

SIDDIQUE I. ABOOBUCKER, PH.D.
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EDUCATION

Ph.D. in Molecular Biosciences

Arkansas State University

Dissertation: "Identification and characterization of a functional L-Gulonolactone Oxidase (GulLO) in *Arabidopsis thaliana*"

Awarded a Molecular Biosciences PhD Scholarship

Aug 2007 – Aug 2014

Jonesboro, AR

B.Tech. in Biotechnology

Anna University of Technology

(Formerly Bharathidasan University)

Aug 2001 – Apr 2005

Tiruchirappalli, India

RESEARCH EXPERIENCE

Post-doctoral Research Associate

Department of Agronomy, Iowa State University

Advisor: Prof. Thomas Lübberstedt

Nov 2017 – Present

Ames, IA

Project: Functional characterization of maize candidate genes involved in spontaneous haploid genome doubling

- Establishing a pipeline to validate maize candidate genes using a combination of approaches
 - CRISPR/Cas9 genome editing in maize
 - Generating *Arabidopsis* haploids (*cenh3* based system) for mutants (homologous to maize candidate genes) and scoring for male fertility
 - Complementing yeast (*Saccharomyces cerevisiae*) mutants with maize candidate alleles
- Understanding the mechanism of haploid genome doubling using maize and *Arabidopsis*

Project: Generating tools to establish an "In vitro nursery" using *Arabidopsis* protoplasts

- Generating transgenic *Arabidopsis* overexpressing fluorescent reporters (GFP and RFP)
- Identifying high GFP expressing lines using fluorescence microscopy
- Creating allelic GFP and RFP transgenic lines using CRISPR/Cas9
- Isolating protoplasts from the reporter lines and sorting based on fluorescence by flow cytometry in collaboration with engineers
- Testing candidate genes and treatments to initiate meiosis using the protoplast reporter system

Post-doctoral Research Associate

Department of Agronomy, Iowa State University

Advisor: Dr. Walter Suza

Jan 2015 – Jun 2018

Ames, IA

Project: Investigating the molecular regulation of sterols and their signaling role in plants

- Identified and characterized a maize sterol c-22 desaturase involved in stigmaterol biosynthesis
- Profiled total metabolites (GC/MS) in mutant maize and transgenic *Arabidopsis* to evaluate stigmaterol's regulatory role
- Conducted gene expression assays for the sterol biosynthetic genes in stigmaterol mutant maize for studying transcriptional regulation
- Assessed stigmaterol overproducing transgenic *Arabidopsis* in dehydration stress tolerance

Project: Plant Breeding e-Learning in AfricaOnline courses taught in African Universities (<http://pbea.agron.iastate.edu>)

- Content Review
 - Reviewed plant breeding course contents in the website for accuracy
 - Worked with course developers and IT team to ensure the content is accurate
- Contribution to Professional Learning
 - Workshop for visiting faculties from African Universities (Iowa State Univ, Jul 2018)
 - Workshop for visiting faculties from African Universities (Iowa State Univ, Aug 2017)

Graduate Research Assistant

Arkansas Biosciences Institute, Arkansas State University
 Advisor: Prof. Argelia Lorence

Aug 2007 - Dec 2014

Jonesboro, AR

Project: Identification and characterization of a functional L-gulonolactone oxidase (GulLO) in *Arabidopsis* in the biosynthesis of vitamin C

- Identified a GulLO enzyme from *Arabidopsis* involved in the biosynthesis of vitamin C
- Expressed and purified a recombinant GulLO in the heterologous *Nicotiana benthamiana* transient expression system
- Characterized the recombinant protein both *in vitro* and *in vivo* in *N. benthamiana*
- Characterized transgenic *Arabidopsis* plants carrying GulLO gene

Project: Characterization of a recombinant *Arabidopsis* glucuronate reductase in vitamin C metabolism

- Expressed and purified a recombinant glucuronate reductase in the heterologous *Nicotiana benthamiana* transient expression system
- Characterized the activity and kinetics of the recombinant protein *in vitro*

Undergraduate Research Associate

Anna University of Technology

Jan 2005 - Sep 2005

Tiruchirappalli, India

Project: Isolation and bio-evaluation of crude protein fractions isolated from Indian green mussel

- Isolated crude protein fractions from the meat and mantle fluid of Indian green mussel *P. viridis*
- Studied its antimicrobial activity against some pathological clinical strains

TECHNICAL EXPERTISE

Molecular Biology and Biochemistry Techniques

- Genome editing technology (CRISPR/Cas9)
- RNA and DNA purification techniques
- Gene expression (RT-PCR, qPCR)
- Molecular cloning and vector construction including Gibson Assembly
- Bacterial transformation (*Agrobacterium tumefaciens*, *Escherichia coli*)
- Yeast transformation (*Pichia pastoris*, *Saccharomyces cerevisiae*)
- Genotyping (SSR markers, HRM markers, T-DNA insertion and transposon elements)
- Molecular characterization of *Arabidopsis*, tobacco, and rice transgenic lines
- Recombinant protein expression in *P. pastoris*, *A. thaliana* and *Nicotiana benthamiana*
- Protein purification techniques
- SDS-PAGE, ELISA, dot blot and Western blot
- Enzyme assays and kinetics

Arabidopsis thaliana, Brachypodium, maize and Nicotiana benthamiana

- *A.thaliana* haploid induction using *cenh3* based system
- Stable transformation in *A. thaliana*
- *A. thaliana* protoplast techniques
- Callus induction from *Brachypodium* embryo and transformation
- Substrate feeding studies
- Plant tissue culture
- Plant care, seed collecting and cataloging

Analytical techniques

- Metabolite extraction and GC/MS analysis
- High performance liquid chromatography (HPLC)
- Liquid chromatography mass spectrometry (LC-MS)
- MALDI-TOF
- Microscopic techniques
- Vitamin C measurement via multiple spectrophotometric methods

TEACHING EXPERIENCE

- **Iowa State University** **Ames, IA**
 - **Plant Breeding e-Learning in Africa - Content Review** **Jan 2017 – Jun 2018**
Online courses taught in African Universities (<http://pbea.agron.iastate.edu>)
 - Reviewed plant breeding course contents in the website for accuracy
 - Worked with course developers and IT team to ensure the content is accurate
- **Arkansas State University** **Jonesboro, AR**
 - **Teaching Assistant for Biochemistry Lab (CHEM 421)** **Aug 2014 – Dec 2014**
Undergraduate level, class size: 13 students
 - Delivered class lectures when the instructor was absent
 - Prepared lab before the classes started
 - Assisted students to perform lab experiments and answered questions during the class
 - **Teaching Assistant for Biochemistry Lab (CHEM 421)** **Jan 2014 - May 2014**
Undergraduate level
 - Contributed to develop a laboratory manual, which is currently used to teach Biochem Lab
 - Setup a new lab and tested protocols of the manual
 - **Teaching Assistant for Organic Chemistry II Lab (CHEM 3113)** **Jan 2014 – May 2014**
Undergraduate level, class size: 2 sections and 30 students each
 - Assisted Dr. Sam Cron in conducting the laboratory classes
 - Set the lab, assisted students to conduct experiments and graded lab reports

MENTORING AND OUTREACH ACTIVITIES

Mentoring Graduate Students and Staff Scientist (4)

1. Drs. Jing Zhao and Maria Mantilla-Perez
Project: Gene expression analysis in Sorghum by RT-qPCR (RNA extraction, cDNA synthesis, qPCR)

2. Mr. Arthur Pereira da Silva
Project: Plasmid vector construction and *Arabidopsis* tissue culture and transformation.
3. Ms. Priyanka Gajjar
Project: Gene expression analysis in maize. RNA extraction and cDNA synthesis for qRT-PCR.

Mentoring Undergraduate Students (7)

Apr 2014 - Present

1. Ms. Cierra Wilson (Senior, Summer 2017 intern, Tuskegee University)
Project: Investigating the relationship between stigmaterol and flowering in *Arabidopsis thaliana*.
2. Ms. Hazawani-Binti Hanapih (Junior, graduated Spring 2017, Iowa State University)
Project: Assessing the drought tolerance of *Arabidopsis* lines overexpressing a maize *ZmCYP710A* (sterol c-22 desaturase gene).
3. Mr. Benjamin Faiz (Senior, graduated Fall 2016, Iowa State University)
Project: Identifying homozygous single insertion transgenic *Arabidopsis* lines overexpressing a maize *ZmCYP710A* (sterol c-22 desaturase) gene.
4. Mr. Muhammad Nazrul Che-Ibrahim (Senior, graduated Fall 2016, Iowa State University)
Project: Identifying homozygous T-DNA insertion *Arabidopsis* mutant lines (*Atcyp710a1*) using PCR and performing hormone response assays with the mutant.
5. Mr. Mohammad Azrin Jamsari (Senior, graduated Fall 2016, Iowa State University)
Project: Screening GEM-DH germplasm for drought tolerance using a polyethylene glycol mediated hydroponics assay.
6. Ms. Nur Qhuraisha Annuar (Senior, graduated Fall 2017, Iowa State University)
Project: Establishing drought tolerance assays with *Arabidopsis thaliana* by controlling soil moisture content.
7. Mr. Gregory Phelps (Senior, graduated Fall 2015, Arkansas State University)
Project: DNA barcoding of native Arkansas plants using molecular biological techniques.

Outreach Activities

- **Workshop for visiting faculties from African Universities (Iowa State Univ, Jul 2018)**
Designed and conducted an “Applied Learning Activity: Metabolite Markers in Maize” for visiting African faculties as part of the Plant Breeding e-Learning in Africa’s “2018 Teaching and Learning Symposium”. <https://vimeo.com/282883876>
- **Workshop for visiting faculties from African Universities (Iowa State Univ, Aug 2017)**
Designed and conducted a “DNA Marker Quality Control Lab” for visiting African faculties as part of the Plant Breeding e-Learning in Africa’s “2017 Teaching and Learning Symposium”.

- **Arkansas Biosciences Institute Outreach Program (Arkansas State Univ, 2008-2013)**
Actively participated in supporting the ASU/ABI outreach program by conducting tours and demonstrations for K-12 students and other groups.
- News article appeared in The Jonesboro Sun, November 11, 2007 “*New path for vitamin C production can improve crop values*” by **Siddique Imran**.

PEER REVIEW PUBLICATIONS

Carzoli AK, **Aboobucker SI**, Sandall LL, Lübberstedt TT, Suza WP (2018) Risks and opportunities of GM crops: Bt maize example. *Global Food Security*. In review.

Aboobucker SI, Suza WP, Lorence A (2017) Characterization of two *Arabidopsis* L-gulono-1,4-lactone oxidases (AtGulLO3 and AtGulLO5) involved in ascorbate biosynthesis. *Reactive Oxygen Species* 4:389–417.

Aboobucker SI, Lorence A (2016) Recent progress on the characterization of L-gulono-1,4-lactone oxidases. *Plant Physiology and Biochemistry* 98:171-185.

Lisko KA, **Aboobucker SI**, Torres R, Lorence A (2014) Engineering elevated vitamin C in plants to improve their nutritional content, growth, and tolerance to abiotic stress. In “Phytochemicals – Biosynthesis, Function and Application” R Jetter (ed). *Recent Advances in Phytochemistry* 44, pp 109-128.

Aboobucker SI, Suza WP. Why do plants convert sitosterol to stigmasterol? In preparation to “Frontiers in Plant Science”.

Aboobucker SI, Showman LJ, Lübberstedt TT, Fei S, Suza WP. Functional characterization of a maize sterol c-22 desaturase (ZmCYP710A) involved in stigmasterol biosynthesis and its role in plant metabolome. (Tentative title) In preparation to “The Plant Cell”.

Yactayo-Chang JP, Nepal N, **Aboobucker SI**, Trujillo G, Wilkie A, Wilson G, Teoh K, Medina K, Lorence A. Characterization of an *Arabidopsis* gulonolactonase, the first enzyme involved in ascorbate biosynthesis localized in the chloroplast. In preparation to “Plant Physiology”.

INVITED TALKS

Aboobucker SI (2014) Characterization of an *Arabidopsis* L-gulono-1,4-lactone oxidase involved in vitamin C biosynthesis. Arkansas P3 Center Symposium, Winthrop Rockefeller Institute, Morrilton, AR

Aboobucker SI, Suza WP, Lorence A (2012) Characterization of a functional *Arabidopsis* L-gulono-1,4-lactone oxidase (GLOase) in *Nicotiana benthamiana*. 3rd Annual Conference of the American Council for Medicinally Active Plants, Jonesboro, AR

SELECTED PRESENTATIONS

Aboobucker SI (2018) Investigating the molecular regulation of sterols and their signaling role in plants. Plant Breeding Seminar, Department of Agronomy, Iowa State University, Ames, IA

Aboobucker SI (2017) Functional characterization of a maize sterol c-22 desaturase involved in stigmaterol biosynthesis and its role in stress tolerance. Plant Breeding Seminar, Department of Agronomy, Iowa State University, Ames, IA

Wilson C, **Aboobucker SI**, Suza WP (2017) Investigating the relationship between stigmaterol and flowering in *Arabidopsis thaliana*.

Hanapiah H, **Aboobucker SI**, Lubberstedt T, Songalael M, Ndunguru J, Fei S, Suza WP (2017) Generating tools and molecular biology training to improve drought tolerance in maize for Tanzania. Leroy and Barbara Everson Seed and Biosafety Symposium 2017, Gateway Hotel and Conference Center, Ames, IA

Aboobucker SI, Mahama AA, Barb J, Beavis W, Lubberstedt T, Singh A, Singh A, Merrick L, Anderson A, Mills E, Fei S, Retallick M, Scofield G, Correia Ap, Wang L, Levings J, Clawson C, Miller G, Gibson P, Edema R, Madakadze R, Akromah R, Sibiya J, Atlin G, Mumm R, Chopra S, Lamkey K, Suza WP (2017) Plant Breeding E-Learning in Africa – A collaborative effort to develop and deliver state-of-the art curriculum for the next generation of plant breeders. Leroy and Barbara Everson Seed and Biosafety Symposium 2017, Gateway Hotel and Conference Center, Ames, IA

Aboobucker SI, Lubberstedt T, Songalael M, Ndunguru J, Fei S, Suza WP (2016) Improving drought tolerance to increase maize production in Tanzania using forward and reverse genetics approaches. Water for Food Global Conference at the University of Nebraska, Nebraska Innovation Campus, Lincoln, NE

Aboobucker SI, Lubberstedt T, Songalael M, Ndunguru J, Fei S, Suza WP (2016) Leveraging Germplasm Enhancement of Maize (GEM) resources to develop cultivars with tolerance to drought and MLND for Tanzania. 58th Annual Maize Genetics Conference, Hyatt Regency, Jacksonville, FL

Phelps G, **Aboobucker SI**, Yactayo-Chang JP, Rivas F, Marsico T, Lorence A (2014) Use of DNA barcodes to identify Arkansas native plants, potential sources of leads against drug-resistant leukemia cells. Fall 2014 INBRE Research Conference, University of Arkansas, Fayetteville, AR (**G Phelps received Honorable Mention in Biological Sciences Category**)

Aboobucker SI (2014) Identification and Characterization of an *Arabidopsis* L-gulonolactone oxidase (GulLO). PhD Dissertation Defense Seminar, Arkansas Biosciences Institute, Jonesboro, AR

Aboobucker SI (2013) Developing an early maturing pigeon pea (*Cajanus cajan*) to increase seed production. Candidacy Defense Seminar, Arkansas Biosciences Institute, Jonesboro, AR

Aboobucker SI, Lorence A (2008) Identification and characterization of a functional L-gulonolactone oxidase in *Arabidopsis*. Graduate Scholar's Day Conference, Arkansas State University, Jonesboro, AR (**SI Aboobucker received Honorable Mention for Best Graduate Oral Presentation**)

VOLUNTEER/SERVICE ACTIVITIES

*Professional***National Science Bowl (High School)****Jan 2017**

Volunteered as a science judge for high school National Science Bowl competition held at Iowa State University.

*Community***North Jonesboro Neighborhood Initiative****Feb 2014**

Participated in conducting door to door surveys to understand the needs of the society, to be used for its development, an initiative by the “City of Jonesboro Residents & The Department of Grants and Community Development”.

Can Food Drive**Nov 2012**

Took part in collecting canned foods for the Food Bank of North East Arkansas.

Jonesboro West End Cleanup**Apr 2012**

Involved in the spring cleaning of the west end of Jonesboro organized by Volunteer ASU.

American Red Cross Blood Donation**Mar 2012**

Volunteered as a front desk assistant for the blood donation camp conducted in the Arkansas State University campus.

ASU Regional Center for Disaster Preparedness Education**Mar 2012**

Participated as a victim in disaster drill to prepare for disasters such as earthquakes, etc. Organized and conducted by the ASU Regional Center for Disaster Preparedness Education.

Muslim Student Association**Sep 2009 - Mar 2013**

Served as president for the Muslim Student Association

LANGUAGES

- English, Tamil (Advanced level: Reading, Writing and Speaking)
- Malayalam (Intermediate level: Reading, Writing and Speaking)
- Arabic, Hindi (Beginner level: Reading, Writing and Speaking)