**KALAVATHY RAJAN**
Assistant Professor
Room 121, 1001 E Texas 289 Loop Frontage, Lubbock, TX 79403
**Mobile No.:** +1(806) 834-8626 **Email:** krajan@ttu.edu

## CURRENT OCCUPATION *since* Sep 1, 2023

**ASSITANT PROFESSOR,** Fiber & Biopolymer Research Institute, Department of Plant & Soil Science, Texas Tech University, Lubbock.

## EDUCATION

| Institution, Location | Area | Degree, Year |
|---|---|---|
| University of Arkansas, Fayetteville, AR<br>*Indian Council of Agricultural Research International Fellow* | Food Science | Doctor of Philosophy, 2015 |
| Tamil Nadu Agricultural University, Coimbatore, India | Food Processing & Marketing | Master of Technology, 2011 |
| Cornell University, Ithaca, NY<br>*Navajbai Ratan Tata Fellow* | Food Science & Technology | Master of Professional Studies, 2010 |
| Tamil Nadu Agricultural University, Coimbatore, India<br>*Gold medalist* | Agriculture | Bachelor of Science, 2008 |

## RESEARCH EXPERIENCE

**Research Scientist,** Center for Renewable Carbon, The University of Tennessee, Knoxville, TN. *Jan 2019 - Aug 2023*

*Projects: (I)* Amphiphobic nanolignin **coatings**; *(II)* **Prebiotic** ingredients from plant cell wall polymers; *(III)* **Enzymatic modification** of lignin; (*IV*) Ionic liquid-assisted fabrication, recycling, and biodegradation testing of hydrophobic lignocellulosic **films**.

*Responsibilities:* **Leading research projects** (from ideation to publication); Writing grants (private, federal and state level agencies); **Project management** (grant report writing, interdisciplinary team coordination); **Mentoring & training** undergraduate and post-graduate students.

**Post-doctoral Research Associate**, Dept. of Biosystems Engineering and Soil Science, The University of Tennessee, Knoxville, TN. *Aug 2016 - Dec 2018*

*Projects:* Photopolymer resin synthesis from catalytically depolymerized lignin; Soft materials development from lignin.

*Responsibilities:* **Mentoring** community college interns; **Training** graduate students and international visiting scientists; Establishment and maintenance of **good lab practices**.

**Post-doctoral Fellow**, Dept. of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, AR. *May 2015 - July 2016*

*Projects:* Cellulose nano crystals and nano fiber synthesis from pine, sweetgum, oak, and poplar wood; Sustainable antioxidants and antimicrobials production from sweetgum and pine barks.

*Responsibilities:* Training & mentoring undergraduate students and international visiting scholars; **Maintenance & operation** of analytical equipment.

KALAVATHY RAJAN
**Mobile No.:** +1(479) 684-8002 **Email:** krajan@utk.edu

**Doctoral Research**, Dept. of Food science, University of Arkansas, Fayetteville, AR. *2012-15*

***Dissertation:*** Characterization of cellulase enzyme inhibitors for the enhanced enzymatic saccharification and cellulosic ethanol production from rice and wheat straw.

## PREVIOUS GRANTSMANSHIP

2023 USDA-NIFA AFRI's Bioengineering and Biomanufacturing priority area ..... USD 621,400

- N. Labbé (PI), K. Rajan (Co-PI), S. Nair, J. Lin, D. D'Souza, *"Production and valorization of hemicellulosic biorefining streams as functional feed ingredients for the poultry industry".* Aug 2023 – Apr 2025.

2022 Southeastern Sun Grant Initiative …….....…....…… USD 122,000

- K. Rajan (PI), N. Labbé (Co-PI). *"Impact of biomass fractionation conditions on the valorization of cellulose- and hemicellulose-enriched fiber products"*. Nov 2022 – July 2023.

2022 Rayonier Advanced Materials, Jessup, GA ..... USD 117,974

- N. Labbé (PI), K. Rajan (Co-PI), J. Lin, D. D'Souza, *"Evaluating the prebiotic potential of softwood-derived hemicellulosic oligosaccharides".* Oct 2022 – Apr 2023.

2021 USDA-NIFA AFRI's Sustainable bioeconomy through biobased products grant..…..... USD 1,000,000

- N. Labbé (PI), K. Rajan (Co-PI), P. Voothuluru. S. Nair, S. Jackson, M. Littmann, K. Jensen, C. Myers, S. Wang, *"Development of functional lignin additives to replace perfluorinated compounds in omniphobic molded fiber and paper packaging product".* Feb 2022 – Jan 2025.

## TEACHING EXPERIENCE

- **Advanced instrumentation in biological engineering (BENG 5103)**……..... *Spring 2016*
  - Graduate level course at the University of Arkansas. Responsibilities included course material preparation, grading, and lab activities.
- **Food and bio-products system engineering (BENG 4743)**……..... *Fall 2014*
  - Graduate level course at the University of Arkansas. Fundamentals and applications of heat, mass and energy transfer in food and living systems. Responsibilities included lab experiments, and course material preparation.

## INVENTION DISCLOSURES

The University of Tennessee Research Foundation Invention disclosure-UTRF-18009-01 *Aug 2017*

- S. C. Chmely (PI), D. P. Harper & K. Rajan; "*Exploiting the detrimental aspects of lignin to produce a superior 3D printing feedstock."*

The University of Tennessee Research Foundation Invention disclosure-UTRF-17073-01 *Dec 2016*

- S. C. Chmely (PI), D. P. Harper & K. Rajan; *"A modification of lignin (-OH groups) using 2-hydroxyethylmethacrylate-imidazole precursor for versatile applications."*

## LIST OF ALL PUBLICATIONS

1. Zhou, Z., **Rajan, K**., Young, T., Labbé, N, Wang, S. (2023) Effect of processing temperature on nanolignin processing and quality during ultrafine friction grinding. *Industrial Crops & Products*, accepted for publication (INDCRO-D-22-06619)
2. Annamraju, A., **Rajan, K**., Zuo, X., Long, B. K., Pingali, S. V., Elder, T. J., Labbé, N. (2023) Atomic level interactions and suprastructural configuration of plant cell wall polymers in dialkylimidazolium ionic liquids. *Biomacromolecules*, DOI: 10.1021/acs.biomac.3c00047

3. Kandhola, G., Djioleu, A., **Rajan, K**., Batta-Mpouma, J., Labbé, N., Sakon, J., Babst, B.A., Ghosh, A., Carrier, D.J., Kim, J.W. (2022) Impact of species-based wood feedstock variability on physicochemical properties of cellulose nanocrystals. *Cellulose*, DOI: 10.1007/s10570-022-04762-9
4. Camfield, E., Bowman, A., Choi, J., Gwinn, K., Labbé, N., **Rajan, K**., Ownley, B., Moustaid-Moussa, N., and D'Souza, D. H. (2022) Switchgrass extractives to mitigate *Escherichia coli* O157:H7 and *Salmonella enterica* serovar Typhimurium contamination of Romaine lettuce at pre- and post-harvest. *Journal of Food Science,* DOI: 10.1111/1750-3841.16249
5. ***Rajan, K.,** Kim, K., Elder, T., Labbé, N. (2022) Ionic liquids-assisted fabrication of hydrophobic thin films from hydrothermally fractionated hybrid poplar wood. *ACS Sustainable Chemistry & Engineering,* DOI: 10.1021/acssuschemeng.2c01741. *Co-corresponding author.
6. Tumuluru, J.S., **Rajan, K.,** Hamilton, C., Pope, C., Rials, T.G., McCord, J., Labbé, N., Andre, N.O. (2022) Pilot-scale pelleting tests on high-moisture pine, switchgrass and their blends: Impact on pellet properties, chemical composition, and heating values. *Frontiers in Energy Research,* DOI: 10.3389/fenrg.2021.788284
7. Sutton, J.T., **Rajan, K.,** Harper, D.P., Chmely, S. (2021) Improving UV curing in lignin-containing photopolymers for stereolithography by chemical reduction and acetylation. *Polymers,* DOI: 10.3390/polym13203473
8. Kanbargi, N., Goswami, M., Collins, L., Kearney, L. T., Bowland, C. C., Kim, K., **Rajan, K.,** Labbé, N., Naskar, A. K. (2021) Synthesis of high-performance lignin-based inverse thermoplastic vulcanizates with tailored morphology and properties. *ACS Applied Polymer Materials*, DOI: 10.1021/acsapm.0c01387
9. Choi, J.M., Camfield, E., Bowman, A., **Rajan, K.,** Labbé, N., Gwinn, K.D., Ownley, B.H., Moustaid-Moussa N., D'Souza D.H. (2021) Value-added switchgrass extractives for reduction of *Escherichia coli* O157: H7 and *Salmonella* Typhimurium populations on Formica coupons. *Food Microbiology*, DOI: 10.1016/j.fm.2020.103674.
10. ***Rajan, K.,** D'Souza D.H., Kim, K.H., Choi, J.M., Elder, T., Carrier, D.J., Labbé, N. (2021) Production and characterization of high value prebiotics from bio-refinery relevant feedstocks. *Frontiers in Microbiology – Microbiotechnology*, DOI: 10.3389/fmicb.2021.675314. *Co-corresponding author.
11. Antunes, F.A.F., **Rajan, K.,** Djioleu, A., Rocha, T.M., Brumano, L.P., Carrier, D.J., da-Silva S.S. (2021) Sustainable 2G ethanol production from switchgrass biomass via co-fermentation of pentoses and hexoses using novel wild yeast. *BioEnergy Research*, DOI: 10.1021/acs.energyfuels.0c03849.
12. Wang, J., **Rajan, K.,** Annamraju, A., Chmely, S., Pingali, S.V., Carrier, D.J., Labbé, N. (2021) A sequential autohydrolysis-ionic liquid fractionation process for high quality lignin production. *Energy & Fuels*, DOI: 10.1021/acs.energyfuels.0c03849.
13. Huang, W., Mang, W., **Rajan, K.,** Wang, Z., Zhou, L. (2021) Valorization of organosolv lignin: Architectural strategy to enhance mechanical strength and UV protection in self-healing polymers. *Industrial Crops & Products*, DOI: 10.1016/j.indcrop.2020.113062.
14. ***Rajan, K.,** Elder, T., Abdoulmoumine, N., Carrier, D.J., Labbé, N. (2020) Understanding the in-situ state of lignocellulosic biomass during ionic liquids-based engineering of renewable materials and chemicals. *Green Chemistry*, DOI: 10.1039/D0GC02582H. *Co-corresponding author
15. Zhang, L., Lyu, S., Zhang, Q., Chmely, S.C., Wu, Y., Melcher, C., **Rajan, K.,** Harper, D., Wang, S., Chen, Z. (2020) Recycling hot-water extractions of lignocellulosic biomass in bio-refinery for synthesis of carbon nanoparticles with amplified luminescence and its application in temperature sensing. *Industrial Crops & Products*, DOI: 10.1016/j.indcrop.2019.112066

16. Kandhola, G., Djioleu, A., **Rajan, K.,** Labbé, N., Carrier, D.J., Kim, J.-W. (2020) Maximizing production of cellulose nanocrystals and nanofibers from pre-extracted loblolly pine kraft pulp: A response surface approach. *Bioresources & Bioprocessing,* DOI: 10.1186/s40643-020-00302-0.
17. **Rajan, K.,** Djioleu, A., Kandhola, G., Labbé, N., Sakon, J., Carrier, D.J., Kim, J.-W. (2020) Investigating the effects of hemicellulose pre-extraction on the production and characterization of loblolly pine nanocellulose. *Cellulose,* DOI: 10.1007/s10570-020-03018-8.
18. Akato, K.M., Nguyen, N.A., **Rajan, K.,** Harper, D.P., Naskar, A.K. (2019) A tough and sustainable fiber-forming material from lignin and waste poly(ethylene terephthalate). *RSC Advances,* DOI: 10.1039/C9RA07052D.
19. Ghosh, A., Kim, K., **Rajan, K.,** Bowland, C.C., Gurram, R.N., Montgomery, R.W., Manesh, A., Labbé, N., Naskar, A.K. (2019) Butanol-based organosolv lignin and reactive modification of poly(ethylene-glycidyl methacrylate). *Industrial & Engineering Chemistry Research*, DOI: 10.1021/acs.iecr.9b04071.
20. Tao, J., **Rajan, K.,** Ownley, B., Gwinn, K., D' Souza, D., Moustaid-Moussa, N., Tschaplinski, T.J., Labbé, N. (2019) Natural variability and antioxidant properties of commercially cultivated switchgrass extractives. *Industrial Crops and Products,* DOI: 10.1016/j.indcrop.2019.111474.
21. Dussourd, D.E., Valkenburg, M.V., Rajan, K., Wagner, D.L. A notodontid novelty: *Theroa zethus* caterpillars use behavior and anti-predator weaponry to disarm host plants. PLOS ONE, DOI: 10.1371/journal.pone.0218994
22. Sutton, J.T., **Rajan, K.,** Harper, D. P., Chmely, S.C. (2018) Lignin-containing photoactive resins for 3D printing by stereolithography. *ACS Applied Materials & Interfaces*, DOI: 10.1021/acsami.8b13031.
23. **Rajan, K.,** Mann, J., English, E., Harper, D.P., Carrier, D.J., Rials, T.G., Labbé, N., Chmely, S.C. (2018) Sustainable hydrogels based on lignin-methacrylate copolymers with enhanced water retention and tunable material properties. *Biomacromolecules*, DOI: 10.1021/acs.biomac.8b00282.
24. Fang, H., Kandhola, G., **Rajan, K.,** Djioleu, A., Carrier, D.J., Hood, K.R., Hood, E.E. (2018) Effects of oligosaccharides isolated from pinewood hot water pre-hydrolyzates on recombinant cellulases. *Frontiers in Bioengineering and Biotechnology*, DOI: 10.3389/fbioe.2018.00055.
25. **Rajan, K.,** Nelson, A., Adams, J.P., Carrier, D.J. (2017) Phytochemical recovery for valorization of loblolly pine and sweetgum bark residues. *ACS Sustainable Chemistry & Engineering*, DOI: 10.1021/acssuschemeng.7b00243.
26. Kandhola, G., **Rajan, K.,** Labbé, N., Chmely, S.C., Herringer, N., Kim, J.-W., Carrier, D.J. (2017) Beneficial effects of *Trametes versicolor* pretreatment on saccharification and lignin enrichment of organosolv-pretreated pinewood. *RSC Advances*, DOI: 10.1039/C7RA09188E.
27. **Rajan, K.,** Shi, Z., Ricke, S.C. (2017) Current aspects of *Salmonella* contamination in the US poultry production chain and the potential application of risk strategies in understanding emerging hazards. *Critical Reviews in Microbiology*, DOI: 10.1080/1040841X.2016.1223600.
28. **Rajan, K.,** Carrier, D.J. (2016) Insights into *exo*-cellulase inhibition by the hot water hydrolyzates of rice straw. *ACS Sustainable Chemistry & Engineering*, DOI: 10.1021/acssuschemeng.5b01778.
29. Kapoor, R. K., **Rajan, K.,** Carrier, D.J. (2015) Applications of *Trametes versicolor* crude culture filtrate in detoxification of biomass pretreatment hydrolysates. *Bioresource technology*, DOI: 10.1016/j.biortech.2015.03.100.

30. **Rajan, K.,** Chen, M.H., Carrier, D.J., Singh, V. (2015) Separation of xylose oligomers from autohydrolyzed *Miscanthus* × *giganteus* using centrifugal partition chromatography. *Food and Bioproducts Processing*, DOI: 10.1016/j.fbp.2015.04.006.
31. Mohanram, S., **Rajan, K.,** Carrier, D.J., Nain, L., Arora, A. (2015) Insights into biological delignification of rice straw by *Trametes hirsuta* and *Myrothecium roridum* and comparison of saccharification yields with dilute acid pretreatment. *Biomass and Bioenergy*, DOI: 10.1016/j.biombioe.2015.02.031.
32. **Rajan, K.,** Carrier, D.J. (2014) Characterization of rice straw prehydrolyzates and their effect on the hydrolysis of model substrates using a commercial *endo*-Cellulase, *β*-Glucosidase and cellulase cocktail. *ACS Sustainable Chemistry & Engineering*, DOI: 10.1021/sc5002947.
33. **Rajan, K.,** Carrier, D.J. (2014) Effect of dilute acid pretreatment conditions and washing on the production of inhibitors and on recovery of sugars during wheat straw enzymatic hydrolysis. *Biomass and Bioenergy*, DOI: 10.1016/j.biombioe.2014.01.013.

## PROFESSIONAL DEVELOPMENT ACTIVITIES

- ***Reviewer*** for NSF Small Business Innovation Research grant panel ..... *Apr 2023*
- ***Supporting Women in Agriculture in Tennessee (SWAT),*** University of Tennessee..... *2022-23*
  - *Leadership team member.* Organizing panels and workshops.
- ***Reviewer*** for USDA-NIFA Small Business Innovation Research grant panel ..... *Feb 2021*
- ***Review editor*** for over 300 manuscripts..... *since 2013*
  - ACS Sustainable Chemistry and Engineering, Green Chemistry, ACS Omega, BioResources, Transactions of the ASABE, Frontiers in Energy Research, Journal of Liquid Chromatography & Related Technologies, MDPI Polymers, MDPI Materials, and Elsevier Waste Management.
- ***Professional society memberships:*** Institute of Food Technologists (**IFT**) ..... *2012-2014*
  - Society for Industrial Microbiology & Biotechnology (**SIMB**), American Chemical Society (**ACS**)..... *since 2013*
- ***Judging*** student work and Conference session ***presiding***
  - 2023 ACS Spring Meeting, Indianapolis, IN ..... *Apr 28-30, 2023*
  - 2018 Frontiers in Biorefining conference, St. Simons Island, GA..... *Nov 7, 2018*
  - 4th Annual Women in STEM Research Symposium, University of Tennessee, TN..... *Mar 4, 2018*
  - The Global Undergraduate Awards, Earth & Environmental Sciences division..... *Sep 2017*
  - 39th Symposium on Biotechnology for Fuels & Chemicals, San Francisco, CA..... *May 1, 2017*

## ONLINE VISIBILITY

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|---|---|
| **ORCiD** | https://orcid.org/0000-0002-1837-1235 |
| **ResearchGate** | https://www.researchgate.net/profile/Kalavathy_Rajan |
| **Loop** | https://loop.frontiersin.org/people/513621/overview |
| **Google Scholar** | https://scholar.google.com/citations?user=rPyVrrIAAAAJ&hl=en |
| **LinkedIn** | https://www.linkedin.com/in/kalavathy-rajan-plantsciences/ |