberty Link corn (1997)
	Dimethenamid (Frontier, Outlook)
	Roundup Ready corn (1998)
	flufenacet (Axiom)
	mesotrione (Callisto)

	diflufenzopyr (Celebrity Plus, Distinct)
	trifloxysulfuron (Envoke)
	pendimethalin (Prowl in rice)
	clomazone (Command in rice)
	triclopyr (Grandstand in rice)
2000s	Clearfield rice (2002)
	bispyribac-sodium (Regiment)
	imazethapyr (Newpath in rice)
	imazamox (Beyond)
	penoxulam (Grasp SC)
	aminopyralid (Milestone)
	mesosulfuron-methyl (Osprey)
	pinoxaden (Axial)
	orthosulfamuron (Strada)
	topramezone (Impact)
	pyrasulfotole (Huskie)
	Liberty Link soybean (2009)
2010s	imazosulfuron (League)
	saflufenacil (Sharpen)
	rimsulfuron + thifensulfuron (Leadoff)
	saflufenacil + dimethenamid-P (Verdict)
	thiencarbazone-methyl + isoxaflutole (Corvus)
	tiencarbazone-methyl + tembotrione (Capreno)
	tembotrione (Laudis)
	topramezone (Armezon or Impact)
	glufosinate (Liberty/Ignite 280)
	sulfentrazone + chlorimuron (Authority XL)
	sulfentrazone + chloransulam (Authority First)
	pyroxasulfone (Zidua)
	pyroxasulfone + fluthiacet-methyl (Anthem)
	proxasulfone + flumioxazin (Fierce)

Table 3. Graduate students receiving M.S. and Ph.D. degrees and students currently pursuing graduate degrees through Louisiana State University in the areas of weed biology, weed physiology, and weed management from 1955 to present along with faculty advisors.

Graduate student	Degree (Year)	Faculty Advisor/Major Professor
Wilbert C. Normand	Ph.D. (1955)	Walter K. Porter
Chester G. McWhorter	Ph.D. (1958)	Walter K. Porter
Rupert D. Palmer	Ph.D. (1959)	Walter K. Porter
Samuel W. Bingham	Ph.D. (1960)	Walter K. Porter
Henry H. Funderburk, Jr.	Ph.D. (1961)	Walter K. Porter
Wayne T. Flinchum	M.S. (1962)	John B. Baker
Henry S. Webert	Ph.D. (1965)	John B. Baker
Wayne T. Flinchum	Ph.D. (1966)	John B. Baker
Thompson D. Pizzolato	M.S. (1968)	John B. Baker
James E. Marler	Ph.D. (1969)	John B. Baker
Paitoon Kittipong	M.S. (1970)	John B. Baker
R. Harry Strang	M.S. (1970)	R. Larry Rogers
Alejandra Paez de Diaz	M.S. (1971)	John B. Baker
Craig S. Henry	M.S. (1971)	John B. Baker
R. Harry Strang	Ph.D. (1972)	R. Larry Rogers
Richard T. Dunand	M.S. (1973)	John B. Baker
Edward P. Richard, Jr.	M.S. (1974)	John B. Baker
Gerald M. Dill, Jr.	M.S. (1977)	Freddie A. Martin
P. Roy Vidrine	M.S. (1977)	William J. Blackmon
Thomas L. Rosenblatt	M.S. (1977)	William J. Blackmon
Milton S. Ailstock	M.S. (1977)	William J. Blackmon
James S. Bannon	Ph.D. (1977)	John B. Baker and R. Larry Rogers
Jean Wong-Chong	M.S. (1978)	Freddie A. Martin
Jairo Clavijo	M.S. (1978)	Thomas R. Harger
Harith Bin Hussain	M.S. (1979)	Thomas R. Harger
Sabudin Bin Mohammed Ali	M.S. (1979)	John B. Baker
Eddie P. Millhollon	M.S. (1980)	Freddie A. Martin
Gerald M. Dill	Ph.D. (1981)	Freddie A. Martin
Jerry M. Lockhart	M.S. (1981)	Freddie A. Martin
Sudabathula Rao	Ph.D. (1981)	Thomas R. Harger
Scotty H. Crowder	Ph.D. (1982)	Thomas R. Harger
Donald J. Garrot, Jr.	M.S. (1982)	Freddie A. Martin
Paul R. Nester	Ph.D. (1983)	Thomas R. Harger
Robert W. Prince	M.S. (1983)	Thomas R. Harger
James W. Shrefler	M.S. (1983)	Thomas R. Harger
Vernon B. Langston	Ph.D. (1983)	Thomas R. Harger
Philip J. Barbour	M.S. (1984)	Thomas R. Harger
John L. Godley	M.S. (1985)	Lynn M. Kitchen
Marco A. Navarro	M.S. (1985)	John B. Baker
Joseph F.Yoder, III	Ph.D. (1985)	Lynn M. Kitchen
Scott Aison	M.S. (1985)	Thomas R. Harger
Thomas D. Byl	M.S. (1986)	Lynn M. Kitchen
Barbara J. Hook	Ph.D. (1986)	Lynn M. Kitchen
Jairo Clavijo	Ph.D. (1987)	John B. Baker
James R. Ault	Ph.D. (1987)	William J. Blackmon

Robert S. Peregoy	Ph.D. (1988)	John B. Baker and Johnnie P. Snow
Adel Mostafa Abou-Salama	Ph.D. (1990)	Freddie A. Martin
Reed J. Lencse	Ph.D. (1990)	James L. Griffin and Gerard T. Berggren
James E. Smith	Ph.D. (1992)	Peter W. Jordan
Katherine R. LeJeune	M.S. (1992)	James L. Griffin
Teresa S. Willard	Ph.D. (1992)	James L. Griffin
Andrew J. Lanie	M.S. (1993)	James L. Griffin
Donnie K. Miller	M.S. (1993)	James L. Griffin
Lee M. Prochaska	M.S. (1993)	James L. Griffin
Stacey A. Bruff	Ph.D. (1994)	James L. Griffin
B. David Black	Ph.D. (1995)	James L. Griffin and John S. Russin
Ronald E. Strahan	M.S. (1996)	James L. Griffin
Donnie K. Miller	Ph.D. (1996)	James L. Griffin
Roland D. Mendt	Ph.D. (1997)	James L. Griffin and Raymond W. Schneider
Charles F. Grymes	Ph.D. (1997)	James L. Griffin
Douglas E. Fairbanks	M.S. (1997)	James L. Griffin and Daniel B. Reynolds
Sujatha Sankula	Ph.D. (1997)	Michael P. Braverman
Patrick A. Clay	M.S. (1998)	James L. Griffin
Christopher B. Corkern	Ph.D. (1999)	James L. Griffin and Daniel B. Reynolds
Wei Zhang	Ph.D. (1999)	Eric P. Webster
Randy O. Wilde	Ph.D. (1999)	Eric P. Webster
Jeffrey A. Masson	M.S. (2000)	Eric P. Webster
Jason A. Bond	M.S. (2000)	James L. Griffin
D. Alan Peters	M.S. (2000)	James L. Griffin
Richard W. Costello	Ph.D. (2000)	James L. Griffin
Carol Carter-Wientjes	M.S. (2000)	James L. Griffin and John S. Russin
Joseph H. Pankey	Ph.D. (2000)	James L. Griffin
David Y. Lanclos	Ph.D. (2001)	Eric P. Webster and James L. Griffin
Blaine J. Viator	Ph.D. (2001)	James L. Griffin
Jeffrey M. Ellis	Ph.D. (2001)	James L. Griffin
Kristie J. Pellerin	M.S. (2002)	Eric P. Webster
Jonathan D. Siebert	M.S. (2003)	James L. Griffin
Christopher R. Mudge	M.S. (2004)	Eric P. Webster
Ronald J. Levy, Jr.	Ph.D. (2004)	James L. Griffin and Steven Linscombe
Chris T. Leon	Ph.D. (2005)	Eric P. Webster
Wilson E. Judice	M.S. (2005)	James L. Griffin
Christopher A. Roider	M.S. (2006)	James L. Griffin and Stephen A. Harrison
R. Matthew Griffin	Ph.D. (2006)	Eric P. Webster
Curtis A. Jones	Ph.D. (2006)	James L. Griffin
Derek M. Scroggs	M.S. (2006)	Donnie K. Miller and James L. Griffin
Luke M. Etheredge, Jr.	Ph.D. (2007)	James L. Griffin
Danielle R. Mack	M.S. (2007)	James L. Griffin
Donna R. Lee	M.S. (2008)	Donnie K. Miller
Mariana F. Bittencourt	M.S. (2009)	James L. Griffin
Justin B. Hensley	Ph.D. (2009)	Eric P. Webster
James D. Taverner	M.S. (2009)	Ronald E. Strahan and Jeffrey S. Beasley
Sunny L. Bottoms	Ph.D. (2009)	Eric P. Webster
Tyler P. Carlson	M.S. (2010)	Eric P. Webster and Michael E. Salassi
José Rodolfo Mite Cáceres	M.S. (2010)	James L. Griffin
Joseph M. Boudreaux	M.S. (2011)	James L. Griffin

Rakesh K. Godari	Ph.D. (2011)	Billy J. Williams
Jonathan W. Sharp	M.S. (2011)	James L. Griffin
Natalie Levy	M.S. (2011)	Eric P. Webster and Don R. Labonte
Current graduate students:	**Degree program**	**Faculty Advisor/Major Professor**
Matthew J. Bauerle	M.S. program	James L. Griffin
Josh T. Copes	Ph.D. program	James L. Griffin
Nathanial D. Fickett	Ph.D. program	Eric P. Webster
J. Caleb Fish	M.S. program	Eric P. Webster
Dexter P. Fontenot	Ph.D. program	James L. Griffin
J. Marshall Hardwick	M.S. program	James L. Griffin
Randall L. Landry	M.S. program	Daniel O. Stephenson IV and James L. Griffin
Albert J. Orgeron	Ph.D. program	James L. Griffin and Benjamin L. Legendre
Brandi C. Woolam	M.S. program	Daniel O. Stephenson IV and James L. Griffin
Suzanne Laird	M.S. program	Dr. James L. Griffin