Subodh Kumar

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KEY RESEARCH INTERESTS

- Biomass characterization
- Anaerobic digestion (Co-digestion, Production, and Upgradation)
- Pretreatment of Lignocellulosic biomass
- Life cycle assessment
- Technoeconomic analysis

ACADEMIC QUALIFICATIONS

Ph.D. in Renewable Energy and Environmental Engineering (*Thesis submitted***)**
Thesis title: *Evaluating the sustainability of hydrothermal pretreatment and anaerobic co-digestion for extracting bioenergy from rice crop residues and waste algal biomass.*

Supervisors: **Late Dr. Ram Chandra,** Assistant Professor, CRDT, IITD, New Delhi, India
Prof. Virendra Kumar Vijay, Professor, CRDT, IITD, New Delhi, India
Prof. Anushree Malik, Professor, CRDT, IITD, New Delhi, India

Master of Technology in Renewable Energy Engineering (June 2017)
Thesis title: *Residual biomass of major cereals of Rajasthan: Pre-treatment, biogas potential, energy and economic analysis.*
Advisors: **Dr. Vivekanand**, Assistant Professor, Centre for Energy and Environment, Malaviya National Institute of Technology, Jaipur, Rajasthan, India.

Bachelor of Technology in Mechanical Engineering (June 2014)
Uttar Pradesh Technical University, Lucknow, Uttar Pradesh, India

PROFESSIONAL EXPERIENCE

- Over 6+ years of experience optimizing anaerobic digestion processes for diverse feedstocks, including agricultural residues, energy crops, and algal biomass.
- Skilled in scaling up batch-scale optimized anaerobic digestion processes to pilot scale, focusing on energy balance, mass balance, and environmental impact analysis.
- Expertise in improving biogas yield and quality through hydrothermal pretreatment and co-digestion of substrates with complementary characteristics.
- Practical experience managing a biogas plant producing 25 m^3 of biogas daily, including process monitoring and troubleshooting.
- Proficient in operating biogas production systems, including digesters, biogas upgrading units, and storage facilities.
- Experienced in drafting project proposals for biogas production, aligning them with regulatory frameworks and renewable energy policies.
- Contributed to two national biogas training programs for government officials, entrepreneurs, and consultants, covering advancements in biogas technology and its applications**.**

Achievements: 22 Publications (10 Journal Articles, 5 Conference Presentation & 7 Book Chapters)

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RESEARCH OUTPUTS

Total publications	:	22
Peer-reviewed journal articles	:	10
Book chapters	:	7
Scopus/SCI/ISI indexed articles	:	15
Total citations (Google Scholar)	:	413
h-index	:	9
i10-index	:	9
Maximum citations of a paper	:	116
Maximum citations in a year	:	145 (2024)

Journal Name	**No. of Papers**	**Impact Factor (JCR 2024)**	**Quartile (SJR 2023)**
Renewable and Sustainable Energy Reviews (Elsevier)	1	16.30	Q1 (3.596)
Journal of Cleaner Production (Elsevier)	1	9.70	Q1 (2.058)
Renewable Energy (Elsevier)	1	9.00	Q1 (1.923)
Environmental Research (Elsevier)	1	7.70	Q1 (1.679)
Fuel (Elsevier)	1	6.70	Q1 (1.451)
Waste and Biomass Valorization (Springer)	1	2.60	Q2 (0.605)
Energies (MDPI)	1	3.00	Q1 (0.651)
Bioresource Technology Reports (Elsevier)	1	-	Q1 (0.785)
Cleaner Engineering and Technology (Elsevier)	1	-	Q1 (1.075)
Biomass Conversion and Biorefinery (Springer)	1	3.5	Q2 (0.595)
Cumulative	10	**58.50**	**-**

ACADEMIC/RESEARCH ACHIEVEMENTS

Ministry of Education Research Fellowship – at IIT Delhi, New Delhi, India (Dec 2018 – Dec 2023)
Ministry of Education Research Fellowship – at MNIT-Jaipur, Rajasthan, India (July 2015 – June 2017)
Research Scholar Travel Award (RSTA)– for presenting the research work at the 4th International Conference on "Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability (BIORETEC-2023)-Lake Garda, Italy (May 2023)
Research Excellence Travel Award (RETA) – for presenting the research work in "3rd International Conference on Environmental Sustainability (ICES-2023)", BITS Pilani, Dubai Campus, Dubai, UAE (Dec 2023)
Best Oral Presentation Award – at 3rd International Conference on Environmental Sustainability (ICES-2023), BITS Pilani, Dubai Campus, Dubai, UAE (Dec 2023)

PUBLICATIONS

Journal Publications- (10)

2024

- Kumar, S., D'Silva, T. C., Chandra, R., Malik, A., Kumar Vijay, V., & Misra, A. (2024). Impact of hydrothermal pretreatment at different temperatures on biomethane yield in anaerobic digestion of rice husk. Biomass Conversion and Biorefinery, 1-16. https://doi.org/10.1007/s13399-024-06106-y
- Sahota, S., **Kumar, S.,** & Lombardi, L. (2024). Biohythane, Biogas, and Biohydrogen Production from Food Waste: Recent Advancements, Technical Bottlenecks, and Prospects. In Energies (Vol. 17, Issue 3). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/en17030666

2023

- D' Silva, T.C., Khan, S.A., **Kumar, S.,** Kumar, D., Isha, A., Deb, S., Yadav, S., Illathukandy, B., Chandra, R., Vijay, V.K., Subbarao, P.M.V., Bagi, Z., Kovacs, K.L., Yu, L., Gandhi, B.P., Semple, K.T. (2023). "*Biohydrogen production through dark fermentation from waste biomass: Current status and future perspectives on biorefinery development*". Fuel, 350, 128842. https://doi.org/10.1016/j.fuel.2023.128842

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- Subbarao, P.M.V., D' Silva, T.C., Adlak, K., **Kumar, S.,** Chandra, R., Vijay, V.K., (2023). "*Anaerobic digestion as a sustainable technology for efficiently utilizing biomass in the context of carbon neutrality and circular economy*," Environ. Res., 234, 116286. https://doi.org/10.1016/j.envres.2023.116286

2021

- **Kumar, S.,** D' Silva, T.C., Chandra, R., Malik, A., Vijay, V.K., Misra, A., (2021). *"Strategies for boosting biomethane production from rice straw: a systematic review."* Bioresour. Technol. Rep. 15, 100813. https://doi.org/10.1016/j.biteb.2021.100813
- Khan, S.A., D' Silva, T.C., **Kumar, S.,** Chandra, R., Vijay, V.K., Misra, A., (2021). *"Mutually trading-off biogas and biochar sectors for broadening biomethane applications: A comprehensive review,"* J. Clean. Prod. 318, 128593. https://doi.org/10.1016/j.jclepro.2021.128593

2020

- Isha, A., **Kumar, S.,** Jha, B., Subbarao, P. M. V., Chandra, R., & Vijay, V. K. (2020). Development of stabilization methods using a pilot scale anaerobic digester for seasonal variations in kitchen wastes for improved methane production with zero breakdowns. Cleaner Engineering and Technology, 1. https://doi.org/10.1016/j.clet.2020.100015

2019

- **Kumar, S.,** Gandhi, P., Yadav, M., Paritosh, K., Pareek, N., & Vivekanand, V. (2019). Weak alkaline treatment of wheat and pearl millet straw for enhanced biogas production and its economic analysis. Renewable Energy, 139. https://doi.org/10.1016/j.renene.2019.02.133

- Gandhi, P., Kumar, S., Paritosh, K., Pareek, N., & Vivekanand, V. (2019). Hotel Generated Food Waste and Its Biogas Potential: A Case Study of Jaipur City, India. Waste and Biomass Valorization, 10(6). https://doi.org/10.1007/s12649-017-0153-1

2018

- **Kumar, S.,** Paritosh, K., Pareek, N., Chawade, A., & Vivekanand, V. (2018). De-construction of major Indian cereal crop residues through chemical pretreatment for improved biogas production: An overview. Renewable and Sustainable Energy Reviews, 90. https://doi.org/10.1016/j.rser.2018.03.049

Book Chapters (7)

2023

- **Kumar, S.,** D' Silva, T.C., Kumar, D., Isha, A., Khan, S.A., Chandra, R., Malik, A.M., Vijay, V.K. (2023). "*Valorization of By-Products Produced During the Extraction and Purification of Biofuels*." Chapter 11, In Biofuel Extraction Techniques: Biofuels, Solar, and Other Technologies, John Wiley & Sons. https://doi.org/10.1002/9781119829522.ch11
- Isha, A., Jha, B., D' Silva, T.C., **Kumar, S.,** Khan, S.A., Kumar, D., Chandra, R., Vijay, V.K. (2023). "*Role of Additives on Anaerobic Digestion, Biomethane Generation, and Stabilization of Process Parameters*." Chapter 4, In: Biofuel Extraction Techniques: Biofuels, Solar, and Other Technologies, John Wiley & Sons. https://doi.org/10.1002/9781119829522.ch4
- D' Silva, T.C., Isha, A., **Kumar, S.,** Khan, S.A., Kumar, D., Chandra, R., Vijay, V.K. (2023). "*An Overview on Established and Emerging Biogas Upgradation Systems for Improving Biomethane Quality*." Chapter 5, In: Biofuel Extraction Techniques: Biofuels, Solar, and Other Technologies, John Wiley & Sons. https://doi.org/10.1002/9781119829522.ch5
- Khan, S.A., Kumar, D., **Kumar, S.,** Isha, A., D' Silva, T.C., Chandra, R.C., Vijay, V.K. (2023). "*Biofuel Applications: Quality Control and Assurance, Techno-Economics and Environmental Sustainability*." Chapter 13, In: Biofuel Extraction Techniques: Biofuels, Solar, and Other Technologies, John Wiley & Sons. https://doi.org/10.1002/9781119829522.ch13

2022

- Khan, S.A., Kumar, D., **Kumar, S.,** Isha, A., D' Silva, T.C., Chandra, R., Vijay, V.K., (2022). "*Recent advances in fast pyrolysis and oil up-gradation*." Chapter 10, In: Thermochemical and Catalytic Conversion Technologies for Future Biorefineries (Vol. I). Springer Nature. https://doi.org/10.1007/978-981-19-4312-6_10

2021

- Kumar, S., Isha, A., Chandra, R., Malik, A., Vijay, V.K., 2021. Algal Biomass: A Promising Source for Future Bioenergy Production, In: Bioenergy Engineering. CRC Press, pp. 131–152. https://doi.org/10.1201/9781003230878-7

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2019

- Chandra, R., Isha, A., **Kumar, S.,** Khan, S.A., Subbarao, P.M.V., Vijay, V.K., Chandel, A.K., Chaudhary, V. P., "Potentials and challenges of biogas upgradation as liquid biomethane." *Biogas Production: From Anaerobic Digestion to a Sustainable Bioenergy Industry* (2020): 307-328. https://doi.org/10.1007/978-3-030-58827-4_14

Conference Proceedings (5)

Oral Presentations

- **Kumar, S.,** Chandra, R., Malik, A., Vijay, V. K., & Misra, A. 'Anaerobic co-digestion of waste microalgae and hydrothermally pretreated rice husk: Evaluation of mass and energy balance on a pilot scale digester' VIII International Conference on "Sustainable Energy and Environmental Challenges (VIII SEEC). MNIT Jaipur| 4-6 December 2023
- **Kumar, S.,** Chandra, R., Malik, A., Vijay, V. K., & Misra, A. 'Co-hydrothermal pretreatment of waste microalgae and rice straw: A strategy to overcome the challenges of mono-digestion' 3rd International Conference on Environmental Sustainability: New Paradigms & Developments. BITS Pilani, Dubai Campus, UAE | 27- 29 November 2023 **(Best oral presentation award)**
- **Kumar, S.,** Chandra, R., Malik, A., Vijay, V. K., & Misra, A. "Anaerobic co-digestion of cow dung and rice straw: Evaluation of biogas and biomethane production at increasing mesophilic temperature". Recent Advances in Chemical Engineering towards Sustainable Future 2022, NIT Surat, Gujarat, India, 17 February 2022.

Poster Presentations

- **Kumar, S.,** Chandra, R., Malik, A., Vijay, V. K., & Misra, A. "Evaluating the effect of hydrothermal pretreatment on biomethane yield of waste algal biomass" Poster presented at 4th International Conference for Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability. Lake Garda Italy, 14–17 May 2023.
- **Kumar, S.,** Chandra, R., Malik, A., Vijay, V. K., & Misra, A. "Optimization of hydrothermal pretreatment for improving the biomethane yield of rice husk" Poster presented at International Conference on Biotechnology for Sustainable Bioresources and Bioeconomy (BSBB-2022), IIT- Guwahati, Guwahati, India, 7-11 December 2022.

PEER REVIEWING ACTIVITY

1. BioEnergy Research (Springer) (×2)

EVENTS ORGANIZED

1. *Coordinator (Food and Accommodation)* – Workshop on Design and Development of Micro-scale Rural Energy Systems organized by CRDT, IIT Delhi, New Delhi, India (March 2023).
2. Organizing team member -National Training Program on Biogas Development and Training, B.T.D.C. organized by CRDT, IIT Delhi, New Delhi, India (January 2024)
3. Organizing team member -National Training Program on Biogas Development and Training, B.T.D.C. organized by CRDT, IIT Delhi, New Delhi, India (March 2020)
4. Organizing team member - Tech4Seva (Technology Outreach as an Enabler for Inclusive & Sustainable Development) organized by CRDT, IIT Delhi, New Delhi, India (August 2019)

REFEREES

1. **Prof. Virendra Kumar Vijay,**
   Professor,
   Centre for Rural Development and Technology, Indian Institute of Technology Delhi, New Delhi, India – 110 016
   E-mail ID: Virendra.Kumar.Vijay@rdat.iitd.ac.in

2. **Prof. Anushree Malik**
   Professor,
   Centre for Rural Development and Technology, Indian Institute of Technology Delhi, New Delhi, India – 110 016
   E-mail ID: Anushree.Malik@rdat.iitd.ac.in

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3. **Dr. Vivekanand,**
Assistant Professor,
Centre for Energy and Environment,
Malaviya National Institute of Technology, Jaipur,
India – 302017
E-mail ID: vivekanand.cee@mnit.ac.in

DECLARATION

I declare that the information and facts stated above are true and correct to the best of my knowledge and belief.

[Subodh Kumar]