

## Chapter 4

# Recent Molecular Approaches for Development of Value- Added Products From Lignocellulosic Food Waste

**Javed Abdulsalam Mulla**

*Institute of Bioinformatics and Biotechnology, India*

### **ABSTRACT**

*The escalating global population has led to an ever-increasing demand for food processing industries, and as a result, the generation of huge amounts of food waste. The severity of this problem is augmented due to dawdling development of effective waste treatment and disposal strategies. In a quest of potential alternative bioenergy resources, lignocellulose is proven to be a good, abundantly available raw material on the land as a leftover of agricultural and industrial byproduct made up cellulose, hemicelluloses, and lignin. It is mostly utilized for biofuels, bio-ethanol production, and other value-added products. The development of the conversion of lignocellulosic biomass to fine chemicals still remains a big challenge. The deciphering molecular mechanism and effective cellulase and hemicellulases producing microorganisms might successfully be accomplished with transcriptome, proteome, and recombinant DNA technology; these are discussed in this chapter.*

DOI: 10.4018/978-1-5225-7706-5.ch004

## **INTRODUCTION**

Lignocellulose is a common term used to explain biomass of plant. Most of the food and food processing industry waste are lignocellulosic in nature with a global estimate of up to 1.3 billion tons/year (Ravindran and Jaiswal, 2015). The many value added products are routinely generated from reducing sugars obtained by hydrolysis of Lignocellulose viz bioethanol, biogas, organic acids, enzymes and biosorbents. It is highly inexpensive renewable carbon resource having 75% of polysaccharide (Sun & Cheng, 2002).

In general it is composed of cellulose (40 to 50%) and hemicelluloses (25 to 30%) and lignin (10 to 20%) (Wyman et al., 1999). Lignin is a non carbohydrate polyphenolic compound. Cellulose hydrolysates comprise glucose and various levels of cellobiose and other glucose oligomers. On the other hand, hemicellulose hydrolysates are more complex mixtures as they include several hexoses (glucose, galactose, and mannose) and pentoses (xylose and arabinose) (Wiseloge et al., 1996). The food processing industry in the all over world is progressing at a very fast speed. Such an increasing industrialisation can give rise to more waste that is ultimately left untreated due to lack of treatment options. The land filling could be the cheapest option for waste management by many industries. Incineration could be the one approach but it requires a lot of expenditure of energy resources. However second one is composting of food waste are time consuming and sluggish. However improper disposal treatment of these waste leads to their putrefaction giving rise to toxic gases such as methane and leaching of other toxic liquids proving hazardous to the environment. Being the plenty and easy availability of food waste, exploitation of value added products from them is meagerly studied. Most of the waste generated from the food industry is lignocellulosic in nature, and thus can be used as potential substrates for the production of high value products.

One such problem that needs to be addressed immediately is the carbohydrate source used for enzyme production. Theoretically, it is possible to recycle cheap carbohydrate sources from industries and use it as a sugar source for enzyme production. However, the heterogeneous nature of biomass carbohydrate sources hinders them to be efficient nutrients leading to incompetent growth of the enzyme producing microorganisms. This is due to the fact that 5-C and 6-C sugars are absorbed by the microbe at different rates during fermentation (Abdel- Rahman et al., 2015). Furthermore these carbohydrate sources comprises of other substances that may act as inhibitors for microbial growth, and leads to poor fermentation yields and subsequently raising the production costs for the desired products.

8 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/recent-molecular-approaches-for-development-of-value-added-products-from-lignocellulosic-food-waste/222991](http://www.igi-global.com/chapter/recent-molecular-approaches-for-development-of-value-added-products-from-lignocellulosic-food-waste/222991)

## Related Content

---

### Biointensive Integrated Pest Management (BIPM) Approaches in Orchards

Kalirajan Murugasridevi, Rajendran Dhanapal, Sengodan Sekar, Ravichandran Tamilselvan and Jayaraman Aravind (2022). *Handbook of Research on Principles and Practices for Orchards Management* (pp. 249-276).

[www.irma-international.org/chapter/biointensive-integrated-pest-management-bipm-approaches-in-orchards/309172](http://www.irma-international.org/chapter/biointensive-integrated-pest-management-bipm-approaches-in-orchards/309172)

### Enhanced Fuzzy Assessment Methodology to Find Overlapping in Membership Function Using K Ratio to Find the Yield of Rice

M. Kalpana and A. V. Senthil Kumar (2020). *Fuzzy Expert Systems and Applications in Agricultural Diagnosis* (pp. 155-174).

[www.irma-international.org/chapter/enhanced-fuzzy-assessment-methodology-to-find-overlapping-in-membership-function-using-k-ratio-to-find-the-yield-of-rice/233221](http://www.irma-international.org/chapter/enhanced-fuzzy-assessment-methodology-to-find-overlapping-in-membership-function-using-k-ratio-to-find-the-yield-of-rice/233221)

### Monitoring the Condition of Mineral Nutrition of Crops Using UAV for Rational Use of Fertilizers

Dmytro Sergiyovich Komarchuk, Vitalii Pylypovych Lysenko, Oleksii Oleksandrovych Opryshko and Nataliia Anatoliivna Pasichnyk (2019). *Advanced Agro-Engineering Technologies for Rural Business Development* (pp. 293-319).

[www.irma-international.org/chapter/monitoring-the-condition-of-mineral-nutrition-of-crops-using-uav-for-rational-use-of-fertilizers/225689](http://www.irma-international.org/chapter/monitoring-the-condition-of-mineral-nutrition-of-crops-using-uav-for-rational-use-of-fertilizers/225689)

### New Food Industries Toward a New Level of Sustainable Supply: Success Stories, Business Models, and Strategies

Vittorio D'Aleo, Francesco D'Aleo and Roberta Bonanno (2019). *Urban Agriculture and Food Systems: Breakthroughs in Research and Practice* (pp. 415-438).

[www.irma-international.org/chapter/new-food-industries-toward-a-new-level-of-sustainable-supply/222403](http://www.irma-international.org/chapter/new-food-industries-toward-a-new-level-of-sustainable-supply/222403)

## Application of Solutions of the Electrochemical Processed Mineral “Bishofit” in Plant Production

Valerij Drevin, Valerij Fomichev, Igor Viktorovich Yudaev, Lyubov Minchenko, Gulnara Gizzatova, Inna Kucheroва, Tatyana Shipaeva, Valeriya Komarova and Ivan Rybintsev (2019). *Advanced Agro-Engineering Technologies for Rural Business Development* (pp. 320-345).

[www.irma-international.org/chapter/application-of-solutions-of-the-electrochemical-processed-mineral-bishofit-in-plant-production/225690](http://www.irma-international.org/chapter/application-of-solutions-of-the-electrochemical-processed-mineral-bishofit-in-plant-production/225690)