Annual Report 2018-19

Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

Vision

To excel as an internationally recognized centre of multi-disciplinary research in science and technology

Mission

a) Conduct basic and applied research in life and related sciences for human betterment

b) Explore the genetic diversity of microbes, plants and animals

c) Develop sustainable technologies for a cleaner environment, agriculture and better health

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(DBT OM BT/BS/17/13/94-PID, dt. 01.03.2019; Intimation regarding superannuation of Dr. Paknikar and Dr. PK Dhakephalkar taking charge as 'Officiating Director' and chairing the IBSC meeting sent on 22.03.2019)

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Dr SA Tamhankar

Central Public Information Officer, ARI

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Grievance Officer, ARI

Dr GK Wagh

Contents

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 2018-19. I would like to touch upon the events that were organised for the benefit of the students, farmers, scientists and the society at large.

An international symposium on fungal biology was organised to provide a platform for researchers, educators, industrialists and young students to share, learn and exchange experiences, innovations, possibilities, and concerns in the field of basic and applied mycology. Close to 250 participants from India and abroad participated in the symposium.

The National Fungal Culture Collection of India conducted training in taxonomy, biodiversity, ex situ conservation and applications of fungi for the benefit of researchers. Similarly, the first national hands-on workshop on concepts in developmental biology was conducted for students, post-doctoral researchers, college and university teachers for practical exposure to handling, maintaining and performing experiments with unique model systems that included hydra, drosophila and zebrafish.

As a prelude to the 4th India International Science Festival a public outreach day was organised for the benefit of students and citizens. Renowned scientist Dr Vijay Bhatkar, President, Vijnana Bharati inaugurated the science exhibition.

For extending our research to the rural areas the institute participated in the science exhibiton held at GMRT, near Rajgurunagar, Pune. Additionally, an open house science exhibition was held in the institute on the occasion of the national science day. It was attended by close to a thousand students and citizens.

Since the farmers are the focus of our crop research, a training programme on the improved soybean cultivation technology was held for farmers, at the experimental farm at Hol, Baramati taluka, Pune.

The national technology day, vigilance awareness week and Hindi fortnight were celebrated with fervour. This year, we organised a two-day scientific conference in Hindi, in

which fifty-eight research papers were presented by scientists from 17 research organisations. The conference was held in collaboration with the CSIR-National Chemical Laboratory and the National Centre for Cell Science.

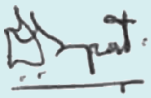
Promotion of science by way of appreciation of good quality research has been vigorously pursued by the MACS. The Yogamaya Devi Award which has been instituted by Dr Kalyan Banerjee, Life Member and past President of MACS in the memory of his mother was awarded for the first time, this year, to honour Scientists who have done outstanding work in the field of biomedical Sciences. It was awarded this year to Prof. NK Arora, Executive Director, The INCLEN Trust International, New Delhi, for his work on 'Polio eradication and its certification in India' and Dr Pradeep Haldar, Deputy Commissioner (Immunization), Ministry of Health and Family Welfare, Government of India.

Similarly, the other prizes presented this year included the Dr RB Ekbote Prize in recognition of significant research contribution in the various areas of Botany, Shri VP Gokhale Prize in recognition of significant research contribution in the various areas of Phytopathology and Dr PP Kanekar Prize for the best paper published by young scientist of MACS-ARI.

Commemoration lectures included Shri. GB Joshi Memorial Oration, Dr GB Deodikar Memorial Oration, and Prof. SP Agharkar Memorial Oration which were delivered by eminent scientists.

The popularity of MACS' scientific promotion programmes like home gardening and field botany continues to grow. The home gardening course has been running successfully for 32 years. Enthusiasts in home gardening and plant taxonomy have been benefitting from these courses.

I invite you to take a look at the diversity of research accomplishments in the various thematic areas, which are detailed in the following pages. I will conclude by saying that the MACS-ARI has seen all round growth in the fundamental and applied aspects of research, popularisation of science and addressing the various national priorities.



DR Bapat
9 August 2019

Executive Summary

Dr PK Dhakephalkar
Director (Officiating)
Agharkar Research Institute
Pune

It gives me immense pleasure to present the Annual Report for the year 2018-19. I assumed the office in the role of Officiating Director in March 2019. I have witnessed maturity and expansion of fundamental and applied research in MACS-ARI. Let me congratulate the entire staff of MACS-ARI and extend my sincere thanks to all scientists, students and other staff members who have contributed in different capacities for the betterment of the institute. I also acknowledge my predecessor, Dr. K. M. Paknikar for his efforts to establish a culture of excellence in research and administration. Research activities in MACS-ARI have always been performed with a clear mandate for promotion of science and dissemination of knowledge for the national welfare. Such research activities were sponsored generously by the Government of India, PSUs and private industries. Their continuing support is gratefully acknowledged.

The emphasis of the research at MACS-ARI has been on exploration of diverse natural resources for taxonomic studies, industrial applications and to answer fundamental questions. ARI scientists have targeted biodiversity hotspots such as Western Ghats, Himalayan mountain range, etc. for investigating diversity and documenting novel taxa of plants, fungi, lichens, diatoms, etc. Some of the novel taxa documented over last one year include a new plant species, *Eriocaulon karaavalense*; anaerobic fungus, *Liebetanzomyces polymorphus*; diatom species, *Cymbella pavanaensis;* diatom genus *Ninastrelnikovia.* Further, members of the family *Lichinaceae* were reported after a gap of 24 years from Himachal Pradesh. Another interesting study of paleobiological importance documented various bivalve ichnogenera exhibiting different ethological attributes from the Jurassic of Jaisalmer Basin.

As a part of Bioprospecting studies, ARI scientists have been investigating applications of various plants for preventing non-communicable diseases. Inflammation associated anemia (AI) is the second most prevalent anemia after iron deficiency anemia. ARI scientists have established that consumption of vitamin C–rich fruits such as amala, guava, tomato and lemon has a significant effect on iron status. Hence, such fruits need to be an imperative part in diets of adolescent girls for reducing inflammation and improving their iron status.

MACS-ARI has always been known for its contribution to Indian agriculture in the form of new disease resistant/ drought resistant high yielding varieties of wheat, soybean, grapes, etc. Development of such varieties requires decades of research and hard work in field. Wheat variety MACS 4028 (*T. durum*) has now been notified for rainfed-timely sown condition of Peninsular Zone. This is the twelfth wheat variety developed by the institute. Soybean variety MACS 1520 showed high and stable yield during trials in Central Zone and has now been identified for release. Such improved breeder seeds of wheat

(239 quintal) and soybean (321 quintal) were supplied to public and private seed multiplying agencies and farmers to facilitate its reach to the masses.

MACS-ARI has put in concerted efforts to use microbes for enhanced energy recovery from renewable and abundant agricultural wastes. A sustainable microbial process for biomethantion of rice straw without thermo-chemical pre-treatment was developed. The process used the fibrolytic microbial consortium and the specially developed nutrient supplement. More than 90% of the theoretical maximum yield improved the techno-economic feasibility of this green and energy efficient process which could be a solution to the 'burning' problem of residual rice straw in Haryana and Punjab region.

The focus of research in Nanobioscience area has been on development of technology in medicine, agriculture and environment. Zinc oxide nanoparticles were explored for anti-diabetic activity. It was established that ZON treatment could halt the progressive loss of pancreatic beta cells in diabetes. The ZON nanoparticles could be used in the treatment of diabetes for controlling the progression of the disease. In another application, zinc complexed chitosan nanoparticles (Zn-CNP) were developed to enhance fertilizer uptake effeciency. Hence, Zn-CNP were used for ferti-fortification of durum wheat in field-scale experiments. In another contribution of nanobiosciences to healthcare, MACS-ARI scientists have developed an easy to use, specific and sensitive, on-site detection method for invasive Aspergillosis in resource poor settings.

Fundamental research at MACS-ARI has focused on answering key questions related to cardiovascular, development and regeneration, germline stem cell maintenance and ageing, etc. Three model systems used for such research included hydra, zebrafish and *Drosophila*. Hydra as a model system has been used to study role of DNA repair proteins in evolution of DNA repair mechanisms. Studies on role of autophagy in *Drosophila* have been carried out to uncover a network between autophagy, signaling and mitochondrial reactive oxygen species that regulate germline stem cell maintenance and aging. Zebrafish model has been used to investigate cardiovascular development and regeneration.

MACS-ARI scientists have been investigating the mechanism of replication of Hepatitis E Virus (HEV). It was established for the first time that the activities of Thrombin and Factor Xa (clotting factors) are essential for replication of Hepatitis E virus and are possibly implicated in ORF1 polyprotein processing. A distinct pro-viral role of Hepatitis E Virus (HEV) RNA dependent RNA polymerase, crucial for successful infection in the host has been proposed. These findings could be crucial in development of vaccine against HEV.

Research at ARI was sponsored through seventy one extramural research grants awarded to ARI scientists. Quality of the research at ARI was evident from 58 research articles published by ARI scientists in journals of international repute. Seven students obtained PhD degree during this period. 58 students are currently pursuing their doctoral research at ARI.

The research excellence achieved by the institute has been possible only through the team work of entire staff and students of ARI. The research activities was ably supported by staff from Administration, Accounts, Purchase, Stores, Engineering and Gardening sections. We are grateful to all employees of the institute for their valuable contribution.

Looking ahead, the funding from government agencies will become even more competitive. It is important for us to strengthen our competitive edge and widen our funding resources. Directed efforts to increase industrial collaborations and sponsorships need to be intensified. This report illustrates the financial performance of the Institute in FY 2018-19. The report also summarizes the on-going research activites and emerging technologies that will help position the Institute at National level for academic and translational research.

PK Dhakephalkar

7 August 2019

ARI Scientists

Biodiversity and Palaeobiology Group

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

Bioenergy Group

Dr Prashant K Dhakephalkar

Dr Monali C Rahalkar

Dr Sumit S Dagar

Mr Pranav R Kshirsagar

Bioprospecting Group

Dr Prasad P Kulkarni

Dr Pratibha Srivastava

Developmental Biology Group

Dr Surendra M Ghaskadbi

Dr Anuradha Ratnaparkhi

Dr Sachin H Jadhav

Dr Chinmoy Patra

Dr Bhupendra V Shravage

Nanobioscience Group

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

Genetics and Plant Breeding Group

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

Dr Yashvanthakumar KJ

Dr VS Baviskar

Dr Sudhir Navathe

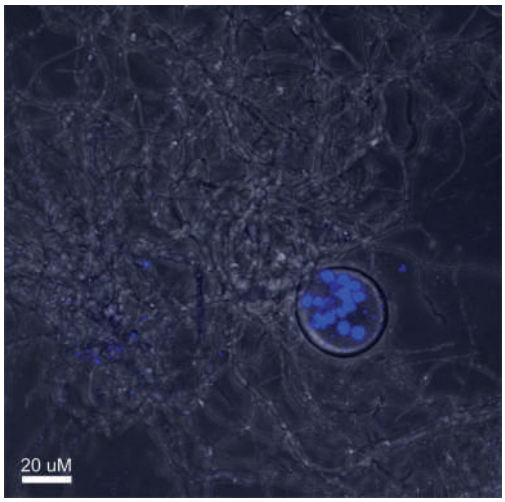
Biodiversity and Palaeobiology

Studies in biodiversity and palaeobiology range from viruses, archaea, bacteria, fungi, lichens, diatoms, plants to fossil forms.

Biodiversity

Archaea, Bacteria

Isolation of fibrolytic anaerobic fungi from herbivorous animals



Anaerobic roll tube technique was used to cultivate 33 strains of anaerobic fungi from rumen liquor or faecal samples of herbivores like cattle, buffalo, goat, sheep, black buck, sambhar deer, blue bull, gaur, horse, and camel. The morphological and molecular characterization results revealed the identity of isolates as *Orpinomyces*, *Piromyces, Caecomyces* and *Cyllamyces*. A new genus of anaerobic fungi was also obtained, which has been named and published as *Liebetanzomyces polymorphus* (Figure 1).

Figure 1
Confocal microscopy image of *Liebetanzomyces polymorphus* showing nucleated sporangium and anucleated rhizoids

Methanotrophs: Diversity, taxonomic descriptions and information from genomes

Methanotrophs are aerobic or microaerophilic organisms which oxidize methane from the environment and act as natural biofilters. They are being explored worldwide for various applications in biotechnology and bioenergy. We are one of the first groups in India to culture, isolate and study methanotrophs. Type I methanotrophs belonging to *Methylococcaceae*, Gammaproteobacteria can be used for various applications, such as for production of biodiesel, single cell proteins, carotenoid pigments, etc. Thirty-one new methanotrophic strains were isolated this year from various freshwater habitats and these belonged to eight genera; most of the isolates belonging to *Methylococcaceae,* Gammaproteobacteria. One putative novel genus and three putative novel species of Type I methanotrophs were discovered during this year.

Novel isolates

Putative new species of an ecologically dominant clade, first from tropical environment (Methylobacter (Mtb.) KRF1)

We enriched and isolated a methanotroph named as KRF1 from a tropical rice field soil sample from India (Figure 2).

The culture consists of motile, long and thick rods (3-5 µm x 0.9-1.2 µm). The culture forms yellow colonies on agarose. KRF1 showed closest phylogenetic affiliation to *Mtb. tundripaludum* SV96^{T} (98.6 % 16S rRNA gene similarity). Due to the taxonomic novelty, and being the first member of *Mtb.* related to *Mtb. tundripaludum* from the tropics, the draft genome was sequenced. The draft genome is 5.02 Mbp and various metabolic pathways are present including the ability to denitrify and fix nitrogen.

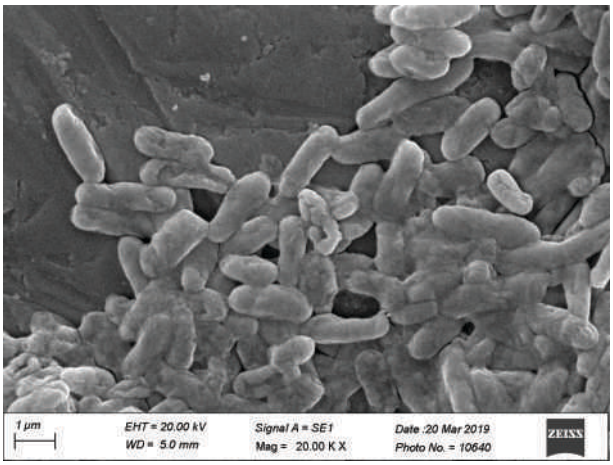


Figure 2
SEM image of *Methylobacter* strain KRF1. Bar represents 1 µm

Isolation of FWC3, member of a novel genus

Using a modified cultivation approach, we isolated one novel genus-species (strain FWC3) (Figure 3).

Strain FWC3, isolated from canal sediment, is a member of a putative novel genus and species (*Ca.* Methylolobus aquaticus, proposed name) and belongs to the family *Methylococcaceae*. The genome of this strain was sequenced to get additional information. The taxonomic novelty was proved from the differences in 16S rRNA gene and average nucleotide identity (ANIb) indices comparison using the draft genome. The draft genome size of FWC3 is 3.4 Mbp and possesses all the methanotrophy related genes, nitrogen fixation genes and dissimilatory nitrite reductase.

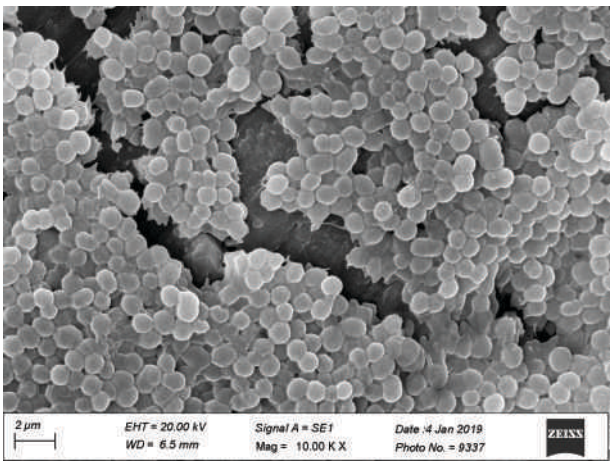


Figure 3
SEM image of FWC3 isolate. Bar represents 2 µm

Fungi

Biodiversity, systematics and documentation of fungi

As a part of biodiversity, conservation and documentation activities of Fungi, several novel fungi were discovered along with revision in taxonomic status of certain genera. During period of report different specimens of pathogens, dead wood, leaf litter, soil, polluted river water, dead bark etc. were collected and studied in details. Fungal genera and species of different taxonomic groups were encountered like *Calonectria*, *Hyweljonesia*, *Saprolegnia*, *Cylindrocarpon*, *Thirumalacharia*, *Corynespora*, *Podaxis*, *Xylaria*, etc. Several novel species and few novel genera of fungi and yeast were also discovered, documented and

published in reputed journals. Novelty of these taxa were based on morphology and multigene phylogenetic analysis. These are as follows.

Coniochaeta simbalensis S Rana & SK Singh, was isolated and described from mushroom rhizospheric soil of district Simbal in Himachal Pradesh. This species was found different from other known species in the genus. It produces morphological characters which are distinct from its close allies. In addition, sequencing and phylogenetic analyses of ITS and LSU regions revealed this taxon to be novel (Figure 4).

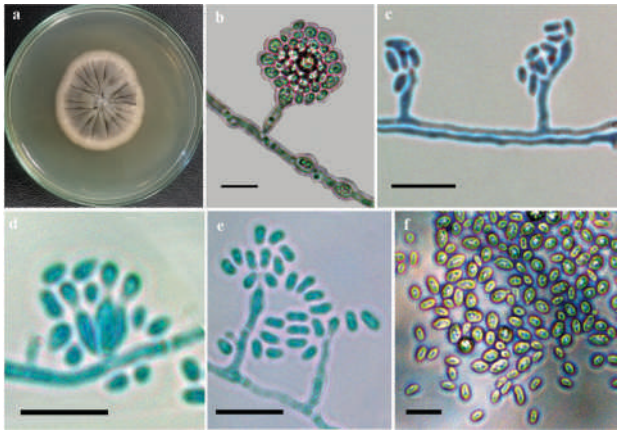


Figure 4
Coniochaeta simbalensis. a Colony morphology on PDA (front view). b Colony morphology on SDA (front view). c colony morphology on PCA. d Hyphal wall septate, thickened, globulated, and showing anastomoses. e Terminal to intercalary chlamydospores. f phialides with gleosporic mass of conidia, g adelophialide with gleosporic mass of conidia (magnified view), h discrete phialides and adelophialides, i Ventricose phialides in group with conidia, j discrete phialides and dispersed conidia, k Mass of conidia. Scale bars: = 10 µm

Hyweljonesia indica PN Singh & SK Singh, was described as a new species. It was collected as a saprobe associated with leaves of *Shorea robusta* Roth colonized by black moulds in India. Overall morphological characters were distinct from the known species reported from Queensland, Australia. Phylogenetic analysis from maximum likelihood based on a combined LSU and ITS sequence dataset clarifiedy its phylogenetic affinities within Teratosphaeriaceae. This is the second species reported from India (Figure 5).

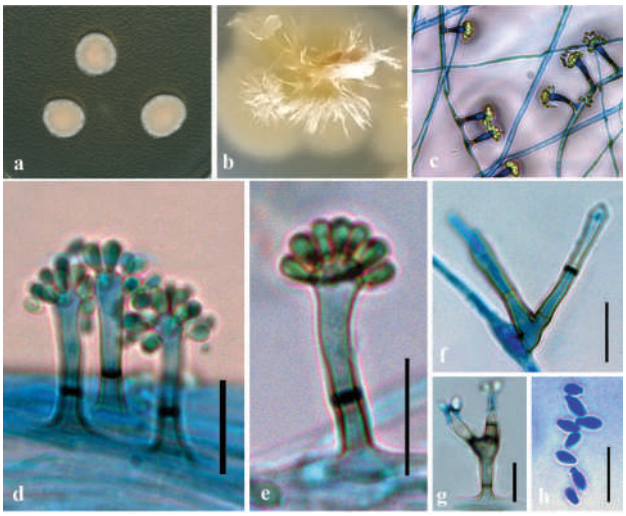


Figure 5
Hyweljonesia indica a Colony on PDA (front view) b Enlarged view of single colony on PDA showing mycelial tufts. c Conidiophores bearing conidiogenous cells and whorls of conidia arising from tuft of mycelial hyphae. d Numerous conidiophores arising laterally from loose and tufted mycelial hyphae. e Enlarged view of single conidiophore bearing whorl of conidia. f Conidiophore branched at base. g Conidiophore bearing two conidiogenous cells and attached conidia. h Obovoid to pyriform hyaline conidia with refractive conidial scars. Scale bars d, f–j = 10 µm

Talaromyces amyrossmaniae Rajeshkumar et al. a synnematous species wasisolated from decaying fruit and litter of *Terminalia bellerica*. It is described and illustrated. Multigene phylogenetic analyses based on the internal transcribed spacer region (ITS), and partial sequences of β-tubulin (*BenA*), calmodulin (*CaM*), and DNA directed RNA polymerase second large subunit (*RPB2*) genes, along with morphological characterization, revealed that these isolates are distinct and form a unique lineage of *Talaromyces* in section *Trachyspermi*. The new species *T. amyrossmaniae* is the first species in section *Trachyspermi* with determinate synnemata (Figure 6).

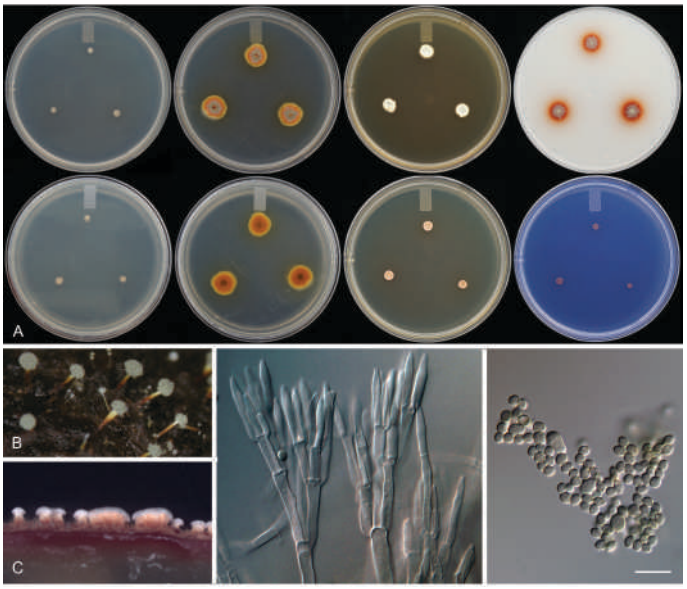


Figure 6
Talaromyces amyrossmaniae. a Colonies obverse on YES, OA, DG18, CREA b Synnemata on *Terminalia bellerica* fruit in nature c Synnema formation on MEAbl after 14 d at 25 °C d Biverticillate penicilli e Conidia. Scale bar: 10 µm

Compared to the higher fungi (Dikarya), taxonomic and evolutionary studies on the basal clades of fungi are fewer in number. Thus, the generic boundaries and higher ranks in the basal clades of fungi are poorly known. Recent DNA based taxonomic studies have provided reliable and accurate information. It is therefore necessary to compile all available information since basal clades genera lack updated checklists or outlines. Recently Tedersoo et al. (MycoKeys 13:1–20, 2016) accepted Aphelidiomycota and Rozellomycota in Fungal clade. Thus, we regard both these phyla as members in Kingdom Fungi. We accept 16 phyla in basal clades viz. Aphelidiomycota, *Basidiobolomycota, Blastocladiomycota, Calcarisporiellomycota, Caulochytriomycota, Chytridiomycota, Entomophthoromycota, Glomeromycota, Kickxellomycota, Monoblepharomycota, Mortierellomycota, Mucoromycota, Neocallimastigomycota*, *Olpidiomycota, Rozellomycota and Zoopagomycota*. Thus, 611 genera in 153 families, 43 orders and 18 classes are provided with details of classification, synonyms, life modes, distribution, recent literature and genomic data.

In addition, a novel yeast species *Blastobotrys bombycis* was isolated from the gut of silkworm *B. mori*.It was found to be a D-xylose fermenting yeast and could produce ethanol from both glucose and xylose. To the best of our knowledge this novel species represents the first report of yeast isolation from silkworms.

Lichens

Lichens were collected from Rohtang pass, Hamta pass, Bijli Mahadev, etc. situated at various higher altitudes in Himachal Pradesh. Members of family *Parmeliaceae*, *Collemataceae*, *Lichinaceae*, *Peltigeraceae, Physciaceae, Ramalinaceae* and *Cladoniaceae* grow luxuriantly in the study area. Five hundred lichen samples belonging to different groups were collected. The specimens were segregated to their respective group depending upon their growth forms, genus and family. They were deposited and accessioned in Ajrekar Mycological Herbarium (AMH).

Morpho-anatomy and chemotaxonomic studies of over 125 specimens belonging to the different groups of lichens have been studied, which comprises 25 species, of which 15 species belong to family *Parmeliaceae*, 3 species belong to *Cladonia*, 7 crustose (*Aspicilia, Lobothallia, Lecanora, Rhizocarpon, Rhizoplaca*). One or two species appear to be new record and one new species to India. Lichen family *Lichinaceae* has been reported after a gap of 24 years from Himachal Pradesh.

Plants

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

Lectotypes were designated for the two names of *Eriocaulon* species, namely *Eriocaulon cuspidatum* Dalzell

and *Eriocaulon margaretae* Fyson. One *Eriocaulon* plastome was sequenced and compared with other available plastomes to understand the gene content, structural rearrangements and genome evolution of order Poales. A new *Eriocaulon* species (Figure 7) has been discovered from Karnataka and the work has been accepted for publication by the journal *Annales Botanici Fennici*.

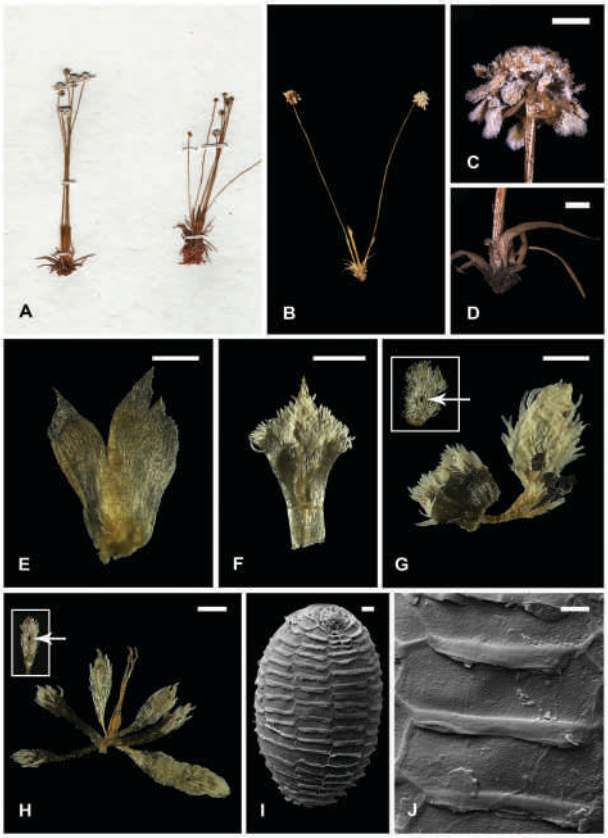


Figure 7
A new *Eriocaulon* species discovered from Karnataka, India

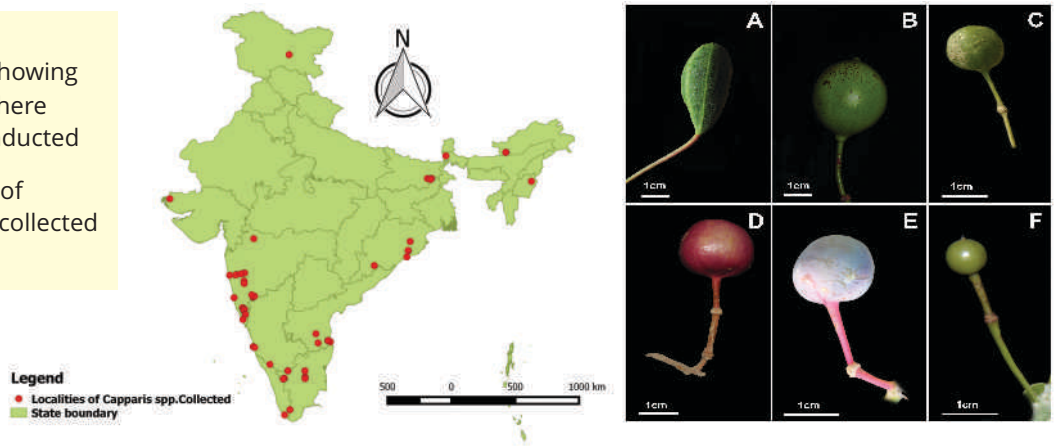
Understanding the morphological evolution and ecological diversification of the forest dwelling capers in Indian subcontinent using molecular phylogenetic tools

The genus *Capparis* is widely distributed along the pan-tropical region in diverse habitats in India. Studies are being carried out to understand morphological evolution and ecological diversification patterns of *Capparis* species from Indian subcontinent. Floristic surveys were conducted in Maharashtra, Gujarat, Andhra Pradesh, Odisha, Tamil Nadu, Kerala, Manipur, Meghalaya, Assam, Arunachal Pradesh and W. Bengal (Figure 8A).

Total 240 accessions of *Capparis* comprising of 23 species were collected from different parts of India. For molecular studies DNA extraction was done for all species and amplification of 23 species with chloroplast markers (*psbA-trnH*, *matK*, *trnL-F*, *rbcL*) and nuclear internal transcribed spacer (ITS) region have been completed. Complete chloroplast genomes of *Capparis spinosa* var. *spinosa* and *Capparis spinosa* var. *herbacea* were sequenced for the first time. DNA barcodes for highly medicinal and economic important plant *Capparis spinosa* var. *spinosa* were also generated based on chloroplast genome sequencing. Congruence of molecular sequence data and morphological characters is being assessed to understand morphological character evolution (Figure 8B).

Figure 8
A. Map of India showing point localities where surveys were conducted

B. Fruit variation of *Capparis* species collected across India



Unravelling the vascular plant endemism of Northern region of Western Ghats

Endemism is a property of organisms to be restricted to a particular area. Endemic plants have always been of interest to plant biologists as they offer a system to study various questions related to ecology and evolutionary biology. One of the widely accepted applications of endemism at the policy level is declaration of 35 global biodiversity hotspots of which India shelters four. Western Ghats (WG) of India is one such hotspot. It is a treasure trove of endemic plants and animals. Northern part of the Western Ghats (NWG) is different from its counterparts in terms of overall rainfall and duration of dry period. In the present study, with focus on NWG, we are trying to document diversity and distribution of endemic vascular plants in various habitats like plateaus, cliffs, forests, forts, grasslands and wetlands. Ten forests and six cliffs were surveyed across the NWG documenting the presence of total 86 species belonging to 63 genera and 31 families of which 24 species are endemic to WG while 14 are exclusively endemic to NWG (Figure 9). There are several endemic trees as well recorded from forests of NWG (Figure 10).

Figure 9
Endemic herb diversity of cliffs of Northern Western Ghats

Figure 10
Endemic tree diversity of forest of Western Ghats

Muraina-grasses of India: Addressing the polymorphism and interspecific variation through morphological, ecological and molecular phylogenetic studies

Ischaemum, a genus of extremely variable characters amongst grasses, has about 73% endemism in India. For our study on this taxonomically complicated genus, we collected 287 accessions all across India comprising 41 species. Morphometric studies were carried out considering 31 pairs of characters to understand the

Figure 11
Ischaemum agasthyamalayanum
a: Habit, b: Awned Pair of spikelets, c: divaricate lower glume of sessile spikelet

grouping of species. During our field exploration *I. agasthyamalayanum,* a so far known high altitude species, was collected in low altitude area for the first time making it an interesting case of species distribution (Figure 11).

Conservation of selected endemic species of orchids of Northern Western Ghats through ex-situ multiplication and reintroduction in wild

Orchids are very sensitive to the changes in their environment as these changes directly affect their survival and germination ability. Many of the orchid species are on the verge of extinction due to anthropogenic pressures like pollution, livestock and agriculture, habitat destruction indicating need of their conservation. *In vitro* propagation of plants is well proven sustainable alternative method for mass multiplication of rare and endangered plants like orchids. We are standardizing the mass multiplication

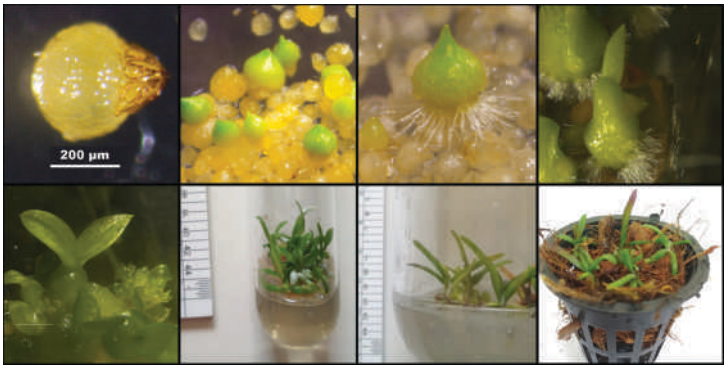
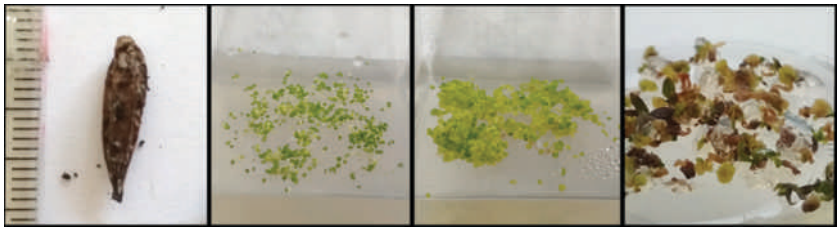


Figure 12
Asymbiotic seed germination and hardening of *Rhynchostylis retusa* (L.) Blume

Figure 13
Asymbiotic seed germination of *Smithsonia straminea* CJ Saldanha



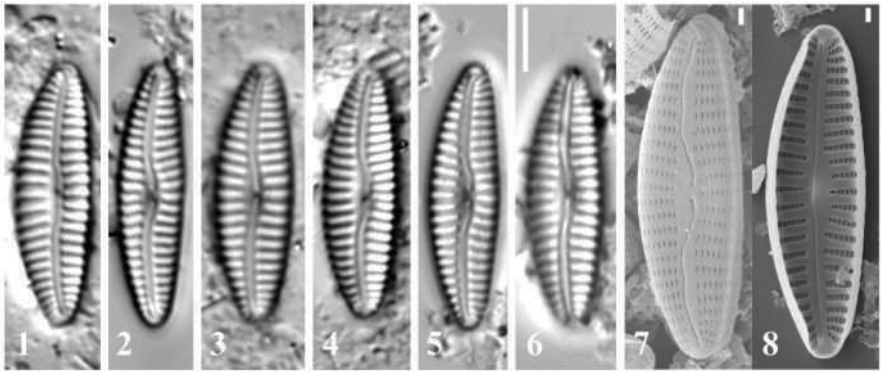
protocol for ten indigenous orchid species using plant tissue culture technique. After successful hardening, they will be re-introduced in the wild. Various vegetative plant parts (sepals, petals, leaves and nodes) as well as seeds were used to establish the mass multiplication protocol for orchids. We have standardized the asymbiotic seed germination protocol for *Thunia alba* var. *bracteata*, *Rynchostylis retusa*, *Smithsonia straminea* and *Habenaria commelinifolia* (Figure 12, 13). Currently we are standardizing hardening protocol for *Rynchostylis retusa* and *Thunia alba*. After successful hardening, these plants will be re-introduced in the wild.

Development of crude drug repository of genuine samples from Maharashtra

As a part of development of crude drug repository of genuine samples from Maharashtra, a total of 80 samples were collected from different locations of five regions of the state viz. Konkan, Western Maharashtra, Khandesh, Marathwada and Vidarbha. Field work involves photo-documentation of habit, habitat, fresh and dried samples and collection of locality data such as GPS coordinates while laboratory work involves documentation of macroscopic characters and evaluation of physicochemical parameters like ash and extractive values. These collections have substantially enriched AHMA crude drug repository, which is the backbone of drug authentication service of ARI.

Developing an online taxonomic guide for the diatoms of Peninsular India

Diatoms are one of the best model organisms to study the microbial biogeographic patterns, due to their species richness, environmental specificity and ubiquitous distribution. This project aims to document the



Cymbella pavanaensis Vigneswaran, Kulikovskiy, Kociolek & Karthick 2019
Scale bar 1-6 = 10µm, 7-8 = 1µm

Figure 14
Light and scanning electron micrographs of *Cymbella pavanaensis* described from the Pavana river

diatom diversity of three freshwater biogeographic regions of Peninsular India, develop a comprehensive online taxonomic resource for freshwater diatom flora of Peninsular India, develop diatom collection at ARI and to train next generation diatom taxonomists. As a part of this project, we collected 117 samples from 38 sites covering the states of Maharashtra, Goa and Kerala. We discovered a new diatom species *Cymbellapavanaensis* Vigneswaran, Kulikovskiy, Kociolek & Karthick from the Pavana River, Western Ghats (Figure 14). We found this species from the most polluted stretch of the Pavana river in the Pune metropolitan area. This finding denotes that the common diatom flora of India is yet to be studied. Additionally, we also found a new species belonging to *Tabullaria*, *Rhophalodia* and *Gomphonema* from various parts of the Western Ghats.

Biogeography and phylogeny of the genus *Stauroneis*

The genus *Stauroneis* Ehrenberg 1843 is one of the most species-rich genus and morphologically diverse group of diatoms. From the Indian subcontinent around 119 *Stauroneis* taxa are known and among these many are force-fitted to European names. Thus our understanding of the genus is minimal. Using *Stauroneis* as a proxy, the current investigation is testing the application of a precise and refined taxonomy supported by the molecular data to determine biogeography, i.e. the distribution of the species and their genetic relatedness. This work is the first ever attempt to understand microbial biogeography of diatoms from the tropical environment. This project discovered two new aerophilic species of *Stauroneis* from the Eastern Himalayas and six new species from the Western Ghats. Additionally, the study revealed four new species of *Stauroneis* at the gene level to delineate species and to estimate the diatom tree of life (Figure 15).

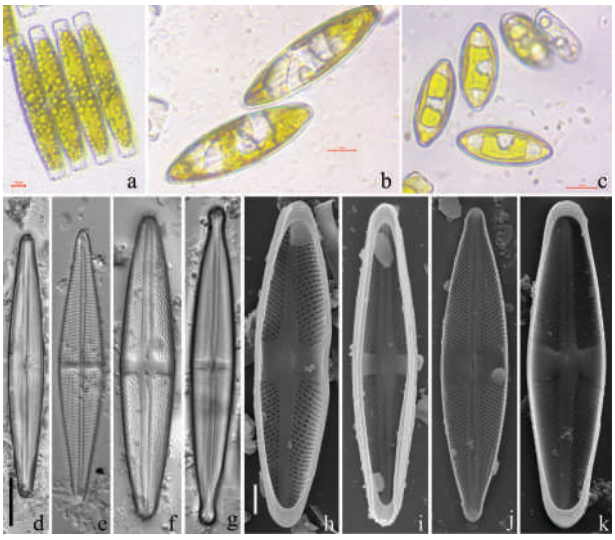


Figure 15
Plate showing the cells of *Stauroneis* in live cultures, cleaned light microscopy and scanning electron microscopic images

Rocky pools of Western Ghats: unexplored habitats for diatoms

Rocky plateaus are one of the unique isolated habitats that show extreme environmental variability, high endemism and interesting adaptive strategies to overcome the environmental stress. The microclimatic

conditions of those regions vary from almost xeric in the summer to flooding during the monsoon. In spite of being good model systems for studies on ecological and evolutionary biology, these pools remain poorly studied across the globe, and very little is known about their diatom biodiversity. Our objectives of this investigation are to assess the diatom floral composition of rocky pools across various macro habitats and beta diversity patterns in diatom communities of rocky pools. More than 200 diatom samples were collected from 23 rocky plateaus from Northern and Central Western Ghats during the post-monsoon season of 2018. The ongoing research revealed novelty even at the generic level. This study found a new species of diatom belonging to the genus *Ninastrelnikovia*. *N. lateritica* S. Roy, Kociolek & B. Karthick described from the Kaas plateau, Northern Western Ghats, where the name depicts the habitat of this taxon (Figure 16). Furthermore, a fascinating new triundulate diatom genus (*Kulikvoskiyia triundulata*) was also found from three different lateritic rocky plateaus in Northern Western Ghats (Figure 16). This study marks the first report of *Ninastrelnikovia* in India.

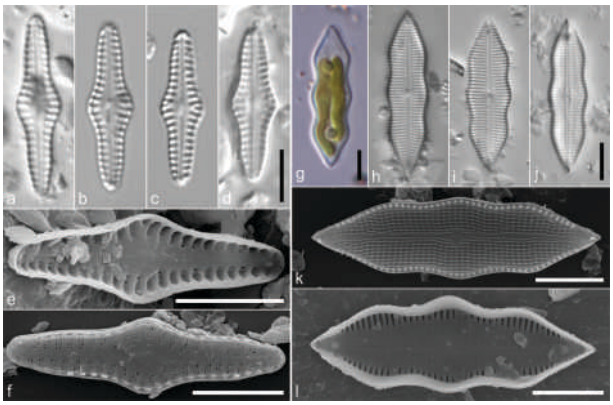


Figure 16 (a-f) *Ninastrelnikovia lateritica*, new species discovered from Northern Western Ghats, India; (g-l) *Kulikvoskiyia triundulata*, a new genus discovered from Northern Western Ghats, India (all scale bars = 5 µm)

Understanding the diversity of diatoms from North-East India

North-East region of India falls under the Indo-Myanmar Biodiversity hotspot which ranks sixth among the presently known 25 biodiversity hotspots. This vast region is still untamed as far as uniqueness of the biodiversity is concerned. It is considered to be one of the most significant places to encounter diverse organisms unique and unknown to science. The current study is inclined towards the understanding of the diversity of diatoms thriving in the aquatic and semi-aquatic environment. Our expeditions to the caves of Meghalaya resulted in putative new species belonging to the genus *Diploneis* (Figure 17). This taxon has been discovered from the Mawsmai Caves, which signifies that even the subterranean habitats hold many taxonomic discoveries to unravel and on the other hand, such ecosystems are frequently overlooked.

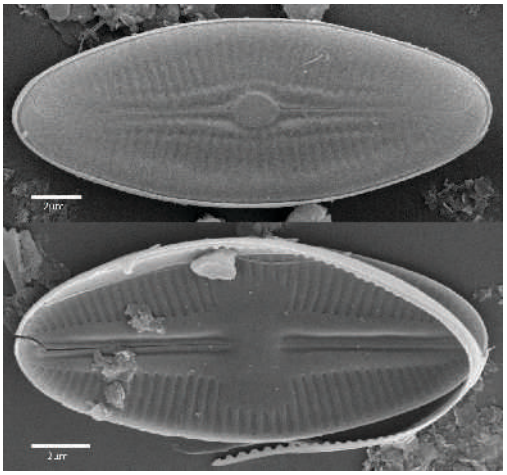


Figure 17 Scanning electron micrograph of *Diploneis* sp. from the caves of Meghalaya

Establishing diatom and environment relationship in the *Myristica* swamps from the Western Ghats

The Western Ghats are amongst the 36 global biodiversity hotspots and are home to many unique ecosystems such as tropical rain forest, montane grasslands, plateaus, streams and rivers. The *Myristica* swamps are one of the unique ecosystems and as their name indicates they are water saturated regions predominantly covered with trees belonging to the ancient family Myristicaceae. Acidic waters with high

humic decomposition make it more interesting to study the aquatic organisms, as the surrounding regions are characterised with neutral to alkaline waters. To understand the diatom community composition and its environment, various swamps from Karnataka and Kerala were visited, which revealed the dominant diatom genera *Eunotia*, *Frustulia*, *Navicula*, *Gomphonema*, *Neidium*, and *Brachysira* .

Dominant diatom genera infer that water quality in these regions is pristine with acidic and oligotrophic condition. The diatom-environment relationship established based on the modern diatom assemblages will be used to infer the past environmental conditions.

Palaeobiology

Ichnology of the Jurassic rocks of the Marwar Basin, Rajasthan

Various bivalve ichnogenera exhibiting different ethological attributes have been documented from the Jurassic of Jaisalmer Basin. Detailed analysis of bivalve traces provides valuable information on bivalve ethology and paleoecology, environmental dynamics, and substrate consistency.

Siphonichnus ophthalmoides (Figure 18a) is a feeding burrow of endobenthic bivalvesoccurring in marginal-marine environments such as shoreface, delta, estuary and lagoon. *Lockeia siliquaria* (Figure 18b) (bivalve resting trace) is an almond-shaped trace of epibenthic bivalves, typically preserved as convex hypichnia; indicative of low-moderate energy and oxygen; rapid pulsed sedimentation; moderate nutrients. *Laevicyclus parvus* (Figure 18c) is assigned to the suspension feeding activity of siphon bearing endobenthic bivalves. *Hillichnus lobosensis* (Figure 18d) is a highly complex bivalve trace fossil depicting the activity of endobenthic deposit-feeding tellinacean bivalves. *Lophoctenium* isp. (Figure 18e) and *Protovirgularia rugosa* (Figure 18f) are feeding and locomotory traces of epibenthic bivalves suggestive of low-moderate energy, low-moderate oxygenconditions, low sedimentation rate, moderate-high amount of nutrients and minor bottom currents. *Gastrochaenolites* isp. (Figure18g), a dwelling trace of suspension feeding bivalves, indicates very shallow marine environments.

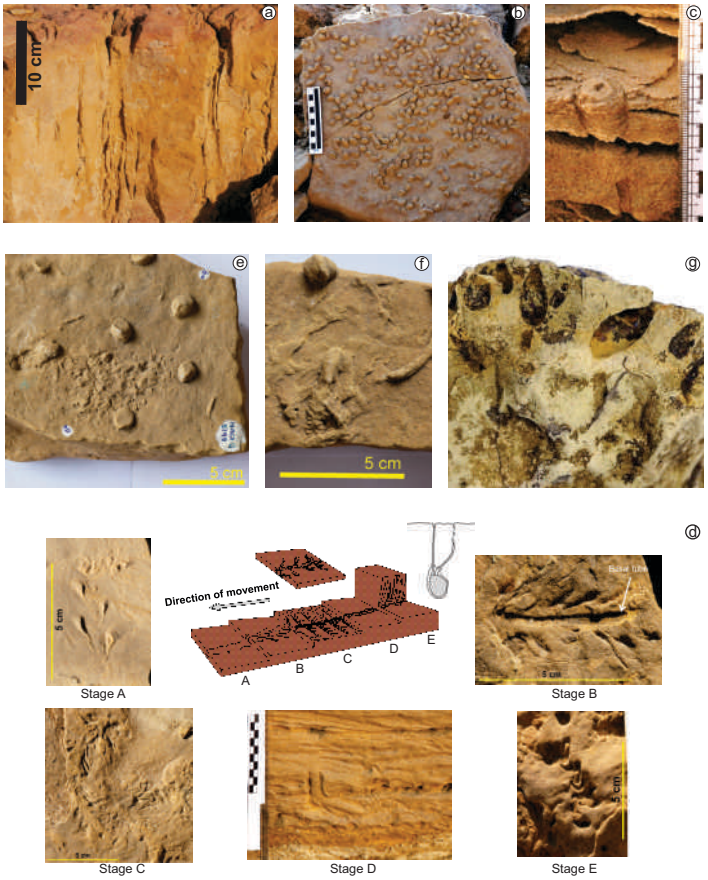


Figure 18
Diverse bivalve ichnogenera exhibiting various ethological types
a. *Siphonichnus ophthalmoides* b. *Lockeia siliquaria*
c. *Laevicyclus parvus* d. *Hillichnus lobosensis*
e. *Lophoctenium* isp. f. *Protovirgularia rugosa*
g. *Gastrochaenolites* isp.

Ichnology and sedimentology of the Chhasra Formation (Burdigalian), Kachchh, Gujarat

Forty-five thin sections of fine grained sandstone, siltstone, marl and limestone of the Chhasra Formation are studied with regards to texture, composition and diagenesis. Insoluble residue analyses of seven samples of Chhasra village section reveals that the insoluble residue content varies from 10.33% to 98.13% and averages 64.91%; while, $CaCO_3$ content varies from 1.86% to 89.67% and averages 35.09%. As compared to siltstones of lower part of section, the limestones of upper part of the section contain appreciable amounts of insoluble residue.

A 60 m thick sequence of the Claystone Member, in Kankawati River section between villages Khirsara and Vinjhan, is represented by laminated claystones and shales intervened by argillaceous, fossiliferous limestone bands. The most striking limestone intercalation is a more than 2.5 m thick, intensely bioturbated bed with a Bioturbation Index of nearly 6, separated by a thickness of 13 m from the first limestone band. This bed is easily demarcated by mazes of *Thalassinoides* and shells of turritellids, oysters (particularly *Hyotissa*), *Indoplacuna*, *Periglypta*, *Conus*, etc. The top of this limestone is marked by hexagons of *Thalassinoides suevicus*.

Morphological and molecular investigation of the porcelaneous benthic foraminifer *Quinqueloculina seminula* (Linnaeus, 1758)

Quinqueloculina seminula (Linnaeus, 1758) is a porcelaneous benthic foraminifer and type species of the genus. This cosmopolitan species plays a crucial role in biomonitoring assessment and paleoenvironment reconstruction studies. However, high morphological variability within the species and the long list of synonymy has resulted in confused taxonomy that to date remains unresolved. Moreover, the lack of clearly defined morpho-taxonomic criteria led to vast confusion concerning the discrimination of Quinqueloculine varieties. In the current project efforts are being made to re-investigate the taxonomic status of this species using the morphological and molecular tools in tandem (Figure 19). The coastal marine sediments containing living *Q. seminula* species were collected from an intertidal region along the Rajapuri creek, Maharashtra coast, north-eastern Arabian Sea.

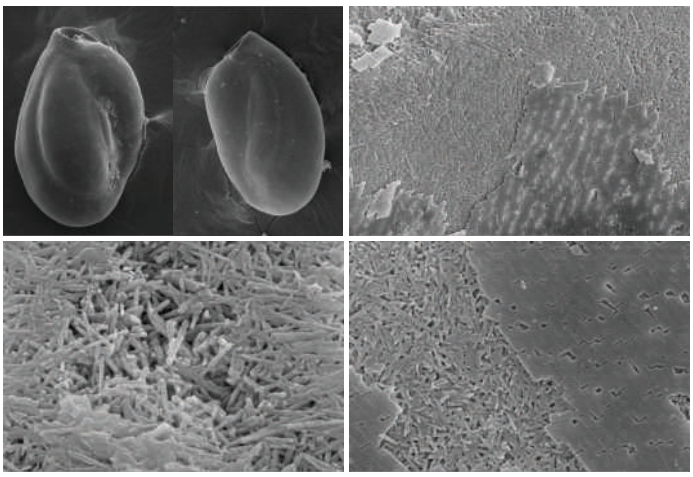


Figure 19
Quinqueloculina seminula and magnified view of the exterior test wall

Bioenergy

Emphasis of research is on petroleum biotechnology and bioenergy wherein microbes are explored for enhanced oil recovery, inhibition of sulphate reducing bacteria and biomethanation.

Biomethanation of lignite

India is blessed with large deposits of lignite, which is a soft brownish low ranked coal that is an intermediate between bituminous coal and peat. Lignite is not a preferred source of fuel because of its low energy density, high moisture content and high emission of CO_2. Biomethanation of lignite was considered as an eco-friendly way of extraction and utilization of energy from such low grade coal.

A microbial process for biomethanation of lignite was developed using a specially established microbial consortia, comprised of mesophilic/ thermophilic hydrolytic bacteria and methanogens. Biomethanation of lignite using this consortia and customized nutrient suite yielded 197 ml and 338 ml methane per g lignite at

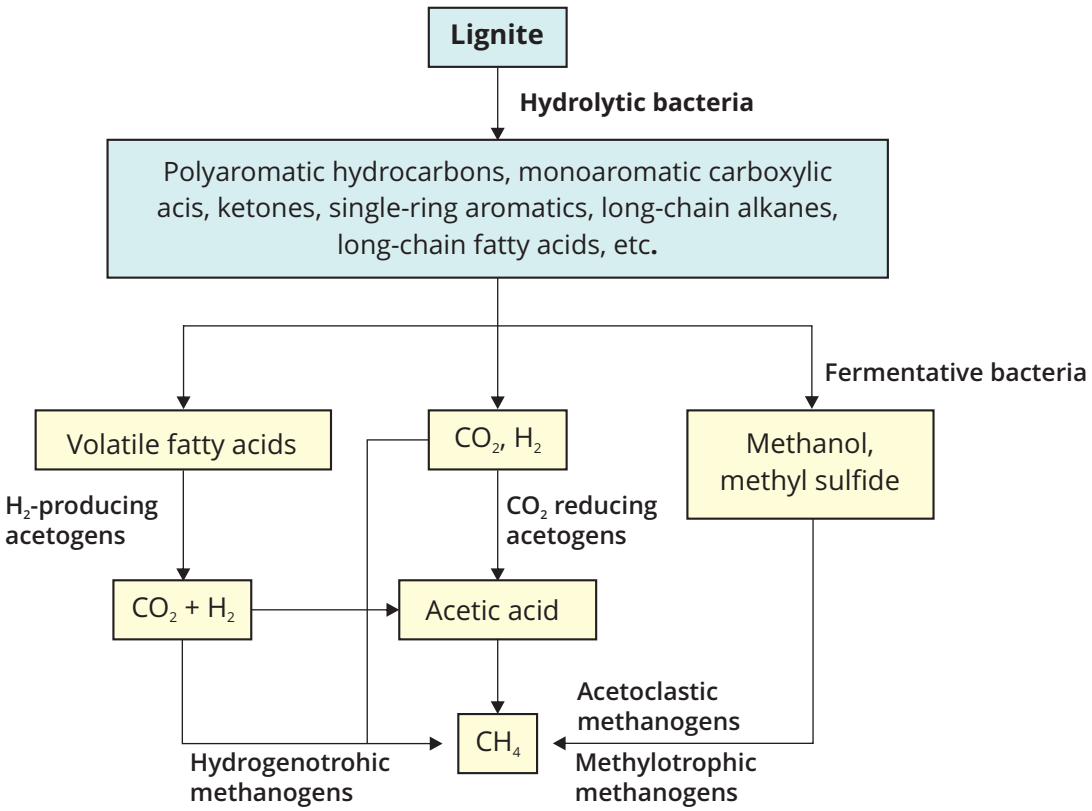


Figure 20 Overview of microbial community involved in biomethanation of lignite (low-rank coal)

37 C and 55 C respectively. The microbial consortia comprised of mesophilic hydrolytic bacteria such as *Coprothermobacter protiolyticus, Clostridium thermosuccinogenes, Aminobacterium mobile;* thermophilic hydrolytic bacteria such as *Tepidanaerobacter syntrophicus;* syntrophs such as *Symbiobacterium thermophilum, Symbiobacterium toebii* and methanogens such as *Methanothermobacter marbungensis, Methanosarcina acetivorans*, etc. (Figure 20). The efficiency of biomethanation of lignite using this specialized consortium was one of the highest ever reported in the scientific literature.

Microbial community insights into biomethanation of rice straw under mesophilic and thermophilic conditions

A sustainable thermophilic microbial process to generate methane from agricultural residues such as rice straw without any thermo-chemical/ enzymatic pre-treatment is developed. Intensive nutritional and process parameter optimization resulted in selection of a specialized microbial consortia that was able to yield 315 L methane per kg VS of rice straw at 55 C. The biomethane yield reported here in more than 90% of the theoretical yield. Meta-omics-based approaches were used to gain insight into this highly efficient biomethanation process. Metagenomics assisted genomes (MAGs) analysis revealed the complete interactive pathway of metabolism of lignocellulose resulting in formation of biomethane (Figure 21). *Clostridium*, *Hungateiclostridium, Alkaliphilus, Anaerocolumna, Olsenella, Paenibacillus, Pseudoclostridium, Tepidanaerobacter* and *Turicibacter* were the dominant constituents of bacterial hydrolytic population. Metatranscriptome profile suggestedsyntrophic acetate oxidation by *Tepidanaerobactersp.,* coupled to hydrogenotrophic methanogenesis by *Methanothermobacter thermoautotrophicus* as the prominent mode of methane generation. Transcriptome analysis revealed the expression of genes encoding enzymes involved in hydrolytic-, acidogenic-, acetogenic- and methanogenic metabolism. Expression of hydrolytic enzymes was further confirmed by the enzyme assays. The above analysis gave us mechanistic insights into how the selected microbial consortium metabolised the recalcitrant lignocellulosic biomass leading to production of biomethane without any thermochemical pretreatment.

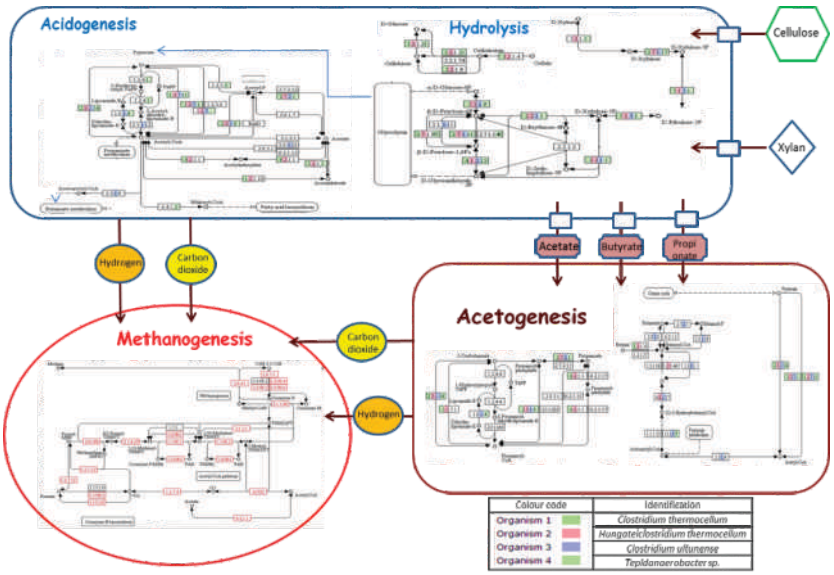


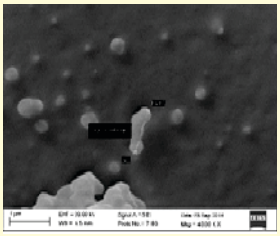
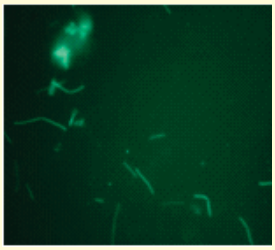
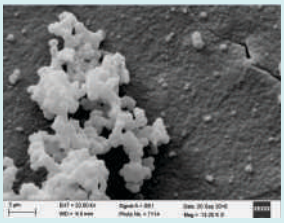
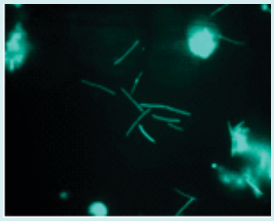
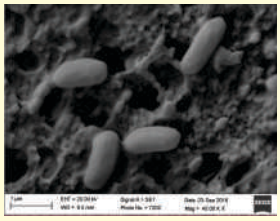
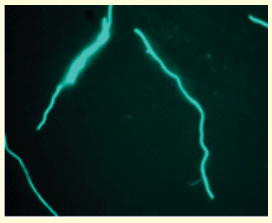
Figure 21
Metabolic overview map for thermophilic biomethanation of rice straw

Biomethanation under simulated Martian conditions implies early life on planet Mars

Existence of methane as an indicator of life has been reported on planet Mars. To confirm the biogenic origin of methane, it is important to establish the existence and metabolic activity of methanogens on Mars. One way to achieve this is through the spectral analysis that could detect the presence of methanogens associated with Martian soil. The present investigation was undertaken to ascertain the possibility of methanogenesis under simulated Martian environment.

Sites which can be considered as Martian analogues on Earth were identified in the Ladakh region. These sites were characterized as Martian analogues on the basis of low moisture content, low organic carbon content, high temperature fluctuations, etc. Presence of methanogens/ biological activity associated with such sites was ascertained in terms of microbial ATP and/or PPi (primordial ATP) content, methanogenesis and microscopic observations (SEM/ Phase contrast) (Table 1). Methanogens were isolated from such Martian analogues and used to study the possible growth, metabolism and methanogenesis under eco-physiological conditions simulating Martian environment. Even though at low rate, the methane generation in presence of low moisture content and under autotrophic conditions suggested that methanogenesis was possible under partially simulated Martian environment.

Table 1 Parameters indicative of biological activities associated with Martian analogues – Ladakh sites

Site	SEM images	Flourescence microscopy image	ATP (mg/ g soil)	Ppi (mg/ g soil)	CH_4(%)
PHS (Panamik Hotsprings)			78.64	297.98	90.1
CHS (Chumathang Hotsprings)			12.38	160.70	84.3
PUGA hotsprings			78.00	234.54	11.4

Methanotrophs in biodiesel production

Methanotrophs are recently being explored worldwide for their capacity to convert gas to liquid (GTL) at ambient temperatures for production of single cell proteins (SCP) and for extraction of fine chemicals.

At present, we have representative strains of about ten methanotrophic genera in our culture collection and we are in the process of screening these for their potential applications, including biodiesel production. These strains are being screened for their fatty acids profile (FAME) analysis. FAME analysis of four strains belonging to four genera were screened (*Methylocucumis*, Ca. *Methylolobus* FWC3, *Methylocystis* and *Methylomonas*) and these showed high amounts of C16 or higher fatty acids which would make them good candidates for production of biodiesel.

Bioprospecting

Focus is laid on the isolation and synthesis of naturally occurring compounds, derivatives and their use in pharmaceuticals, nutraceuticals, agriculture and industries, besides deciphering the mechanistic approach of these compounds for disorders such as Alzheimer's disease, anaemia, diabetes, cancer, and chikungunya virus.

Natural Product Chemistry

Capacity of lichen metabolites towards neuroprotection

Lichen species of the family *Parmeliaceae* and *Physciaceae* from Western Himalaya are used as traditional medicine for various life disorders in India. However, their neuroprotective potential has not yet been evaluated under H_2O_2 induced oxidative stress in nervous system like cells. With this background the study was carried outto evaluate capacity of lichen metabolites towards neuroprotection via antioxidant action and cholinesterase enzyme inhibition. Lichen species *Flavoparmelia caperata, Flavopunctelia flaventior* and *Heterodermia leucomelos* (Figure 22) were collected from Western Himalaya, India.

Figure 22

A. *Flavoparmelia caperata* (L.) Hale, B. *Flavopunctelia flaventior* (Stirton) Hale, C. *Heterodermia leucomelos* (L.) Poelt

The major compounds Protocetraric acid, Lecanoric acid and Zeorin from these species were isolated by PTLC and confirmed with HPLC analysis. These lichen compounds were studied for their antioxidant capacity, cholinesterase inhibition, neuroprotection (using mouse Neuroblastoma (N2a) cell line) and cytotoxicity of cancer cell lines(MCF-7 and HepG-2). The antioxidant potential in terms of DPPH, ABTS, H_2O_2 scavenging, FRAP and AChE and BChE inhibition have been studied. AChE inhibition was confirmed by in-silico method. Zeorin showed significant DPPH free radical scavenging activity and also exhibited significant AChE inhibition which was confirmed by molecular docking study. Lecanoric acid and Zeorin increases the cell viability of N2a cells against H_2O_2 induced toxicity. Zeorin and Lecanoric acid also showed cytotoxicity against cancer cell lines MCF-7 and HepG2.

Multi-target directed N4-substituted acetyl-coumarin-thiosemicarbazones for Alzheimer's disease

Alzheimer's disease (AD) is a multifactorial neurological disorder. We studied structural and biological properties of N4-substituted thiosemicarbazone derivatives of acetyl coumarin viz. ACT, ACMT, ACET and ACPT. Molecular docking analysis of coumarin-TSCs with acetylcholinesterase enzyme (AChE) showed their effective interaction with the catalytic active site of AChE that caused the enhancement in their AChE inhibitory potential (Figure 23).

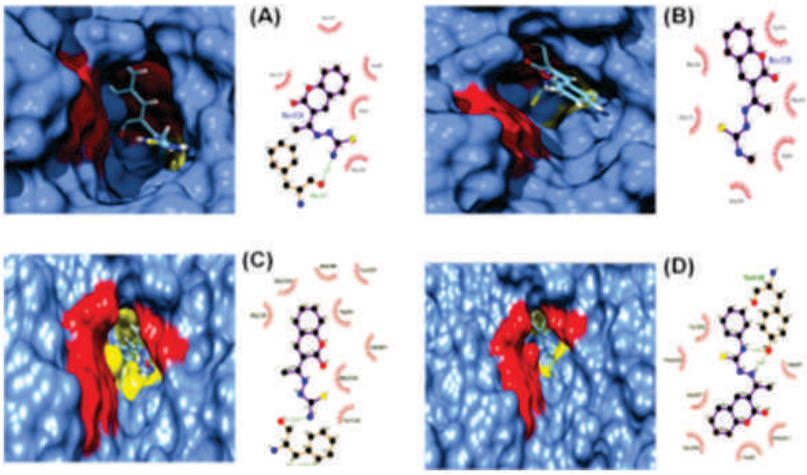


Figure 23
Docking and ligplot analysis of AChE in the presence of ACT, ACMT, ACET and ACPT

Methyl substitution at N4 position had no cytotoxic effect; phenyl substitution resulted in moderate cytotoxicity, while ethyl substituted coumarin-TSC derivative was found to be highly cytotoxic. The study of anti-inflammatory activity demonstrated that pre-treatment of cells with acetyl-coumarin TSC having phenyl substitution at thioamide nitrogen results in decreased nitrite production upon LPS induced inflammation. The newly synthesized coumarin-TSC derivatives were found to rescue rough eye phenotype in *Drosophila* AD model as shown by scanning electron microscopy (SEM). Thus, various substitutions at the N4 position of thiosemicarbazone moiety result in theenhancement of the neuroprotective abilities of the parent acetyl coumarin thiosemicarbazone.

Functional food for 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. Hepcidin is a key molecule, which regulates iron metabolism in the body and plays an important role in AI. In our previous study of adolescent girls, we observed that vitamin B_{12} showed a negative association with TNF-α and positive association with serum ferritin. Furthermore, an increased risk of high TNF-α level was observed among girlswho had vitamin B_{12} deficiency as well as anemia. We therefore, examined dietary habits, iron and inflammatory status of adolescent girls (n=85) in order to determine whether food components contribute to the positive connection between iron status and inflammation. We found that consumption of vitamin C–rich fruits such as *amala*, guava, tomato and lemon had a significant effect on iron status. Likewise, consumption of iron-rich green leafy vegetables (GLV: such as amaranth, colocasia leaves, fetid cassia, safflower leaves, and radish leaves) is associated with the better iron status in these girls. Therefore, the consumption of vitamin C–rich fruits and GLV intake are imperative for improvement of iron status among adolescent girls.

Antiviral activity of dihydrorugosaflavonoid derivatives against Chikungunya virus

Antiviral therapy is crucial for the treatment and prevention of viral diseases. The unavailability of specific antiviral drug against chikungunya (CHIKV) disease has created an alarming situation to identify or develop

new chemical entities for the inhibition of CHIKV. Molecular docking studies of dihydrorugosaflavonoid derivatives were carried out with nonstructural protein-3 (nsP3), which recently has been considered as a probable target for the development of potent inhibitors, which fit into the adenosine-binding site of the macro domain.

The bromo derivative of rugosaflavonoid showed in the active site pocket of nsp3macro domain and showed interactions with Val33, Tyr142, Cys143 and Arg-144. The docking scores of chloroand bromoderivatives were found -7.54 and -6.86 kcal mol^{-1} respectively. This effective binding indicates that these compounds may interfere in the function of nsP3 microdomain and thus, can inhibit the replication of CHIKV. The compoundsshowed their inhibitory potential for CHIKV through cytopathic effect assay and plaque reduction assay. The qRT-PCR assay result confirmed the ability of dihydrorugosaflavonoids to reduce viral RNA level in CHIKV infected cells at <30 µm. Further, the viral inhibition of CHIKV by these compounds was confirmed by performing immunofluorescence assay.

Synthesis of naturally occurring podocarflavone A

Podocarflavone Ais an 8-aryl flavone class of compound isolated from the leaves and twigs of plant *Podocarpus macrophyllus maki*. This plant belongs to Podocarpaceae family and distributed over tropical and subtropical regions of eastern Asia and throughout Australia. Various pharmacological activities such as antioxidant, antitumor, insecticidal, anti-feedant, allelopathic and fungicidal activities are reported for the compounds isolated from *P. macrophyllus maki*, which enhance its importance for natural product chemistry. The synthesis was completed in 7 steps.

Developmental Biology

Model organisms such as hydra, drosophila and zebrafish are used to study the different processes such as autophagy, cell-cell communication, regulation of cell morphogenesis, etc., during development and regeneration.

Conserved DNA helicases and UV-induced DNA damage in hydra

Nucleotide excision repair (NER) pathway is an evolutionarily conserved mechanism of genome maintenance in prokaryotes and eukaryotes. It detects and repairs distortions in DNA double helix. Xeroderma Pigmentosum group B (XPB) and Xeroderma Pigmentosum group D (XPD) are two important helicases in NER which are also critical subunits of TFIIH complex. We have studied XPB and XPD from the basal metazoan hydra which exhibits lack of organismal senescence. *In silico* analysis of proteins was performed using MEGA 6.0, Clustal Omega, Swiss Model etc. Gene expression was studied by *in situ* hybridization and qRT-PCR. Both XPB and XPD are able to unwind the DNA (Figure 24). DNA blot assay was used to determine repair of CPDs. Interactions between proteins were determined by co-immunoprecipitation. *In silico* analysis revealed presence of seven classical helicase motifs in HyXPB and HyXPD. Hydra repairs most of the thymine dimers induced by UVC (500 J/m^2) by 72 h post-UV exposure (Figure 25). *HyXPB* and *HyXPD* transcripts are localized all over the body column and their expression remained unaltered post-UV exposure indicating that both genes

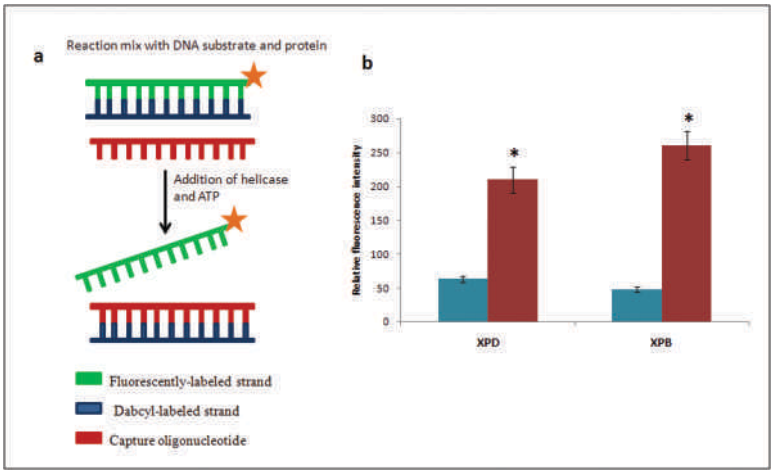


Figure 24

HyXPB and HyXPD are able to unwind DNA (a) Schematic representation of helicase assay. Since HyXPB and HyXPD unwind DNA in opposite polarities, cy3 was labeled at one end and dabcyl as a quencher on the opposite strand. Capture oligonucleotide was added to bind to dabcyl-labeled strand to prevent it from annealing to cy3 labeled strand. (b) In comparison to control (without HyXPB), five-fold increase in fluorescence is observed whereas HyXPD shows three-fold increase in fluorescence as compared to its control

are constitutively expressed. In spite of high levels of sequence conservation, XPB and XPD failed to rescue defects in human XPB and XPD deficient cell lines. This was found to be due to their inability to get incorporated into the TFIIH multiprotein complex. Our work on DNA repair proteins in hydrabrings out the utility of hydra as model system to study evolution of DNA repair mechanisms in metazoans.

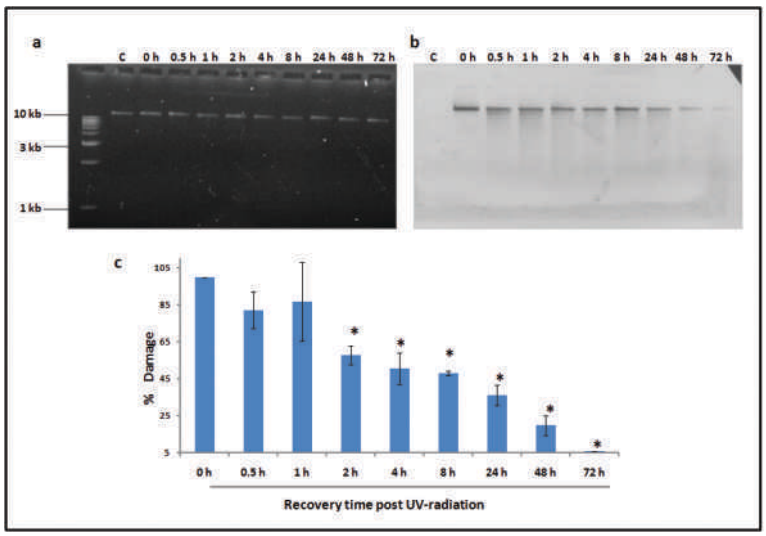


Figure 25
Hydra repairs cyclobutane pyrimidine dimers (CPDs) induced by UV. 1% agarose gel (input) observed under UV transilluminator (a) with 250 ng each of genomic DNA samples prepared after UV exposure at 500 J/m2, followed by recovery periods of 0 h, 0.5 h, 1 h, 2 h, 4 h, 8 h, 24 h, 48 h and 72 h respectively. (b) DNA blot assay detected by nitro blue tetrazolium (NBT) and 5-bromo-4-chloro-3-indolyl-phosphate (BCIP) to determine repair of cyclobutane pyrimidine dimers (CPDs) in Hydra post-UV radiation at different recovery times of 0 h, 0.5 h, 1 h, 2 h, 4 h, 8 h, 24 h, 48 h and 72 h respectively. (c) Quantitation of removal of CPDs by Hydra. % DNA damage and recovery time post-UV radiation were plotted on y-axis and x-axis respectively. Each experiment was repeated three times and data presented is ±S.E. of these replicates. * $p<0.05$ as compared to control

Role of autophagy in germline stem cell maintenance and aging in Drosophila

Cellular homeostasis is maintained by multiple evolutionarily conserved processes, macroautophagy (autophagy) being one of them. Autophagy involves formation of a double membraned vesicle which delivers cargo including damaged organelles and toxic protein aggregates to the lysosome for destruction. Drosophila is an excellent model system to understand regulation of autophagy during stress and its role in maintenance of stem cells including germline stem cells (GSCs). To monitor autophagy in GSCs, we have developed several germ-cell specific autophagy reporters and Reactive Oxygen Species (ROS) sensors (Figure 26) and are currently characterizing them in the context of GSC maintenance and aging. Our data suggest that autophagy is reduced in aged female ovaries as compared to young ovaries. GSCs mutant for Autophagy-related (Atg) genes are lost from the GSC-niche at a significantly higher rate as compared to the control (wild-type) GSCs. On the contrary, moderately increasing autophagy levels in the GSCs can sustain them within the GSC-niche for longer duration in comparison to control. Cell cycle analyses suggests that GSCs with increased autophagy levels show increased capacity of proliferation for longer duration as compared to controls. The elevated levels of autophagy influence signals that maintain GSCs (Figure 27). Increased autophagy in GSCs leads to increased sustenance of E-cadherin at the niche-GSC contact sites (Figure 27). Further experiments are being carried out to elucidate the mechanism of E-cadherin regulation by autophagy. These studies will uncover a network between autophagy, signaling and mitochondrial ROS that regulate GSC maintenance and aging.

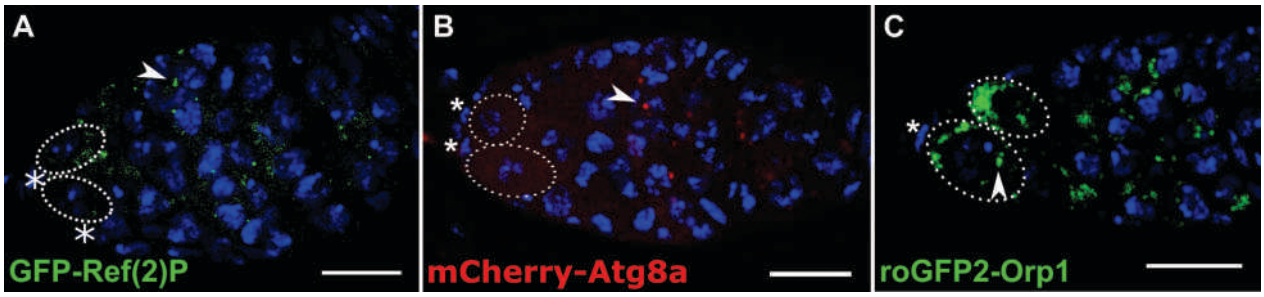


Figure 26

Analyses of GFP-Ref2P, mCherry-Atg8a and mito-roGFP2-Orp1 expression in female germline cells. Expression of transgenes in germarium dissected from nutrient-rich diet fed Drosophila. (A) GFP-Ref(2)P (green) (B) mCherry-Atg8a (red) (C) mito-roGFP2-Orp1 (green). Dotted ovals mark the GSCs in A, B and asterisks mark the niche (cap) cells. Arrow heads points to GFP-Ref(2)P, mCherry-Atg8a punctae and mito-roGFP2-Orp1 expression respectively. DNA is marked with DAPI (blue). Scale bar 20 µm

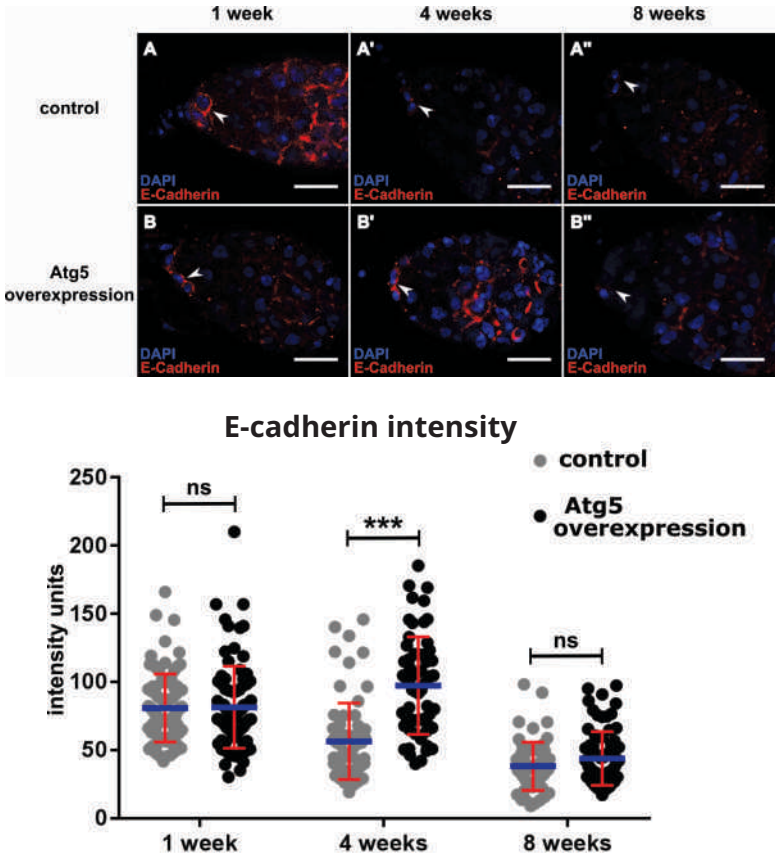


Figure 27

Increased expression of Atg5 specifically in GSCs leads to increased sustenance of E-cadherin at the niche-GSC boundary. (A-A") Expression of E-cadherin in control (UASp-EGFP-drAtg5/+) at 1 week, 4 week and 8 weeks of aging respectively (B-B") Expression of E-cadherin in Atg5 misexpression (UASp-EGFP-drAtg5/nos-Gal4-VP16) at 1 week, 4 week and 8 weeks of aging respectively. Arrowheads point at E-cadherin deposition at the niche-GSC boundary. Scale bar 20 µm. (C) Interleaved scatter graph showing the intensity of E-cadherin in control GSCs Vs Atg5 overexpressing GSCs of the germarium at 1week, 4week and 8 weeks. Error bars represent SD in red and the mean is blue. *p<0.05, **p<0.01, *p<0.001

Regulation of glutamate receptors at the larval neuromuscular junction in *Drosophila*

The *Drosophila* larval neuromuscular junction (nmj) has been used extensively as a model to understand mechanisms regulating synaptic development and function. These synapses are glutamatergic since they use glutamate as a neurotransmitter. The glutamate receptor present at the post-synaptic densities is made up of four subunits: GluRIIA or B, GlurIIC, IID and IIE. Mechanisms involved in the regulation of post-synaptic receptors play an important role in synaptic plasticity. We are interested in understanding the role of Monensin sensitivity protein 1 (Mon1) in the regulation of GluRIIA at the nmj. Mon1 is an endocytic protein

which in complex with caffeine copper zinc1 (CCZ1) functions as a GEF to recruit Rab7 to convert the Rab5 positive early endosome to a late endosome. In *Drosophila*, loss of *mon1* in neurons leads to an increase in glutamate receptors (GluRIIA) at the post-synaptic densities. To determine whether this regulation is dependent on Rab7 we have conducted genetic experiments to test if Mon1 and Rab7 interact to regulate GluRIIA. Our study suggests that Rab7 regulates GluRIIA expression and there is a dose dependent interaction between *Dmon1* and *rab7* in this process (Figure 28). These results suggest that the late endosomal pathway regulated by Mon1-Rab7 in neurons plays an important role in regulating post-synaptic receptor levels at the larval neuromuscular junction.

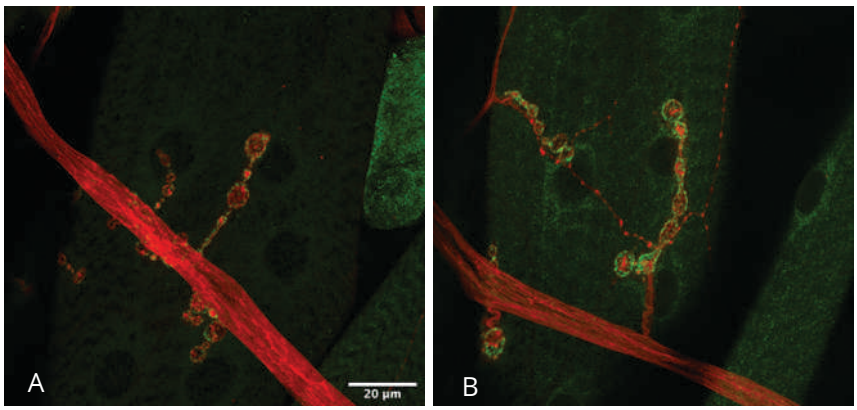


Figure 28
Knock-down of Rab7 in neurons leads to upregulation of GluRIIA. A. NMJ of a control animal stained with anti-HRP (red) and GluRIIA (green) B. NMJ of an animal expressing Rab7 dsRNA in neurons showing an increase in the intensity of GluRIIA staining

Zebrafish as a model to study cardiovascular development and regeneration

Nephronectin regulates axial vein morphogenesis in zebrafish. Angiogenesis is the development of new vessels from pre-existing vessels. It is a critical morphological event both in organ development as well as in diseases. Like in other vertebrates, in zebrafish vessels form a complex network to fulfil tissue oxygen demands. Development of complex vascular systems is dependent on the directional migration of groups of endothelial cells, which is called angiogenic sprouting. Here we have demonstrated that in zebrafish the extracellular matrix protein-coding gene nephronectin (npnt) is transiently expressed in the caudal vein plexus (CVP) forming region at the time of posterior axial vein sprouting and CVP morphogenesis (24 to 32 hours post fertilization (hpf)). Morpholino-mediated Npnt depletion resulted in the diminished axial vein sprouting, endothelial cell proliferation and ventral vein malformation. Time-lapse analysis from 28 to 40hpf indicated a decrease in the frequency of caudal vein sprout formation in nephronectin morphants. Existing sprouting also appeared multi-directional indicating a navigation problem. Importantly, integrin αv, integrin β3 and npnt expression overlapped in the region of the caudal vein plexus and morpholino-mediated integrin αV knockdown in zebrafish phenocopied nephronectin depletion. Taken together, our data indicate that Npnt is necessary for CVP formation in zebrafish and might be via integrin αV/β3 heterodimer (Figure 29).

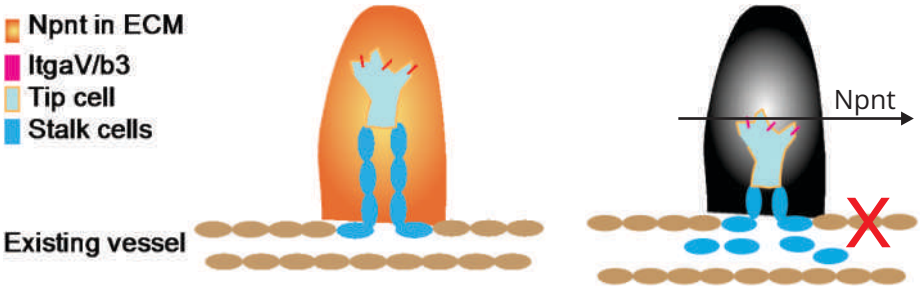


Figure 29
Schematic representation of the working model of the Nephronectin during CVP morphogenesis in zebrafish

Genetics and Plant Breeding

Improving the productivity and profitability of crops on an ecologically and economically sustainable basis under the All India Coordinated Research Projects on wheat, soybean and grapes, funded by Indian Council of Agricultural Research, New Delhi is the main aim.

Biotechnology

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

Marker assisted breeding

Using marker assisted breeding approach lines with improved grain quality traits like protein content, gluten strength and yellow pigment content have been developed in the background of bread wheat cultivars MACS 2496 and NI 5439 as well as durum wheat cultivars MACS 3125 and HI 8498. Under separate marker assisted breeding programme lines with improved leaf and stem rust resistance have also been developed in the background of bread wheat cultivars LOK 1 and NI 5439 as well as durum wheat cultivars MACS 3125. These lines can serve as genetic stocks for the improvement of other popular varieties in future breeding programmes. To pyramid rust resistance genes into high grain quality wheat lines another marker assisted breeding programme has been undertaken. Selected high grain quality lines in the background of MACS 2496 and NI 5439 were crossed with a donor line HD2967+Lr19-Sr25+Lr34+Yr10. Crossed seed were planted during regular crop season 2018-19 and F_2 seed was harvested to generate large F_2 population. Hybridity of F_1 plants was tested using molecular markers linked to the desired rust resistance genes and quality traits.

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 diseases 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. However, sticky dough problem of 1BL/1RS (*Glu-B3*$^-$/*Sec-1*$^+$) can be overcome by either removal of monomeric secalins and/or addition of polymeric glutenins by introgression of new 1BL/1RS (*Glu-B3*$^+$/*Sec-1*$^-$) translocation.Introgression of this translocation in the background of popular bread wheat varieties MACS 2496, MACS 6222 and MACS 6478 using marker assisted backcross breeding approach is underway. The backcrosses are presently at BC_2F_2/BC_2F_3 stages. Plants with desired introgressed segment 1BL/1RS (*Glu-B3*$^+$/*Sec-1*$^-$) have been identified in all the three backgrounds. The presence of *Glu-B3* locus was also confirmed by SDS PAGE analysis.

TILLING resource in Indian durum wheat for forward- and reverse-genetic analysis

EMS-mutagenized TILLING (Targeting Induced Local Legions in Genome) population of durum wheat cultivar Bijaga Yellow is being screened by forward and reverse genetic approach to identify improved phenotype for various agronomically important traits as well as novel mutant alleles in a gibberellin biosynthesis genes. Identification of putative mutants for *GA20oxA1* and *GA20oxB1* genes by high resolution melt (HRM) analysis (Figure 30) is in progress. The mutations were further confirmed by DNA sequencing.Six missense and one silent mutation in *GA20oxA1* whilesix missense and 3 silent mutations in*GA20oxB1*have beenconfirmed.Based on SIFT score,two mutations each in *GA20oxA1*and*GA20oxB1,* whichmay have serious effect on function of these genes have been identified.

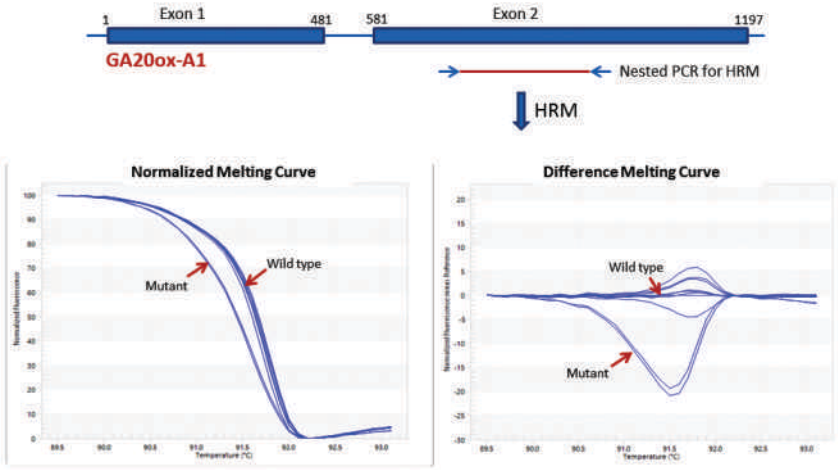


Figure 30
Identification of mutations in M_2 DNA by high resolution melt analysis (HRM). Shift in HRM curve indicating putative mutations

Development of a robust marker for Psy-1 homoeologs and its application in improvement of yellow pigment content in durum wheat

Phytoene synthase-1 (*Psy-1*) homoeologs are associated with yellow pigment content (YPC) in endosperm of durum and bread wheat. A microsatellite variation in promoter region of *Psy-A1* was identified in durum wheat and marker Psy-1SSR, targeting this variation was developed which amplifies variation in *Psy-A1* and *Psy-B1* loci simultaneously. Marker Psy-A1SSR was further validated in two different RIL populations and a set of 222 tetraploid wheat accessions including less cultivated tetraploid wheat species. Marker-assisted introgression of Psy-A1SSRe allele from PDW 233 to durum wheat cultivars MACS 3125 and HI 8498 resulted in improvement of YPC. Backcrossed BC3F2:4 and BC2F2:3 lines selected using Psy-A1SSR showed 89-98% gain in YPC over recurrent parents indicating robustness of marker and its utility in marker assisted improvement of YPC in durum wheat cultivars.

Mapping of dwarfing gene Rht14 in durum wheat and its effect on seedling vigour, internode length and plant height

Two RIL populations were used to identify the map position of *Rht14* and to estimate its effect on plant height, coleoptile length, seedling shoot length, spike length and internode length. *Rht14* on chromosome 6A was mapped in the genomic region 383 - 422 Mbp flanked by *GA2oxA9* and wmc753 in a Bijaga Yellow/Castelporziano RIL population.The dwarfing effects of *Rht14* on plant height, internode length and seedling vigor was compared with those of *Rht-B1b* in an HI 8498/Castelporziano RIL population. Both genes significantly reduced plant height and internode length. *Rht-B1b* conferred a significant reduction in coleoptile length and seedling shoot length, whereas *Rht14* reduced plant height, but not coleoptile and seedling shoot

length. Therefore, *Rht14* can be a used as an alternative to *Rht-B1b* for development of cultivars suitable for deeper sowing in dry environments and conservation agriculture where crop residues are retained.

Wheat Improvement

Wheat research is aimed at developing high yielding, disease resistant and end user quality wheat (*T. aestivum, T. durum* and *T. dicoccum*) varieties for India in general and peninsular zone in particular. Production of breeder seed is done as entrusted by ICAR/Central or State Government. Institute is also engaged in dissemination of latest technology of wheat production directly on farmer's field through field demonstration.

Twelfth wheat variety MACS 4028 for rainfed ecosystem

Wheat variety MACS 4028 (*T. durum*) is notified (S.O.1379 (E)) for rainfed-timely sown condition of Peninsular Zone (Figure 31). MACS 4028 has shown superior and stable yielding ability (19.3 q/ha) under timely sown rainfed conditions in Peninsular Zone.

Figure 31
Rainfed durum wheat variety: MACS 4028

Promising wheat entries in pipeline and in advanced varietal trial

Bread wheat entries for restricted irrigation are increasingly in demand in the region for the change in the situation of reduced number irrigation and increase in the temperature. For the first time from our centre three entries, potentially possible to be varieties, MACS 6696, MACS 6695, MACS 4058(d) are in the 2nd year advanced varietal trials under restricted irrigated conditions in PZ. Among these MACS 6695 and MACS 6696 were found significantly superior over checks for the past two years of national trials data.

Progress in wheat improvement

The wheat breeding programme is targeted towards four agro ecosystems viz., rainfed, irrigated full fertility, restricted irrigation, and late sown for the development of wheat varieties in all the three species under cultivation (*T. aestivum, T. durum* and *T. dicoccum*). This year, parental cross combinations targeted generation of 105 straight crosses, 20 top crosses and 25 back crosses. A total of 1650 segregating breeding materials were subjected to precise phenotypic selection. The number of yield and yield contributing traits data are recorded for about 386 fixed (homozygous) cultures in augmented trial, 249 in initial station replicated trial and 194 in advance replicated plot trial.

This year 11 wheat entries are being evaluated in the national initial varietal trial.Among these, two are in restricted irrigation (one durum and one bread wheat), five in irrigated high fertility (three bread and two durum wheat), two bread wheat entries in late sown and two dicoccum entries in irrigated special trial. Based on three years yield and disease data for station trial about 30 entries were promoted to the national programme on IPPSN (Initial plant pathology screening nursery). A total of 419 genotypes from co-ordinated trials and 267 genotypes form the station trials were evaluated. The brown rust, stem rust and leaf blight was observed on various varieties grown in farmer's field during the surveys.

Pusa hydrogel and herbal hydrogel were evaluated for *in-situ* moisture conservation in wheat. Application of six irrigations recorded significantly higher grain yield and soil application of Pusa hydrogel @ 2.5 kg/ha recorded numerically higher grain yield (30.65 q/ha). With the purpose of standardizing the package of practices for dicoccum cultivation the combination of various planting options like line spacing and seed rate were tested. The higher line spacing (25 cm) numerically recorded higher grain yield (49.85 q/ha),while lower seed rates (75 kg/ha) recorded significantly higher grain yield (50.96 q/ha) over higher seed rates. Precision nitrogen management in irrigated wheat using NDVI sensor indicated the rich plot treatment (90 kg N/ha basal + 90 kg N/ha at CRI stage) recorded significantly higher wheat grain yield (63.37 q/ha). The experiment on different dates of sowing under changing climate indicated higher wheat grain yield (47.90 q/ha) with first date of sowing i.e. 5th November whereas variety HI 1544 was stable across the sowing dates with higher grain yield (42.41 q/ha).

Wheat Front Line Demonstrations

With an aim to popularize newly released wheat varieties along with the improved production technologies, Front Line Demonstrations (FLD) are organized every year with the support of Ministry of Agriculture. During *rabi* season2017-18**,** MACS 6478 recorded higher average increase in wheat yield i.e. 25.2% over farmers practice or variety. The grand average percent increase in wheat yield by using improved variety was 15.7% over farmer's varieties. During 2018-19, 25 FLD's were carried out in cluster approach at neighboring villages to the Hol and Songaon. The demonstrations comprised 17 aestivum, 7 durum and 1dicoccumvarieties suitable under both rainfed, irrigated as well asrestricted irrigation conditions of Peninsular zone.

Breeder Seed Programme

During 2018-19 season 239 q of breeder seed was supplied to different seed multiplying agencies and farmers. Based on the joint inspection for the 2019-20 seed production plots expected breeder seed production is 306 q.

Public Private Partnership (PPP)

In co-ordination with ITC Limited, Choupal Pradarshan Khets (CPK) were conducted for MACS 6222 and MACS 6478 (10 each) in Amravati Hub of Maharashtra. Both the wheat varieties showed 74% yield advantage over the popular check Lok1.

Soybean Improvement

Evaluation of MACS soybean varieties in All India Co-ordinated soybean trials

Soybean variety MACS 1620 gave the highest yield of 3506 kg/ha and ranked first in trials in North Eastern Hill Zone of India and gave 20% higher yield than highest yielding check variety RKS 113 (2914 kg/ha). Another variety MACS 1566 with a yield of 2222 kg/ha ranked second in trials of Eastern Zone of India.

MACS 1493 with an yield of 2679 kg/ha ranked second in trials in Southern Zone of India during two years of testing and gave 17% higher yield than highest yielding check variety DSB 21 (2308 kg/ha). Another variety MACS 1520 ranked first in three years of testing in yield trials of Central Zone.

Identification of MACS 1520 soybean variety for release

MACS 1520 showed high and stable yield in Central Zone and matures in 100 days with highest per day yield of 22 kg/ha (Figure 32). This variety is superior in yield (2149 kg/ha) over the highest yielding check variety NRC 86 (1850 kg/ha) by 16%, national check variety JS 335 by 30%, early check variety JS 20-34 by 37% and JS 97-52 by 31%. This variety is resistant to major diseases of Central Zone like charcoal rot, yellow mosaic virus, bacterial pustule, *Rhizoctonia* aerial blight and *Alternaria* leaf spot. MACS 1520 has high resistance to stem fly, girdle beetle and defoliators, leaf hopper, stink bug, bean bugs and pod borer. MACS 1520 is suitable for mechanical harvesting and has non shattering pod habit. It has maximum yield potential of 29 q/ha. This variety was identified for release in Central Zone of India covering states of Madhya Pradesh, Bundelkhand Region of UP, Rajasthan, Gujarat and Marathwada and Vidarbha Regions of Maharashtra by the Varietal Identification Committee during the 49th Annual Group Meeting of AICRP on Soybean.

Figure 32
MACS 1520 - mature plant, seed, flowers and green plant

Station trials for soybean improvement

Sixty-eight elite breeding lines were developed and tested in three graded replicated trials. Of these, seven lines gave more yield than the highest yielding control variety MACS 1188 and one line, MACS 1562, maturing in 85 days, and giving a yield of 3366 kg/ha was found promising for earliness to maturity.

In agronomy, two station trials on evaluation of AVT II entries for fertilizers dose and plant population were conducted. The results of an evaluation of AVT II entries at different fertilizer doses showed that 100% recommended dose of fertilizer (RDF) yielded (2445 kg/ha) significantly higher over 75% RDF (2150 kg/ha) and 125% RDF (2276 kg/ha), while soybean variety MACS 1520 (2588 kg/ha) gave significantly higher yield over rest of the entries. In an evaluation for plant population of these entries at 0.3, 0.45 and 0.6 M/ha, sowing at 0.45 M/ha (2643 kg/ha) gave maximum seed yield than rest of the two populations while variety MACS 1520 (2961 kg/ha) gave significantly higher seed yield than rest of the varieties.

Agronomy studies on soybean

In a field experiment, an evaluation of cropping systems along with different tillage systems, soybean-maize-soybean-maize (4581 kg/ha) two cropping system treatments produced significantly higher seed yield compared to soybean (2737 kg/ha) during last year of cropping system in rest two treatments. In rabi, soybean-soybean-maize-soybean (6171 kg/ha) produced significantly higher seed yield over other cropping systems, whereas soybean equivalent yield (SEY) was significantly high in soybean-soybean-soybean-maize cropping system (5836 kg/ha). In bridging yield gap in soybean production through site specific nutrient management (SSNM), the treatment SSNM basal recommendation through nutrient expert gave significantly higher seed yield (3166 kg/ha) over absolute control (2676 kg/ha) and farmers practice (2808 kg/ha). Also the yield gap over RDF was highest in treatment absolute control (368 kg/ha) and farmers practice (236 kg/ha). An evaluation of soybean varieties at different plant geometries under ridges and furrow planting showed that variety MACS 1188 sown at 45 x 5 cm (3065kg/ha)plant geometry gave maximum yield than 45 x 20 cm, 45 x 30 cm and was followed by 45 x 10 cm (2905 kg/ha). The yield levels for JS 93-05 were lower than MACS 1188 at various plant geometries.

Mitigating the drought stress in soybean

In an experiment mitigating the drought stress in soybean through agronomic, physiological and molecular breeding, a set of 74 soybean genotypes along with five checks was evaluated for drought stress tolerance. Among them RSC 10-46, TAMS 98-23, MACS 1281 and Hardee were observed best performing in drought situation in terms of yield and other parameters. The crosses of identified drought tolerant genotypes with promising high yielding varieties were made to obtain F1 seeds and generation advancement is in progress for further segregation studies. RNA sequencing work is in progress for gene expression studies.

Resistance of MACS varieties to diseases and pests

Soybean variety MACS 1543 was identified as a source for resistance against stem fly and MACS 1493 for resistance against multiple insects.

Soybean breeder seed production

A total of 321 quintals of breeder seed of soybean, including MACS 1188, MACS 1281 and JS 335 varieties was supplied to public and private seed multiplying agencies and farmers (Figure 33). Likewise, 567 quintals of breeder seed of soybean has been produced during *kharif* 2018 season and will be supplied during *kharif* 2019 for sowing and further seed multiplication.

Figure 33
Soybean breeder seed storage

Soybean front line demonstrations (FLDs)

Twenty FLDs were conducted on farmer's fields in Baramati taluka of Pune district to demonstrate and evaluate the impact of improved technology (IT) over farmer's practice (FP) using four soybean varieties MACS 1281, MACS 1188, MACS 1460 and RKS 18. Adoption of IT increased soybean yield by 22.87% over FP and gave additional net returns of Rs.15442 per hectare.

Grape improvement

Grape germplasm

Sixty-two cultivars of *Vitis*, six rootstocks, five *Vitis species* and 25 wild species of family *Vitaceae* are being maintained under this project. IC numbers were obtained for 8 cultivars from NBPGR, New Delhi.

Grape improvement

Under the hybridization programme twelve cross combinations were attempted to incorporate seedlessness and disease resistance in progenies using seven female parents viz. Buckland sweet water, Carolina black rose, Goethe, Jawahar, James, Khalili, Madhoo angur and two seedless male parents (Thompson seedless and Manik Chaman) to incorporate seedlessness and disease resistance in progenies. Three thousand seeds derived from the crossing programme are being given chilling treatment for getting good germination.

Twenty-eight new hybrids developed earlier were evaluated for their fruit quality. Following promising hybrids were selected.

i) Seedless hybrids with potential as table varieties

1. ARI 733: Bangalore Blue x Manik Chaman
2. ARI 1164: Gulabi x Beauty seedless
3. ARI 1179: Khalili x Jumbo

ii) Seeded hybrids with bold and aromatic berries

1. ARI 1152: (Anab-e-Shahi x Catawba) x Anab-e-Shahi
2. ARI 1120: (Anab-e-Shahi x Catawba) x Tas-A-Ganesh

iii) Two seedless mutants of ARI 516

Berry size was significantly increased when mutants were treated with 140 ppm of exogenous GA at 2 mm and 6 mm berry size.

Evaluation of grape juice varieties

Six juice varieties including ARI 516 planted on Dogridge rootstock in Randomized Block Design with 4 replications were evaluated for berry yield, juice recovery and quality. ARI 516 is performing better in terms of yield and berry quality (TSS 22^{0}B and unique musky flavour).

Popularization of ARI-516

Five thousand five hundred cuttings and ninety saplings of ARI 516 were sold to different grape growers in Maharashtra for cultivation in their field. The processed products of ARI 516 like jam and juice were appreciated by the consumers when introduced in 'Baramati Dhanya Mahotsav'.

Nanobioscience

Research carried out at Nanobioscience group ranges from synthesis and characterization of nanomaterials to understanding the interactions of nanoparticles/nanomaterials with different biological systems.

Nanomedicine

In this area we are carrying out work on the use of nanomaterials as therapeutic agents. Zinc oxide nanoparticles are being studied for their anti-diabetic activity. Nanocarriers for delivery of drugs are developed. The mechanism underlying replication of hepatitis E virus is also being studied. The transcriptome profile of silver nanoparticles treated *Staphylococcus aureus* is studied to explore potential targets for inhibition of biofilms.

Mechanisms underlying the anti-diabetic activity of zinc oxide nanoparticles

We have been working on unravelling the anti-diabetic effects of zinc oxide nanoparticles (ZON). In our earlier results, ZON demonstrated enhancement of SOD activity, an anti-oxidant enzyme in the cell. Further, we investigated the protective effects of ZON on oxidative stress mediated cell death. Hydrogen peroxide (H_2O_2) was used to induce oxidative stress to pancreatic beta cells. It was observed that ZON treatment protected RIN5F cells from H_2O_2 mediated apoptotic death (Figure 34). These results suggest that ZON treatment can halt the progressive loss of pancreatic beta cells in diabetes.

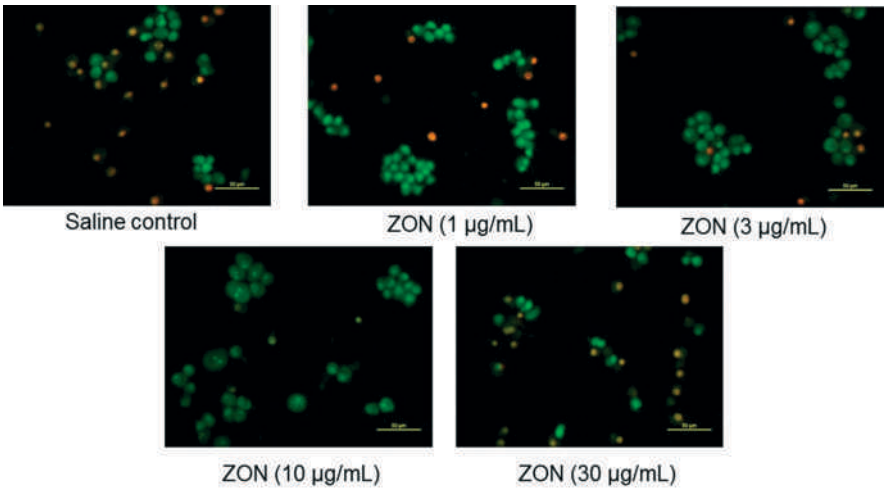


Figure 34

AO/EB staining of control and ZON treated cells after H_2O_2 induced oxidative stress

Decapeptide functionalized targeted mesoporous silica nanoparticles with doxorubicin exhibit enhanced apoptotic effect in breast and prostate cancer cells

Considering the increase in cancer cases and number of deaths per year worldwide, development of potential targeted nano-therapeutics is imperative. To address these issues, we developed decapeptide-conjugated mesoporous silica nanoparticles (MSNPs) loaded with DOX for the targeted drug delivery in breast and prostate cancer cells. MSNPs were synthesized and subsequently functionalized with an analog of GnRH by using a heterobifunctional polyethylene glycol as a linker. An anti-cancer drug DOX was loaded. DOX-loaded nanocarriers were then studied for their cellular uptake using confocal microscopy. Higher uptake of DOX-loaded targeted MSNPs was observed as compared to DOX-loaded bare MSNPs in GnRH-overexpressing breast (MCF-7) and prostate (LNCaP) cancer cells. The targeted MSNPs also showed significantly higher cytotoxicity than DOX-loaded bare MSNPs at different time points. After 48 hours of treatment, the IC50 value for DOX-loaded targeted MSNPs was found to be 0.44 and 0.43 μM in MCF-7 and LNCaP cells, respectively. Acridine orange/ethidium bromide staining and flow cytometry analysis further confirmed the pathway of cell death through apoptosis. This study suggested that GnRH analog-conjugated targeted MSNPs can be the suitable and promising approach for targeted drug delivery in all hormone-dependent cancer cells.

A robust pH-sensitive unimolecular dendritic nanocarrier that enables targeted anti-cancer drug delivery via GLUT transporters

The aim of this study was to explore the potential of dendritic unimolecular nanoconstruct, PAMAM-Tryptophan-(N-acetylglucosamine) [PTN] as anti-cancer drug delivery system. The PAMAM dendrimers were modified with L-tryptophan and N-acetyl glucosamine (NAG) for higher drug loading and to utilize GLUT transporters, respectively. DOX-loaded PTN demonstrated significant ($P < 0.001$) higher cytotoxicity against breast cancer cells than PAMAM. The percentage viability after 48 h was found to be 5.0 ± 2.32, 18.3 ± 2.91 and 5.9 ± 0.55% for free DOX, PAMAM-DOX, and PTN-DOX, respectively in MDA-MB-231 cells. A similar profile was observed for HepG2 cells. Further, flow cytometry analysis confirmed that the cell death mode was apoptosis. The study indicated that conjugating tryptophan to parent dendrimer could significantly enhance cargo loading capacity and binding NAG could be an attractive therapeutic approach for GLUT transporters mediated delivery of anticancer drugs.

Rapid detection of Invasive Aspergillosis

Invasive aspergillosis (IA) caused by the fungal pathogens *Aspergillus fumigatus* and *Aspergillus flavus* in immuno-compromised patients leads to high mortality. Currently used methods for the diagnosis of IA rely on isolation and identification of etiological agent from the clinical samples in conjunction with high resolution computer tomography (HRCT), chest scans and serological detection of *Aspergillus* antigen viz. galactomannan, an IA biomarker, by ELISA test. Galactomannan (GM) is released by the fungus during host infection. A majority of the patients go undiagnosed and untreated as most clinical laboratories lack such costly tests. In our DBT sponsored studies, we have developed a diagnostic solution to this problem.

Clinical strains of *A. fumigatus* and *A. flavus* were acquired from our collaborator PGIMER, Chandigarh. GM was purified by cold alkali method, characterized and used for raising polyclonal antibodies (pAbs) in-house in rabbits. Gold nanoparticles were synthesized (AuNPs, ~24 ± 5 nm size, -36 ± 2 mV zeta potential) and conjugated with the pAbs. Utilizing the pAbs-AuNPs as a detection agent, a sensitive and rapid dot-blot immunoassay was developed with a visual read-out. The nano-gold immunodiagnostic dot blot assay had a detection limit of 1 pg ml^{-1} for *Aspergillus* GM in serum and was 1000 times more sensitive than the commercial

ELISA. The assay with anti-*A. fumigatus* and anti-*A. flavus* pAbs did not cross-react with common fungal pathogens such as *Penicillium* and *Candida*. Evaluation of the developed assay with 142 clinical serum and bronchoalveolar lavage samples showed a high sensitivity (86.05%) and specificity (93.94%) with an overall assay accuracy of 91.55%. The nano-gold immunodiagnostic assay (Figure 35), on further validation, has immense potential as an easy to use, specific and sensitive, on-site detection method for IA in resource poor settings and can contribute to improved human health care.

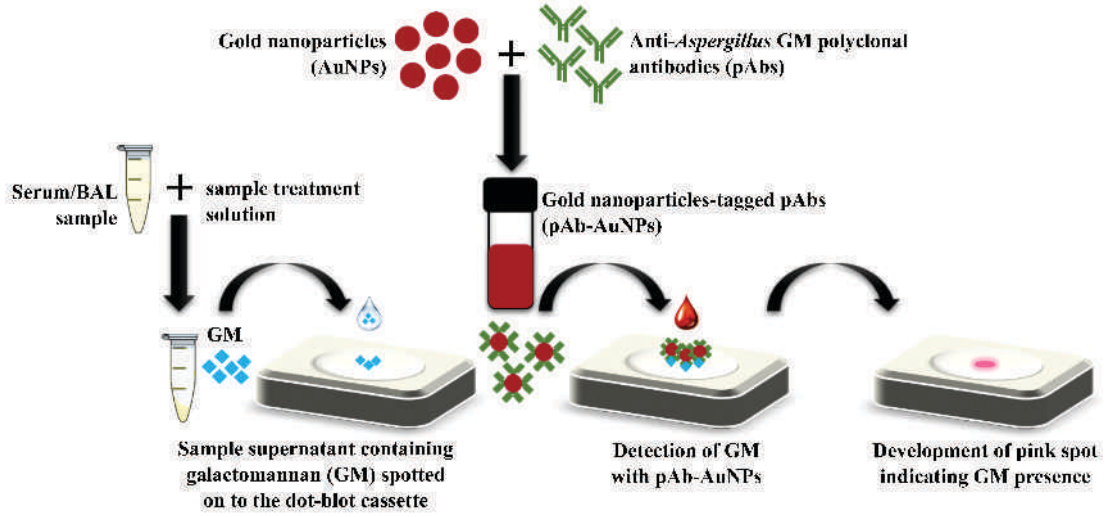


Figure 35 Immunodiagnostic assay for detection of invasive Aspergillosis

Potential targets for biofilm inhibition identified via transcriptome analysis of silver nanoparticles treated *Staphylococcus aureus biofilms*

The biofilms of *Staphylococcus aureus* on the implanted materials and chronic wounds are life-threatening and are a substantial financial burden on the healthcare system. Silver nanoparticles (SNP), known for their multi-level physiological effects in planktonic cells could be a promising agent in the treatment of biofilm-related infections also. To gain insight into the effects of SNP on various physiological processes in biofilms we studied the transcriptome of *Staphylococcus aureus* ATCC 29213. To distinguish between 'nanoparticles-specific' and 'ion-specific' effect of silver, a comparative analysis of the functional genes in response to Ag^{+} was performed. Compared to untreated biofilms, 21% (i.e. 629 genes) and 28.5% (i. e. 830 genes) of the total functional coding genes were differentially regulated upon exposure to SNP and Ag^{+}. Genes encoding capsular polysaccharides, intercellular adhesion, and virulence were downregulated in SNP and Ag^{+} treated biofilms. Genes involved in carbohydrate, protein metabolism including DNA and RNA synthesis, oxidative stress etc. were differentially expressed. Activation of efflux pumps and multidrug export proteins was observed. Silver blocked the integration of mobile genetic elements in *S. aureus* genome. The present study points out quorum sensing and virulence determinants as possible targets for inhibition of biofilms possibly with/without existing antibiotics.

A distinct pro-viral role of HEV RNA dependent RNA polymerase discovered

Hepatitis E virus (HEV) induces interferons and regulates the induction of interferon-stimulated genes (ISGs) in the host cell. HEV infection has been shown to promote the expression of different ISGs such as ISG15, IFIT1, MX1, RSAD2/Viperin and CxCL10, in cell culture and animal models. Interferon-induced protein with

tetratricopeptide repeat 1 (IFIT1) is an ISGencoded protein that inhibits the translation of viral RNA, having 5'-triphosphate or the mRNA lacking 2'-O-methylation on the 5'-cap. In our study, we found that IFIT1 binds to HEV RNA to inhibit its translation. HEV replication is also restricted in hepatoma cells with overexpressed IFIT1. However, despite this binding of IFIT1 to HEV RNA, HEV successfully replicates in hepatoma cells in the infection scenario. In an effort to identify the underlying mechanism, we found that HEV RNAdependent RNA polymerase (RdRp) binds to IFIT1, thereby protecting the viral RNA from IFIT1-mediated translation inhibition. RdRp sequesters IFIT1, resulting in the successful progression of viral replication in the infected cells. Thus, we discovered a distinct pro-viral role of HEV RdRp that is crucial for successful infection in the host and propose a unique mechanism developed by HEV to overcome IFIT1-mediated host immune response.

Nanotechnology in Agriculture

In this area, we try to develop nanofertilizers for increasing the fertilizer use efficiency and achieving micronutrient enhancement in grain.

Nanofertilization with Zn-CNP enhances zinc use efficiency in wheat

Ferti-fortification of wheat with zinc, an essential micronutrient is one of the strategies for combating 'hidden hunger' in a large proportion of people all over the world. During fertilization, application of large quantities of micronutrients often results in nutrient wastage and subsequent environmental pollution. We assessed the utility of zinc complexed chitosan nanoparticles (Zn-CNP) for ferti-fortification of durum wheat in field-scale experiments. The efficacy of Zn-CNP was assessed vis-a-vis conventionally applied ZnSO4 (0.2%; 400 mg/L zinc) in two durum wheat genotypes (MACS 3125, an indigenous high yielding genotype and UC 1114, a genotype containing the *Gpc-B1*gene). The observed grain zinc enrichment using Zn-CNP nanocarrier (~36%) and conventional ZnSO4 (~50%) were comparable, despite 10 folds less zinc (40 mg/L) used in the former. Nanofertilizer application increased grain zinc content without affecting grain yield, protein content, spikelets per spike, thousand kernel weight, etc. Grain zinc enrichment observed in the four-year field trials on plots with varying soil zinc content was consistent. Thus, Zn-CNP was a novel nanofertilizer, which enhanced fertilizer use efficiency. The work describes a new paradigm in micronutrient fortification, viz. 'use nanofertilizers at the right place, right time and in right doses'.

Annexure

Repositories

Agharkar Herbarium at MACS (AHMA)

During the report period, 4063 specimens were scanned. Incorporation of specimens of medicinal plants collected from different agro-climatic zones of Maharashtra has been started. Around 300 specimens have been checked for their names, overall quality and were numbered. These specimens are also scanned and will be incorporated in the herbarium. Apart from this, around 370 other specimens are in the process of incorporation after being checked for identification, nomenclature and quality. A meta-analysis of the information associated with specimens was done during the report period.

Ajrekar Mycological Herbarium (AMH)

Ajrekar Mycological Herbarium holds 10120 exsiccate specimens including 159 specimens received from different centers in India for deposit and accession during the period of report.

Central Animal Facility

Animal Facility at ARI was established in 1999. The Facility includes animal rooms, experimental rooms, changing room, clean and dirty corridors and utility areas. The Facility is registered with Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Environment and Forests, Government of India, New Delhi. The Registration No. of the Facility is 101/ GO/RRcBiBt/S/99/CPCSEA. The Facility has licenses for a) research and breeding of small animals, b) breeding of small laboratory animals (rat and mice) for trading purpose and c) research for commercial purpose. The routine genetic and health monitoring of laboratory animals is carried out by a qualified veterinarian.

The Facility is equipped with IVC system, metabolic cages, bio-safety cabinet and instruments to conduct pharmacological studies. High-end instruments such as small animal ventilator and anaesthesia machine are available. The Facility provides the services such as supply of in-bred mice and rats, maintenance of small animals, and pharmacological and toxicological testing. This year the Facility has provided healthy animals to conduct animal experimentation involved in eight intra- and extra-mural funding projects. Two new strains of mice BALB/c and SCID are introduced in the Facility. Training in ethical handling of laboratory animals for technical staff, students and scientists of the Institute is provided and lectures on the use of animals in biomedical research are conducted for PhD students. The animal models for various diseases are developed in the Animal Facility to test various drugs and biologically active molecules.

Crude drug repository

Crude drug repository hosts 1844 specimens {1813 plant originated (1786 organized and 27 unorganized), 19 animal originated, 12 mineral originated} of plant part used as/ in medicine collected from field and or market.

Diatom Collection

Currently the diatom collection holds around 2642 samples covering the present day to early Holocene times. Two Russian Scientists visited the collection as a part of the Indo-Russia collaborative project.

Fossil Repository

Fossil repository hosts over 8000 fossil type specimens of various animal and plant groups. Over 5000 megafossils, include phylum mollusca, brachiopoda, echinodermata, annelida, chordata, bryozoa, and various trace fossils, intertrappean fish, plant fossils as well as recent traces, collected from various localities of peninsular India. Over 2500 microfossils, including foraminifera, pollens and spores are also part of the collection. 24 specimens of Ichnofossils from Bagh Beds, Gujarat were added to the repository during the period of report.

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)

As a part of the conservation of fungal diversity, live, pure and authenticated cultures of interesting fungi received from various organizations in India were deposited and accessioned. The total accession of NFCCI comes to 4578. 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 305 fungi were accessioned during period report and 129 authentic fungal strains were supplied to various academia, research institution, and industry.

Library and Information Centre

The Library and Information Centre provides access to several international online full-text resources as well as to the databases like Web of Science, and J-Gate and maintains the website of the institute. The detailed information about various services and activities of the Centre is available on the institute's website www.aripune.org. The library is part of a CSIR-DST consortium known as the National Knowledge Resource Consortium (NKRC).

The current holdings of the library are:

Particulars	Total	Particulars	Total
Books / Bound Volumes	28015	Maps and Atlases	567
Reference Books	1134	Microfilms / Fisches	636
PhD Thesis	353	Annual Report	42
M Sc / M Phil Thesis	97	Journals	111
ARI Reprints	3461	Digital collection/Documents	3182

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. During the period of report total 278 authentication reports were generated; out of these, 34 were for industries.

Fungal Identification Service of NFCCI

During the period of report 607 fungal cultures, other samples received from academic, research institutions and industries were authenticated/ identified. As such, 130 centers including 120 academic & research institutions and 10 private centers in India benefited from the various services.

Consultancy provided

To: ERM India Private Limited, Gurgaon

Title: Biodiversity Impact Assessment Study for Transmission Line in Goa (3km) passing through Bhagwaan Mahaveer Wildlife Sanctuary and Karnataka (7km) passing through Dandeli Wildlife Sanctuary

By: Datar MN

Technical services

Enumeration of Lactic acid bacteria and yeast from a probiotic formulation. To: M/s Nature Care

Volatile fatty acid analysis and total solids, volatile solids analysis. To: M/s Ecopositive Solutions Pvt. Ltd; Vishwadeep Pressparts Pvt. Ltd.

Biogas composition analysis. To: Ecopositive Solutions Pvt. Ltd; Gram Oorja Solutions Private Ltd; Spectrum Renewable Energy Pvt. Ltd; Intelux Electronics Pvt. Ltd.; Engineering colleges/institutes (1 No.)

Bacterial Identification: Thirty-four bacterial samples were identified using 16SrRNA gene sequencing approach. To: Colleges and institutions

Supply of cultures: Thirteen bacterial cultures. To: Colleges

Lyophilization of liquid sample. To: Indira College of Pharmacy

Book chapters/ Book reviews/ Bulletins/ Research papers/ Monographs/ Booklets

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Datar MN. *Jigarbaj Gavat.* Saptahik Sakal

Datar MN. *Tasty Goshti*. Saptahik Sakal (45 articles)

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Rahalkar MC and Bahulikar R. 2018. Hemerythrins are widespread and conserved for methanotrophic guilds. Gene Reports, 11:250-254

Rahalkar MC and Pandit PS. 2018. Genome-based insights into a putative novel *Methylomonas* species (strain Kb3), isolated from an Indian rice field. Gene Reports, 13:9-13

Rahalkar MC, Patil S, Dhakephalkar PK and Bahulikar RA. 2018. Cultivated methanotrophs associated with rhizospheres of traditional rice landraces from Western India belong to *Methylocaldum* and *Methylocystis*. 3 Biotech, 8(6):281

Rai N, Amasiddha B, Sinha N, Das TR, Patil R, Harikrishna, Jain N, Singh GP, Singh PK, Suresh Chand, K. Vinod Prabhu. 2018. Physiological and morphological evaluation of MABB derived lines under drought stress in bread wheat (*Triticum aestivum* L. em. Thell.). Indian Journal of Genetics, 78(4):417-425

Reja RM, Patel R, Kumar V, Jha A, Gopi HN. 2019. Divergent supramolecular gelation of backbone modified short hybrid δ-peptides. Biomacromolecules, 20:1254−1262

Roy S, Kociolek JP, Lowe RL and Karthick B. 2019. *Ninastrelnikovia lateritica* sp. nov., a new and rare freshwater diatom species from the rocky pools of the Western Ghats, India with a note on the genus *Ninastrelnikovia* Lange-Bertalot & A. Fuhrmann (Bacillariophyta). Phytotaxa, 394(1):59–70

Salunkhe SN and Kulkarni KG. 2018. First record of *Ptilophyllum* from the Baisakhi Formation (Jurassic), Jaisalmer District, Rajasthan, India. Journal of the Palaeontological Society of India, 63(2):181-189

Santoro A, Walke G, Vileno B, Kulkarni PP, Raibauta L and Faller P. 2018. Low catalytic activity of the Cu(II)-binding motif (Xxx-Zzz-His; ATCUN) in reactive oxygen species production and inhibition by the Cu(I)-chelator BCS. Chemical Communications, 54:11945-11948

Shaikh AC, Varma ME, Mule RD, Banerjee S, Kulkarni PP and Patil NT. 2019. Ionic Pyridinium–Oxazole Dyads: Design, Synthesis, and Application in Mitochondrial Imaging. Journal of Organic Chemistry, 84(4):1766–1777

Singh N, Paknikar KM and Rajwade JM. 2019. Transcriptome analysis of silver nanoparticles treated *Staphylococcus aureus* reveals potential targets for biofilm inhibition. Colloids and Surfaces B: Biointerfaces, 175:487-497

Singh T, Kshirsagar PR, Das A, Yadav K, Mallik S, Mascarenhas-Pereira MBL, Tresa Remya A, Thomas, Shivaramu MS, LokaBharathi PA, Khadge NH, Nagender Nath B, Dhakephalkar PK , Sridhar D. Iyer, Dwijesh Ray, Valsangkar AB, Garg A, Prakash Babu C, Waghole RJ, Waghmare SS, Rajwade JM and Paknikar KM. 2019. Implications of microbial thiosulfate utilization in red clay sediments of the Central Indian Basin: The Martian Analogy. Geochemistry, Geophysics, Geosystems, 20(2):708-729

Srinivasan SY, Paknikar KM, Bodas D and Gajbhiye V. 2018. Applications of cobalt ferrite nanoparticles in biomedical nanotechnology. Nanomedicine, 13:1221–1238

Tambe P, Kumar P, Paknikar KM and Gajbhiye V. 2018. Decapeptide functionalized targeted mesoporous silica nanoparticles with doxorubicin exhibit enhanced apoptotic effect in breast and prostate cancer cells. International Journal of Nanomedicine, 13:7669-7680

Tetali S, Karkamkar SP and Phalake SV. 2018. Grape breeding for powdery mildew resistance. Indian Journal of Horticulture, 75(4):541-545

Vigneshwaran A, Kulikovskiy MS, Glushchenko A, Kociolek JP and Karthick B. 2019. A new species of *Cymbella* (Bacillariophyceae, Cymbellaceae) from the Pavana River, Western Ghats, India. Phytotaxa, 395(3):209-218

Vyas NA, Singh SB, Kumbhar AS, Ranade DS, Walke GR, Kulkarni PP, Jani V, Sonavane UB, Joshi RR and Rapole S. 2018. Acetylcholinesterase and Aβ aggregation inhibition by heterometallic Ruthenium(II)–Platinum(II) Polypyridyl Complexes. Inorganic Chemistry, 57(13):7524–7535

Yarramala DS, Prakash P, Ranade DS, Doshi S, Kulkarni PP, Bhaumik P and Rao CP. 2019. Cytotoxicity of apo bovine α-lactalbumin complexed with La3+ on cancer cells supported by its high resolution crystal structure. Scientific Reports, DOI: 10.1038/s41598-018-38024-1

Papers Presented in Conferences/ Symposia/ Seminars

Oral Presentation

Ashtekar N, Lad S, Singh SK and Rajesh Kumar KC. Studies on phylogenetic complexities of Indian *Penicillium.* International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 19-21 November 2018

Das A, Dhakephalkar PK, Lokabharathi PA, Ray D, Bhattacharya S, Mallik S, Dwivedi A, Londhe R, Daware MB, Karthick B, Fernandes CEG, Khedekar VD, Dagar AK, Prabhjot Kaur, Yadav K, Kshirsagar PR, Kshirsagar DC, Waghmare SS, Rajwade JM, Shukla AD and Paknikar KM. Towards mitigating disputes on microbial imaging techniques in astrobiological investigations. National Space Science Symposium, SPPU, Pune, 29-31 January 2019

Datar MN. *Uttar paschimi ghat mein avruttbiji poudhon ka vitran.* Sanyukt Rajbhasha Vaigyanik Sammelan: Janopayogi Vigyaan - Chunautiyaan evam Sambhavnayein, Agharkar Research Institute, Pune, 3-4 April 2018

Gajbhiye V. Nanocarriers-mediated siRNA delivery for treatment of cancer. 2nd International Conference on Nanomedicine and Drug Delivery Conference, Tokyo, Japan, 21–23 June 2018

Gajbhiye V. Unimolecular Dendritic Nanoconstructs for Delivery of drug/siRNA. Global Experts Meeting on Frontiers in Nanomedicine and Drug Delivery, UK, 18-20 March 2019

Mukherjee D. Connective tissue growth factor-a promotes heart regeneration by regulating Pro-regenerative ECM molecules necessary for CM proliferation and migration. 3rd Indian Zebrafish Investigator Meeting, CCMB, Hyderabad, 3-6 July 2018

Oak M. Indian durum wheat breeding for end use quality. International Symposium on 100 Years of Wheat Cytogenetics: Its Impact on Crop Improvement, Ch. Charan Singh University, Meerut, 3-4 November 2018

Rana S and Singh SK. taxonomy, molecular systematics, phylogeography and diversity evaluation to delimit Indian *Fusaria.* International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 19-21 November 2018 (2nd Prize)

Sharma B, Khare R. Sanyukt Rajbhasha Vaigyanik Sammelan, ARI, 3-4 April 2018

Tetali S. Hybridization for Powdery mildew resistance in Grapes. 8th Indian Horticultural Congress, IGKV, Raipur, Chhattisgarh, 17-21 January 2019

Tetali S. Recent grapes suitable for juice. CAFT training program, Contemporary Methods of Conservation and Management of Plant Genetic Resources in Subtropical fruit crops with special reference to grapes, pomegranate and citrus, University of Horticultural Sciences Bagalkot, Karnataka, 28 January 2019

International Symposium, Fungal Biology: Advances, Applications and Conservation, National Fungal Culture Collection of India, ARI, Pune, 19-21 November 2018

Khare R. Lichens as surrogates of habitat heterogeneity and climatic variation in a sacred alpine wetland, Western Himalaya

Sharma B. Lichen biodiversity assessment of Andaman and Lakshadweep Islands, India

Poster Presentation

Avchar R, Avilla D, Barrett, Carvalho C, Sampaio JP, Vootla SK and Baghela A. *Blastobotrys bombycis* sp. nov., A D-Xylose-fermenting yeast isolated from the gut of the silkworm larva *Bombyx mori*. International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 19-21 November 2018 (2nd Prize)

Engineer A. Metagenomics aided augmentation of resident microbes and their metabolism to enhance oil recovery from depleted reservoirs. 1st DBT-BioCARe Conclave on Women Scientists Achieving Great Heights. NIPGR, New Delhi, 8-9 March 2019 (Best Poster Prize)

Kolge H, Patil G and Ghormade V. Fluoconazole loaded polymeric nanoformulations for pH modulated effective antifungal activity. SPSI Macro Conference, 15th International Conference in Polymer Science and Technology, IISER, Pune and CSIR-NCL. 19-22 December 2018

Maurya DK, Rana S, Singh PN and Singh SK. Diversity and phylogenetic analysis of Mucoromycetes from Bhamburda Van Vihar, Pune, Maharashtra. International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 19-21 November 2018

Pore S. Enhanced thermotrophic biomethanation of rice straw by supplementation of startup inoculum with thermophilic methanogens: Insights from transcriptome analysis. Conference of American Society for Microbiology, Atlanta, USA, 7–11 June 2018

Ratnaparkhi A, Basargekar A. Investigating role of DMon1 in regulating glutamate receptor levels at the Drosophila larval neuromuscular junction. EMBO Workshop, Molecular neuroscience: From genes to circuits in health and disease, NCBS, Bangalore, 4-7 February 2019

Shahnoor F, Sharma BO, Gaikwad SB and Rajeshkumar KC. Modern taxonomy of Indian Parmeliaceae. International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 19-21 November 2018 (2nd Prize)

Singh N, Paknikar KM and Rajwade JM. Genome-wide transcriptome profiling of *Pseudomonas aeruginosa* biofilm elucidates mechanisms underlying toxicity of silver nanoparticles. XLII All India Cell Biology Conference & 2nd International Conference on Trends in Cell and Molecular Biology, BITS Pilani, KK Birla Goa Campus, Goa, 21-23 December 2018

Singh PN, Lagashetti AC, Tetali S and Singh SK. Biocontrol of powdery mildew of grapes using fungal isolates: an emerging eco-friendly approach. International Symposium on Fungal Biology: Advances, Applications and Conservation & 45th Annual Meeting of Mycological Society of India (MSI), Agharkar Research Institute, Pune, 19-21 November 2018

Singh S, Ghormade V and Jaiswal S. Clothing impregnated with terbinafine nanoparticles to prevent dermatophytosis amongst soldiers. Armed Forces Medical Research Conference, AFMC, Pune, 5-8 February 2019

Srivastava P and Puranik NV. Synthesis and potential of naturally occurring flavones in our laboratory. Women Scientists & Entrepreneurs Conclave, IISF 2018, Lucknow, 7-8 October 2018

International Symposium, Fungal Biology: Advances, Applications and Conservation, National Fungal Culture Collection of India, ARI, Pune, 19-21 November 2018

Gaikwad S. Radical Scavenging Potential of Lichens from Western Himalaya

Mapari S. Bioactive Metabolites in Cladoniaceae from Higher Elevations of Western Himalaya

3rd Indian Zebrafish Investigator Meeting, CCMB, Hyderabad, 3-6 July 2018

Rayrikar A. Extracellular matrix molecules in inter-vertebral tissue maintenance of zebrafish

Joshi B. Adhesion G-Protein Coupled Receptors in Heart Development

7th Indian Chitin and Chitosan Society meeting, CSIR-NCL, Pune, 11-13 October 2018

Kolge H, Paknikar KM and Ghormade V. Nanoparticles mediated delivery of dsRNA for effective silencing of acetylcholinesterase gene in *Helicoverpa armigera*. (Best poster award)

Patil G, Badiger MV and Ghormade V. Chitosan based hemostatic agent-xerogel for rapid hemostasis

Invited/ Lead Lectures in Conference/ Seminars

Baghela A. Lead lecture. International Symposium on Fungal Biology: Advances, Application and Conservation and 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 20 November 2018

Bodas D. The promise of resolving the monodispersity conundrum in Nanotechnology: case studies with a versatile polymer chitosan. XLII All India Cell Biology Conference & 2nd International Conference on Trends in Cell and Molecular Biology, BITS Pilani, KK Birla Goa Campus, Goa, 21-23 December 2018

Introduction to microsystems engineering. New Arts, Commerce and Science College, Ahmednagar, 22 February 2019

Choudhary RK. Molecular Phylogeny of the genus *Eriocaulon* L. in Western Ghats, India. Institute of Life Sciences, Bhubaneshwar, 15 March 2019

The changing paradigm in plant taxonomy. National seminar, Plant Sciences: Current Challenges and Pesrpectives. Calicut University, 2 March 2019

Nine lectures, MSc, SPPU, 2018-19

Datar MN. Diversity vs degradation - What sacred groves tell us? Botanical Survey of India, Pune, 22 May 2018

Cliff flora. Marathi Vidyan Parishad and Fergusson College, Pune, 10 August 2018

History of food plants. Botanical Survey of India, Pune, 17 October 2018

Vanaspati Nirikshan. Ranwata Society, Satara, 4 December 2018

History of food plants. Moving Academy, Pune, 29 January 2019

Engineer A. My journey. India International Science Festival, Lucknow, 5-8 October 2018

Exciting journeys: from Idea to Execution. 1st DBT-BioCARe Conclave on Women Scientists Achieving Great Heights. NIPGR, New Delhi, 8-9 March 2019

Gajbhiye V. Industrial Advances in Drug Delivery System: Confronts and Strategies. Rasiklal M. Dhariwal Institute of Pharmaceutical Education & Research, Chinchwad, 8 February 2019

Ghaskadbi S. Series of talks. 1st National Hands-on Workshop on Concepts in Developmental Biology, ARI, Pune, 25-30 June 2018

Hydra as a model system for evo-devo: Genes, signals and stem cells. Prof. Ramakrishna More College, Akurdi, Pune, 3 August 2018

Development of animal body plan. Refresher Programme in Natural Sciences, SP Pune University, 28 August 2018

Development of animal form. Sangamner Nagarpalika Arts, DJ Malpani Commerce & BN Sarda Science College, Sangamner, 5 September 2018

Hydra as a model system to study evolutionary developmental biology: Genes, signals and stem cells; Development of form and shape in animals. Science Academies' lecture workshop on Current Trends in Biology. Telangana Social Welfare Residential Degree College for Women, Armoor, 3 October 2018

Hydra as a model system in Evo-devo: Genes, signals and stem cells. National Conference on Contemporary excitement in new Biology. Nagaland University, Lumami Campus, 30-31 October 2018

Evolution of developmental signaling pathways: Role of BMP inhibitors noggin and gremlin in organizer formation in hydra. InSDB Biennial Meeting 2018, IIT Kanpur, 11-15 December 2018

DNA repair repertoire of the enigmatic hydra. XLII All India Cell Biology Conference, BITS Pilani Goa Campus, Goa. 21-23 December 2018. XLII Indian Social Science Congress, KIIT University, Bhubaneswar, 27-31 December 2018

Development of form and shape in animals; Hydra as a model system to study evolutionary developmental biology: Genes, signals and stem cells. Science Academies' lecture workshop on Modern Trends in Biological Sciences. New Arts, Commerce and Science College, Parner, 9 January 2019

Hydra as a model system for evo-devo: Genes, signals and stem cells. Department of Zoology, St. Xavier's College, Mumbai, 7 February 2019

Role of BMP inhibitors noggin and gremlin in organizer formation in hydra. Recent Advances in Modern Biology & Biotechnology (RAMBB 2019), DY Patil Biotechnology and Bioinformatics Institute, Pune, 14 March 2019

Hydra as a model system to study evolution of cell signaling pathways. ZOOCON-2019, Punjab University, Chandigarh, 26 March 2019

Ghormade V. Perspectives for nano-biotechnology enabled protection and nutrition of plants. Workshop on production of biofertilizers and biopesticides from soil microorganisms, Savitribai Phule Pune University, 8 March 2019

Emerging nanotechnologies in mycotoxin detetection for safe healthy food. Food Analysis and Quality Control, Sinhgad College of Science, Pune, 12 February 2019

Chitosan - a versatile polymeric material for human health care. 7th Indian Chitin Chitosan Society meeting, National Chemical Laboratory, Pune, 11-13 October 2018

Karthick B. Conserving the lesser known. Srishti Institute of Art, Design and Technology, Bengaluru, 22 February 2019

Glass Houses of Water: Application of Diatoms in Biodiversity and Environmental Research. Savitribai Phule Pune University, 9 March 2019

Three talks. Refresher Programme - Plant Taxonomy, Phytogeography and Ecology. Central University of Punjab, Bathinda, 11-12 March 2019

Kaushik T. Resource person, Workshop on Identification of Research Methodology Resources for Teachers. National Resource Centre for Education, National Institute of Educational Planning and Administration, New Delhi, 11-13 June 2018

Kulkarni KG. Fossils and their relevance. International Fossil Day, Deccan College Post Graduate and Research Institute, Pune, 16 October 2018

Lanjekar VB Methane hydrate: Who contributes for methane formation in this largest energy reservoir. National Conference, Recent Trends in Microbial Technology, Dr Babasaheb Ambedkar Marathwada University, Osmanabad, Aurangabad, 11-12 March 2019

Londhe R. Hydra cultivation and regeneration. Nowrosjee Wadia College, Pune, 25 February 2019

Patra C. Resource person, 3rd Indian Zebrafish Investigator Meeting, CCMB, Hyderabad, 3-6 July 2018

Plenary lecture, InSDB meeting, IIT Kanpur, 11-15 December 2018

Resource person, International Conference on Molecular Signaling - 2019 meeting,

Heart development in zebrafish. Sanyukta Rajbhasha Vaigyanik Sammelan, ARI, 3-4 April 2018

Heart development in zebrafish. Prof. Ramakrishna More College, Pune, 3 August 2018

Zebrafish heart. SPPU, Pune

Lecture. International Conference on Molecular Signaling – 2019, NCCS, Pune 23-25 January 2019

Platform presentation. InSDB meeting, IIT Kanpur, 11-15 December 2018

aGPCRs in zebrafish development. Weinstein Cardiovascular Development and Regeneration Conference, Nara, Japan, May 2018

NCCS, Pune, 23-25 January 2019

Rajeshkumar KC. Lead lecture. International Symposium on Fungal Biology: Advances, Application and Conservation and 45th Annual Meeting of Mycological Society of India, Agharkar Research Institute, Pune, 20 November 2018

Rajwade J. Zinc complexed chitosan nanoparticles: A promising micronutrient nanocarrier in agriculture. 7th Indian Chitin and Chitosan Society meeting, Pune, 11-13 October 2018

Nanodiagnostics. Abasaheb Garware College, Pune, 31 January 2019

Nanostructured materials for biological applications. Workshop on nanostructured materials in catalysis, Sinhagad College of Engineering, Pune, 26 March 2019

Ratnaparkhi A. Drosophila as a model system; CNS development. Hands-on Developmental Biology Workshop, ARI, Pune, 25-29 June 2018

Trans-synaptic regulation of glutamate receptors by Mon1 at the Drosophila neuromuscular junction. EMBO conference, Synapses to memory: RNA based regulatory mechanisms, NBRC, Manesar, 15-18 October 2018

Neurodegenerative diseases. Biology and Disease course, IISER, Pune, 12 and 14 February 2019

Trans-synaptic regulation of glutamate receptors by Mon1 at the Drosophila neuromuscular junction. Asia-Pacific Drosophila Neuroscience Conference, Taipei, Taiwan, 16-20 January 2019

Of neurons, glia and the synapse. NCL, Pune, 22 March 2019

Shravage B. Autophagy regulatory gene atg8. Sanyukta Rajbhasha Vaigyanik Sammelan, ARI, 3-4 April 2018

The role of autophagy in germline stem cell aging. Group monitoring workshop, NIPGR, New Delhi, 12 April 2018

Resources for research methodologies in higher education. Workshop, NRCE-NIEPA, Delhi, 11-13 June 2018

Concepts in Developmental Biology. 1st Hands-on workshop, ARI, Pune, 25-29 June 2018

Autophagy regulates maintenance of GSCs in Drosophila. DBT, 29 Jan 2019

International Conference on Molecular Basis of Diseases and Therapeutics, CUR, 8-10 March, 2019.

Singh SK. Fungal Diversity and Conservation. National Seminar, Recent Trends in Microbial Technology. Government College of Arts, Science and Commerce, Quepem, Goa, 8-9 February 2019

Plenary lecture - Conservation of Fungi. 2) Biodiversity and Bioprospecting of Fungi: An Overview. Workshop on Teaching and Learning Skills in Taxonomy, Biodiversity and Bioprospecting of Fungi. Department of Botany, SPPU, Pune, 20 and 22 December 2018

Lead lecture. 59th Annual Conference of Association of Microbiologists of India & International Symposium of Host pathogen Interactions. School of Life Sciences, University of Hyderabad, 9-12 December 2018

Lead lecture. International Symposium on Fungal Biology: Advances, Application and Conservation and 45th Annual Meeting of Mycological Society of India. Agharkar Research Institute, Pune, 20 November 2018

Plenary lecture. National Seminar, Advances in Plant Sciences. SPP University, Pune, 12-13 January 2019

Singh PN. Fungal Diversity - The Past & Present Status of Fungi, Taxonomic Studies, Isolation & Conservation. National Conference on Current Trends and Future Prospects in Fungal Biotechnology. The Institute of Science, Mumbai, 2 September 2018

Lead lecture. Systematics of Fungi from Western Ghats, Maharashtra. International Symposium on Fungal Biology: Advances, Application and Conservation (INSFB 2018) and 45th Annual Meeting of Mycological Society of India. Agharkar Research Institute, Pune, 20 November 2018

Srivastava P. Keynote lecture. Workshop, Involvement of chemistry in pharmaceutical industries and various aspects related to pharma. Modern College of Arts, Science and Commerce, Pune, 22 January 2019

Lecture. Modern College, Pune, 20 December 2018

Umrani R. Development of nanotherapeutics for diabetes and cancer. Challenges and Opportunities in Nanotherapeutics, Sinhagad Institute of Pharmacy, Pune, 22-23 February 2019

Development of an anti-diabetic drug inspired from Ayurveda. Quality Improvement Program on Emerging Concepts in Phototherapeutics, Poona College of Pharmacy, Pune, 4-16 February 2019

Visits abroad

Choudhary RK. Workshop, Tropical plant identification and their systematics. International Biological Material Research Center, Korea Research Institute of Bioscience & Biotechnology, Daejeon, South Korea, 22-26 October 2018

Gajbhiye V. 2nd International Conference on Nanomedicine and Drug Delivery Conference, Tokyo, Japan, 21–23 June 2018

Global Experts Meeting on Frontiers in Nanomedicine and Drug Delivery, UK, 18-20 March 2019

Karthick B. Laboratory of Molecular Systematics of Aquatic Plants, Institute of Plant Physiology, Russian Academy of Sciences, Moscow, Russia, 16-31 July 2018

Kulkarni KG. Mesozoic trace fossils. Symposium on Paleontological History of the Indian subcontinent, American Paleontological Conference (11th NAPC), Califomia, USA, 23-27 June 2018

Mukherjee D. CNIC Conference on Emerging Concepts in Cardiovascular Biology, Madrid, Spain, 17-18 November 2018

Patra C. Weinstein Cardiovascular Development and Regeneration Conference, Nara, Japan, 16-18 May 2018

Ratnaparkhi A. Asia-Pacific *Drosophila* Neuroscience Conference, Taipei, Taiwan, 16-20 January 2019

Yashavantha Kumar KJ. Basic Wheat Improvement Course, International Maize and Wheat Improvement Centre, CIMMYT, Mexico, 28 February- 21 May 2018

Honours

Patra C. Awarded the 'Wellcome Trust - DBT Intermediate fellowship'

PhD awards

Student	Thesis	Guide, Co-Guide
Dapkekar A	Biopolymers based colloidal formulations for enhancing zinc use efficiency in wheat	Rajwade JM, Oak MD, Paknikar KM
Deshpande P	Nanocarriers mediated foliar delivery of zinc in wheat: studies on mechanisms of uptake and mobilization	Rajwade JM, Oak MD, Paknikar KM
Kamat V	Micromixer assisted synthesis of nanoparticles: Assessment for their cellular toxicity and uptake	Paknikar KM, Bodas DS
Paranjape AR	Sequence stratigraphic studies of the Cretaceous succession, Cauvery basin, Ariyalur area, Tamil Nadu, India	Kulkarni KG
Sharma S	Maternal calcium metabolism and its relation with metabolic syndrome in rat adult offspring	Kulkarni PP
Shetty DJ	Designing microbial/ physico-chemical pretreatment for enhanced biogas production from rice-straw	Dhakephalkar PK, Singh SK
Shweta Kumari	Role of FGFR and Fog signaling pathways in embryonic glial cell development of *Drosophila melanogaster*	Ratnaparkhi A

Supervision of PhD Students

(Guide, Co-Guide, Student, Thesis)

Bodas DS

Pandey S: Synthesis of multicolour quantum efficient fluorescent nanocrystals using microreactor for the application in bioimaging

Choudhary RK, Tamhankar SA

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

Choudhary RK

Maurya S. Biogeography, diversification and molecular phylogenetics of genus *Capparis* L. in the Indian subcontinent

Datar MN

Kulkarni A. Plant life between inundation and desiccation: a study on rock outcrops of Northern Western Ghats, India

Vijayan S. Study of cliff dwelling vascular chasmophytes from Northern Western Ghats with special emphasis on desiccation tolerant species

Shigwan B. Forests of Northern Western Ghats: diversity, composition and effects of disturbance on tree vegetation

Dagar SS

Deore K. Thermophilic methanogenic archaea from hot springs and oil reservoirs, and their application.

Gaikwad S. Bacteriophages for inhibition of sulfate reducing bacteria associated with oil reservoir souring

Dhakephalkar PK, Dagar SS

Pore S. Biomethanation of rice straw at elevated temperature: Assessment of microbial community dynamics

Dhakephalkar PK

Nagkirti PD. A microbial process for decontamination of saturates and aromatic hydrocarbons associated with terrestrial oil spills

Maheshwari S. Metagenome and metatranscriptome analysis to gain insights into biomethanation of rice straw

Kapse N. Influence of microbial metabolism and reservoir properties on enhanced oil recovery: Insights from simulated laboratory studies

Gajbhiye V

Kumar P. Nanoparticles mediated co-delivery of drug and si-RNA for treatment of drug resistant cancer

Tambe P. Nanocarrier mediated si-RNA delivery for targeting LHRH overexpressing cancer cells

Salve R. Targeted co-delivery of siRNAs for effective therapeutic outcome against metastatic ovarian cancer

Ghaskadbi S

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

Ghaskadbi SM, Patwardhan VG

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

Ghaskadbi SM, Paknikar KM

Dixit N. Analysis of autophagy in hydra

Ghormade V

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

Patil G. Development of chitosan based hydrogels for rapid hemostasis

Rahi S. Rapid detection of mycotoxins for ensuring food safety

Oak MD

Methe PS. Development of wheat genotype with good biscuit making properties using marker assisted selection and mutation breeding

Kawade SS. Gluten protein dynamics and wheat end use quality

Tetali SP

Bagwan JH. Elucidation of physiological mechanisms contributing to resilience of wheat under restricted moisture

Jha A

Khairnar B. Designing and synthesis of novel therapeutic β-sheet breaker peptides for Alzheimer's disease

Karpe Y

Kanade G. Roles of non-coding regions in the genomes of Hepatitis E virus

Patil R. Roles of microRNAs in Hepatitis E virus replication

Pingale K. Interaction of Hepatitis E virus RNA dependant RNA polymerase with host cell proteins

Kulkarni KG

Paranjape A. Sequence stratigraphic studies of the Cretaceous succession, Cauvery basin, Ariyalur area, Tamil Nadu, India.

Salunkhe S. Ichnological studies of the late Oxfordian-Kimmeridgian Baisakhi Formation, Jaisalmer Basin, Rajasthan, India.

Soman A. Studies in Paleogene bivalvia from Kachchh with special reference to palaeozoogeographic considerations (Co-Guide)

Karthick B

Thacker M. Diatoms as Indicators of Environmental and Climatic Changes in the *Myristica* Swamps of the Western Ghats

Wadmare N. Systematics and Biogeography of the genus *Stauroneis* (Bacillariophyceae) from the Indian subcontinent

Cheran R. Aerial diatoms of the Eastern Himalayas: Diversity and distribution across environmental gradients

Kulkarni PP

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

Varma M. Thiosemicarbazone derivatives as modulators of Aβ induced oxidative stress and toxicity in Alzheimer's disease

Paknikar KM

Raval K. Studies in immunodiagnosis of invasive Aspergillosis

Madiwal V. Nanoscale surface modifications of dental materials for preventing implant related failures.

Jamalpure S. Development of a multiplexed, point-of-care (POC) diagnostics for the detection of viral pathogens affecting shrimp and prawns

Patra C

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

Joshi B: Role of '*celsr1'* in morphogenesis using zebrafish as a model organism

Patil RM

Sonali M. Agronomic, physiological and transcriptomic response of soybean to drought stress at reproductive stage

Parimal V. Genetic studies on gibberllin-responsive dwarfing loci Rht14 and Rht18 and their deployment in wheat improvement

Venkatesan S. EMS-Induced mutations for wheat improvement and their detection by TILLING

Rajwade JM

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

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

Ratnaparkhi A

Basargekar A. Investigation of the role of DMon1 in *Drosophila* nervous system

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

Rahalkar MC

Pandit P. Exploration of taxonomic and functional diversity of methanotrophs associated with lowland paddy fields

Khatri K. Conversion of methane to biodiesel using methanotrophs

Srivastava P

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

Shravage BV

Murmu N. Determine the role of autophage in germline stem cell aging in *Drosophila*

Nilangekar K: Determine the role of autophagy in germline stem cell niche in *Drosophila*

Tamhankar SA

Chavan AM. Study of the diverse semidwarfing genes in durum wheat

Umrani RD

Kulkarni N: Studies on surface functionalized Lanthanum Strontium Manganese Oxide nanoparticles mediated hyperthermia for the treatment of breast cancer

Padhye A: Evaluation of zinc oxide nanoparticles in delaying the development of diabetic nephropathy

Upadhye AS

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

Upadhye AS, Tamhankar SA

Joshi R. Pharmacognostic and Molecular studies on *Brihati* complex

Teaching in schools

Drs KG Kulkarni, JM Rajwade, DS Bodas, V Ghormade, SP Tetali, RM Patil, Karthick B and RJ Waghole taught various science topics to school students.

Human Resource Development Activities

Scientists guided MSc students of various institutions for their MSc dissertations.

Popularization of Science and Society Oriented Activities

MACS-ARI Certificate course in Home Gardening, 7 June 2018 - 20 December 2018

MACS-ARI and Nisargsevak Certificate Course in Field Botany, 12 February 2018- 10May 2019

Workshops organized

Taxonomy, Biodiversity, Ex situ Conservation and Applications of Fungi. Batch-I, 21-28 May 2018; Batch-II, 22-24 November 2018; Batch-III, 25-27 March 2019

1st Hands-on Workshop on Concepts in Developmental Biology, ARI, 25-29 June 2018

International/ National Symposium Organized

International Symposium on Fungal Biology: Advances, Application and Conservation and 45th Annual Meeting of Mycological Society of India, 19-21 November 2018, under the aegis of DST-National Facility. Close to 250 participants from India, France, Germany, Ghana and the UK participated. The programme included inaugural lecture by David Hawksworth, Royal Botanic Garden Kew, UK.

राजभाषा का दर्जा

संयुक्त राजभाषा वैज्ञानिक सम्मेलन, 3–4.4.2018

विषय: जनोपयोगी विज्ञान–चुनौतियां एवं संभावनाएं

मुख्य अतिथि डॉ ऋषिपाल धीमान 'ऋषि'जी, उपाध्यक्ष, साहित्य लोक अहमदाबाद, गुजरात, पूर्व–वैज्ञानिक (रसायन शास्त्र), तेल एवं प्राकृतिक गैस आयोग ने सम्मेलन के आयोजन सराहना की। पुणे स्थित आघारकर अनुसंधान संस्थान, राष्ट्रीय कोशिका विज्ञान केन्द्र, और राष्ट्रीय रासायनिक प्रयोगशाला ने मिलकर यह सम्मेलन आयोजित किया। विदाई समारोह के मुख्य अतिथि श्री. जयंतरावजी सहस्त्रबुद्धे, आयोजन सचिव, विज्ञान भारती ने सम्मेलन के आयोजन पर समाधान व्यक्त किया। सम्मेलन में आठ तकनीकी सत्रों में 58 अनुसंधान लेख प्रस्तुत किए गए। 17 वैज्ञानिक संस्थाओंसे 125 प्रतिभागी उपस्थित रहे।

हिन्दी पखवाड़ा, 1–15.9.2018

व्याख्यान, शोधकार्यों का हिन्दी में प्रस्तुतिकरण, निबंध प्रतियोगिता (मूलभूत बनाम उपयोगी विज्ञान), वाद–विवाद/ विचारोंकी अभिव्यक्ति (प्लास्टिक प्रतिबंध की प्रासंगिकता), स्वरचित कविता पाठ, चुटकुले एवं हिन्दी गाने जैसे कार्यक्रमों का आयोजन किया गया।

संस्थागत हिंदी कार्यान्वयन समिति अध्यक्ष डॉ. संजय सिंह ने हिन्दी पखवाड़ा मनाने की पार्श्वभुमी बताई। संस्थान के निदेशक डॉ. किशोर पाकणीकर ने सभी प्रतिभागियोंको बधाई दी। श्री. पुलोक सेनगुप्ता, अवर सचिव, विज्ञान और प्रौद्योगिकी विभाग ने कार्यक्रम का उदघाटन किया ।

7 सितंबर 2018 को 'शोधकार्यों का हिन्दी में मौखिक प्रस्तुतिकरण' हुआ। 21 छात्रों ने अपने शोध कार्यों के बारे में पावर प्वाइंट में 10 मिनट का प्रस्तुतिकरण दिया। 11 सितंबर 2018 को 'वाद–विवाद, काव्य वाचन, हिंदी गाने, हास्य–व्यंग, और चुटकुले' का आयोजन किया गया। डॉ. प्रतिभा श्रीवास्तव ने वाद–विवाद/ विचारों की अभिव्यक्ति में 'प्लास्टिक प्रतिबंध की प्रासंगिकता' इस विषय पर विचार प्रस्तुत किए। वाद–विवाद प्रतियोगिता में 7 प्रतिभागियोंने हिस्सा लिया। स्वरचित कविता पाठ में कुल 8 प्रतिभागियों ने सहभाग दिया। 'मूलभूत बनाम उपयोगी विज्ञान' निबंध प्रतियोगिता में 7 प्रतिभागियोंने भाग लिया। नकद पुरस्कारों से विजेताओं को सम्मानित किया गया। रेश्मा जाधव, निधि मुर्मू, भाग्यश्री जोशी ने समूह गान प्रस्तुत किया।

14 सितंबर 2018 को श्री. संजय भारद्वाज, अध्यक्ष, हिन्दी आंदोलन परिवार, पुणे को आमंत्रित किया गया। आप ने 'राष्ट्रभाषा: मनन, मंथन, मंतव्य' इस विषय पर विचार प्रस्तुत किए। विभिन्न प्रतियोगिताओं के विजेताओं को श्री. संजय भारद्वाज के हाथों पुरस्कार राशि, प्रमाण–पत्र और पुस्तकें भेंट दी गई।

निरीक्षण टीम, 25–28.3.2019

राजभाषा विभाग, गृह मंत्रालय द्वारा वार्षिक कार्यक्रम वर्ष 2018–2019 में निर्धारित लक्ष्यों के प्रगामी प्रयोग की स्थिति के संम्बंध मे आवश्यक विचार विमर्श एवं निरीक्षण हेतु विज्ञान और प्रौद्योगिकी विभाग के अवर सचिव श्री. तुलसी दास, कनिष्ठ हिंदी अनुवादक सुश्री रेनू कुमारी तथा कनिष्ठ हिंदी अनुवादक सुश्री पारुल कौशिक ने संस्थान को भेंट दी।

संस्थागत राजभाषा कार्यान्वयन समिति

डॉ. संजय सिंह, वैज्ञानिक ई, अध्यक्ष
डॉ. अनुराधा रत्नपारखी, वैज्ञानिक ई, सदस्य
डॉ. मनोज ओक, वैज्ञानिक डी, सदस्य
डॉ. रितेशकुमार चौधरी, वैज्ञानिक डी, सदस्य
डॉ. विरेन्द्र गजभिये, वैज्ञानिक डी, सदस्य
डॉ. अभिषेक बाघेला, वैज्ञानिक डी, सदस्य
डॉ. सुमित डागर, वैज्ञानिक डी, सदस्य
डॉ. प्रतिभा श्रीवास्तव, वैज्ञानिक सी, सदस्य
डॉ. तुषार कौशिक, वैज्ञानिक सी, सदस्य
डॉ. गुरुदत्त वाघ, तकनीकी अधिकारी डी, सदस्य
श्रीमती. स्मिता अष्टपुत्रे, लेखा और वित्त अधिकारी, सदस्य
श्री. अ. रहमान, प्रशासनिक अधिकारी, सदस्य
श्री. अ. व. चौधरी, तकनीकी अधिकारी डी, सदस्य
श्री. प्र. व. गोसावी, क्रय और भंडार अधिकारी, सदस्य
श्री. आर. पी. जानराव, सहायक लायब्ररी एवं सुचना अधिकारी, सदस्य
श्रीमती. मंजुषा तिवारी, अधिकारी ए, सदस्य

संस्थागत राजभाषा अनुपालन समिति

डॉ. संजय सिंह, वैज्ञानिक ई, अध्यक्ष
डॉ. रितेशकुमार चौधरी, वैज्ञानिक डी, सदस्य
डॉ. सुमित डागर, वैज्ञानिक डी, सदस्य
डॉ. प्रतिभा श्रीवास्तव, वैज्ञानिक सी, सदस्य
डॉ. गुरुदत्त वाघ, तकनीकी अधिकारी डी, सदस्य
श्री. अ. रहमान, प्रशासनिक अधिकारी, सदस्य
श्रीमती. मंजुषा तिवारी, अधिकारी ए, सदस्य

हिन्दी शब्द: संस्थान के कर्मचारियों को हिन्दी शब्दों से अवगत करने हेतु 'आज का हिन्दी शब्द' और उसका अंग्रेजी प्रतिशब्द नियमित तौर पर लिखा जाता है।

Functions

National Technology Day,

18.5.2018

Symposium: Idea to Enterprise. Past students who have turned entrepreneurs illustrated their experience. Ms Sandeepa Kanitkar, KanBiosys Pvt Ltd, Pune, and Dr Vilas Sinkar, NCCS, Pune were the guests of honour.

Public Outreach Day,

28.9.2018

A science exhibition for school and college students and the citizens was organised as a precursor to the 4th India International Science Festival, Lucknow, 5-8 October 2018. Renowned scientist Dr Vijay Bhatkar inaugurated the exhibition. Close to a thousand students attended the exhibition. The following were felicitated: Science popularization/ NGO - Shri Parag Gore (Box of Science); Science Teachers - Manjiri Datar (Rathi Secondary School), Rohini Kamble and Shailaja Jagtap (Chandrakant Darode School); Journalists - Swati Shinde Gole (The Times Of India), Anjali Marar (The Indian Express).

Kisan Mela,

19 June 2018

Twenty-five farmers were trained in the improved soybean cultivation technology during *kharif* 2018 as a part of frontline demonstrations on soybean at ARI, Hol Farm.

India International Science Festival, Lucknow,

5-8.10.2018

Dr Anjali Jha, Dr Karthick Balasubramanian, Dr Rajesh Kumar KC, Dr Pratibha Srivastava and Dr Vijendra Baviskar participated.

Vigilance Awareness Week,

29.10.2018-3.11.2018

29.10.2018 Integrity pledge
31.10.2018, *Rashtriya Ekta Diwas* (National Unity Day) pledge
Lecture: Eradicate corruption: Build a new India
Speaker: Mr. Vivek Velankar, Sajag Nagrik Manch, Pune

Shri. GB Joshi Memorial Oration, 17.11.2018

Doubling the Farmers' Income in Maharashtra: Strategies and Scope

Dr KP Viswanatha
Vice-Chancellor
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra

Dr GB Deodikar Memorial Oration,

18.11.2018

India's Biodiversity: Challenges and Opportunities

Prof. Kamal Bawa
Distinguished Professor of Biology
Department of Biology
University of Massachusetts Boston, USA

58th Prof. SP Agharkar Memorial Oration,

18.11.2018

The Critical Role of Fungi in Planetary and Human Health

Prof. DL Hawksworth CBE
Comparative Plant and Fungal Biology
Royal Botanic Gardens, Kew
Richmond, Surrey, UK

Yogamaya Devi Award,

28.2.2019

'Polio eradication and its certification in India'

Prof. NK Arora, Executive Director
The INCLEN Trust International, New Delhi

Dr Pradeep Haldar, Deputy Commissioner (Immunization), Ministry of Health and Family Welfare, Government of India

Shri. VP Gokhale Prize Dr Prasanna Kumar MK, Associate Professor of Plant Pathology, Department of Plant Pathology, College of Agricultural Sciences, University of Agricultural Sciences, GKVK, Bangalore

Dr RB Ekbote Prize Dr Mohan Lal, Scientist (Plant Breeding), Medicinal Aromatic & Economic Plant Group, Biological Science & Technology Division, CSIR-North East Institute of Science & Technology, RRI, Jorhat, Assam

Dr PP Kanekar Prize Dr Yogesh Karpe, Scientist, Nanobioscience, ARI

National Science Day,

28.2.2019-1.3.2019

An open house for students and citizens was held on 28 February 2019. Similarly, ARI participated in the exhibition at GMRT, Khodad on both the days.

Press/ Media Publicity Articles on research activities appeared in several newspapers.

Institutional Research Projects

Sr. No.	Project Code	Project Title	Investigator(s)	Associated Staff
1	BD01	Unravelling the vascular plant endemism of Northern region of Western Ghats	Datar MN	Shigwan B
2	BD02	Palaeozoogeographic provincialism and faunal diversity: Kachchh Paleogene basin	Kulkarni KG	Kamble A
3	BD03	Modernization of fossil repository	Kaushik T Kulkarni KG	Sikilkar N
4	BD04	Studying the diversity and taxonomy of modern foraminifera from coastal Maharashtra using morphological and molecular tools	Kaushik T Dagar SS	Thirumalai M
5	BD05	Screening of fungi for bio-control of powdery mildew of grapes	Singh PN Singh SK Tetali S	Lagashetti A

Sr. No.	Project Code	Project Title	Investigator(s)	Associated Staff
6	BD06	Study of neuro-protective potential via antioxidant action and active constituents determination of parmelioid lichens from Western Himalayan Region	Behera BC Baghela A Sharma BO	Gaikwad S Mapari S Khare R
7	BD07	Diatom Herbarium and Culture Collection	Karthick B	Wadmare N
8	BD08	Reappraisal of taxonomy of parmelioid lichens using morphological, molecular tools and phylogenetic analysis	Sharma BO Rajesh Kumar KC	Gaikwad S
9	BE01	Investigating the methane mitigation potential of cultivated metanotrophsisolated from rice fields for application as bioinoculants	Rahalkar M Kshirsagar P	
10	BE02	Biomethanation from rice straw using inoculum supplemented with anaerobic fungi: Scale up studies	Kshirsagar P Dhakephalkar PK Dagar SS	
11	BIO24	Natural supplements for the treatment of inflammation associated anemia	Kulkarni PP	Ghatpande N Misar A
12	BOT15	Digitizing Herbarium – AHMA	Datar MN	Gaikwad N Kulkarni A
13	BOT17	Repository of crude drugs, authentication service and development of HPTLC profile library of phytochemical reference standards	Upadhye AS	Rakshe A
14	BOT21	Developing profiles for medicinally important species from Genus *Solanum*L. and their application in identification of market samples	Upadhye AS Tamhankar SA Choudhary RK	Joshi R
15	BOT22	Molecular phylogeny of *Eriocaulon* L. of the Northern Western Ghats, India	Choudhary RK Tamhankar SA Datar MN	Darshetkar A
16	BOT23	Do semi-aquatic habitats act as refugia for endemic diatoms in Western Ghats and Eastern Ghats?	Karthick B	Lokhande V
17	DB01	Role of VEGF and FGF signaling in regeneration and pattern formation in hydra	Patwardhan V Ghaskadbi SM	-
18	DB02	Characterization of Dmon1 expression in the embryonic CNS in *Drosophila*	Ratnaparkhi A	-
19	GEN16	Mapping QTL/genes for resistance to spot blotch caused by *Bipolarissorokiniana* in durum wheat	Tamhankar SA Patil RM Honrao BK	Venkatesan S
20	GEN17	Mitigating the drought stress through agronomical, physiological and molecular breeding tools in soybean	Jaybhay SA Patil RM Varghese P	Mundhe S
21	GEO17	Role of ichnofauna in deciphering sequence of deposition of the Upper Jurassic rocks of the Marwar Basin	Kulkarni KG	Salunkhe S
22	MYC02	National Facility – repositories and service (NFCCI, AMH, and identification service)	Singh SK Singh PN Rajeshkumar KC Baghela A	Maurya D Lad S

Sr. No.	Project Code	Project Title	Investigator(s)	Associated Staff
23	MYC08	Taxonomy, multigene phylogeny and monographic documentation of Indian Fusaria	Singh SK Baghela A	Rana S
24	MYC09	Development of multi-locus microsatellite typing (MLST) method and an efficient gene targeting system for a devastating plant fungal pathogen*Colletotrichumgloeosporioides*	Baghela A Singh SK	Mehta N
25	NBS07	Modification of Lanthanum Strontium Manganese Oxide (LSMO) nanoparticles for active targeting; and assessment of tumor regression in a rodent model of breast cancer	Umrani R Gajbhiye V Paknikar KM	
26	NBS08	Development of Multitalented Nano-Platform for Targeted SiRNA Delivery to LHRH Overexpressed Cancerous cells	Gajbhiye V Paknikar KM	
27	NBS09	Study of chitosan sponge/hydrogel incorporating polymeric nanoparticles with blood clotting factors for improved hemostasis	Ghormade V	
28	VIRO01	Study of Salmonella bacteriophages from environment	Banerjee K Karpe Y	
29	ZOO17	Molecular investigations of autophagic process during starvation, tissue regeneration and protein aggregate clearance	Shravage BV Kulkarni PP Ghaskadbi SM	
30	ZOO18	Identification and functional analysis of novel regulators during heart development and regeneration	Patra C	Korade S

Sponsored 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	P Varghese
2	ARI/SP/002	All India Co-ordinated Fruit Improvement Project (1.10.1970 onwards)	ICAR, New Delhi	S Tetali
3	ARI/SP/003	All India Co-ordinated Wheat Improvement Project (1.4.1972 onwards)	ICAR, New Delhi	Yashavantha Kumar KJ
4	ARI/SP/033	Production of soybean breeder seeds of annual oil seed crops (2.2.1988 onwards)	ICAR, New Delhi	P Varghese
5	ARI/SP/034	Front-line demonstrations of annual oil seed Soybean (21.2.1989 onwards)	ICAR, New Delhi	P Varghese
6	ARI/SP/043	Front-line demonstrations in Wheat (1.4.1993 onwards)	ICAR, New Delhi	Yashavantha Kumar KJ
7	ARI/SP/096	Wheat breeder seed scheme (1995 Onwards)	ICAR, New Delhi	Yashavantha Kumar KJ
8	ARI/SP/118(A)	CRP agrobiodiversity project (1.4.2014 onwards)	ICAR, Karnal	BK Honrao

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
9	ARI/SP/218	Exploitation of inter-specific biodiversity for wheat improvement (1.3.2013 to 28.2.2018) Extended up to 30.6.2018	DBT, New Delhi	Yashavantha Kumar KJ
10	ARI/SP/228	Cell-penetrating peptides as drug delivery agents for cancer & Alzheimer. DST-INSPIRE Faculty Award (16.5.2014 to 15.5.2019)	DST, New Delhi	A Jha
11	ARI/SP/229	Engineered Nanocancer Mediated Targeted Co-delivery of siRNA & Anti-cancer Drugs for Effective Gene Silencing & Tumor Therapy. DST-INSPIRE Faculty Award (1.7.2014 to 30.6.2019)	DST, New Delhi	V Gajbhiye
12	ARI/SP/231	Development of crude drug repository of genuine samples from Maharashtra (16.8.14 to 15.8.2019)	RGSTC, Mumbai	MN Datar
13	ARI/SP/232	Safe, healthy food - farm to table: New diagnostic tools for detection, mycotoxin procedures, mycotoxin and food borne microbial pathogens (10.10.2014 to 9.10.2017) Extended up to 29.9.2018	DBT, New Delhi	V Ghormade
14	ARI/SP/234	Development of field level nanoparticles based immunodiagnostics for viral pathogens of shrimp and prawn (23.1.2015 to 22.1.2019)	DBT, New Delhi	KM Paknikar
15	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) (26.3.2015 to 25.3.2020)	DBT, New Delhi	M Oak
16	ARI/SP/239	Identification and analysis of extracellular matrix components important for heart development using zebrafish as model organism (12.3.2015 to 11.3.2020)	Max Planck	C Patra
17	ARI/SP/239 A	Identification and analysis of extracellular matrix components important for heart development using zebrafish as model organism (9.2.2016 to 8.2.2019) Extended up to 18.7.2019	DST, New Delhi	C Patra
18	ARI/SP/240	An integrated approach of molecular breeding for downy powdery mildew resistance in grape (25.6.2015 to 24.6.2018)	DBT, New Delhi	S Tetali
19	ARI/SP/242	Dark energy microbial biosphere in ocean sediments - geomicrobial & astrobiological implications (7.7.2015 to 6.7.2018)	SERB, New Delhi	A Das
20	ARI/SP/244	Impact of EMF radiation of animal development at cellular & molecular levels (11.8.2015 to 10.8.2018)	SERB, New Delhi	A Ratnaparkhi
21	ARI/SP/245	Novel indole derivatives and their metal complexes for Alzheimer's disease (21.9.2015 to 20.9.2018)	SERB, New Delhi	PP Kulkarni

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
22	ARI/SP/247	Identification and characterization of kinetochore proteins of a devasting plant fungal pathogen *Collectrichum graminicola* and their application in characterizing the centromeres in a genome-wide analysis (16.11.2015 to 15.11.2018)	SERB, New Delhi	A Baghela
23	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	R Khare
24	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	SS Dagar
25	ARI/SP/250	Marker assisted elimination of off-flavour generating lipoxygenase-2 gene from kunitz trypsin inhibitor free soybean genotypes (4.12.2015 to 3.12.2020)	DBT, New Delhi	P Varghese
26	ARI/SP/251	Identification of enhancers regulating expression in glial subsets in Drosophila (15.2.2016 to 14.2.2019)	SERB, New Delhi	A Ratnaparkhi
27	ARI/SP/252	Can diatom communities across spatial and environmental gradients of Western Ghats reflect water quality conditions of streams (26.2.2016 to 25.2.2019)	SERB, New Delhi	K Balsubramanian
28	ARI/SP/253	Polyphasic taxonomy, conservation and monographic documentation of Indian *Aspergillus* and *Penicillium* species (9.3.2016 to 8.3.2019)	SERB, New Delhi	Rajesh Kumar KC
29	ARI/SP/254	Elucidating the community structure of methanogenic archaea in methane hydrates (29.3.2016 to 28.3.2019)	SERB, New Delhi	VB Lanjekar
30	ARI/SP/256	Investigating the role of autophagy in stem cell maintenance and ageing (25.5.2016 to 24.5.2021)	DBT, New Delhi	BV Shravage
31		Role of BMP signaling inhibitors Noggin and gremlin in pattern formation in hydra (2.5.2016 to 1.5.2019)	CSIR, New Delhi	SM Ghaskadbi
32	ARI/SP/257	Active micromixer mediated controlled synthesis of polymeric nanoparticles, in situ drug loading and their effect on fungal cells (30.9.2016 to 29.9.2019)	SERB, New Delhi	DS Bodas
33	ARI/SP/258	Bio-menthanation under simulated Mars environment implies early life on Planet Mars (1.9.2016 to 30.8.2019)	ISRO, Bangalore	PK Dhakephalkar

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
34	ARI/SP/259	Deciphering the role of adhesion G protein-coupled receptors during heart development using zebrafish as a model organism (22.9.2016 to 21.9.2019)	SERB, New Delhi	C Patra
35	ARI/SP/260	Determine the role of autophagy in germline stem cell aging in *Drosophila* (21.9.2016 to 20.9.2019)	SERB, New Delhi	BV Shravage
36	ARI/SP/261	Delivery of miRNA-nanoparicle complex to promote cardiac repair and regeneration after myocardial injury (26.12.2016 to 25.12.2019)	DST, New Delhi	V Gajbhiye
37	ARI/SP/262	Understanding the morphological evolution and ecological diversification of the forest dwelling Capers in Indian subcontinent using molecular phylogenetic tools (18.10.2016 to 17.10.2019)	SERB, New Delhi	RK Choudhary, SA Tamhankar, MN Datar
38	ARI/SP/263	Candidate Chikungunya virus vaccine: Nanoparticle mediated delivery of recombinant antigen presenting cells (APCs) (18.3.2017 to 17.3.2020)	DST, New Delhi	Y Karpe
39	ARI/SP/264	Development of TILLING resource in Indian durum wheat Bijaga Yellow for forward-and reverse-genetics analysis (17.3.2017 to 16.3.2020)	SERB, New Delhi	RM Patil
40	ARI/SP/265	Muraina-grasses of India: addressing the polymorphism and interspecific variations through morphological, ecological and molecular phylogenetic studies (23.3.2017 to 22.3.2020)	SERB, New Delhi	MN Datar, RK Choudhary, SA Tamhankar
41	ARI/SP/266	Deciphering the past environmental conditions of freshwater myristica swamps of Western Ghats using diatom assemblages (17.4.2017 to 16.4.2020)	Ministry of Earth Sciences	K Balsubramanian
42	ARI/SP/267	Improvement of storage grains: mycotoxin mitigation by nanoparticles based rapid diagnostic for mycotoxin producers and control of mycotoxin contamination by fungal metabolites (27.3.2017 to 26.3.2020)	DST, New Delhi	V Ghormade
43	ARI/SP/268	Conservation of selected endemic species of orchids of northern western ghats through ex situ multiplication and reintroduction in wild (3.5.17 to 2.5.2020)	TATA Power Corporation	MN Datar, AS Upadhye
44	ARI/SP/269	Scale-up synthesis of Jasada bhasma inspired zinc oxide, development of formulation(s) thereof, and validation of their biological activity (1.6.17 to 31.5.2019)	In collaboration with Pitambari	R Umrani, KM Paknikar

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
45	ARI/SP/270	Exploring non-pathogenic protozoa as a eukaryotic platform for protein expression (15.6.2017 to 14.6.2020)	DBT, New Delhi	Y Karpe
46	ARI/SP/271	Study role of Untranslated Regions (UTR) in the genome of Chikungunya virus (5.5.2017 to 4.5.2020)	CSIR, New Delhi	Y Karpe
47	ARI/SP/272	Ichnological and sedimentological evaluation of the Chhasra Formation (Burdigalian), Kachchh, Gujarat (01.05.2017 to 30.04.2020)	CSIR, New Delhi	KG Kulkarni
48	ARI/SP/273	Evaluation of in vitro biocompatibility of photofunctionalized dental implant materials (29.5.2017 to 3.3.2019	DY Patil, Pimpri	JM Rajwade
49	ARI/SP/274	Diatom and cyanobacteria flora of Peninsular India: Molecular reinvestigation of endemic and cosmopolitan taxa across biodiversity hotspot (Western Ghats) (16.8.2017 to 15.8.2019)	DST, New Delhi	K Balsubramanian
50	ARI/SP/275	Metagenomics aided augmentation of resident microbes and their metabolism to enhance oil recovery from depleted reservoirs (2.8.2017 to 1.8.2020)	DBT, New Delhi	A Engineer
51	ARI/SP/276	Elucidating the potential of anaerobic rumen fungi for enhancing biomethanation in anaerobic digesters fed on agricultural wastes (1.1.2018 to 31.12.2020)	DBT, New Delhi	SS Dagar
52	ARI/SP/277	Development and demonstration of bioconversion process for generation of methane from subsurface lignite deposits (9.1.2018 to 8.1.2020)	OECT, New Delhi	PK Dhakephalkar
53	ARI/SP/278	Determine the role of autophagy in Germline stem cell maintenance (31.1.2018 to 30.1.2021)	DBT, New Delhi	BV Shravage
54	ARI/SP/279	Freshwater diversity of Peninsular India (excluding Tamil Nadu) Taxonomic enumeration and development of online flora (18.1.2018 to 17.1.2021)	Ministry of Enviroment, Forest and Climate change	K Balsubramanian
55	ARI/SP/280	Role of Dmon 1 at the synapse and regulation of glutamate receptors (21.3.2018 to 20.3.2021)	DBT, New Delhi	A Ratnaparkhi
56	ARI/SP/281	Pyramiding of rust resistance genes into high grain quality wheat lines developed through marker-assisted selection (19.3.2018 to 18.3.2021)	DBT, New Delhi	SA Tamhankar
57	ARI/SP/282	Bioresource and sustainable livelihoods in North East India (29.3.2018 to 28.3.2021)	DBT, New Delhi	K Balsubramanian
58	ARI/SP/283	Digitization and dissemination of lichen specimens at Ajrekar Mycological Herbarium (AMH) (5.5.2018 to 4.5.2021)	RGSTC, Mumbai	B Sharma

Sr. No.	Project Code	Project Title	Sponsored By	Investigators
59	ARI/SP/284	Community structure and ecology of diatoms in the rocky pools of the Western Ghats (2.4.2018 to 1.4.2020)	SERB, New Delhi	S Roy
60	ARI/SP/285	Methane oxidizing bacteria: Community structure, elucidation and cultivation from Indian lowland rice ecosystems for future applications (5.9.2018 to 4.9.2021)	DST, New Delhi	P Pandit
61	ARI/SP/286	Valorization of methane from biogas to biodiesel and single cell proteins (SCPs) using methanotrophs (methane oxidizing bacteria) (15.9.2018 to 14.9.2021)	SERB, New Delhi	MC Rahalkar
62	ARI/SP/287	Nanoparticles mediated dsRNA delivery for biocontrol of the polyphagous insect pests, *Helicoverpa armigera* (armyworm) and *Scirtothrips dorsalis* (thrips) (2.11.2018 to 1.11.2021)	SERB, New Delhi	V Ghormade
63	ARI/SP/288	Effect of amyloid beta peptide on intracellular copper metabolism: Implications to inflammation and neuro-degeneration (12.3.2019 to 11.3.2022)	SERB, New Delhi	PP Kulkarni
64	ARI/SP/289	Microbial production of hydrogen from rice straw	KPIT Engineering Ltd., Pune	PK Dhakephalkar
65	ARI/SP/290	Engineering multitalented nanotheranostics for silencing the malignant gene in multiple cancers to accomplish eradication of tumor burden (22.3.2019 to 21.3.2021)	SERB, New Delhi	V Gajbhiye
66	ARI/SP/291	Understanding the conidial anastomosis tube (CAT) fusion dynamics and its role in generating genetic diversity in a fungal pathogen *Colletotrichum gloeosporioides* (30.3.2019 to 29.3.2022)	SERB, New Delhi	A Baghela
67	ARI/SP/292	Mapping genes/QTL for resistance to spot blotch and stem rust in durum wheat (26.3.2019 to 25.3.2022)	SERB, New Delhi	SA Tamhankar
68	ARI/SP/293	High resolution QTL mapping for iron (Fe), zinc (Zn), grain protein, and phytate content and their introgression in high yielding wheat cultivars (25.3.2019 to 24.3.2022)	DBT, New Delhi	SA Tamhankar
69	ARI/SP/294	Development, evaluation and molecular characterization of a seedless mutant in Grapes variety ARI 516 (30.3.2019 to 29.3.2022)	SERB, New Delhi	S Tetali
70	ARI/SP/295	A chromogenic immunosensor for rapid detection of Vibrio spp. in aquaculture (25.3.2019 to 24.3.2021)	SERB, New Delhi	MK Pawar
71	ARI/SP/296	Strengthening of seed infrastructure facilities at soybean breeder seed production centers under the component creation of seed infrastructure facilities of sub-mission on seed and planting material (SMSP)	ICAR-Indian Institute of Seed Science, Kushmaur	P Varghese

Personnel (List of Staff Members as on 31.03.2019)

Director (Officiating)

Dr. P.K. Dhakephalkar, Sci. G

Biodiversity & Paleobiology Group

Biodiversity - Fungi

Dr. S.K. Singh, Sci. E
Dr. Rajesh Kumar K.C., Sci. D
Dr. A. Baghela, Sci. D
Dr. P.N. Singh, Sci. C
Mr. S.B. Gaikwad, Technical Officer A
Mr. D.K. Mourya, Lab. Assistant C
Ms. S.S. Lad, Lab. Assistant C

Biodiversity - Lichens

Dr. B.C. Behera, Sci. E
Dr. (Mrs.) B.O. Sharma, Technical Officer B

Biodiversity - Palaeobiology

Dr. (Mrs.) K.G. Kulkarni, Sci. D
Dr. T. Kaushik, Sci.C
Dr. P.G. Gamre, Technical Officer A
Mr. S.S. Deshmukh, Lab. Assistant E

Biodiversity - Plants and Diatoms

Dr. R.K. Chaudhary, Sci. D
Dr. Karthick B, Sci. D
Mr. V.N. Joshi, Technical Officer A
Mr. M.H. Mhetre, Lab. Assistant D
Mrs. N.S. Gaikwad, Lab. Assistant C
Mr. S.A. Pardhi, Lab. Assistant A

Biodiversity - Garden

Dr. M. N. Datar, Sci. C
Mrs. K. H. Sable, Technical Officer B
Mr. S. N. Gajbhar, Attendant D
Mr. M. T. Gurav, Attendant D

Bioenergy Group

Dr. P.K. Dhakephalkar, Sci. G
Dr. (Mrs.) M.C. Rahalkar, Sci. D
Dr. S.S. Dagar, Sci. D
Mr. P.R. Kshirsagar, Sci. C
Dr. (Mrs.) D.C. Kshirsagar, Technical Officer C
Mrs. A.S. Kelkar, Technical Officer B
Dr. V.B. Lanjekar, Technical Officer B

Bioprospecting Group

Dr. P.P. Kulkarni, Sci. E
Dr. (Mrs.) P. Srivastava, Sci. C
Dr. (Mrs.) H.M. Puntambekar, Technical Officer C
Dr. R.J. Waghole, Technical Officer A
Dr. (Mrs.) A.V. Misar, Technical Assistant B

Developmental Biology Group

Dr. (Mrs.) A. Ratnaparkhi, Sci. E
Dr. C. Patra, Sci. D
Dr. B.V. Shravage, Sci. D
Mr. M.B. Daware, Technical Officer B
Mrs. R.J. Londhe, Technical Officer A
Mrs. A. A. Nikam, Lab. Assistant A

Genetics & Plant Breeding Group

Dr. S.A. Tamhankar, Sci. F
Dr. M.D. Oak, Sci. D
Dr. Philips Varghese, Sci. D
Dr. (Mrs.) S.P. Tetali, Sci. C
Dr. R.M. Patil, Sci. C
Mr. S.A. Jaybhay, Sci. C
Mr. A.M. Chavan, Sci. C
Dr. Y. Kumar K.J., Sci. B
Dr. V.S. Baviskar, Sci. B
Mr. S.P. Nawathe, Sci. B
Mr. V.M. Khade, Technical Officer B
Mrs. S.P. Karkamkar, Technical Officer B
Mr. V. D. Surve, Technical Officer B
Mr. J.H. Bagwan, Technical Officer B
Mr. B.D. Idhol, Technical Officer A
Mr. S.V. Phalake, Technical Officer A
Mr. B.N. Waghmare, Technical Assistant B
Mr. V.D. Gite, Technical Assistant B
Mr. S.S. Khairnar, Technical Assistant B
Mrs. A.A. Deshpande, Technical Assistant B
Mrs. J.S. Sarode, Lab. Assistant C

Mr. D.H. Salunkhe, Lab. Assistant C
Mr. D.N. Bankar, Lab. Assistant C
Mr. P.G. Lavand, Technician A
Mr. S.L. Bhandalkar, Attendant C
Mr. S.R. Kachhi, Attendant B
Mr. S.V. Ghadge, Attendant B
Mr. D.L. Kolte, Attendant A
Mr. T.B. Dhurve, Attendant A
Mr. G.S. Rajguru, Attendant A

Nanobioscience Group

Dr. (Mrs.) J.M. Rajwade, Sci. E
Dr. D.S. Bodas, Sci. E
Dr. V. Ghormade, Sci. D
Dr. (Mrs.) R.D. Umrani, Sci. D
Dr. V. Gajbhiye, Sci. D
Dr. Y.A. Karpe, Sci. D
Mrs. R.G. Bambe, Technical Assistant B
Mr. A. Dwivedi, Technical Assistant A
Mr. S.S. Waghmare, Lab. Assistant C
Mr. Nayankumara D, Technician A

Animal House

Dr. S.H. Jadhav, Sci. C
Mr. K.V. Tiwari, Attendant B
Mr. V.M. Gosavi, Attendant B

Director's Office

Dr. G.K. Wagh, Technical Officer D
Dr. (Mrs.) P.P. Apte, Technician B
Mrs. R.S. Shinde, Assistant A
Mr. S.P. Balsane, Attendant A

Administration Unit

Mr. A. Rahman, Administrative Officer
Mr. V.B. Bhalerao, Officer B
Mr. C.D. Nagpure, Officer B
Mr. A.G. Dhongade, Sr. Pvt. Secretary
Mrs. J.V. Deshpande, Pvt. Secretary
Mrs. M.B. Tiwari, Officer A
Mr. D.S. Zade, Assistant B
Ms. D.V. Gawade, Assistant A
Mr. R.B. Dhobale, Assistant A
Mrs. S.S. Shah, Assistant A
Mr. R.M. Dhandhore, Attendant C
Mr. A.B. Kusalkar, Driver
Mr. G.H. Agawan, Driver

Accounts Unit

Mrs. S.A. Ashtaputre, Finance & Accounts Officer
Mr. H.N. Mate, Officer B
Mr. A.D. Joshi, Officer A
Mrs. M.C. Ranjane, Assistant B
Mrs. M.V. Patake, Assistant A
Mr. S.S. Chavan, Assistant A
Ms. P.S. Welankar, Assistant A
Mr. R.G. Birwadkar, Assistant A
Mr. K.R. Sathe, Attendant B

Purchase Unit

Mr. P.V. Gosavi, Stores & Purchase Officer
Mrs. S.A. Tembe, Officer B
Mrs. U. Kulkarnii, Officer A
Mrs. S.S. Kalekar, Assistant B
Mrs. P.D. Gagare, Assistant A
Mr. A.V. Wable, Assistant A
Mr. A.T. Salvi, Attendant C

Store Unit

Mrs. V.G. Tallu, Officer A
Ms. T.V. Kurhade, Assistant A
Mr. S.A. Shaikh, Assistant A
Mr. R.M. Salunke, Attendant C

Engineering Unit

Mr. A.V. Chaudhari, Technical Officer D
Mrs. M.S. Kharade, Technical Officer C
Mr. P.V. Sawant, Technical Officer A
Mr. R.G. Murade, Technician A
Mr. D.S. Shinde, Technician A
Mr. S.B. Karanjekar, Attendant D

Library & Information Centre

Mr. R.P. Janrao, Asst. Lib. & Info. Officer
Mrs. S.A. Deshmukh, Sr. Lib. Assistant
Mr. A.D. Patil, Officer A
Mr. R.R. Kale, Library & Info. Asst.

Other Technical Staff

Mr. B.A. Kawthekar, Technician D

Appointments

Sr. No.	Name & Designation	Group / Unit	Date of Joining
1	Mr. S.P. Navathe, Sci. B under ICAR Wheat Scheme	Genetics & Plant Breeding	1.1.2019

Promotion

Scientific Staff

Dr. P.K. Dhakephalkar, Sci. G

Dr. D.S. Bodas, Sci. E

Dr. Y.A. Karpe, Sci. D

Dr. Rajeshkumar K.C., Sci. D

Dr. A. Baghela, Sci. D

Dr. C. Patra, Sci. D

Dr. S.S. Dagar, Sci. D

Dr. B.V. Shravage, Sci. D

Mr. A.M. Chavan, Sci. C

Dr. T. Kaushik, Sci. C

Technical Staff

Mrs. K.H. Sable, Technical Officer B

Mr. J.H. Bagwan, Technical Officer B

Mr. S.B. Gaikwad, Technical Officer A

Mr. V.N. Joshi, Technical Officer A

Mr. S.V. Phalke, Technical Officer A

Mr. R.J. Waghole, Technical Officer A

Mr. D.N. Bankar, Lab. Assistant C

Administrative Staff

Mr. C.D. Nagpure, Officer B

Mrs. M.B. Tiwari, Officer A

Mr. A.D. Patil, Officer A

MACP

Mr. D.S. Zade, Assistant B

Non-Technical Maintenance Staff

Mr. M.T. Gurav, Attendant D

Mr. R.M. Dhandhore, Attendant C

Mr. A.T. Salvi, Attendant C

Mr. S.L. Bhandalkar, Attendant C

MACP

Mr. S.R. Kachhi, Attendant B

Mr. K.R. Sathe, Attendant B

Mr. S.V. Ghadge, Attendant B

Mr. K.V. Tiwari, Attendant B

Mr. V.M. Gosavi, Attendant B

Mr. D.L. Kolte, Attendant A

Superannuation

Dr. B.K. Honrao, 31.5.2018

Mr. S.V. Kulkarni, 31.5.2018

Mr. M.D. Chavan, 30.6.2018

Dr. (Mrs.) A.S. Upadhye, 31.12.2018

Dr. S.N. Kulkarni, 31.1.2019

Dr. K.M. Paknikar, 28.2.2019

Termination

Mr. S.S. Raskar, 10.5.2018

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 2018-2019

Group	SC	ST	OBC	General	Total
A	--	--	--	1	1
B	--	--	--	--	--
C	--	--	--	--	--
Total	--	--	--	1	1

Research Fellows

Prof. Agharkar Chair

Dr. K.M. Paknikar

Emeritus Scientist

Dr. S.M. Ghaskadbi, CSIR- E.S.

Fellows

Dr. Anjali Jha, DST Inspire Scientist

Dr. Anupama Engineer, DBT-Project Scientist

Dr. Surajit Roy, SERB - N- Post Doctoral Fellow

Mrs. Pranitha Pandit, DST- WOS-A

Research Associates

Dr. Gauri Katre
Dr. Pradnya Kedari
Dr. Shashi Kiran

Senior Research Fellows

Sponsored Project

Sai Hivarkar

Junior Research Fellows

ARI Projects

Aboli Kulkarni
Thirumalai M.
Sachin Mapari
Shahnoor Fatima
Saurabh Gaikwad
Renuka Joshi
Vinay Salve

Sponsored Projects

Mital Thacker
Satishkumar Maurya
Sagar Narlawar
Kiran Nilangekar
Komal Timane
Bhumi Suthar
Ganesh Kakde
Tanvir Shaikh
Shweta Yogi
Pooja Pawar
Neha Redkar
Sachin Bhujbal
Minal Ayachit
Jyoti Chamale
Mohamed Shaikh
Nidhi Mote

Research Students

ARI Project

Bhushan Shigwan

Sponsored Projects

Sushen Lomte
Girish Pathak
Lourelle Dias
Sarang Bokil
Suhasini Venkatesan
Jyoti Mohite
Kartiki Kadam

Project Fellows

Sponsored Projects

Radhakrishnan Cheran
Kedar Mulye
Chintan Bhatt
Vigneshwaran A.

Project Assistants

ARI Project

Sonali Korade

Sponsored Projects

Sohan Salunkhe
Kunal Yadav

Project Mali

Sponsored Project

Shivaji Parvate

Smt. Parvatibai Agharkar Fellowship

Komal Raval

Fellows with Own Fellowship

CSIR Senior Research Fellows

Mokshada Varma
Gokul Patil
Prajakta Tambe
Kumal Khatri
Neelam Kapse
Anagha Basargekar
Rameshwar Avchar
Ashwini Darshetkar

CSIR Junior Research Fellows

Smrithy Vijayan
Kunal Pingale
Nidhi Murmu
Bhagyashri Joshi
Ajay Lagashetty
Nikita Mehta
Pooja Salunke
Snehal Jamalpure
Ganesh Wagh
Pravinkumar Methe
Neha Wadmare
Payal Deshpande

DBT Senior Research Fellows

Pramod Kumar
Amey Rayrikar

DBT Junior Research Fellows

Parimal Vikhe

DST-INSPIRE Junior Research Fellows

Shraddha Rahi
Sonali Mundhe
Aishwarya Padhye

ICMR Senior Research Fellows

Neha Kulkarni
Gayatri Kanade
Sulaxna Pandey
Niraj Ghatpande

UGC Senior Research Fellows

Rajashree Patil
Pradnya Nagkirti
Kasturi Deore
Bhushan Khairnar
Vaibhav Madiwal

UGC Junior Research Fellows

Shivali Rana
Rajesh Salve
Sonali Kawade
Snigdha Tiwari
Kalyani Deshmukh

Audit Report 2018-19

Maharashtra Association for the Cultivation of Science

Auditors Report

We have audited the attached Balance sheet of Maharashtra Association for the Cultivation of Science, Pune as at 31st March, 2019 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 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 statements presentation & reporting. We believe that our Audit provides reasonable basis of 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 31" March 2019
   ii) In the case of the Income and Expenditure Account, of the Surplus for the year ended on the date.

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832
UDIN : 19113832AAAAAX3363

Place: Pune
Date: 27/8/2019

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, 2019

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 manageror 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 P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832
UDIN : 19113832AAAAAX3363

Place: Pune
Date: 27/8/2019

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

Balance Sheet as on 31.03.2019

Amount - Rs.

FUNDS AND LIABILITIES	SCH.	CURRENT YEAR	PREVIOUS YEAR
CAPITAL ACCOUNTS	**A**	1,07,61,721	1,07,61,721
CURRENT LIABILITIES	**B**	34,49,063	24,90,835
INCOME & EXP.A/C (Sub Schedule 4)		1,68,27,030	1,62,34,896
TOTAL		**3,10,37,814**	**2,94,87,452**
PROPERTY AND ASSETS			
FIXED ASSETS	**C**	93,35,788	93,97,640
INVESTMENTS	**D**	1,63,02,069	1,53,42,699
DEPOSITS & ADVANCES	**E**	39,66,883	29,69,132
CASH & BANK BALANCES	**F**	14,33,073	17,77,981
TOTAL		**3,10,37,814**	**2,94,87,452**

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 P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

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

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

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

Place: Pune
Date: 27/8/2019

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

Income and Expenditure Account for the Year Ended on 31.03.2019

Amount - Rs.

EXPENDITURE	CURRENT YEAR	PREVIOUS YEAR	INCOME	CURRENT YEAR	PREVIOUS YEAR
Depreciation : Immovable Properties (By way of provision or adjustment)	2,965	2,965	Interest (Realised)		
			On S.B. A/c	1,53,681	2,00,054
			On Investments	9,49,955	14,94,501
Establishment Expenses (As per Schedule H)	2,80,973	6,92,407	Donation	30,000	2,04,800
Audit fees	3,630	3,540	Income from other Sources (As per Schedule L)	2,25,000	1,93,775
Legal Fees	39,000	41,000	Income tax refund received (Interest)	-	58,601
Professional fees	20,195	59,260			
Depreciation : Furniture & Dead Stock	73,932	1,35,442			
Expenditure on the object of The Trust (As per Schedule I)	3,45,807	4,52,235			
Surplus carried over to Balane sheet	5,92,134	7,64,882			
TOTAL	**13,58,636**	**21,51,731**	**TOTAL**	**13,58,636**	**21,51,731**

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 P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

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

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

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

Place: Pune
Date: 27/8/2019

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

Statement of Receipts & Payments for the Year Ended on 31.03.2019

Amount - Rs.

RECEIPTS	SCH.	CURRENT YEAR	PREVIOUS YEAR	PAYMENTS	SCH.	CURRENT YEAR	PREVIOUS YEAR
Opening Balances	F	17,77,981	17,63,115	Establishment Expenses	H	2,27,377	3,81,418
Interest Received				Expenditure on Object of Trust	K	2,71,207	3,71,818
On Savings Bank A/c		1,53,681	2,00,054				
Interest on Investments		4,15,399	4,08,259	Audit Fees & Creditors		2,30,451	3,540
				Legal Fees		39,000	18,900
Income tax refund received with interest		-	5,46,980	Professional fees		5,000	8,000
Donation Received				Fixed Deposit with Banks *		5,00,000	-
Dr. R.B. Ekbote Award		-	34,400				
Yogamaya Devi Award		30,000	1,25,000	Indirect Receipt & Payment	J	14,77,61,022	21,43,77,780
Income from Other Sources	G	2,25,000	1,93,775	Closing Balances	F	14,33,073	17,77,981
Indirect Receipt & Payment	J	14,78,65,070	21,36,67,853				
TOTAL		**15,04,67,132**	**21,69,39,437**	**TOTAL**		**15,04,67,132**	**21,69,39,437**

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 P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

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

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

Place: Pune
Date: 27/8/2019

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

Schedules to and forming part of Balance sheet as on 31.03.2019

Schedule "A" : Capital Account

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
TRUST FUND OR CORPUS	1	1,03,77,874	1,03,77,874
OTHER EARMARKED FUNDS	2	3,83,847	3,83,847
TOTAL Rs.		**1,07,61,721**	**1,07,61,721**

Schedule "B" : Current Liabilities

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
OTHER LIABILITIES	3	34,49,063	24,90,835
TOTAL Rs.		**34,49,063**	**24,90,835**

Schedule "C" : Fixed Assets

Amount - Rs.

PARTICULARS	SUB-SCH	CURRENT YEAR	PREVIOUS YEAR
IMMOVABLE PROPERTIES	5	91,32,407	91,35,372
FURNITURE AND DEAD STOCK	6	2,03,381	2,62,268
TOTAL Rs.		**93,35,788**	**93,97,640**

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

Schedules to and forming part of Balance Sheet as on 31.03.2019

Schedule "D" : Investments

Amount - Rs.

Sr. No.	Name of the Company	Particulars	Date of Investment	Date of Maturity	Current Year	Previous Year
	SHARES				1,325	1,325
1	Central Potteries Ltd.	Share of Rs. 25 each				
	Nagpur	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.	Shares of Rs. 10 each 50 ordinary	-	-	500	500
		Share certificate No.33932				
		bearing Sr. No.4632651-4632700				
	FIXED DEPOSITS					
1	BANK OF MAHARASHTRA	60307790389	24.05.2018	24.05.2020	5,00,000	-
		60088467793	30.12.2017	30.12.2020	3,00,000	3,00,000
		60088467534	30.12.2017	30.12.2020	3,00,000	3,00,000
		60126451909	01.03.2019	01.03.2020	2,00,000	2,00,000
		60152059714	08.11.2017	08.11.2019	16,60,000	16,60,000
		60150708401	23.10.2017	23.10.2019	8,00,000	8,00,000
		60161620207	06.02.2018	06.02.2020	4,00,000	4,00,000
		60137302953	05.07.2017	05.07.2019	17,88,432	17,88,432
		60137302238	05.07.2017	05.07.2019	38,52,010	38,52,010
2	INDIAN BANK	6019228988	05.03.2018	03.03.2021	8,57,788	8,57,788
		6019228671	05.03.2018	03.03.2021	8,57,788	8,57,788
		6056528884	03.08.2018	31.08.2021	2,00,000	2,00,000
		6201547509	24.02.2019	24.02.2020	10,00,000	10,00,000
		6201547485	24.02.2019	24.02.2020	5,00,000	5,00,000
		6201547532	24.02.2019	24.02.2020	10,00,000	10,00,000
3	BANK OF BARODA	906244	02.03.2019	02.03.2020	1,04,377	97,908
4	BANK OF INDIA	50345110007246	24.11.2018	24.11.2020	19,79,849	15,26,948
	GRAND TOTAL				**1,63,02,069**	**1,53,42,699**

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

Schedules to and forming part of Balance sheet as on 31.03.2019

Schedule "E" : Deposits & Advances

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
DEPOSITS :				
Telephone Deposit	10,000		14,207	
Deposit with Court	15,000	25,000	15,000	29,207
ADVANCES :				
Income Tax Deducted at Source	33,44,610	33,44,610	23,62,333	23,62,333
Interest accrued on Investments (Subject to confirmation from bank & other agencies)				
As per last Balance Sheet	5,77,592		7,14,950	
Less Realised during the year	3,46,192		5,29,388	
	2,31,400		1,85,562	
Accrued Interest during the year	3,65,873	5,97,273	3,92,030	5,77,592
TOTAL Rs.		**39,66,883**		**29,69,132**

Schedule "F" : Cash & Bank Balances

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	OPENING BALANCE	CLOSING BALANCE	OPENING BALANCE	CLOSING BALANCE
CASH IN HAND	35,344	19,356	13,038	35,344
BANK :-				
With Bank of Maharashtra Erandwana Branch in Savings A/c No.9709	16,88,994	12,54,208	16,24,444	16,88,994
With Union Bank of India, F.C.Road Branch in S.B.A/c 48941261091951	53,643	1,59,509	1,25,633	53,643
TOTAL Rs.	**17,77,981**	**14,33,073**	**17,63,115**	**17,77,981**

Schedule "G" : Income From Other Sources

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT
Sale of Publication	-	-	1,775	1,775
Fee for Home Gardening Course	2,25,000	2,25,000	1,92,000	1,92,000
TOTAL Rs.	**2,25,000**	**2,25,000**	**1,93,775**	**1,93,775**

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 31.03.2019

Schedule "H" : Establishment Expenses

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT	INCOME & EXP. ACCOUNT	RECEIPT & PAYMENT ACCOUNT
Honorarium to Staff	1,79,225	1,79,225	1,40,173	1,40,173
Meeting Expenses	14,857	14,857	6,000	6,000
Miscellaneous Expenses	33,699	2,655	2,03,154	24,420
Hospitality Expenses	7,195	1,690	-	-
Travelling & Conveyance	14,428	529	3,779	3,779
Printing & Stationery	12,149	12,149	6,756	6,756
Advertisement charges	15,375	15,375	6,375	-
Bank charges	897	897	290	290
Seed Money MACS TEF	-	-	2,00,000	2,00,000
Consultancy	-	-	1,25,880	-
Repairs & Maintenance	3,148	-	-	-
TOTAL Rs.	**2,80,973**	**2,27,377**	**6,92,407**	**3,81,418**

Schedules to and forming part of Income & Expenditure
Account for the year ended on 31.03.2019

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Expenditure out of Earmarked Donations		
Prof. V.P Gokhale Award Expenses	9,700	13,133
Dr. R.B. Ekbote Award Expenses	15,900	10,605
Dr. A.D Agate Award Expenses	2,500	-
Donation Expenses Prof. P.V. Sukhatme	2,500	750
Yogmaya Devi Award Expenses	25,000	-
Prof. S.P. Agharkar Chair Expenses	1,40,000	2,70,000
Home Garden Course Expenses	69,733	1,16,017
Prof. S.P. Agharkar Memorial Day Expenses	-	9,220
Science Promotion Exps.	-	5,800
Smt. Parvatibai Agharkar Fellowship Award	80,474	26,710
TOTAL Rs.	**3,45,807**	**4,52,235**

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

Schedules forming part of Receipt & Payment Account for the year ended on 31.03.2019

Schedule "J" : Indirect Receipts & Payments

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
	RECEIPTS	PAYMENTS	RECEIPTS	PAYMENTS
ARI Account	14,24,17,000	14,24,17,000	21,02,19,028	21,05,72,143
Schemes Account	52,20,363	52,20,363	34,09,716	37,30,137
Advance to staff	90,000	90,000	39,000	39,000
TDS Professional fees & Contractor	3,900	33,659	109	36,500
Telephone Deposit un-clear ch.	4,207	-	-	-
Testing fees (Smartchem Tech)	1,29,600	-	-	-
TOTAL Rs.	**14,78,65,070**	**14,77,61,022**	**21,36,67,853**	**21,43,77,780**

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

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Expenditure out of Earmerked Donations		
Prof. V.P Gokhale Award Expenses	5,000	5,000
Dr. R.B. Ekbote Award Expenses	5,000	5,000
A. D. Agate Award Expenses	2,500	-
Yogamaya Award Expenses	25,000	-
Donation Expenses Prof. P.V. Sukhatme	2,500	750
Prof. S.P. Agharkar Chair Expenses	81,000	2,43,000
Home Garden Course Expenses	69,733	85,558
Science promotion Exps.	-	5,800
Smt. Parvatibai Agharkar fellowship award	80,474	26,710
TOTAL Rs.	**2,71,207**	**3,71,818**

Schedule "L" : Income From Other Sources

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Sale of Publication	-	1,775
Fee for Home Gardening Course	2,25,000	1,92,000
TOTAL Rs.	**2,25,000**	**1,93,775**

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

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

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

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

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

Place: Pune
Date: 27/8/2019

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

Schedules to and forming part of Balance Sheet as on 31.03.2019

Sub Schedule "1" : Trust Fund or Corpus

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Trust/Corpus Fund	1,03,77,874	1,03,77,874
TOTAL Rs.	**1,03,77,874**	**1,03,77,874**

Sub Schedule "2" : Other Earmarked Funds

Amount - Rs.

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

Sub Schedule "3" : Other Liabilities

Amount - Rs.

PARTICULARS	CURRENT YEAR	PREVIOUS YEAR
Audit fees payable	3,540	3,450
Medclin Research Pvt. Ltd	2,70,992	2,70,992
TDS Payable	31,19,531	22,10,018
Sundry Creditors	55,000	6,375
TOTAL Rs.	**34,49,063**	**24,90,835**

Sub Schedule "4" : Income & Expenditure Account

Amount - Rs.

PARTICULARS	CURRENT YEAR		PREVIOUS YEAR	
Opening Balance	1,62,34,896		1,54,70,014	
Surplus carried over to Balance sheet	5,92,134		7,64,882	
		1,68,27,030		1,62,34,896
TOTAL Rs.		**1,68,27,030**		**1,62,34,896**

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

Schedules to and forming part of Balance Sheet as on 31.03.2019

Sub Schedule "5" : Immovable Properties

Amount - Rs.

SR No	Particulars	Rate of Depreciation	GROSS BLOCK			DEPRECIATION BLOCK					WDV as on 31.03.2019
			Cost as on 01.04.18	Additions during the year	Total Cost as on 31.03.2019	Upto 31.3.2018	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep.for the Year	Total as on 31.03.2019	
1	Land at Pune		96,500	-	96,500	-	-	-	-	-	96,500
2	Land at Songaon		88,19,437	-	88,19,437	-	-	-	-	-	88,19,437
5	Land Development Expenses at Hol		2,02,583	-	2,02,583	-	-	-	-	-	2,02,583
3	Biometry Building	2.50%	1,15,200	-	1,15,200	98,750	2,880	-	2,880	1,01,630	13,570
4	Microbiology Building	2.50%	3,389	-	3,389	2,987	85	-	85	3,072	317
	TOTAL Rs.		**92,37,109**	**-**	**92,37,109**	**1,01,737**	**2,965**	**-**	**2,965**	**1,04,702**	**91,32,407**

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

Schedules to and forming part of Balance Sheet as on 31.03.2019

Sub Schedule "6" : Furniture and Dead Stock

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK						
	Cost as on 1.4.2018	Additions during the year	Total cost as on 31.03.2019	Rate of Depreciation	Up to 31.3.2018	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep.for the Year	Total as on 31.03.2019	WDV as on 31.03.2019
1	2	3	4	5	6	7	8	9	10	11
A) (I) GENERAL										
1. Office Equipments & Furniture & Sports Items	5,89,242	15,045	6,04,287	10%	4,67,650	58,924	1,505	60,430	5,28,080	76,207
2. Apparatus & Equipments	3,15,076		3,15,076	20%	289,836	-	-	-	2,89,836	25,240
3. Electric Fittings	9,870	-	9,870	10%	9,869	-	-	-	9,869	1
4. Books	1,19,522	-	1,19,522	20%	1,16,442	-	-	-	1,16,442	3,080
5. Y -Type System for Grapes- Hol	1,10,497	-	1,10,497	10%	88,400	11,050	-	11,050	99,450	11,048
6. Construction of Statute	98,090	-	98,090	2.5%	12,260	2,452	-	2,452	14,712	83,378
SUB TOTAL (A) (I)	**12,42,297**	**15,045**	**12,57,342**		**9,84,457**	**72,426**	**1,505**	**73,932**	**10,58,389**	**1,98,954**
A) (II) SPECIAL PUBLICATIONS										
1. Marathi Publication by Prof. M.N. Kamat (Cost of Rs. 1.54)	4,428	-	4,428	0%	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	0%	1,100	-	-	-	1,100	2,054
SUB-TOTAL (A) (II)	**7,582**	**-**	**7,582**	**0%**	**3,467**	**-**	**-**	**-**	**3,467**	**4,115**
TOTAL A (I+II)	**12,49,879**	**15,045**	**12,64,924**	**0%**	**9,87,924**	**72,426**	**1,505**	**73,932**	**10,61,856**	**2,03,069**

Amount - Rs.

PARTICULARS	GROSS BLOCK			DEPRECIATION BLOCK						
	Cost as on 1.4.2018	Additions during the year	Total cost as on 31.03.2019	Rate of Depreciation	Up to 31.3.2018	Dep. On opening Balance	Dep. On the Additions during the year	Total Dep.for the Year	Total as on 31.03.2019	WDV as on 31.03.2019
1	2	3	4	5	6	7	8	9	10	11
B) UNIVERSITY OF PUNE										
1. Office Equipment & Furniture	1,300	-	1,300	0%	1,242	-	-	-	1,242	58
2. Books	25,538	-	25,538	0%	25,341	-	-	-	25,341	197
3. Aparatus & Equipments	9,914	-	9,914	0%	9,891	-	-	-	9,891	23
TOTAL (B)	**36,752**	**-**	**36,752**	**0%**	**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)	**13,10,212**	**15,045**	**13,25,257**		**10,47,945**	**72,426**	**1,505**	**73,932**	**11,21,877**	**2,03,381**

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 31 March, 2019 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 carried old outstanding balances carrying since last few year confirmation of which are not available and impact of the same on Financial Statement cannot he quantified. Party ledger balances are subject to confirmation & subsequent adjustments if any.
2. Fixed Assets and Closing Stock as on 31 March, 2019 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 2019

   ii) In the case of the Income and Expenditure Account of the Deficit 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.

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832
UDIN : 19113832AAAAAX3363

Place: Pune
Date: 27/8/2019

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

Balance Sheet as on 31.03.2019

Amount - Rs.

Particulars	Sch	Current Year	Previous Year
CORPUS/CAPITAL FUND AND LIABILITIES:			
CORPUS/CAPITAL FUND	1	9,75,71,363	11,09,88,544
RESERVES AND SURPLUS	2	-	-
EARMARKED/ENDOWMENT FUNDS	3	13,18,05,478	8,44,27,530
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	18,06,06,637	14,89,99,767
TOTAL		**40,99,83,478**	**34,44,15,841**
ASSETS:			
FIXED ASSETS	8	19,79,07,987	17,76,44,647
INVESTMENTS-FROM EARMARKED/ENDOWMENT FUNDS	9	9,58,60,318	15,02,18,803
INVESTMENTS-OTHERS	10	-	-
CURRENT ASSETS, LOANS, ADVANCES ETC.	11	11,62,15,173	1,65,52,391
MISCELLANEOUS EXPENDITURES (to the extent not written off or adjusted)		-	-
TOTAL		**40,99,83,478**	**34,44,15,841**
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

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
FINANCE & ACCOUNTS OFFICER
MACS ARI

Sd/-
OFFICIATING DIRECTOR
MACS ARI

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

Place: Pune
Date: 27/8/2019

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

Income & Expenditure Account for the Year ended 31.03.2019

Amount - Rs.

Particulars	Sch	Current Year	Previous Year
Income			
Income from Sales/Services	12	31,97,715	32,45,900
Grants/Subsidies	13	18,26,01,984	16,67,99,980
Fees/Subscriptions	14	2,42,956	4,00,588
Income from Investments(Income on Invest. From earmarked/endowment Funds transferred to Funds)	15	-	-
Income from Royalty,Publications etc.	16	21,340	49,055
Interest Earned	17	1,66,371	16,44,207
Other Income	18	9,51,288	6,06,072
Increase/(decrease) in stock of Laboratory consumables	19	53,818	(2,89,200)
Donation Received in kind (Equipment)		-	-
Total (A)		**18,72,35,472**	**17,24,56,602**
Expenditure			
Establishment Expenses	20	15,02,34,360	14,21,80,132
Other Administrative Expenses etc.	21	4,95,29,258	4,17,91,956
Expenditure on Grants, Subsidies etc.	22	-	-
Interest	23	-	-
Depreciation (Net Total at the year-end corresponding to schedule 8)	8	73,09,035	58,16,525
Total (B)		**20,70,72,653**	**18,97,88,614**
Balance being excess of Income over Expenditure (A-B)		(1,98,37,181)	(1,73,32,012)
CORPUS/CAPITAL FUND		**(1,98,37,181)**	**(1,73,32,012)**
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

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
FINANCE & ACCOUNTS OFFICER
MACS ARI

Sd/-
OFFICIATING DIRECTOR
MACS ARI

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

Place: Pune
Date: 27/8/2019

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

Schedules Forming Part of Balance Sheet as at 31.03.2019

Schedule 1: Corpus/Capital Fund

Amount - Rs.

Particulars	Current Year		Previous Year	
Corpus Fund				
Balance as the beginning of the year	7,43,11,087		6,30,90,530	
Add : Contributions towards Corpus/ Capital Fund (Schedule D)	2,34,34,240		2,85,52,569	
Add/ (Deduct) : Balance of Net Income/ (Expenditure)	(1,98,37,181)	7,79,08,146	(1,73,32,012)	7,43,11,087
Capital Fund				
Balance as the beginning of the year	3,66,77,457		2,36,40,075	
Add: Capital Grant during the year	64,20,000		4,00,35,000	
Add: Interest Received*	-		15,54,951	
Less: Expenditure during the year	2,34,34,240		2,85,52,569	
		1,96,63,217		3,66,77,457
Balance at the end of the year		**9,75,71,363**		**11,09,88,544**

Schedule 2: Reserves & Surplus

Amount - Rs.

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.		**-**		**-**

Interest earned on capital shown as liability payable to DST

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

Schedules Forming Part of Balance Sheet as at 31.03.2019

Schedule 3 : Earmarked/Endowment Funds

Amount - Rs.

PARTICULARS	FUND-WISE BREAK UP				TOTALS	
	Lab. Res. Fund (Tech. Dev. Fund)	Dr. A. B. Joshi	Dr. A. D. Agate	Welfare fund	Current Year	Previous Year
a> Opening balance of the funds	8,36,20,606	6,77,925	2,060	1,26,939	8,44,27,530	7,45,34,200
b> Additions to the funds:	-	-	-	-	-	-
i) Donations/grants	-	-	-	-	-	-
ii) Income from investments made on account of funds.	57,82,437	18,302	-	-	58,00,739	58,93,700
iii) Culture Identification Charges	-	-	-	-	-	-
iv) Overhead Charges from Scheme	33,48,984	-	-	-	33,48,984	42,93,525
v) Interest received on Funds from various projects	-	-	-	-	-	7,08,643
vi) Other Misc.	10,51,999	-	-	-	10,51,999	9,39,802
TOTAL (a+b)	**9,38,04,026**	**6,96,227**	**2,060**	**1,26,939**	**9,46,29,252**	**8,63,69,870**
c> Utilisation/Expenditure towards objectives of funds	-	-	-	-	-	-
i> Capital Expenditure	-	-	-	-	-	-
Fixed Assets	-	-	-	-	-	-
Others	-	-	-	-	-	-
ii> Revenue Expenditure	-	-	-	-	-	-
Salaries,Wages and allowances etc.	1,24,89,878	-	-	-	1,24,89,878	18,91,840
Rent	-				-	
Other Administrative Expense	63,397	-	-	-	63,397	50,500
					-	-
TOTAL (c)	**1,25,53,275**	**-**	**-**	**-**	**1,25,53,275**	**19,42,340**
NET BALANCE AS AT THE YEAR-END (a+b-c)	**8,12,50,751**	**6,96,227**	**2,060**	**1,26,939**	**8,20,75,977**	**8,44,27,530**
Add: Balance as per Schedule 3A	-	-	-	-	4,97,29,501	-
Total Balance as on 31.3.2019	**8,12,50,751**	**6,96,227**	**2,060**	**1,26,939**	**13,18,05,478**	**8,44,27,530**

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

Schedules Forming Part of Balance Sheet as at 31.03.2019

Schedule "3-A" : Unspent Balance of Scheme-Grant

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		Debit	Credit	Debit	Credit	Debit	Credit
1	DBT Genetic Screen-197				9,150		9,150
2	Dr. Gajbhiye Travel Grant			45,371	45,371		
3	F/CSIR/SP 272- Dr. K.G. Kulkarni		1,21,653	3,24,807	4,08,003		2,04,849
4	F/SERB/SP-295 - Ms. Madhuri Pawar			1,00,000	9,60,541		8,60,541
5	S/ARP Environment		7,892				7,892
6	S/CSIR/Dr. Ghaskadbi Csir		2,93,089	5,23,596	2,40,000		9,493
7	S/CSIR/ Leather Additional Comp	800				800	
8	S/CSIR/SP 271- Dr. Yogesh Karpe		43,172	5,14,642	4,77,586		6,116
9	S/DBT/ SP 185	1,71,438				1,71,438	
10	S/DBT/SP 188- Dr. Ghaskadbi	2,41,502				2,41,502	
11	S/ DBT/ SP 189-Dr. Ghaskadbi		17,479				17,479
12	S/DBT/ SP 199	60,303				60,303	
13	S/DBT/SP 206-Dr. Tamhankar	2,75,488		1,11,999	3,87,487		
14	S/DBT/SP 207-Dr. Behera		14,32,670				14,32,670
15	S/DBT/ SP 210-Dr. Prasad Kulkarni			14,299	14,299		
16	S/DBT/SP 218-Dr. Honrao		8,49,990	1,78,450	55,127		7,26,667
17	S/DBT/SP 232-Dr. Ghormade		3,17,881	3,35,456	30,693		13,118
18	S/DBT/ SP 234-Dr. Paknikar/ Dr. Ghormade		8,47,434	6,88,972	61,997		2,20,459
19	S/DBT/ SP 238-Dr. Manoj Oak		6,58,934	9,97,792	6,12,881		2,74,023
20	S/DBT/SP 240-Dr. Tetali		1,82,822	2,68,695	85,873		
21	S/DBT/ SP 250- Dr. Varghese		1,14,453	4,15,122	4,39,381		1,38,712
22	S/DBT/SP 256-Dr. Shravage		70,706	4,89,237	4,38,211		19,680
23	S/DBT/SP- 270- Dr. Yogesh Karpe		12,99,526	15,27,684	12,63,881		10,35,723
24	S/DBT/SP-275-Dr. Anupama Engineer		17,39,017	19,99,433	6,26,023		3,65,607
25	S/DBT/SP 276-Dr. Sumit Dagar		25,59,689	15,45,904	9,80,901		19,94,686
26	S/DBT/SP-278-Dr. Shravage		20,47,664	19,35,890	51,653		1,63,427
27	S/DBT/SP 280-- Dr. Ratnaparkhi		28,10,953	5,43,496	93,659		23,61,116
28	S/DBT/ SP 281-Dr. Tamhankar		12,91,026	8,79,724	38,420		4,49,722
29	S/DBT/ SP 282- Dr. Karthick B.		16,00,461	16,79,335	2,47,781		1,68,907
30	S/DBT/SP-293 - Dr. S.A. Tamhankar			1,00,000	35,43,302		34,43,302
31	S/DBT/ SP 70		242				242
32	S/DBT/ Wheat Molecular Seminar		976				976
33	S/DST/ Anaemia Workshop		91,595				91,595
34	S/DST/ GLV MEETING		11,845				11,845
35	S/DST Inspire/SP 228- Dr. Anjali Jha		1,00,618	14,79,143	17,30,694		3,52,169

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		Debit	Credit	Debit	Credit	Debit	Credit
36	S/DST Inspire/SP 229- Dr. Gajbhiye		2,58,193	5,20,645	6,41,827		3,79,375
37	S/DST/SP 160 Culture Coll.-			1,608	1,608		
38	S/DST/ SP 194			4,500	4,500		
39	S/DST/SP 230-Dr. Bodas		1,107				1,107
40	S/DST/SP 239A- Dr. Patra		7,96,597	21,48,506	9,83,437	3,68,472	
41	S/ DST/ SP 255- Dr. Rajwade		2,29,755	7,000	22,000		2,44,755
42	S/DST/ SP 261- Dr. Gajbhiye		11,84,380	21,83,167	10,82,768		83,981
43	S/DST/SP 263- Dr. Yogesh Karpe		9,58,219	20,98,895	14,36,884		2,96,208
44	S/DST/SP 267-Dr. Ghormade		3,14,616	500	7,814		3,21,930
45	S/DST/SP-274- Dr. Karthick		5,69,896	5,10,735	16,003		75,164
46	S/DST/SP-285 - Ms Pranitha Pandit			5,36,819	8,13,029		2,76,210
47	S/ DST WOS-B/ SP 152	3,19,195				3,19,195	
48	S/DYPatil/SP 233	1,689			1,689		
49	S/DYPatil/SP 273 New D.Y. Patil		4,03,659	3,90,782			12,877
50	S/GCP/SP 166	33,379				33,379	
51	S/GCP WORKSHOP		2,26,032				2,26,032
52	S/HTBIL/SP 193 Health Sch.-		30,700	30,700			
53	S/HTBSIL/ SP 243		2,47,542				2,47,542
54	S/ICAR/Soybean Workshop		15,634				15,634
55	S/ICAR/ SOY Contract Sch		5,872				5,872
56	S/ICAR/SP 001	36,787		69,83,402	73,78,750		3,58,561
57	S/ICAR/SP 002		26,23,261	37,06,986	21,64,195		10,80,469
58	S/ICAR/SP 003		9,79,688	1,06,89,609	1,02,52,860		5,42,939
59	S/ICAR/SP 033		53,14,132	34,55,234	38,26,684		56,85,581
60	S/ICAR/SP 034		3,296	1,03,674	1,01,408		1,030
61	S/ICAR/SP 043	8,135		24,250	92,373		59,988
62	S/ICAR/SP 096		49,86,737	11,16,045	19,01,004		57,71,696
63	S/ICAR/SP 183		8,457				8,457
64	S/ICAR/SP 211		4,24,762				4,24,762
65	S/ICAR/SP-296 - Dr. Philips Varghese				5,58,000		5,58,000
66	S/ICAR/Wheat Trial		125				125
67	S/INDO Swiss Biotechnology	10,014				10,014	-
68	S/INDO-US Bioremediation	818				818	-
69	S/ISRO/SP-258	1,43,056		2,96,656	6,62,729		2,23,017
70	S/LSRB/SP 145		1,204				1,204
71	S/MAX PLANCK/SP 239		23,29,457	15,30,557	13,50,014		21,48,914
72	S/MOEF/SP-279- Dr. Karthick		11,37,497	3,12,611	44,325		8,69,211
73	S/MoES/SP 266		1,43,377	4,83,007	80,508	2,59,122	
74	S/OECT/SP 241		3,17,627				3,17,627
75	S/OECT/SP 246	2,65,765		1,78,180	11,20,110		6,76,166

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		Debit	Credit	Debit	Credit	Debit	Credit
76	S/OECT/SP 277- Dr. Dhakephalkar			10,99,888	39,45,026		28,45,138
77	Soham Pore - SERB Travel Grant			87,780	87,780		
78	S/ONGC/SP 205	4,53,731				4,53,731	
79	S/ONGC/ SP 235	12,68,258				12,68,258	
80	S/ONGC/ SP 236	11,41,777				11,41,777	
81	S/Pitambari Products Pvt Ltd/SP 269		1,92,161	1,80,342	2,50,000		2,61,819
82	S/RGSTC/SP 168- Dr. Upadhye		23,532	4,090			19,442
83	S/RGSTC/SP 231- Dr. Upadhye		8,91,574	12,63,292	12,74,061		9,02,343
84	S/RGSTC/SP-283 Dr. Bharati Sharma			8,25,118	12,69,600		4,44,482
85	S/SERB/SP 220- Dr. Gargee Pandit		31,957				31,957
86	S/SERB/ SP 242- Dr. Anindita Das		1,426	2,11,129	3,50,000		1,40,297
87	S/SERB/ SP 244- Dr. Vidya Patwardhan		2,40,496	5,32,985		2,92,489	
88	S/SERB/SP 245- Dr. P.P. Kulkarni		2,74,055	3,23,758	1,26,284		76,581
89	S/SERB/SP 247- Dr. Abhishek Baghela		1,37,539	3,48,565	2,51,668		40,642
90	S/SERB/SP 248- Dr. Roshni Khare		1,30,377	4,99,621	5,01,856		1,32,612
91	S/SERB/SP 249- Dr. Sumit Singh Dagar		17,338	4,37,762	5,06,834		86,410
92	S/SERB/SP 251- Dr. A. Ratnaparkhi		8,45,637	12,42,383	6,34,591		2,37,845
93	S/SERB/ SP 252- Dr. Karthick Balsubramanian		94,118	5,76,354	4,94,852		12,616
94	S/SERB/SP 253- Dr. Rajesh Kumar K C		1,19,823	7,05,291	6,37,223		51,755
95	S/SERB/SP 254 - Dr. Vikram Lanjekar		1,81,617	11,11,915	9,71,453		41,155
96	S/SERB/ SP 257- Dr. Bodas	88,212		6,30,545	10,12,406		2,93,649
97	S/SERB/ SP 259 - Dr. Chinmoy Patra	42,290		9,51,796	11,32,637		1,38,552
98	S/SERB/ SP 260 - Dr. Shravage		1,41,785	9,36,442	9,62,166		1,67,508
99	S/SERB/ SP 262- Dr. R. K. Choudhary		2,60,032	6,65,447	6,06,714		2,01,299
100	S/SERB/SP-264-Dr. R.M. Patil		2,49,123	7,95,841	5,85,567		38,849
101	S/SERB/SP 265- Dr. Mandar Datar		17,90,984	19,61,892	3,88,679		2,17,771
102	S/SERB/SP-284 Dr. Surajit Roy			9,57,239	9,71,692		14,453
103	S/SERB/SP-286 Dr. Monali Rahalkar			3,13,173	8,22,459		5,09,286
104	S/SERB/SP-287 - Dr. Vandana Ghormade			2,31,199	18,55,591		16,24,392
105	S/SERB/SP-288 - Dr. Prasad Kulkarni			89,650	16,25,560		15,35,910
106	S/SERB/SP-290 - Dr. Virendra Gajbhiye			98,500	13,42,277		12,43,777
107	S/SERB/SP-291 - Dr. Abhishek Baghela			1,06,320	17,31,246		16,24,926

Amount - Rs.

SR. NO.	PATICULARS	OPENING BALANCE		DURING THE YEAR		CLOSING BALANCE	
		Debit	Credit	Debit	Credit	Debit	Credit
108	S/SERB/SP-292 - Dr. S.A. Tamhankar			1,13,323	22,01,756		20,88,433
109	S/SERB/SP-294 - Dr. Sujata Tetali			86,639	14,07,007		13,20,368
110	S/ SP 171-B		72,149				72,149
111	S/Tata/SP-268- Dr. M. N. Datar		3,42,815	9,88,678	9,81,360		3,35,497
112	Vishwadeep Pressparts Pvt Ltd		3,52,185				3,52,185
113	CSIR All Schemes		78,608				78,608
114	F/CSIR/ Anagha Basargekar		15,887	11,825			4,062
115	F/CSIR/ Consolidated		2,72,122				2,72,122
116	F/CSIR/ Gaikwad Ramesh		20,000				20,000
117	F/CSIR/ Gulshan Walke		403				403
118	F/CSIR/ Kumal Kaatri		13,417	9,499			3,918
119	F/CSIR/ Kunal Pingale		113				113
120	F/CSIR/ Neelam Kapse		2,300				2,300
121	F/CSIR/Patil Gokul		29				29
122	F/CSIR/ Prajakta Tambe		468				468
123	F/CSIR/ Rameshwar Avchar		360				360
124	F/CSIR/ Soham Pore		1,438				1,438
125	F/CSIR/ Sweta Malik		10				10
126	DBT-JRF Vikhe Parimal		18,252	3,85,525	3,87,500		20,227
127	DBT-RA -Dr. Gauri Mirji		4,71,200	5,18,000	46,800		
128	F/DBT JRF/ Ameya Rayrikar		27,303	4,93,008	4,18,400	47,305	
129	F/DBT JRF/ Pramod Kumar		79,399	4,29,617	4,30,400		80,182
130	F/DBT/RA- Dr. Gouri Katre		1,61,548	7,35,145	7,26,000		1,52,403
131	F/DST INSPIRE/ Mayuri Shah		2,50,400				2,50,400
132	F/DST INSPIRE/ Pankuri K	23,558				23,558	
133	F/DST INSPIRE/ Shradhha Rahi		89,320	3,16,819	2,30,680		3,181
134	F/DST INSPIRE/ Sonali Mundhe			5,99,555	7,88,500		1,88,945
135	F/ICMR/ Gumaste U	42,498				42,498	
136	F/ICMR/ Neha Kulkarni		1,842	4,40,882	4,42,711		3,671
137	F/ICMR/ Niraj Ghatpande			1,40,903	3,80,666		2,39,763
138	F/ICMR/ Nishikant Dixit		15,223	2,87,010	1,90,333	81,454	
139	F/ICMR/ Prabir Kumar		5,000				5,000
140	F/SRF/ICMR/ Gayatri Kanade			3,19,320	4,56,800		1,37,480
141	F/SRF/ICMR/ Sulaxna Pandey			3,00,979	4,56,800		1,55,821
142	UGC ALL SCH.		5,26,013				5,26,013
143	UGC-Consolidated		1,34,689	1,34,689			
144	C V Raman Fellowship- Dr. Frank Ackah		707	707			
	Grand Total	**46,28,691**	**5,06,00,381**	**7,75,13,555**	**8,12,71,366**	**48,16,113**	**5,45,45,614**
			4,59,71,690				**4,97,29,501**

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

Schedules Forming Part of Balance Sheet as at 31.03.2019

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 Intitutions 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 hypothication 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 31.03.2019

Schedule 7: Current Liabilities & Provisions

Amount - Rs.

Particulars	Current Year		Previous Year	
A. Current Liabilities				
1. Acceptances	-		-	
2. Sundry Creditors:				
a) For Goods		75,488		2,73,925
3. Advances Received	-		-	
4. Interest Accrued but not due on:	-		-	
a) Secured Loans/borrowings	-		-	
b) Unsecured Loans/borrowings	-		-	
5. Statutory Liabilities:	-		-	
a) TDS Payable	4,27,234		41,335	
b) Service Tax Output Payable	5,27,391		45,064	
c) PF Commissioner A/c	7,57,289		2,91,193	
d) P.F. New Pension Scheme	4,85,191		1,22,210	
e) State Profession Tax	25,000	22,22,105	1,600	5,01,402
6. Other Current Liabilities	50,95,764	50,95,764	7,29,418	7,29,418
7. Unspent Balance of Grant	2,03,91,856		1,19,96,840	
8. Earnest Money Deposit	10,65,430		21,33,017	
9. Security Deposit	15,61,490		12,68,198	
10. Other Tution Fees & University Share	1,78,524		1,69,818	
11. Recovery of Bank Loan	3,700		1,500	
12. Workshops Meetings etc.	16,84,507		11,64,111	
13. Interest Earned Payable to DST	48,09,214		-	
14. Retention Money	1,52,967	2,98,47,688	1,52,967	1,68,86,451
Total (A)		**3,72,41,045**		**1,83,91,196**
B. Provisions				
1. For Taxation				
2. Gratuity	7,96,49,036		7,26,99,170	
3. Superannuation/Pension	-		-	
4. Accumulated Leave Encashment	5,39,79,410		4,83,47,312	
5. Trade Warranties/Claims	-		-	
6. Others	-		-	
- Salary Payable for March	82,34,085		82,89,864	
- Audit Fees	11,800		13,500	
- Electricity & Power	6,97,048		4,76,210	
- Postage & Telephone	62,816		1,13,265	
- Campus Maintainance	-		1,09,370	
- Security Service Charges	3,36,259		3,01,271	
- Hired Labour Charges	3,95,138		2,58,609	
Total (B)		**14,33,65,592**	**-**	**13,06,08,571**
Total (A+B)		**18,06,06,637**		**14,89,99,767**

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

Schedules Forming Part of Balance Sheet as at 31.03.2019

Schedule 8 : Fixed Assets

Amount - Rs.

DESCRIPTION	GROSS BLOCK						DEPRECIATION					NET BLOCK	
	Cost/ valuation As at beginning of the year	Rate of Dep.	Delitions during the year	Net cost as on 31.3.2019	Additions during the year	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	As at the Previous year-end
A FIXED ASSETS:													
1 LAND													
a>Freehold- Land at Hol	1,70,514	-	-	1,70,514	-	1,70,514	-	-	-	-	-	1,70,514	1,70,514
Land at Hol (Donated by G.O.M)	4,400	-	-	4,400	-	4,400	-	-	-	-	-	4,400	4,400
b> Leasehold			-	-	-	-	-	-	-	-	-	-	-
2 BUILDINGS:													
a> On Freehold	7,74,01,081	-	-	6,44,17,473	27,91,960	7,48,64,899	2,22,64,602	19,35,027	34,900	19,69,927	2,42,34,529	5,59,58,511	5,51,36,478
b> On Leasehold	-	-	-	-	-	-	-	-	-	-	-	-	
c> Ownership Flats/ Premises	-	-	-	-	-	-	-	-	-	-	-	-	
d> Superstructures on Land and not beloging to the entity	-	-	-	-	-	-	-	-	-	-	-	-	
e> Temprory Structures	23,12,701	2.5%	-	23,12,701	-	23,12,701	7,90,991	57,802	-	57,802	8,48,793	14,63,908	15,21,710
3 PLANT MACHINERY & EQUIPMENT	29,94,53,351	10% / 20%	27,960	29,94,25,391	1,27,75,709	31,22,01,100	22,13,73,079	1,16,388	21,93,221	23,09,609	22,36,82,687	8,85,18,413	7,80,80,274
4 VEHICLES	24,48,857	20%	-	24,48,857	7,79,523	32,28,380	21,33,281	-	77,952	77,952	22,11,233	10,17,147	3,15,575
5 FURNITURE,FIXTURES	3,35,17,833	10%	-	3,35,17,833	3,89,112	3,39,06,945	1,83,38,927	8,23,977	37,987	8,61,964	1,92,00,892	1,47,06,053	1,51,78,907
6 COMPUTER/PERIPHERALS	2,01,15,740	20%	-	2,01,15,740	3,79,043	2,04,94,783	1,88,76510	-	39,320	39,320	1,89,15,830	15,78,953	12,39,230
7 COMPUTER SOFTWARE	31,32,350	60%	-	31,32,350	7,30,262	38,62,612	22,73,716	-	2,24,929	2,24,929	24,98,645	13,63,967	8,58,634
8 ELECTRIC INSTALLATIONS	1,53,61,197	10%/ 15%	-	1,53,61,197	47,92,177	2,01,53,374	77,44,560	11,70,128	2,39,609	14,09,737	91,54,297	1,09,99,078	76,16,637
9 LIBRARY BOOKS	1,00,90,495	20%	-	1,00,90,495	7,96,455	1,08,86,950	89,10,119	-	1,03,419	1,03,419	90,13,538	18,73,412	11,80,376
10 OTHER FIXED ASSETS	1,01,75,046	-	-	1,01,75,046	-	1,01,75,046	26,67,040	2,54,376	-	2,54,376	29,21,416	72,53,630	75,08,006
TOTAL OF CURRENT YEAR	**47,41,83,565**		**27,960**	**-**	**2,34,34,241**	**49,22,61,704**	**30,53,72,825**	**43,57,698**	**29,51,337**	**73,09,035**	**31,26,81,859**	**18,49,07,987**	**16,88,10,742**
PREVIOUS YEAR	44,56,52,098		21,102	-	2,85,52,569	47,41,83,565	29,95,56,299	35,59,933	22,56,592	58,16,525	30,53,72,824	16,88,10,742	14,60,95,800
TOTAL (A)	**47,41,83,565**		**27,960**	**-**	**2,34,34,241**	**49,22,61,704**	**30,53,72,825**	**43,57,698**	**29,51,337**	**73,09,035**	**31,26,81,859**	**18,49,07,987**	**16,88,10,742**
B CAPITAL W.I.P													-
CENTRAL PUBLIC WORKS DEPT	88,33,905		88,40,518	-	1,30,06,613	-	-	-	-	-	-	1,30,00,000	88,33,905
TOTAL (A+B)												**19,79,07,987**	**17,76,44,647**

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 31.03.2019

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

Amount - Rs.

Particulars	Current Year	Previous Year
1. In Government Securities	-	-
2. Other approved Securities	-	-
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 Lab. Reserve Fund (Tech. Dev. Fund A/c: SBI & UBI)	7,67,42,840	8,22,11,879
8. Others (Fixed Deposits from Regular Grant-SBI & UBI)	1,88,62,477	6,77,51,923
TOTAL Rs.	**9,58,60,318**	**15,02,18,803**

Schedule 10: Investments - Others

Amount - Rs.

Particulars	Current Year	Previous Year
In Government Securities	0.00	0.00
Other approved Securities	0.00	0.00
Shares	0.00	0.00
Debentures and Bonds	0.00	0.00
Subsidiaries and Joint Ventures	0.00	0.00
TOTAL Rs.	0.00	0.00

Schedule 11: Current Assets, Loans & Advances

Amount - Rs.

Particulars	Current Year		Previous Year	
A. CURRENT ASSETS:				
1. Inventories:				
a> Stores and Spares				
b> Publications	20,525		41,295	
c> Stock-in-trade of consumables (as taken valued and certified by the Management)	3,23,846	3,44,371	3,65,819	4,07,114
2. Sundry Debtors:				
a> Debts Outstanding for a period exceeding six months				
3. Cash balances in hand (including cheques/drafts and imprest)	38,542	38,542	53,350	53,350
4. Bank Balances:				

Amount - Rs.

Particulars	Current Year		Previous Year	
a> With scheduled Banks				
-On Current Accounts	1,82,82,266		(29,62,990)	
-On Deposit Accounts	-		-	
-On Savings Accounts	2,78,64,698		27,54,597	
- On Current Accounts (TDF)	60,84,211	5,22,31,175	5,58,606	3,50,213
b> With non-Scheduled Banks:				
-On Current Accounts	-		-	
-On Deposit Accounts	-		-	
-On Savings Accounts	-		-	
TOTAL (A)		**5,26,14,088**		**8,10,677**
B. LOANS, ADVANCES AND OTHER ASSETS				
1. Loans:				
a) Staff (For HBA, Vehicle Advance and Computer)	54,725		1,35,555	
d) Amount receivable from Schemes	17,68,813	18,23,538	40,82,244	42,17,799
2. Advances and other amounts recoverable in cash or in kind or for value to be received:				
a> On Capital & Revenue Expenditure	-		-	
b> Prepayments (Cash Insurance)	-		1,284	
c> Advances to staff (For TA etc)	1,41,334		4,47,355	
e> Festival Advance	-		65,400	
f> Deposits kept with Govt. Agencies (MSEB, Telephone, Gas Cylinder etc.)	9,81,823	11,23,157	9,81,823	14,95,862
3. Income Accrued:				
a> On Investments from Earmarked/Endowment Funds	28,14,731		28,04,422	
b> On Loans and Advances (HBA, Vehicle Adv. & Computer Adv.)	8,950		12,550	
4. Claims Receivable	38,49,245		22,38,114	
5. GST Input /Service Tax Input	35,99,469		42,82,825	
6. Kumar Krishi Mitra Fellowship	31,281		31,281	
7. Royalty Receivable	-		-	
8. Amount Receivable from MACS	6,21,213	1,09,24,889	6,58,862	1,00,28,053
Total (B)		**1,38,71,584**		**1,57,41,714**
C. NET CURRENT ASSETS AGAINST SPONSORED SCHEMES		**4,97,29,501**		**-**
TOTAL (A+B+C)		**11,62,15,173**		**1,65,52,391**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2019

Schedule 12: Income From Sales/Services

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Sales		
a) Sales of Finished Goods (Farm Produce)	7,76,497	13,80,613
b) Sale of Raw Material	4,500	5,240
c) Sale of Scraps	17,665	17,364
2. Income from Services		
b) Cultural Identification Charges/Analytical Services	21,58,061	16,01,433
d) Others	99,332	1,250
e) Testing fees-Soyabean/Wheat	1,41,600	2,40,000
TOTAL Rs.	**31,97,715**	**32,45,900**

Schedule 13: Grants/Subsidies

Amount - Rs.

Particulars	Current Year	Previous Year
1. Central Government	19,09,97,000	16,99,21,000
Add: Unspent balance at the beginning of the year	1,19,96,840	88,75,820
Less: Unspent balance at the year end	2,03,91,856	1,19,96,840
	18,26,01,984	**16,67,99,980**
2. State Government	-	-
3. Government Agencies	-	-
4. Institutions/Welfare Bodies	-	-
5. International Organisations		-
6. Others (Specify)	-	-
Net Surplus of sale of Assets	-	-
TOTAL Rs.	**18,26,01,984**	**16,67,99,980**

* Unspent balance of grant is against recurring balance & non-recurring balance is regrouped under Schedule I Capital Fund

Schedule 14: Fees/Subscriptions

Amount - Rs.

Particulars	Current Year	Previous Year
1. Entrance Fees (Library Membership fees)	29,000	62,000
2. Annual Fees (Licence fees)/Subscriptions	11,056	22,992
3. Seminar/Program Fees	-	-
4. Others (Ph.D. Tuition fee, Ph.D.Provisional Admission fee)	2,02,900	3,15,596
TOTAL Rs.	**2,42,956**	**4,00,588**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2019

Schedule 15: Income From Investments

Amount - Rs.

Particulars	INVESTMENT FROM EARMARKED FUND		INVESTMENT - OTHERS	
	Current	Previous	Current	Previous
INCOME FROM INVESTMENTS: (Income on Invest. From Earmarked/ Endowment Funds transferred to Funds.)	Year	Year	Year	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 Rs.	**0.00**	**0.00**	**0.00**	**0.00**
TRANSFERRED TO EARMARKED/ ENDOWMENTFUND	**0.00**	**0.00**	**0.00**	**0.00**

Schedule 16: Income from Royalty, Publications, etc.

Amount - Rs.

Particulars	Current Year	Previous Year
1. Income from Royalty	-	-
2. Income from Publications	190	1,355
3. Others (Sale of Tender Forms/I Cards)	7,100	10,000
4. Application Money	14,050	37,700
TOTAL Rs.	**21,340**	**49,055**

Schedule 17 : Interest Earned

Amount - Rs.

Particulars	Current Year	Previous Year
1. On Term Deposits		
a) With Scheduled Banks	-	12,58,626
b) With Non-Scheduled Banks	-	-
2. On Saving Accounts		
a) With Scheduled Banks	-	2,15,562
b) With Non-Scheduled Banks	-	-
c) Post Office Savings Accounts	-	-
3. On Loans		
a) Employees/Staff (On HBA, Vehicle and Computer Advance)	1,66,371	1,58,899
b) Intrest Received on L.C	-	11,120
4. Interest on Debtors and Other Receivables	-	-
TOTAL Rs.	**1,66,371**	**16,44,207**

Interest earned on DST grant for F.Y 2018-19 shown as liability (payable to DST)

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2019

Schedule 18 : Other Income

Amount - Rs.

Particulars	Current Year	Previous Year
1) Profit on Sale/Disposal of Assets:		
a) Owned Assets	-	-
b) Assets acquired out of grants, or received free of cost		-
2) Export Incentives realized	-	-
3) Fees for Miscellaneous Services	6,00,220	4,92,072
4) Miscellaneous Income	3,51,068	1,14,000
TOTAL Rs.	**9,51,288**	**6,06,072**

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	3,23,846	3,65,819
- Finished Goods	1,16,561	-
- Publications	20,525	41,295
	4,60,932	4,07,114
b) Less: Opening Stock		
- Laboratory Consumables	3,65,819	6,62,749
- Finished Goods	-	-
- Publications	41,295	33,565
	4,07,114	6,96,314
Net Increase/(Decrease)	**53,818**	**(2,89,200)**

Schedule 20 : Establishment Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
1) Salaries and Wages	10,60,49,312	9,92,27,313
2) Allowances and Bonus	2,31,367	9,83,979
3) Contribution to Provident Fund & New Pension Scheme	1,04,35,039	91,26,221
4) Contribution to Other Fund (D.L.I.F.)	1,88,350	51,225
5) Staff Welfare Expenses	22,66,219	14,57,576
6) Expenses on Employees Reitrement and Terminal Benefits	2,69,62,283	2,16,10,796
7) Stipend to Research & Fellowship Students	30,80,976	66,11,306
8) Encashment of Earned Leave for LTC	10,20,814	31,11,716
TOTAL Rs.	**15,02,34,360**	**14,21,80,132**

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

Schedules forming part of Income & Expenditure Account for the year ended 31.03.2019

Schedule 21: Other Administrative Expenses

Amount - Rs.

Particulars	Current Year	Previous Year
Advertisement & Publicity	5,50,764	1,83,017
Auditors Remuneration	10,100	9,300
Electricity & Power	77,44,011	60,10,253
Farm Expenses	35,37,519	34,38,763
Hospitality Expenses	3,42,739	3,99,205
Insurance	5,019	2,408
Legal & Professional Fees	4,28,515	10,96,771
Other Office Expenses	3,02,148	6,60,064
Postage, Telephone & Communication	7,25,282	6,47,052
Printing & Stationery	8,21,486	8,19,968
Purchases of Chemicals & Glassware	62,98,331	94,88,109
Rent Rates & Taxes	16,94,131	17,38,871
Repairs & Maintenance	1,33,22,524	70,45,793
Retired Staff Medical Expenses	9,44,405	9,84,564
Security & Labour Expenses	78,55,021	45,55,444
Seminar /Workshop Expenses	9,25,110	2,29,653
Subscription Fees	22,72,494	23,25,484
Travelling & Conveyance	9,31,719	13,35,924
Vehicle Running and Maint Exps	2,25,231	1,46,142
Water Charges	5,92,709	6,75,172
TOTAL Rs.	**4,95,29,258**	**4,17,91,956**

Schedule 22: Expenditure on Grants, Subsidies etc.

Amount - Rs.

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**

Schedule 23 : Interest

Amount - Rs.

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 31.03.2019

Schedule D: Transfer to Capital Fund

Amount - Rs.

Particulars	Current Year		Previous Year	
Other Fixed Assets				
Books	7,96,455		7,85,654	
Buildings	27,91,960		-	
Computer / Peripherials/Softwares	11,09,305		2,58,536	
Office Furniture & Dead Stock	3,89,112		1,05,73,158	
Other Fixed Assets	-		6,613	
App. & Equipments	1,27,75,709		89,93,929	
Electrical Installation	47,92,177		79,34,679	
Vehicles	7,79,523			
		2,34,34,240		**2,85,52,569**

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

Sd/-
FINANCE & ACCOUNTS OFFICER
MACS ARI

Sd/-
OFFICIATING DIRECTOR
MACS ARI

Place: Pune
Date: 27/8/2019

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 31.03.2019

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.

It is not possible for us to verify the actual date of asset put to use and hence the same has been taken on the basis of information and explanation given by the management. Accordingly depreciation is calculated irrespective of put to use for the whole year.

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" is 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 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. 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:

1. All direct expenses attributable to fixed asset acquired are capitalized.

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
FRN :123794W

Sd/-
Prasad M Patankar
Proprietor
MRN : 113832

Sd/-
FINANCE & ACCOUNTS OFFICER
MACS ARI

Sd/-
OFFICIATING DIRECTOR
MACS ARI

Place: Pune
Date: 27/8/2019

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 31.03.2019

Schedule 25: Contingent 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)
- Letter of credit. opened by bank behalf of the entity -Nil(Previous Year- 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:

Grants are recognized on receipts. Grants received from Department of Science & Technology (DST) for Creation of Capital Assets are treated as Capital Fund of the Institute. Grants received for General, Salaries and Salaries-SC are treated as of revenue nature and shown under Income & Expenditure Account.

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.	Particular	For year ended 31st March 2019
1	Withdrawal Rate	2.00%
2	Discounting Rate	7.76%
3	Future Salary Rise	5.00%

The position of gratuity payable on death/retirement of employees and leave encashment as on 31st March, 2019 is as below

Particulars	Provision for Gratuity	Provision for Leave Encashment
Opening balance as on 1st April 2018	7,26,99,170	4,83,47,312
Add:- Addition during the year 2018-19	69,49,866	56,32,098
Less:- Deduction during the year 2018-19	.....	.....
Closing Balance as on 31st March 2019	7,96,49,036	5,39,79,410

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 is necessary for confirming the balances appearing in the books of account and also long outstanding of balances as at the Balance Sheet date, but 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. In case of items debited to Income and Expenditure account, it was informed to us that the expenditure is not of capital nature.

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

14. Interest Earned on DST Grant for F.Y 2018-19 shown as liability payable to DST, New Delhi.

As per our report of even date
For M/S P.M Patankar & Associates
Chartered Accountants
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FINANCE & ACCOUNTS OFFICER
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Prasad M Patankar
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MRN : 113832

Place: Pune
Date: 27/8/2019

Agharkar Research Institute co-hosted a
Symposium on
Glimpses of Science from North-East India

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Symbiosis Ishanya Cultural & Educational Centre (SICEC), Pune

ELTIS-SIFIL, Plot 419, Model Colony, Gokhale Cross Road, Next to Atur Centre, Pune - 411 016
Tel.: (020) 2566 2822 / 2567 7431 / 32 **Fax:** (020) 2567 3400 **E-mail :** director@eltis-symbiosis.org

Symposium on

Glimpses of Science from North-East India

(Focal Theme - Life Sciences)

Come all and enhance your knowledge about the potential of life sciences in North-East India !!!!

A unique opportunity to hear the experts live and to interact.

KEYNOTE SPEAKERS

- **Prof. Anupam Chatterjee**, Shillong on 'Oral and esophageal cancer in North-East India continues in epidemic proportions: evaluation of carcinogenic risks and its early detection'
- **Prof. Jyoti Prakash Tamang**, Gangtok on 'Understanding of ethno-microbiology to genomic sequencing of ethnic fermented foods and beverages'
- **Prof. Latha Rangan**, Guwahati on 'Combining the old with the new - "Nature is our prototype" new positives of research in the field of applied biodiversity'
- **Dr. Mohd. Aslam**, New Delhi on 'Biotech developments in NER'
- **Prof. Narayan Chandra Talukdar**, Guwahati on 'Bacterial diversity and its role in soil and rhizosphere with special reference to agri-eco systems in the valleys and hills of North East India'
- **Prof. Parimal Chandra Bhattacharjee**, Guwahati on 'Wildlife research and conservation action: an overview'

ENTRY FREE FOR ALL!!!

Time:
9.30 am to 1.30 pm

Day & Date:
Friday, August 31, 2018

Venue:
Symbiosis Vishwabhavan, Auditorium, S. B. Road, Pune

Co-Hosts:
- CSIR-National Chemical Laboratory, Pune (CSIR-NCL)
- Agharkar Research Institute, Pune (ARI)
- National Centre for Cell Science, Pune (NCCS)
- Symbiosis School of Biological Sciences, Pune (SSBS)

Partner : North-East Community Organization Pune (NECOP)

Maharashtra Association for the Cultivation of Science
Agharkar Research Institute

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