

TEXAS TECH UNIVERSITY Fiber & Biopolymer Research Institute[®]

Newsletter September 2021-March 2022

FBRI will host the Texas International Cotton School



The Fiber & Biopolymer Research Institute in collaboration with the Lubbock Cotton Exchange will host the 41st session of the Texas International Cotton School. This session will be held August 1-11, 2022 in Lubbock, Texas.

The Texas International School has taught more than 500 students from 59 countries. It has raised the profile of Texas cotton around the world, creating a global network of people we communicate with and sometimes directly resulting in new customers of Texas cotton. Furthermore, the increased dominance of Texas in cotton production, along with the fact that almost all of Texas' production is now exported, makes the school more useful than before.

"The cotton school is structured to provide an integrated understanding of the Texas cotton industry and how it interacts with the global cotton/textile complex. The intensive, two-week educational course on cotton and textiles provides experience, knowledge, and insight into future developments affecting global markets. Professionals from around the world attend, as well as leading cotton experts." ~ Excerpt from the Texas International Cotton School website.

Texas Tech graduate students alongside professionals are engaged in an extensive curriculum which include breeding strategies, production systems, biotechnology, marketing, insurance, fiber quality/textile processing, and several tours and gatherings. For more information, please visit: <u>https://www.texasintlcottonschool.com/</u>.

New Invention Disclosures

- 1. J. Shamshina, N. Abidi. Preparation of chitin nanocrystals from crustacean biomass using ionic liquid 1-ethyl-3methylimidazolium hydrogen sulfate. Provisional Patent # # 63/253,307, filed October 2021.
- 2. T. Reid, **N. Abidi**, N. Bergfeld, P. Tran. Selenium containing antimicrobial compound as a reactive dye and cross-linking treatment for textile applications. Provisional Patent # 63/253,326, filed October 2021.
- 3. **C. Turner, Md.A. Sayeed, E. Hequet**. Reconstruction of the Cotton Fiber Length Distribution from a Fibrogram. Provisional Patent # 63/327,623 filed April 2022.



FBRI Faculty and Graduate Student Participated in the NSF regional I-Corps program

In this program the team conducted customer discovery and validation to lean potential commercial application of chitin nanocrystals extracted directly from crustacean biomass.

Dr. Abidi was also part of a team from TTU HSC (Ted Reid and N. Bergfeld) who participated in the program to explore the development of diseleniummonochlorotriazine compounds as antimicrobial agents for cotton fabric.

From eft to right: Dr. Shamshina, Rumi, Dr. Abidi.

Awards and Recognitions:

• **Reagan Heinrich** (Graduate Student) won first place in the Crop Improvement Conference student competition at the Beltwide Cotton Conferences for her presentation, "Breeding *Gossypium hirsutum* for Improved *Verticillium Dahliae* Resistance with an Elite Fiber Quality Profile."

- **Dr. B. Kelly** was selected for a TTU HUB Faculty C-Startup and named an Innovation HUB 2021-22 Faculty Mentor.
- Dr. N. Abidi was recognized at the recent Spring 2022 Inventor Celebration Event for his issued patent for "Cotton fiber

FBRI Newsletter

FBRI Team Expands



Zhen Zhang Ph.D.

polymer processing and rheology, polymer degradation and stability, and antibacterial materials.

Outreach/Engagements



Ag and Energy site visit hosted by Congressman Arrington and Pfluger.



Dr. R. Hendrick (TTU Provost and Senior VP), Dr. J. Heppert (TTU Vice President of Research & Innovation) Dr. C. Akers (Interim Dean, Davis College), and Dr. G. Ritchie (Chair, Plant & Soil Science) toured FBRI.



BastCore—Hemp Processing Innovations.



In January 2022, Dr. Zhen Zhang joined the FBRI as a Postdoctoral Research Scientist. Dr. Zhang obtained his PhD from NC State University in Forest Biomaterials (Advisors: Prof. L.A. Lucia and S. Michelsen) studying "structure-properties" relationships of natural polymers-related hydrogels. He then worked as a postdoc fellow at University of New Mexico (Advisor: Prof. D.G Whitten) where he synthesized fluorescent organic molecules and utilized them as antiviral and antibacterial additives for coating cellulosic materials. He published more than 20 papers in different journals including *ACS Materials Letters, Polymer, Chemical Engineering journal* and *Composites Science & Technology* as the first and/or corresponding author and participated in two patents. He is an editorial board member of "*Polymers*". His research interest is focused on soft matter,

Tour of cotton producers organized by WindStar gin (led by Dr. R. Bowman).



At the request of USDA Cotton Production and Processing Research Unit and the National Cotton Ginners Association, FBRI hosted the 2022 Southwester Ginners School (150 participants) (March 29-30, 2022).



Students from TTU Department of Design.

Published Book

N. Abidi. FTIR Microspectroscopy – Selected Emerging Applications. ISBN 978-3-030-84424-0, ISBN 978-3-030-84424-4 (eBook), Springer Nature 2021.

The aim of this book is to summarize in a single document the research work that is being performed using UATR and IR imaging in selected emerging applications in plant materials and biological samples. This book provides the readers new knowledge, updates information, emerging applications, and understanding of the potential use of FTIR Microspectroscopy.

Peer-review Publications: September 2021-March 2022

- 1. Md. Abu Sayeed[¥], B.R. Kelly, C. Turner[¥], E.F. Hequet. "Investigation of a Multivariate Correction Method for HVI Fibrogram Measurements." *Agronomy (Basel)* 12, no. 2 (2022): 460.
- 2. Tesema, AF.*, Sayeed, MA.^{*}, Turner, C.^{*}, Kelly, BR., Hequet, EF. 2022. An Approach for Obtaining Stable, Reproducible, and Accurate Fibrogram Measurements from High Volume Instruments. *Agronomy*. 2022; 12(5):1120
- 3. P. Berton, N. Abidi, J.L. Shamshina "Ionic liquids: Implementing Objectives of Sustainability for the Next Generation Chemical Processes and Industrial Applications," *Curr. Opin. Green Sustain. Chem.* **2022**, 100625, DOI: 10.1016/j.cogsc.2022.100625.
- 4. J.L. Shamshina, S. Acharya[¥], S.S. Rumi^{*}, S. Liyanage[¥], P. Parajuli^{*}, Abidi, N. "Cryogenic Grinding of Cotton Fiber Cellulose: the Effect on Physicochemical Properties," *Carbohydrate Polym.* **2022**, 119408, DOI: 10.1016/j.carbpol.2022.119408.
- 5. S. Acharya[¥], S. Liyanage[¥], P. Parajuli^{*}, S.S. Rumi^{*}, J.L. Shamshina, N. Abidi "Utilization of Cellulose to its Full Potential: A Review on Cellulose Dissolution, Regeneration, and Applications," *Polymers (Basel)* **2021**, *13*(*24*), 4344.
- 6. A. C. Achinivu, J. L. Shamshina, R.D. Rogers "Chitin Extracted from Various Biomass Sources: It's Not the Same," *Fluid Phase Equilibria* **2021**, 10.1016/j.fluid.2021.113286.(Invited for a Special Issue on bio-product extraction.)
- 7. J. L. Shamshina, N. Abidi "Choosing the Right Strategy: Cryogrinding vs Ball Milling Comparing Apples to Apples," for the Marine based green chemistry themed collection of *Green Chem.* **2021**, 9646 9657, DOI: 10.1039/d1gc03128g.
- 8. Md Jasim Uddin; S. Liyanage[¥]; J. Warzywoda; N. Abidi; Harvinder Gill. Role of Sporopollenin Shell Interfacial Properties in Protein Adsorption. *Langmuir*, 38(2022) 2763-2776
- 9. T. Hossain*, S. Liyanage[¥], N. Abidi. FTIR microspectroscopic approach to investigate macromolecular distribution in seed coat cross-sections. *Vibrational Spectroscopy*, 120(2022)103376.
- 10. Pascoli, D.U., Aui, A., Frank, J., Therasme, O., Dixon, K., Gustafson, R., Kelly, B., Volk, T.A., Wright, M.M. 2021. The US bioeconomy at the intersection of technology, policy, and education. *Biofuels, Bioproducts and Biorefining*. DOI: 10.1002/bbb.2302.

Presentations

- 1. H. Md Rashedul, C. Turner[¥], Md.A. Sayeed[¥], E. Hequet. "Use of Fiber Length Parameters from HVI and AFIS to Predict Yarn Quality." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-6, 2022.
- 2. Md.A. Sayeed[¥], C. Turner[¥], E. Hequet. "Calculating the Uniformity of Cotton Fiber Length Using the Complete HVI Fibrogram." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, Jan 4-6, 2022.
- 3. T.A. Ferede, Md.A. Sayeed[¥], C. Turner[¥], E. Hequet. "Procedure to Correct the High Volume Instrument Fibrogram." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, Jan 4-6, 2022.
- 4. C. Turner[¥], Md.A. Sayeed[¥], E. Hequet. "Reconstruction of Fiber Length Distribution from HVI Fibrograms." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, Jan 4-6, 2022.
- 5. E. Hequet, S. Wayne. "Vortex Spinning of Elite Germplasm." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, Jan 4-6, 2022.
- 6. W. Smith, E. Hequet. "Fiber Properties for Vortex Spinning Upland Cotton." Proc. Beltwide Cotton Conferences, San Antonio, TX, USA, Jan 4-6, 2022.
- 7. J. L. Shamshina, R. S. Stein, S. Acharya[¥], and N. Abidi, "Is Cryogrinding for Biopolymers a Proper Substitute for Conventional Ball Milling?" Presented by J. L. Shamshina before the 263rd ACS National Meeting (March 20 24, 2021), Hybrid, Abstract number 3654975.
- 8.S. Rumi*, S. Lyanage[¥], J. L. Shamshina, and N. Abidi, "Effect of Microwave Plasma Pre-treatment on Cotton Cellulose Dissolution," Presented by S. Rumi before the 263rd ACS National Meeting (March 20 24, 2021), Hybrid, Abstract number 3663076.

Page 3

Noureddine Abidi

Microspectroscopy

Selected Emerging Applications

FTIR

Presentations, continued

- 8. M.N. Uddin*, J.L. Shamshina, N. Abidi, "Transformation of Hemp Bast into Usable Fiber for Hemp-based Textiles," Presented by M. N. Uddin before the 263rd ACS National Meeting (March 20 24, 2021).
- 9. B. Shumate*, B. Kelly, J. Wanjura, M. Maeda. 2021. Variation and Uncertainty Analysis of Upland Cotton (*Gossypium hirsutum*) Production on the Texas High Plains. ASA-CSSA-SSSA International Annual Meeting, Salt Lake City, Utah. November 7-10.
- 10. R. Heinrich*, B. Shumate,* B. Kelly, A.S. Da-Silva, Y. Kocoglu, H. Sari-Sarraf, A. Kabir, A. Ray. 2022. A New Imaging Modality for High-Throughput Imaging of Cotton Fibers. Beltwide Cotton Conference. January 4-7. San Antonio, TX.
- 11. K. Russell, P. Dotray, B. Kelly. 2022. Cotton Fiber Quality Response to Low Rates of 2,4-D. Beltwide Cotton Conference. January 4-7. San Antonio, TX.
- 12. R. Heinrich*, J. Dever, B. Kelly. 2022. Breeding *Gossypium hirsutum* for Improved *Verticillium Dahliae* Resistance with an Elite Fiber Quality Profile. Beltwide Cotton Conference. January 4-7. San Antonio, TX.
- 13. B. Kelly. 2022. Cotton Fiber Quality Measurement. Great Plains Cotton Conference. March 2. Wichita, KS.

The 2021 FBRI Cotton Testing Season



From left to right: M. Pedroza, T. Rascon. Mario and Tony run the microgin as well as ring spinning, rotor spinning and vortex spinning.

FBRI Laboratories provide valuable research and evaluation services to cotton breeders, researchers, producers, and seed companies. They also provide excellent opportunities for undergraduate and graduate students to perform their research projects on cotton. In addition to various research projects, our support to the cotton industry include ginning, fiber testing/evaluation, fiber processing, yarn spinning.

For the 2021 cotton harvest season, we ginned more that 6,000 seed cotton samples and tested more than 80,0000 fiber samples. Experienced and dedicated technicians work very hard to deliver results to customers across the cotton belt (University researchers, breeders, seed companies, and producers).



From left to right: J.C. Sanchez, R. Sanchez. Raul and Jesus are responsible for the Back Process: Opening, Carding, Drawing, and Combing. These steps are critical to prepare fibers for spinning.



From left to right: D. Anaya, J. Velasquez, L. Cruz, T. Outland, A. Khawar, D. Lopez, M. Sosa (not pictured B. Young, L. Cheryl, R. Ruiz). This group of experienced Technicians led by Khawar is in charge of testing cotton fibers and yarns.

Managing Director: Noureddine Abidi, PhD. Email: noureddine.abidi@ttu.edu Phone: 806.834.1221 Shipping: 1001 East Loop 289 Frontage, Lubbock, TX, 79403 **Mailing:** PO Box 45019, Lubbock, TX, 79409 Phone: 806.742.5333 Fax: 806.742.5343 Email: fbri@ttu.edu

Page 4

http://www.depts.ttu.edu/fbri/FBRI.php