



## Sustainable Role of Enzymes in Biofuels Development

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### Abstract:

Enzymes play a pivotal role in biofuels production at competitive price. Biofuels are considered the cornerstone of advance biorefinery development. Bioethanol, biodiesel and biogas are major liquid transportation biofuels which are sustainable, clean and carbon neutral alternatives of conventional petroleum derived fuels. While first generation (1G) ethanol production is well established process, cellulosic ethanol production is still evolving to meet the right economics at commercial scale. Ethanol produced from lignocellulosic biomass so called second-generation (2G) is a cumbersome process and costlier than 1G ethanol. Given that high ethanol demand in various sectors, harnessing the lignocellulosic biomass for ethanol production is necessary. Currently, the cost of production and the technical immaturity of the process are major impeding factors in commercialization of 2G ethanol. Cellulases hydrolyse the second-generation biomass into renewable sugars which are fermented into ethanol, biobutanol, and other biofuels. Biodiesel is another promising sustainable fuel made from waste oils, animal fats, vegetal oils and is totally renewable and non-toxic liquid fuel. Lipase catalyse triacylglycerides transesterification reactions making biodiesel. Biogas is a potential energy source which is produced by the anaerobic digestion (AD) of organic wastes in the form of methane. Hydrolyses enzymes such as cellulase, hemicellulase, pectinase, ligninase have a crucial role in AD of organic wastes. Fungi are the major producers of cellulases, lipases, ligninases growing on waste feedstocks under submerged or solid-state fermentation process.

### Biography:

Anuj Kumar Chandel is a USP-CAPES visiting Professor and Researcher of Industrial Biotechnology at Engineering School of Lorena, University of Sao Paulo (USP), Brazil. He received his Bachelor's, Master's and PhD degrees from Meerut University, IIT-Roorkee and JNT University, Hyderabad, India, respectively. Before joining USP-Lorena, he has worked as a Lead Scientist at Sugarcane Technology Centre (CTC)-Piracicaba, Brazil and



was responsible for scientific leadership for deployment of cellulosic ethanol process at demonstration plant and scale-up activities. Overall, he has 17 years' research experience working in industries and Universities on biofuels production, industrial enzymes production and membrane-based separations. He has published 58 articles in peer-reviewed journals and 30 book chapters. He has also co-edited 7 books on Xylitol, Sustainable Degradation of Lignocellulosic Biomass, Brazilian Biofuels Development, Indian Biofuels Development, Extremophiles, Sugarcane biorefinery and Sustainable sources of energy: Enzymatic resources. His contributions span the biomass science, biotechnology and policy domains and include sustainable development of biofuels and biochemicals under biorefinery concept. A frequently invited presenter on technical and strategic aspects of biomass energy, in prominent forums and International conferences.

### Publication of speakers:

1. Vieira, Matheus & Kadoguchi, Elen & Segato, Fernando & da Silva, Silvio & Chandel, Anuj. (2020). Production of cellulases by *Aureobasidium pullulans* LB83: optimization, characterization, and hydrolytic potential for the production of cellulosic sugars Production of cellulases by *Aureobasidium pullulans* LB83: optimization, characterization, and hydrolytic potential for the production of cellulosic sugars.
2. Garlapati, Vijay Kumar & Chandel, Anuj & jeevan kumar, Prashant & Sharma, Swati & Sevda, Surajbhan & Ingle, Avinash & Pant, Deepak. (2020). Circular Economy Aspects of Lignin: Towards a Lignocellulose Biorefinery. *Renewable and Sustainable Energy Reviews*. 130. 109977. 10.1016/j.rser.2020.109977

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