



University Administrative Block
 Situated Aravalli hills with about 1000 acres (4 km²)

- ► 8,500 students and the faculty strength is around 550
- Research University with PG & Doctoral programme
- Ten Schools & centers and 4 special centers

School of Environmental Sciences- Multidisciplinary subjects on physical, chemical, geological and biological sciences for Environmental management

Environmental Microbiology & Biotechnology

Bioremediation, bioconversion and detoxification of natural and xenobiotic compounds for biofuels and biomaterials

Professor Indu Shekhar Thakur School of Environmental Sciences Jawaharlal Nehru University New Delhi-110 067 October 28-29, 2013

Emerging pollutants, bioremediation and bioconversion

Online pH meter

Industrial sources **#Pulp and paper** industry

lignosulphonic acid, chlorinated resin acid, chlorinated phenols dioxins, dibenzofuran. bipheny chlorinated hvdrocarbon

#Distillery industry melanoidins

#Tannery industry **Chlorinated** phenolics. PCPs, chromium

#Municipal Plastic, dioxins,

undance 150000

14000

130000

120000

11000

100000

90000

80000

70000

60000

50000 40000 18--->

emerging contaminants, Ecoestrogens, antibiotic etc

Pops in distillery effluent







Biogas production & effluent treatment

Pops in tannery effluent



Pops in pulp & paper effluent



diversus (bacteria). A and B represents aerobic bioreactors used for treatm

Climate change and Biodiversity



Molecular characterization of pentachlorophenol-degrading bacterial

onsoruum	ior treatin	ent of ch	lormau	Onemos	tata	DGGE	Relation a	mong isolates	
Pentachlorophe- nol (PCP) is a chlorinated insecticide and fungicide Used widely in tannery, card	Member of Pulp and P S.N. Biolog 1. Klotsiella preconvert 2. Servatia marcescens 3. Citobacler freundi Members of the tan 1. Servatia marcescens 2. Servatia marcescens 3. P. fluorescens 4. Servatia marcescens	sper mill consortium text 16xDNA e Enkerobacter sp. P. aenginosa Activebbacter sp. Bery consortium 5. marcescens P. fluorescens S. marcescens S. marcescens	Gene Bank AY131333 AY131332 AF291188 AF536218 AF536219 AF137203 AF536220						
board, textile industries and formed	A catoace	dentification of	of PCP-de	grading isol	ate PCP de	gradation by	strain- Acii	netobacter sp.	
in the environment. Highly toxic and		e calconcellous 105 r acter calconcellous str or johnsonii 165 rRMA 165 rRMA gene (DSM ar sp. Venusci	disconnal BHA nam BP2 165 ra gene (atrain A' 80963)	prine procession al RNA (prine FCC 179007)	<u> </u>		Ē.,		
recalcitrant compounds. Limited		indi (1944 gene Ber johnstonill 165 mil- reficus 103 mil-4 gen lip. phenon 2 165 mil- guence	A gene e (stran ATCC A gene, stran PCP	-gene:Shot	gun clon	PCP-	gene:Sou	them blot	
degrade PCP. PCP degradation						i ii			
pathway complex. Bioremediation	PCP-a	ene: Translati	ional proc	luct homolo	av with	offier isol	ate (2006)	(8)	

1. Developed dioxin-degrading alophilic bacterial consortium

Applied DGGE and ARDRA for characterization of dibenzofuran degrading bacteria in soil and sediment.

4. Identified dioxygenase complex andlateral and angular metabolic Pathway in degradation.

6. Cloned Fe-S domain of 4.4a vgenase, a catabolic enzyme





CO₂ concentrating chemolithotrophic bacteria for production of biodiesel



Secretome analysis of microorganisms for production of biofuels by biodegradation and bioconversion of lignocellulosic waste in pulp and paper mill effluent



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Biodegradation and bio-utilization of lignocellulosic waste for biofuels and biochemicals



Enrichment and identification of autotrophic cynobacteria for

carbon dioxide concentration *****BG medium+ sod. Bicarbonate (0, 10, 50, 100 mM)



Phylogenetic tree of Lyngbyo sp. isolated from marble mines 16S rDNA analysis



Dry weight (g/L

Enrichment and identification of autotrophic microalgae for carbon dioxide concentration



Algal medium+ sod. Bicarbonate (0, 10, 50, 100 mM)
Isolation and identification of Scendesmus sp. isolated from marble mine lake



S.No.	Fatty acid methyl ester (FAME)	FAME (%)
		in biodiesel
1.	Hexadecanoic acid, methyl ester	14.6 ± 0.12
2.	Heptadecanoic acid methyl ester	14.6 ± 0.19
3.	Octadecanoic acid, methyl ester	12.1 ± 0.48
4.	9-Octadecanoic acid, methyl ester	14.0 ± 0.33
5.	9,12-Octadecadienoic acid, methyl ester	6.5 ± 0.17
6.	9,12,15-Octadecatrienoic acid, methyl ester	14.9 ± 0.01
7.	10-Nonadecenoic acid, methyl ester	8.6 ± 0.10
8.	Eicosanoic acid, methyl ester	14.5 ± 0.13

Objectives

1. Inventory, data generation and characterization of lignocellulosic and manmade biowaste generated from municipal and industrial sites in India and EU.

2. Development of effective microbial cell factories by isolation and characterization of microorganisms (fungi, bacteria and microalgae) from indigenous sources and continuous enrichment (molecular breeding/bioaugmentation) and enzymatic cocktail based methods, and optimization of processes parameters for recovery of bioethanol, biomethane and biohydrogen (biofuel) and chemicals for zero waste at laboratory scale in batch reactor.

3. Pilot scale demonstration of the methods for production of biofuels (biogas, bioethanol and biohydrogen) and chemical for zero waste.

4. Testing of techno-economic viability of the above technologies by life-cycle assessment (LCA) method to evaluate the performance of the developed technologies building upon existing and on-going LCA activities in the field of biobased products and processes.

