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LIGNOCELLULOSIC BIOMASS IN INDIA

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Abstract: Biofuel are advanced in a wide-scale for the purpose of accomplishing energy security and reducing green house gas effect. In this paper discuss on lignocellulosic biomass and potential to convert into chemical biofuel. Availability of lignocellulosic biomass in India and economical sustainability of biofuel. Also discuss the process used to convert biofuel in to biomass.

Index Terms **– Biofuel, Lignocellulostic biomass, second generation biorefinary.**

INTRODUCTION : The world population is estimated to increases from the current 7.2 billion to 8 billion by 2030 [1]. Food, water and oxygen is the basic life need but energy source also important now days for sustenance. Fossil fuels as crude oil, gasoline, coal and natural gas dominate the global energy market and estimated timescales for depletion of oil, coal and gas are around 35, 107 and 37 years, respectively. It is foreseeable that about 84% of this energy supply will be from fossil fuels, 6% from nuclear sources and 8% from renewable resources [2,5].

Bioenergy and biofulel is a promising asset as its ecological and financial benefits are turning out to be more distinguishable because of enhancements in innovation. National and international bodies concerned with promoting agricultural and environmental sustainability through the reduction in green house gas emissions have been expanding their interest in biofuels. Furthermore, the policy makers are investing their efforts in diversifying bioenergy as a possible significant contributor towards the socioeconomic development of rural communities and a means to reduce poverty by generating local employment and income [6]. Because of this expanded mindfulness in bioenergy area, it is presently thought to be as one of the reasonable improvement plans for the accomplishment of 2015 Thousand years Improvement Objectives, particularly in easing worldwide yearning and destitution, took on by the Unified Countries General Gathering in 2000 [7].

Waste biomass is one of the most prospective energy resources to fuel the demand of the growing economy. Hence, there is a need to develop technologies that would enable the conversation of waste biomass to bio energy considering the thermodynamic efficiency as well as environmental impacts. In spite of many beneficial approaches of bio energy, their increased exploitation is unusually now leading to serious environmental concerns In the recent years, considerable amount of bioenergy research has been directed towards biomass characterization, pretreatment, Thermochemical and biochemical conversion as well as biofuel upgrading. Although, some literature exist that review the pros and cons of using biofuels to replace fossil fuels with their social and environmental effects yet the available information remains scattered. In addition, a comprehensive review on biomass availability in a global scale and their potential for bio fuel production is rare in literature. With the objective of filling these gaps, this review surveys some of the significant findings focusing on the transition towards lignocellulosic biomass utilization and perspectives on social, economic and environmental impacts. This paper makes an attempt to assess the sustainability of lignocellulosic materials with respect to their conversion to next-generation bio fuels.

1. LIGNOCELLULOSIC BIOMASS FUEL :

Bio- fuels is the promising area to mitigate energy and climate change. Around 40% energy is from liquid fuel consumption. Hence current focus is on biodiesel and bio ethanol. But now day's biobutanol is the new area in potential biofuel because of production potential from wide variety of feedstock. Butanol has the potential to replace bioethanol and biodiesel from market.

Ethanol from food crop is called first generation fuel. First generation food crop is produce from crop like, corn, wheat, sugarcane etc. But the commercial use of such biofuel has limitation because of ethical issue in use of food crop. In contrast second generation biofuel has potential without food verses fuel conundrum. Because second generation biofuels is used lignocellulosic part of plant mainly consist of Cellulose, Hemicellulose and Lignin. Compare to first generation ethanol, second generation have lower Green House Gas emission.

Plant residue from forest and agriculture are the main source of lignocellulosic mass. Lignocellulosic biomass is easily available and economic. Use of lignocellulosic biomass also decrease hazardous effect of waste treatment. (8)

2. ECONOMIC SUSTAINABILITY BY BIOFUELS

The design and conception of a biofuel industry are very important for evaluating the environmental and social outcomes of biofuels. The execution should be ensuring that the management and governance practices are achieved sustainability goal. A couple of such assessments are currently in front of an audience to review the manageability norms of biofuel businesses in the regardless nations. The Roundtable on Maintainable Palm Oil is a review cycle used to survey a great extent proposed U.S. interest in a palm oil-based biodiesel plant. The directive includes a set of sustainability criteria such as 10% target of domestic biofuel production and imports and mitigating 50% of GHG emissions by 2017 and 60% by 2018, respectively. Exploring the aftereffects of maintainability reviews with dissects of food security influences because of development in biorefining business sector could act as a suitable apparatus to decrease worldwide destitution and craving.

There should be adaptability in approach to oblige a few vulnerabilities that could exist like the utilization of 2G feed-stock including lignocellulosic materials. Consistently, more than 40 million tons of lignocelluloses are created, quite a bit of which being discarded. Transforming these disposed of plant materials into biofuels could benefit socio-monetarily as they don't contend with food crops. These feedstocks have a tendency to animate neighborhood furthermore, provincial economies and increment home grown biofuel creation. [09-11]

3. AVAILABILITY OF LIGNOCELLULOSIC BIOMASS FOR BIOREFINING IN INDIA.

India is the country were separate ministry address renewable source of energy in development of biofuel along with the other sustainable energy source. In 2003 planning commission was specially focus on renewable source of energy . The ethanol industry in India is primarily based on molasses from cane sugar industry which produce 2.7 billion which available for blend with fuel. India has advanced the development of non-eatable oil-seed crops e.g., Jatropha on peripheral grounds, epitomizing a nation to develop energy crops with no danger towards food and arable land. India is the seventh largest country in the world has 51% of arable land. The agricultural lands and forest cover in India are about 53% and 20%, respectively.

A huge piece of horticultural buildups is utilized for grain, compost, paper and mash handling and as strong fuel in rustic regions while less than10% is accessible for elective reason. Consistently India produces

around 112MMT of rice straw, 22.4 MMT of rice husk, 109.9MMT of wheat straw, 101.3MMT of sugar stick bagasse and 97.8MMT of sugar stick tops [12]. The creation of deposits from cotton and bean stew development is additionally huge with a gauge of 18.9 and 0.6MMT, individually. The prevailing agrarian buildups in India are those from rice, wheat, sugarcane and cotton representing 66% of the complete buildup creation [13]. Other strong feedstocks are the deposits from handling of woodland items like bamboo and reed. India is almost 2.4% of the world's surface supporting 16% of the total populace [14]. With a populace of 1.2 billion and the quickly developing economy, India is focused on conveying inexhaustible assets to enhance its quickly heightening energy prerequisites.

4. CONVERSION OF LIGNOCELLULOSIC BIOMASS IN TO FUELS AND CHEMICAL

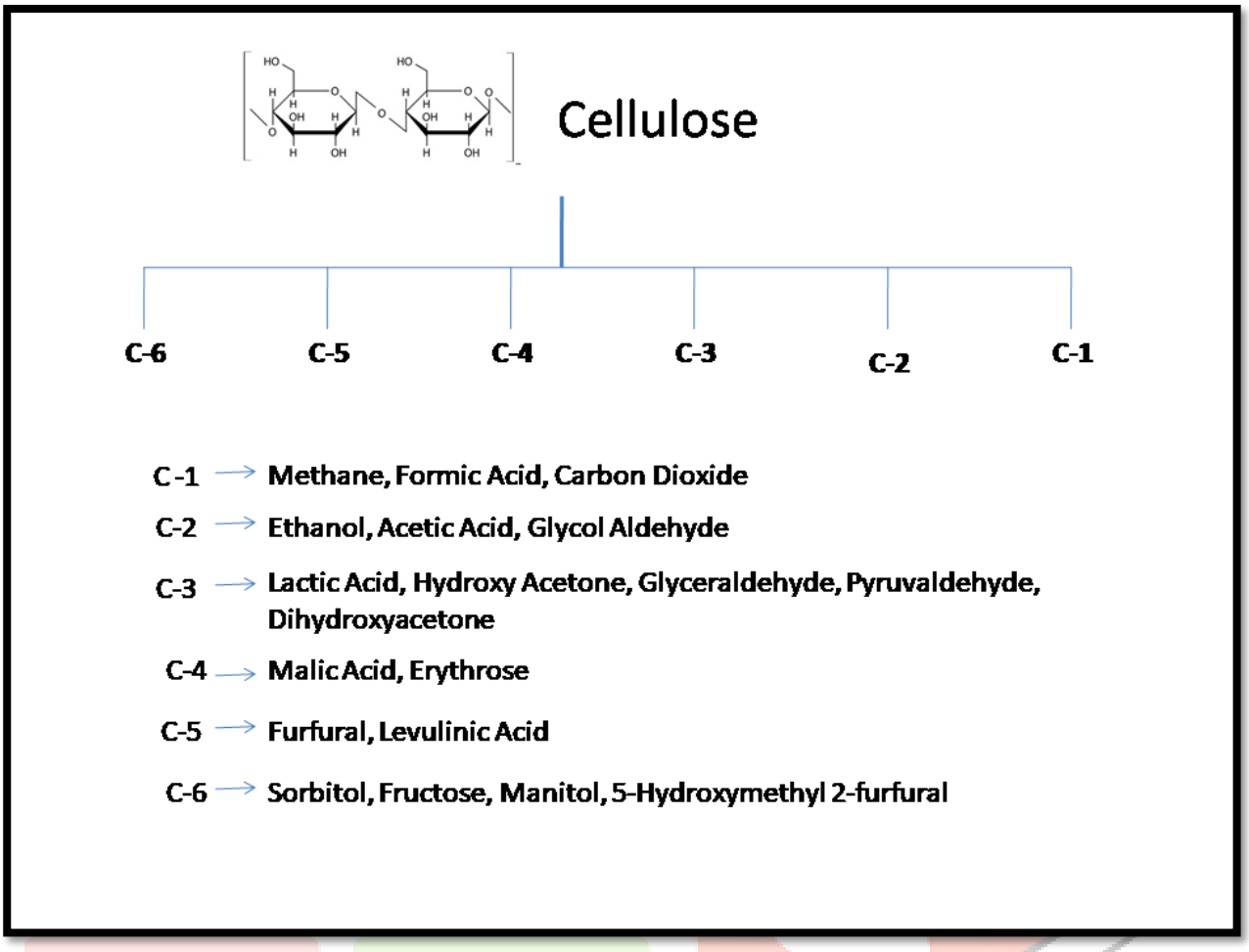
Comparatively, as to the three main components in lignocellulosic biomass, the structure of cellulose is the simplest and most ordered. Cellulose consists of only anhydrous glucose units, while hemicelluloses contain many different sugar monomers. Consequently, cellulose is crystalline and hemicellulose just has a random, amorphous structure. Over many years, numerous specialists have tried to investigate the creation of fuel and chemical compounds from cellulose, which is illustrative of lignocellulosic biomass. A cellulose particle has the conventional compound with formula $(C_6H_{12}O_5)_n$. It comprises of a skeletal direct polysaccharide, wherein glucose based monomer units are jointed together through B-1,4-glycosidic linkages. The glucose units are further firmly attached by intramolecular and Intermolecular hydrogen bonding networks. The chain length of a cellulose particle goes from around 100 to 14 000 units. Cellulose exists as a vigorous robust crystalline structure. Conversion can be occur in various rout as discuss below.

4.1 - Catalytic Hydrolysis - in this method lignocellulosic biomass is hydrolyzed in acidic solution. Cellulose in lignocellulosic biomass is convert in to reducing sugar in which aldehyde group open, acide hydrolysis can be done by liquid acid catalyst and solid acid catalyst rout. [15,16]

4.2 - Catalytic Solvolysis - Along with organic liquid certain chemical reagent also convert lignocellulosic biomass in to useful chemical by solvolysis. There is direct interaction between solvent and reactant. [17]

4.3 - Catalytic Pyrolysis - Thermal decomposition of lignocellulosic biomass in absence of oxygen gives valuable product. Through Fischer-Tropsch synthesis technique using catalyst many commercial plants are in working. [18,19]

Cellulose can be converted in to useful chemicals and fuel by different process like



5. CONCLUSION :

The sustainable fuel and dependence on coal is challenging area of today's researcher, lignocellulosic biomass is the hopeful biomass for renewable source of energy many research on various technique are reported, including heterogeneous catalyst, ionic liquid, pyrolysis etc but till now commercial viable technology is not deliver by science. Recently a breakthrough research is publish on catalytic conversion of lignocellulosic biomass in to biofuel. Upcoming decade will definitely gives us good quality of fuel and chemical from lignocellulosic biomass.Most important is it improve economy of formers in India.

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