Sunil Kumar Srivastava, Ph.D.

Curriculum Vitae

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Work Experience

07.2011 – Till Date Assistant Professor, Department of Chemistry, Jaypee University of Engineering & Technology.

An Environmental Expert/Consultant for the District Environmental Impact Assessment Authority (DEIAA, Govt. of India), Advisor and Expert for the Water Quality at JUET, Advisor for Sewage Treatment Plant at JUET, Guna, India. Research and Development activity in "solid waste management, water quality, and Nonconventional source of energy. Teaching for B.Tech., M.Sc. /M. Tech. and Ph.D. students at JUET.

08.2018-12.2018 Guest Faculty, School of Nano technology, Jawaharlal Nehru University, New Delhi, India.

Teaches Chemistry of nanomaterial to post-graduate students (M.Tech.) in the School of Nano-technology in Jawaharlal Nehru University, New Delhi, India

07.2010 – 06.2011 Sr Lecturer, Department of Chemistry, Jaypee University of Engineering & Technology, India

The designed Sewage treatment plant at JUET, Advisor for water quality in the university campus, Designed solid waste collection, transportation, and proper disposal mechanism on the university campus. Teaching for B. Tech., M.Sc. /M. Tech. and Ph.D. students at JUET.

07.2008 – 06.2010 Lecturer, Department of Chemistry, Jaypee Institute of Engineering & Technology, India

Teaching for B.Tech. /M. Tech. students at JUET. Assist in the water quality monitoring team in the institute campus. Supervised B. Tech, M. Tech, M.Sc., and B.Sc. students research project.

05.2006 – 06.2008 Lecturer, Department of Chemistry, IMS Engineering College, India

Teaching for B.Tech. /M. Tech. students at JUET. Assist in solid waste management activity in the institute campus.

Higher Education

07.2002-05.2006 Doctor of Philosophy in Environmental Science, Jawaharlal Nehru University, India

Thesis entitled *"Study of the Ground Water Quality Variations in the Vicinity of the Selected Landfill Sites in Delhi, India"* completed, thesis defended, and degree awarded in 2006.

08.2000-05.2002 First Div. (75.83 %) Master of Philosophy in Environmental Science, Jawaharlal Nehru University, India

Thesis entitled *"Sediment Characteristics of the Achankovil River Basin, Kerala, India."* completed, thesis defended and degree awarded in 2002

07.1997-05.1999 First Div. (63.0 %) Master of Science in Chemistry, Banaras Hindu University, India

07.1993-06.1997 First Div. (61.6 %) Bachelor of Science in Chemistry (HONS.), Banaras Hindu University, India

Skills

Instrument: AAS, Spectrophotometer, TGA, NMR, IR, GC, ICP-MS, etc
Software: Microsoft Office, Window-10, MiniTab-14, Pro-Origin, Visual MODFLOW/MT3D, WATCLAST, AQUACHEM, SURFUR, MAPSCAN, MAPINFO, ARCVIW, SPSS, STATISTICA, PHREEQC, MATLAB, etc
Language: Fluent in English and Intermediate in Swedish and French.

Achievement and Award

Recent Project: Entitled "Hydrogeochemical Assessments of Groundwater Quality Using Graphical & Multivariate Statistical Method, Guna District" completed on 10th Oct. 2018.

Recent Ph.D. Theis Supervision: Entitled "Production, Characterization, and Immobilization of Fungal Lipase Produced using Soybean Husk as a Substrate" Complete in December 2019.

International Scholarship/Fellowship: Linnaeus-Palme Scholarship for the year 2005-2006 by SIDA, Sweden.

Highlights of best research work relevant to proposed Research plan

1. **Invasive weed optimization coupled biomass and product dynamics of tuning soybean husk towards lipolytic enzyme. Bioresource Technology 2021 (Elsevier Pub.) (IF 9.642).**

   Highlights: Waste to the product approach was proposed for tuning environ-threat soybean husk towards lipolytic enzyme by integrating the invasive weed optimization with biomass and product dynamics study. The invasive weed optimization constitutes based on the non-linear regression model results in a 47 % enhancement in lipolytic enzyme using the optimization parameters of 7% Sigma Final, 9% exponent; Smax of 5 with a population size of 35 and Max. generations of 99. The biomass dynamic study showcases the dynamic parameters of 0.0239 μmax, 8.17 X_{Lim}^{st} and 0.852 R_{Fin} values. The product dynamic studies reveal the kinetic parameters of k^{st} , k^{div} , P^{Fin}, which seem to be equal to −0.0338, 0.0896 and 68.1, respectively. Overall, the present study put forth the zero-waste (soybean husk) to the product (lipolytic enzyme) approach by introducing the novel "Invasive Weed Optimization" coupled with "Biomass and product dynamics" to the bioprocessing field.

2. **Engineering aspects of immobilized lipases on esterification: A special emphasis on crowding, confinement, and Diffusion effects. Jan. 2018 (Wiley VCH Pub.), Engineering in Life Science, vol 18, page 308-316. (Impact Factor 2.678).**

   Cross-linked enzyme crystal (CLEC) and sol-gel entrapped pseudomonas sp. lipase were investigated for the esterification of lauric acid with ethanol by considering the effects of reaction conditions on reaction rate. The activation energy for the reaction was estimated to be 1097.58 J/mol and 181.75 J/mol for sol-gel and CLEC entrapped lipase respectively. CLEC lipase exhibited a marginal internal diffusion effect on reaction rate over sol-gel lipases and found to be interesting. The overall reaction mechanism was found to conform to the Ping Pong Bi Bi mechanism. The higher efficiency of sol-gel lipases over CLEC lipases in esterification reaction is mainly due to the combined effects of crowding, confinement and diffusional limitations.

3. **Assessment of groundwater quality for the suitability of irrigation and its impacts on crop yields in the Guna district, India. Agricultural Water Management 2019 (Elsevier Pub.) vol. 216, page 224-241 (IF 4.516).**

   This study was performed to understand the impact of groundwater quality on the crop yields and its suitability for the irrigation. The hydrogeochemical assessment indicates chemical weathering is prevalent in the aquifer system. Low sodium-hazard observed in almost all samples. High salinity-hazard observed in the shallow aquifer indicates leaching of contaminants from the surface. Salinity-hazard statistics indicates ~27.60% groundwater suitable for irrigation, ~47.65% groundwater considerable for irrigation of selected crops whose salinity tolerance limit is high, ~13.44% groundwater (fresh-brackish) cause problem in the soil and ~11.31% groundwater unsuitable for the irrigation. Salinity tolerance limit indicates yield (%) of the few crops remain unaffected. These crops are Hordeum vulgare (Barley), Gossy pium (Cotton), Beta vulgaris (Sugar-beet), Cynodon dactylon (Bermuda-grass), Thinopyrum ponticum (tall Wheat-grass), Thinopyrum intermedium (Wheat-grass) etc. The yield potential (%) partially affected in the few crops like Arachis hypogaea (Groundnut) (~95.30%), Oryza sativa (Rice) (~93.29%), Carthamus tintorius (Safflower) (~97.32%), Sorghum bicolor (Sorghum) (~95.97%), Glycine max (Soybean) (~97.32%), Triticum aestivum (Wheat) (~99.33%), Brassica

oleracea var. italica (Broccoli) (~92.62%), Cucumis sativus (Cucumber) (~90.60%), Solanum lycopersicum (Tomato) (~90.60%), Phalaris aquatic (Harding-grass) (~97.96%), Lolium perenne (Perennial ray-grass) (~97.99%), Sorghum drummondii (Sudan-grass) (~92.62%), Festuca arundinacea (tall-Fescue) (~95.30%), Lotus corniculatus (Trefoil-small) (~97.32%), Phoenix dactylifera (Date-palm) (~95.97%), Ficus carica (Fig) (~95.97%), Olea europaea (Olive) (~95.97%), Punica granatum (Pomegranate) (~91.28%) etc. Few crops sensitive to salinity-hazard indicate low-yield potential listed as Phaseolus vulgaris (Bean) (~36.91%), Daucus carota (Carrot) (~36.91%), Fragaria ananassa (Strawberry) (~36.91%). This groundwater is suitable for the irrigation of crops like Barley, Cotton, Sugar-beet, Wheat, Wheat-grass, Bermuda-grass, etc. But this groundwater can be used for irrigation after salinity management for the crops like Groundnut, Rice, Soybean, Broccoli, Cucumber, Tomato, Harding-grass, tall Fescue, Trefoil-small, Date-palm, Fig, Olive, and Pomegranate. The similar range of the crop yields observed in both Soil Water Salinity (SWS) Model and Ayers and Westcot Model, if the salinity of the irrigation water is low (≤1.5 mS/cm). While low reduction in crop yields observed according to SWS Model in comparisons to Ayers and Westcot Model if the salinity of the irrigation water is high (> 1.5 mS/cm). The major reduction in crop yields observed in Ayers and Westcot Model, while the moderate decline in crop yields observed in SWS Model at higher salinity. Crop yield in the study area can be improved by implementing proper irrigation water management

4. **The mathematical modeling for the optimization of triacylglycerol Acylhydrolases Production Through Artificial Neural Network and Genetic Algorithm". International Journal of Pharma and BioSciences. Vol. 10 (3), page 135-143 (SJIF 7.446)**

The demand of industrial enzymes is growing tremendously worldwide due to the intervention of enzyme in the various commercial and industrial applications. The fulfillment of the market demand, several production strategies have been employed by researcher to get the optimal yield. Mathematical modeling helps in deriving a non-linear equation by considering the individual, square and interaction effects of the process variables on the product formation. The soft computing-based optimization helps in attaining the optimum output of the production without trapping in local optima. The influencing parameters for enzyme productions considered in this research work are temperature (°C), liquid to solid ratio, pH and incubation time (hours). Artificial Neural Networks (ANN) and Genetic Algorithms (GA) serve as a better modeling tool and optimization approach for enzyme production due to the better search and optimal criteria. In this research work with mathematical modeling for the optimization of triacylglycerol acylhydrolase production using agro-residue as a substrate was carried out using Artificial Neural Network (ANN) and Genetic Algorithm (GA). The Feed-Forward-Back Propagation (FFBP) algorithm along with CCD data was used for the ANN model development. This model also supported with regression plots which show the high regression coefficient (R2 =0.75). The optimization of this model shows that the enzyme production can be improved up to ~88.52 % at temperature 35°C, liquid-solid ratio is 1.5, pH 7 and incubation time 120 h. The proposed optimized model helps in scale-up studies of enzyme production without any difficulty. This research work revealed that the enhanced process attributes of ANN-GA over OVAT (One Variable at a Time) approach.

5. **Advancement in biogas production from solid waste by optimizing the anaerobic digestion. Waste Disposal and Sustainable Energy 2020 (Springer) vol 2, issue 2, page 85-103. https://doi.10.1007/s42768-020-00036-x**

The crisis of fossil fuel and their negative impact on the environment has caused concern among the scientific communities leading them to look around for renewable sources of energy. This review has emphasized the efficient utilization of organic municipal solid waste as well as agriculture waste in an anaerobic digester for the production of biogas as a sustainable renewable energy. Recent advances in biogas production along with previous research work have been discussed to offer a comprehensive synopsis of the accumulated knowledge. This review also elucidates about the design of an anaerobic digester, the prospect of anaerobic digestion and opportunity in new advances in technology. Biogas is one of the most accepted sustainable renewable energy. The characterization, elimination of contaminants, pretreatment, anaerobic digestion in optimum condition and utilization of energy crops enhanced the efficiency of an anaerobic digester. Pretreatment of segregated organic solid waste increased its putrescibility and further biogas production. The optimized parameters in this review

were pH, temperature, loading rate, C/N ratio and solid/liquid ratio of the feedstock. The flow rate of the feedstock was optimized according to the available volume of the digester, residence time and the characteristics of the feedstock. The design of an anaerobic digester should be preferably cylindrical in shape, with a diameter ranging from 6 to 40 m, the depth ranging from 7.5 to 15 m and the conical floor having a slope around 15%. A comprehensive reform in technical, economic, and social policies is essential to accomplish a sustainable energy system considering biogas as a future renewable energy

6. **Production of microbial enzyme triacylglycerol Acylhydrolases by ASPERGILLUS SYDOWII JPG01 by in submerged fermentation using agroresidues". Asian Journal of Microbiology, Biotechnology, and Environmental Sciences. Vol 21, issue 4, 2019 (Impact factor 0.365)**

Agriculture waste is one of the major concerns to environmentalist worldwide for a long time. This research work carried out with objective to utilize these agro-residues for production of the microbial enzyme. In this study wheat straw (WS), soybean husk (SH), barley straw (BS) and corn stover (CS) are utilized as a substrate for production microbial enzyme triacylglycerol acylhydrolase by Aspergillus sydowii JPG01. The comparative study of agro-residues indicates thatthe suitability order of agriculture waste for the enzyme production as SH>WS>CS>BS. Hence Soybean Husk is the better substrate in comparison to the other.

List of Publication

2021	1	Invasive weed optimization coupled biomass and product dynamics of tuning soybean husk towards lipolytic enzyme. Bioresource Technology 2021 **(Elsevier Pub.) (IF 9.642) vol 344, pp 126254**. https://doi.org/10.1016/j.biortech.2021.126254.
	2	New Challenges on Natural Resources and their Impact on Climate Change in the Indian Context. Book: India: Climate Change Impacts, Mitigation and Adaptation in Developing Countries 2021. **(Springer)** vol 1, issue 1, page 1-15.
2020	3	Advancement in biogas production from solid waste by optimizing the anaerobic digestion. Waste Disposal and Sustainable Energy 2020 **(Springer)** vol 2, issue 2, page 85-103. https://doi.10.1007/s42768-020-00036-x.
2019	4	Assessment of groundwater quality for the suitability of irrigation and its impacts on crop yields in the Guna district, India. Agricultural Water Management 2019 **(Elsevier Pub.)** vol. 216, page 224-241 **(IF 4.516).**
	5	The mathematical modeling for the optimization of triacylglycerol Acylhydrolases Production Through Artificial Neural Network and Genetic Algorithm". International Journal of Pharma and BioSciences. Vol. 10 (3), page 135-143 **(SJIF 7.446)**
	6	Production of microbial enzyme triacylglycerol Acylhydrolases by ASPERGILLUS SYDOWII JPG01 by in submerged fermentation using agroresidues". Asian Journal of Microbiology, Biotechnology, and Environmental Sciences 2019 **(SCI. Pub.)**. Vol 21, issue 4, **(IF 0.365).**
2018	7	Geochemical assessment of fluoride enrichment and nitrate contamination in groundwater in hard rock aquifer by using graphical and statistical methods. Journal of Earth System Science 2018 **(Springer Pub.)** Vol 127, issue 7, pp 104 (1-23) **(Impact Factor 1.830).**
	8	Engineering aspects of immobilized lipases on esterification: A special emphasis on crowding, confinement, and Diffusion effects. Jan. 2018 **(Wiley VCH Pub.)**, Engineering in Life Science, vol 18, page 308-316. **(Impact Factor 2.678).**
	9	Assessment of landfills vulnerability on the groundwater quality located near floodplain of the perennial river and simulation of contaminant transport. Modeling Earth System and Environment 2018" **(Springer Pub.)** vol 4 Issue 2 page 729-752.
2017	10	An assessment of hydrogeochemistry of two wetlands located in Bihar State in the subtropical climatic zone of India. Environmental Earth Sciences, 2017 **(Springer Pub)** vol 76 (1); pp 1-19**; (IF 2.867**).
	11	Design of anaerobic digester for producing biogas from Municipal Solid Waste. Poster presentation in International Workshop on Sustainable Energy, Kalmar Institute of Technology, Sweden, 6-8th Dec. 2017, poster No 20.

2016 12 Statistical evaluation of Recovery of copper from ewaste by using Hydrometallurgical Method and RSM model" Journal of Environmental Science, Toxicology and Food Technology" Oct. 2016, vol 10, issue 7 ver. II pp 31-43 **(IF 1.832).**

2012 13 Groundwater in Vicinity of landfill. 2012 (LAMBERT ACADEMIC PUBLISHING), GERMANY, Jan. 2012 ISBN: 9783847328858.

2011 14 Bottom-Up approach: A versatile approach to nanomaterial synthesis. Poster presentation in National Conference, Recent Trend in material Science (RTMS) from 8th to 10th October 2011.

2008 15 Geochemical Assessment of Groundwater Quality in the vicinity of Bhalswa landfill using Graphical and multivariate statistical method, Delhi, India. Environmental Geology, 2008**, (Springer Pub.)** Vol. 53, 1509-1528. **(IF 2.867).**

16 Hydrogeochemical studies around the Bhalswa landfill in Delhi, India. AA Balkema **(Taylor and Francis Group London UK)** "Groundwater for Sustainable Development: Problems, Perspectives and Challenges (2008) "ISBN: 9780415407762, ISBN-10: 0415407761 Chap 8, 69-85.

2007 17 An Aquifer Vulnerability Assessment Using the DRASTIC Model in Landfill Sites, Delhi, India. In proceeding an international Conference on Coastal Zone Environment and Sustainable Development, Vulnerable, Adaptation, and Beyond. (12th to 14th Feb 2007) pp 103.

18 An Approach to Manage Groundwater Aquifers Including Coastal City Aquifer of India. In proceeding an international Conference on Coastal Zone Environment and Sustainable Development, Vulnerable, Adaptation, and Beyond. (12th to 14th Feb 2007) pp 104

2006 19 Metal fractionation studies in Surfacial and Core sediments in the Achankovil River basin, India. Environmental Monitoring and Assessment 2006 **(Springer Pub.)** (Volume 121, NO. 1-3, Page 77-102) **(IF 2.871).**

20 Hydrogeochemistry of groundwater in the vicinity of Bhalswa Landfill, Delhi, India. In proceeding with the International Conference on Groundwater for Sustainable Development, Problem Perspective, and Challenges from 1st Feb to 4rth Feb 2006.

21 Simulation of Solute Transport in South Delhi, Using Okhla Phase II as a point source, Delhi, India. In proceeding with the International Conference on Groundwater for Sustainable Development, Problem Perspective, and Challenges from 1st Feb to 4rth Feb 2006.

2005 22 An overview of the Hydrogeochemical Water Quality Model" (2005) Mathematical Models in Hydro-geochemistry, Assessment of Quality and Management (Sept 19th to 5th Oct 2005) (pp 49-59).

23 Groundwater Resource Management. In proceeding with an international workshop conducted by SIS, Jawaharlal Nehru University (7th to 8th April 2005) (unpublished).

24 Groundwater quality in the vicinity of Bhalswa Landfill, Delhi, India. In proceeding of the National Workshop conducted by IIT, Delhi (18th-19th May 2005).

2004 25 An overview of Mathematical Modelling. Hands-on Training in Mathematical Modelling, Prashant Publishing Co. (2004), New Delhi, India pp 48-57.

(Sunil Kumar Srivastava)