



Government of Gujarat



AVAILABLE TECHNOLOGY

“TECHNOLOGY SCROLL”

FOSTERING BIOTECH BUSINESS

VOLUME II

INDUSTRIAL BIOTECHNOLOGY

3
PO.BHAT-382 428

GUJARAT STATE BIOTECHNOLOGY MISSION



C 1913

E. D. I. I. LIBRARY
AHMEDABAD

660.6
G8T3

0

DISCLAIMER

The technology scroll is a compilation and reproduction of information available on public domains. GSBTM does not take responsibility of the contents or its validation. While every effort has been made to ensure that the information contained in this document is accurate at the time of going to press, no liability for damage is accepted by GSBTM arising from any errors or omissions that may appear, in the final form.

GSBTM has reproduced the information, contents, as they have been placed by the respective organization on their websites. However classification has been done so as to make it more client and user friendly.

All rights of publication of this product in this form, design, layout, are reserved by GSBTM. No part of this publication in this form, design, layout, may be reproduced, or transmitted, by any means, mechanical, photocopying, recording or otherwise, without the permission of GSBTM.

About this Compilation

Technology Scroll, is an initiative of Gujarat State Biotechnology Mission, under aegis of Government of Gujarat. The compilation has been done by GSBTM team. For more information on the matters / technologies, please refer to the contact details provided.

Editorial Note

To request more information on GSBTM or Gujarat Biotechnology sector, or to order copies of whole compilation(s), please contact:

Mission Director

Gujarat State Biotechnology Mission

Department of Science & Technology, Government of Gujarat

Block-11, 9th Floor, Udyog Bhavan, Gandhinagar 382 011

Tel: +91 79 232 52196, 97 Fax: +91 79 232 52195

mdbtm@gujarat.gov.in

[Http://btm.gujarat.gov.in/](http://btm.gujarat.gov.in/)

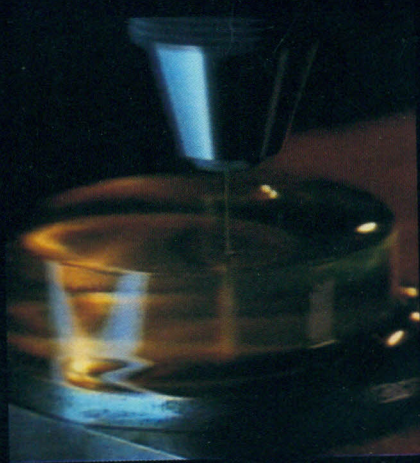
Copyright © 2006 GUJARAT STATE BIOTECHNOLOGY MISSION

666-6

6873

C

INDUSTRIAL BIOTECHNOLOGY ▶▶




C1913

Narendra Modi
CHIEF MINISTER
GUJARAT STATE



Sardar Bhavan, Sachivalaya,
Block No. 1, 5th Floor,
Gandhinagar-382 010. Gujarat
Phone : (O) (079) 23232611 to
23232619
Fax No. : (079) 23222101

Message of H' ble Chief Minister of Gujarat

Technology scroll

Relevance of science & technology lies in its ability to contribute to socio-economic welfare of human society. The state of Gujarat is aware and abreast of the expanding vistas of modern technologies and its potential to facilitate socio-economic development and therefore, state has identified Biotechnology, as Growth Engine for future progress. Gujarat has firm belief that Biotechnology will not only fuel the development of diverse sectors and related industries but has proven potential for wealth creation as well.

Conversion of technological innovations into business enterprise and wealth creation, thereby, is the need, reflection and measure of a knowledge based economy. Business translation in knowledge economy is a function of opportunities created by new technologies and the entrepreneurship skills. The globally demonstrated entrepreneurship spirit of Gujarat has always been there to explore the new areas of business including those emanating from sunrise technologies such as Biotechnology.

In this regard, the Technology Scroll, brought out by Gujarat State Biotechnology Mission,, is a logical, timely and right step forward. This scroll would encourage and facilitate entrepreneurs to venture into the business arena of this emerging science. It is hoped that it would be instrumental in stimulating biotechnology based entrepreneurship in Gujarat.

I am sure that the purpose and spirit with which Technology scroll has been prepared, shall be realized to the fullest and for the benefit of all. I extend my heartiest congratulations and Best wishes, to Gujarat state Biotechnology mission, for their laudable efforts in developing this exclusive compilation.

(Narendra Modi)



CHIEF SECRETARY
GOVERNMENT OF GUJARAT

Gujarat is among the most industrialized States in the country. The State has achieved impressive growth in chemical, manufacturing, mining and textile sectors. The State is now moving towards rapid development of knowledge industries, focusing on information and bio-technologies. The State Biotechnology Mission has prepared a Technology Scroll which lists technologies globally available for business entrepreneurs. The scroll illustrates opportunities for investment in the bio-technology application and would be of immense help to entrepreneurs in identifying potential for investment. This is a commendable effort of the Gujarat State Bio-technology Mission and I hope that the compilation would be found useful by bio-technology entrepreneurs.


(S.G. Mankad)

BLOCK NO. 1, 3RD FLOOR, NEW SACHIVALAYA, GANDHINAGAR-382 010

Tel : (079) 23250301/2, 23220372 • Fax : (079) 23250305

E-Mail : csguj@gujarat.gov.in



सत्यमेव जयते

RAJ KUMAR, I.A.S.
Secretary

Government of Gujarat
Department of Science & Technology

Message of Secretary, Science & technology

Technology Scroll

Biotechnology, undoubtedly, is the growth engine of the future. With its cutting edge technology innovation and vast applications in multiple sector it stands to offer cost effective solutions to society. Knowledge harnessing for socio-economic development is a function of research and entrepreneurship. While application based research is the need of hour, availing the opportunities through developed work is equally significant and logically desirable.

This inventory of potential business opportunities in Biotechnology sector would not only facilitate start ups, new entrepreneurs and existing players but shall also encourage higher level of business activity in Biotechnology in the state. The technology scroll shall enable increased interaction among the stakeholders and facilitate business relationship. The benefits of this compilation to industry, commerce, academia or researchers are alike.

I convey my sincere wishes and heartiest congratulations to Gujarat State Biotechnology Mission for coming up with this novel idea and trust that all would find this endeavor as initiative for catalyzing Biotechnology entrepreneurship in the State.

Raj Kumar

Foreword

On behalf of Gujarat State Biotechnology Mission, Department of Science & technology, I am delighted to bring to you the first version of Technology Scroll

Having identified, Biotechnology, as Growth engine for next few decades and also as singular most potential tool for socio-economic development-- Government of Gujarat,, is committed to facilitate the process of transformation of traditional economy and catalyze the growth of Biotechnology in the state. As world wide trends underline, the role of Biotechnology, in the convergence of several old economy industries- Gujarat, with its strong background of traditional industries -- looks towards this emerging science with hope and vision.

The initiative of preparation of Technology Scroll is in line with, the strategy of Government of Gujarat, to move towards economy which is driven by modern technologies. The objectives of this compilation is to

- Facilitate the convergence of traditional industries of Gujarat, towards use and adoption of Biotechnology,
- Encourage the knowledge and innovation based entrepreneurship in the state,
- Enable the techno-economic benefits of newly available technologies,
- Facilitate global networking of knowledge and technologies for business translation,
- Encouraging Biotechnology business,

Gujarat has traditional strengths in Pharmaceuticals, chemicals, agriculture, animal husbandry, food processing sectors. The inherent strength of infrastructure, natural resource, intellectual capital and financially stable economy, provide ideal foundation for leveraging these strengths -- to converge towards and diversify-- into niche biotechnology segments.

While Global entrepreneurs have been major value wealth creators in Biotechnology business, it is the wide base of techno-based entrepreneurship, which stands to provide, the critically needed impetus. Globally proven entrepreneurship spirit of Gujarat, needs the opportunities with business potentials. And Technology Scroll prepared, just aims to do that.

It is compilation of Technology Database of approximately 600 Technologies developed and available globally. While 520 technologies are from different countries, mostly USA and Europe, around 80 technologies are the ones developed by research and academic institutes in India. The compilation covers a total of 9 Biotechnology Sectors, namely, agriculture, environment, Pharmaceuticals and healthcare, Animal Biotechnology; Bioinformatics; Food Biotechnology; Molecular Biotechnology; Nano Biotechnology Industrial Biotechnology To facilitate the stakeholders, Technology scroll has been brought out in sector specific volumes. To cater to the need and business interest of wide spectrum of product and process-- encompassed by these 9 sectors of biotechnology-- the compilation covers, around 170 Sub-sectors. 78 technologies from Agriculture & allied areas, 71 technologies from Industrial biotechnology, 197 technologies from Pharmaceutical & healthcare, 103 technologies from Animal Biotechnology; Bioinformatics; Food Biotechnology; Molecular Biotechnology; Nano Biotechnology and 41 technologies from environment biotechnology, provide the rich substratum for future business venture and entrepreneurship.

Preparation of technology Scroll has its genesis in GSBTM, commitment to come up with products and outputs that facilitate Biotechnology foresight, entrepreneurship, business, investment and wealth creation.

As we aim to step into knowledge and technology driven era, I encourage and invite the Gujarati and other entrepreneurs alike to explore the business horizons of Biotechnology and second our efforts in elevating Gujarat to global Bio-Map.

I am sure that in the maiden effort of this nature, some lacunae are bound to creep in, which provide the scope for further improvement. It will be our constant endeavor to update the content of this compilation at regular interval. I invite and welcome your inputs and feedback.

Shri Akshay K Saxena, IFS
Mission Director

Volume - 1 Agriculture and Allied Areas

Sub Sector	Pages
1.1 Agri-Diagnostics	1-8
1.2 Bio-control	9-28
1.3 Biodiversity Conservation	29
1.4 Bio-Fertilizers	30-38
1.5 Bio-Fuels	39-40
1.6 Bio-Propecting	41
1.7 Field Crop	42
1.8 Genetic Engineering	43-44
1.9 Genomics/Proteomics	45-47
1.10 GM Crop	48-51
1.11 Horticulture	52-55
1.12 Industrial Products	56
1.13 Instrumentation	57
1.14 Medicinal aromatic Plants	58
1.15 Plant Breeding	59-63
1.16 Plant Molecular Biology	64-71
1.17 Plantibodies	72
1.18 Preservation	73
1.19 Tissue Culture	74-77
1.20 Transgenic	78-80
1.21 Waste Management	81-83

Volume - 2 INDUSTRIAL BIOTECHNOLOGY

Sub Sector	Pages
2.1 Anti-microbial Targets	1
2.2 Biodegradation	2-3
2.3 Biofuels	4-5
2.4 Bio-Process	6-23
2.5 Genetic Diversity Exploitation & Therapeutics	24
2.6 Immobilization	25
2.7 Industrial Products	26-58
2.8 MABs	59
2.9 Microbiology	60
2.10 Microbiology/Strain Improvement	61-69
2.11 Microbiology/Strain Improvement & Therapeutics	70
2.12 Therapeutics	71
2.13 Therapeutics & Vaccines	72

Volume - 3 PHARMACEUTICALS & HEALTH CARE

Sub Sector	Pages
3.1 Basic Research	1-3
3.2 Bio-Active Compounds	4-7
3.3 Bio-Analytical Instrumentation	8
3.4 Bio-Analytical Techniques	9-10
3.5 Bio-Catalyst / Enzyme Production	11-12
3.6 Bio-Medical Application	13

Contents in brief

Volume - 3 PHARMACEUTICALS & HEALTH CARE

3.7 Bio-Medical Instrumentation	14-33
3.8 Bio-Medical Instrumentation / Molecular Diagnostics	34-35
3.9 Cell line Study	36
3.10 Cell line Study / Screening & Therapeutics	37
3.11 Clinical Trials	38
3.12 Clinical Trials & Therapeutics	39
3.13 Clinical Trials Management	40-44
3.14 Clinical Trials Management & Drug Delivery System	45
3.15 Compound Synthesis & Screening	46
3.16 CytoToxicity	47
3.17 Diagnostics & Therapeutics	48
3.18 Diagnostics	49-89
3.19 Diagnostics & Monitoring	90
3.20 Diagnostics & Predictives	91
3.21 Diagnostics & Therapeutics	92-109
3.22 Diagnostics & Treatment	110
3.23 Diagnostics & Vaccines	111-112
3.24 Diagnostics / MABs	113
3.25 Diagnostics, Therapeutics & Immunology	114-115
3.26 Diagnostics / Bioassays	116
3.27 Diagnostics / Instrumentation	117-120
3.28 Drug Discovery	121-124
3.29 Functional Genomics	125
3.30 Gene Amplification	126
3.31 Gene Expression Study	127
3.32 Gene Therapy	128
3.33 Gene transfer & Therapeutics	129-130
3.34 Genetic diversity Exploitation	131
3.35 Genome Analysis	132
3.36 Genomics	133
3.37 Immuno Therapeutics	134-136
3.38 MABs	137-138
3.39 Media	139
3.40 Molecular Biology	140-141
3.41 Molecular Biomarkers & Therapeutics	142
3.42 Molecular Diagnostics	143-146
3.43 Molecular Diagnostics & Therapeutics	147-150
3.44 Molecular Diagnostics & Vaccines	151
3.45 Molecular Markers	152-153
3.46 Molecular Targets & Diagnostics	154-155
3.47 Molecular Therapeutics	156-162
3.48 Patient Management System	163
3.49 Pharmaco-genetics / Therapeutics	164
3.50 Pre-clinical Testing	165
3.51 Target Therapeutics	166
3.52 Targeted Molecular Therapeutics	167
3.53 Therapeutic Markers / MABs	168-169
3.54 Therapeutics	170-215
3.56 Therapeutics & Vaccines	217-219
3.57 Therapeutics / Drug Development	220
3.58 Tissue Engineering	221-227
3.59 Vaccines	228-231
3.55 Therapeutics & Targets	216

Volume - 4

Sector - ANIMAL BIOTECHNOLOGY

Sub Sector	Pages
4.1 Biomaterials	1-2
4.2 Dairy Products	3-5
4.3 Diagnostics	6-7
4.4 Diagnostics & Vaccines	8-9
4.5 Food Borne Diseases	10
4.6 Genetic Engineering	11-13
4.7 Immunobiology / Parasitology	14-15
4.8 MABs / Diagnostics	16
4.9 Recombinant Technology Diagnostics & Therapeutics	17
4.10 Therapeutics	18
4.11 Therapeutics / Vaccines	19-22
4.12 Vaccines	23-25

Sector - BIOINFORMATICS

Sub Sector	Pages
4.13 Algorithms / Software Development	26-27
4.14 Bio-computing	28
4.15 Computer Applications for Genomics	29-31
4.16 Databases	32-36
4.17 Software Development	37

Sector - FOOD BIOTECHNOLOGY

Sub Sector	Pages
4.18 Bio-control / Bio-safety	38
4.19 Diagnostics	39-44
4.20 Food Additives	45-46
4.21 Food Borne Disease	47-48
4.22 Food Processes & Preservation	49
4.23 Food Processing	50-56
4.24 Food Processing / Packaging / Preservation	57
4.25 Food Products	58-60
4.26 Food Quality	61-62
4.27 Food Safety	63-66
4.28 Genome Mapping	67-68
4.29 Industrial Products	69
4.30 In-vitro Testing	70
4.31 Preservatives	71-74
4.32 Quality-Control	75-78

Sector - MOLECULAR BIOLOGY

Sub Sector	Pages
4.34 Analytical Reagents	80
4.35 Bio-analytical Instrumentation	81
4.36 Bio-analytical Technique	82-83
4.37 Biomaterials, Reagents	84
4.38 Biosensor	85
4.39 Cloning	86
4.40 Drug Discovery	87
4.41 Functional Biomolecule	88
4.42 Gene Analysis & Diagnostics	89-90

Contents in brief

4.43 Gene Library	91-92
4.44 Gene Mapping	93
4.45 Gene Sequencing	94
4.46 Gene Therapy	95-97
4.47 Genetic Engineering	98-99
4.48 Genome Mapping	100-101
4.49 Genomics / Proteomics	102
4.50 Mapping & Cloning	103
4.51 Molecular Biology	104
4.52 Molecular Therapeutics	105
4.53 Therapeutics	106-107
4.54 Therapeutics & Vaccines	108
4.55 Transgenic Plant	109

Sector - NANO BIOTECHNOLOGY

Sub Sector	Pages
4.56 Biomaterials	110
4.57 Biosensor	111
4.58 Biosensor & Diagnostics	112
4.59 Diagnostics	113-114
4.60 Functional Biomolecules	115

Volume - 5

Sector - ENVIRONMENTAL BIOTECHNOLOGY

Sub Sector	Pages
5.1 Bio-control	1-2
5.2 Bio-Process	3
5.3 Bio-Remediation	4-16
5.4 Bio-Sensor	17-21
5.5 Genetic Engineering	22-24
5.6 Microbial Diversity	25-28
5.7 Microbiology / Diagnostics	29
5.8 Pollution Management	30-47
5.9 Sterilization Process	48
5.10 Waste Management	49-53
5.11 Waste Water Treatment	54
5.12 Bioremediation	55

Sector - MARINE BIOTECHNOLOGY

Sub Sector	Pages
5.13 Aquaculture	56-57
5.14 Diagnostics	58-59
5.15 Nutrition	60
5.16 Vaccines	61-62
5.17 Value Addition	63

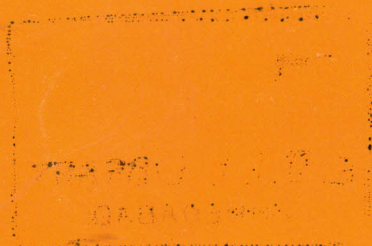
CONTENTS

VOLUME – II INDUSTRIAL BIOTECHNOLOGY			
Sr. No.	Sub-Sector	Name of Technology	Page No.
79	Anti-microbial targets	Anti-microbial protease inhibitor	1
80	Biodegradation	New method for making biobased additives	2
81		Increasing biodegradation of sparingly soluble vapors	3
82	Biofuels	New method to aid in producing biodiesel fuel	4
83		Process for the conversion of and aqueous biomass hydrolyzed into fuels or chemicals by the selective removal of fermentation inhibitors	5
84	Bio-process	Hydroxynitrile lyases for industrial enantioselective synthesis	6
85		Biotechnology of extremophiles	7
86		Gas/solid technology for the production of natural molecules for the food and fragrance industry, synthons for the fine chemistry and VOCs biodepollution	8-9
87		Biotransformation in the synthesis of food additives, fragrances and pharmaceuticals	10
88		Aqueous fractionation of biomass based on novel carbohydrate hydrolysis kinetics	11
89		Recovery of tea-polyphenol from low-grade tea	12
90		An affinity membrane cartridge	13
91		Biodissolution of pearl powder	14
92		Improved procedure for refolding insoluble proteins	15
93		Optimum protein solubility screen	16
94		Biomimetic agents for replacement of NAD ⁺ /NADH in enzymatic reactions	17
95		Microbial processing of waste tire rubber: rubber cycle technology	18
96		Combined enzyme mediated fermentation of cellulose and xylose to ethanol by schizosaccharoyces pombe, cellulase, .beta.-glucosidase, and xylose isomerase	19
97		Controlled catalytic and thermal sequential pyrolysis and hydrolysis of phenolic resin containing waste streams to sequentially recover monomers and chemicals	20
98		Expression of enzymes involved in cellulose modification	21
99		Method to help produce ethanol	22
100		Microwave method to extract pectin from citrus	23
101	Genetic diversity exploitation & therapeutics	Combinatorial fungal PKS enzymes for novel polyketides.	24
102	Immobilization	Armored enzyme nanoparticles	25
103	Industrial products	Nbira – fruit based fermented health drink	26
104		Enhanced glucoamylase production	27
105		Enhanced production of alkaline protease	28
106		Micro fluidic enabling platform for miniaturized cell-based assays	29
107		Microscopic starch-based shells	30
108		Novel system for the sequential, directional cloning of multiple dna sequences	31
109		Alkaline tolerant dextranase from streptomyces anulatus	32
110		Process for making improved epoxies and plastics from sugar	33
111		Starch-based composition for use in industrial applications	34
112		Bloom dead sea life (natural beauty products)	35
113		Biodegradable copolymer for biomaterial applications	36
114		Method for promoting tissue adhesion to soft tissue implants	37
115		Reducing cellulase enzyme use for hydrolysis of lignocellulosic biomass	38
116		Z-Enediynes: polymers for bone fixation	39
117		Bacteria and enzymes for production of alternan fragments	40
118		Bioreactor device and method and system for fabricating tissue	41
119		Composites comprising plant material from parthenium spp. And plastics	42
120		Continuous process for sebabic acid from castor oil	43
121		Improved process for making plasticizers	44
122		Method for manufacturing limonoid glucosides	45
123		Method for the development of delta-lactones ad hydroxy acids from unsaturated fatty acids and their glycerides	46
124		Microbial production of a novel compound,7,10-Dihydroxy-8-octadecenoic acid from oleic acid	47
125		Process for producing phenolic compounds from lignins	48
126		Renewable alternative to petroleum-derived chemicals	49
127		SHAM-sensitive terminal oxidase gene from xylose-fermenting yeast	50
128		Single zymomonas mobilis strain for xylose and arabinose fermentation	51
129		Starch-based microcellular foams	52

CONTENTS

VOLUME – II INDUSTRIAL BIOTECHNOLOGY

Sr. No.	Sub-Sector	Name of Technology	Page No.
130		Using soybean oil-based composites to make industrial products without molds	53
131		Xylanase from streptomyces roseiscleroticus NRRL-11019 for removing color from kraft wood pulps	54
132		Xylose-fermenting yeast mutants	55
133		How to make and use a porous device useful for chemical and biological applications	56
134		Interleaved water and fat dual-echo spin echo magnetic resonance imaging with intrinsic chemical shift elimination	57
135		System and method for three-dimensional interleaved water and fat image acquisition with chemical-shift correction	58
136	Mabs	Method for producing monoclonal antibodies for detecting campylobacter	59
137	Microbiology	Process for selection of oxygen-tolerant algal mutants that produce H.sub.2	60
138	Microbiology/ strain improvement	Modification of cellular stress responses for improved protein production in filamentous fungi	61
139		Switching the mode of metabolism in baker's yeast, saccharomyces cerevisiae, from fermentation to respiration	62
140		Method using bacterial compounds to control plant pathogens	63
141		Cloning of cellular genes from acidothermus cellulolyticus	64
142		Microbial production of epoxides	65
143		Recombinant lactobacillus for fermentation of xylose to lactic acid and lactate	66
144		Recombinant zymomonas for pentose fermentation	67
145		Recombinant zymomonas mobilis with improved xylose utilization	68
146		Stabilization of PET operon plasmids and ethanol production in escherichia coli strains lacking dehydrogenase and pyruvate formate lyase activities	69
147	Microbiology/ strain improvement & therapeutics	Improvement of bacillus strains for production of secreted proteins	70
148	Therapeutics	Vascular biomaterial devices and methods	71
149	Therapeutics & vaccines	Enzyme-mediated serial cultivation of anchorage-dependent cells	72



GSBTM Editorial Team: Technology Scroll

Chief Editor : Akshay Saxena, IFS

Executive Editor: Snehal Bagatharia, Ph.D.

Editorial Assistants:

Taru Nagori

Jigar M. Shah

Rakesh kumawat

Rohini P. Shah

Bhavesh Nayak

Graphics & Design: Samalson Designs

GSBTM 2006

॥ जीवो ब्रह्मैव नामः ॥



GUJARAT STATE BIOTECHNOLOGY MISSION

Department of Science & Technology, Government of Gujarat

Block-11, 9th Floor, Udyog Bhavan, Gandhinagar-382017

Phone: 91-79-232 52196,97 Fax: 91-79-232 52195

web site: <http://btm.gujarat.gov.in> E-mail: info-btm@gujarat.gov.in



ED

