Biotechnology Reports 27 (2020) e00486

Contents lists available at ScienceDirect

Biotechnology Reports

journal homepage: www.elsevier.com/locate/btre

Microbial technology for the sustainable development of energy and environment

The issues on Energy and Environmental Sustainability are the largest challenges to meeting the UN Sustainable Development Goals. With the highly rapid development of the modern society, the increasing environmental pollution and the growing consumption of energy have already become two major issues, which need addressing now and in the future. Both ensuring the best use of resources to reduce environmental pollution and developing new sustainable strategies to convert biomass into green energy carries are urgently required by the public. Solutions to these long-term problems will require the cooperation of multidisciplinary researchers. However, microbial technologies for bioremediation of environmental pollutants [1–4], biological control [5–10], and bioconversion of biomass into clean energy carries or fuels [11–14] and green chemicals [15–17] are promising approaches to the sustainable development of energy and environment.

The present special issue of the *Biotechnology Reports* collects thirteen articles (1 Short communication, 2 Review articles, and 10 Research articles) to address the relevant topics from industrial biotechnology, biofuels production, energy storage, new processes in biotechnology, biodegradation of environmental pollutants to synthetic biology for biosynthesis of chemicals with sustainability potentials.

To begin with, Rasimphi and Tinarwo highlight the importance of biogas as a clean and renewable form of energy to the fuel crisis and the environmental pollution associated with the fossil fuel and discuss the correlating factors influencing decision-makers in the sustainable adoption and utilization of biogas technology in South Africa. Şenol reports the large potential of hazelnut shells and hazelnut wastes in the production of biogas and the mitigation of CO_2 emissions. Moreover, Hakizimana et al. provide the up-to-date information on the current strategies and parameters for the enhanced microbial production of butanediol. López-Domínguez et al. optimize the enzymatic hydrolysis of *Opuntia ficus-indica* cladode as biomass for bioethanol production with competitive yield. The paper by Lawer-Yolar et al. reports that the oils from the tropical forest tree can be used as a potential phase change material for thermal energy storage.

Akhtar and Mannan comprehensively review mycoremediation of environmental pollutants from the industry (e.g., heavy metals and aromatic hydrocarbons) and the agriculture (e.g., pesticides, herbicides, and cyanotoxins) and provide the strategies to address the global problem of pollution. The study by Pourbabaee et al. reports the hydrophobe and halotolerant bacterial culture, unveils the main rationale behind phenanthrene degradation, and provides a strong reference for bioremediation of saline environments contaminated by phenanthrene and other similar compounds.

Moreover, laccase has good performances in bioremediation of pollutants. The paper by Unuofin demonstrates the sustainability potentials of bacterial laccase tinctures in both dye decolourization and denim bioscouring, which has greatly advanced the applications toward a sustainable and total environment through production of fine biochemicals, and the minimization of environmental wastes. The research article by Mehandia et al. reports an alkali and thermostable laccase from a novel *Alcaligenes faecalis* and its application in decolorization of synthetic dyes in industries. Durán-Aranguren et al. report that bioactive compounds extracted from *Cordyceps nidus* can induce laccase activity of *Pleurotus ostreatus*, which provides the useful information for the application of laccase with improvement. Also, Junior et al. demonstrate an integrated process of vinasse degradation, laccase production and purification with potential industrial application.

In addition, Zhang et al. disclose the genomic information of a novel algicidal bacterium and uncover the regulation of quorum sensing to its algicidal activity, which will provide useful information for developing novel chemical-ecological methods to control harmful algae. Wu et al. demonstrate the novel bioprocess for enhanced production of astaxanthin, which is a potent antioxidant in the food industry, healthcare, and clinical treatments.

In summary, this special issue provides a comprehensive overview about microbial technology for the sustainable development of energy and environment and will help generate more newly developed insights into the solutions to the long-term sustainability of Energy & Environment.

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