



Annual Report 2015-16



Vision

Our goal is to excel as an internationally recognized centre of multi-disciplinary life science research that focuses on industrial development, human health and environment.

Mission

Conduct basic and applied research in life sciences and harness the genetic diversity of microbes, plants and animals towards a cleaner environment, sustainable agriculture and better health of the masses.



Annual Report 2015-16



Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

Correct Citation

ARI Annual Report 2015-2016
Pune, India



© No part of this publication be reproduced
without permission of the Director,
Agharkar Research Institute,
GG Agarkar Road,
Pune 411 004

Published by

Dr KM Paknikar
Director (Officiating)
Agharkar Research Institute
GG Agarkar Road,
Pune 411 004, India
Tel.: (020) 25653680, 25325000
Fax: (020) 25651542, 25677278
Email: director@aripune.org
Web: www.aripune.org

Printed by

Anson Advertising & Marketing
Pune
Email: ansonorama@gmail.com

Governance and Committees

Governing Body, MACS (2014-17)

Dr DR Bapat, President
Prof. SF Patil, Vice-President
Dr NS Rajurkar, Treasurer
Mr AS Kirloskar, Secretary
Dr PK Ranjekar
Dr BD Kulkarni
Mr PP Paralikar
Dr K Banerjee
Dr VM Nadkarni
Secretary, DST, Ex-Officio Member
Dr KM Paknikar, Director (Officiating), ARI,
Ex-Officio Member

Institute Council, ARI

Dr DR Bapat, Chairman
Secretary, DST or his nominee,
Ex-Officio Member
Joint Secretary and Financial Advisor,
DST or his nominee, Member
Dr K Banerjee, Member
Dr BD Kulkarni, Member
Dr PK Ranjekar, Member
Dr SV Gangal, Member
Prof. J Bellare, Member
Dr KM Paknikar, Director (Officiating), ARI,
Member Secretary

Finance and Budget Committee, ARI

Dr KM Paknikar, Director (Officiating), ARI,
Chairman
Joint Secretary and Financial Advisor,
DST or his nominee
Dr NS Rajurkar, Treasurer, MACS
Mr G Barik, AO & FAO (In-charge), ARI,
Member Secretary

Research Advisory Committee, ARI (April 2013-March 2016)

Prof. SC Lakhotia, Chairman
Dr Tapan Chakrabarti
Prof. BB Chattoo
Prof. Jayesh Bellare
Dr GJ Samathanam
Dr BM Khadi
Dr Kamala Krishnaswamy
Dr S Chandrasekhar
Dr LMS Palni
Prof. PK Saraswati
Dr Renu Swarup
Dr KM Paknikar, Director (Officiating), ARI,
Ex-Officio Member Secretary

Building and Works Committee, ARI

Dr KM Paknikar, Director (Officiating), ARI, Chairman
Joint Secretary and Financial Advisor, DST or his nominee
Mr AS Kirloskar, Secretary, MACS
Superintending Engineer, CPWD, Pune Circle
Assistant Chief Engineer, PWD, PWD Circle, Pune
Mr AA Sane, Architect
Mr AV Mahajan, Civil Engineer
Mr SW Mone, Structural Engineer
Mr AV Chaudhari, Technical Officer, ARI
Mr G Barik, Administrative Officer & FAO (In-charge), ARI, Member Secretary

Agricultural Farm Management Committee, ARI

Dr DR Bapat, President, MACS, Chairman
Dr KM Paknikar, Director (Officiating), ARI
Dr BG Keskar, Member
Dr NK Umrani, Member
Dr Sp Taware, In-charge, Genetics and Plant Breeding Group, ARI, Member-Secretary

Institutional Animal Ethics Committee, ARI

Dr KM Paknikar, Chairperson, IAEC
Dr CG Raut, CPCSEA Nominee
Dr MR Wani, Veterinarian, Link Nominee, CPCSEA
Dr SM Ghaskadbi, In-charge, Animal House Facility
Dr PB Parab, Scientist from other Institute
Mr NN Kukade, Non-Scientifically socially aware member
Dr DR Ranade, Scientist from different discipline
Dr BN Joshi, Secretary, Scientist from different discipline

Institutional Bio-safety Committee, ARI

Dr KM Paknikar, Director (Officiating), Chairperson
Dr Mohan R Wani, Scientist F, NCCS Pune, DBT Nominee
Dr Saroj Ghaskadbi, Dept of Zoology, SPPU, Outside Expert
Dr DI Borole, Medical Consultant, Biosafety Officer
Dr PK Dhakephalkar, Internal Member
Dr Vidya Patwardhan, Internal Member
Dr JM Rajwade, Internal Member
Dr SA Tamhankar, Member Secretary

Vigilance Officer, ARI

Dr SA Tamhankar

Central Public Information Officer, ARI

Dr VG Patwardhan

Grievance Officer, ARI

Dr GK Wagh

Contents

Foreword	
Executive Summary	
Biodiversity and Palaeobiology	1
Bioenergy	16
Bioprospecting	21
Developmental Biology	26
Genetics and Plant Breeding	32
Nanobioscience	39
Annexure	46

Dr Harsh Vardhan
Hon'ble Union Minister for Science & Technology & Earth Sciences

3 February 2016

Dr Harsh Vardhan was received by Dr DR Bapat, President, Maharashtra Association for the Cultivation of Science and Dr KM Paknikar, Director, Agharkar Research Institute



The Hon'ble Minister addressed the scientists, students and staff



Foreword

Dr DR Bapat
President
Maharashtra Association for the Cultivation of Science
Pune

Dear Friends,

I have the pleasure of presenting to you the MACS-ARI annual report for 2015-16.

A significant event of this year was the visit of Dr Harsh Vardhan, Hon'ble Union Minister for Science & Technology & Earth Sciences, to MACS-Agharkar Research Institute on 3 February 2016. After going through an exhibition depicting research achievements of ARI and releasing a booklet on patents obtained by the Scientists of the Institute, the Hon'ble Minister made some valuable observations, on some of the research activities of the institute, which were thought provoking.

In his address to the scientists, students and staff, the Hon'ble Minister said, "MACS-ARI's contribution to the society through its research related programmes in a wide variety of areas is remarkable." In this connection he appreciated the efforts made by Late Prof. SP Agharkar in the earlier years.

Making specific suggestions with respect to future roadmap for research programmes the Hon'ble Minister opined, "ARI should identify research institutes in India where similar research activities are going on." He further stated that, "In India coordination and cooperation in scientific community is seriously missing and hence there is a need to develop professional synergy among the institutes." He further emphasised that patents those have utility to the society need be encouraged.

The outcome of the visit was, "Appreciation and recognition of ARI as a major centre of research among autonomous institutes".

Having said that, I would now touch upon some major research achievements in the year.

- The first report of isolation, identification and characterization of methanotrophs from Indian rice fields is credited to the institute. This has a direct relevance to the issue of green-house gases.

- A microbial consortium of hydrolytic bacteria and anaerobic fungi was developed. It improved the hydrolysis of lignocellulose component of rice straw and enhanced the biomethanation process efficiency by 30 per cent.
- 155 quintals and 190 quintals breeder seed of MACS wheat and soybean varieties were supplied to different seed multiplying agencies and farmers.
- It was shown for the first time that the growth of nanoparticles occurs within 5-15 minutes, and nucleation cannot be separated from the growth phase of nanoparticles.

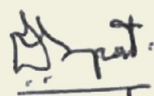
Coming to the popularisation of science and reaching to the society, topics of societal and scientific relevance were addressed in the memorial orations organized by MACS. Dr GB Deodikar Memorial Oration was delivered by Dr Nitin Pandit, CEO, World Resources Institute India, Mumbai on 'Sustainable Development'. Dr Vidya Gupta, Former Chair and Chief Scientist, Biochemical Sciences Division, CSIR-National Chemical Laboratory, Pune delivered Shri GB Joshi Memorial Oration on 'GM Crops: Need of the Hour'. The 55th Prof. SP Agharkar Memorial Oration was delivered by Dr BD Kulkarni, Distinguished Scientist, National Chemical Laboratory, Pune on 'Sustainability: Science and Engineering of Life Support Natural Systems'.

To encourage scientific aptitude, awards such as the Dr RB Ekbote Award in recognition of significant research contribution in the various areas of Botany, Shri VP Gokhale Award in recognition of significant research contribution in the various areas of Phytopathology and Dr PP Kanekar Award for the best paper published by young scientist/s of MACS-ARI, were given.

MACS continues to organise scientific promotion programmes like Home Gardening and Field Botany. These courses have become very popular.

To summarise, MACS has continued to contribute on its mandate objectives, viz. encouraging research, popularising science and reaching to society in a significant way.

I look forward to suggestions for making MACS a more vibrant organisation.



DR Bapat

18 August 2016, Pune

Executive Summary

Dr KM Paknikar

Director (Officiating)
Agharkar Research Institute
Pune

Dear Readers,

I have the honour to present this Annual Report of the Institute with great satisfaction. Over the past three years, the Institute has made a steady and impressive progress. The average impact factor of the research publications now stands around 2.5, for the first time. This can be considered as an important accomplishment, given the diversity of topics handled by the Institute scientists with a focus on applied and society oriented research. I am confident that the impact of our research will be more perceptible in the coming years.

The visit of Hon'ble Union Minister for Science & Technology & Earth Sciences, Dr Harsh Vardhan, was a high point in the institute's history. The remarks of the Hon'ble Minister with respect to MACS-ARI - an autonomous institute, as quoted in the Foreword by Dr DR Bapat, President, MACS, recognize the sincere efforts of the institute and boosted our morale. The modest beginning of MACS and the sincere efforts made in the past seven decades are gradually yielding results.

The steady pace of progress has encouraged us to strengthen our international outreach. The recent foray has come in the form of signing of a Memorandum of Understanding for collaborative research with Korea Research Institute of Bioscience & Biotechnology (KRIBB).

With some firm steps taken in recent years and the alignment of research activities into six thematic areas viz. Biodiversity, Bioenergy, Bioprospecting, Developmental Biology, Genetics & Plant Breeding and Nanobioscience, MACS-ARI is growing into a robust multi-disciplinary research institution that is all set to make greater inroads with the continued support from Department of Science and Technology.

MACS-ARI has been contributing to Government Programmes and missions such as Swachh Bharat, Swastha Bharat, Make in India, Innovate in India through its research activities. The research at the institute has been aligned along the needs of the country including food security, health, diagnostics, aquaculture, pharmaceuticals, petroleum biotechnology, bioenergy, plant based drugs, and biodiversity. Public-Private-Partnership (PPP) too has been successfully implemented in the various areas at the institute.

To give a glimpse of the institute's commitment to research along the lines mentioned above, a few achievements are presented below.

Food security: One noteworthy example of PPP is the outreach to farmers in collaboration with ITC wherein thirty Choupal Pradarshan Khets (CPKs) of wheat varieties MACS 6222 (15) and MACS 6478 (15) were conducted in Maharashtra and Karnataka.

Implementation of improved technology (IT) developed by MACS-ARI too has made an impact on soybean yield and raised it by 13.12 % over farmer's practice and ensured additional net returns of Rs. 8197 per hectare to the farmer.

Health, diagnostics, aquaculture and pharmaceuticals: This area is being addressed through different routes. These routes include Nanobioscience and Bioprospecting.

The nanobioscience route has yielded several leads. Chitosan nanoparticles of any given size ranging from 50 to 600 nm with < 10 % deviation in their size were synthesized with extreme control on the reaction parameters. Such monodisperse chitosan nanoparticles synthesized in microreactors exhibited high amphotericin entrapment and enhanced antifungal activity against the human fungal pathogen *Candida albicans*.

By modifying bacterial cellulose (BC), a natural nanoscale material, novel nanocomposite scaffolds BC hydroxyapatite (HA) and BC glycosaminoglycans (GAG) were developed to mimic bone and the cartilage, respectively. The strategy has a real translational potential for repairing osteochondral defects in humans.

The aquaculture industry is expected to benefit from a recently developed lateral flow immunochromatographic assay for the detection of white spot syndrome virus (WSSV). The assay is field-usable and has a read-out time of less than 20 minutes.

The bioprospecting route is yielding good results with respect to Alzheimer's disease (AD). Aggregation of the amyloid- β peptide (A β) plays an important role in the progression of AD. Novel 3-Acetyl coumarin thiosemicarbazone derivative was synthesized and its ability to inhibit aggregation of A β (1-42) using several experimental methods was demonstrated.

The synthesis of Rugosaflavonoid and some of its analogs has been completed for the first time. These molecules showed cytotoxicity to breast cancer cells indicating potential in treatment of cancer.

Petroleum biotechnology and bioenergy: A long-standing collaboration with ONGC has led us to develop microbial methods in petroleum biotechnology.

A special thermostable nutrient medium was designed to support the microbial growth and metabolite production under high temperature conditions prevailing in Indian oil reservoirs. These developments are crucial for establishing an effective enhanced oil recovery process.

A microbial consortium was developed, which was able to degrade ~ 70 % of the petroleum hydrocarbons present in soils contaminated with crude oil.

Biodiversity: Plant biodiversity studies including living and fossil forms have long been the mainstay of research at the institute.

Two new species of fungi *Exosporium gymnaeae* and *Mycoenterolobium flabelliforme* were isolated and identified from *Gymnema silvestre* and *Tectona grandis*.

Exploration of the diatom diversity of semi-aquatic habitats from the Western Ghats and adjoining mountain ecosystems have yielded two new species of *Achnanthisdium*.

In the palaeobiological studies, it has been found that the layers of hiatus concretions within the Harudi Formation are of global significance as they represent first occurrence of carbonate concretions in Paleogene times in contrast to the dominance of phosphatic concretions.

Developmental Biology: Cell-cell interactions and the molecular level mysteries are being investigated using model systems such as *Drosophila*, Hydra and Zebra fish.

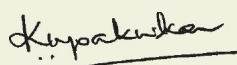
To understand the role of autophagy in different physiological processes *Drosophila melanogaster* is used as a model. Using bioinformatics tools several known and putative transcription factors that regulate *Atg8a* (autophagy related genes - Atg) expression have been identified.

Besides the few interesting research achievements mentioned above, there are many in the following pages of this report. You will appreciate that the activities are in line with many important programmes and missions of the Government.

Two seemingly small but futuristic steps have recently been put forward. Rooftop solar panels installed on the institute buildings contribute up to 30 % of the total energy requirement. Another step is the launching of a Section 80 Company by the name MACS Technology and Education Foundation (MACS-TED). Attempts at a preliminary level have inspired MACS-ARI's PhD students to develop their start-ups.

MACS-ARI's progress in conformity with its objectives, vision and mission has always centred on benefitting the society. Reaching out to the society has become a hallmark of MACS-ARI. Contact with farmers is being maintained through the organisation of Kisan melas at the institute's farms. MACS-ARI has been organizing a home gardening course for common citizens for the past 27 years. Our scientists and staff have continued to teach in secondary schools voluntarily. Participation in the India International Science Festival and Indian Science Congress exhibitions, observation of the National Science Day, National Technology Day, Hindi Divas, Vigilance Awareness Week are in commitment to our national priorities.

We look forward to receiving suggestions from anyone to strengthen our engagement with science and its application for the benefit of the society.



KM Paknikar

18 August 2016, Pune

Biodiversity and Palaeobiology Group

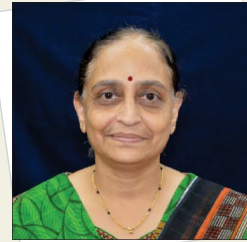
Scientists



Dr Sanjay K Singh



Dr Bhaskar C Behera



Dr Kantimati G Kulkarni



Dr Paras Nath Singh



Dr Anuradha S Upadhye



Dr Ritesh K Choudhary



Dr Karthick Balasubramanian



Dr Rajesh Kumar KC



Dr Abhishek Baghela



Dr Mandar N Datar



Dr Tushar Kaushik

Biodiversity and Palaeobiology Group

Areas of Research

Research in this group focuses upon diversity in archaea and bacteria, fungi and lichens, plants and diatoms, viruses, and palaeobiology.

Methanotrophs

Oil related microbes

Fungal taxonomy

Lichen metabolites

Grassland studies

Molecular phylogeny

Diatoms

Medicinal plants

Crude drugs

Archaea and Bacteria

Methanotrophs from Indian rice fields

Methane is the second most important greenhouse gas. Rice fields in India contribute around 5-6 Teragrams (10^{12} g) methane per year. Methanotrophs dwelling in rice fields act as natural methane bio-filters and oxidize up to 30 % of the produced methane. Interestingly, there is a paucity of information regarding prevalence and diversity of methanotrophs associated with Indian rice fields. The present investigation is the first report of isolation, identification and characterization of methanotrophs from Indian rice fields.

Fifteen isolates were characterized using 16S rRNA and *pmoA* genes which showed three putative new species and one putative new genus. Methane oxidation capacities of the isolates were 2-10 times more than that of reported methanotroph cultures (range 10-40 fmol $\text{CH}_4/\text{hr}/\text{cell}$). The draft genome of strain Sn10-6, member of a putative new genus, revealed the presence of unique genes required for survival in the rhizosphere habitat in addition to methane oxidation and nitrogen fixation genes. These species could be important in lowering methane emissions from India and await further investigation (Figures 1 and 2).

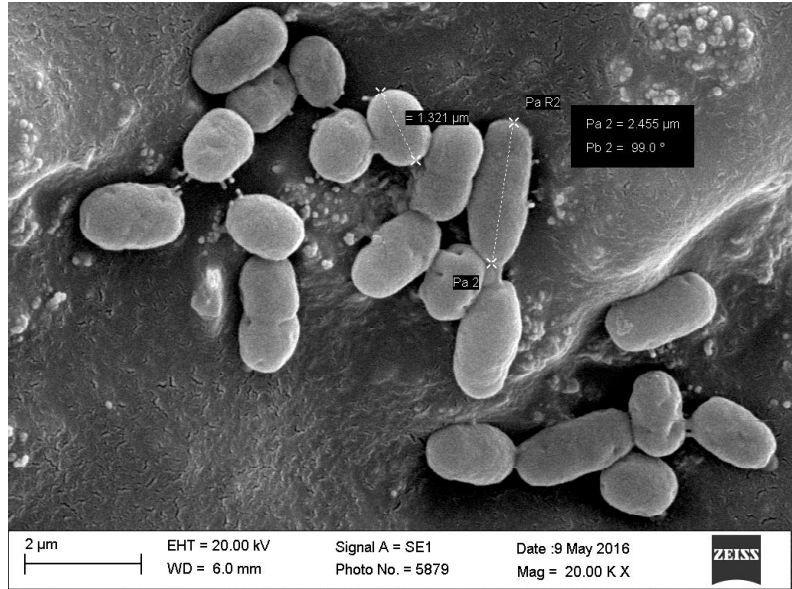


Figure 1

Scanning electron micrograph of a novel methanotroph genus and species strain Sn10-6 (*Methylocucumis oryzae* gen. nov. sp. nov. to be proposed)

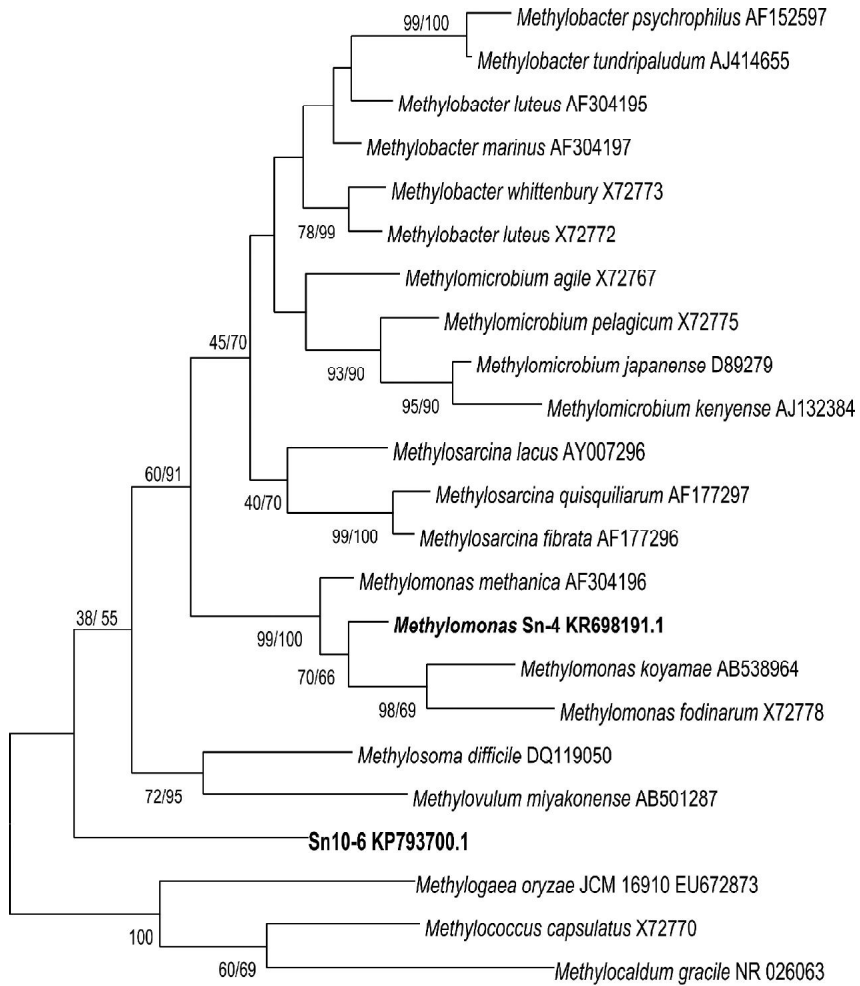


Figure 2

Maximum likelihood tree with 1000 bootstraps showing a putative new genus (strain Sn10-6) and putative new species of *Methylomonas* strain Sn-4. Bar indicates 2 % difference

Taxonomic diversity and functional characterization of the uncultured microbial community from Bombay High oil field

Oil wells are characterized by high temperature, high pressure, high salinity and anoxic environment. Such conditions make oil reservoir a hostile environment for the growth of microorganisms. Even then, presence of microorganisms is often reported from oil wells all over the world. The present investigation was undertaken to characterize the uncultured microbial community from oil wells in Bombay High region for taxonomic novelty as well as for functional characterization towards potential application in enhanced oil recovery.

Total microbial community DNA was isolated and sequenced as metagenome using Ion Torrent personal genome machine. The plateauing of rarefaction curve revealed exhaustive accounting of the constituents of the microbial community (Figure 3a). Unique diversity associated with individual oil wells was evident in the principal component analysis (Figure 3b). Dominance of bacteria and archaea is illustrated in Figure 3(c, d). Domain distribution also revealed presence of viruses, mainly bacteriophages. Functional characterization by Kegg pathway analysis (Table 1) revealed ability of microbial populations to produce solvents, acids and gases which aid in displacement and solubilisation of oil adhered to formation rocks and subsequent pressurization of reservoir which push the oil towards the surface. This analysis has revealed that mere supplementation of the oil well with heat stable nutrient media may drive the indigenous microbial flora to produce desired metabolites and aid microbial enhanced oil recovery (MEOR).

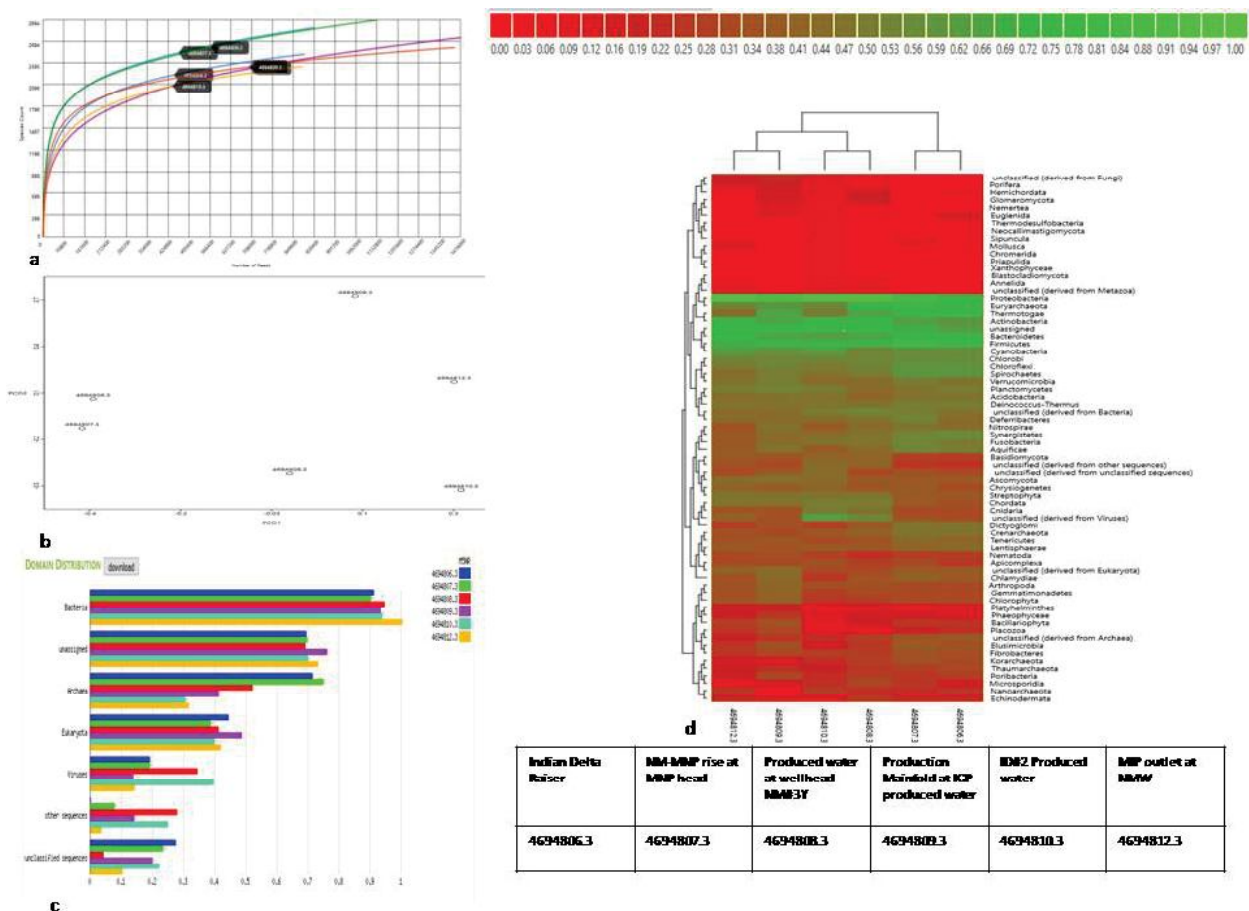


Figure 3

Metagenomic analysis of formation water samples: a) Rarefaction Curve, b) Principal Component Analysis (PCoA), c) Domain Distribution, d) Heat Map

Table 1 Enzyme found in metagenome belonging to subsystem of 'Metabolism of Aromatic Compounds'

Division	Subdivision	Enzyme	Abundance	
Metabolism of central aromatic intermediates	4-hydroxyphenylacetic acid catabolic pathway	5-carboxymethyl-2-hydroxymuconate semialdehyde dehydrogenase (EC 1.2.1.60)	66	
		5-carboxymethyl-2-oxo-hex-3-ene-1,7-dioate decarboxylase (EC 4.1.1.68)	58	
		3,4-dihydroxyphenylacetate 2,3-dioxygenase (EC 1.13.11.15)	58	
	Central meta-cleavage pathway of aromatic compound degradation	2-polyphenylphenol hydroxylase and related flavodoxin oxidoreductases	717	
		4-oxalocrotonate tautomerase (EC 5.3.2.-)	175	
		Catechol 2,3-dioxygenase (EC 1.13.11.2)	574	
		Acetaldehyde dehydrogenase, acetylating, (EC 1.2.1.10) in gene cluster for degradation of phenols, cresols, catechol	382	
	Homogentisate pathway of aromatic compound degradation	Aromatic-amino-acid aminotransferase (EC 2.6.1.57)	289	
		Maleylacetoacetate isomerase (EC 5.2.1.2)	116	
	Procatechuate branch of beta-ketodipate pathway	Muconate cycloisomerase (EC 5.5.1.1)	40	
		Beta-ketoadipateenol-lactone hydrolase (EC 3.1.1.24)	7	
		3-oxoadipate CoA-transferase subunit B (EC 2.8.3.6)	16	
	Peripheral pathway for catabolism of aromatic compounds	Biphenyl degradation	Acetaldehyde dehydrogenase, acetylating, (EC 1.2.1.10) in gene cluster for degradation of phenols, cresols, catechol	382
			4-hydroxy-2-oxovalerate aldolase (EC 4.1.3.-)	470
		Quinate degradation	3-dehydroquinate dehydratase II (EC 4.2.1.10)	335
3-dehydroquinate dehydratase I (EC 4.2.1.10)			10	
Benzoate degradation		Benzoate 1,2-dioxygenase alpha subunit (EC 1.14.12.10)	31	
		Benzoylformate decarboxylase (EC 4.1.1.7)	11	
Naphthalene and anthracene degradation		2-hydroxychromene-2-carboxylate isomerase	29	
		Dihydrodiol dehydrogenase (EC 1.3.1.56)	20	
Toluene degradation		Toluene-4-monooxygenase, subunit TmoD	7	
		toluenesulfonate zinc-independent alcohol dehydrogenase	2	
Salicylate ester degradation	AreB (Aryl-alcohol dehydrogenase) (EC 1.1.1.90)	11		
	Salicylate hydroxylase (EC 1.14.13.1)	2		

Division	Subdivision	Enzyme	Abundance
Anaerobic degradation of aromatic compounds	Anaerobic benzoate metabolism	Acetyl-CoA acetyltransferase (EC 2.3.1.9)	1462
		3-hydroxybutyryl-CoA dehydrogenase (EC 1.1.1.157)	331
		Glutaryl-CoA dehydrogenase (EC 1.3.99.7)	500
	Anaerobic toluene and ethylbenzene degradation	Acetophenone carboxylase subunit Apc1	5
Acetophenone carboxylase subunit Apc4		15	

Fungi and Lichens

Conventional and modern taxonomic approaches such as polyphasic taxonomic tools using multigene sequencing techniques and microsatellite marker for fungal taxonomy and authentication, besides bioprospecting of lichen metabolites, are being studied.

Taxonomy of Fungi and Lichens

Two new species *Exosporium gymnae* and *Mycoenterolobium flabelliforme* were isolated and identified from *Gymnema silvestre* and *Tectona grandis*, respectively and published. A phylogenetic study of fungal family *Trichocomaceae/Aspergillaceae* (45 strains) was conducted using ITS and β -tubulin regions. A re-discovery and phylogeny of a rare *Penicillium paradoxum* was made from the Western Ghats after five decades. Identification and documentation of *Fusarium spp* was undertaken based on morphological and sequence analysis of target genes (ITS-rDNA & EF-1 α) of 22 *Fusarium* isolates. The phylogenetic trees were constructed based on sequences from different target genes. The phylogenetic analysis resulted in identification and documentation of interesting *Fusarium* species, like *Fusarium lateritium*, *Fusarium nygamai*, and *Fusarium pseudocircinatum*. In addition, a novel multi-locus microsatellite typing (MLMT) method for *Colletotrichum gloeosporioides* was developed. This method was found to be highly discriminatory and reproducible. The MLMT analysis showed some level of correlation between the genotypes and host wherein the isolates from *Ocimum sanctum*, *Capsicum sp.* and *Mangifera indica* formed a cluster, therefore, exhibit some level of correlation between genotypes and host. Morpho- and chemo-taxonomic (TLC) studies were conducted for more than 75 lichen specimens and 20 species belonging to *Physciaceae*, *Graphidaceae*, *Parmeliaceae* were identified.

Lichen metabolites

A study has been conducted to standardize optimal culture conditions and to assess free radical scavenging, prolyl endopeptidase inhibitory (PEPI), and antimicrobial potential of natural and cultured lichen species *Cetrelia olivetorum* (Parmeliaceae). The study indicates therapeutic potential of Himalayan lichen *C. olivetorum* against neurodegenerative diseases.

Plants and Diatoms

Plant community studies on selected grasslands of Western Maharashtra

Awn is dispersal unit of grasses. It also drills the spikelet deep into the soil. To check whether there is any correlation between grass habitats and awn morphology, awns of nine grass species; three each from habitats viz. marshy, rocky and hill slopes, were studied using SEM (Figure 4). In habitats like the dry rocky

area and hill slopes hygrosopic silicified hairs, responsible for water absorption, were seen clustered near furrows. However, they were absent in species growing in marshy areas. In marshy habitat, the diaspore detached from the plant does not need greater area for absorption of water as humidity is more and the surface in which the grain needs to be burrowed is smooth. In contrast, in other habitats, the crowding of silicified hairs on the awns facilitate more absorption of water leading to propelling of grains even in the dry soil.

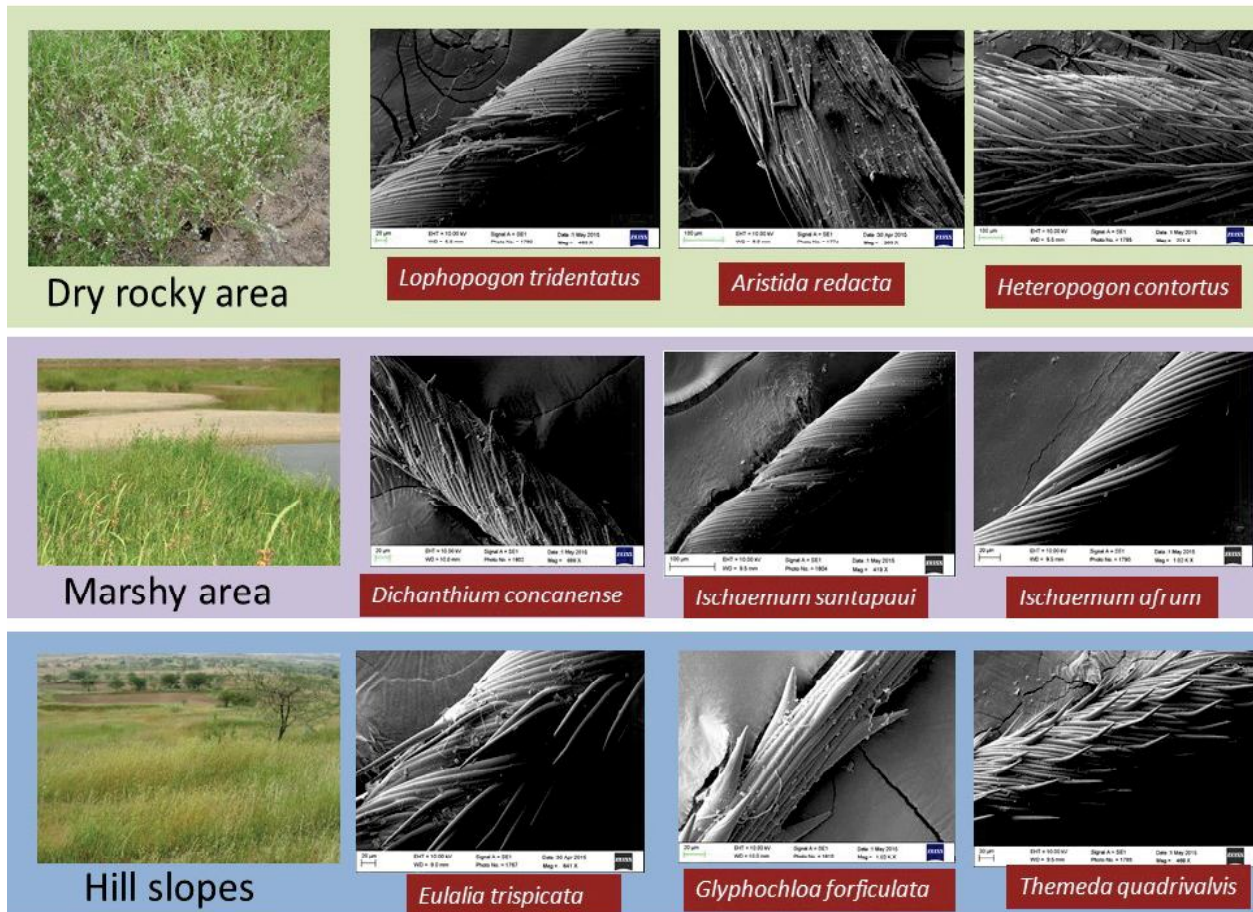


Figure 4

Ultrastructure of grass awns growing in three different habits

Molecular phylogeny of *Eriocaulon* L. of the Northern Western Ghats, India

Eriocaulons (Pipeworts) have greatest threatened species percentage in the Western Ghats. Molecular phylogenetic studies on the genus are being carried out to assess the congruence of morphological and molecular data, to find the trend of morphological character evolution and to develop possible DNA barcodes. Field trips were conducted to collect specimens from Central and Southern Western Ghats. 30 accessions of *Eriocaulon* were collected and all were identified after critical morphological examination (Figure 5). SEM studies on *Eriocaulon* seeds were also carried out for 20 species. DNA isolation was done, and three molecular markers namely *ITS*, *psbA-trnH*, and *trnL-F* regions were amplified and sequenced for 20 species.

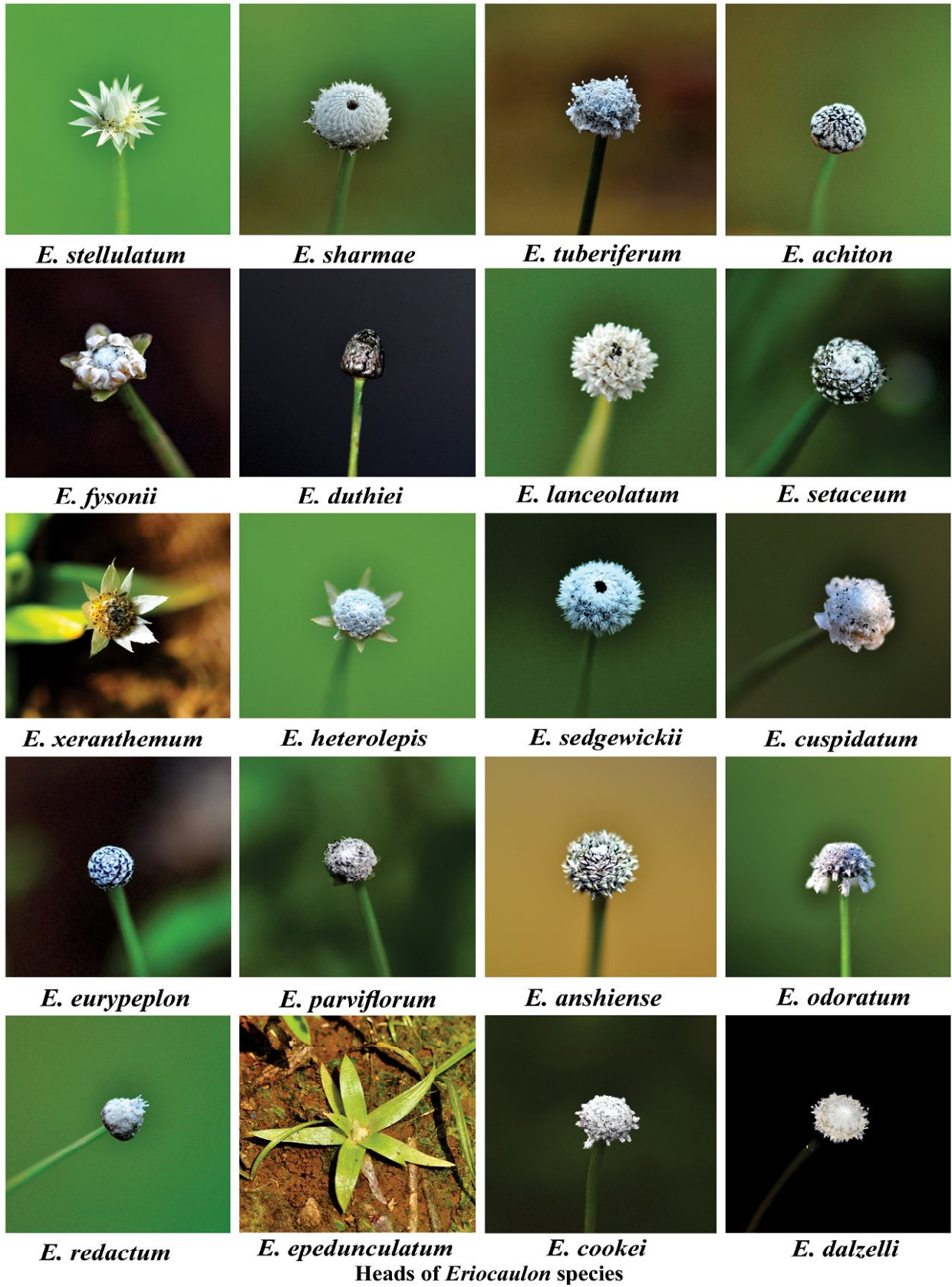


Figure 5

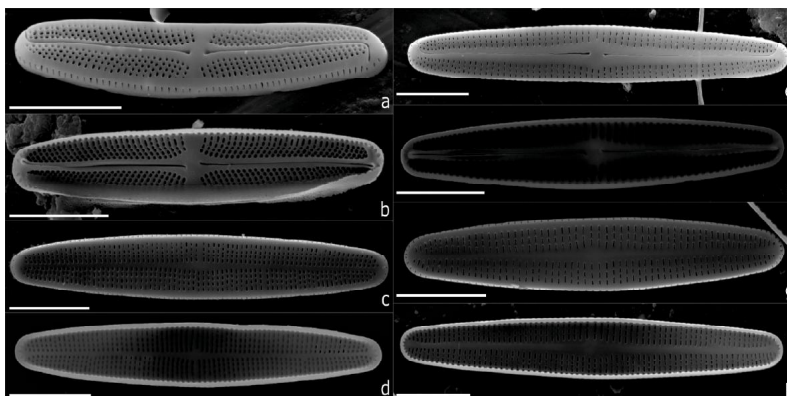
Diversity of *Eriocaulon* L. in the Western Ghats

Do semi-aquatic habitats act as refugia for endemic diatoms in the Western Ghats?

Exploration of the diatom diversity of semi-aquatic habitats from the Western Ghats and adjoining mountain ecosystems have yielded two new species of *Achnanthisdium* (Figure 6). The semi-aquatic habitats provide a different environmental condition with limited moisture, which supports a wide array of unique diatom community dominated by endemic elements.

Figure 6

Ultrastructure of two new species of *Achnanthisdium* from waterfalls of Kolli Hills, Eastern Ghats. Scale bar = 5 μ m



Developing profiles for medicinally important species from genus *Solanum* L. and their application in identification of market samples

Microscopic parameters like glandular/ non glandular hairs, stellate trichomes, oxalic acid crystals are useful to distinguish between different *Solanum* species. Significant differences in percentage ash and extractive values of whole plant samples were observed; *S. melongena* (10.65) > *S. americanum* (9.85) > *S. xanthocarpum* (9.42). HPTLC profiling of fruits of genuine samples - *S. americanum*, *S. villosum* along with market samples and bioactive marker standard solasodine was carried out. Market samples were comparable with *S. americanum* (SAF1), however methanolic extracts were devoid of the bioactive marker (Figure 7).

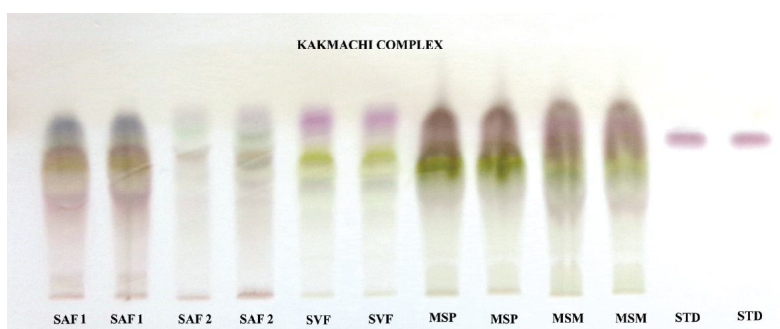


Figure 7

HPTLC Fingerprint profiles of *Solanum* species in the Kakmachi complex and market samples. SAF1 & SAF2- *Solanum americanum* L. fruits from 2 locations; SVF- *Solanum villosum* fruits; MSP- Market sample, Pune; MSM- Market sample, Mumbai; STD- Solasodine standard 1 mg/ml

Development of crude drug repository of genuine samples from Maharashtra

Under the RGSTC sponsored project, a repository of genuine crude drug resources from Maharashtra is being developed. Various herbaria from Maharashtra were screened for medicinal plant records. During last one year, 87 specimens belonging to 31 families were added to the repository. The ash and extractive (water and acid insoluble) values are being calculated to compare the physical constants from different agro-climatic zones. No significant difference in values from Konkan and Western Ghats were

observed; however in tree species, the extractive values are little higher. The comparison of values from two agro-climatic zones – the Western Ghats and Konkan is represented in Figures 8 and 9.

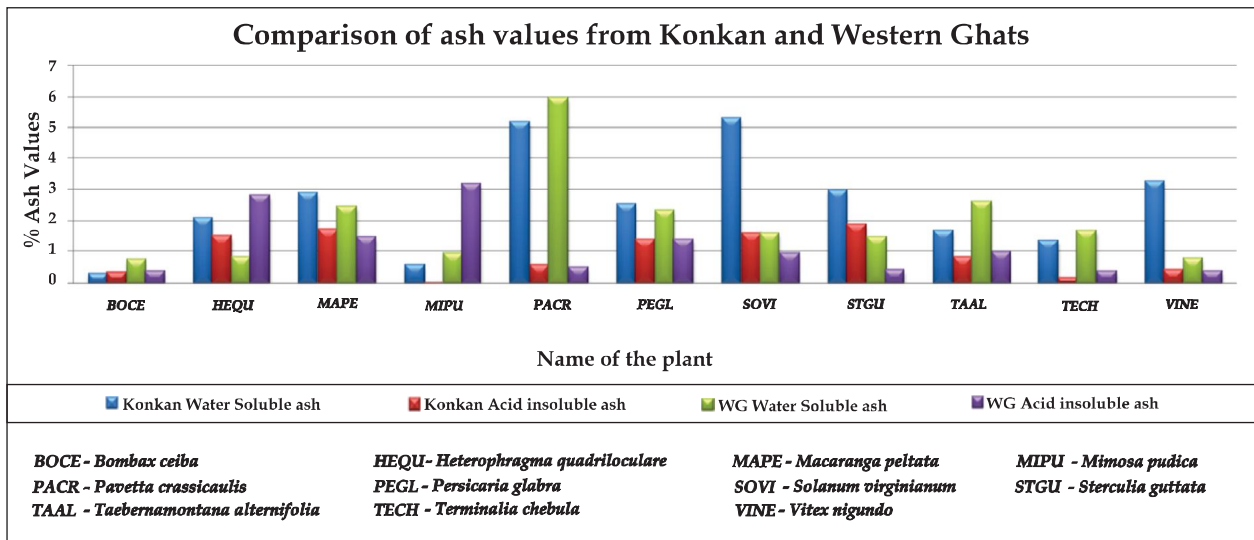


Figure 8

Comparison of ash analysis from Konkan and the Western Ghats

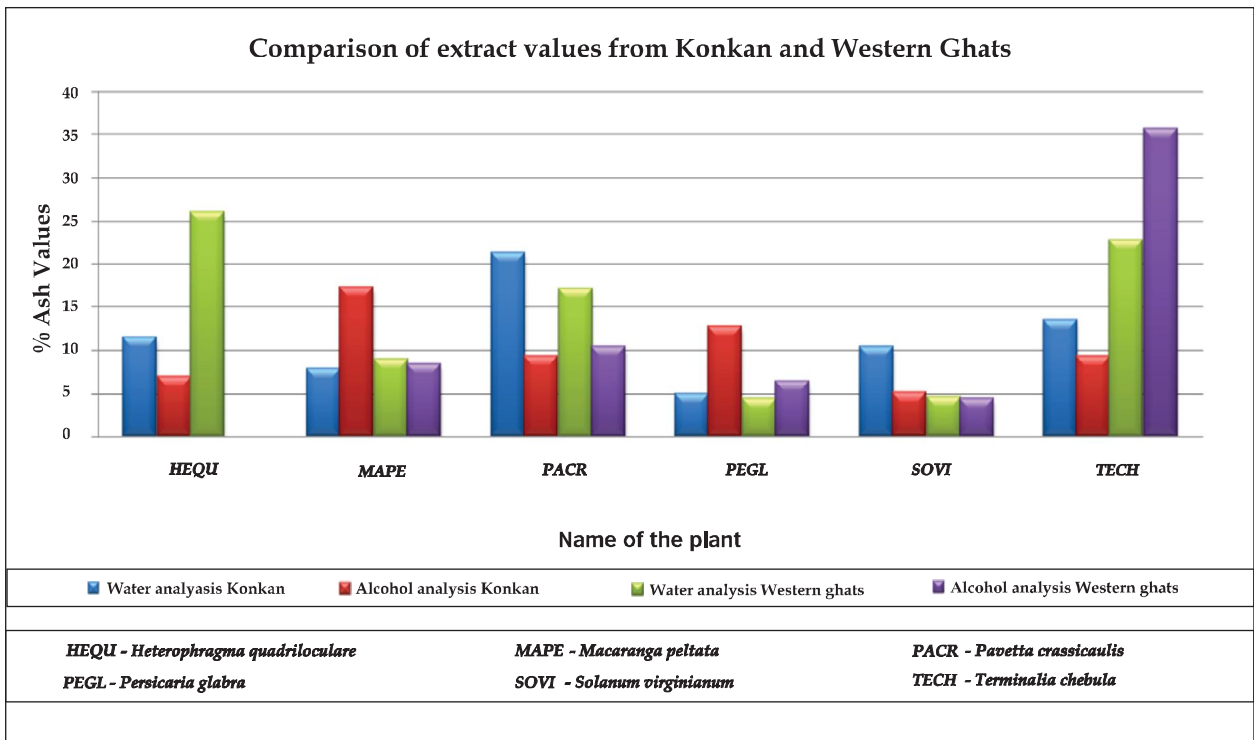


Figure 9

Comparison of extractive analysis from Konkan and the Western Ghats

HPTLC profile library of Phytochemical Reference Standards (PRS)

HPTLC profiling was developed for selected Indian medicinal plants which is helpful in quality control of medicinal plants. The spectra library of thirty PRS has been completed (Table 2).

Table 2 List of Phytochemical Reference Standards profiled

Name of the PRS	Name of the PRS	Name of the PRS
Alizarin	Connesine	Piperine
Aloin	Curcumin	Piperlongumine
Alpha Santonin	Ellagic acid	Pseudopelletierine
Asiaticoside	Emodin	Purpurine
Azadirachtin	Eugenol	Rutin
Bergapten	Glycyrrhizin	Sennoside A
Beta sitosterol	Hesperidin	Sigmasterol
Bixin	Marmelosin	Solasodine
Cinnamaldehyde	Maslinic acid	Strychnine
Colchicine	Naringin	Trigonelline hydrochloride

Studies on Indian medicinal plants used in oral care for prevention of teeth caries

Based on previous ethnobotanical observations five plant species were selected for studies on oral care for prevention of teeth caries. Antioxidant activity was evaluated by DPPH, NO, RPA and Photochemiluminescence assays. Methanolic extracts of bark of *Bombax ceiba* L. and *Albizia lebbeck* (L.) Benth showed highest antioxidant activity. Further *in vitro* testing is in progress.

Viruses

Novel *Salmonella* bacteriophages isolated

Salmonella is a medically important Gram-negative foodborne pathogen. Genomic diversity of *Salmonella* is increasingly studied but the knowledge of *Salmonella* phage diversity is limited. We isolated *Salmonella* phages from sewage and river water and carried out genomic characterization of 12 *Salmonella* phages using next generation sequencing platform. Newly sequenced phages were classified based on amino-acid sequence phylogenetic analysis. In newly sequenced phages, several virulence genes, DNA metabolism genes, tRNA genes, antibiotic resistance genes and genes not having known role in the life cycle of phages were identified. Results suggest that most of the phages having G+C content different than their host possess DNA metabolism genes. The presence of tRNAs in the genome of *Salmonella*_phage38-India was identified; however, no correlation between tRNA genes and overall codon usage in the phage genome was observed. Thus, the phage encoded tRNAs may increase fitness of phages.

Palaeobiology

Decoding changes in palaeoenvironment using ichnoassemblages, distribution of fossil mega-invertebrates and palynomorphs from different sedimentary basins of peninsular as well as understanding sediment–organism relationship using modern habitats were studied.

Ichnology of the Upper Jurassic rocks of the Marwar Basin, Rajasthan

Hardground ichno-assemblages and associated conglomerates confirmed erosional contact between Jaisalmer and Baisakhi formations evident in various sections (Figure 10a-b). Spatiotemporal analyses of ichnofacies in the Baisakhi Formation indicate a transition from *Zoophycos ichnofacies* (lower member) through *Cruziana* to *Skolithos* (middle member) to *Cruziana* (upper member) hint at a regressive phase from lower member to middle member and a short transgressive phase from middle to upper member (Figure 10c).

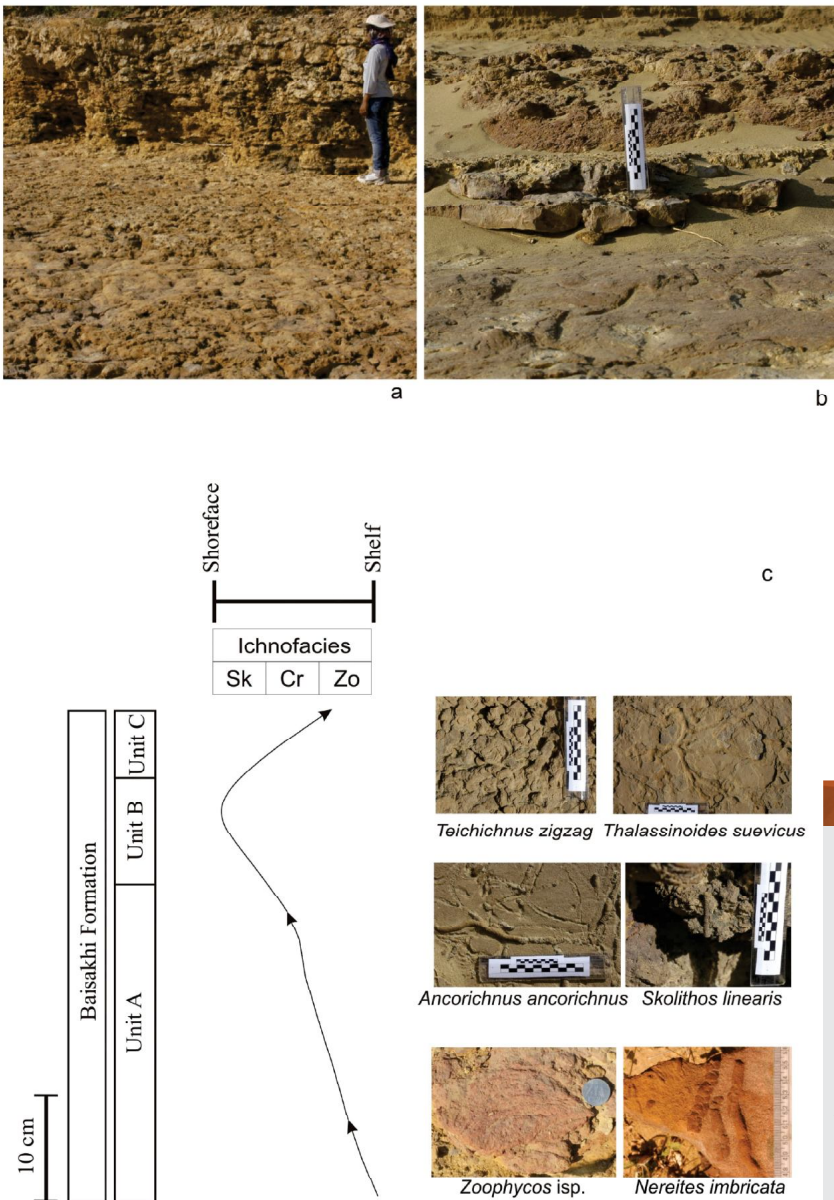


Figure 10

Ichnology of Upper Jurassic rocks of Marwar Basin, Rajasthan. a. Exposure of hardground at the base of Baisakhi Formation, Baramsar evincing unconformable contact with underlying Jaisalmer Formation. b. Hardground and overlying conglomerate in a stream bed near village Kanod. c. Graphic representation of sea level fall and rise during deposition of Baisakhi Formation deciphered from trace fossil assemblages and ichnofacies

Carbonate hiatus concretions in Eocene of Kachchh, of global significance

Hiatus concretionary layers are indicative of very slow sedimentation, change in pore water chemistry leading to their early diagenesis (Figure 11a). Restriction of sponge borings to the under-surface and bivalve borings to the upper surface in one concretionary layer of the Harudi Formation indicates presence of overhangs (Figure 11b, c). These layers of hiatus concretions within the Harudi Formation are of global significance as they represent first occurrence of carbonate concretions in Paleogene times in contrast to the dominance of phosphatic concretions.

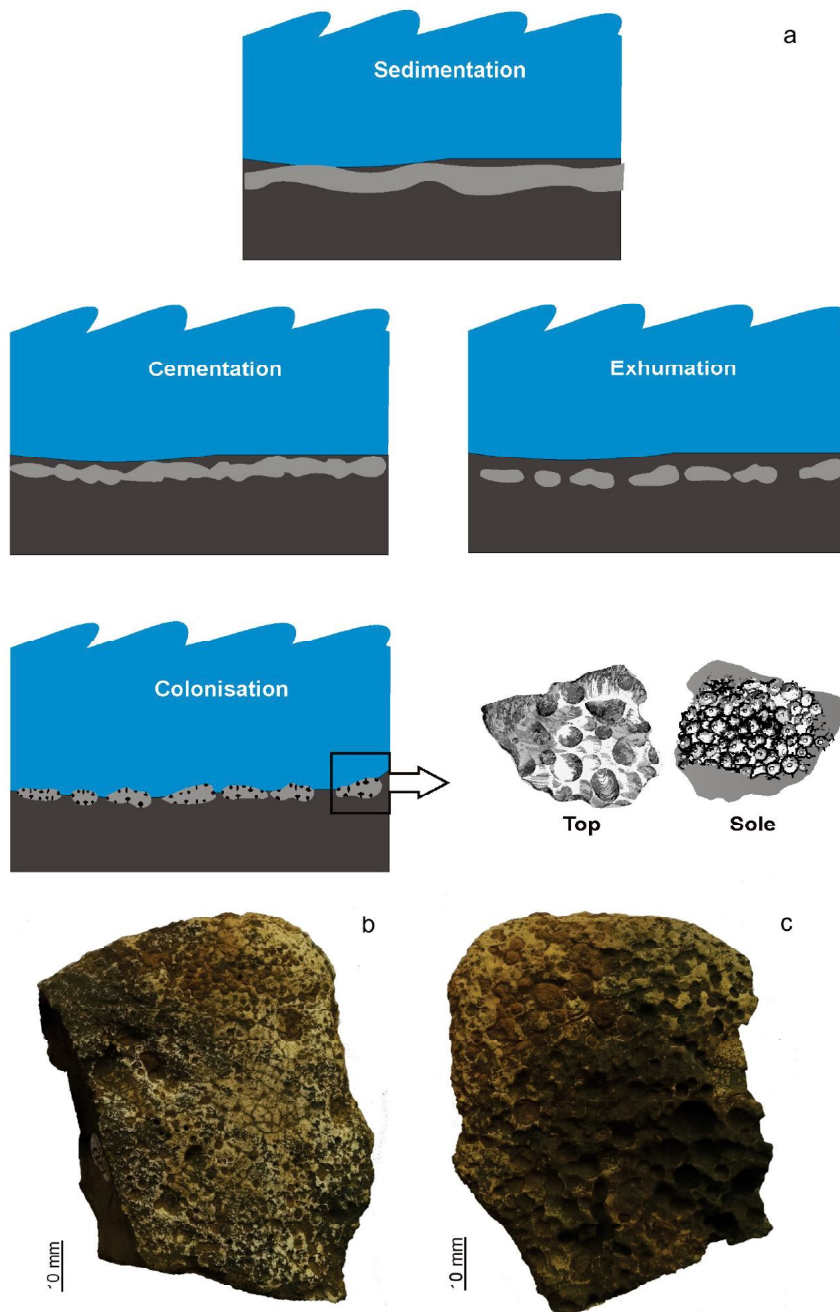


Figure 11

Carbonate hiatus concretions in Eocene of Kachchh, of global significance a. Schematic sketch showing the development mechanics of hiatus concretionary layer formed in the Harudi Formation (modified after Zatoń et al, 2010), b. Sponge borings on the under surface of the carbonate concretion, c. Bivalve borings on the upper surface of the same concretion as in 11a

Cretaceous sediment gravity flows in outcrop discovered, Cauvery Basin, Tamil Nadu

A channelized complex of high-density sediment gravity flows discovered within the Late Turonian – Coniacian, Trichinopoly Group is equivalent with oil-bearing sands in subsurface (Figure 12). It has an average width of ~500 m and length of ~1500 m and three types of channelized systems viz. shoestring channel, channel belt and levee belt.

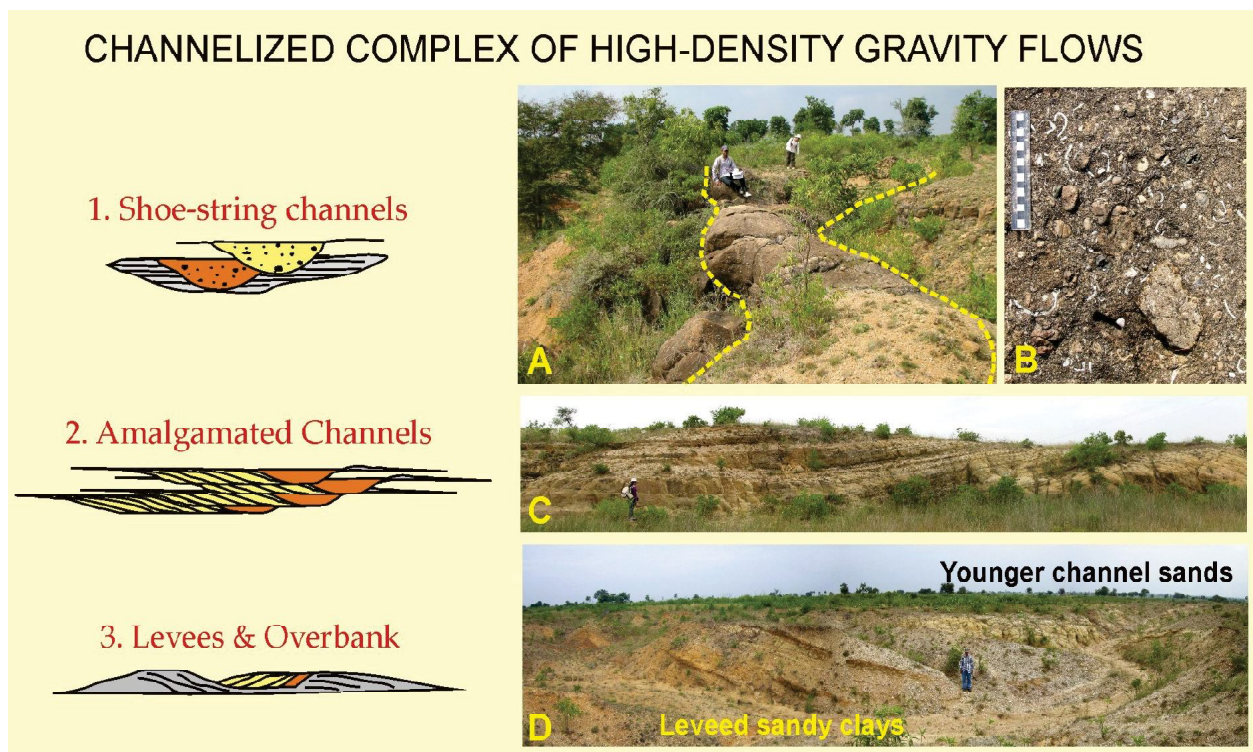


Figure 12

A) Highly sinuous shoe-string channel; B) Channels composed of debris flow conglomerates; C) Low sinuosity, stacked and multilateral amalgamated, unconfined to partially confined channels, channelized lobes and lateral accretion packages; D) Thin parallel bedded, normal graded sands, silts and clays forming internal and external levees

Monsoon variability over Peninsular India during Late Pleistocene

Signatures of vegetation shift were recorded in the terrestrial archive from corridors of Western Ghats. Fossil flora recovered from Kangvai well (Figure 13), Ratnagiri District, Maharashtra (17°53'41" N; 73°12'23" E) suggests that the Southwest (SW) and Northeast monsoons (NE) contributed ~ 64 % and 18 % of the total rainfall, respectively during Late Pleistocene (44,020 ± 390 years BP). As both were very active, along with pre-monsoonal rain, the length of the rainy season extended up to nine months per annum favoring prevalence of wet evergreen forests until the Late Glacial Maximum or slightly before it. Due to the weakening of NE and pre-monsoon rainfall later in the Late Pleistocene and Early Holocene, the area experiences only four months of the rainy season at present. This resulted in the extinction of wet evergreen taxa, now endemic to the wetter parts of Western Ghats, from the fossil locality. This is the first quantitative rainfall reconstruction from India measuring the pre-monsoon, summer monsoon, post-monsoon and dry season from fluvio-lacustrine sediments.

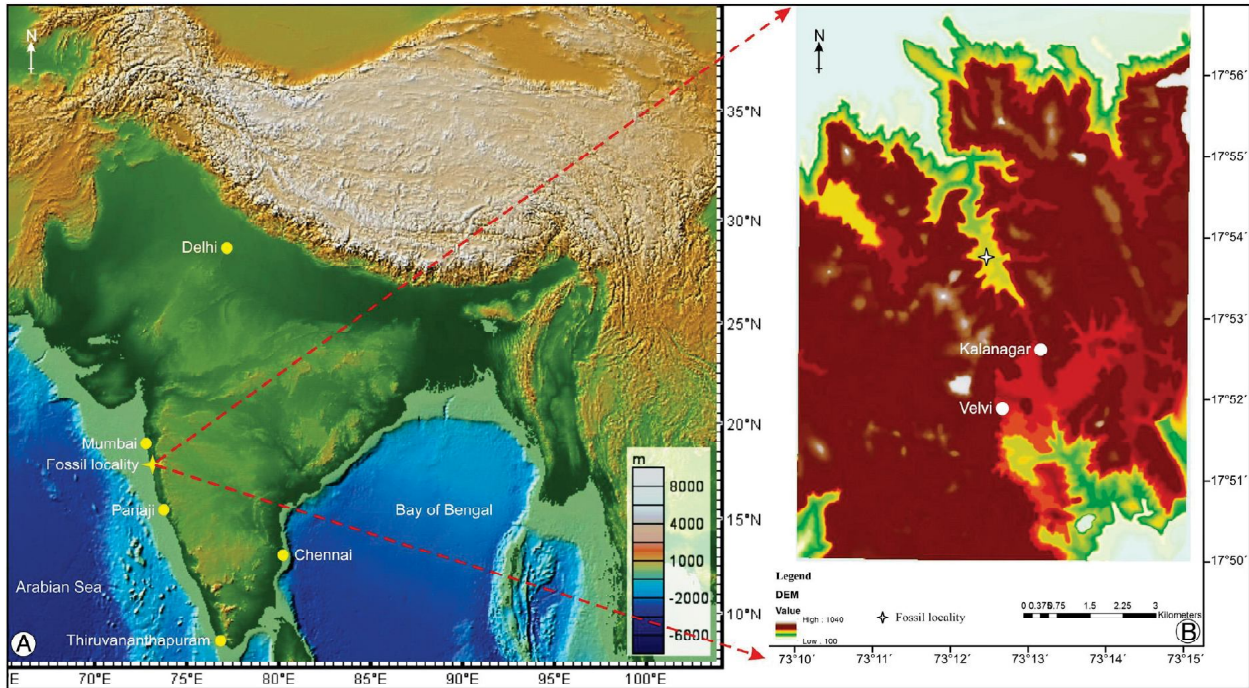


Figure 13

Map showing the fossil locality. a. Physiographic map showing the studied area (yellow asterisk); b. High resolution Digital Elevation Model

Biogenic sedimentary structures from Kundalika estuary and adjacent sandy shores reveal variation in faunal biodiversity

Study of ichnoactivity has revealed that variety of biogenic activity increases seaward in contrast to the middle reaches of the estuary (Figure 14).

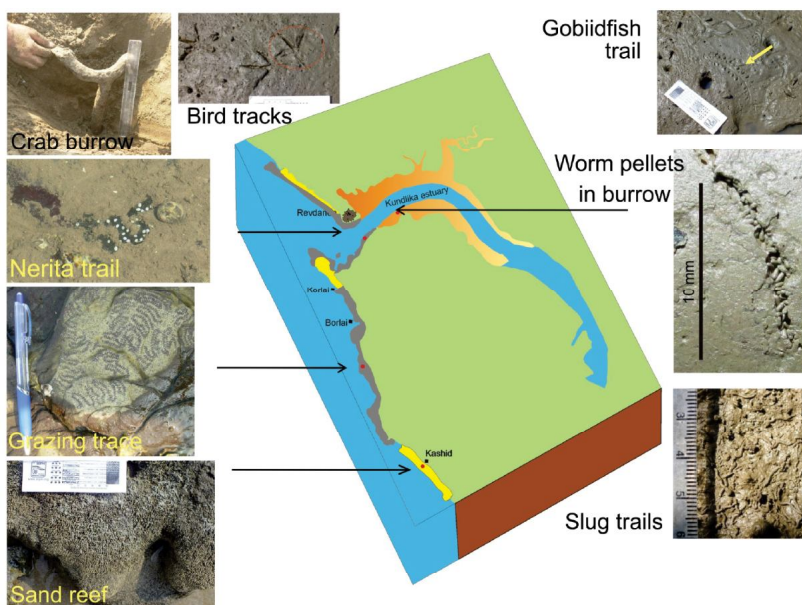


Figure 14

Study of biogenic sedimentary structures from Kundalika estuary and adjacent sandy shores. Distribution of biogenic sedimentary structures resulting from animal sediment interaction

Bioenergy Group

Scientists



Dr Prashant K Dhakephalkar



Dr Monali C Rahalkar

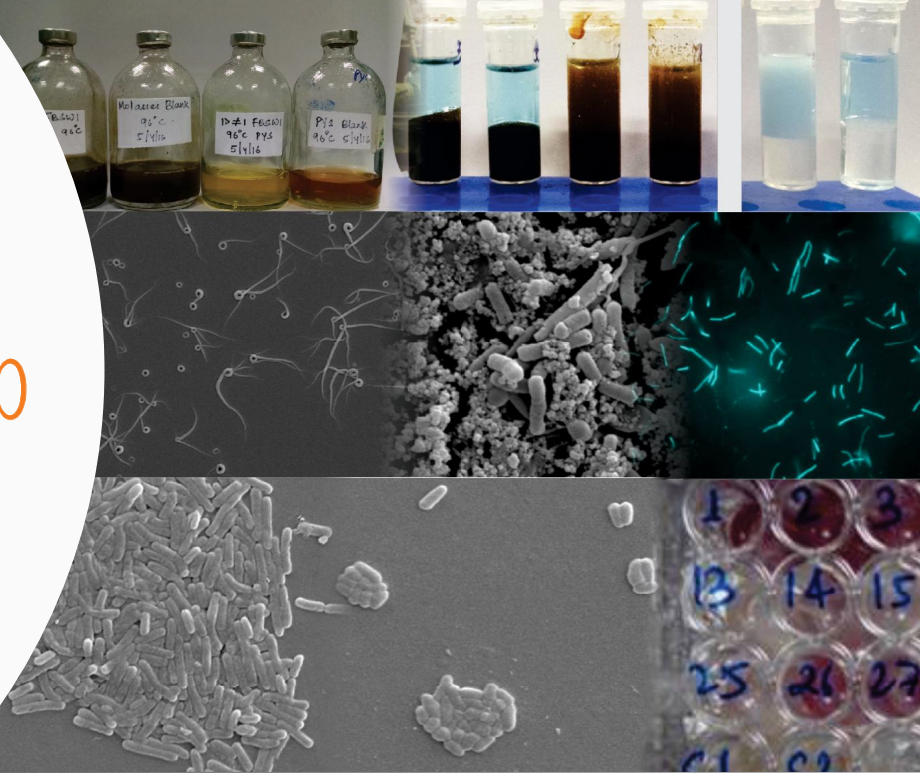


Dr Sumit S Dagar



Mr Pranav R Kshirsagar

Bioenergy Group



Major emphasis of the research in Bioenergy group has been on exploiting microorganisms for enhanced energy production. Microorganisms have been explored for (1) enhanced biomethanation of rice straw, (2) enhanced oil recovery from depleted oil reservoirs, and (3) biomethanation of residual lignite/ crude oil, etc. Microorganisms have also been explored for bioremediation of terrestrial spills of crude oil resulted during extraction and recovery of petroleum oil.

Areas of Research

Microbial enhanced oil recovery Biomethanation Bioremediation

Making The Most From Waste

Microbial Enhanced Oil Recovery (MEOR)

Hyperthermophilic isolates growing at 96 °C and higher temperature were isolated, identified and characterized from high temperature oil wells (Figure 15). Growth and nutritional requirement of these isolates was optimized to support production of metabolites such as solvents, biosurfactants, acids and gas (Figure 16). These metabolites could significantly mobilize and emulsify the crude oil adhered to formation rocks by weathering the formation rocks and reducing the viscosity of the crude oil and pressurizing the reservoir. A special thermostable nutrient medium was designed to support the microbial growth and metabolite production in conditions simulating Indian oil reservoirs. Scanning electron microscopy revealed the presence of rods as well as cocci in the enrichment selected for MEOR at 101 °C (Figure 17).



Figure 15

Thermostable nutrient medium developed to support microbial growth and metabolite production at 96 °C

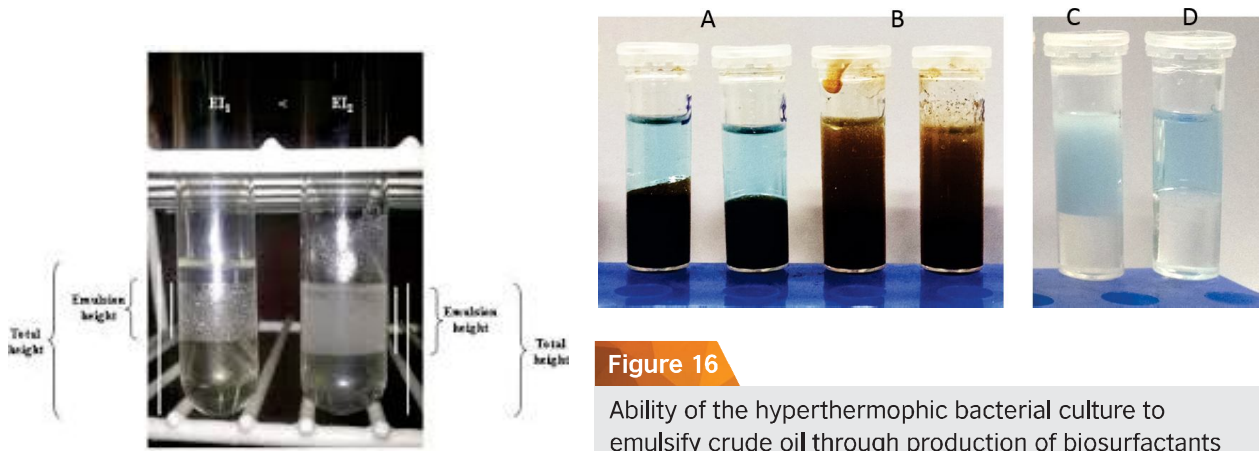


Figure 16

Ability of the hyperthermophilic bacterial culture to emulsify crude oil through production of biosurfactants

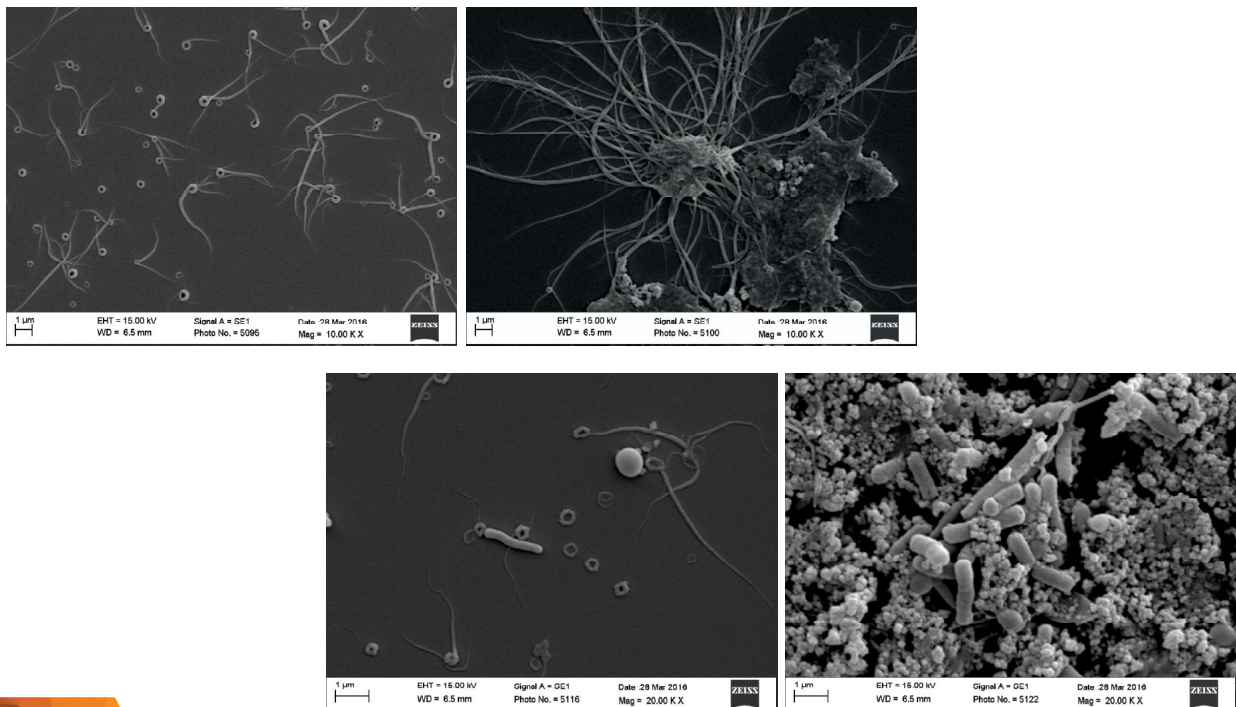


Figure 17

Scanning electron micrographs of hyperthermophilic bacteria growing at 101 °C in molasses

Enhanced biomethanation of rice straw

Rice straw is an economical, renewable and abundantly available source for generation of biomethane as an alternative/ renewable source of energy. One of the major constraints in technocommercially feasible exploitation of this source is the requirement for energy intensive, expensive, and laborious pretreatment of the raw material. Such drawback can be overcome if microbial inoculum capable of degradation of lignocellulosic biomass through production of hydrolytic enzymes is developed. A microbial consortium of hydrolytic bacteria and anaerobic fungi was developed. The anaerobic fungi could enhance hydrolysis of lignocellulosic component of rice straw and enhance the biomethanation process efficiency by ~30 %. The process efficiency was further improved by ~15 % at 55 °C by employing thermophilic methanogens (Figure 18).



Figure 18a

Isolated colonies of methanogens in roll tube bottles

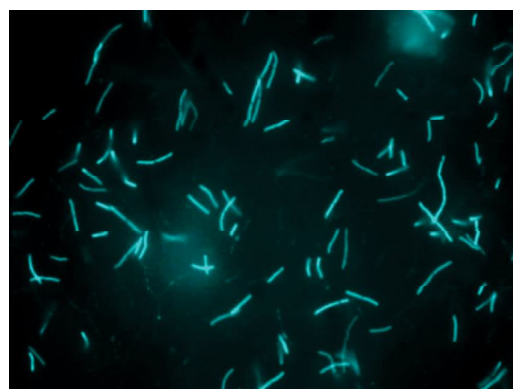


Figure 18b

Methanothermobacter thermoautotrophicus

Biomethanation of residual oil/ lignite

A significant portion of crude oil or lignite coal cannot be recovered from the reservoirs/ mines due to technocommercial limitations. However, tremendous energy associated with such residual crude oil/ lignite coal can be recovered in the form of biomethane using specially developed microbial formulations. Microorganisms capable of degrading crude oil and/or lignite coals were isolated, identified and characterized. Their ability to convert hydrocarbons into volatile fatty acids and H_2/CO_2 was optimized through manipulation of nutritional supplementations and growth parameters. Efforts have now been focused on preparation of a microbial consortium of bacteria and methanogens that can convert lignite waste into biomethane. Lignite degradation ability of bacteria in terms of INT reduction assay is illustrated in Figure 19.

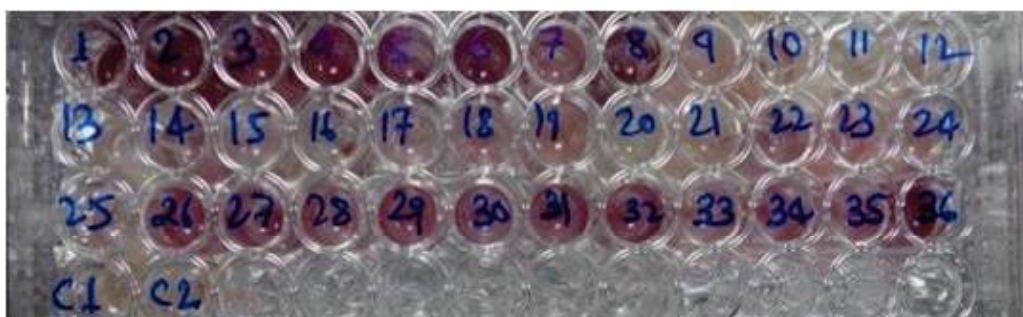


Figure 19

INT reduction assay

Bioremediation of terrestrial oil spills

A time and cost effective microbial process is being developed for remediation of petroleum contaminated sites. It is believed that use of powdered microbial formulations can be an ideal strategy for effective in situ bioremediation of contaminated sites. More than 110 oil degrading bacterial strains were isolated from different sites contaminated with petroleum oil. A microbial consortium of four bacterial strains was developed to efficiently degrade petroleum hydrocarbons associated with terrestrial oil spills. Dynamic process parameter optimization was performed to increase the efficiency of the microbial consortium. The consortium was able to degrade ~70 % of the petroleum hydrocarbons present in soils contaminated with crude oil. Cellular morphology of oil degrading bacteria evident in the electron micrographs is shown in Figure 20.

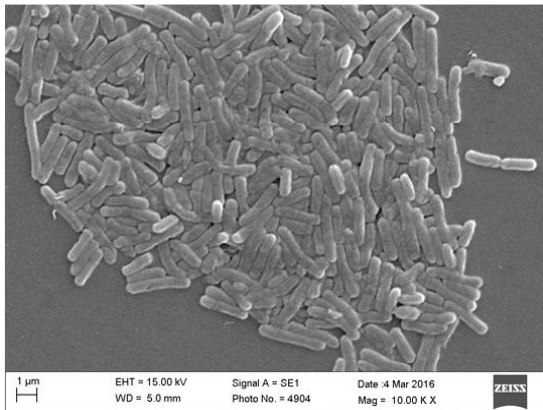


Figure 20a

Bacillus aerophilus (PW15)

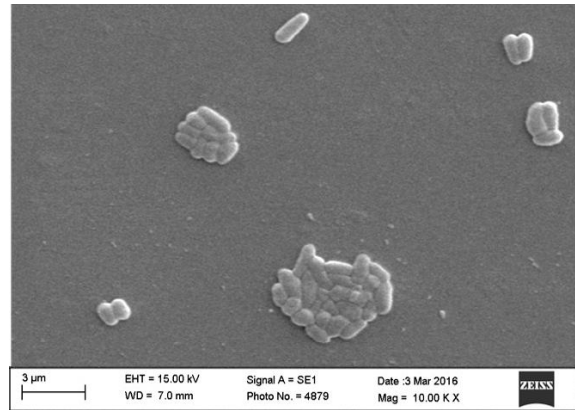


Figure 20b

Xylanimonas cellulosilytica (PW21)

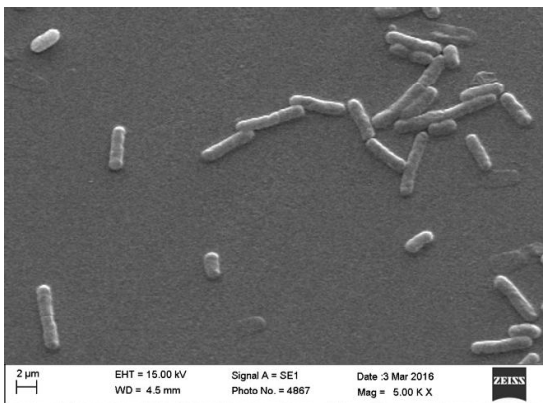


Figure 20c

Bacillus aerophilus (S73)

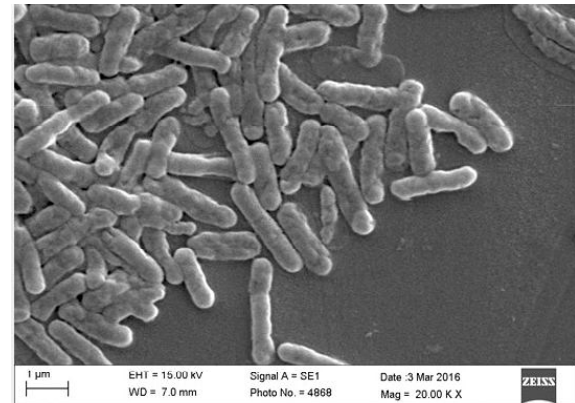


Figure 20d

Bacillus licheniformis (S78)

Bioprospecting Group

Scientists



Dr DG Naik



Dr BN Joshi



Dr Prasad P Kulkarni



Dr Pratibha Srivastava

Bioprospecting Group



Isolation and synthesis of naturally occurring compounds, derivatives and their use in pharmaceuticals, nutraceuticals, agriculture and industries; deciphering the mechanistic approach of these compounds for disorders such as Alzheimer's disease, diabetes, cancer, and chickungunya virus are areas of focus in the Bioprospecting group.

Areas of Research

Novel molecules

Herbal extracts

Insulin like protein

Bioactive molecules

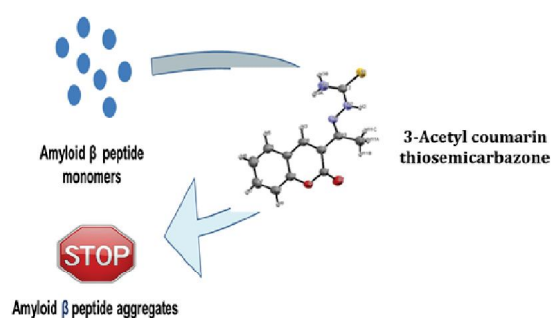
Mechanistic Approach to Treat Alzheimer's, Diabetes, Cancer

Novel molecule to treat Alzheimer's synthesized

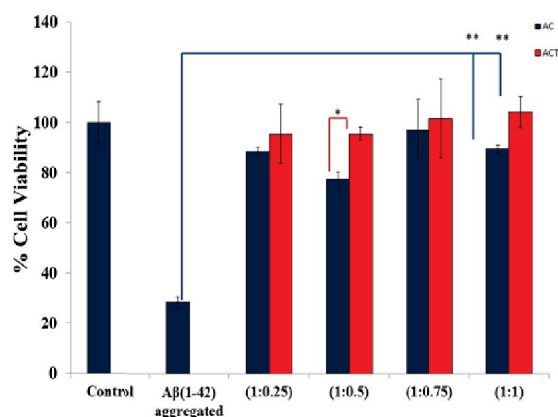
Aggregation of the amyloid- β peptide ($A\beta$) plays an important role in the progression of Alzheimer's disease (AD). Designing of efficacious molecules for the inhibition of $A\beta$ peptide aggregation and $A\beta$ -induced neurotoxicity is identified as feasible therapeutic strategy to prevent AD.

Thiosemicarbazone compounds possess a variety of biological properties but were never explored for treatment of Alzheimer's disease. Novel 3-Acetyl coumarin thiosemicarbazone derivative was synthesized and its ability to inhibit aggregation of $A\beta$ (1-42) using several experimental methods was demonstrated (Figure 21).

Our results indicated the protective effect of 3-Acetyl coumarin thiosemicarbazone against $A\beta$ -induced cytotoxicity in SH-SY5Y cells. Thus, due to the ease of synthesis, established drug properties, inhibition of peptide aggregation and its ability to rescue $A\beta$ induced neurotoxicity, thiosemicarbazone compounds are promising candidates for use in the treatment of AD.



Inhibition of A β peptide aggregation in the presence of 3-Acetyl coumarin thiosemicarbazone



Attenuation of A β -induced cytotoxicity in the presence of 3-Acetyl coumarin thiosemicarbazone and parent compound 3-Acetyl coumarin

Figure 21

3-Acetyl coumarin thiosemicarbazone derivative

Herbal extracts useful in the treatment of inflammation associated anemia

Inflammation associated anemia (AI) is the second most prevalent anemia after iron deficiency anemia. A variety of conditions including infections, cancer and autoimmune conditions can lead to AI. RAW 264.7 (Murine macrophage-like cell line) cell culture model was developed for iron metabolism study. The effect of *Phyllanthus emblica* Linn (Amalaki), *Eclipta prostrata* L. (Bhringraj) and *Tinospora cordifolia* (Guduchi) plant extracts on iron metabolism in RAW 264.7 cells was also studied. Labile iron and intracellular nitric oxide levels together indicate AI.

Treatment with amalaki, bhringraj and guduchi aqueous extracts increased labile iron levels in RAW 264.7 cells. Further, confocal microscopy results showed redistribution of intracellular iron upon treatment with ascorbic acid which is an active ingredient of amalaki (Figure 22). Bhringraj extract, whose active ingredient remains to be identified, showed relatively more increase in labile iron levels under inflammatory conditions as compared to amalaki and guduchi extracts. Guduchi extract showed relatively higher inhibition of nitric oxide (NO) production compared to the other two extracts.

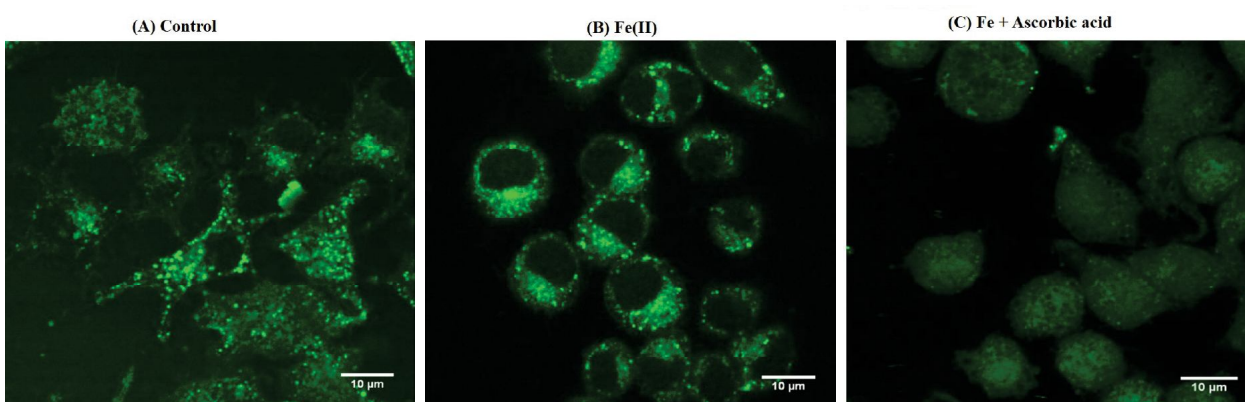


Figure 22

Ascorbic acid results in redistribution of iron in RAW 264.7 cells

Oral route to treat diabetes

The orally active insulin like protein (ILP) showing cross reactivity with anti-insulin antibodies has been purified from the fresh leaves of *Costus igneus* (Figure 23). The mechanism of action of ILP was found to be similar to insulin with increase in cytoplasmic IRS-1 with a concomitant increase in GLUT-4 translocation to the plasma membrane in a time dependent manner (Figure 23). ILP was nontoxic in normal and diabetic model of Swiss mice in subchronic toxicity study and was found to protect pancreatic beta cells (Figure 24). MALDI TOF/TOF MS analysis of ILP revealed sequence homology with the predicted protein from *Physcomitrella patens*. The study reveals that ILP acts via insulin signaling pathway and can be used as oral insulin mimetic.

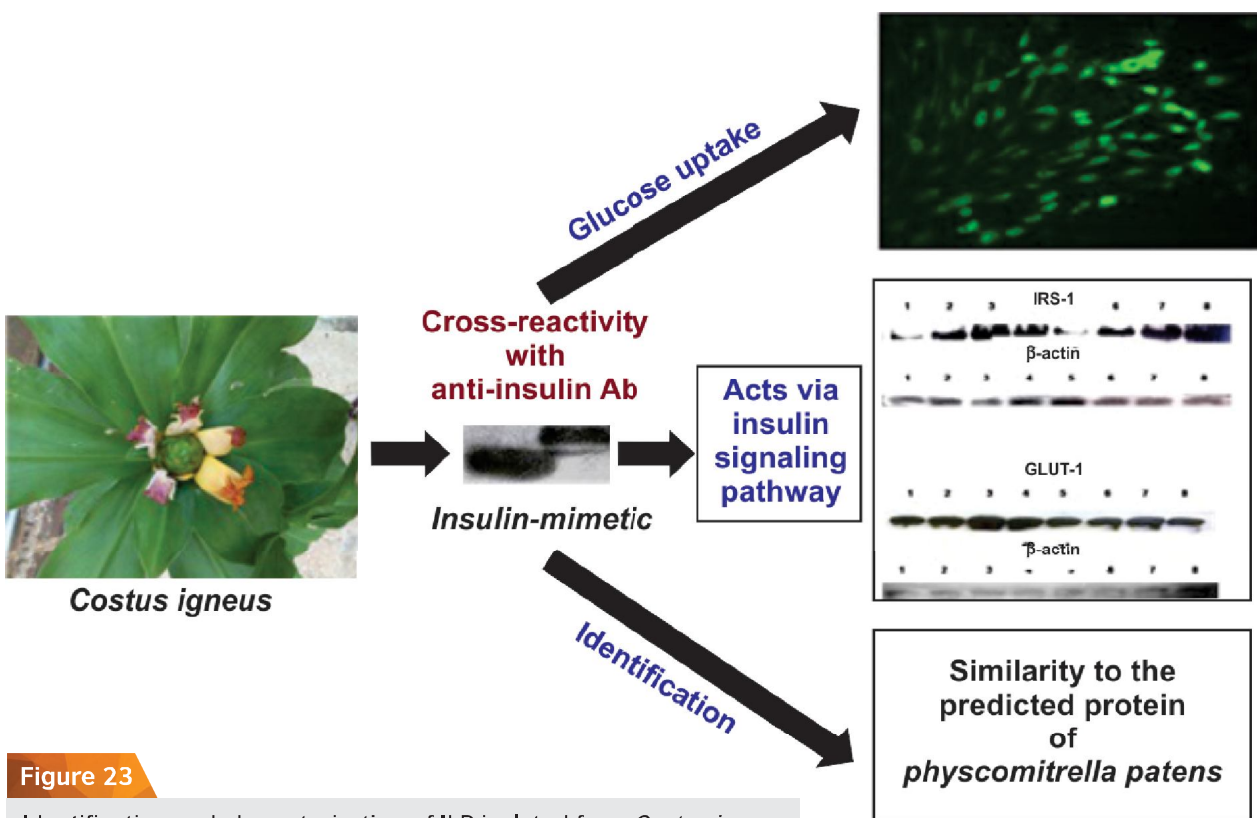


Figure 23

Identification and characterization of ILP isolated from *Costus igneus*

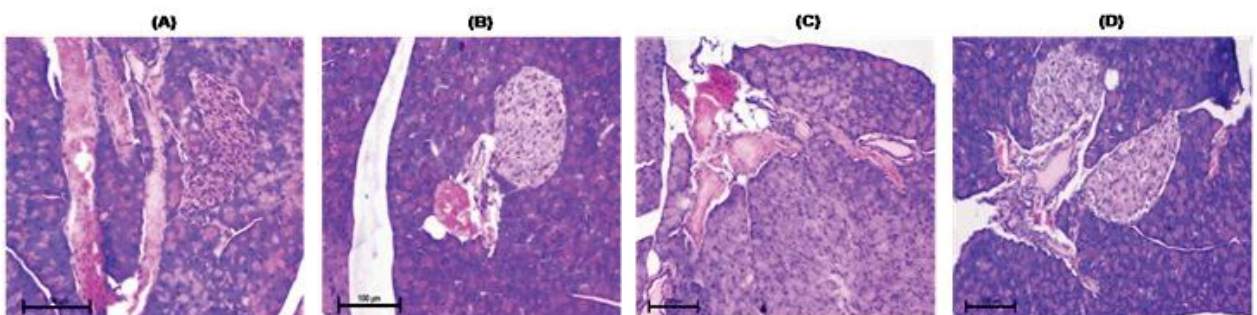


Figure 24

Histological analysis of the pancreas

Natural Product Chemistry

Synthesis of bioactive molecules against Chikungunya and Cancer

Chromone is a valid scaffold in the field of medicinal chemistry due to its wide range of biological activities. Structure-activity relationships of chromones have generated interest among medicinal chemists either to isolate novel flavones or to develop the synthetic routes for naturally occurring flavones. Rugosaflavonoid (methyl 7-hydroxy-2-(4-methoxyphenyl)-4-oxo-4H-chromene-5-carboxylate) is a new flavonoid, isolated from *Rosa rugosa* which showed cytotoxicity against NB4, SHSY5Y, and MCF7 cells.

Rosa rugosa Thunb. (Figure 25a) is a common ornamental flower distributed in the temperate regions of eastern Asia and widely cultivated in Yunnan Province. Looking at the potential of natural flavones in medicinal chemistry the synthesis of Rugosaflavonoid and some of its analogs has been completed for the first time (Figure 25b).

Additionally, these compounds have been screened against Chikungunya virus. Chikungunya virus (CHIKV) is a mosquito-borne pathogen of the genus *Alphavirus* (Family *Togaviridae*). It has caused major outbreaks in which patients commonly show onset of fever and accompanying joint pains like arthritis. When tested against CHIKV, these compounds showed 88-100 % inhibition at 1mM concentrations in TCID50 assay (Figure 25c).

Besides infectious diseases, diseases like cancer also pose significant challenges to human health. Flavones have shown to be useful in the preventive as well as curative measures for carcinogenesis. In the cytotoxicity assay, synthesized molecules showed cytotoxicity to breast cancer cells (MCF7) at 5 μ m concentrations and 50 % growth inhibition was observed in MTT assay indicating the potential of newly synthesized flavones in treatment of cancer (Figure 25d).

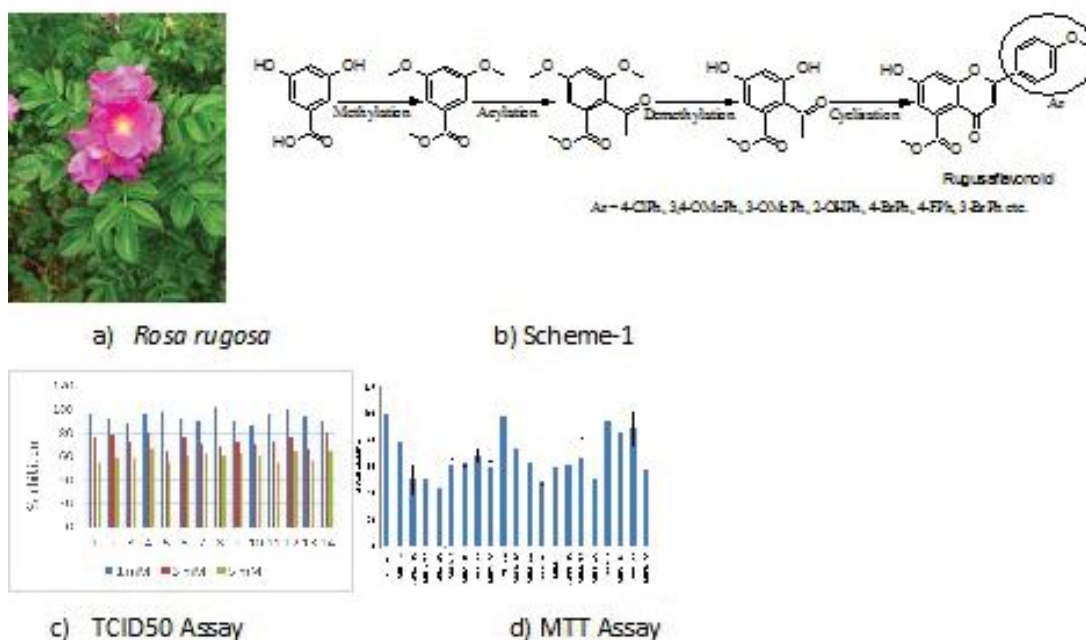
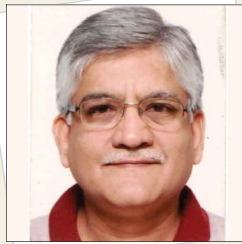


Figure 25

Naturally occurring molecule of Rugosaflavonoid. a) *Rosa rugosa* plant, b) Schematic representation of synthesis of Rugosaflavonoid and its derivatives, c) TCID50 assay pf CHIKV, d) MTT assay for anticancer activity

Developmental Biology Group

Scientists



Dr Surendra M Ghaskadbi



Dr Vidya G Patwardhan



Dr Anuradha Ratnaparkhi



Dr Sachin H Jadhav

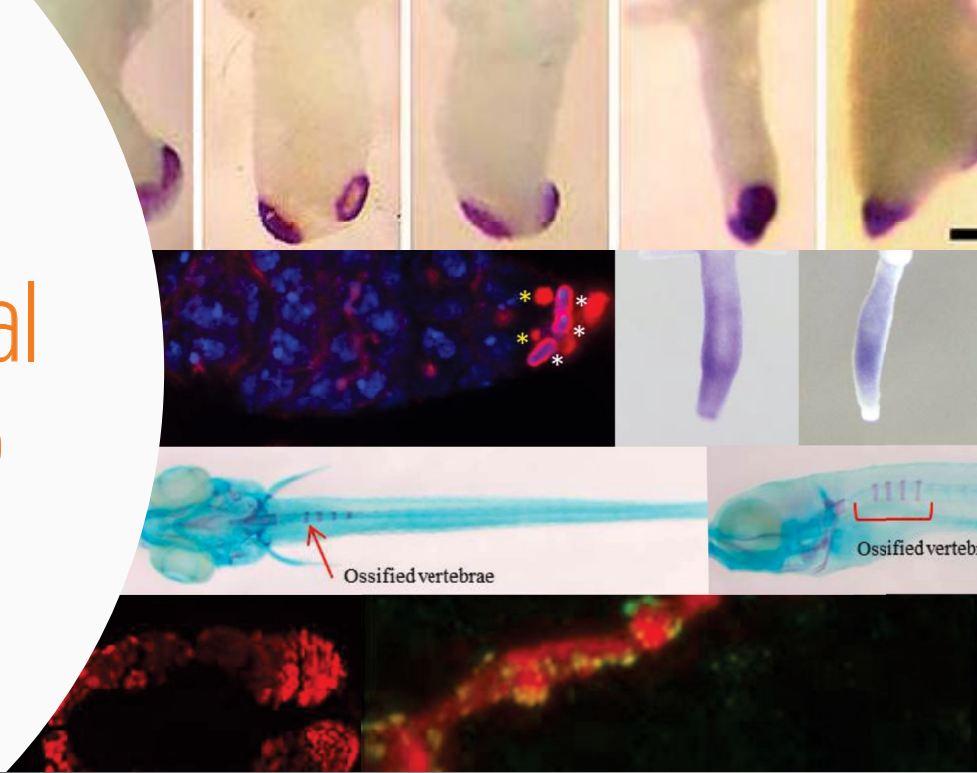


Dr Chinmoy Patra



Dr Bhupendra V Shrivage

Developmental Biology Group



Using the diploblastic cnidarian hydra, insect model *Drosophila* and a chordate zebrafish the Developmental Biology group is trying to understand the processes that shape organisms during embryonic development.

Areas of Research

Ectopic foot formation Synapses Autophagy

Connective tissue growth factor Cardiac endothelial cells

Hydra

UV induces ectopic foot in about 30 % of regenerating middle pieces of hydra (Figure 26). Metalloproteinases are important in foot formation and Wnt pathway genes in head formation. In UV irradiated whole polyps, Wnt pathway was activated as suggested by enhanced expression of β -catenin, with the concomitant upregulation of inhibitors of Wnt pathway, *DKK3* and *GSK3 β (Figure 27), similar to regenerating middle pieces. In whole polyps and regenerating middle pieces, UV irradiation caused up-regulation of *HMP2* and *HMMP*, the two metalloproteinases involved in foot formation in hydra. Q-PCR results show that in whole hydra *HMP2* expression was significantly increased starting from 30 min post exposure to UV at 254 nm (500 J/m^2) while *HMMP* was up-regulated from 6 h. In middle pieces, increased expression of both metalloproteinases was observed only 48 h post irradiation. In both, whole polyps and middle pieces, UV exposure induced higher expression of Wnt and β -catenin accompanied by up-regulation of *GSK3 β and *DKK3*. This probably leads to inactivation of Wnt signaling. We therefore conclude that ectopic foot formation in UV irradiated regenerating middle pieces of hydra is a combined effect of up-regulation of metalloproteinases and inactivation of Wnt pathway.**

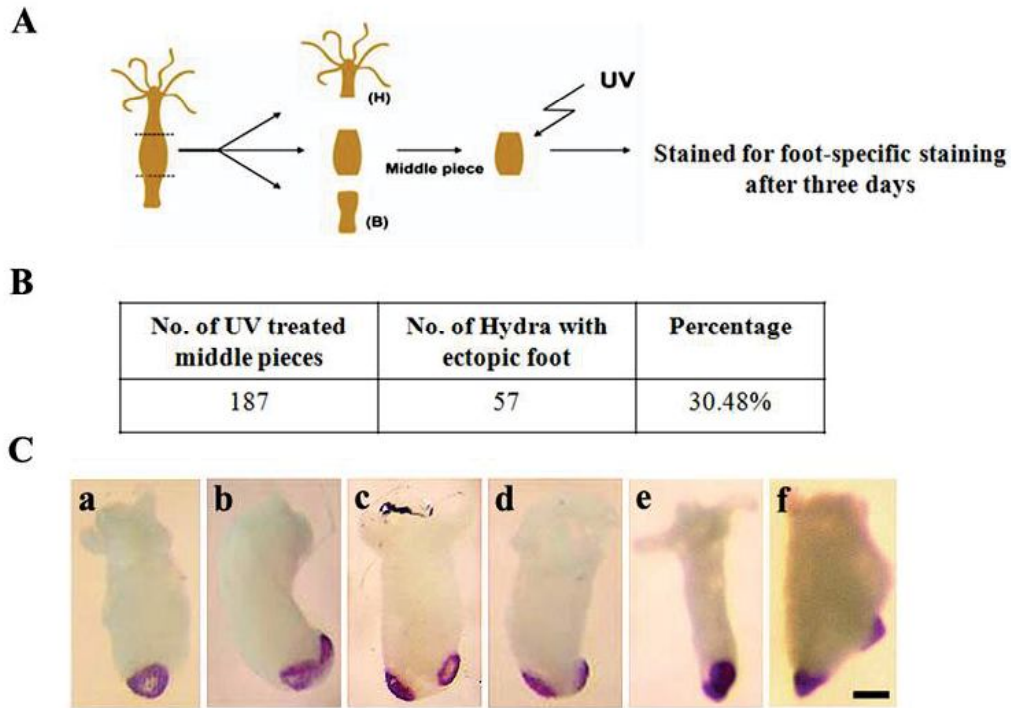


Figure 26

UV irradiation-induced ectopic foot formation in regenerating middle pieces of hydra

Middle pieces of hydra were irradiated with 500 J/m² UV at 254 nm and regeneration was monitored over a period of 3-4 days. (A) Schematic representation of trisection and irradiation of middle piece followed by foot-specific staining in the regenerates. (B) Quantification of UV irradiation-induced ectopic foot formation in the middle pieces. (C) UV irradiation-induced ectopic foot (b-f) as opposed to a single foot in unirradiated, control middle piece (a). (Scale bar, 200 μm)

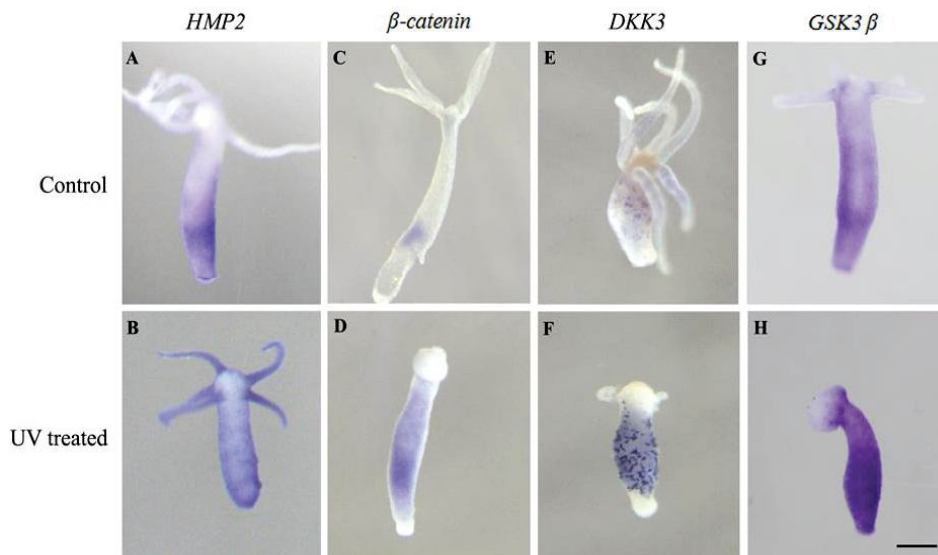


Figure 27

Localization of *HMP2*, β -*catenin*, *DKK3* and *GSK3* β in whole hydra using *in situ* hybridization

DIG labeled antisense probes were used for the detection of transcripts. Enhanced expression of *HMP2* (B), β -*catenin* (D), *DKK3* (F) and *GSK3* β (H) in UV irradiated hydra as compared to unirradiated controls (A, C, E and G) (Scale bar, 200 μm)

Drosophila

Development of a functional nervous system involves precise formation and maintenance of neuronal connections or synapses. Synapses are sites of neurotransmitter release and facilitate cell-cell communication within the nervous system. The *Drosophila* larval neuromuscular junction is used extensively as model system to understand synaptic development, function and maintenance. These synapses are glutamatergic, similar to those in the spinal cord of humans. Mechanisms that control post-synaptic receptor expression and trafficking to and from the synapse are poorly understood. We have identified *Drosophila mon1* as a novel player involved in regulating post-synaptic glutamate receptors levels. Mon1 is a highly conserved protein, whose function across model systems ranging from yeast to *Arabidopsis*, is to regulate the conversion of an early endosome, to a late endosome through recruitment of Rab7. At the neuromuscular junction, neuronal Mon1 is released from the presynaptic terminal. Loss of *mon1* in neurons leads to a significant increase in post-synaptic glutamate receptor levels independent of transcriptional up-regulation (Figure 28). Our results suggest that Mon1 functions transsynaptically to regulate glutamate receptor levels.

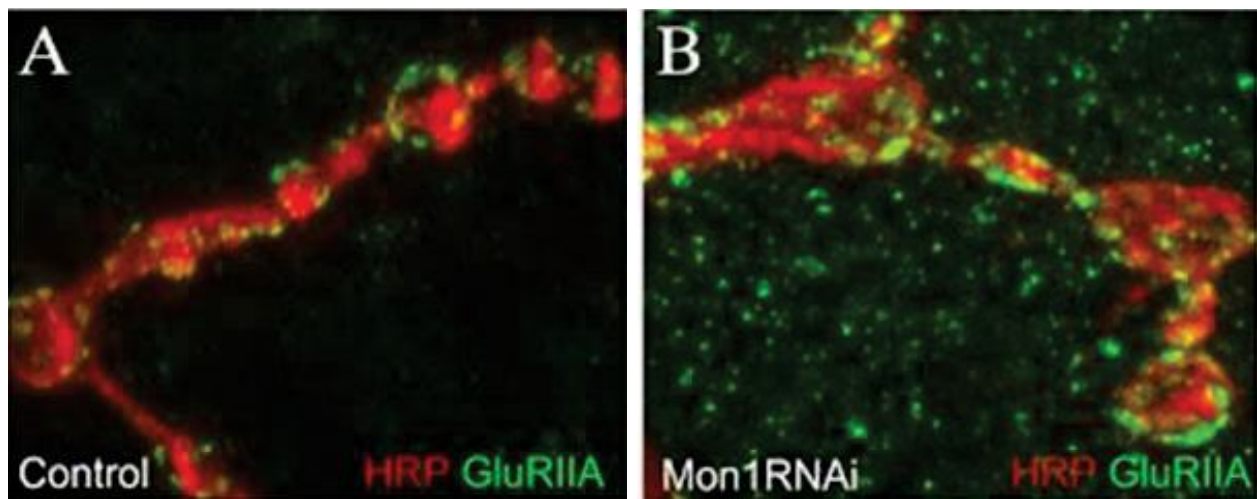


Figure 28

Knock down of neuronal *mon1* increases GluRIIA levels

(A) Control animal stained with anti-HRP (red) and Glutamate receptor subunit IIA (GluRIIA, green). Receptor expression is observed surrounding the presynaptic bouton (red). (B) Animal expressing *mon1* dsRNA in neurons. Increase in the size and intensity of GluRIIA expression is observed

To understand the role of autophagy in different physiological processes we use *Drosophila melanogaster* as a model. Starvation leads to transcriptional activation of several autophagy related (Atg) genes (Figure 29). Our objective is to identify the cis-regulatory elements and transcription factors that mediate the activation of Atg genes, in particular *Atg8a*. We have previously identified 2kb upstream promoter region of *Atg8a* that recapitulates *Atg8a* expression upon starvation *in-vivo*. A series of *Atg8a* promoter deletions constructs are currently being tested in starvation-induced autophagy assay to identify the minimal *Atg8a* promoter region. Using bioinformatics tools several known and putative transcription factors that regulate *Atg8a* expression have been identified.

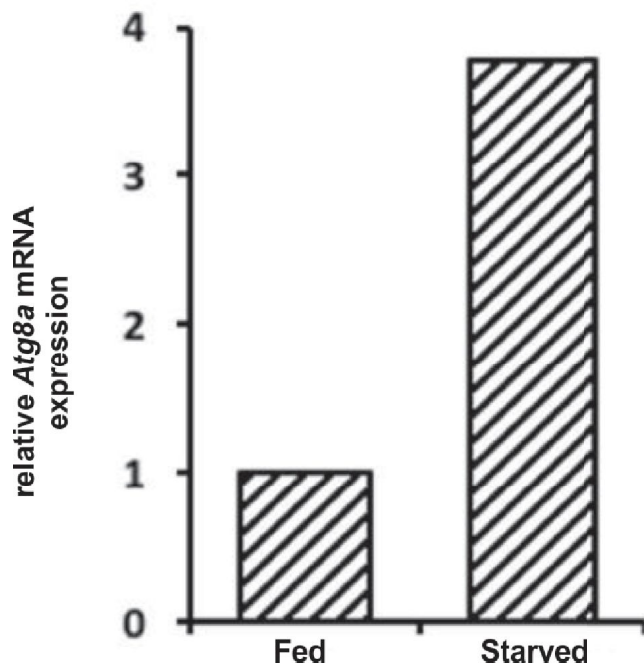


Figure 29

Relative abundance of *Atg8a* mRNA in fat body of fed vs starved *Drosophila* larvae. *Atg8a* expression is induced several fold upon starvation.

Female germ line stem cells (GSCs) (Figure 30) are being studied to elucidate the role of autophagy in their maintenance, differentiation and aging. We are screening for small molecules that have autophagy inducing activity as well as ability to disrupt AB aggregates leading to reversal of Alzheimer's disease (AD) phenotype in a *Drosophila* model of AD.

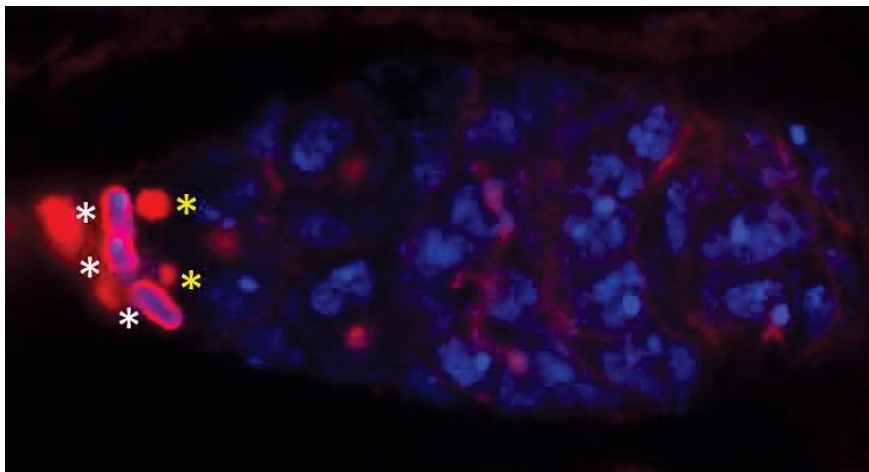


Figure 30

Female germline stem cells of *Drosophila*

Female gerarium of *Drosophila* showing niche cells (red circles surrounding blue nuclei) marked by white asterisks and germline stem cells (red dots associated with niche cells) marked with yellow asterisks

As a first step towards understanding the role of autophagy in regeneration in hydra, we have cloned and performed in silico characterization of *Atg12* and *Atg5* from hydra.

Zebrafish

During organ development and regeneration Connective Tissue Growth Factor (CTGF) interacts with ECM components and regulates growth factors and cell membrane receptors. We report the effect of the loss-of-function of CTGF during zebrafish development. Our data suggest (1) *ctgfa* is expressed in the muscle forming precursor cells from 12 hours post fertilization (hpf) to 30 hpf. However, in the matured somite *ctgf* does not express, (2) *ctgfa* mutants exhibit delayed ossification in vertebrae (Figure 31A, B), and (3) Skeletal muscle marker, 102 kDa protein is down regulated in *ctgfa* mutants (Figure 31C). In contrast, F59 positive superficial slow muscle cells were normal in distribution in *ctgfa* mutants (Figure 31D).

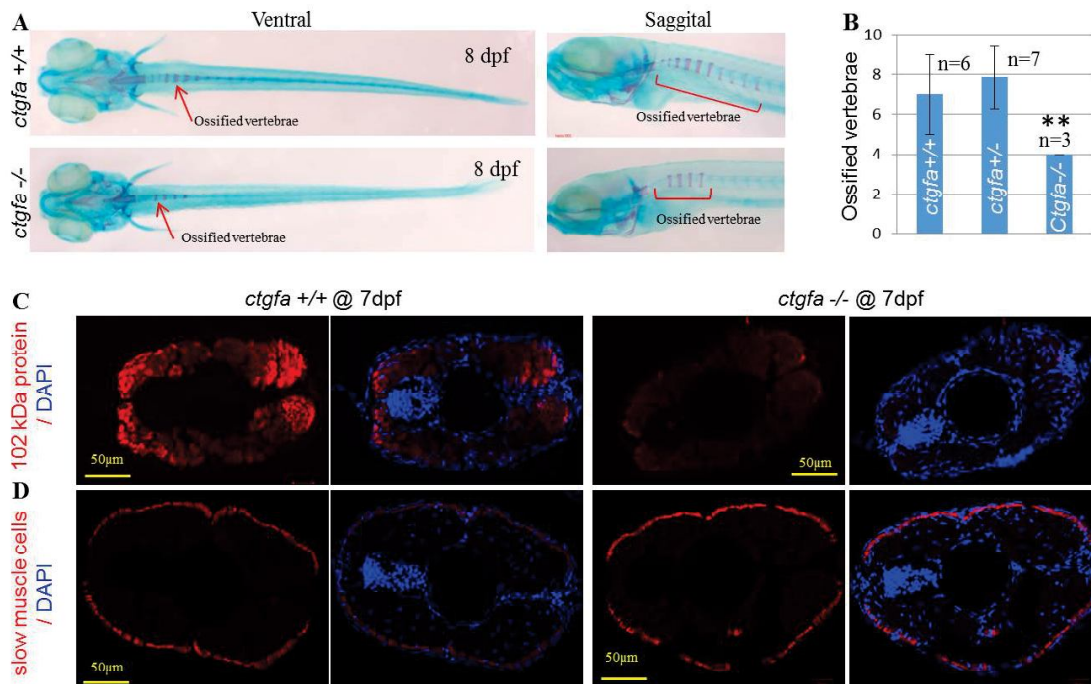


Figure 31

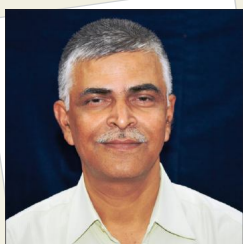
CTGFA is important for ossification and skeletal muscle maturation in zebrafish

(A) Alizarin red/ Alcian blue staining indicates the ossified bones (red) in the notochord of 7 dpf wild type and *ctgfa* mutant embryos. (B) Quantification of ossified vertebrae (mean±SEM). (C) Transverse sections through the trunk of 7 dpf wild type and *ctgfa* mutant embryo were stained with anti-Skeletal muscle marker, 102 kDa protein antibodies (skeletal muscle, red) and DAPI (nuclei, blue). (D) Transverse sections through the trunk of 7 dpf wild type and *ctgfa* mutant embryo were stained with slow muscle marker, F59 antibodies (slow muscle muscle, red) and DAPI (nuclei, blue)

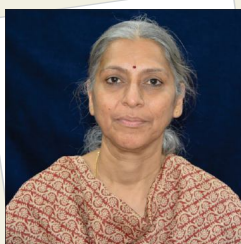
In another project, we investigated the distribution of cardiac endothelial cells (cECs) in adult mouse and zebrafish cardiac ventricles. Surprisingly, we find that (1) active coronary vessel growth is present in adult zebrafish, (2) in zebrafish, ~37 % and ~39 % cells are cECs and cardiomyocytes (CMs) respectively, a composition similar to that seen in mouse. However, we find that in zebrafish, around 36 % of the ventricular tissue is covered with ECs, i.e. more than 5 fold higher than in mouse. Capitalizing on the high abundance of cECs in zebrafish, we established a technique to isolate cECs, using fluorescent transgenic lines, with high purity. This approach circumvents the need for antibodies, a commonly used strategy in other systems that can influence the function of specific receptors on the isolated cells. Such primary cultures could be a useful tool for supplementary in vitro studies on the accumulating zebrafish mutant lines and the screening of small molecule libraries on cardiac specific endothelial cells.

Genetics and Plant Breeding Group

Scientists



Dr Sunil P Taware



Dr Shubhada A Tamhankar



Dr Balgounda K Honrao



Dr Manoj D Oak



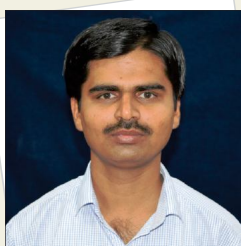
Dr Sujata P Tetali



Dr Philips Varghese



Dr Ravindra M Patil



Mr Santosh A Jaybhay



Mr Ajit M Chavan

Genetics and Plant Breeding Group



ARI is one of the leading centers for improvement of crops such as wheat, soybean and grapes under the All India Coordinated Research Projects funded by Indian Council of Agricultural Research, New Delhi. Genetics and Plant Breeding group is engaged in improving productivity and profitability of crops on an ecologically and economically sustainable basis.

Areas of Research

Crop biotechnology Improvement of wheat, soybean, grape varieties

Crop Biotechnology

Advances in genomics and transcriptomics have provided wealth of information about crop biology. Development of functional markers using this information is ongoing which may help in breeding next generation crop varieties

Improving grain protein content, gluten strength and yellow pigment content

Marker assisted breeding was undertaken for the improvement of grain protein content and gluten strength in the popular bread wheat varieties NI 5439 and MACS 2496 of peninsular region and grain protein and yellow pigment content in the durum wheat varieties MACS 3125 and HI 8498. Based on two years replicated trial data, promising lines for all the targeted traits have been identified. These selected lines will be included in coordinated multilocation trials during next rabi season. Three promising lines each for high grain protein content and yellow pigment content in the background of durum variety MACS 3125 have been included in initial plant pathological screening nursery (IPPSN) during rabi season of 2015-16 for disease resistance screening. Based on their performance, the selected lines will be included in coordinated marker assisted selection (MAS) trial during next rabi season.

Developing biotic stress resistant wheat varieties

Development of biotic stress resistant wheat varieties by incorporating leaf and stem rust resistance genes is also underway. For majority of the resistance genes, introgressed lines for respective genes are

being tested in field trials. Twenty-eight promising genotypes with leaf rust resistance genes *Lr24/Lr28/Lr34* in the background of Lok 1 have been included in augmented yield trial during the 2015-16 season.

Overcoming the sticky dough problem

The replacement of short arm of wheat 1B chromosome by short arm of rye 1R chromosome (1BL/1RS translocation) has been widely used around the world to enhance wheat yield potential, resistance to rust and mildew, and adaptation. Many popular Indian varieties also contain this translocation. The translocation is, however, associated with inherent quality problems associated with reduced dough strength and dough stickiness. To overcome sticky dough problem of 1BL/1RS (*Glu-B3-/Sec-1+*), removal of monomeric secalins and addition of polymeric glutenins by introgression of new 1BL/1RS (*Glu-B3+/Sec-1-*) translocation using marker assisted backcross breeding approach is underway.

Mapping of GA-sensitive dwarfing genes in durum wheat

Considering importance of GA-sensitive dwarfing genes in limited moisture conditions, mapping of these genes is in progress. For mapping of *Rht18*, recombinant inbred line (RIL) population developed from Bijaga yellow/ Icaro cross is being investigated. A major QTL for plant height (LOD 26.97; $R^2 = 65.62\%$) was observed in composite interval mapping (CIM) analysis spanning *Rht18* region on chromosome 6A. On the basis of QTL position and synteny information from rice, *gibberellin-2-oxidase-A9* (*TdGA2ox-A9*) was identified as a potential candidate for *Rht18* semi-dwarfism. *TdGA2ox-A9* specific marker showed perfect association with variation in plant height due to *Rht18*. Elevated expression of *TdGA2ox-A9* in peduncle of Icaro at head emergence stage supported its involvement in reducing plant height. *TdGA2ox-A9* may be modulating plant height by inactivating C20 GA precursors.

Mapping QTL/genes for resistance to spot blotch in durum wheat

Spot blotch caused by *Bipolaris sorokiniana* (Sacc.) Shoem is a major biotic stress to wheat in India causing up to 100 % yield loss under severe disease conditions. Breeding for resistance to spot blotch provides an economic and eco-friendly strategy to manage the disease. However, information on the genetics of spot blotch resistance is inadequate particularly in durum wheat. QTL mapping for spot blotch resistance is therefore undertaken in the RIL population developed from cross of Bijaga yellow (Susceptible) × MACS 3125 (Resistant). In marker analysis total 316 polymorphic markers were tested for bulk segregation analysis (BSA) and population was genotyped for 57 markers. Putative QTL for spot blotch resistance in durum wheat have been identified on chromosomes 1BL, 2BL and 3AS.

Wheat Improvement

Promising wheat entries

Based on the performance under coordinated trials in different zones, wheat entry MACS 3949 (*Triticum durum*) was in the final year testing under irrigated timely sown condition in Peninsular zone during 2015-16 season. This entry was significantly superior over the best check - UAS 428. The yield gain was 9.2 % in NIVT 4 and 5.50 % in AVT 1st year. MACS 3949 is resistant to both brown and black rust under artificial condition and it has bold and lustrous grain with 1000 grain weight 49 g and the highest yield potential of 60.6 q/ha with mean yield 46 q/ha.

Two entries MACS 4028(d) (AVT-RF-TS-TAD) and MACS 6066(a) (AVT-RI-TS-TAD) were promoted to advance varietal trials in Peninsular Zone during 2015-16 season. Both entries yielded significantly superior over the best check. The yield gain over the best check was 25.82 % and 19.29 %, respectively.

Multilocational germplasm evaluation under Consortium Research Programme (CRP) in agro-biodiversity

1542 cultures were evaluated under Consortium Research Programme (CRP) in agro-biodiversity. Pathological observations were recorded for leaf rust and stem rust. A total of 613 cultures were resistant and 304 moderately resistant to black rust, while 34 were resistant and 370 moderately resistant to brown rust. Overall, 245 cultures were resistant to both leaf and stem rusts (Figure 32).



Figure 32

Multilocational germplasm evaluation under Consortium Research Programme (CRP) on agro-biodiversity of wheat germplasm

Wheat frontline demonstrations (FLDs) on farmers' fields

Latest wheat varieties MACS 6478(a), MACS 6222(a), MACS 2971(dicc) and HW 1098(dicc) with improved technology showed 19.9 % increase in yield over local checks. During this season ten FLDs have been conducted in two clusters at Hol and Songaon, Taluka Baramati, District Pune using MACS 6478(a) and HW 1098(dicc) as new improved varieties with RAJ 4037, HD 2189, Gold-23 and DDK 1029 as popular checks (Figure 33).

Figure 33

Frontline demonstrations



Breeder seed programme

During 2015-16 season 155 quintals of breeder seed was supplied to different seed multiplying agencies and farmers. Breeder seed production of MACS wheat varieties was undertaken at Hol and Songaon farm on 6.8 ha and 215 quintals (pre-processing) seed is produced for 2016-17 season (Figure 34).



Figure 34

Breeder seed production

Public-Private Partnership (PPP)

Thirty wheat Choupal Pradarshan Khets (CPKs) of MACS 6222 (15) and MACS 6478 (15) were conducted in Maharashtra and Karnataka along with ITC. This will help in speedy spread of new varieties/ technologies. Data of last season showed that MACS wheat varieties were superior in performance over check varieties in all respects and performed very well even under 2-3 irrigations.

Exploiting wheat alien introgressions for increased photosynthetic productivity in contrasting environmental conditions under different nitrogen treatments (BBSRC)

Screening of new amphidiploids and 30 Indian genotypes was being done by using various physiological instruments in breeding (Figure 35). These techniques have been used to screen for desirable traits in an amphidiploid population for increasing nitrogen use efficiency and photosynthetic efficiency in wheat. An infra-red gas analyzer LI-COR 6400 XT was used to assess the photosynthetic capacity within the amphidiploids. Measurements Amax (maximum photosynthetic capacity), ACi curves and Light response curves were noted. These rapid screen techniques are used to screen the amphidiploids and 30 Indian genotypes that demonstrated higher photosynthetic capacity under different nitrogen treatments. After analysis it could be inferred that the Indian genotypes showed improved photosynthetic capacity compared to the amphidiploids under high irradiation, i.e. 2000 PAR. However, within the amphidiploid population there were three varieties which were comparatively better. Thus, in future, few Indian genotypes that demonstrated higher photosynthesis can be used for breeding with the amphidiploids.



Figure 35

Visit of BBSRC scientists

Indo-Australian project on root and establishment traits for greater water use efficiency in wheat

On the basis of yield data, five high yielding and five low yielding genotypes along with two Indian checks were selected for root analysis and root coring was performed in hill experiment trial. Eight genotypes in which root coring has been carried out in this year were found similar to that of in previous year and confirmed their superiority over the other genotypes based on yield data.

Soybean Improvement

Soybean varieties show high yield in AVTs

Two soybean varieties MACS 1370 and MACS 1460 showed the best yield performance in North Eastern Zone in Advanced Varietal Trial-II (AVT-II - the final year testing of All India Co-ordinated trials) and in AVT-I

(2nd year of testing), respectively. MACS 1370 gave the highest average yield of 1878 kg/ha in the trials conducted for last three years at six centres in North Eastern Zone. Likewise, MACS 1410 showed better yield (2182 kg/ha) than the checks and was the earliest maturing (91 days) variety in the trials conducted for last three years at seven centres in the Southern zone.

Soybean varieties show high yield in IVTs

In the yield evaluation trials MACS 1410, MACS 1442 and MACS 1460 performed significantly better than the highest yielding check variety RKS 18. MACS 1410 (88 days) and MACS 1460 (84 days) were also the earliest maturing varieties in respective trials. In the Initial Varietal Trial (IVT) conducted at Hol Farm MACS 1488 gave significantly highest yield (4375 kg/ha).

Station trials for soybean improvement

Eighty-one elite breeding lines were developed and tested in three graded replicated trials. Of these, 13 lines gave significantly more yield than the highest yielding control variety of the respective trial.

Agronomy and sowing dates

In sowing dates experiment, average seed yield of five AVT-II varieties tested was significantly reduced by 20 % when the sowing was delayed by 20 days after normal sowing date. In foliar nutrition trial, treatment with recommended fertilizer dose (RDF) supplemented with foliar spray of 2 % di-ammonium phosphate (DAP) at pod initiation stage (3509 kg/ha) enhanced the seed yield by 16 % over RDF only (3030 kg/ha).

Resistant varieties

Three soybean varieties MACS 1370, MACS 1407 and MACS 1410 showed multiple disease resistance across zones. Likewise, on the basis of four years data MACS 1336 was identified as donor for resistance to charcoal rot disease.

On the basis of last three years data, two soybean varieties MACS 1370 and MACS 1410 were identified for resistance against three major insect pests viz. stem fly, girdle beetle and leaf miner.

Breeder seed production

A total of 189.90 quintals of breeder seed of soybean was supplied to public and private seed multiplying agencies and farmers. Likewise, 226.80 quintals of breeder seed of soybean has been produced during kharif 2015 season.

Improved technology scores over farmers practice

Twenty FLDs were conducted on farmers' fields in Taluka Baramati, District Pune and Taluka Phaltan, District Satara to demonstrate and evaluate the impact of improved technology (IT) over farmer's practice (FP) using three soybean varieties MACS 1281, MACS 1188 and RKS 18 (Figure 36). Adoption of IT increased soybean yield by 13.12 % over FP and gave additional net returns of Rs. 8197 per hectare.

Public-Private Partnership (PPP)

Demonstrations of recently developed soybean varieties MACS 1188 and MACS 1281 were conducted by ITC under PPP mode to popularize the varieties among farmers through Choupal Pradarshan Khet (CPK). This year, in spite of low yields in the CPKs due to adverse climatic conditions the farmers have appreciated the possible high yield of MACS varieties due to their good plant features.



Figure 36

Frontline demonstrations

Grape Improvement

Grape cultivars yield well

Fifty-nine cultivars of *Vitis* were evaluated for six phenological and 13 different berry characters. Highest significant yield (9.162 kg/vine) as well as bunch weight (763.5 g) was recorded in Cheemasahabi. Anab-e-shahi performed well with respect to characters like yield/plant (6.986 kg/plant), bunch weight (332.7 g), 100 berry weight (409 g) and berry size. Sharad Seedless and Madhoo angur also showed significantly higher performance for yield per plant as well as bunch weight.

Grapes for table purpose

In the hybridization programme, twenty-six cross combinations were attempted using 14 female and 4 seedless male parents to incorporate desirable fruit characters and disease resistance. Fifty-five hybrids were evaluated for their fruit quality. ARI-334 [H-246 (Catawba x Anab-e-Shahi) x Tas-A-Ganesh)], ARI-1308 (James x Kishmish belli) produced seedless berries with high TSS (200 B) which could be used for table purpose.

Mutation breeding for seedlessness

ARI-516 is a high yielding, seeded hybrid having musky flavoured juice. To identify and select disease resistant mutant plants having seedless berries in ARI-516, a strategy of mutation breeding using different doses of physical and chemical mutagens was used in 2012 and 2013. Out of total 670 cuttings one plant which was exposed to 3 kr dose of gamma radiations produced seedless berries in the current year. Seedlessness will be confirmed and other quality parameters will be evaluated in the next year.

Nanobioscience Group

Scientists



Dr Kishore M Paknikar



Dr Jyutika M Rajwade



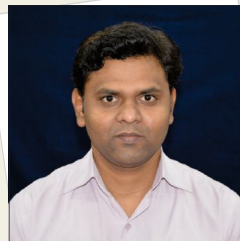
Dr Dhananjay S Bodas



Dr Vandana Ghormade



Dr Rinku D Umrani

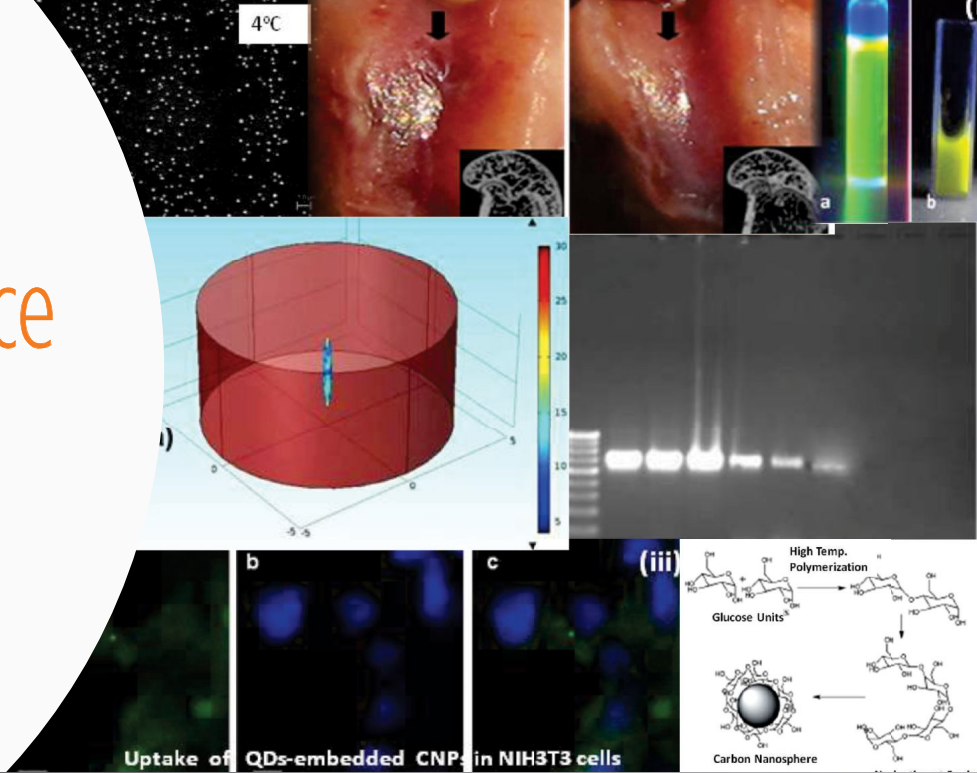


Dr Virendra A Gajbhiye



Dr Yogesh A Karpe

Nanobiotechnology Group



Areas of Research

The Nanobiotechnology group focusses on understanding the formation of nanomaterials, customizing the size of nanoparticles using microreactors, nanomedicine, and applications of nanotechnology in diagnostics.

Carbon nanospheres

Bioactivity

Human fungal pathogens

Cancer

Osteochondral defects

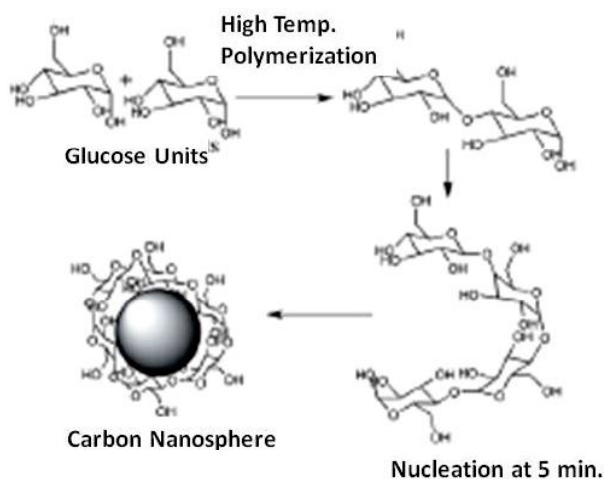
Aquaculture industry

Diabetes

Salmonella phage diversity

Carbon nanospheres - How are they formed?

Carbon nanospheres have intrinsic fluorescence and biocompatibility. Our earlier studies have proved the utility of carbon nanospheres for the nuclear delivery of a peptide and as an imaging agent for visualization of tumors.



Our present study elucidates that during hydrothermal synthesis, formation of carbon nanospheres is initiated by the creation of nuclei by polymerization of glucose units into curved oligomer chains, ultimately leading to the formation of efficient compact nuclear structure (Figure 37).

Figure 37

Scheme depicting the formation of carbon nanospheres

We have shown for the first time that the growth of nanoparticles is rather rapid, occurs within 5-15 minutes and nucleation cannot be separated from the growth phase of nanoparticles.

The mechanism is rather continuous where one nucleus grows into a sphere and at the same time during the growth phase of the first, nucleation for the second occurs. The nanospheres thus formed bear carboxyl groups on the surface. The size of nanospheres so formed is 200–2000 nm, depending on the reaction time and glucose concentration.

Monodisperse nanoparticles synthesis and bioactivity enhancement

Polymeric nanoparticles are of great scientific interest but show a high degree of polydispersity with respect to their size. For specific applications which are highly size dependent, monodispersity is a desirable characteristic. Hence, it was hypothesized that confining the reaction volume with precise control over the reaction parameters would lead to synthesis of monodisperse nanoparticles.

Typically a reaction such as synthesis of chitosan nanoparticles is completed within 20-60 minutes but we achieved the same in 5 seconds in a microreactor. Concentration of reactants, reaction temperature and time were found to determine the size of nanoparticles (Figure 38).

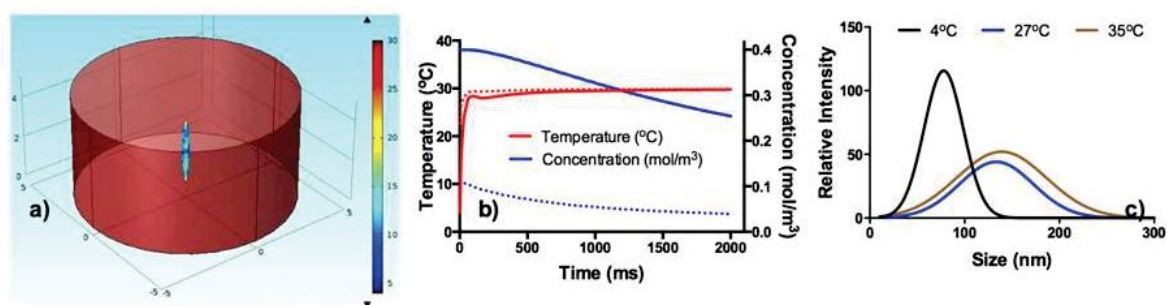


Figure 38

a) Simulation model of the droplet and the surrounding medium. b) Simulation profile showing the variation of temperature and reactant concentration as a function of time. Dotted and continuous line represent temperature and concentration at the droplet periphery and the core respectively; c) Effect of temperature on the size distribution of chitosan nanoparticles (chitosan concentration used 0.4 mg/mL)

To synthesize large quantity of monodisperse nanoparticles we designed and fabricated a microreactor which can carry out confined reactions and can be operated in a continuous flow mode. With extreme control on the reaction parameters we are able to synthesize chitosan nanoparticles of any given size ranging from 50 to 600 nm with <10 % deviation in their size (Figure 39). These particles were successfully loaded with antifungal drugs and they showed promising bioactivity.

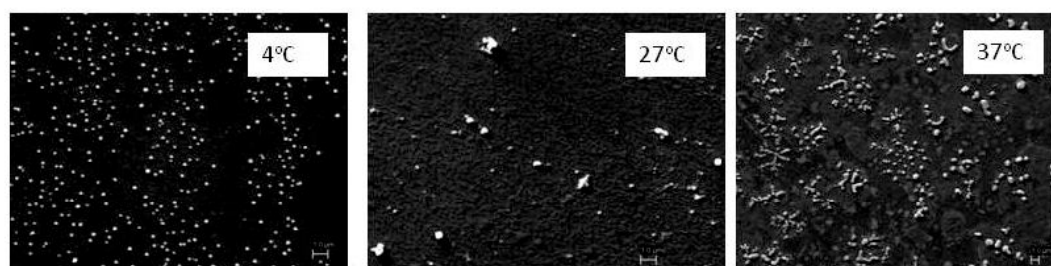


Figure 39

Monodisperse chitosan nanoparticles formed in microreactor at 4 °C

Effective control of human fungal pathogen by chitosan nanoparticles

Biocompatible chitosan nanoparticles (CNPs) are multitasking as they display the ability to entrap a variety of substances such as drug or quantum dots (QDs) due to their cationic nature.

Cadmium telluride quantum dots (CdTe QDs) display great potential as fluorescent labels for bioimaging, but are hampered due to their high cytotoxicity. In order to improve their biocompatibility, CdTe QDs, as fluorescent labels, were embedded electrostatically into chitosan nanoparticles by a facile green synthetic method. The formation of these composites was confirmed by high resolution transmission electron microscopy, thermogravimetry and Fourier transform infrared spectroscopy.

QDs-embedded CNPs exposed NIH3T3 mouse fibroblast cells showed increased viability and better internalization compared to bare QDs. Such stable, luminescent, biocompatible CdTe QDs-embedded CNPs with a favorable toxicity profile and better cellular uptake have potential applications in bioimaging and targeted detection of cellular components (Figure 40). Biocompatible chitosan nanoparticles are promising drug delivery vehicles provided they display a homogenous size distribution that controls their drug loading capacity. Monodisperse chitosan nanoparticles synthesized in microreactor exhibited high Amphotericin entrapment and effective antifungal activity against the human fungal pathogen *Candida albicans*.

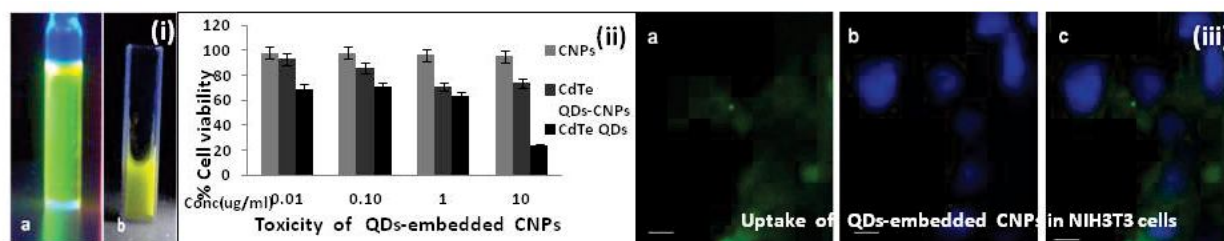


Figure 40

CdTe QDs embedded chitosan nanoparticles (CNPs) for bioimaging (i) fluorescence of QDs and QDs embedded in CNPs (ii) Toxicity of bare and embedded QDs with NIH3T3 cells (iii) internalization of QDs-embedded CNPs in NIH3T3 cells

Treating cancer by radiofrequency-induced hyperthermia

Hyperthermia refers to a treatment procedure in which body temperature is increased to a few degrees above physiological temperature, between approximately 41°C and 47°C. These high temperatures can kill cancerous cells selectively because of the fact that cancerous cells are more thermosensitive than normal cells. Although attractive, lack of local and uniform heating in the tumor region remains a major concern in case of 'hyperthermia' as a modality in treatment of cancers.

Radiofrequency (RF)-induced hyperthermia mediated by magnetic nanoparticles is a promising strategy for the treatment of cancer. This is primarily due to the fact that once deposited in tumors magnetic nanoparticles can cause efficient heating at low RF field (100–400 kHz) thereby minimizing nonspecific heating of healthy tissues.

The present study demonstrated excellent therapeutic efficacy of Dex-LSMO-mediated hyperthermia in melanoma cells in vitro. RF-induced hyperthermia caused decrease in cell viability (Figure 41), enhanced apoptosis, and induced HSP expression in a time-dependent and temperature-dependent manner. Expression of HSP's indicates that RF-induced Dex-LSMO-mediated hyperthermia may also cause immunogenicity and result in tumor regression.

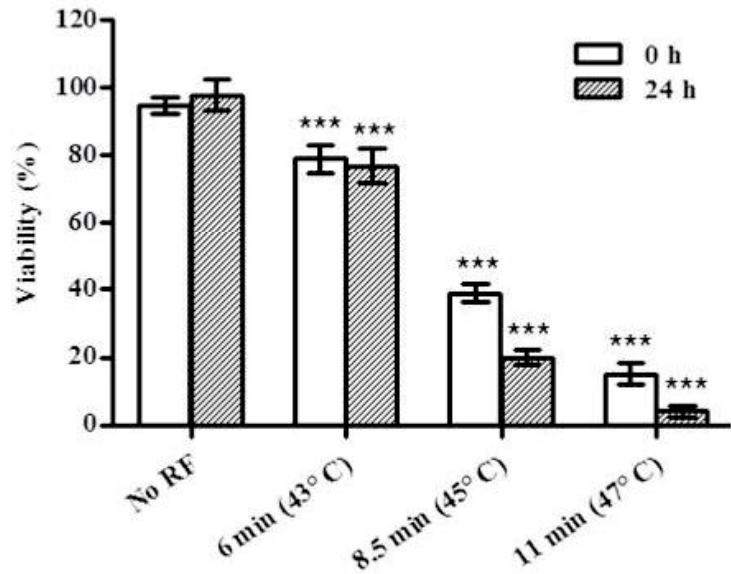


Figure 41

Viability of B16F1 cells at 0 hours and 24 hours after a single cycle of RF-induced Dex-LSMO-mediated hyperthermia

Nanocomposite scaffolds to handle joint pain

Treating osteochondral defects using tissue engineering is challenging because of inherent tissue complexity. The scaffold in particular has to mimic both cartilage and the underlying subchondral bone. To address this issue, we modified bacterial cellulose (BC), a natural nanoscale material obtained from *Komagataeibacter hansenii* MCM B-967. Novel nanocomposite scaffolds BC hydroxyapatite (HA) and BC glycosaminoglycans (GAG) were developed to mimic the bone and cartilage, respectively. In vitro biocompatibility was proved using osteoblasts and chondrocytes. In vivo subcutaneous implantation studies in Wistar rats indicated no inflammatory response as evidenced by histology and expression of TNF- α and IL-1.

The potential of the nanocomposite scaffolds in the treatment of critical sized osteochondral knee defects in Wistar rats was assessed. After implantation (1 month) histological and immunohistochemical studies revealed characteristic features such as hyaline-like neocartilage layer with good surface regularity, integration with the adjacent host cartilage and a regenerated subchondral bone. By 3 months, the regenerated osteochondral tissue resembled closely to age-matched un-operated control. The microcomputed tomography data also support the above findings (Figure 42). The results indicate migration of autologous cells into the defect site, their ability to sense the biological cues spatially presented in the novel BC-GAG and BC-HA scaffolds and subsequent differentiation into the appropriate cell lineage. The strategy has a real translational potential for repairing osteochondral defects in humans.

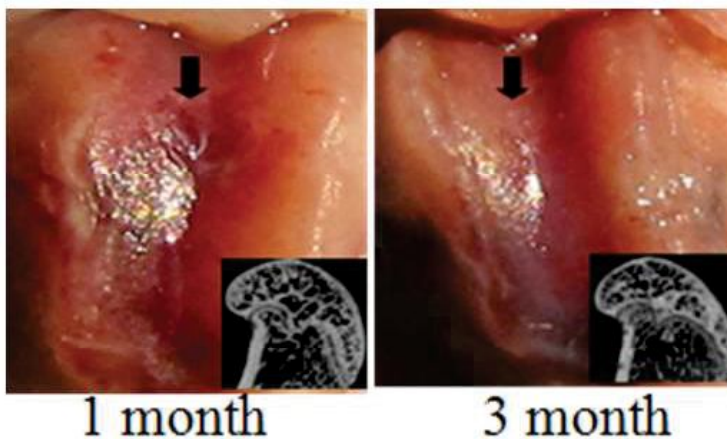


Figure 42

Bacterial cellulose based nanocomposites heal critical size osteochondral defects (inset microcomputed tomography of implant region)

Good news for the aquaculture industry

Indian prawn and shrimp farming is susceptible to a wide range of viral pathogens. Infections result in severe economic losses to the aquaculture industry. We have developed an immunochromatographic assay for the detection of white spot syndrome virus (WSSV). The detection system employs polyclonal anti-WSSV serum conjugated with gold nanoparticles that aid the visual detection (Figure 43). The assay is specific as evidenced by no reactivity with other viruses (MBV, HPV and IHNV) that are known to infect shrimp. The immunoassay based detection of WSSV is not equipment intensive and does not require skilled personnel. With lateral flow assay (LFA) results comparable to single step PCR, and the fact that read-out time of LFA is less than 20 minutes, the assay can be used by fish farmers and hatchery operators to screen brooders and seed; monitoring of stock on farm site and also for disease surveillance. The results of field testing are highly encouraging.

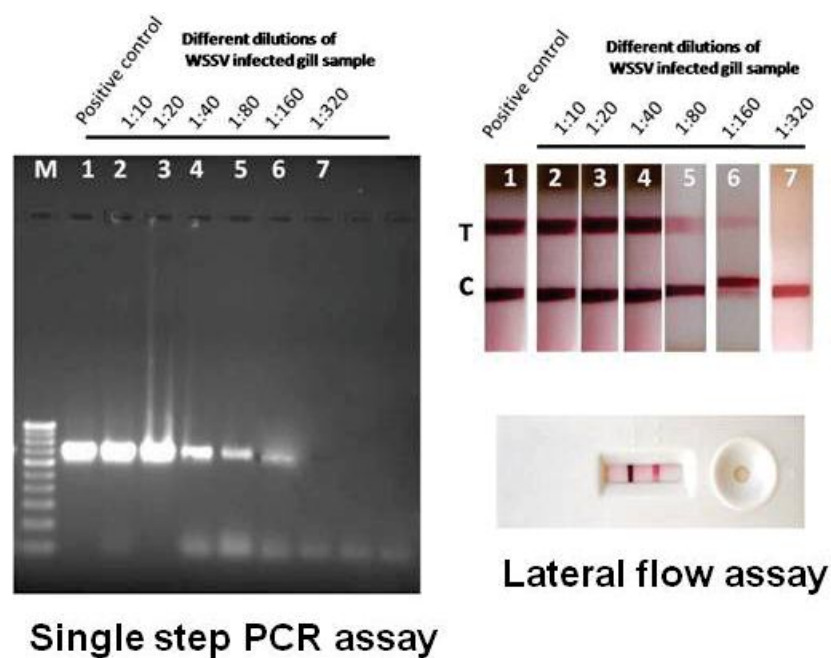


Figure 43

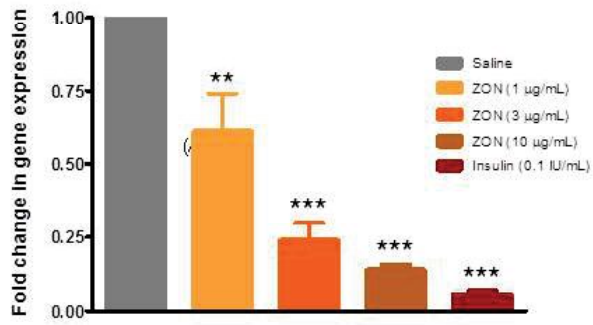
Comparison of the lateral flow immunoassay and single step PCR for detection of WSSV

ZON to treat diabetes

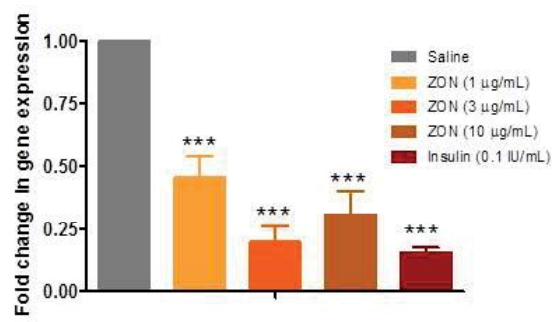
Zinc is an essential micronutrient with marked effects on glucose metabolism. Zinc levels are negatively correlated with diabetes and supplementation studies have revealed beneficial effects on blood glucose levels.

We evaluated ZON as a novel oral agent for the treatment of diabetes. Earlier in vivo studies revealed that ZON reduced fed and fasted blood glucose levels in diabetic rats. It is known that gluconeogenesis is a major pathway contributing to hepatic glucose output in the fasted condition. Therefore, studies on G-6-Pase and PEPCK gene expression (rate limiting enzymes of gluconeogenesis) were carried out. It was found that ZON treatment to HepG2 cells significantly reduced G-6-Pase and PEPCK gene expression, similar to insulin (used as a positive control) (Figure 44). These results suggest that treatment with ZON can suppress gluconeogenesis, thereby lowering fasted blood glucose levels.

(A)



(B)

**Figure 44**

Quantitative real time PCR gene expression analysis of gluconeogenesis enzymes. Fold change in G-6-Pase (A) and PEPCK (B) gene expression after treatment with ZON or insulin

Annexure



Repositories

Agharkar Herbarium at MACS (AHMA)

The herbarium was rearranged for 150 families of dicots in light of updated family concepts and nomenclature. Online herbarium database was updated. Additionally, 4090 herbarium specimens were scanned for incorporating in the database.

Ajrekar Mycological Herbarium (AMH)

The herbarium holds 9764 exsiccatae specimens including specimens received from different centers in India for deposit and accession.

Animal House

Central Animal Facility (CAF) at ARI was established in 1999 to provide laboratory animals of required specifications for research projects. The CAF is registered with Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). The major responsibility of this facility is to provide quality animals for research. Routine genetic monitoring and biochemical monitoring of laboratory animals are carried out using microsatellite SSLP and biochemical markers.

Crude drug repository

Crude drug repository hosts 1,103 specimens {1071 plant originated (1046 organized and 25 unorganized), 20 animal originated, 12 mineral originated} of plant parts used as/in medicine, collected from field and or market.

Fossil Repository

Fossil repository hosts 7970 specimens of animal and plant fossils. These include ammonoidea, bivalvia, gastropoda, bryozoa, echinoidea, foraminifera, trace fossils, intertrappean fish, plant fossils, pollens and spores collected from various localities from Peninsular India. The repository was enriched this year by the addition of 75 trace fossil specimens from Western Kutch, Gujarat, of early Cenozoic age (65 - 35 Myr).

MACS Collection of Microorganisms (MCM)

Specialized cultures of microorganisms used in various processes are being maintained in active form and supplied to researchers on demand. The specialized cultures include standard reference cultures, cultures used in metal-microbe interactions and industrial waste treatment, extremophiles such as halophilic, thermophilic and methanogenic archaea and alkaliphilic cultures.

Nation Fungal Culture Collection of India (NFCCI -WDCM 932) National Facility

As a part of the conservation of fungal diversity, live, pure and authenticated cultures of 270 interesting fungi received from various organizations in India were deposited and accessioned. The total accession of NFCCI comes to 3979. The fungal germplasm is being maintained in culture collection by following standard long-term preservation methods like freeze drying, distilled water, glycerol and liquid nitrogen. A total 123 authentic fungal strains were supplied to various academia, research institution, and industry.

Library and Information Centre (LIC)

The library and information centre is a part of a CSIR-DST consortium known as the national knowledge resource consortium. Online full text access has been provided to several international e-journals, resources as well as to bibliographical databases like web of science, SCOPUS, etc. The detailed information about various activities and services of LIC is available on the institute's website www.ari pune.org. The kiosk information system has been installed to provide access to Web OPAC and other resources. The LIC maintains the website of the institution. The current holdings of LIC are as follows:

Particulars	Total	Particulars	Total
Books/Bound volumes	27193	Maps and Atlases	562
Reference Books	1112	Microfilms/ Fisches	636
Ph.D. Thesis	309	Annual Report	484
M.Sc./ M.Phil. Thesis	97	Journals	133
ARI Reprints	3215	Digital Collection/ Documents	3060

Services Rendered/Offered

Crude Drug Authentication Service

ARI has been rendering the Authentication Service of identification/authentication of crude drug samples/specimens for academic as well as industrial purposes. A report total 275 authentication reports were generated of which 24 were for industries.

Fungal Identification Service of NFCCI

570 fungal cultures, other samples received from academic, research institutions and industry were authenticated/identified. As such, 193 centers including 177 academic and research institutions, and 16 private centers in India benefited from its various services.

Technical services

Headspace CO₂ analysis for Intox, Pune

Analysis of bioreactor effluent samples for Noble Exchange, NCL Innovation Park, Pune

Biodegradability testing of samples for Polychem Industries, Pune

Biogas analysis for various industries and colleges/institutes.

Indian Patent applications

Patent	Details	Inventors
Microchip based portable real time polymerase chain reactor	E1/2763/2016/MUM	D Bodas and KM Paknikar
Cell proliferative agent comprising nanoparticles and compositions thereof	E-2/375/2016/MUM	RD Umrani and KM Paknikar

Research papers/Monographs/Book Chapters/ Bulletins/Booklets

Monographs/Books

Datar MN and Upadhye AS. 2016. Forest Foods of Northern Western Ghats. MACS-Agharkar Research Institute. ISBN: 978-93-85735-10-3

Chapters in Books, Proceedings

Prashant R, Mani E, Rai R, Gupta K, Tiwari R, Oak M, Kadoo N and Gupta V. Complex G × E interactions and QTL clusters govern end-use quality traits in hexaploid wheat. In: Advances in Wheat Genetics: From Genome to Field, Proceedings of the 12th International Wheat Genetics Symposium, Eds. Y. Ogihara et al., DOI 10.1007/978-4-431-55675-633/pp. 293-299

Jadhav R, Datar MN and Upadhye AS. 2015. Wild relatives of crop plants from Northern Western Ghats of Maharashtra: Diversity and distribution. In: Advances in Plant Sciences and Biotechnology, Eds. Krishnan and Rodrigues, Goa University. ISBN: 978-81-908791-4-9/pp.17-27

Gorade P and Datar MN. 2015. Protected grasslands of Maharashtra: Diversity, productivity, threats and conservation. In: Advances in Plant Sciences and Biotechnology. Eds. Krishnan S and Rodrigues BF, Goa University. ISBN: 978-81-908791-4-9/pp. 1-9

Honkalas V, Dabir A and Dhakephalkar PK. 2015. Life in anoxic sub-seafloor environment: Linking microbial metabolism and megareserves of methane hydrate. In: Advances in Biotechnology, Advances in Biochemical Engineering/ Biotechnology, Eds. Rajni Hatti-Kaul, Gashaw Mamo, Bo Mattiasson)/In Press

Popular Article in Marathi

Chavan AM and Honrao BK. Gahu utpadakata vadhisathi tips. Sakal-Agrowon (Rabi special), October 2015

Bankar DN, Surve VD, Gite VD and Bagwan JH. Gahu lagwadiche sudharit tantra, Sakal- Pragati, November 2015

Tetali S, Karkamkar SP and Phalake SV. Draksha rasasathi ek uttam vaan ARI-516, Draksha vrutta smaranika, 55: 95-96, 2015

Research Papers in SCI Journals

Bach TT, Quang BH, Choudhary RK, Hai DV, Diep TT and Lee J. 2015. *Prismatomeris fragrans* E.T. Geddes (Rubiaceae)- a new record for the flora of Vietnam. Bangladesh Journal Plant Taxonomy, 22(2):147-149 (Impact Factor: 0.696)

Bhagat PN, Patil KR, Bodas DS and Paknikar KM. 2015. Hydrothermal synthesis and characterization of carbon nanospheres: a mechanistic insight. RSC Advances, 5:59491-59494(Impact Factor: 3.84)

- Chakrabarty P, Rana S, Bandopadhyay S, Naik DG, Sarkar S and Basu P. 2015. Field populations of native Indian honey bees from pesticide intensive agricultural landscape show signs of impaired olfaction. *Scientific Reports*, 27:12504 (Impact factor: 5.578)
- Chakraborty D, Das K, Baghela A, Singh SK and Dentinger BTM. 2015. *Boletus recapitulatus* (Boletaceae), a new species from India with peculiar mushroom-shaped cells. *Phytotaxa*, 236(2):150-160 (Impact Factor: 1.318)
- Chhabra H, Kumbhar J, Rajwade J, Jadhav S, Paknikar KM, Jadhav S and Bellare JR. 2016. Three-dimensional scaffold of gelatin-poly (methyl vinyl ether-alt-maleic anhydride) for regenerative medicine: Proliferation and differentiation of mesenchymal stem cells. *Journal of Bioactive and Compatible Polymers*, DOI:10.1177/0883911515617491 (Impact Factor : 2.352)
- Dangi R, Tamhankar S, Choudhary RK and Rao S. 2016. Molecular phylogenetics and systematics of *Trigonella L.* (Fabaceae) based on nuclear ribosomal ITS and chloroplast trnL intron sequences. *Genetic Resource Crop Evolution*, 63(1):79-96 (Impact Factor: 1.461)
- Das K, Chakraborty D, Baghela A, Singh SK and Dentinger TM. 2015. *Boletus lakhanpalii*, a new species in Boletaceae from Sikkim (India) with uncertain phylogenetic placement. *Sydowia*, 67:11-19 (Impact Factor: 1.021)
- Das K, Hofstetter V, Chakraborty D, Baghela A, Singh SK and Buyck B. 2015. *Cantharellus sikkimensis* sp. nov. (Cantharellales, Agaricomycetes) from the Indian Himalayas. *Phytotaxa*, 222(4):267-275 (Impact Factor: 1.318)
- Dasgupta A, Sawant MA, Lavhale MS, Krishnapati LS, Ghaskadbi S and Sitasawad SL. 2015. AECHL-1, a novel triterpenoid targets tumor neo-vasculature and impairs the endothelial cell cytoskeleton. *Angiogenesis*, 18(3):283-299 (Impact Factor: 4.876)
- Deivasigamani S, Basargekar A, Shweta Kumari, Sonavane P, Ratnaparkhi GS and Ratnaparkhi A. 2015. A presynaptic regulatory system acts transsynaptically via mon1 to regulate glutamate receptor levels in drosophila. *Genetics*, 201:651-664 (Impact Factor: 5.963)
- Gaikwad SS, Chowdhury SP, Shouche YS, Ghaskadbi S and Ghaskadbi Surendra. 2015. Laboratory maintained and wild populations of hydra differ in their microbiota. *Annals Microbiology*, doi:10.1007/s13213-015-1177-z (Impact Factor: 0.990)
- Ginotra YP, Ramteke SN, Walke GR, Rapole S and Kulkarni PP. 2015. Histidine availability is decisive in ROS-mediated cytotoxicity of copper complexes of Aβ1-16 peptide. *Free Radical Research*, DOI:10.3109/10715762.2015.1133907 (Impact Factor: 2.976)
- Hardikar MR, Varma ME, Kulkarni AA, Kulkarni PP and Joshi BN. 2016. Elucidation of hypoglycemic action and toxicity studies of insulin-like protein from *Costus igneus*. *Phytochemistry*, 124:99-107 (Impact Factor: 2.547)
- Honkalas VS, Dabir, AP, Arora P, Ranade DR and Dhakephalkar PK. 2015. Draft genome sequence of *Clostridium celerecrescens* 152B isolated from sub-seafloor methane hydrate deposits. *Marine Genomics*, 21, 23-24 (Impact Factor: 1.792).
- Honkalas VS, Dabir AP, Arora P, Ranade DR and Dhakephalkar PK. 2015. Draft genome sequence of *Clostridium sulfidigenes* 113A isolated from sub-seafloor sediments associated with methane hydrate deposits. *Marine Genomics* (Impact Factor: 1.792)
- Joshi AB, Bodas D, Rauch D and Gangal SA. 2016. Effect of oxygen vacancies on crystallization and piezoelectric performance of PZT. *Ferroelectrics*, 494:117-122 (Impact Factor: 0.469)
- Kamat V, Bodas D and Paknikar KM. 2016. Chitosan nanoparticles synthesis caught in action using microdroplet reactions. *Scientific Reports*, 6: 22260 (Impact Factor: 5.578)

- Kamat V, Marathe I, Ghormade V, Bodas D and Paknikar KM. 2015. Synthesis of monodisperse chitosan nanoparticles and in situ drug loading using active microreactor. *ACS Applied Materials and Interfaces*, 7(41):22839-22847 (Impact Factor: 6.723)
- Karpe YA, Kanade GD, Pingale KD, Arankalle VA and Banerjee K. 2016. Genomic characterization of salmonella bacteriophages isolated from India. *Virus Genes*, 52(1):117-126 (Impact Factor: 1.576)
- Karthick B, Kociolek JP, Taylor JC and Cocquyt C. 2016. *Gomphonema grande* sp. nov., a new diatom (Bacillariophyta) from the democratic republic of the Congo, Tropical Africa. *Phytotaxa*, 245(3):187-196 (Impact Factor: 1.318)
- Karthick B, Nautiyal R, Kociolek JP and Ramchandra TV. 2015. Two new species of *Gomphonema* (Bacillariophyceae) from Doon valley, Uttarakhand, India. *Nova Hedwigia*, 144:165-174 (Impact Factor: 1.195)
- Kayat J, Mehra NK, Gajbhiye V and Jain NK. 2016. Drug targeting to arthritic region via folic acid appended surface-engineered multi-walled carbon nanotubes. *Journal of Drug Targeting*, 24(4):318-27 (Impact Factor: 2.741)
- Krishnapati LS and Ghaskadbi S. 2016. Insulin induces the expression of FGF-2 but does not synergize with it during angiogenesis. *Microvascular Research*, 103:55-63 (Impact Factor: 2.126)
- Kulkarni KG and Panchang R. 2015. New insights into polychaete traces and fecal pellets: Another complex ichnotaxon? *PLOS One*, 10(10):e0139933 (Impact Factor: 3.234)
- Kulkarni V, Bodas D and Paknikar KM. 2015. Lanthanum Strontium Manganese Oxide (LSMO) nanoparticles: a versatile platform for anticancer therapy. *RSC Advances*, 5:60254-60263 (Impact Factor: 3.84)
- Kumbhar JV, Rajwade JM and Paknikar KM. 2015. Fruit peels support higher yield and superior quality bacterial cellulose production. *Applied Microbiology and Biotechnology*, 99(16):6677-91 (Impact Factor: 3.337)
- Kumbhalkar B, Tamhankar S and Upadhye A. 2015. Development of a high-performance thin-layer chromatographic method for quantification of Cucurbitacin B in bottle gourd (*Lagenaria siceraria*) for quality control. *Journal of Planar Chromatography*, 28(4):294-299 (Impact Factor: 0.67)
- Lanjekar VB, Marathe NP, Shouche YS and Ranade DR. 2015. *Clostridium punense* sp. nov. an obligate anaerobic bacteria isolated from healthy human faeces. *International Journal of Systematic and Evolutionary Microbiology*, 65:4746-4756 (Impact Factor: 2.511)
- Paknikar KM. 2015. Agharkar Research Institute, Pune. *Current Science*, 108 (11):2007-09 (Impact Factor 0.926)
- Pandit PS, Rahalkar MC, Dhakephalkar PK, Ranade DR, Pore S, Arora P and Kapse N. 2016. Deciphering community structure of methanotrophs dwelling in rice rhizospheres of an Indian rice field using cultivation and cultivation-independent approaches. *Microbial Ecology*, 71(3):634-644 (Impact Factor: 2.973)
- Prashant R, Mani E, Rai R, Gupta RK, Tiwari R, Dholakia B, Oak M, Roder M, Kadoo N and Gupta V. 2015. Genotype X environment interactions and QTL clusters underlying dough rheology traits in *Triticum aestivum* L. *Journal of Cereal Science*, 64:82-91 (Impact Factor: 2.094)
- Puranik NV, Puntambekar HM and Srivastava P. 2016. Antidiabetic potential and enzyme kinetics of benzothiazole derivatives and their non-bonded interactions with α -glucosidase and α -amylase. *Medicinal Chemistry Research*, 25(4):805-816 (Impact Factor: 1.402)
- Rahalkar MC, Pandit PS, Dhakephalkar PK, Pore S, Arora P and Kapse N. 2016. Genome characteristics of a novel type I methanotroph (Sn 10-6) isolated from a flooded Indian rice field. *Microbial Ecology*, 71:519-523 (Impact Factor: 2.973)

- Rajopadhye AA and Upadhye AS. 2016. Estimation of bioactive compound, maslinic acid by HPTLC, and evaluation of hepatoprotective activity on fruit pulp of *Ziziphus jujuba* Mill. cultivars in India. Evidence-based Complementary and Alternative Medicine, doi.org/10.1155/2016/4758734 (Impact Factor: 1.880)
- Rajopadhye AA, Upadhye AS and Taware SP. 2016. Bioactivity of indigenous plant *Glossocardia bosvallia* (L.f.) DC. against insect pests of stored products. Indian Journal of Traditional Knowledge, 15(2):260-265 (Impact Factor: 0.411)
- Ranade DS, Bapat AM, Ramteke SN, Joshi BN, Roussel, Pascal T, Deschamps P and Kulkarni PP. 2015. Thiosemicarbazone modification of 3-acetyl coumarin inhibits of AB peptide aggregation and protect against AB-induced cytotoxicity. European Journal of Medicinal Chemistry (Impact Factor: 3.447)
- Rich SM, Wasson AP, Richards RA, Katore T, Prashar R, Chowdhary R, Saxena DC, Mamurtha HM, Zwart A, Misar SC, Sai P, Chatrath R, Christopher J and Watt M. 2016. Wheats developed for high yield on stored soil moisture have deep vigorous root systems. Functional Plant Biology, 43(2):173-188 (Impact Factor: 3.145)
- Savale SA, Pol CS, Khare R, Verma N, Gaikwad SB, Mandal B and Behera BC. 2015. Radical scavenging, prolyl endopeptidase inhibitory, and antimicrobial potential of a cultured himalayan lichen *Cetrelia olivetorum*. Pharmaceutical Biology, 54(4):692-700 (Impact Factor: 1.241)
- Saxena N, Pore S, Arora P, Kapse N, Engineer A, Ranade DR and Dhakephalkar PK. 2015. Cultivable bacterial flora of Indian oil reservoir: isolation, identification and characterization of the biotechnological potential. Biologia, 70(1):1-10 (Impact Factor: 0.827).
- Shaikh AC, Ranade DS, Thorat S, Maity A, Kulkarni PP, Gonnade RG, Munshi P and Patil NT. 2015. Highly emissive organic solids with remarkably broad color tunability based on N, C-chelate, four-coordinate organoborons. Chemical Communications, 51(89):16115-16118 (Impact Factor: 6.834)
- Sharma SS, Gokhale M and Joshi BN. 2016. High levels of serum insulin prevents bone resorption of the offspring born to calcium deficient wistar rats. European Journal of Biomedical and Pharmaceutical Sciences, 3(4):401-405 (Impact Factor: 3.881)
- Singh P, Kapse N, Arora P, Singh SM and Dhakephalkar PK. 2015. Draft genome of *Cryobacterium* sp. MLB-32, an obligate psychrophile from glacier cryoconite holes of high Arctic. Marine Genomics, 21: 25-26 (Impact Factor: 1.792).
- Srivastava G, Trivedi A, Mehrotra RC, Paudyal KN, Limaye RB, Kumaran KPN and Yadav SK. 2016. Monsoon variability over Peninsular India during Late Pleistocene: Signatures of vegetation shift recorded in terrestrial archive from the corridors of Western Ghats. Palaeogeography, Palaeoclimatology, Palaeoecology, 443:57-65 (Impact Factor: 2.339)
- Thuong SD, Bach TT, Choudhary RK, Tucker GC, Hai DV, Quang BH, Chinh VT and Lee J. 2015. *Capparis gialaiensis* (Capparaceae), a new species from Vietnam. Annales Botanici Fennici, 52(3-4): 219-223 (Impact Factor: 0.698)
- Tiwari A, Kesharwani P, Gajbhiye V and Jain NK. 2015. Synthesis and characterization of dendro-PLGA nanoconjugate for protein stabilization. Colloids and Surfaces B: Biointerfaces, 134: 279-286 (Impact Factor: 4.152)
- Waghole RJ and Naik DG. 2015. Chemical composition and anti-fungal properties of essential oil from *Tetrastigma sulcatum* (Law.) Gamble leaves. Journal of Essential Oil Bearing Plants, 7(5):896-902 (Impact factor: 0.306)
- Zeeshan M, Murugadas A, Ghaskadbi S, Rajendren RB and Abdulkar M. 2016. ROS dependent copper toxicity in hydra- biochemical and molecular study. Comparative Biochemistry and Physiology Part C: Toxicology and Pharmacology, 185-186:1-12 (Impact Factor: 2.616)

Research Papers in Other Journals

- Aamir S, Sutar S, Singh SK and Baghela A. 2015. A rapid and efficient method of fungal genomic DNA extraction, suitable for PCR based molecular methods. *Plant Pathology and Quarantine*, 5(2):74-81
- Behera BC, Morey MV and Gaikwad SB. 2015. Anti-lipoxygenase, radical scavenging and antimicrobial activities of lichen species of genus *Heterodermia* (Physciaceae). *Botanica Pacifica. A journal of plant science and conservation*. DOI: 10.17581/bp.2016.05101
- Datar MN. 2016. Floristic diversity and effect of anthropogenic activities on human dominated grasslands in subtropical regions of peninsular India. *Tropical Grasslands- Forrajes Tropicales*, 4:8-18
- Gajbhiye KR, Gajbhiye V and Soni V. 2015. Targeted brain delivery of bioactive molecules using nanocarriers. *Journal of Bioequivalence & Bioavailability*, 7(3): 112-122
- Garje A, Adhav YG and Bodas D. 2015. Design and simulation of blocked blood vessel for early detection of heart diseases, *Physics and Technology of Sensors (ISPTS), 2nd International Symposium on, Pune*. doi: 10.1109/ISPTS.2015.7220113/ pp. 204-208
- Gharge B, Upadhye V and Bodas D. 2015. Design and simulation of microcantilevers for detection of pathogens, *Physics and Technology of Sensors (ISPTS), 2nd International Symposium on, Pune*. doi: 10.1109/ISPTS.2015.7220122/ pp. 249-252
- Gite SS, Yadav SA, Nilegaonkar SS and Agte VV. 2015. Antioxidant quality ranking of some plant materials based on multiple in-vitro radical scavenging assays. *Journal of Chemical and Pharmaceutical Research*, 7(7):152-159
- Hai DV, Khoi NK, Choudhary RK, Yunfei D, Lee S and Lee J. 2016. *Justicia kampotiana* Benoist (Acanthaceae): a new record for the flora of Vietnam. *Korean Journal of Plant Taxonomy*, 46(1):55-59
- Jadhav R, Datar MN and Upadhye A. 2015. Forest foods of Northern Western Ghats: Mode of consumption, nutrition, and availability. *Asian Agri-History*, 19(4):293-316
- Jaybhay SA, Taware SP, Varghese P and Idhol BD. 2015. Crop management through organic and inorganic inputs in Soybean (*Glycine max* (L.) Merrill) based cropping systems. *International Journal of Advanced Research*, 3 (4):705-711
- Kale A and Karthick B. 2015. The diatoms: Big significance of tiny glass houses. *Resonance*, 20(10):919-930
- Kanekar SP, Saxena N, Pore SD, Arora P, Kanekar PP and Dhakephalkar PK. 2015. Draft genome sequence of *Halostagnicola* sp. A56, an extremely halophilic archaeon isolated from the Andaman islands. *Genome Announcements*, 3(6):e01332-15
- Karandikar KG, Singh PN, Singh SK. 2015. *Mycoenterolobium flabelliforme*: a new anamorphic fungus from India. *Plant Pathology & Quarantine*, 5(2):49-51
- Lanjekar VB, Deshpande MG, Padmanabhan G, Dnyansagar VR, Ranade DR and Dhakephalkar PK. 2016. Development of a bioprocess to reduce pathogenic load and malodor of human night soil. *South Asia Journal of Experimental Biology*, 5(6):251-257
- Palande V, Meora R, Sonavale RM, Makashir M, Modak MS, Kapse N and Kunchiraman B N. 2015. Inhibition of pathogenic strains of *Candida albicans* and non-albicans by *Bacillus* species isolated from traditional Indian fermented food preparations. *International Journal of Current Microbiology and Applied Science*, 4(3): 691-699
- Schink B and Rahalkar, M. 2016. *Methylosoma*. *Bergey's Manual of Systematics of Archaea and Bacteria*, 1-4
- Singh PN, Baghela A, Singh SK and Maurya DK. 2015. *Exosporium gymnemae* sp. nov. from India. *Mycosphere*, 6(4):508-514
- Tambe P, Kumar P, Gajbhiye V and Paknikar KM. 2015. siRNA mediated gene silencing: hurdles, strategies and applications. *Pharmaceutical Nanotechnology*, 3:322-333

- Taware SP, Jaybhay SA and Varghese P. 2015. Effect of different sowing dates on yield and its attributes in soybean. *Journal of Agricultural Research and Technology*, 40(1):167-169
- Upadhye A and Dias L. 2015. Medico-ethnobotany of Agharkar Herbarium at Maharashtra Association for Cultivation of Science (AHMA) to safeguard the traditional knowledge. *Journal of Economic and Taxonomic Botany*, 39: 46-80
- Vidhate R, Singh J, Ghormade V, Chavan SB, Patil A and Deshpande MV. 2015. Use of hydrolytic enzymes of *Myrothecium verrucaria* and conidia of *Metarhizium anisopliae*, singly and sequentially to control pest and pathogens in grapes and their compatibility with pesticides used in the field. *Biopesticides International*, 11: 48-60
- Waghole RJ, Misar AV, Mujumdar AM and Naik DG. 2015. Antioxidant and anti-inflammatory activities of *Tetragium sulcatum* (law.) Gamble leaf extract and its fractions. *International Journal of Pharmacy and Phytochemical Research* 7: 896-902

Papers Presented at Conferences/ Symposia/ Seminars

Oral Presentation

- Baghela A. DNA barcoding: From theory to applications in taxonomy & biodiversity conservation. National Conference on Biotechnology for Sustainable Future, New Arts, Commerce & Science College, Ahmednagar, Maharashtra, 4-5 March 2016
- Baghela A. Molecular identification tools & their applications in biodiversity conservation. National Workshop on Applications of Bioinformatics in Biodiversity Studies, Abasaheb Garware College of Arts and Science, Pune, Maharashtra, 21 March 2016
- Bagwan JH, Patil RM, Chavan AM, Honrao BK and Taware SP. Effect of drought stress on various growth, physiological and yield contributing traits in wheat. International Conference on Plant Research and Resource Management, TC College Baramati, Pune, 11-13 February 2016
- Kaushik T, Singh AK and Sinha DK. Closing of Indonesian seaway and development of Western Pacific Warm Pool during Pliocene: Evidence from stable oxygen isotope record and census population of planktic foraminifera. National Seminar on Past and Present Geochemical processes-Impact on climate change, JNU, Delhi, 21-23 December 2015
- Kumaran KPN. Mangrove response to sea level changes and monsoon variability. International Conference on Mangroves and Climate Change, University of Madras, Chennai, 16-18 July 2015
- Ramteke S, Ranade D, Bapat A, Shrivage B and Kulkarni P. Thiosemicarbazone derivatives as autophagy regulators in Alzheimer's disease. Life Sciences Workshop, Mumbai, 16-19 March 2016
- Shrivage B. Autophagy is necessary for germline stem cell maintenance in *Drosophila*. 8th Young Investigators' Meeting 2016, Manesar, 28 February-2 March 2016
- Singh PN. A glimpse into the fungi: taxonomy, conservation and significance. Dr. PB Chavan Memorial Lecture, Yashwant Rao Chavan Institute of Science, Satara, Maharashtra, 20 January 2016
- Singh SK. Role of NFCCI in conservation of mycological heritage of India for future generation, Gurunanak College of Arts, Science & Commerce, Mumbai, 11-12 December 2015
- Singh SK. Studies on fungal endophytes in India: A review. 6th International Conference on Plant, Pathogens and People with the mission Challenges in Plant Pathology to Benefit Humankind, Indian Phytopathological Society, NASC Complex, New Delhi, 23-27 February 2016
- Turwankar A, Krishnapati LS and Ghaskadbi S. Preliminary studies on the role of VEGF and FGF during regeneration in *Hydra*. MK Chandrashekar Memorial Meeting -JNCASR, Bangalore, 4-5 February 2016

XXV Indian Colloquium on Micropaleontology and Stratigraphy- (ICMS-2015), Institute of Science, Aurangabad, 18-19 December 2015

Kulkarni KG. Keynote address: Recent researches in ichnofossils: Interpretative ichnology

Paranjape AR. Study of trace fossils from the Silakudi Formation to decipher its palaeoenvironment

31st IAS Meeting of Sedimentology, Krakow, Poland, 22-25 June 2015

Kulkarni KG and Gurav SS. Importance of carbonate hiatus concretion layers in the middle Eocene depositional sequence of Kachchh, India

Paranjape AR, Kale AS and Kulkarni KG. Basin margin high-density gravity flow deposits from the Late Cretaceous of Cauvery Basin, India

Asian Mycological Congress 2015, Goa, 7-10 October 2015

Mehta N, Aamir S, Singh SK and Baghela A. Development of a multilocus microsatellite typing (MLMT) method for a fungal pathogen *Colletotrichum gloeosporioides*

Rajeshkumar KC. Raising the profile of fungal conservation in India – Fungal Universe for Next Generation Initiatives

Singh SK. Cryopreservation: A reliable method of fungal conservation

Biennial Meeting of Indian Society of Developmental Biologists, Hyderabad, 15-18 July 2015

Dixit N, Shrivage B and Ghaskadbi S. Identification and preliminary characterization of autophagy related genes from *Hydra*

Krishnapati LS, Khade S, Kavimandan A and Ghaskadbi S. Expression of BMP and its inhibitor Noggin in hydra: Possible role in axial patterning

Patwardhan R and Ghaskadbi S. Identification and preliminary characterization of *gremlin* from Hydra

National Conference on Cryptogam Research in India: Progress and Prospects, NBRI, Lucknow, 28-29 September 2015

Behera BC. Bioprospecting potential of lichens

Pandit GS. Lichens of the rocky outcrops from Western Ghats, Maharashtra

Poster presentation

Bhat A, Jha A, Gopi HN and Paknikar KM. Development of peptide therapeutics for Alzheimer's disease. International Symposium on Peptide Engineering Meeting, IISER Pune, 5-7 December 2015

Gholap H, Kulkarni V, Kale S and Ghormade V. Synthesis, characterization and biological evaluation of CdTe and CdTeZnS quantum dots embedded chitosan nanoparticles composites for their application in bioimaging. National Symposium on Medical Biophysics, SPPU, Pune, 25-26 September 2015

Raval KM, Ghormade V, Chakrabarti A and Paknikar KM. Nano-diagnostics for human invasive aspergillosis. International Conference on Nanoscience and Technology -CONSAT IISER, Pune, 29 February-02 March 2016

6th International conference in metal and genetics, chemical biology and therapeutics, Bangalore, 17-20 February 2016

Walke G. Studies of interaction of copper with Amyloid β peptide involved in Alzheimer's disease

Ranade D. Thiosemicarbazone analogues for the treatment of Alzheimer's disease

Workshop on Insights in Biology 2025, Maharashtra Academy of Sciences and CSIR-National Chemical Laboratory, Pune, CSIR-NCL, 29 October 2015

Kolge H and Ghormade V. Pest management 2025: Role of nanotechnology (Best Poster award)

Puranik NV. Unexplored benzothiazoles as α -amylase and α -glucosidase inhibitors

International Conference on New Horizons in Biotechnology, NIIST, CSIR, Trivandrum, BRSI, 22-25 November 2015

Kapse N, Kamalaskar L, Pore S, Dhakephalkar A, Ranade DR and Dhakephalkar PK. Genome sequence and gene expression studies reveal novel hydrogenases mediated hydrogen production by *Clostridium biohydrogenum* sp. nov. MCM-B 509^T.

Shetty DJ, Maheshwari S, Kshirsagar PR, Lanjekar VB, Dhakephalkar PK (2015). Alkali pretreatment at ambient temperature: a promising method to enhance biochemical methane potential of rice straw

Participation in Conferences/Symposia/Seminars/Workshops

Basargekar A - SERB School in Insect Biology, University of Hyderabad, Hyderabad, 7-21 December 2015

Choudhary RK - Workshop on Techniques in Molecular Phylogenetic Analysis, Savitribai Phule Pune University, Pune, 6 January 2016

Workshop on Application of Bioinformatics in Biodiversity Studies, Abasaheb Garware College, Pune, 22 March 2016

Ghaskadbi S - Biennial Meeting of Indian Society of Developmental Biologists, CCMB, Hyderabad 15-18 July 2015

85th Annual Session of National Academy of Sciences, India (NASI) & Symposium on Marine and Freshwater Ecosystem for National Development, National Academy of Sciences, India (NASI) & Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar 6-8 December 2015

Jaybhay SA - 45th Annual Group Meeting of AICRP, Regional Research Centre, Amravati, 09-11 May 2015

Kaushik T - National Seminar on Past and Present Geochemical Processes Impact on Climate Change: Jawaharlal Nehru, University, Delhi, 21-23 December 2015

Kumaran KPN - International Conference on Mangroves and Climate Change, University of Madras, Chennai, 16-18 July 2015

Naik DG - 3rd Annual Conference of India Section AOAC INTERNATIONAL, Pune, 19-20 November 2015

XXV Indian Colloquium on Micropaleontology and Stratigraphy– (ICMS-2015), Institute of Science, Aurangabad, 18-19 December 2015

Patil RM - Workshop on Breeding Management System, ICAR-ACIAR Indo-Australian Program on Marker Assisted Wheat Breeding, IIWBR, Karnal, 3-5 December 2015

Taware SP - 45th Annual Group Meeting of AICRP, Regional Research Centre, Amravati, 09-11 May 2015

Tetali S - 55th Annual Conference of Maharashtra Rajya Draksha Bagayatdar Sangh, Pune, 30 August - 2 September 2015

Pre-Group discussion of All India Coordinated Research Project on Fruits, Bengaluru, 8-9 February 2016

3rd Group discussion of All India Coordinated Research Project on Fruits, Punjab Agricultural University, Ludhiana, 3-6 March 2016

Umrani RD - International Conference on Nanoscience and Technology (ICONSAT-2016), IISER, Pune, 29 February - 2 March 2016

Varghese P - 45th Annual Group Meeting of AICRP, Regional Research Centre, Amravati, 09-11 May 2015

Kulkarni KG and Paranjape AR - XXV Indian Colloquium on Micropaleontology and Stratigraphy– (ICMS-2015), Institute of Science, Aurangabad, 18-19 December 2015

Kulkarni PP and Ginotra Y and Ramteke S - 6th International Conference in Metal and Genetics, Chemical Biology and Therapeutics, Bangalore, 17-20 February 2016

Paranjape AR and Kulkarni KG - 31st IAS Meeting of Sedimentology, Krakow, Poland, June 2015

Honrao BK, Misra SC and Chavan AM - 54th All India Wheat and Barley Research Workers Meet SDAU, Sardarkrushinagar, Gujarat, 21-24 August 2015

Rajwade JM and Bodas DS - Current Regulation on Medical Devices and in Vitro diagnostics, Central Development Service Agency, Chennai, 24 February 2016

Singh PN and Rajeshkumar KC - National Workshop on Grants Management, IISER, Pune, 11 February 2016

Visits Abroad

Dr KM Paknikar- Signing of Memorandum of Understanding, South Korea, 19-24 July 2015

Keynote Speaker, Africa-India-UK Conference on Emerging Frontiers for Sustainable Water, Johannesburg, South Africa, 3-5 August 2015

Member, Scientific Council Meeting, Indo-German S&T Centre, Bonn, Germany, 19-25 November 2015

Keynote Speaker, International Conference on Water Treatment and Solar Energy Applications, Muscat, Oman, 15-16 December 2015

Dr DS Bodas Alexander von Humboldt (AvH) funding, Technical University of Dresden, Germany, 19 November-16 January 2016

Dr Philips V Global Forum on Innovations in Agriculture, ADNEC, Abu Dhabi, UAE, 15-18 February 2016

Dr Karthick B Tokyo Gakugei University, 15-24 February 2016

Dr C Patra Max-Planck-Institute for Heart and Lung Research, Bad Nauheim, Germany

PhD Degree award

Candidate	Title	Guide, Co-Guide
P Deshpande	Development of attractant/repellent formulations for Indian honeybees from <i>Swertia densifolia</i>	DG Naik
V Kulkarni	Studies on magnetic fluid hyperthermia and chemotherapy for treatment of breast cancer	KM Paknikar
P Bhagat	Nuclear delivery of SMAR-I using nanoparticles to modulate cancer	KM Paknikar
S Agrawal	Studies on phage based microfluidic assay for detection of food borne pathogens	KM Paknikar
M Choudhari	Nanomaterial based rapid testing of antibacterial susceptibility and identification of clinical isolates	KM Paknikar
Sagar Kanekar	Biodiversity and biotechnological exploration of halophiles from Andaman Islands and Lonar lake, India	PK Dhakephalkar
L Kamalaskar	Investigation of a novel sp. DMHC- 10 for its polyphasic identification and bio-hydrogen production	DR Ranade, PK Dhakephalkar

Supervision of PhD students

(Guide, Co-Guide, Student, Title)

Choudhary RK, Tamhankar SA

Darshetkar A. Molecular phylogeny of the genus *Eriocaulon* L. from Western Ghats of India

Dhakephalkar PK

Arora P. Hyperthermophiles from oil application in enhanced oil recovery

Dabir A. Investigation of biogenic methanogenesis leading to methane hydrate deposits in Krishna Godavari Basin

Dahigaonkar K. Archaeal and bacterial diversity of mud volcanoes of Andaman

Honkalas V. Taxonomy and metabolite analysis of bacterial flora contributing to methane hydrates in deep submarine sediments

Shetty D. Designing microbial/physico-chemical pre-treatment for enhancement of biogas production from rice straw

Tapadia S. Microbial community profiling and transcriptome analysis to gain insight into biomethanation of rice straw

Ghaskadbi SM

Galande A. Analysis of the homologues of nucleotide excision repair in hydra

Dixit N. Analysis of autophagy in hydra

Ghaskadbi S, Patwardhan VG

Daware M. Elucidation of role of extracellular matrix protein periostin in zebrafish heart development

Turwankar A. Role of VEGF and FGF signaling in regeneration and pattern formation in hydra

Ghormade V

Kolge H. Silencing of lipase and juvenile hormone methyl transferase gene(s) in *Helicoverpa armigera* via dsRNA-nanoparticles

Joshi BN

Sharma S. Maternal calcium metabolism and its relation with metabolic syndrome in rat adult offspring

Ranade D. Metal ion induced oligomerisation and toxicity of amyloid beta peptide

Varma M. Purification, cloning, expression and characterization studies of insulin-like protein from plant sources

Karthick B, Tamhankar SA

Kale A. Diversity and distribution of diatoms from aerial habitats along the Western Ghats

Kulkarni PP

Ginotra Y. Studies on interaction of copper with L-histidine and histidine-rich Amyloid-Peptide

Ramteke S. Understanding role of Cu and Zn metal ions in the aggregation and toxicity of Apeptide

Walke G. Studies of metal complexes of peptides involved in neurological diseases and their interactions with bioactive molecules

Ghatpande N. Development of nutraceuticals for the treatment of inflammation associated anemia

Naik DG

Waghole RJ. Exploration of *Tetrastigma sulcatum* for antifungal properties

Paknikar KM

Asani S. Mechanistic studies on anti-diabetic action of zinc oxide nanoparticles in vitro Kulabhusan P. Phage display peptides for detection of pathogens

Kamat V. Micromixer assisted synthesis of nanoparticles: Assessment for their cellular toxicity and uptake

Raval K. Studies in immunodiagnosis of invasive Aspergilliosis

Rajwade JM

Kumbhar J. Developing bacterial cellulose nanocomposites as scaffolds for osteochondral tissue engineering

Deshpande P. Nanocarriers mediated foliar delivery of zinc in wheat: studies on mechanisms of uptake and mobilization

Dapkekar A. Biopolymers based colloidal formulations for enhancing zinc use efficiency in wheat

Chowdhury S. Increasing seedling vigor in oil-seeds via nano-priming

Singh N. Studies on transcriptome profiling of biofilm bacteria treated with silver and copper nanoparticles

Chikte R. Development of nanomaterials based formulation for control of bacterial blight disease of pomegranate

Ratnaparkhi A

Basargekar A. Investigation of the role of DMON1 in *Drosophila* nervous system

Kumari S. Role of FGFR and Fog signaling pathways in embryonic glial cell development of *Drosophila melanogaster*

Ratnaparkhi A, Patra C

Rayrikar A. Exploration the role of 'connective tissue growth factor a' in zebrafish development

Srivastava P

Puranik NV. Synthesis and bio-evaluation of naturally occurring chromones and their analogues

Upadhye AS, Tamhankar SA

Dias L. Studies on selected Indian medicinal plants used in oral care for prevention of teeth caries

Joshi R. Pharmacognostic and molecular studies on Bhrihati complex

Honours/ Awards/ Distinction

Datar MN and Upadhye AS - Dr KL Mehra Memorial Award 2015 for their publication titled, 'Forest foods of Northern Western Ghats: Mode of Consumption, Nutrition and Availability'

Ghaskadbi S - Member, Animal Sciences Program Advisory Committee under SERB, DST

Member, Editorial Board, International Journal of Cellular and Molecular Medicine

DBT Nominee, Institutional Bio-safety Committees of (i) Lupin Limited (Biotech Division), Pune and (ii) InTox, Pune

Kulkarni P - Member, Editorial Advisory Board, Metallomics, RSC journal

Patra C - Invited reviewer for journal *ACS Chemical Neuroscience*.

Shravage B - Early Career Research Award by DST-SERB

Ramalingaswami Re-Entry Fellowship Award of the Department of Biotechnology

Singh SK - AK Sarbhoy Memorial Award in recognition of outstanding research contribution in the field of Mycology & Plant Pathology, Indian Phytopathological Society, New Delhi

Tamhankar SA - Expert, Crop Molecular Breeding, Department of Biotechnology, GOI

Member, Biosafety Committee, Hi Tech Biosciences India Ltd, Pune

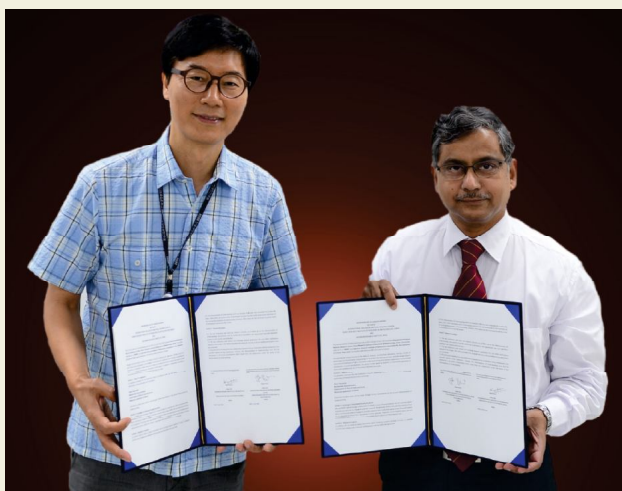
MoU with South Korean institute

A Memorandum of Understanding (MoU) was signed between Agharkar Research Institute, Pune (ARI) and International Biological Material Research Center, Korea Research Institute of Bioscience & Biotechnology, South Korea (IBMRC, KRIBB). The MoU was signed by Dr KM Paknikar, Director, ARI and his counterpart Dr Joongku Lee at Daejeon, South Korea on 21 July 2015.

Plant taxonomy; biodiversity documentation; conservation of flora of India and Korea, and molecular systematics of plants, and other areas of mutual interest will be addressed. The MoU will also facilitate the exchange of scientists between the two institutes.

The MoU will further pave the way for bio-prospecting research on native plant species and accumulation and continuous improvement of bioresource related knowledge.

India is known for its huge bio-resource treasure, but its complete documentation is still awaited. The MoU focusses upon capacity building of ARI taxonomists and enabling them to match international standards. This would include molecular tools and techniques in taxonomic studies. In the past, many eminent plant taxonomists from ARI, viz. Prof. SP Agharkar, Dr GB Deodikar, Dr VD Vartak, etc. have made huge contributions in exploring native flora.



Dr Joongku Lee (L), Director, IBMRC, KRIBB and Dr KM Paknikar (R), Director, ARI

Visit

Dr Harsh Vardhan
Hon'ble Union Minister for Science & Technology & Earth Sciences

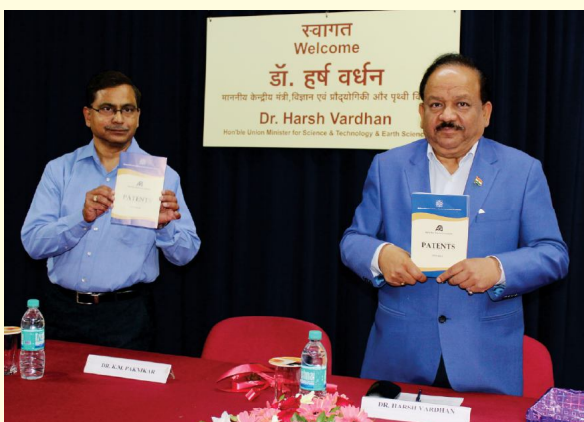
3 February 2016



Exhibition of research work



A look at the Atomic Force Microscope - Scanning Near-field Optical Microscope (AFM-SNOM) facility



A booklet on patents by ARI was released



A memento was presented by the Director to the Hon'ble Union Minister

Exhibitions and Outreach

Dr KM Paknikar Interviewed in the programme 'Eureka' on Rajya Sabha Television
India International Science Festival, New Delhi, 4-8 December 2015

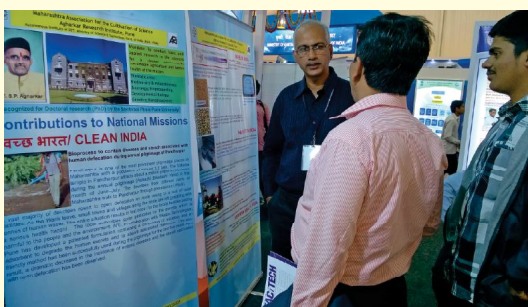


(L-R) Dr V Gajbhiye, Dr KM Paknikar, Dr SS Dagar, Dr RK Choudhary



Dignitaries at ARI stall

Indian Science Congress, University of Mysore, 3-7 January 2016



Visitors & DST officials at ARI Stall

Kisan Mela

Exhibition on wheat, soybean, and grape varieties



ARI farm, Songaon, Taluka Baramati, District Pune, 18 February 2016

Fifty farmers benefitted from the programme. They showed keen interest in recently released high yielding wheat varieties MACS 6478, MACS 6222 and MACS 2971 (Khapli wheat); soybean variety MACS 1188 and grape variety ARI 516 (Table and juice purpose). Dr Sujata Tetali disseminated information on grape varieties.

Sustainable Soy Week

Jointly organized by ARI, Pune & Solidaridad, Bhopal at ARI's Research Farm, Hol, Taluka Baramati, District Pune, 5 June 2015

Forty farmers participated in the programme in which Dr SP Taware, Dr Philips Varghese and Mr SA Jaybhay delivered lectures on sustainable soybean production.



Teaching at schools

Scientists and staff participated in the voluntary teaching programme at schools.

National functions



National Technology Day

Monday, 11 May 2015

Innovation: An Industrial Perspective

Dr RP Gaikaiwari

MTech., PhD (Chem. Engg.), FBRI

Chairman and Managing Director

Hi Tech BioSciences India Ltd., Pune

हिन्दी दिवस व्याख्यान

शुक्रवार, 11 सितंबर 2015

हिन्दी का अंतर्राष्ट्रीय स्वरूप

श्रीमती स्वाती आर चड्ढा

हिन्दी अधिकारी, एन.सी.एल., पुणे



डॉ ए पी जे अब्दुल कलाम जयंती

15.10.2015

डॉ अनिल लचके, भूतपूर्व वैज्ञानिक, एन सी एल, पुणे और प्रसिद्ध विज्ञान लेखक

इस अवसर पर एक पोस्टर प्रदर्शनी का आयोजन किया गया, जिसमें संस्थान के कर्मचारियों और छात्रों ने सहभाग दिया।



Vigilance Week

26-31 October 2015

Theme: Preventive Vigilance as a Tool of Good Governance

Dr JK Solanki

Head, Administration and Finance

National Centre for Radio Astrophysics

Tata Institute of Fundamental Research, Pune

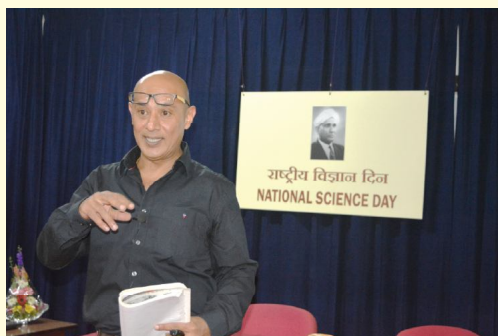
During the week banners were displayed at prominent places in the Institute for creating vigilance awareness.

National Science Day

Theme: Make in India - S&T driven innovations



Talks by students, Friday, 26 Feb 2016



Talk, Monday, 29 Feb 2016

Science entrepreneurship and technology commercialisation

Dr Amitabh Shrivastava
CEO & Executive Director
CSIR-Tech Pvt. Ltd.
CSIR-NCL Innovation Park, Pune

National Science Day Exhibition, 28-29 February 2016 Giant Metrewave Radio Telescope, Khodad, Narayangaon, Pune



ARI representatives at the exhibition venue



At the stall



Students and farmers at the ARI stall



Prize distribution at the hands of Dr KM Paknikar, Director, ARI



Director, ARI connecting with the participants at the valedictory function

Founder's Day Function



55th Prof. SP Agharkar Memorial Oration
Wednesday, 18 November 2015

Sustainability: Science and Engineering of Life
Support Natural Systems

Dr BD Kulkarni
Distinguished Scientist
National Chemical Laboratory, Pune

Shri VP Gokhale Prize

Dr Amrita Banerjee
Scientist (Plant Pathology)
Division of Crop Protection
Indian Council of Agricultural Research
(ICAR)
ICAR Research Complex for NEH Region,
Umroi Road, Umiam, Meghalaya



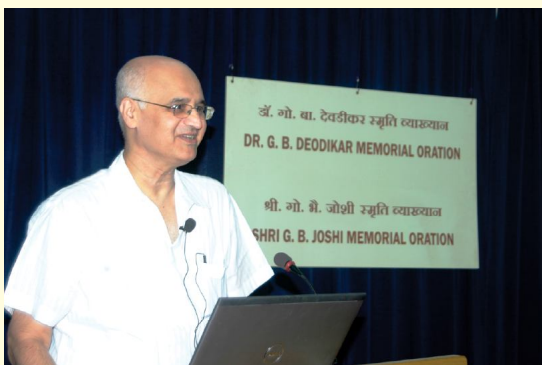


Dr RB Ekbote Prize

Dr Jai Chand Rana
Division of Germplasm Evaluation
NBPGR, Pusa Campus
New Delhi

Dr Pradnya P Kanekar Award

Dr DS Bodas
Scientist, ARI



Dr GB Deodikar Memorial Oration

17 November 2015

Sustainable Development

Dr Nitin Pandit
CEO, World Resources Institute India
Mumbai

Shri GB Joshi Memorial Oration

17 November 2015

GM Crops: Need of the Hour

Dr Vidya Gupta, FNAAS
Former Chair and Chief Scientist
Biochemical Sciences Division
CSIR-National Chemical Laboratory, Pune



Press Clippings



FROM THE LAB

A WEEKLY UPDATE FROM INDIA'S FINEST RESEARCH INSTITUTES

A uniform nano world

KISHORE PAKNIKAR & TEAM
AGHARKAR RESEARCH INSTITUTE, PUNE

THERE ARE enormous possibilities of nanoscience applications in diverse fields such as health, drug delivery, food processing, water purification, electronics, and many others.

A nanoparticle (or nanopowder or nanocluster or nanocrystal) is a microscopic particle with at least one of its dimensions less than 100 nanometres (nm). One nanometre is a billionth of a metre. Typically, a nanoparticle would be about thousand times smaller than the tip of human hair.

The reason why nanoparticles become special, and therefore have been attracting so much scientific interest, is the fact that these materials exhibit very different properties when they are reduced to nano-sizes. For example, a nanoparticle of gold does not have golden colour. It exhibits very different colours depending on the size of the particle in the nano-range. So a 4 nm gold particle has a different colour than a 50 nm or a 200 nm gold particle, and none of them is golden. Similarly, white gold, as we see it, melts at about 1100 degrees Celsius, while nanoparticles of gold can melt at 100 degrees Celsius.

At nano-sizes, particles also start exhibiting some quantum properties, like super-paramagnetism. Quantum properties are associated with sub-atomic particles like electrons or neutrons that behave very differently than objects of sizes that we are familiar with. Such special properties open up a variety of possibilities for use of known materials for novel applications.

As of now, we create nanoparticles either by breaking down larger normal sized materials to nano size, or by assembling atoms or molecules in building-block fashion to reach nano sizes. The reductionist approach involves chemical reactions. For example, gold nanoparticles can be synthesised by reacting gold chloride and sodium borohydride.

While both methods of synthesis of nanoparticles work fine, neither of them produces evenly-sized nano particles. Rather, randomly sized particles in the nano-range are achieved. This is called polydisperse preparation.

Scientists for long have been trying to develop methods that produce nanoparticles of a specific size, or to achieve monodispersity. It is not difficult to see why this is important. Let's look at gold again. A mixture of gold nanoparticles of all sizes will show no particular colour. That means that some properties, colour in this case, would not become evident in a random mixture of all sizes. Since we are interested in using specific properties of these nanoparticles, and since many of these properties are size-dependent, it becomes very important to create nanoparticles of uniform size that exhibit those specific properties.

It is here that we have been able to achieve some success. As mentioned, nanoparticles can be prepared using chemical reactions. These generally lead to polydisperse preparations, especially in case of polymers which have large and



THE RESEARCH

Developing nanoparticles of uniform size to achieve 'monodispersity', so that their specific properties can be put to use

complex molecular structures. To achieve monodispersity, the reaction parameters like temperature, rate of reaction, time, concentration of reactants etc need to be very precisely controlled and monitored. But this is very difficult to achieve in normal reactions.

So we decided to confine the reaction volume to minute quantities in order to precisely control the reaction parameters. For our experiment we decided to produce nanoparticles of chitosan, an FDA-cleared biodegradable and biocompatible natural polymer that is already being used as drug-delivery agent, for gene therapy and other processes. We used the reactant, chitosan, as micro-droplets. With such confinement, we were able to control factors like temperature, rate of reaction, time etc. This reaction did indeed produce nanoparticles of uniform size. And unlike normal reactions, which take between 20 and 60 minutes to produce chitosan nanoparticles, we were able to produce the nanoparticles in just 5 seconds.

For our experiment, we designed and fabricated a micro-reactor that can be operated in a continuous flow mode, so that large quantities of monodisperse nanoparticles can be produced in a sequential manner. The cylindrical micro-reactor has an inlet channel and an outlet channel. The reactants are introduced in a continuous flow and nanoparticles are also synthesised continuously. Using this method, we have now been able to produce chitosan nanoparticles of any size between 50 nm and 600 nm within an accuracy error of below 10 per cent.

For your research to be considered for this column, please write to Senior Editor Amitabh Sinha at amitabh.sinha@expressindia.com

संशोधन करा... पण समन्वयही महत्त्वाचा!

डॉ. हर्ष वर्धन यांचा संशोधन संस्थांना सल्ला; विविध संस्थांना दिली भेट

पुणे, ता. ३ : "आपल्या देशात मेहनती आणि गुणवान वैज्ञानिक भरपूर आहेत. पण वैज्ञानिकांचे आणि विविध संशोधन संस्थांचे आपापसांत पुरेसे सामंजस्य आणि समन्वय नाही, ही तुरुबाची वाव आहे. एकाच विषयात देशात विविध ट्रिक्वारी सुरू असणाऱ्या संशोधनात समन्वय साधला गेल्यास वेगळी अन् पैशांची बचत होऊन संशोधनाची परिणामकारकता अधिक वेगाने मिळू शकते. 'आयामध्ये काय सुरू आहे, हे चेन्नईमध्ये माहीत नसणे,' ही कोटी मानसिकता आता उरणेपाची नाही," असे पत्र केवळ विज्ञान व तंत्रज्ञान मंत्री डॉ. हर्ष वर्धन यांनी येथे व्यक्त केले.



आघारकर संशोधन संस्था : पुणे भेटीदरम्यान डॉ. हर्ष वर्धन यांनी शहरातील विविध संशोधन संस्थांना भेट दिली. बुधवारी आघारकर संस्थेत काही संशोधन प्रकल्प पाहिलाना ते सुक्ष्मदर्शिकेत असे गुगुनूत घेले होते.

एकर येथ्याची आज गरज आहे. 'गुड-वेयर-नेस्ट' अशा मागाने प्रत्येक वाकतात सुधारणा करात व म्हणकर आणि समन्वय साधत देशातुतील समस्या सोडविण्यात या संस्थांनी योगदान द्यावे. या सुमूसीकरणातून

देशाचा वैज्ञानिक आलेख नक्कीच उंचावेत."

नुसती 'पेटंट्स' काय उपयोगाची? डॉ. हर्ष वर्धन म्हणाले, "निव्वळ पेटंट आणि त्याची वाढती संख्या

पूर्वी आपल्या देशात कुठे होत्या एवढ्या सुविधा? पण केवळ दूरदृष्टीतून आणि प्रयत्नांतून तत्कालीन संशोधकांनी अनेक बदल घडविले. आजही आपल्याकडे सर्वत्रच यल्ले पोटाच्या प्रयोगशाळा नसतील, मात्र, काय करण्याची जिद, स्वतः प्रत्यक्षात उतरविण्याची क्षमता आणि यत्नात 'किल्ला इन्स्ट्रुक्ट' असली, की हाती घेतलेली कामां फली शारीर्य म्हणून संपता! - डॉ. हर्ष वर्धन

उपयोगाची नाही. आपण मिळविलेल्या या पेटंटमध्ये समाजाला उपयुक्त भाग किती, हायव्हिल महत्त्वाचा मुद्दा आहे. 'माझ्या नावावर किती पेटंट ज्या झाले' यापेक्षा 'माझे संशोधन समाजाच्या तळागाळापर्यंत किती पोचले' हे तयार पाहण्याची गरज आहे."

सकाळ, 4 फेब्रुवारी 2016

India ready for outbreak of Zika virus, says Dr Harsh Vardhan

ANJALI MARAR
reporters@sakaaltimes.com

Pune: Even as the World Health Organisation has deemed the dreaded Zika virus an international health emergency, the Centre has claimed that it is fully prepared to tackle the virus in India.



Union Minister for Science and Technology Dr Harsh Vardhan on Wednesday said that India is fully prepared to tackle the virus, like it had done during Ebola pandemic in 2014.

Speaking exclusively to Sakal Times on the sidelines of his visit to the city, the minister said that the Union government has taken all precautionary measures, particularly at airports, in order to tackle possible threats of the virus. An outbreak of the virus, which is transmitted by Aedes mosquitoes, was detected in Brazil in May and has since then spread to more than 20 countries in South America, including two new ones on Monday: Costa Rica and Jamaica. The same mosquito is believed to cause dengue and chikungunya too.

>>>Contd on P2; More on P3

India prepared to tackle Zika virus...

>>>Contd from P1

As the world continues to search for immediate preventive measures and also a possible drug or vaccine to control the spread of the virus, scientists at a Hyderabad-based lab have claimed to have developed world's first vaccine against the Zika virus. Reacting on this development, Vardhan rubbished the claim, and said, "It is not possible to develop a vaccine in such a short span of time."

The Union minister was in the city on a three-day visit during which he visited and reviewed activities at Indian Institute of Tropical Meteorology (IITM), National Chemical Laboratory, Agharkar Research Institute and National Centre for Cell Science (NCCS). Among the other key issues that the minister spoke include ways to tackle climate change.

The Indian EXPRESS Sun, 20 March 2016
epaper.editions epaper.indianexpress.com/c/9205642

The Indian Express, 20 March 2016

Sakal Times, 4 February 2016

'Lack of co-ordination between institutions hampering research'

Union Minister of Science and Technology **Dr Harsh Vardhan** expresses concern over lack of co-ordination between scientific institutes hampering research in an exclusive interview with **Anjali Marar**.

What are the key findings by your ministry about the various scientific institutions in the country?

Since the last year-and-a-half, I have been touring scientific establishments and labs across the country, trying to understand the areas of their work. During this time, I have realised that there is good quality work going on but due to lack of communication and co-ordination between institutions, there is slow progress in discoveries. Similar research work is being un-



Dr Harsh Vardhan

ST EXCLUSIVE

deraken in multiple institutes. Also, many of the institutions were found to be working without any specific goals. Despite having a dedicated channel CSIR-Unit for Research and Development of Information Products (URDIP), which tracks all research performances, the scientific community has underutilised this facility.

How is the ministry planning to tackle this?

Since last year, five clusters have been identified. These clusters typically focus on

areas like chemistry, biology, physics, information and engineering. A senior scientist from a respective field has been identified to lead the cluster, who will co-ordinate research projects and activities. The ministry will chair regular review meetings with these cluster heads to take stock of the progress in researches.

How do you respond to Bharat Ratna CNR Rao's claim that the ministry is providing limited funds to research in basic sciences?

I do not want to comment on this as it is an opinion expressed individually. How-

ever, I can confidently say that the ministry has allotted adequate funds and also not slashed budgets for any research activity. This is also applicable for research in basic sciences.

How can 'Start-up' India help the young scientific community?

The Prime Minister has declared Rs 10,000 crore for start-ups, a lot of scientists too can benefit from this endeavour, be it for setting up scientific incubation centres or industry-related setups, the government is willing to extend help with necessary tax waivers too. There is a lot of potential among Indian scientists and we need to work together in hastening the progress.

What is your message for scientists?

The ministry wants scientists to synergise their efforts and time in undertaking research that will help in finding solutions for problems faced by the common man. Both fundamental and applied sciences must go hand-in-hand so that there is faster technology transfer and related industry can commercialise.

Sakal Times, 4 February 2016

शहर परिसर

दक्षिण कोरियाशी

'आधारकर'चा करार

पुणे, ता. २९ : वनस्पती वर्गीकरणशास्त्र, जैवविविधता दस्तऐवज, भारत व कोरियातील वनस्पतींचे संवर्धन, तसेच आंतररेष्विय शास्त्र या विषयांवर समन्वयाने अभ्यास करण्याच्या उद्देशाने आधारकर संशोधन संस्था आणि दक्षिण कोरिया येथील इंटरनॅशनल बायोलॉजिकल मॅटेरिअल रिसर्च सेंटर व कोरिया रिसर्च इन्स्टिट्यूट ऑफ बायोसायन्स अँड बायोटेक्नॉलॉजी या संस्थांमध्ये नुकताच सामंजस्य करार झाला. आधारकर संस्थेच्या वतीने संचालक डॉ. के. एम. पाकणीकर आणि दक्षिण कोरियातर्फे डॉ. जुंक् ली यांनी करारावर सहाय्य केल्या.

सकाळ, 30 जुलै 2015

ARI INKS MOU WITH SOUTH KOREAN INSTITUTE TO EXTEND RESEARCH IN BIODIVERSITY STUDIES

Sakal Times

ANJALI MARAR
reporters@sakaalimes.com

Pune: City-based Agharkar Research Institute (ARI) has signed its first ever Memorandum of Understanding (MoU) with an institute in South Korea for strengthening and extending its research in the field of biodiversity studies.

The three-year contract was inked on July 21 between ARI and the International Biological Material Research Center, Korea Research Institute of Bioscience & Biotechnology (IBMRC, KRIBB), South Korea.

"The MoU with KRIBB will help us further enhance our studies in biodiversity. We will be working closely in the field of plant-taxono-



INKED: Director of IBMRC, KRIBB Joongku Lee (left) along with ARI Director KM Paknikar after signing the MoU.

my, which mainly involves identification and classification of plants," ARI Director KM Paknikar told Sakal Times.

Scientists of the two in-

stitutions will collaborate on biodiversity documentation, conserving the flora of India and South Korea and molecular systematics of plants.

A LESSON TO LEARN FROM S KOREA

■ What ARI Director KM Paknikar found interesting during his visit to South Korea was that the country had mapped records of all its flora and fauna.

■ "At present, we do not have knowledge of all existing flora and fauna in India. It is time we, too, start mapping plants and animals in our country so that it will help in conserving biodiversity," Paknikar said.

There will also be exchange programmes between scientists of the two institutes.

What Paknikar also found interesting during his visit to South Korea was that the country had mapped records of all its flora and fauna.

"At present, we do not have knowledge of all existing flora and fauna in India. It is time we, too,

start mapping plants and animals in our country so that it will help in conserving biodiversity," Paknikar added.

Earlier, the institute had worked with United States-based Wayne State University in 2006. The current MoU is the second such MoU where the 69-year-old institute is going to work with an international university.

Sakal Times, 1 August 2015

Agharkar Research signs MoU with Korean research institute

Pune: A Memorandum of Understanding (MoU) was signed between the Agharkar Research Institute, Pune (ARI) and the International Biological Materials Research Center, Korea Research Institute of Bioscience & Biotechnology, South Korea (IBMRC, KRIBB). The MoU was signed by Dr KM Paknikar, Director, ARI and his counterpart Dr Joongku Lee at Daejeon, South Korea on July 21. Areas of mutual interest will be addressed such as: Plant taxonomy; biodiversity documentation; conservation of flora of India and Korea, and molecular systematics of plants, among others. The MoU will facilitate the exchange of scientists be-

tween the two institutes. It will pave the way for bio-prospecting research on native plant species and accumulation and continuous improvement of bio-resource related knowledge. India is known for its huge bio-resource treasure, but its complete documentation is still awaited. The MoU focuses upon capacity building of ARI taxonomists and enabling them to match international standards. This would include molecular tools and techniques in taxonomic studies. In the past, many eminent plant taxonomists from ARI, viz. Prof. SP Agharkar, Dr. GB Deodikar and others have made huge contributions in exploring native flora. **ENS**

The Indian Express,
30 July 2015

The Indian EXPRESS
epaper editions

Thu, 30 July 2015
epaper.indianexpress.c

ARI's solution can prevent diseases during Kumbh Mela

ANJALI MARAR
reporters@sakaalimes.com

Pune: City-based Agharkar Research Institute (ARI) is taking forward Prime Minister Narendra Modi's Swachh Bharat Abhiyan by playing a major role in preventing outbreak of diseases in Nashik during the Kumbh Mela.

In order to prevent diseases and pollution caused due to open defecation, scientists at ARI, along with Vikalpa Technologies, have developed a solution of microbial culture that is not only capable of absorbing the foul odour, but also hastens the degradation process of human excreta.

ARI's involvement in the Kumbh was decided after a national-level meeting with the heads of institutes under the Department of Science and Technology (DST) in Hyderabad. It was called earlier this month by Union Minister for Science and Technology Dr Harshwardhan.

As lakhs of people congregate for events like the Pandharpur Wari, Kumbh Melas, the problem of open defecation is very common in India. Though, it is caused due to lack of toilet facilities, its implications on human and environment health is large.

Moreover, there is prevalence of unhygienic conditions and loss of aesthetic value of the villages and cities, leaving behind a daunting task for the civic officials. "Having successfully used this microbial solution along the route of the Pandharpur Wari, we now plan to extend this service during the Kumbh Mela in Nashik. We are currently in talks with the concerned authorities for the further course of action," Director of ARI KM Paknikar told Sakal Times.

According to the scientists, the government authorities often spray chemicals and pesticides upon the human excreta as part of the cleaning up processes.

But the health hazard due to this is large as it has high chances of entering the

drinking water or soil in the area, thereby compromising on the health of locals.

Sakal Times, 31 July 2015

Change In Water Quality Due to Effluent Discharge May Affect Them From pre-history to deaths by drowning, diatoms tell it all

Ananya.Dutta
@timesgroup.com

Pune: In the 1950s, renowned algae expert H P Gandhi had collected samples from a lake in Kolhapur and reported 11 species of a group of algae called diatoms from it, two of them endemic to the Western Ghats.

A re-evaluation of the samples collected by him using state-of-the-art technology now available, a group of scientists were able to identify eight species, but six which are endemic to the region.

“The time has come to relook at our biodiversity in the Western Ghats when it comes to microscopic organisms like diatoms,” said Karthick Balasubramanian, scientist at the Biodiversity and Paleobiology group of



Asterionella



Cymbella aspera

Photo courtesy: Karthick Balasubramanian

toms are found in the oceans, you can find them in lakes, streams, on rocks, on the bark of trees, near waterfalls, in the soil, etc. Even in the most polluted environment, you will find that some species of diatoms have managed to survive,” said Aditi Kale, another researcher working on diatoms at ARI.

This ability of diatoms makes them an ideal candidate as bio-indicators to assess the quality of a water body. “Diatoms are very sensitive to factors such as temperature, levels of nutrients and chemicals and salinity of water. The species of diatoms that grow in pristine waters will be very different from those found in polluted sources. Moreover, statistical models can be created where the presence of diatoms can be quantified,” Balasubramanian said.

Pollution monitoring tests are usually done periodically and chemical tests would notice an anomaly only if there is a variation from the normal at the time the test is done. If there is a release of contaminant in between that comes back to normal over a period of



WONDERS OF THE WESTERN GHATS

Agharkar Research Institute (ARI) in Pune. He has discovered 25 new species of diatoms in just over four years since 2011.

Diatoms are a group of algae that have a unique feature; they are enclosed in a cell wall made of silica (the most abundant material in the earth’s crust). The incorporation of this silica in their cell walls known as frustules renders them nearly-indestructible and imparts the ability to survive in diverse environments.

“While the bulk of dia-



Diatoms have evolved skills that allow them to survive in habitats like the crevices of rocks, the top layer of soil, etc

WHAT ARE DIATOMS?

One of the most populous groups of algae out there, diatoms are unicellular organisms. Their unique feature is that they are enclosed in a cell wall made of silica called frustules. The frustule is divided into two parts that fit together like a soap-dish

■ Estimated species of Diatoms Globally | **1.2 million**

Of these only about **25,000** have been discovered

■ In Indian sub-continent | **7-8,000** are found

■ Diatoms are believed to contribute about **25%** to the total oxygen produced in the world. Of the last four breaths you took, one was supplied entirely by diatoms

■ Genome mapping conducted on diatoms has revealed that they have derived their genetic material from a variety of sources including plants, animals and fungi

time, it would go undetected. However, if there is a sudden change in water quality then living things like diatoms would be adversely affected.

“If on conducting a test you suddenly find a change in diatom community in the water you would know something went wrong in between,” he added. But he rued the paucity of information about the species diversity of diatoms in India.

“As per present records, there are about 25,000 known species of diatoms in the world. Of these, about 8,000 species are recorded in the Indian sub-continent, 80% of which are also found in Europe and America. The current list of known species needs to be revised,” he said.

Most of the studies on diatoms conducted in the past were done using European literature for reference. As a result it is possible that a number of species were “misidentified” as was illustrated when the reevaluation of the

samples collected from Kolhapur was done, he added.

For comparison, he pointed out that about 78% of amphibians, 76% of the molluscs and 53% of fishes found in the Western Ghats are endemic to the region. “How can the level of endemism for diatoms be so low,” he asked.

Research on diatoms has several applications. The near indestructible nature of the diatom cell wall means that frustules of diatoms from prehistoric times are available in the sediments of natural lakes. Careful analysis of these frustules can go a long way in understanding the environmental history of the region, he said.

Perhaps even more fascinating is the use of diatoms in forensic science. The presence of diatoms in the lung tissue of a body found inside a lake can tell a forensic expert whether the person died of drowning or if they were killed elsewhere and the body dumped there afterwards.

Institutional Research Projects

Sl no.	Project Code	Project Title	Investigator(s)	Associated Staff
1	New BIO 04	Functional foods for diabetes: Evaluation of oral hypoglycemic proteins from <i>Costusspeciosus</i> (Koenig), insulin plant (Pushkarmula) from Western Ghats of India	BN Joshi	M Varma
2	BIO 24	Natural supplements for the treatment of inflammation associated anemia	PP Kulkarni BN Joshi	N Ghatpande A Misar
3	CHEM 1	Study of pheromones and semiochemicals	DG Naik	CN Dandge H Puntambekar PV Deshpande
4	CHEM 3	Chemical investigations of medicinal plants	Naik DG Upadhye AS	RJ Waghole
5	CHEM 11	Design and synthesis of analogs of naturally occurring and pharmaceutically active molecules against Chikungunya virus	P Srivastava	NV Puranik
6	ZOO 15	Structural and functional characterization of pattern-forming and DNA repair genes from hydra	S Ghaskadbi & V Kavimandan	Patwardhan A
7	ZOO 16	Signaling pathways in glial cell development: the role of FGFR signaling	A Ratnaparkhi	A Basargekar
8	ZOO 17	Molecular investigations of autophagic process during starvation, tissue regeneration and protein aggregate clearance	B Shrivage	A Bali
9	ZOO18	Identification and functional analysis of novel regulators during heart development and regeneration	C Patra	A Rayrikar
10	GEN 14	Marker assisted selection for seedlessness in table grape breeding	S Tetali SA Tamhankar	C Neerajakshi
11	GEN 15	Characterization of GA-sensitive dwarf durums at molecular level	RM Patil	P Vikhe
12	GEN 16	Mapping QTL/genes for resistance to spot blotch caused by <i>Bipolarissorokiniana</i> in durum wheat	SA Tamhankar RM Patil BK Honrao SC Misra	S Venkatesan
13	BOT 15	Digitizing Herbarium- AHMA	MN Datar R Khaire	N Gaikwad
14	BOT 17	Repository of crude drugs, authentication service and development of HPTLC profile library of PRS (Phytochemical Reference Standard)	AS Upadhye	A Misar A Rajopadhye L Dias
15	BOT 18	Plant community studies on selected grasslands of Western Maharashtra	MN Datar	P Gorade

SI no.	Project Code	Project Title	Investigator(s)	Associated Staff
16	BOT 21	Developing profiles for medicinally important species from Genus <i>Solanum</i> L. and their application in identification of market samples	AS Upadhye SA Tamhankar RK Choudhary	R Joshi
17	BOT 22	Molecular phylogeny of <i>Eriocaulon</i> L. of the Northern Western Ghats, India	RK Choudhary SA Tamhankar MN Datar	A Darshetkar
18	BOT 23	Do semi-aquatic habitats act as refugia for endemic diatoms in Western Ghats?	K Balasubramanian	A Kale
19	GEO 17	Role of ichnofauna in deciphering sequence of deposition of the Upper Jurassic rocks of the Marwar Basin	KG Kulkarni	S Salunkhe
20	GEO 18	Study of biogenic sedimentary structures in the Kundalika estuary, West Coast of Maharashtra and their comparison with fossil Counterparts	KG Kulkarni R Panchang	A Kamble
21	MYC 02	Core activities - National Facility - Repositories and service (NFCCI, AMH, and Identification Service)	SK Singh PN Singh KC Rajeshkumar A Bhagela	D Maurya S Lad
22	MYC 07	Polyphasic taxonomy of fungal families <i>Nectriaceae</i> , <i>Mycosphaerellaceae</i> and <i>Trichocomaceae</i> with secondary metabolite profiling and database development for applied research	KC Rajeshkumar SK Singh DG Naik R Umrani	S Marathe
23	MYC 08	Taxonomy, multigene phylogeny and monographic documentation of Indian Fusaria	SK Singh A Bhagela	C Acharya
24	MYC 09	Development of multi-locus microsatellite typing (MLST) method and an efficient gene targeting system for a devastating plant fungal pathogen <i>Colletotrichum gloeosporioides</i>	A Bhagela SK Singh	N Mehta
25	MIC 10	Microbial diversity and conservation	KM Paknikar PK Dhakephalkar M Rahalkar SS Dagar	N Kapase AS Kelkar
26	MIC 32	Mining the anoxic ecosystems for efficient fibrolytic microbes	PKDhakephalkar S Dagar M Rahalkar	A Joshi
27	NBS 07	Studies on the biological fate of zinc oxide nanoparticles	RD Umrani V Gajbhiye KM Paknikar	S Panchal
28	NBS 08	Development of multitasking nano-platform for targeted siRNA delivery to LHRH over expressed cancerous cells	V Gajbhiye KM Paknikar	P Tambe

Sponsored Research Projects

Sr No	Project Code	Project Title	Sponsored By	Investigators
1	ARI/SP/001	All India Co-ordinated Research Project on Soybean (1.4.1968 onwards)	ICAR, New Delhi	Dr SP Taware
2	ARI/SP/002	All India Co-ordinated Fruit Improvement Project (1.10.70 onwards)	ICAR, New Delhi	Dr BK Honrao
3	ARI/SP/003	All India Co-ordinated Wheat Improvement Project (1.4.1972 onwards)	ICAR, New Delhi	Dr S Tetali
4	ARI/SP/033	Production of Soybean Breeder Seeds of Annual Oil Seed Crops (2.2.88 onwards)	ICAR, New Delhi	Dr SP Taware
5	ARI/SP/034	Front-line Demonstrations of Annual Oil Seed Soybean (21.2.89 onwards)	ICAR, New Delhi	Dr SP Taware
6	ARI/SP/043	Front-line Demonstrations in Wheat (1.4.1993 onwards)	ICAR, New Delhi	Dr BK Honrao
7	ARI/SP/096	Wheat Breeder Seed Scheme (1995 onwards)	ICAR, New Delhi	Dr BK Honrao
8	ARI/SP/118	CRP Agrobiodiversity Project (March 2006 onwards)	ICAR, Karnal	Dr BK Honrao
9	ARI/SP/166	Generating new wheat germplasm with enhanced draught/heat tolerance using AB genomes genetic diversity (15.10.2008 onwards)	World Bank	Dr BK Honrao
10	ARI/SP/168	Digitized inventory of medicinal plant resources of Maharashtra	RGSTC, Mumbai	Dr AS Upadhye
11	ARI/SP/179	Mobilizing Qtl/Genes for quality Traits into high yielding WHEAT varieties Through Marker-Assisted Selection (23.09.2009 to 22.09.2014) Extended upto 22.09.2016	DBT, New Delhi	Dr SA Tamhankar
12	ARI/SP/181	Molecular marker assisted development of biotic stress resistant wheat varieties (13.11.2009 to 12.11.2014) Extended w.e.f. 24.09.2014 to 23.09.2015	DBT, New Delhi	Dr SA Tamhankar
13	ARI/SP/183	Network Project:Physiological water use efficiency (root traits) (23.11.09 to 23.11.2017)	ICAR, Karnal	Dr BK Honrao
14	ARI/SP/188	Epigenetics of regeneric in hydra (19.03.2010 to 18.03.2015) Extended upto 30.09.2015	DBT, New Delhi	Dr SM Ghaskadbi
15	ARI/SP/189	Transgenic hydra facility for the study of molecular regulation of regeneric and pattern formation (19.03.2010 to 18.03.2015) Extended upto 30.09.2015	DBT, New Delhi	Dr SM Ghaskadbi
16	ARI/SP/201	Women Scientist Scheme A(WOS-A) entitled "Documentation of mangrove foraminifera of coastal Maharashtra with special reference to their environment significance (21.12.2011 to 01.07.2015)	DST, New Delhi	Dr R Panchang
17	ARI/SP/206	Biofertilization of wheat for micronutrients through conventional and molecular approaches-Phase II (22.03.2012 to 21.03.2017)	DBT, New Delhi	Dr SA Tamhankar
18	ARI/SP/207	National Network program on lichens: Bioprospecting its secondary compounds and establishing cultures and collections (21.03.2012 to 20.03.2017)	DBT, New Delhi	Dr BC Behera

Sr No	Project Code	Project Title	Sponsored By	Investigators
19	ARI/SP/208	Production of lichen secondary metabolites using bioreactor and study of their cytotoxic activity in vitro (01.06.2012 to 31.05.2015)	SERB, New Delhi	Dr N Verma
20	ARI/SP/210	Copper induced oxidative stress and neurotoxicity of AB peptides in cellular model of Alzheimer's Disease. (09.5.2012 to 8.05.2015) Extended upto May-2016	DBT, New Delhi	Dr PP Kulkarni
21	ARI/SP/211	Enhancing use efficiency of micronutrients: Novel delivery systems. (28.06.2012 to 19.06.2017)	ICAR, New Delhi	Dr KM Paknikar
22	ARI/SP/212	Bioactive Molecules for the Treatment of the Alzheimer's Disease (03.09.2012 to 03.09.2015) Extended upto 28.12.2015	DBT, New Delhi	Dr PP Kulkarni
23	ARI/SP/213	Developing rapid diagnostics for the detection of Aspergilliosis. (03.10.2012 to 2.10.2015) Extended upto 19.09.2016	DBT, New Delhi	Dr KM Paknikar
24	ARI/SP/216	Survey of Wild Edible Plants and Wild Relatives of Edible Plants Found in Western Ghats of Maharashtra. (28.01.2013 to 31.05.2015)	Forest, Pune	Dr M Datar
25	ARI/SP/218	Exploitation of inter-specific biodiversity for Wheat Improvement (01.03.2013 to 28.02.2018)	DBT, New Delhi	Dr BK Honrao
26	ARI/SP/219	Antimicrobial Nanomaterials for Control of Bacterial Blight of Pomegranate (01.04.2013 to 31.03.2016)	KanBiosys Pvt. Ltd., Pune	Dr KM Paknikar
27	ARI/SP/220	Ecological studies of lichens in the Deccan outcrops (14.06.2013 to 13.06.2016)	SERB, New Delhi	DrGS Pandit
28	ARI/SP/221	Microbial regulation of immune gene expression in hydra (14.06.2013 to 13.06.2016)	SERB, NewDelhi	Dr SM Ghaskadbi
29	ARI/SP/222	Molecular mapping of GA-sensitive dwarfing genes and crop establishment traits in durum wheat (25.06.2013 to 24.06.2016)	SERB, New Delhi	Dr RM Patil
30	ARI/SP/223	Increasing the productivity of the wheat crop under conditions of rising temperatures and water scarcity in South Asia (01.07.2012 to 30.06.2015)	BMZ, Germany	Dr BK Honrao
31	ARI/SP/224	Microbial control of methane turnover in rice fields (19.07.2013 to 18.07.2016)	DBT, New Delhi	Dr M Rahalkar
32	ARI/SP/226	Late Holocene vegetation, climate dynamics and human - environment interaction along Konkan coast, India (01.05.2014 to 30.04.2017)	DST, New Delhi	Dr R Limaye
33	ARI/SP/227	Chikunguniya Virus Replication & Ubiquity System DST-INSPIRE (01.01.2014 to 14.06.2017)	DST, New Delhi	Dr Y Karpe
34	ARI/SP/228	Cell-penetrating peptides as drug delivery agents for cancer & Alzheimer DST-INSPIRE (16.05.2014 to 15.05.19)	DST, New Delhi	Dr A Jha
35	ARI/SP/229	Engineered Nanocancer Mediated Targeted Co-delivery of siRNA & anti-cancer Drugs for Effective gene silencing & tumor therapy DST-INSPIRE (01.07.2014 to 30.06.2019)	DST, New Delhi	Dr V Gajbhiye

Sr No	Project Code	Project Title	Sponsored By	Investigators
36	ARI/SP/230	Development of microfluidics immunoassay for detection of salmonella typhimurium (25.07.2014 to 24.07.2017)	DST, New Delhi	Dr D Bodas
37	ARI/SP/231	Development of Crude Drug Repository of Genuine samples from Maharashtra (16.08.14 to 15.08.2019)	RGSTC, Mumbai	Dr AS Upadhye
38	ARI/SP/232	Safe healthy food farm to table: new diagnostic tools for detection mycotoxin procedures, mycotoxin and food borne microbial pathogen (10.10.2014 to 09.10.2017)	DBT, New Delhi	Dr V Ghormade
39	ARI/SP/233	Comparative evaluation of the antibacterial effect, adhesion of gingival fibroblast and epithelial attachment to titanium, zirconia and titanium with silver nano coatings. (Oct 2014 to September 2015)	ITI Switzerland	Dr J Rajwade
40	ARI/SP/234	Development of field level nanoparticles based immunodiagnosics for viral pathogens of shrimp and prawn. (27.01.2015 to 26.01.2018)	DBT, New Delhi	Dr KMPaknikar
41	ARI/SP/235	Isolation of hyperthermophiles for MEOR application for reservoirs above 90 deg c. (10.02.2015 to 09.02.2017)	ONGC, Ahmedabad	Dr PK Dhakephalkar
42	ARI/SP/236	Development of Bioremediation process for Petroleum Hydrocarbon contaminated sites using powdered microbial formulations (10.02.2015 to 09.02.2017)	ONGC, Ahmedabad	Dr PK Dhakephalkar
43	ARI/SP/237	Crosstalk between Wnt and BMP signalling pathways during regeneration and pattern formation in hydra (25.03.2015 to 24.03.2018)	DST, New Delhi	Dr KL Surekha
44	ARI/SP/238	Improvement of end use quality of 1BL/1RS translocation containing wheat varieties by removing of Sec-1 loci and Glu-B3 using marker assisted back cross breeding (MABB) (26.03.2015 to 25.03.2020)	DBT, New Delhi	Dr M Oak
45	ARI/SP/239	Identification and analysis of extracellular matrix components important for heart development using zebrafish as model organism (12.03.2015 to 11.03.2018)	Max Planck & DST	Dr C Patra
46	ARI/SP/240	An integrated approach of molecular breeding for downy powdery mildew resistance in Grape. (25.06.2015 to 24.06.2018)	DBT, New Delhi	Dr S Tetali
47	ARI/SP/241	Development of specialized microbial culture bank for energy recovery from lignite and matured oil reservoirs (29.06.2015 to 28.06.2016)	ONGC/OECT, New Delhi	Dr PK Dhakephalkar
48	ARI/SP/242	Dark Energy microbial biosphere in ocean sediments-geomicrobial&astobiological implications. (07.07.2015 to 06.07.2018)	SERB, New Delhi	Dr A Das
49	ARI/SP/243	Probiotic Genome Sequencing. (11.8.2015 to 10.02.2016)	Hi tech Bio Sciences India Ltd. , Pune	Dr PK Dhakephalkar

Sr No	Project Code	Project Title	Sponsored By	Investigators
50	ARI/SP/244	Impact of EMF radiation of animal development at cellular & molecular levels. (11.08.2015 to 10.08.2018)	SERB, New Delhi	Dr SM Ghaskadbi
51	ARI/SP/245	Novel indole derivatives and their metal complexes for alzheimer's disease. (18.09.2015 to 17.09.2018)	SERB, New Delhi	Dr PP Kulkarni
52	ARI/SP/246	Isolation and characterization of SRB Lysing Bacteriophage for Inhibition of petroleum field Souring and SRB Induced Corrosion. (23.09.2015 to 23.09.2017)	ONGC/OECT, New Delhi	Dr PK Dhakephalkar
53	ARI/SP/247	Identification and characterization of kinetochore proteins of a devastating plant fungal pathogen <i>Collectrichumgraminicola</i> and their application in characterizing the centromeres in a genome-wide analysis. (16.11.2015 to 15.11.2018)	SERB, New Delhi	Dr A Baghela
54	ARI/SP/248	Studies on the biodiversity and bioactivity assessment of high altitudinal lichens having economic potential in Western Himalaya. (21.11.2015 to 20.11.2018)	SERB, New Delhi	Dr R Khare
55	ARI/SP/249	Exploring the diversity of lignocellulose degrading thermophilic anaerobic bacteria from Indian hot springs for bioenergy applications. (26.11.2015 to 25.11.2018)	SERB, New Delhi	Dr S Dagar
56	ARI/SP/250	Marker Assisted Elimination of off-flavour generating lipoxygenase-2 gene from kunitz trypsin inhibitor free soybean genotypes. (04.12.2015 to 03.12.2020)	DBT, New Delhi	Dr P Varghese
57	ARI/SP/251	Identification of enhancers regulating expression in glial subsets in <i>Drosophila</i> . (15.02.2016 to 14.02.2019)	DST, New Delhi	Dr A Ratnaparkhi
58	ARI/SP/252	Can diatom communities across spatial and environmental gradients of Western Ghats reflect water quality conditions of streams? (29.02.2016 to 28.02.2016)	SERB, New Delhi	Dr K Balasubramanian
59	ARI/SP/253	Polyphasic taxonomy, conservation and monographic documentation of Indian <i>Aspergillus</i> and <i>Penicillium</i> species. (11.03.2016 to 10.03.2019)	SERB, New Delhi	Dr KC Rajesh Kumar
60	ARI/SP/254	Elucidating the community structure of methanogenic archaea in methane hydrates. (29.03.2016 to 28.03.2019)	SERB, New Delhi	Dr V Lanjekar
61	ARI/SP/255	Studies on nanoparticles assisted dispersion of biofilms formed in drinking water distribution system. (31.03.2016 to 31.03.2018)	DST, New Delhi	Dr JM Rajwade
62	ARI/SP/256	Investigate the role Autophagy in stem cell maintenance and aging. (25.05.2016 to 24.05.2021)	DBT, New Delhi	Dr B Shrivage
63	Dr. Kumaran, Emeritus Scientist	Late quaternary vegetation and climate changes in southwest India evidence from sediment archives of kollam Alappuzha coastal plains of the south Kerala sedimentary basin (Upto 31.03.2016)	CSIR, New Delhi	Dr KPN Kumaran

Personnel (List of Staff Members as of 31.03.2016)

<p>Director (Officiating) Dr KM Paknikar, Sc.G</p>	<p>Dr P Srivastava, Sc.C Dr CN Dandge, Technical Officer C Dr HM Puntambekar, Technical Officer C RJ Waghole, Technical Assistant B Dr AV Misar, Technical Assistant B</p>
<p>Biodiversity & Paleobiology Group Dr SM Ghaskadbi, Sc.G & Coordinator Dr SK Singh, Sc. E Dr BC Behera, Sc. E Dr KG Kulkarni, Sc. D Dr PN Singh, Sc. C Dr AS Upadhye, Sc. C Dr RK Chaudhary, Sc. C Dr B Karthick, Sc. C Dr KC Rajesh Kumar, Sc. C Dr A Baghela, Sc. C Dr MN Datar, Sc. C Dr T Kaushik, Sc. B Dr BO Sharma, Technical Officer A KK Patil, Technical Officer A Dr PG Gamre, Technical Officer A VN Joshi, Technical Assistant B SB Gaikwad, Technical Assistant B SS Deshmukh, Laboratory Assistant E MH Mhetre, Laboratory Assistant C DK Mourya, Laboratory Assistant C SS Lad, Laboratory Assistant C NS Gaikwad, Laboratory Assistant B SA Pardhi, Laboratory Assistant A MD Chavan, Attendant D SN Gajbhar, Attendant D NS Mane, Attendant B</p>	<p>Developmental Biology Group Dr SM Ghaskadbi, Sc. G & Coordinator Dr VG Patwardhan, Sc.E Dr A Ratnaparkhi, Sc. E Dr SH Jadhav, Sc.C Dr C Patra, Sc. C Dr BV Shrivage, Sc. C MB Daware, Technical Officer A RJ Londhe, Technical Assistant B B Haldar, Technical Assistant A AA Nikam, Laboratory Assistant A</p>
<p>Bioenergy Group Dr PK Dhakephalkar, Sc. F & Coordinator Dr MC Rahalkar, Sc.C Dr SS Dagar, Sc.C Mr PR Kshirsagar, Sc. C Dr DC Kshirsagar, Technical Officer C AS Kelkar, Technical Officer B VK Nalavade, Laboratory Assistant D Dr VB Lanjekar, Laboratory Assistant B GM Ingale, Attendant B</p>	<p>Genetics & Plant Breeding Group Dr SP Taware, Sc. F & Coordinator Dr SA Tamhankar, Sc.F Dr BKHonrao, Sc.E Dr MD Oak, Sc. D Dr SP Tetali, Sc.C Dr Philip Varghese, Sc.C Dr RM Patil, Sc.C SA Jaybhay, Sc. B AM Chavan, Sc. B VM Khade, Technical Officer B VD Surve, Technical Officer A SP Karkamkar, Technical Officer A JH Bagwan, Technical Officer A BD Idhol, Technical Assistant B SV Phalake, Technical Assistant B VD Gite, Technical Assistant B BN Pulaje, Technical Assistant B SS Khairnar, Technical Assistant B JS Sarode, Laboratory Assistant C AA Deshpande, Technical Assistant B SS Raskar, Technical Assistant A DH Salunkhe, Laboratory Assistant B DN Bankar, Laboratory Assistant B PG Lavand, Laboratory Assistant A AD Sonvalkar, Driver (Special Grade) MT Gurav, Attendant C TA Kolte, Attendant C RD Shinde, Attendant C</p>
<p>Bioprospecting Group Dr DG Naik, Sc.F & Coordinator Dr BN Joshi, Sc.D Dr PP Kulkarni, Sc.D</p>	

SL Bhandalkar, Attendant A
 SV Ghadge, Attendant A
 SR Kachhi, Attendant A
 DL Kolte, Attendant A
 TB Joshi, Attendant A
 GS Rajguru, Attendant A

Nanobioscience Group

Dr KM Paknikar, Sc.G & Coordinator
 Dr JM Rajwade, Sc.D
 Dr DS Bodas, Sc. D
 Dr V Ghormade, Sc. D
 Dr RD Umrani, Sc. C
 Dr Virendra Gajbhiye, Sc. C
 Dr YA Karpe, Sc. C
 RG Bambe, Technical Assistant B
 A Dwivedi, Technical Assistant A
 SS Waghmare, Laboratory Assistant B
 D Nayankumara, Technician A

Animal House (under Dr. S.M.Ghaskadbi)

KV Tiwari, Attendant A
 VM Gosavi, Attendant A

Director's Office

Dr GK Wagh, Technical Officer D
 Dr PP Apte, Technician B
 RS Shinde, Assistant A
 SP Balsane, Attendant A

Administration

G Barik, Administrative Officer
 VB Bhalerao, Officer B
 CD Nagpure, Officer A
 J V Deshpande, Pvt. Secretary
 DS Zade, Assistant B
 MB Tiwari, Assistant B
 MV Patke, Assistant A
 PD Gagare, Assistant A
 SA Shaikh, Assistant A
 RM Salunke, Attendant C
 RM Dhandhore, Attendant B
 AB Kusalkar, Driver
 GH Agawan, Driver

Accounts (under charge of Shri G. Barik, A.O.)

HN Mate, Officer B

PP Pathak, Officer B
 AD Joshi, Officer A
 SV Kulkarni, Officer A
 M Ranjane, Assistant B
 TV Kurhade, Assistant A
 AV Wable, Assistant A
 SR Jagtap, Assistant A
 KR Sathe, Attendant A

Purchase

PV Gosavi, Stores & Purchase Officer
 AG Dhongade, Sr. PS
 VG Tallu, Officer A
 U Kulkarnii, Officer A
 DV Gavade, Assistant A
 R Dhobale, Assistant A
 AT Salvi, Attendant B

Store

SA Tembe, Officer B
 SS Kalekar, Assistant A
 SS Chavan, Assistant A

Engineering Unit

AV Chaudhari, Technical Officer C
 M Kharade, Technical Officer B
 PV Sawant, Technical Officer A
 RG Murade, Technician A
 DS Shinde, Technician A
 SB Karanjekar, Attendant D

Library and Information Centre

Dr SN Kulkarni, Pr. Lib. & Info. Officer
 RP Janrao, Asst. Lib. & Info. Officer
 AD Patil, Assistant B
 S Deshmukh, Sr. Lib. Assistant
 RR Kale, Attendant B

Other Technical Staff

RK Dongre, Technical Officer D
 BA Kawthekar, Technician D
 AS Waghole, Technician D

Promotions

Scientific Staff

Dr JM Rajwade, Sc. E
 Dr V Ghormade, Sc. D
 Dr MD Oak, Sc. D
 Dr MN Datar, Sc. C

Administrative Staff

VB Bhalerao, Officer B
 PP Pathak, Officer B
 U Kulkarni, Officer A
 AD Joshi, Officer A
 SV Kulkarni, Officer A

NTMS

SN Gajbhar, Attendant D
 RM Salunke, Attendant C
 RR Kale, Attendant B

Appointments

Name & Designation	Group/ Unit	Date of Joining
Scientific		
AM Chavan, Sc. B	Genetics & Plant Breeding (Hol Farm)	18.05.2015
T Kaushik, Sc. B	Biodiversity & Palaeobiology	12.08.2015
Technical		
PV Sawant, Tech. Officer A	Engineering Unit	02.06.2015
A Dwivedi, Tech. Assistant A	Centre for Nanobioscience	31.07.2015
AA Nikam, Laboratory Assistant A	Developmental Biology	03.06.2015
D Nayankumara, Technician A	Centre for Nanobioscience	18.08.2015
SA Pardhi, Laboratory Assistant A	Biodiversity & Palaeobiology	26.02.2016
S Deshmukh, Sr. Library Assistant	Library	01.06.2015
SS Raskar, Technical Assistant A	Genetics & Plant Breeding (Hol Farm)	21.03.2016
Driver		
GH Agawan, Driver	Administration	11.01.2016
NTMS		
TB Joshi, Attendant A	Genetics & Plant Breeding (Hol Farm)	29.03.2016
GS Rajguru, Attendant A	Genetics & Plant Breeding (Songaon Farm)	29.03.2016

Superannuation

Dr SC Misra, Sci. F
 Dr DG Naik, Sc. F
 Dr SS Nilegaonkar, Sc. E
 SS Khomane, Attendant D
 PS Pujari, Officer B

Voluntary Retirement

BR Kakade, Tech. Officer A

Reservation & Concessions

To provide adequate representation of SCs, STs and OBCs in direct recruitment posts instructions given by the Govt. of India, Dept. of Per. & Trg. OM NO.36012/2/96-Estt. (Res.), dated 2 July 1997 have been implemented.

Details of posts filled during 2015-2016

Group	SC	ST	OBC	General	Total
A	-	-	-	2	2
B	1	--	2	-	3
C	1	1	3	2	7
Total	2	1	5	4	12

Fellows as on 31.03.2016

<p>Research Associate</p> <p>ARI Projects Dr Anagha Rajopadhye Dr Anupama Engineer</p> <p>Sponsored Projects Dr V Gowdaman Dr Shikha Sharma</p>	<p>Research Student</p> <table border="0"> <tr> <td>Abhijit Kulkarni</td> <td>Neelam Kapase</td> </tr> <tr> <td>Amruta Alwaris</td> <td>Ninad Puranik</td> </tr> <tr> <td>Arundhati Bali</td> <td>Pranitha Pandit</td> </tr> <tr> <td>Ashwini Darshetkar</td> <td>Radhakrishnan Cheran</td> </tr> <tr> <td>Chaitrali Jadhav</td> <td>Sayali Marathe</td> </tr> <tr> <td>Chaitrali Pol</td> <td>Sohan Salunkhe</td> </tr> <tr> <td>Girish Pathak</td> <td>Sulaxna Pandey</td> </tr> <tr> <td>Kunal Pingale</td> <td>Sushen Lomte</td> </tr> <tr> <td>Lourelle Dias</td> <td>Vishaka Somawanshi</td> </tr> </table>	Abhijit Kulkarni	Neelam Kapase	Amruta Alwaris	Ninad Puranik	Arundhati Bali	Pranitha Pandit	Ashwini Darshetkar	Radhakrishnan Cheran	Chaitrali Jadhav	Sayali Marathe	Chaitrali Pol	Sohan Salunkhe	Girish Pathak	Sulaxna Pandey	Kunal Pingale	Sushen Lomte	Lourelle Dias	Vishaka Somawanshi																																										
Abhijit Kulkarni	Neelam Kapase																																																												
Amruta Alwaris	Ninad Puranik																																																												
Arundhati Bali	Pranitha Pandit																																																												
Ashwini Darshetkar	Radhakrishnan Cheran																																																												
Chaitrali Jadhav	Sayali Marathe																																																												
Chaitrali Pol	Sohan Salunkhe																																																												
Girish Pathak	Sulaxna Pandey																																																												
Kunal Pingale	Sushen Lomte																																																												
Lourelle Dias	Vishaka Somawanshi																																																												
<p>Senior Research Fellow</p> <p>ARI Projects Jyoti Kumbhar</p> <p>Sponsored Projects Dr Vasundhara Paliwal Dnyanesh Ranade Shruti Nair Shruti Sawantdesai</p>	<p>Fellows with own fellowship</p> <table border="0"> <tr> <td>Dr KPN Kumaran</td> <td>CSIR, Emeritus Scientist</td> </tr> <tr> <td>Dr V Ghate</td> <td>RGSTC Project, Emeritus Scientist</td> </tr> <tr> <td>Dr SC Misra</td> <td>Emeritus Scientist</td> </tr> <tr> <td>Dr Ruta Limaye</td> <td>DST- Women</td> </tr> <tr> <td>Dr Anjali Jha,</td> <td>DST- Inspire Faculty</td> </tr> <tr> <td>Dr Gargi Pandit</td> <td>DST-SERB Young Scientist</td> </tr> <tr> <td>Dr Anindita Das</td> <td>DST-SERB Young Scientist</td> </tr> <tr> <td>Dr SL Surekha</td> <td>DST-SERB Young Scientist</td> </tr> <tr> <td>Roshani Khare</td> <td>DST-SERB Young Scientist</td> </tr> <tr> <td>Swati Asani</td> <td>CSIR-SRF</td> </tr> <tr> <td>Paresh Deshpande</td> <td>CSIR-SRF</td> </tr> <tr> <td>Preeti Arora</td> <td>CSIR-SRF</td> </tr> <tr> <td>Soham Pore</td> <td>CSIR-SRF</td> </tr> <tr> <td>Pankuri Kawadiwale</td> <td>DST Inspire Fellowship</td> </tr> <tr> <td>Sneha Maheshwari (Tapdia)</td> <td>UGC-SRF</td> </tr> <tr> <td>Prabir Kulbhushan</td> <td>ICMR-SRF</td> </tr> <tr> <td>Nishikant Dixit</td> <td>ICMR-SRF</td> </tr> <tr> <td>Rohini Chikte</td> <td>UGC-SRF</td> </tr> <tr> <td>Anuprita Turvankar</td> <td>UGC-SRF</td> </tr> <tr> <td>Vivek Kamat</td> <td>UGC-SRF</td> </tr> <tr> <td>Shweta Kumari</td> <td>UGC-SRF</td> </tr> <tr> <td>Komal Raval</td> <td>UGC-SRF</td> </tr> <tr> <td>Ashwin Dapkekar</td> <td>UGC-JRF</td> </tr> <tr> <td>Alisha Galande</td> <td>UGC-JRF</td> </tr> <tr> <td>Kasturi Deore</td> <td>UGC-JRF</td> </tr> <tr> <td>Aditi Kale</td> <td>UGC-JRF</td> </tr> <tr> <td>Mokshada Varma</td> <td>CSIR-JRF</td> </tr> <tr> <td>Pradnya Nagkirti</td> <td>UGC-JRF</td> </tr> <tr> <td>Ameya Rairikar</td> <td>DBT-JRF</td> </tr> <tr> <td>Pramod Kumar</td> <td>DBT-JRF</td> </tr> </table>	Dr KPN Kumaran	CSIR, Emeritus Scientist	Dr V Ghate	RGSTC Project, Emeritus Scientist	Dr SC Misra	Emeritus Scientist	Dr Ruta Limaye	DST- Women	Dr Anjali Jha,	DST- Inspire Faculty	Dr Gargi Pandit	DST-SERB Young Scientist	Dr Anindita Das	DST-SERB Young Scientist	Dr SL Surekha	DST-SERB Young Scientist	Roshani Khare	DST-SERB Young Scientist	Swati Asani	CSIR-SRF	Paresh Deshpande	CSIR-SRF	Preeti Arora	CSIR-SRF	Soham Pore	CSIR-SRF	Pankuri Kawadiwale	DST Inspire Fellowship	Sneha Maheshwari (Tapdia)	UGC-SRF	Prabir Kulbhushan	ICMR-SRF	Nishikant Dixit	ICMR-SRF	Rohini Chikte	UGC-SRF	Anuprita Turvankar	UGC-SRF	Vivek Kamat	UGC-SRF	Shweta Kumari	UGC-SRF	Komal Raval	UGC-SRF	Ashwin Dapkekar	UGC-JRF	Alisha Galande	UGC-JRF	Kasturi Deore	UGC-JRF	Aditi Kale	UGC-JRF	Mokshada Varma	CSIR-JRF	Pradnya Nagkirti	UGC-JRF	Ameya Rairikar	DBT-JRF	Pramod Kumar	DBT-JRF
Dr KPN Kumaran	CSIR, Emeritus Scientist																																																												
Dr V Ghate	RGSTC Project, Emeritus Scientist																																																												
Dr SC Misra	Emeritus Scientist																																																												
Dr Ruta Limaye	DST- Women																																																												
Dr Anjali Jha,	DST- Inspire Faculty																																																												
Dr Gargi Pandit	DST-SERB Young Scientist																																																												
Dr Anindita Das	DST-SERB Young Scientist																																																												
Dr SL Surekha	DST-SERB Young Scientist																																																												
Roshani Khare	DST-SERB Young Scientist																																																												
Swati Asani	CSIR-SRF																																																												
Paresh Deshpande	CSIR-SRF																																																												
Preeti Arora	CSIR-SRF																																																												
Soham Pore	CSIR-SRF																																																												
Pankuri Kawadiwale	DST Inspire Fellowship																																																												
Sneha Maheshwari (Tapdia)	UGC-SRF																																																												
Prabir Kulbhushan	ICMR-SRF																																																												
Nishikant Dixit	ICMR-SRF																																																												
Rohini Chikte	UGC-SRF																																																												
Anuprita Turvankar	UGC-SRF																																																												
Vivek Kamat	UGC-SRF																																																												
Shweta Kumari	UGC-SRF																																																												
Komal Raval	UGC-SRF																																																												
Ashwin Dapkekar	UGC-JRF																																																												
Alisha Galande	UGC-JRF																																																												
Kasturi Deore	UGC-JRF																																																												
Aditi Kale	UGC-JRF																																																												
Mokshada Varma	CSIR-JRF																																																												
Pradnya Nagkirti	UGC-JRF																																																												
Ameya Rairikar	DBT-JRF																																																												
Pramod Kumar	DBT-JRF																																																												
<p>Junior Research Fellow</p> <p>ARI Projects Anagha Basargekar Suhasini Venkatesan Prajakta Tambe Shashikant Panchal Parimal Vikhe Nikita Mehta Henry Kolge Gayatri Kanade Nimisha Singh Debanjan Mukherjee Chinmayee Acharya Akshay Joshi</p> <p>Sponsored Projects Anuja Patil Dnyaneshwar Shinde Gulshan Walke Kedar Pathak Krupa Patwardhan LRK Jai Vidhya Priyanka Choudhary Sai Hivarkar Swapnil Savale Shital Sonwane</p>																																																													

राजभाषा का दर्जा

भारत सरकार के राजभाषा सम्बंधी आदेशों पर हमारे संस्थान में निम्नलिखित प्रयास जारी हैं।

- हाल ही में हमारे संस्थान का नाम “नगर राजभाषा कार्यान्वयन समिति”, में शामिल हुआ है।
- संस्थान के मेन बिल्डींग में हररोज “आज का शब्द” (हिन्दी तथा अंग्रेजी) में लिखा जाता है। हिन्दी शब्दों से परिचित करवाने हेतु हररोज एक शब्द और उसके अंग्रेजी सम शब्द का प्रदर्शन।
- हिन्दी और अंग्रेजी में वार्षिक प्रतिवेदन कर प्रकाशन व्दिभाषी में प्रकाशित किया जाता है।
- संस्थान की वेबसाइट में हिन्दी का प्रयोग।
- सभी कम्प्यूटरों पर “सारांश” हिन्दी सॉफ्टवेयर का उपयोग।
- राजभाषा अधिनियम 1963 की धारा 3(3) के तहत परिपत्रक, सामान्य आदेश, ज्ञापन, संकल्प, अधिसूचनाएं, नियम, करार, संविदा, टेंडर नोटिस, संसदीय प्रश्न आदि हिन्दी में भेजे जाते हैं। संस्थान से भेजे जानेवाले पत्रों में हिन्दी में पत्राचार बढ़ाने पर विशेष जोर दिया जा रहा है।
- संस्थान में भिन्न सभाओं का कार्यवृत्त हिन्दी में बनाया जाता है।
- संस्थानको प्राप्त तथा संस्थान से जानेवाले सभी पत्रों की प्रविष्टियाँ हिन्दी में की जाती हैं।
- सभी वैज्ञानिक, कर्मचारी अपनी टिप्पणियाँ हिन्दी में लिखते हैं।
- हाजिरी रजिस्टर में किए जानेवाले हस्ताक्षर भी हिन्दी में किए जाते हैं।
- “राष्ट्रीय विज्ञान दिवस” के दौरान हुए प्रदर्शनी में ज्यादा से ज्यादा हिन्दी का उपयोग किया जाता है।
- हिन्दी समिती का गठन किया गया है।
- हिन्दी दिवस और पखवाड़े का आयोजन किया जाता है।
- सभी अधिकारियों के विजिटिंग कार्ड हिन्दी में छपवाएँ गए हैं।
- रबड़ की मोहरें साइनबोर्ड, सीलें, पत्र शीर्ष, नाम पट्ट हिन्दी में किए गए हैं।
- हिन्दी पुस्तकों की खरीद में वृद्धि हुई है।
- व्दिभाषी (हिन्दी+अंग्रेजी) शब्दकोष/शब्दावली तथा सहायक साहित्य खरीदे गए हैं।
- संस्थान में भर्ती तथा पदोन्नति आदि के लिए आयोजित साक्षात्कार हिन्दी में लिए जाते हैं, तथा उम्मीदवारों को हिन्दी में जबाब देने की छूट दी जाती है।
- सभी वैज्ञानिक तथा कर्मचारी, अपना अधिकांश कार्य हिन्दी में करते हैं।



Audit Report 2015-16

Maharashtra Association for the Cultivation of Science

Auditor's Report

We have audited the attached Balance sheet of Maharashtra Association for the Cultivation of Science, Pune as at 31st March, 2016 and the Income and Expenditure Account for the year ended on that date, annexed to.

These financial statements are responsibility of the Institute's Management. Our responsibility is to express opinion on these financial statements based on our Audit. We conducted our Audit in accordance with Auditing Standards generally accepted in India & Provisions of Bombay Public Trust Act, 1950 (Wherever necessary). Those standards require that we plan and perform the Audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An Audit includes examining on a test basis, evidence supporting the amounts and disclosures in the financial statements. An Audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statement presentation & reporting. We believe that our Audit provides a reasonable basis for our opinion.

Subject to above, we report that:

1. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our Audit.
2. In our opinion, proper books of accounts as required by law have been kept by the institute so far as it appears from our examination of those books.
3. The Balance Sheet and Income and Expenditure Account dealt with by the report are in agreement with the books of accounts.
4. In our opinion and to the best of our information and according to the explanations given to us, subject to our comments in annexure to this report, the said accounts give a true and fair view.
 - i. In the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2016
 - ii. In the case of the Income and Expenditure Account, of the Surplus for the year ended on the date.

For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Place: Pune
Date: 05/08/2016

**REPORT OF AN AUDITOR RELATING TO ACCOUNTS AUDITED
UNDER SUB-SECTION (2) OF SECTION 33 & 34 AND RULE 19 OF
THE BOMBAY PUBLIC TRUSTS ACT**

Name of the Public Trust:- MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE

For year ending: 31st March, 2016

Sr.No.	Particulars	Remarks
A	Whether accounts are maintained regularly and in accordance with the provisions of the Act and the rules	YES
B	Whether receipts and disbursements are properly and correctly shown in the accounts	YES
C	Whether the cash balance and vouchers in the custody of the manager or trustee on the date of audit were in agreement with the accounts	YES
D	Whether all books, deeds, accounts, vouchers or other documents records required by the auditor were produced before him	YES
E	Whether a register of movable and immovable properties is properly maintained, the changes therein are communicated from time to time to the regional office and the defects and inaccuracies mentioned in the previous audit report have been duly complied within	YES
F	Whether the manager or trustee or any other person required by the auditor to appear before him did so and furnished the necessary information required by him	YES
G	Whether any property or funds of the Trust were applied for any object or purpose other than the object or purpose of the Trust	NO
H	Whether tenders were invited for repairs or construction involving expenditure exceeding Rs. 5000/-	YES
I	Whether any money of the public trust has been invested contrary to the provisions of Section 35	NO
J	Alienation, if any of the immovable property contrary to the provisions of Section 36 which have come to the notice of the auditor	NO
K	All cases of irregular, illegal or improper expenditure or failure or omission to recover monies or other property belonging to the public trust or of loss or waste of money or other property thereof and whether such expenditure, failure, omission loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustees or any other person while in the management of the trust	NO
L	Whether the minutes books of the proceedings of the meeting is maintained	YES
M	Whether any of the trustees has any interest in the investment of the trust	NO
N	Whether the irregularities pointed out by the auditors in the accounts of the previous year have been duly complied with by the trustees during the period of audit	YES
O	Any special matter which the auditor may think fit or necessary to bring to the notice of the Deputy or Assistant Charity Commissioner	NO

As per our report of even date
For **M/S SPAY & CO**
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Place: Pune

Date: 05/08/2016

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Balance Sheet as on 31.3.2016

			Amount - Rs.		
FUNDS AND LIABILITIES	SCH.	AMOUNT	PROPERTY AND ASSET	SCH.	AMOUNT
CAPITAL ACCOUNTS	A	1,07,61,721	FIXED ASSETS	C	93,26,755
CURRENT LIABILITIES	B	6,60,653	INVESTMENTS	D	1,39,19,751
INCOME & EXP.A/C (sub Schedule 4)		1,39,85,709	DEPOSITS & ADVANCES	E	11,76,700
			CASH & BANK BALANCES	F	9,84,877
TOTAL		2,54,08,083	TOTAL		2,54,08,083

The above Balance Sheet to the best of our knowledge and belief contains a true account of the Funds, Liabilities and of the Property and Assets of the Association.

As per our report of even date
For **M/S SPAY & CO**
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Sd/-
HON.F.& A.O.
M.A.C.S.

Sd/-
HON.TREASURER
M.A.C.S.

Sd/-
HON.SECRETARY
M.A.C.S.

Date: 05/08/2016

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Income and Expenditure Account For The Year Ended on 31.3.2016

		Amount - Rs.	
EXPENDITURE	AMOUNT	INCOME	AMOUNT
Depreciation : Immovable Properties (By way of provision or adjustment)	2,965	Interest (Realised) On S.B. A/c	86,395
		On Investments	11,57,059
Establishment Expenses (As per Schedule H)	1,02,006	Donation in Cash	22,000
Audit fees	3,499	Income from other Sources (As per Schedule L)	1,47,155
Legal Fees	50,000		
		Income tax refund received	2,06,100
Professional fees	72,608		
Depreciation : Furniture & Dead Stock	14,097		
Expenditure on the object of The Trust (As per Schedule I)	5,54,081		
Surplus carried over to Balane sheet	8,19,453		
TOTAL	16,18,709	TOTAL	16,18,709

We hereby certify that the above income and Expenditure Account is correct to the best of our knowledge and belief.

As per our report of even date
For **M/S SPAY & CO**
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Sd/-
HON.F.& A.O.
M.A.C.S.

Sd/-
HON.TREASURER
M.A.C.S.

Sd/-
HON.SECRETARY
M.A.C.S.

Date: 05/08/2016

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Statement of Receipts & Payents For The Year Ended on 31.3.2016

Amount - Rs.					
RECEIPTS	SCH.	AMOUNT	PAYMENTS	SCH.	AMOUNT
Opening Balances	F	5,09,500	Establishment Expenses	H	1,02,006
Interest Received On Savings Bank A/c		86,395	Expenditure on Object of Trust	K	5,54,081
Interest on Investments		16,02,179	Audit Fees		3,499
Encashment of FDR with Bank		1,19,37,924	Legal Fees		50,000
Income tax refund received		2,06,100	Professional fees		72,608
			Fixed Deposit with Banks		1,30,15,095
Donation Received for Dr. R.B. Ekbote Award		22,000			
Income from Other Sources	G	1,47,155	Indirect Receipt & Payment	J	19,92,41,850
Indirect Receipt & Payment	J	19,95,12,762	Closing Balances	F	9,84,877
TOTAL		21,40,24,016	TOTAL		21,40,24,016

We hereby certify that the aforesaid statement to be true and correct to the best of our knowledge and belief.

As per our report of even date
For **M/S SPAY & CO**
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Sd/-
HON.F.& A.O.
M.A.C.S.

Sd/-
HON.TREASURER
M.A.C.S.

Sd/-
HON.SECRETARY
M.A.C.S.

Date: 05/08/2016

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Schedules to and forming part of Balance sheet as on 31.3.2016

Schedule "A" : Capital Account

PARTICULARS	SUB-SCH	Amount - Rs.
		AMOUNT
TRUST FUND OR CORPUS	1	1,03,77,874
OTHER EARMARKED FUNDS	2	3,83,847
TOTAL(RS.)		1,07,61,721

Schedule "B" : Current Liabilities

PARTICULARS	SUB-SCH	Amount - Rs.
		AMOUNT
OTHER LIABILITIES	3	6,60,653
TOTAL(RS.)		6,60,653

Schedule "C" : Fixed Assets

PARTICULARS	SUB-SCH	Amount - Rs.
		AMOUNT
IMMOVABLE PROPERTIES	5	91,41,302
FURNITURE AND DEAD STOCK	6	1,85,453
TOTAL(RS.)		93,26,755

Schedules to and forming part of Balance Sheet as on 31.3.2016

Schedule "D" : Investments

Sr. No.	Name of the Company	Particulars	Date of Investment	Date of maturity	Amount - Rs.	Total Rs.
1	SHARES Central Potteries Ltd. Nagpur	Share of Rs. 25 each		Not quoted	1,325	1,325
	Certificate No.1343 bearing Sr.No.29114 to 29126	13 ordinary	21.01.1949			
	Certificate No. 551 bearing Sr.No. 3717 to 3756	40 ordinary	10.06.1940			
2	HINDUSTAN MOTORS LTD.	Share certificate No.33932 Shares of Rs. 10/- each 4632651-4632700	-	-	500	500
FIXED DEPOSITS						
1	BANK OF MAHARASHTRA	6008467793	30.12.2014	30.12.2017	3,00,000	3,00,000
		60088467534	30.12.2014	30.12.2017	3,00,000	3,00,000
		60126451909	01.03.2016	01.03.2017	2,00,000	2,00,000
		60152059714	08.11.2015	08.11.2017	16,60,000	16,60,000
		60150708401	24.10.2015	23.10.2017	8,00,000	8,00,000
		60161620207	08.02.2016	06.02.2018	4,00,000	4,00,000
		60137302953	09.07.2015	05.07.2017	15,36,499	15,36,499
		60137302238	09.07.2015	05.07.2017	33,09,383	33,09,383
2	INDIAN BANK	6019228988	07.03.2015	05.03.2018	6,62,122	6,62,122
		6019228671	07.03.2015	05.03.2018	6,62,122	6,62,122
		6056528884	06.08.2015	03.08.2018	2,00,000	2,00,000
		6201547509	24.02.2016	24.02.2017	10,00,000	10,00,000
		6201547485	24.02.2016	24.02.2017	5,00,000	5,00,000
		6201547532	24.02.2016	24.02.2017	10,00,000	10,00,000
3	BANK OF BARODA	249183	02.03.2016	02.03.2017	84,969	84,969
4	BANK OF INDIA	50345110007246	24.11.2014	24.11.2016	13,02,831	13,02,831
7	GRAND TOTAL					1,39,19,751

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Schedule to and forming part of Balance sheet as on 31.3.2016

Schedule "E" : Deposits & Advances

Amount - Rs.

PARTICULARS	AMOUNT	AMOUNT
DEPOSITS : (As per last Balance Sheet)		
Telephone Deposit	14,207	
Deposit with Court	15,000	29,207
ADVANCES :		
Income Tax Deducted at Source (As per last Balance Sheet)		4,80,726
Advance to Staff	-	3,000
Income Tax refundable		1,33,922
Interest accrued on Investments (Subject to confirmation from bank & other agencies)		
As per last Balance Sheet)	10,60,237	
Less Realised during the year	7,40,829	3,19,408
Accrued Interest during the year		2,10,437
TOTAL Rs.		11,76,700

Schedule "F" : Cash & Bank Balances

Amount - Rs.

PARTICULARS	OPENING BALANCE	CLOSING BALANCE
Cash in Hand	4,877	36,275
BANK :-		
With Bank of Maharashtra Erandwana Branch in Savings A/c No.9709	4,09,873	8,48,653
With State Bank of India Deccan Gymkhana Branch in S.B. A/c No. 01100005452	33,072	35,740
With Union Bank of India, F.C.Road Branch in S.B,A/c 48941261091951	61,678	64,209
TOTAL (RS.)	5,09,500	9,84,877

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004.

Schedules to and forming part of Statement of Receipts & Payments
and Income & Expenditure Account for the year ended on 31.3.2016

Schedule "G" : Income From Other Sources

PARTICULARS	Amount - Rs.	
	INCOME & EXP. ACCOUNT AMOUNT	RECEIPT & ACCOUNT AMOUNT
Sale of Publication	-	155
Fee for Home Gardening Course	-	1,47,000
TOTAL (RS.)	-	1,47,155

Schedule "H" : Establishment Expenses

PARTICULARS	Amount - Rs.	
	INCOME & EXP. ACCOUNT AMOUNT	RECEIPT & ACCOUNT AMOUNT
Contribution to welfare fund	-	-
Honorarium to Staff	85,088	85,088
Meeting Expenses	4,768	4,768
Miscellaneous Expenses (includes Advt.Expenses)	6,604	6,604
Postage Expenses	-	-
Travelling & Conveyance	1,380	1,380
Printing & Stationery	4,166	4,166
TOTAL (RS.)	1,02,006	1,02,006

Schedule "I" : Expenditure on the Object of the Trust

PARTICULARS	Amount - Rs.
	AMOUNT
Expenditure out of Earmarked Donations	
Prof. V.P Gokhale Award Expenses	11,000
Dr. R.B.Ekbote Award Expenses	11,120
Dr. P.P. Kanekar Award Expenses	-
Donation Expenses Prof. P.V.Sukhatme	750
Prof.S.P.Agharkar Chair Expenses	2,59,161
Home Garden Course Expenses	1,42,437
Prof. S.P. Agharkar Memorial Day expenses	-
Science promotion Exps.	94,000
Public Lecture	-
Seminar Exps. Geology	-
Smt. Parvatibai Agharkar fellowship award	35,613
TOTAL (RS.)	5,54,081

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Schedules to and forming part of Statement of Receipts & Payments
and Income & Expenditure Account for the year ended on 31.3.2016

Schedule "J" : Indirect Receipts & Payments

Amount - Rs.

PARTICULARS	RECEIPTS	PAYMENTS
ARI Account	19,00,00,000	19,00,00,000
Schemes Account	90,11,481	90,11,481
Advance to staff	11,000	14,000
TDS Professional fees & Contractor	10,281	10,281
Medicline Research Pvt. Ltd	4,80,000	2,06,088
TOTAL	19,95,12,762	19,92,41,850

Schedule "K" : Expenditure on the Object of the Trust

Amount - Rs.

PARTICULARS	AMOUNT
Expenditure out of Earmarked Donations	
Prof. V.P Gokhale Award Expenses	11,000
Dr. R.B.Ekbote Award Expenses	11,120
Dr. P.P. Kanekar Award Expenses	-
Donation Expenses Prof. P.V.Sukhatme	750
Prof.S.P.Agharkar Chair Expenses	2,59,161
Home Garden Course Expenses	1,42,437
Prof. S.P. Agharkar Memorial Day expenses	-
Science promotion Exps.	94,000
Public Lecture	-
Seminar Exps. Geology	-
Smt. Parvatibai Agharkar fellowship award	35,613
TOTAL (RS.)	5,54,081

Schedule "L" : Income From Other Sources

Amount - Rs.

PARTICULARS	AMOUNT	AMOUNT
Sale of Publication	-	155
Fee for Home Gardening Course	-	1,47,000
TOTAL (RS.)	-	1,47,155

Sd/-
HON.F.& A.O.
M.A.C.S.

Sd/-
HON.TREASURER
M.A.C.S.

Sd/-
HON.SECRETARY
M.A.C.S.

Date: 05/08/2016

As per our report of even date
For **M/S SPAY & CO**
Chartered Accountants
FRN:132976W
Sd/-
PARAS MUNOT
Partner
MRN:142148

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Schedules to and forming part of Balance sheet as on 31.3.2016

Schedule "1" : Trust Fund or Corpus

Amount - Rs.

PARTICULARS	AMOUNT
As per Last Balance Sheet	1,03,77,874
TOTAL(RS.)	1,03,77,874

Schedule "2" : Other Earmarked Funds

Amount - Rs.

PARTICULARS	AMOUNT
Reserve Fund (Created vide resolution No. 16 dated 12.4.1984) (As per Last Balance Sheet)	36,926
Museum Fund (As per Last Balance Sheet)	888
Prof. S.P. Agharkar Fund (As per Last Balance Sheet)	14,000
Prof. S.P. Agharkar Birth Centenary Fund (As per last Balance Sheet)	3,32,033
TOTAL (RS.)	3,83,847

Schedule "3" : Other Liabilities

Amount - Rs.

PARTICULARS	AMOUNT
Advance payable to Mr B.K. Kale (As per Last Balance Sheet)	886
ARI Account	61,984
Audit fees payable	3,450
Medclin Research Pvt. Ltd	2,73,912
Scheme-Others	3,20,421
TOTAL (RS.)	6,60,653

Schedule "4" : Income & Expenditure Account

Amount - Rs.

PARTICULARS	AMOUNT
Opening Balance	1,31,66,256
Surplus carried over to Balance sheet	8,19,453
	1,39,85,709
TOTAL (RS.)	1,39,85,709

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004

Schedule to and forming part of Balance Sheet as on 31.3.2016

Sub Schedule "5" : Immovable Properties

Amount - Rs.

Sr No.	Particulars	Rate of Depreciation	GROSS BLOCK			DEPRECIATION BLOCK				WDV as on 31.3.2016
			Cost as on 01.04.15	Additions during the year	Total Cost as on 31.3.2016	Upto 31.3.2015	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep. for the Year	
1	Land at Pune		96,500	-	96,500	-	-	-	-	96,500
2	Land at Songaon		88,19,437	-	88,19,437	-	-	-	-	88,19,437
3	Biometry Building	2.50%	1,15,200	-	1,15,200	90,110	2,880	-	2,880	22,210
4	Microbiology Building (Refer Note A)	2.50%	3,389	-	3,389	2,732	85	-	85	572
5	Land Development Expenses at Hol		2,02,583	-	2,02,583	-	-	-	-	2,02,583
	TOTAL (RS.)		92,37,109	-	92,37,109	92,842	2,965	-	2,965	91,41,302

Note :

A. Only excess expenditure against grant received from DST is shown.

MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE: PUNE - 411 004.
Schedules to and forming part of Balance Sheet as on 31.3.2016

Sub Schedule "6" Furniture and Dead Stock

Amount - Rs.

Sr No.	Particulars	GROSS BLOCK			DEPRECIATION BLOCK							WDV as on 31.3.2016
		Cost as on 01.04.15	Additions during the year	Total Cost as on 31.3.2016	Rate of Depreciation	Upto 31.3.2015	Dep. On opening Balance	Dep. On Additions during the year	Total Dep. for the Year	Total as on 31.3.2016		
1	2	3	4	5	6	7	8	9	10	11		
A)(I) GENERAL												
	1. Office Equipments & Furniture & Sports Items	3,92,943	5,933	3,98,876	10%	3,89,096	-	593.30	593.30	3,89,689	9,187	
	2. Apparatus & Equipments	2,47,036	-	2,47,036	20%	2,13,211	1	-	1	2,13,212	33,824	
	3. Electric Fittings	9,870	-	9,870	10%	9,869	-	-	-	9,869	1	
	4. Books	1,19,522	-	1,19,522	20%	1,16,439	1	-	1	1,16,440	3,082	
	5. YType System for Grapes-Hol	1,10,497	-	1,10,497	10%	55,250	11,050	-	11,050	66,300	44,198	
	6. Construction of Statute	98,090	-	98,090	3%	4,904	2,452	-	2,452	7,356	90,734	
	SUB TOTAL (A)(I)	9,77,958	5,933	9,83,891		7,88,769	13,504	593	14,097	8,02,866	1,81,026	
A)(II) SPECIAL PUBLICATIONS												
	1. Marathi Publication by Prof. M.N.Kamat (Cost of Rs. 1.54)	4,428	-	4,428	-	2,367	-	-	-	2,367	2,061	
	2. Enumeration of Plants from Gomantak by Dr.V.D.Vartak (Cost of Rs. 3.60)	3,154	-	3,154	-	1,100	-	-	-	1,100	2,054	
	SUB-TOTAL (A)(II)	7,582	-	7,582		3,467	-	-	-	3,467	4,115	
	TOTAL A (I+II)	9,85,540	5,933	9,91,473		7,92,236	13,504	593	14,097	8,06,333	1,85,141	
B) UNIVERSITY OF PUNE												
	1. Office Equipment & Furniture	1,300	-	1,300	-	1,242	-	-	-	1,242	58	
	2. Books	25,538	-	25,538	-	25,341	-	-	-	25,341	197	
	3. Apparatus & Equipments	9,914	-	9,914	-	9,891	-	-	-	9,891	23	
	TOTAL (B)	36,752	-	36,752		36,474	-	-	-	36,474	278	
C) GOVT.OF MAHARASHTRA												
	1. Office Equipment & Furniture	1,008	-	1,008	10%	993	-	-	-	993	15	
	2. Apparatus & Equipments	21,363	-	21,363	20%	21,345	-	-	-	21,345	18	
	3. Books	1,210	-	1,210	20%	1,209	-	-	-	1,209	1	
	TOTAL (C)	23,581	-	23,581		23,547	-	-	-	23,547	34	
	GRAND TOTAL (A+B+C)	1,045,873	5,933	10,51,806		8,52,257	13,504	593	14,097	8,66,354	1,85,453	

Agharkar Research Institute of Maharashtra Association for the Cultivation of Science

Auditor's Report

We have audited the attached Balance Sheet of Agharkar Research Institute of Maharashtra Association for the Cultivation of Science, situated at Gopal Ganesh Agharkar Road, Pune as at 31st March, 2016 and Income and Expenditure Account for the year ended on that date annexed to.

These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our Audit. We conducted our Audit in accordance with Auditing Standards generally accepted in India & Provisions of Bombay Public Trust Act, 1950. Those standards require that we plan and perform the Audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An Audit includes examining on a test basis, evidence supporting the amounts and disclosures in the financial statements. An Audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statement presentation & reporting. We believe that our Audit provides a reasonable basis for our opinion.

Emphasis of Matter-

We draw your attention to following matter.

1. Institute has not paid Service Tax Collected during FY 2015-16 amounting to Rs.320747/- and also not filed and Service Tax Return. Impact of the interest and penalty on Financial Statement Cannot be quantified.
2. Institute has carried old outstanding balances carrying since last few years confirmation of which are not available and impact of the same on Financial Statement cannot be quantified. Party ledger balances are subject to confirmation & subsequent adjustments if any.
3. Fixed Assets and Closing Stock as on 31st March, 2016 has been Included in the financial statements as taken, valued and certified by the management of the Institute. Valuation has not been verified by us and reliance has been placed on the value of Fixed Assets and Closing Stock certified by the management.

Subject to above, we report that:

1. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our Audit.
2. In our opinion, proper books of accounts as required by law have been kept by the institute so far as it appears from our examination of those books.
3. The Balance Sheet, Income and Expenditure Account and the Receipts and Payments Account dealt with by the report are in agreement with the books of accounts.
4. In our opinion and to the best of our information and according to the explanations given to us, subject to our comments in annexure to this report, the said accounts give a true and fair view.
 - i. In the case of the Balance Sheet, of the state of affairs of the Centre as at 31st March 2016
 - ii. In the case of the Income and Expenditure Account, of the surplus for the year ended on the date.
5. In our opinion, the Balance sheet & Income & Expenditure Account dealt with by this report, are in compliance with the accounting standards prescribed by the Institute of Chartered Accountants of India except the Accounting Standards – 1 “Disclosure of Accounting Policies”, Accounting Standards – 2 “Valuation of Inventories”, Accounting Standards – 5 – “Net Profit or Loss for the Period, Prior Period items and changes in Accounting Policies”, Accounting Standards – 11 – “The effects of changes in Foreign Exchange Rate”, Accounting Standards – 12 – Accounting for Government Grants”. Exceptions can be referred to Significant Accounting Policies & Notes to Account followed by the Institute and impact of the same on Financial Statement cannot be quantified.

For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Place: Pune
Date: 05/08/2016

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Balance Sheet as on 31.03.2016

Amount - Rs.

Particulars	Sch	Current Year	Previous Year
CORPUS/CAPITAL FUND AND LIABILITIES:			
CORPUS/CAPITAL FUND	1	4,24,99,942	3,17,87,896
RESERVES AND SURPLUS	2	-	-
EARMARKED/ENDOWMENT FUNDS	3	6,43,19,932	5,48,69,091
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	15,66,57,874	14,35,94,397
TOTAL		26,34,77,748	23,02,51,384
ASSETS:			
FIXED ASSETS	8	13,97,29,947	12,77,15,679
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	8,07,10,703	6,97,06,291
INVESTMENTS-OTHERS	10	-	-
CURRENT ASSETS,LOANS,ADVANCES ETC.	11	4,30,37,098	3,28,29,414
MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)			
TOTAL		26,34,77,748	23,02,51,384
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

The above Balance Sheet to the best of our knowledge & belief contains a True Account of the Funds and Liabilities of the Property and Assets of the Agharkar Research Institute.

Note : Previous year's figures are regrouped wherever necessary

Sd/-
FINANCE & ACCOUNTS OFFICER
A.R.I.

Sd/-
OFFICIATING DIRECTOR
A.R.I.

As per our report of even date
For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-
PARAS MUNOT
Partner
MRN:142148

Date: 05/08/2016

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Income & Expenditure Account for the Year ended 31.03.2016

Amount - Rs.

Particulars	Sch	Current Year	Previous Year
Income			
Income from Sales/Services	12	12,99,206	10,68,444
Grants/Subsidies	13	18,76,30,000	13,43,52,350
Fees/Subscriptions	14	4,01,861	1,33,365
Income from Investments(Income on Invest. From earmarked/endowment Funds transferred to Funds)	15	-	-
Income from Royalty, Publications etc.	16	1,01,085	79,272
Interest Earned	17	89,19,860	60,80,882
Other Income	18	5,89,708	4,05,978
Increase/(decrease) in stock of Laboratory consumables	19	(4,955)	(44,518)
Donation Received in kind (Equipment)		-	-
Total (A)		19,89,36,765	14,20,75,773
Expenditure			
Establishment Expenses	20	13,76,37,213	11,16,48,588
Other Administrative Expenses etc.	21	3,86,49,213	3,48,20,116
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end-corresponding to schedule 8)	8	119,38,293	1,28,01,294
Total (B)		18,82,24,719	15,92,69,998
Balance being excess of Income over Expenditure (A-B)		1,07,12,046	(1,71,94,225)
Extra Ordinary Items: Depreciation of earlier periods		-	2,25,05,347
Transfer to Trust fund (for capital expenditure Schedule D)		2,78,76,557	4,08,20,049
BALANCE BEING SURPLUS/(DEFICIT)CARRIED TO		2,78,76,557	4,08,20,049
CORPUS/CAPITAL FUND		(1,71,64,511)	(3,55,08,927)
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

Note: We hereby certify that the above Income & Expenditure account is correct to the best of our knowledge and belief.

Note : Previous year's figures are regrouped wherever necessary

Sd/-

FINANCE & ACCOUNTS OFFICER
A.R.I.

Sd/-

OFFICIATING DIRECTOR
A.R.I.

As per our report of even date
For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-

PARAS MUNOT
Partner
MRN:142148

Date: 05/08/2016

M.A.C.S.'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule 1: Corpus/Capital Fund

Amount - Rs.

Particulars	Current Year		Previous Year	
Balance as the beginning of the year	3,17,87,896		2,64,76,774	
Add : Contributions towards Corpus/Capital Fund (Schedule D)	2,78,76,557		4,08,20,049	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(1,71,64,511)		(3,55,08,927)	
		4,24,99,942		3,17,87,896
Balance at the end of the year		4,24,99,942		3,17,87,896

Schedule 2: Reserves & Surplus

Particulars	Current Year		Previous Year	
1. Capital Reserve :-				
As per last Account	-		-	
Addition during the year	-		-	
Less: Transfer to Establishment expenses	-	-	-	-
2. Revaluation Reserve :-				
As per last Account	-		-	
Addition during the year	-		-	
Less: Deductions during the year	-	-	-	-
3. Special Reserve : A.R.I. Reserve Fund :-				
As per last Account	-		-	
Addition during the year	-		-	
Add: Interest accrued	-		-	
Less: Deductions during the year	-	-	-	-
4. General Reserve :				
As per last Account	-		-	
Addition during the year	-		-	
Less: Deductions during the year	-	-	-	-
Total (Rs.)	-	-	-	-

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule: 3 Earmarked/Endowment Funds

Amount - Rs.

	FUND-WISE BREAK UP				TOTALS	
	Tech.Dev. Fund	Dr. A. B. Joshi	Dr. A. D. Agate	Welfare fund	Current Year	Previous Year
a. Opening balance of the funds	53,181,917	614,489	3,885	129,160	53,929,451	48,809,530
b. Additions to the funds:						
i. Donations/grants	-	-	-	-	-	-
ii. Income from investments made on account of funds.	1,495,780	22,188	175	-	1,518,143	2,257,032
iii. Culture Identification Charges	1,719,106	-	-	-	1,719,106	1,057,883
iv. Overhead Charges from Scheme	2,688,750	-	-	-	2,688,750	2,697,252
v. Interest received on Funds from various projects	1,037,279	-	-	-	1,037,279	-
vi. Refund from scheme for fellowship advance made	-	-	-	-	-	23,252
vii. Other Misc. Income	3,429,024	-	-	-	3,429,024	-
viii. Contribution from MACS	-	-	-	-	-	-
ix. Unspent Balance of HCJMRI Project	-	-	-	-	-	27,524
TOTAL (a+b)	63,551,856	636,677	4,060	129,160	64,321,753	54,872,473
c. Utilisation/Expenditure towards objectives of funds						
i. Capital Expenditure						
Fixed Assets	-	-	-	-	-	-
Others						
Advance paid to ARI						
ii. Revenue Expenditure						
Salaries, Wages and allowances etc.						
Rent						
Other Administrative Expense			500	1,321	1,821	3,382
(Payment to CSIR, ICMR fellows- Temp. Advance						
TOTAL (C)	-	-	500	1,321	1,821	3,382
NET BALANCE AS AT THE YEAR-END (a+b-c)	63,551,856	636,677	3,560	127,839	64,319,932	54,869,091

M.A.C.S.'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule 4: Secured Loans and Borrowings

Amount - Rs.

Particulars	Current Year		Previous Year	
1. Central Government		0.00		0.00
2. State Government (Specify)		0.00		0.00
3. Financial Institutions				
a. Term Loans	0.00		0.00	
b. Interest Accrued and due	0.00	0.00	0.00	0.00
4. Banks:				
a. Term Loans	0.00		0.00	
- Interest accrued and due	0.00		0.00	
b. Other Loans (Specify)	0.00		0.00	
- Interest accrued and due	0.00	0.00	0.00	0.00
5. Other Institutions and Agencies		0.00		0.00
6. Debentures and Bonds		0.00		0.00
7. Others (Specify)		0.00		0.00
TOTAL (Rs.)		0.00		0.00

Note: Amounts due within one year Nil

Schedule 5: Unsecured Loans and Borrowings

Amount - Rs.

Particulars	Current Year		Previous Year	
1 Central Government		0.00		0.00
2 State Government (specify)		0.00		0.00
3 Financial Institutions		0.00		0.00
4 Banks		0.00		0.00
a. Term Loans	0.00	0.00	0.00	0.00
b. Other Loans (Specify)	0.00	0.00	0.00	0.00
5 Other Institutions and Agencies		0.00		0.00
6 Debentures and Bonds		0.00		0.00
7 Fixed Deposits		0.00		0.00
8 Others (Specify)		0.00		0.00
TOTAL (Rs.)		0.00		0.00

Schedule 6: Deferred Credit Liabilities

Amount - Rs.

Particulars	Current Year		Previous Year	
a. Acceptance secured by hypothecation of capital equipment and other assets	0.00	0.00	0.00	0.00
b. Others	0.00	0.00	0.00	0.00
TOTAL (Rs.)		0.00		0.00

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule 7: Current Liabilities & Provisions

Amount - Rs.

Particulars	Current Year		Previous Year	
A. Current Liabilities				
1. Acceptances	-		-	
2. Sundry Creditors:				
a. For Goods		8,44,522		17,719
3. Advances Received	-		-	
4. Interest Accrued but not due on:	-		-	
a. Secured Loans/borrowings	-		-	
b. Unsecured Loans/borrowings	-		-	
5. Sundry Liabilities:	-		-	
a. Sales Tax	-		-	
b. Culture Identification charges	17,19,106		10,57,883	
c. Unpaid Salary	3,93,257		4,33,160	
d. Income Tax (Contractor)	57,781		20,890	
e. Income tax for (Professional charges)	10,980		130	
f. Service Tax Payable	-		-	
g. Group Insurance	91,538		38,383	
h. LIC	-		243	
i. PF Commissioner A/c	2,91,193		2,93,659	
j. P.F.New Pension Scheme	1,40,617		31,587	
k. State Profession Tax	1,600		1,200	
l. Income tax (salary)	14,541	27,20,613	23,315	19,00,450
6. Other current Liabilities(Various Consultancies)	13,38,652		10,47,396	
Self Contribution - P.F.	-		-	
7. Unspent Balance of Grant	2,47,52,000		2,23,82,000	
8. Earnest Money Deposit for Construction and Equipments	21,56,772		22,39,395	
9. Security deposit	7,69,706		10,40,996	
10. Other Tution Fees	76,291		58,990	
11. Recovery of Bank Loan	1,500		1,500	
12. DST PAC Meeting	1,63,610		1,63,610	
13. FIST Programme	5,46,809		5,46,809	
14. DST Straigernt Meeting	58,406		58,406	

Particulars	Current Year		Previous Year	
15. DST Solar Meeting	1,28,254		1,28,254	
16. Deepak Fertilizers-SOYBEAN	44,024		-	
17. Deepak Fertilizers-WHEAT	45,670		-	
18. Organizing Group Meeting & Monitoring Committee	540		540	
19. DST Good Lab Practice Seminar	51,860		51,860	
20. Scheme	8,88,511		47,40,939	
21. Retention Money	1,52,967		1,52,967	
22. PEC Meeting DST 8-9 May15	2,51,294		-	
23. Technology Transfer - Robonik India Pvt.Ltd.	13,43,250	3,27,70,116	13,43,250	3,39,56,912
Total (A)		3,63,35,251		3,58,75,081
B. PROVISIONS				
1. For Taxation	-		-	
2. Gratuity	6,30,36,823		5,69,58,950	
3. Superannuation/Pension	-		-	
4. Accumulated Leave Encashment	4,74,06,282		4,20,71,888	
5. Trade Warranties/Claims	-		-	
6. Others	-		-	
- Salary payable for March	84,57,115		73,20,760	
- Audit fees	11,500		16,854	
- Electricity & Power	4,19,080		3,93,630	
- Postage & Telephone	57,404		30,472	
- Vehicle maintainance	-		-	
- Campus maintainance	-		1,14,174	
- Security Service Charges	-		1,54,029	
- Water Charges	-		2,06,600	
- Farm Expenses	-		-	
- Hired Labour Charges	2,05,517		1,74,081	
- P.F. & N.P.S.	6,98,462		2,74,058	
- P.F. & N.P.S. Adm. Charges	30,440		3,820	
- Stipend	-		-	
- Reimbursement of Telephone Expenses	-		-	
- Provision for Books	-		-	
- ARI Staff TDS Refundable	-		-	-
Total (B)		12,03,22,623		10,77,19,316
Total (A+B)		15,66,57,874		14,35,94,397

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules Forming Part of Balance Sheet as at 31.03.2016
Schedule 8: Fixed Assets

Description	Gross Block				Depreciation				Net Block		Amount - Rs.		
	Cost/valuation As at beginning of the year	Rate of Dep.	Additions during the year	Deletions during the year	Net cost as on 31.3.2016	Cost valuation at the year-end	As at the beginning of the year	Depreciation on the opening cost	Dep. on Additions during the year	Total dep. during the year		Total up to the Year-end	As at the Current year-end
A. FIXED ASSETS:													
1. LAND													
a. Freehold	174,914	Nil	-	-	-	174,914	-	-	-	-	-	174,914	174,914
b. Leasehold	-	Nil	-	-	-	-	-	-	-	-	-	-	-
2. BUILDINGS:													
a. On Freehold	64,417,473	2.5%	-	-	-	64,417,473	-	1,610,437	-	1,610,437	17,339,212	47,078,261	48,688,698
b. On Leasehold	-	Nil	-	-	-	-	-	-	-	-	-	-	-
c. Ownership Flats/Premises	-	-	-	-	-	-	-	-	-	-	-	-	-
d. Superstructures on Land and not belonging to the entity	-	-	-	-	-	-	-	-	-	-	-	-	-
e. Temporary Structures	1,941,457	2.5%	99,000	-	99,000	2,040,457	627,144	48,536	2,475	51,011	678,155	1,362,302	1,314,313
f. Shed and glasshouse at Hol	628	2.5%	-	-	-	628	627	-	-	627	-	1	1
3. PLANT MACHINERY & EQUIPMENT													
a. Equipment at Hol	867,495	10%	82,940	-	82,940	950,435	158,918	86,750	8,294	95,044	253,962	696,474	708,578
b. Equipments at Pune	265,467,854	20%	12,452,607	46,118	12,406,489	277,874,343	215,632,548	1	2,481,298	2,481,299	218,113,847	59,760,496	49,835,306
4. VEHICLES	2,448,857	20%	-	-	-	2,448,857	1,922,897	-	-	105,192	2,028,089	420,768	525,960
5. FURNITURE, FIXTURES, MODULAR FURNITURE-NEW LAB	13,462,158	10%	250,901	4,800	246,101	13,708,259	12,775,868	1	24,610	24,611	12,800,479	907,780	686,291
6. COMPUTER/PERIPHERALS	8,239,764	10%	-	-	-	8,239,764	2,471,929	823,976	-	823,976	3,295,905	4,943,859	5,767,835
7. COMPUTER SOFTWARE *	15,008,882	20%	2,846,296	30,000	2,816,296	17,825,178	11,494,154	3,001,776	563,259	3,565,036	15,059,190	2,765,988	3,514,728
8. ELECTRIC INSTALLATIONS	2,983,737	10%	1,809,600	-	1,809,600	1,809,600	1,809,600	-	1,809,600	1,809,600	1,809,600	-	-
9. TRANSFORMER / DIESEL GENERATOR	3,758,288	15%	-	-	-	2,983,737	2,776,700	563,743	-	20,704	2,797,404	186,333	207,037
10. LIBRARY BOOKS	7,808,681	20%	699,115	17,582	681,533	8,490,214	6,909,235	1	136,307	136,308	7,045,543	1,444,671	899,446
11. TUBEWELLS & W. SUPPLY	112,538	2.5%	-	-	-	112,538	75,496	2,813	-	2,813	78,309	34,229	37,042
12. SOLAR SYSTEM HOSTEL	167,379	10%	-	-	-	167,379	143,451	16,738	-	16,738	160,189	7,190	23,928
13. OTHER FIXED ASSETS	6,172,170	2.5%	-	-	-	6,172,170	1,664,281	154,304	-	154,304	1,818,585	4,353,585	4,507,889
14. RE-CARPETING OF EXISTING ROADS	3,012,790	2.5%	-	-	-	3,012,790	197,208	75,320	-	75,320	272,528	2,740,262	2,815,582
15. RENOVATION CANTEEN	1,329,408	2.5%	-	-	-	1,329,408	66,470	33,235	-	33,235	99,705	1,229,703	1,262,938
16. CC TV WORKS AT ARI CAMPUS	517,114	15.0%	-	-	-	517,114	90,495	77,567	-	77,567	168,062	349,052	426,619
17. CONSTRUCTION OF TEMPORARY SHED AT SONGAON	515,458	2.5%	-	-	-	515,458	25,772	12,886	-	12,886	38,658	476,800	489,686
18. CONST. OF H.T. SUBSTATION	5,328,142	2.5%	-	-	-	5,328,142	638,504	133,204	-	133,204	771,708	4,556,434	4,689,638
19. CONSTRUCTION OF COMPOUND WALL AT PUNE	-	2.5%	5,810,600	-	5,810,600	5,810,600	-	-	145,265	145,265	145,265	5,665,335	-
TOTAL OF CURRENT YEAR	403,735,187		24,051,059	98,500	-	427,687,746	276,019,508	6,641,289	5,171,108	11,938,293	287,957,801	139,729,947	127,715,679
PREVIOUS YEAR	375,918,315		29,374,373	-	-	403,735,187	285,723,562	7,330,985	5,470,309	12,801,294	276,019,508	127,715,679	88,403,346
TOTAL	403,735,187		24,051,059	98,500	-	427,687,746	276,019,508	6,641,289	5,171,108	11,938,293	287,957,801	139,729,947	127,715,679

Note : The afforsaid expenditure is incurred out of Govt. Grants, disposal of which is subject to conditions attached to these Grants

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule 9: Investments from Earmarked/ Endowment Funds (Long Term)

Particulars	Amount - Rs.	
	Current Year	Previous Year
1. In Government Securities	-	-
2. Other approved Securities (Templeton Mutual Fund)	-	-
3. Shares	-	-
4. F.D.R. with Indian Bank (Dr. A.B. Joshi Donation)	2,50,000	2,50,000
5. Subsidiaries and Joint Ventures		
6. Others (Fixed Deposits) (Dr. A.D. Agate Donation)	5,001	5,001
7. Others (Fixed Deposits from Technology Development Fund A/c:SBI & UBI)	8,04,55,702	6,94,51,290
8 Others(Fixed Deposit with Union Bank of India) (includes accrued interest)	-	-
TOTAL	8,07,10,703	6,97,06,291

Schedule 10: Investments - Others

Particulars	Current Year		Previous Year	
1 In Government Securities	0.00	0.00	0.00	0.00
2 Other approved Securities	0.00	0.00	0.00	0.00
3 Shares	0.00	0.00	0.00	0.00
4 Debentures and Bonds	0.00	0.00	0.00	0.00
5 Subsidiaries and Joint Ventures	0.00	0.00	0.00	0.00
TOTAL (Rs.)	0.00	0.00	0.00	0.00

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule 11: Current Assets, Loans & Advances

Amount - Rs.

Particulars	Current Year		Previous Year	
A. CURRENT ASSETS:				
1. Inventories:				
a. Stores and Spares	-		-	
b. Publications	25,860		25,120	
c. Stock-in-trade of consumables (as taken valued and certified by the Management)	90,701	1,16,561	96,396	1,21,516
2. Sundry Debtors:	1,047		1,047	
a. Debts Outstanding for a period exceeding six months	-		-	
b. DBT Monitoring Meeting	48,156		48,156	
- Receivable from staff (Animal house Tender form)	3,140		3,140	
c. Brain storming Session	1,66,602		1,66,602	
3. Cash balances in hand (including cheques/drafts and imprest)	85,820	3,04,765	1,27,114	3,46,059
4. Bank Balances:				
a. With scheduled Banks	-		-	
- On Current Accounts	39,50,624		16,17,765	
- On Deposit Accounts (CLTD A/c)	-		-	
- On Savings Accounts	2,14,22,048		87,05,025	
- On Current Accounts (TDF)	40,92,385	2,94,65,057	25,63,949	1,28,86,739
b. With non-Scheduled Banks:				
- On Current Accounts	-		-	
- On Deposit Accounts	-		-	
- On Savings Accounts	-		-	
5. F.D. Against L/C.	-		-	
6. Dr. Acharya	181	181	181	181
7. Amount receivable from Schemes	-	-	-	-
TOTAL (A)		2,98,86,564		1,33,54,495
B. LOANS, ADVANCES AND OTHER ASSETS				
1. Loans:				
a. Staff (For HBA, Vehicle Advance and Computer)	8,10,816		11,54,567	

Particulars	Current Year		Previous Year	
b. Other Entities engaged in activities/objectives similar to that of the Entity	-		-	
c. Amount receivable from Schemes - NPS	-		-	
d. Amount receivable from Schemes	37,11,526	45,22,342	35,00,000	46,54,567
2. Advances and other amounts recoverable in cash or in kind or for value to be received:				
a. On Capital & Revenue Expenditure	38,25,498		1,14,45,676	
b. Prepayments(Cash Insurance)	1,283		1,265	
c. Advances to staff (For TA etc)	6,78,522		5,32,027	
d. Prepaid Medical Insurance Premium	1,45,087		1,45,087	
e. Festival Advance	1,49,475		1,15,500	
f. Prepaid subscriptions for journals	-		2,70,000	
g. Deposits kept with Govt. Agencies (MSEB, Telephone, GAS Cylinder etc.)	9,83,034		9,36,541	
i. Prepaid LIC	66,296		-	
j. NFCCI Workshop June 2016	6,375		-	
3. Income Accrued:		58,55,570		1,34,46,096
a. On Investments from Earmarked/ Endowment Funds	13,64,171		-	
c. On Loans and Advances(HBA, Vehicle Adv. & Computer Adv.)	74,474		1,37,397	
d. Accrued int (Technology Dev Fund Account)	-		-	
e. Amount receivable from INDO-TUNISIA	56,400		56,400	
f. Interest on F.D.R. - Union Bank of India	47,671		-	
4. Claims Receivable (TDS)	7,42,977		7,15,037	
5. Amount Receivable - Adv.given to MEF Scheme Staff	-		-	
6. Kumar Krishi Mitra Fellowship	31,281		31,281	
7. Royalty Receivable	10,000		10,000	
8. Vigyan Prasar	-		-	
9. Amount Receivable from MACS	34,044		12,537	
10. Parliamentary Standing Committee	4,11,604	27,72,622	4,11,604	13,74,256
TOTAL (B)		1,31,50,534		19,474,919
TOTAL (A+B)		4,30,37,098		3,28,29,414

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Schedule 12: Income From Sales/Services

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Sales		
a. Sales of Finished Goods (Farm Produce)	12,81,480	9,20,166
b. Sale of Raw Material	-	-
c. Sale of Scraps	-	7,7,768
2. Income from Services		
a. Service Charges	690	390
b. SEM Charges	-	-
c. Maintenance Services (Equipment/Property)	-	-
d. Others	16,886	70,000
e. Fees for Information (Right to Information Act)	150	120
Total (Rs.)	12,99,206	10,68,444

Schedule 13: Grants/Subsidies

Particulars	Current Year	Previous Year
1. Central Government	19,00,00,000	15,62,70,000
Add: Unspent balance at the beginning of the year	2,23,82,000	4,64,350
Less: Unspent balance at the year end	2,47,52,000	2,23,82,000
	18,76,30,000	13,43,52,350
2. State Government	-	-
3. Government Agencies	-	-
4. Institutions/Welfare Bodies	-	-
5. International Organisations	-	-
6. Others (Specify)	-	-
Net Surplus of sale of Assets		
Total (Rs.)	18,76,30,000	13,43,52,350

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Schedule 14: Fees/Subscriptions

Amount - Rs.

Particulars	Current Year	Previous Year
1. Entrance Fees (Library Membership fees)	56,986	5,238
2. Annual Fees (Licence fees)/Subscriptions	13,375	7,613
3. Seminar/Program Fees	-	-
4. Others (Ph.D. Tuition fee, Ph.D.Provisional Admission fee)	3,31,500	1,20,514
Total (Rs.)	4,01,861	1,33,365

Schedule 15: Income From Investments

(Income on Invest. From Earmarked/Endowment Funds transferred to Funds.)

Particulars	Investment from Earmarked Fund		Investment - Others	
	Current Year	Previous Year	Current Year	Previous Year
1. Interest				
a. On Govt. Securities	0.00	0.00	0.00	0.00
b. Other Bonds/Debentures	0.00	0.00	0.00	0.00
2. Dividends				
a. On Shares	0.00	0.00	0.00	0.00
b. On Mutual Fund Securities	0.00	0.00	0.00	0.00
3. Rents	0.00	0.00	0.00	0.00
4. Others(Interest on bank deposits)	0.00	0.00	0.00	0.00
TOTAL	0.00	0.00	0.00	0.00
TRANSFERRED TO EARMARKED/ ENDOWMENT FUND	0.00	0.00	0.00	0.00

Schedule 16: Income From Royalty, Publications, etc.

Particulars	Current Year	Previous Year
1. Income from Royalty	-	-
2. Income from Publications	2,035	1,947
3. Others (Sale of Tender Forms/I Cards)	27,500	8,800
4. Application Money	71,550	68,525
Total (Rs.)	1,01,085	7,9,272

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Schedule 17: Interest Earned

Amount - Rs.

Particulars	Current Year	Previous Year
1. On Term Deposits		
a. With Scheduled Banks	20,66,246	18,09,015
b. With Non-Scheduled Banks	-	
c. With Bank (TDF Account)	64,42,740	35,84,439
2. On Saving Accounts	3,06,736	5,26,410
a. With Scheduled Banks		
b. With Non-Scheduled Banks		
c. Post Office Savings Accounts		
d. Others M.S.E.B Deposit	-	31,400
3. On Loans		
a. Employees/Staff (On HBA, Vehicle and Computer Advance)	81,775	1,29,618
4. Interest on Debtors and Other Receivables	2,2,363	-
Total (Rs.)	89,19,860	60,80,882

Schedule 18: Other Income

Particulars	Current Year	Previous Year
1. Profit on Sale/Disposal of Assets:		
a. Owned Assets (Sale of Mahindra Jeep)	-	
b. Assets acquired out of grants, or received free of cost		
2. Export Incentives realized		
3. Fees for Miscellaneous Services (Training Charges)		
4. Miscellaneous Income	1,66,528	8,828
5. Lab Space Usage Charge	-	
6. Guest House Receipts	40,550	30,525
7. Hostel Fees Received	20,630	15,425
8. Medical Scheme for Retired staff	2,28,000	3,42,000
9. Late Fee for Ph.D. Tuition Fee	9,000	1,200
10. Laboratory Fees	1,25,000	8,000
11. F.D. Against L.C.	-	-
Total (Rs.)	5,89,708	4,05,978

M.A.C.S.'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Schedule 19: Increase/(decrease) in the Stock of Finished Goods & Work in Progress

Amount - Rs.

Particulars	Current Year	Previous Year
a. Closing stock		
- Laboratory Consumables	90,701	96,396
- Finished Goods		
- Publications	25,860	25,120
	1,16,561	1,21,516
b. Less: Opening Stock		
- Laboratory Consumables	96,396	144,507
- Finished Goods		
- Publications	25,120	21,527
	1,21,516	1,66,034
Net Increase/(Decrease)	(4,955)	(44,518)

Schedule 20: Establishment Expenses

Particulars	Current Year	Previous Year
1) Salaries and Wages	9,13,96,265	8,55,63,359
2) Allowances and Bonus	8,96,674	1,89,970
3) Contribution to Provident Fund & New Pension Scheme	1,16,98,578	45,81,003
4) Contribution to Other Fund (D.L.I.F.)	64,516	43,444
5) Staff Welfare Expenses	24,60,590	26,73,179
6) Expenses on Employees Retirement and Terminal Benefits	2,21,40,421	1,24,42,118
7) Stipend to Trainees	66,06,155	34,36,212
8) Encashment of Earned Leave for LTC	1,44,093	5,62,426
9) Reimbursement of Residential Telephone Expenses	2,18,992	2,01,353
10) Fellowship & Research Associateship	16,16,770	14,99,468
11) P.F. and N.P.S. Admn.Charges	3,94,159	4,56,056
	13,76,37,213	11,16,48,588

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Schedule 21: Other Administrative Expenses

Particulars	Amount - Rs.	
	Current Year	Previous Year
ADVERTISEMENT & PUBLICITY	19,96,26.00	2,63,139
AUDITORS REMUNERATION	11,500	16,854
BANK CHARGES	65,298	46,597
CAMPUS MAINT. EXPS	21,96,602	12,08,672
CASH INSURANCE	4,874	3,386
DATA BASE EXPENSES	-	-
ELECTRICITY & POWER	54,06,882	64,17,710
FARM HOL & SONGAON EXPS	6,72,011	8,40,472
FIELD TOUR	3,06,134	4,65,385
GARDEN EXPS	37,410	93,631
HIRED LABOUR CHARGES	20,56,925	24,30,679
HINDI DAY EXPENSES	-	-
HONORARIUM	1,78,500	1,94,500
HOSPITALITY EXPS	1,69,450	2,66,353
INFORMATION TECH & NETWORKING	2,22,236	4,89,493
LABOUR & PROCESSING EXPS	6,16,635	1,78,210
LEGAL FEES	50,000	54,700
LIB MISC EXPS	-	457
LIVERIES	32,576	3,000
NATIONAL TECHNOLOGY DAY EXPENSES	-	11,928
OFFICE EXPS MISC	1,25,128	1,11,983
PATENT RENEWAL CHARGES	1,50,200	2,59,250
PARLIMENTARY STANDING COMMITTEE EXPENSES	-	-
POSTAGE, TELEPHONE & COMMUNICATION CHARGES	7,17,957	5,02,997
PRINTING & STATIONERY	7,51,780	7,31,648
PROF S P AGHARKAR DAY EXPS	1,57,448	1,82,531
PROFESSIONAL FEES	18,000	41,346
PROPERTY TAX	16,02,091	14,45,418
Balance C/D	1,57,49,263	1,62,60,339

M.A.C.S.'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2016

Amount - Rs.

Particulars	Current Year	Previous Year
Balance B/D	1,57,49,263	1,62,60,339
PURCHASES OF CHEMICALS & GLASSWARE	92,36,237	77,47,591
REPAIRS AND MAINTANANCE	36,71,050	23,58,983
SCIENCE DAY EXPS	2,250	16,772
SCIENCE EXHIBT. EXP.-2015	2,44,442	-
SECURITY SERVICE CHARGES	16,81,339	16,35,166
SEM CHARGES	-	-
SEMINAR EXPS	59,500	25,164
SERVICE TAX PAYMENT (NET)	993,193	782,166
SUBSCRIPTION EXPS	50,12,830	42,15,566
TA/CONVEYANCE--INDIAN AND FOREIGN TOUR	5,71,169	6,33,187
VEHICLE RUNNING AND MAINT EXPS	1,76,055	1,33,983
PUBLICATIONS	3,75,410	1,87,189
WATER CHARGES	8,76,475	8,24,010
TOTAL (Rs.)	3,86,49,213	3,48,20,116

Schedule 22: EXPENDITURE ON GRANTS, SUBSIDIES ETC.

Particulars	Current Year		Previous Year	
a. Grants given to Institutions/ Organisation	0.00	0.00	0.00	0.00
b. Subsidies given to Institutions/ Organisations	0.00	0.00	0.00	0.00
TOTAL (Rs.)	0.00		0.00	

Note : Name of the Entries, their Activities along with the amount of Grants/
Subsidies are to be disclosed.

Schedule 23: INTEREST

Particulars	Current Year		Previous Year	
a. On Fixed Loans	0.00	0.00	0.00	0.00
b. On Other Loans (including Bank Charges)	0.00	0.00	0.00	0.00
c. Others (Specify)				
TOTAL (Rs.)	0.00		0.00	

M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004

Schedules Forming Part of Balance Sheet as at 31.03.2016

Schedule D: Transfer to Trust Fund (Capital Account)

Amount - Rs.

Particulars	Current Year		Previous Year	
Other Fixed Assets	-		-	
Temporaty Structures	99,000		-	
Modular furniture for New Lab Bldg	-		-	
Books	6,99,115		4,98,750	
Construction of Buildings	-		65,720	
Computer / Peripherals/Softwares	46,55,896		35,07,439	
Office Furniture & Dead Stock	2,50,901		1,60,679	
Other Fixed Assets	-		-	
Veheical -			9,39,640	
App. & Equipments	1,24,52,607		2,35,10,545	
Equipments at Hol	82,940		6,91,600	
Transformer / Generator	-		-	
CC TV Works at ARI Campus	-		-	
Recarpeting of Existing Roads	-		-	
Construction of Temporary shed at Songaon	-		-	
Construction of Compound Wall at Pune	58,10,600		-	
		2,40,51,059		2,93,74,373
Advance to Supplier for Equipments				
Applied Separations Inc.	-		21,13,139	
Bruker Axs Analytical Inst.Pvt.Ltd.	-		1,40,000	
C. DAC	1,58,673		1,58,673	
CPWD	9,50,926		58,45,000	
Easy Comp Solutions	11,250		11,250	
FlyJac Logistics	3,52,516		3,52,516	
Freight Express	1,58,349		1,58,349	
Heidolph Instruments GmbH & Co.	-		2,77,446	
Inkroma	-		18,09,600	
Mapple ESM Technologies Ltd.	1,21,500		1,21,500	
PSP Freight Lines Pvt.Ltd.	1,51,405		1,51,405	
LCICA Microsystems	1,450		1,450	
ESCO Micro Pvt Ltd., Singapore	3,05,348		3,05,348	
Ingram Micro India Pvt. Ltd.	1,614,081		-	
		38,25,498		1,14,45,676
TOTAL		2,78,76,557		4,08,20,049

As per our report of even date

For M/S SPAY & CO

Chartered Accountants

FRN:132976W

Sd/-

PARAS MUNOT

Partner

MRN:142148

Sd/-

FINANCE & ACCOUNTS OFFICER

A.R.I.

Sd/-

OFFICIATING DIRECTOR

A.R.I.

Date: 05/08/2016

FORM OF FINANCIAL STATEMENTS: Non –profit making organization
Name of Entity: M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules forming part of the Accounts for the period ended 31.3.2016

Schedule: 24 Significant Accounting Policies

a. Accounting Convention :

The Financial statements are prepared under the historical cost convention and in accordance with the applicable Accounting Standards except where otherwise stated. Accrual system of accounting is generally followed to record the transaction in the financial statements.

b. Fixed Assets :

Fixed assets are stated at their original cost of acquisition, less depreciation.

c. Method of Depreciation:

Depreciation on fixed assets has been provided on straight line basis (SLM) as per the rates prescribed under the Bombay Public Trust Act, 1950.

d. Extra-ordinary Items, Prior Period Items, Changes in Accounting Policies :

On the basis of information and explanation given by the management Extra-ordinary Items, Prior Period Items, Changes in Accounting Policies are separately disclosed in the financial Statement but are integrated through various items appearing under the same.

e. Foreign Currency Transactions:

Transactions denominated in foreign currency are accounted as the exchange rate prevailing at the date of the transaction; however foreign exchange gain loss is not calculated and accounted for.

f. Investments:

1. Long term investments are valued at cost and where required, provision is made for permanent diminution in the value of such investment.
2. Investment classified as "Current" are valued at cost and market value.
3. Cost means acquisition cost which includes acquisition expenses like brokerage, transfer stamp, etc.

g. Revenue Recognition:

1. All Revenue receipts are on accrual basis.
2. All Expenses are generally accounted for on accrual basis.

h. Accounting for Government Grants:

1. Government grants of the nature of contribution towards capital cost of setting projects as capital reserve
2. Grant in respect of specific assets acquired are shown as a deduction from the cost of related assets.
3. Government grants/subsidies are generally accounted on accrual basis.

4. Government grants are taken for seminars in revenue nature but directly taken to Current asset and expenditure is booked against it so as to determine shortage or excess if any.

i. Retirement Benefits:

1. Generally, liability towards gratuity payable on death/retirement and leave encashment of the employees is provided based on Actuarial Valuation.
2. Provision for accumulated leave encashment benefit to the employees is accrued and computed on the assumption that the employees are entitled to receive the benefit as each year end which is also done on Actuarial Valuation.

j. Capitalization:

All direct expenses attributable to fixed asset acquired are capitalized.

As per our report of even date
For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-
FINANCE & ACCOUNTS OFFICER
A.R.I.

Date: 05/08/2016

Sd/-
OFFICIATING DIRECTOR
A.R.I.

Sd/-
PARAS MUNOT
Partner
MRN:142148

FORM OF FINANCIAL STATEMENTS: Non –profit making organization
Name of Entity: M.A.C.S'S AGHARKAR RESEARCH INSTITUTE, PUNE - 411 004
Schedules forming part of the Accounts for the period ended 31.3.2016

Schedule: 25Contingent liabilities and Notes on Accounts (Illustrative)

1. Contingent liability:

- a. Claims against the entity not acknowledge as debts-**Nil** (Previous Year-**Nil**)
- b. In respect of:
 - Bank guarantee given by on behalf of the entity -**N.A.**(Previous Year-**Nil**)
 - Letters of credit opened by bank behalf of the entity -**Nil**(Previous Year-**Rs.Nil**)
 - Bill discounted with banks-**Nil** (Previous Year-**Nil**)
- c. Disputed demands in respect of:
 - Income tax -**Nil** (previous Year-**Nil**) Sales tax -**Nil** (Previous Year-**Nil**)
 - Municipal Taxes -**Nil** (Previous Year-**Nil**)
- d. In respect of claims from parties for non-execution of orders, but contested by the entity **Nil** (Previous Year-**Nil**)

2. Capital Commitments:

Estimated value of contracts remaining to be executed on capital account and not provided for (Net of Advances)-**Nil** (Previous Year)-**Nil**

3. Lease obligation

Further obligation for rental under finance lease arrangements for plant and machinery is **Nil** (previous Year **Nil**)

4. Current Assets, Loans and Advances:

In the opinion of the management, the current assets, loans and advances have a value on realization in the ordinary course of business, equal to the aggregate amount shown in the Balance Sheet. Some of balance of sundry debtors, deposits, loans and advances are subject to confirmation from the respective parties and consequential reconciliation adjustments arising there from, if any.

5. Taxation

In view of there being no taxable income under Income Tax Act 1961, No provision for income tax has been considered necessary. In view of this, no disclosure is required as per accounting standards -22 issued by The Institute of Chartered Accountants of India (ICAI).

6. Grants:

During the year, The Institute has received revenue as well as capital grants from government. The accounts of such grants are disclosed in financial statements as per AS-12 issued by Institute of Chartered Accountants India (ICAI) except grants which are received from DST for meetings/seminar which are of revenue nature are routed through Balance Sheet rather than Income & Expenditure.

7. Retirement Benefit:

Generally, liability towards gratuity payable on death/retirement of employees is provided based on Actuarial Valuation and provision for accumulated leave encashment benefit to the employees is accrued and computed on the assumption that employees are entitled to receive the benefit at each year end which is also done on Actuarial Valuation.

The principle assumption used in determining the gratuity obligation are as below:-

Sr. No.	Particulars	For year ended 31 st March, 2016
1.	Withdrawal Rate	2.00%
2.	Discounting Rate	7.86%
3.	Future Salary Rate	5.00%

The position of gratuity payable on death/retirement of employees and leave encashment as on 31st March, 2016 is as below

Particulars	Provision for Gratuity	Provision for Leave Encashment
Opening balance as on 31 st March 2015	5,69,58,950	4,20,71,888
Add:- Addition during the year 2015-16.	60,77,873	53,34,394
Closing Balance as on 31 st March 2016.	6,30,36,823	4,74,06,282

8. Impairment of Assets:

As per Accounting Standard-28 "Impairment of Assets" issued by the institute of Chartered India, comes in to effect, in respect of accounting commencing on or after 1st April, 2005. We have relied upon the management on the matters related to impairment of assets, in view of management there are no impairment losses.

9. Previous year figure are rearranged, recast or regrouped wherever necessary, to make them comparable which those of the year under audit.
10. Third party confirmation are necessary for confirming the balances as at the Balance Sheet date, but the institute was not able to provide any of such confirmation to us. Hence, we are unable to comment on the accuracy of such third party balances.
11. Provisions are recognized when the firm has present obligation as a result of past event; it is more likely that an outflow resources will be required to settle the obligation; and the amount has been reliably estimated.
12. Opening Inter balances of ARI-MACS-SCHEMES ARE NOT matching. Also during the year transactions are not matching. No reply has been received from the Institute in this regard.
13. In case of items debited to Income and Expenditure account, it was informed to us that the expenditure is not of capital nature.
14. Depreciation on fixed assets has been provided on straight line basis (SLM) as per the rates prescribed under the Bombay Public Trust Act, 1950.

As per our report of even date
For M/S SPAY & CO
Chartered Accountants
FRN:132976W

Sd/-
FINANCE & ACCOUNTS OFFICER
A.R.I.

Sd/-
OFFICIATING DIRECTOR
A.R.I.

Sd/-
PARAS MUNOT
Partner
MRN:142148

Date: 05/08/2016

Exhibitions and Outreach

India International Science Festival New Delhi, 4-8 December 2015



Sri A Jayakumar, Secretary General, Vijnana Bharati (2nd from left)



Dr Harsh Vardhan, Hon'ble Union Minister for Science & Technology & Earth Sciences

M A C S



**Maharashtra Association for the Cultivation of Science
Agharkar Research Institute**

Autonomous Institute of the Department of Science & Technology, Government of India
G. G. Agarkar Road, Pune 411 004, India
Telephone : +91-20-25653680 Fax : +91-20-25651542
website : www.aripune.org